

Appendix E

Air Quality

APPENDIX E AIR QUALITY

Introduction

This Air Quality Appendix provides modeling assumptions and backup for results presented in Section 5.5 of the DPIR/DEIR. Included within this documentation is a brief description of the methodology employed along with pertinent calculations and data used in the emissions and dispersion calculations supporting the mesoscale, microscale, and stationary source air quality analyses.

Motor Vehicle Emission Rates (Microscale & Mesoscale)

The EPA MOBILE6.2 computer program generated motor vehicle emissions used in the garage stationary source analysis along with the mobile source CAL3QHC modeling and mesoscale analysis. The model input parameters were provided by MassDEP. Emission rates were derived for 2012 and 2022 for speed limits of 2.5, 10, 15, and 30 mph for use in the microscale analyses. The 10 mph rate was used to estimate parking garage emissions.

Mesoscale Analysis (including Greenhouse Gases)

A mesoscale analysis consists of using link and intersection data to calculate total emissions of NO_x, VOC, and GHG over the project transportation study area. All calculations are made using Microsoft Excel and are presented in this appendix.

CAL3QHC (Microscale) Analysis

For the intersections studied, the CAL3QHC model was applied to calculate CO concentrations at sensitive receptor locations using emission rates derived in MOBILE6.2. The intersection's queue links and free flow links were input to the model along with sensitive receptors at all locations nearby each intersection. The meteorological assumptions input into the model were a 1.0 meter per second wind speed, Pasquill-Gifford Class D stability combined with a mixing height of 1,000 meters. For each direction, the full range of wind directions at 10 degree intervals was examined. In addition, a surface roughness (z_0) of 175 cm was used for all intersections. Idle emission rates for queue links were based on 2.5 mph emission rates derived in MOBILE6.2 and converted from grams per mile to grams per hour. Emission rates for speeds of 10, 15, and 30 mph were used for right turn, left turn, and free flow links, respectively.

Stationary Source Emissions

Emissions for the heating combustion units were calculated using the latest DEP emission limits for boilers based on the Boiler Environmental Results Program (ERP). Boiler stack data were obtained from engineering plans, vendor data, and engineering judgment. The emergency generator emissions were calculated based on a g/bhp-hr emission factor provided by vendor information for typical size units. A combination of vendor data and engineering judgment were also used for the

CHP facility. Since final design has not yet been completed, all equipment provided is subject to change.

The hourly emission rates were converted to grams per second and input to the AERMOD model. For the NAAQS analysis, modeling was conducted for CO, SO₂, NO_x, PM-10, and PM-2.5.

All assumptions and data used in the stationary source emissions and stack parameter calculations are provided herein.

AERMOD

The EPA AERMOD model was used to calculate air quality impacts due to the installation of heating combustion boilers, emergency generators, CHP, and cooling towers. For non-combustion sources, ambient temperature releases were assumed; otherwise temperatures of the exhaust gas were used. Urban dispersion coefficients were used. Building downwash was accounted for in the modeling based on the building heights and projected widths of the buildings. The maximum modeled impacts from the stack sources were conservatively added to monitored background values for comparison to the NAAQS.

Boiler, Cooling Tower, Emergency
Generator, and CHP
Exhaust Emissions Calculations

Children's Hospital Boston - Clinical Tower

Heating Boilers

			Notes
Source Name		CBBBLR1-2	
Make		Cleaver Brooks	
Model		CBEX Prem	
Qty.		2	From 11/27/12 email from S. Carroll to C. Emil
Boiler Heat Input	MMBTU/hr (ea.):	33.500	
Boiler Emission Rates	lb/MMBTU	g/s	
NOx	0.035	0.14773	from Waldron NG data sheet
CO	0.036	0.15195	from Waldron NG data sheet
VOC	0.006	0.02533	from Waldron NG data sheet
PM-2.5	0.007	0.02955	from Waldron NG data sheet (filterable only)
PM-10	0.007	0.02955	from Waldron NG data sheet (filterable only)
SO2	0.0017	0.00718	from Waldron NG data sheet
CO2	115.385	487.02772	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
Gas Exit Temp	°F	508	from Waldron NG data sheet
Gas Exit Temp	°K	537.6	calculated
Exhaust air (CFM)	CFM	11659.14	from Waldron NG data sheet scaled to 33.5 MMBTU/hr
Gas Exit Velocity	fps	61.85	calculated
Gas Exit Velocity	mps	18.85	calculated
Roof Height	feet	161.00	from site plans
Stack height	feet above roofline	30	client stated
Stack height	feet	191	calculated
Stack height	meters	58.217	calculated
Stack Diameter	feet	2.000	assumed to meet exit velocity value
Stack Diameter	meters	0.610	calculated

Cooling Towers

			Notes
Designation		CCBCT1-4	From 11/27/12 email from S. Carroll to C. Emil (4) 1400 ton
Make		BAC	assumed
Model		3728C-2	assumed
Cooling Tower Rate	tons	1456	from mfg
Tower Overall Dimensions	feet	-24x21x16	from mfg
CT Stack Height (above roofline)	feet	16.42	from mfg
Primary Building Height (ft)	feet	161.00	from site plans
CT Stack Height	feet	177.4	calculated
CT Stack Height	meters	54.08	calculated
Number of cells (per tower)	#	2	from mfg
Cooling Tower Specs			
Cooling Tower Exhaust Flow	CFM	357720	from mfg
Cooling Tower Cell Exhaust Flow	CFM	178860	calculated (per cell)
Cooling Tower Cell Exhaust Flow	kg/s	94.1	calculated
Cooling Tower Exhaust Temp	°F	78	assumed
Cooling Tower Exhaust Temp	K	298.7	calculated
Cooling Tower Cell Diameter	feet	12	assumed essentially same 0.5xL
Cooling Tower Cell Diameter	meters	3.66	calculated
Cooling Tower Stack Velocity	fps	26.36	calculated
Cooling Tower Stack Velocity	mps	8.03	calculated
Cooling Tower Drift			
Drift Rate	% of circ water	0.001	assumed
Circulating Water Rate	gpm	4,368	assumed 3gpm/ton cooling
Circulating Water Rate	gph	262,080	calculated
TDS+TSS concentration in drift	mg/L	1,500	assumed
PM emission rate in drift (per cell)	lb/hr	0.016	calculated
PM emission rate in drift (per cell)	g/s	0.00207	calculated

Children's Hospital Boston - Clinical Tower

Emergency Generators

			Notes
Designation		CCBEG1-4	
Number		4	From 11/27/12 email from S. Carroll to C. Emil
Electrical output	kilowatts	2500	From 11/27/12 email from S. Carroll to C. Emil
Make		Caterpillar	Assumed
model		3516C	Assumed
Engine Horsepower	BHP	3604.00	Mfg data
Engine power	kilowatts	2687.50	calculated
Fuel consumption @full load	gph	173.30	Mfg data
Heat Input	MMBTU/hr:	23.7421	calculated
Stack Parameters			
<i>Exhaust Temperature</i>	°F	921.2	Mfg data
<i>Exhaust Temperature</i>	°K	767.2	calculated
Total Exhaust Flow	ACFM	19059.34	Mfg data
Flange Diameter	in.	8	Mfg data
Maximum Backpressure	in. H2O	26.9	Mfg data
Maximum velocity	fpm	16362.30	calculated
Flow area required	sq. ft	1.165	calculated
Number of exhausts (typ. 1 or 2)	#	1	from roof plan Roof-PH H1.P-H3.01.pdf
Selected silencer diameter	in	16	From 11/27/12 email from S. Carroll to C. Emil
Actual silencer opening area	sq. ft each	1.396	calculated
Actual velocity	fpm each	13650.247	calculated
Actual velocity	fps each	227.504	calculated
<i>Single Stack Effective Diameter</i>	ft	1.333	calculated
<i>Single Stack Effective Diameter</i>	m	0.406	calculated
<i>Single Stack Effective Velocity</i>	fps	227.504	calculated
<i>Single Stack Effective Velocity</i>	mps	69.343	calculated
Primary Building Height	ft	161.00	from site plans
<i>Stack Height (10' above roofline)</i>	ft	191.00	From 11/27/12 email from S. Carroll to C. Emil
<i>Stack Height</i>	m	58.22	calculated
Pollutant			
	Emission factor unit	Emission factor	
NOx	g/BHP-hr	6.05	EF from mfg data (Not to exceed)
CO	g/BHP-hr	0.74	EF from mfg data (Not to exceed)
VOC	g/BHP-hr	0.13	EF from mfg data (Not to exceed)
PM10	g/BHP-hr	0.05	EF from mfg data (Not to exceed)
PM2.5	g/BHP-hr	0.05	EF from mfg data (Not to exceed)
SO2	g/BHP-hr	0.004630658	15 ppm S mass conserved
HAPs	lb/MMBTU	0.00149	AP42 Table 3.4-4 & 3.3-2
CO2	lb/MMBTU	165	AP42 Table 3.4-1 & 3.3-1
Short Term Emission Rate			
NOx	g/s	0.2076	uses EPA "intermittent" factor (300 hrs/yr)
CO	g/s	0.7383	calculated
VOC	g/s	0.1348	calculated
PM10	g/s	0.0504	calculated
PM2.5	g/s	0.0504	calculated
SO2	g/s	0.0046	calculated
Long Term (300 hr/yr) Emission Rate			
NOx	g/s	0.2076	calculated
CO	g/s	0.0253	calculated
VOC	g/s	0.0046	calculated
PM10	g/s	0.0017	calculated
PM2.5	g/s	0.0017	calculated
SO2	g/s	0.00016	calculated

Children's Hospital Boston - Clinical Tower

Cogeneration Unit

			Notes
Designation		CHPRECIP	
Number		1	
Electrical output	kilowatts	1200	
Make			
model			
Fuel			
Horsepower	BrakeHP	1686.92	
Fuel consumption @full load	scf/hr	9076.92	
Heat Input	MMBTU/hr:	9.44	
Pollutant	Emission factor unit		
NOx	g/bhp-hr	1.00	
CO	g/bhp-hr	2.10E+00	
VOC	g/bhp-hr	3.50E-01	
PM10	lb/MMBtu	1.00E-02	
PM2.5	lb/MMBtu	1.00E-02	
SO2	lb/MMBtu	5.88E-04	
HAPs	lb/MMBtu	6.71E-02	
CO2	lb/MMBtu	1.10E+02	
Uncontrolled Emission Rates			
NOx	g/s	0.4686	
CO	g/s	0.9840	
VOC	g/s	0.1640	
PM10	g/s	0.0119	
PM2.5	g/s	0.0119	
SO2	g/s	0.0007	
Controlled Emission Rates			
NOx	g/s	0.0225	
CO	g/s	0.0285	
VOC	g/s	0.1640	
PM10	g/s	0.0119	
PM2.5	g/s	0.0119	
SO2	g/s	0.0007	
Stack Parameters			
<i>Exhaust Temperature</i>	°F	240	
<i>Exhaust Temperature</i>	°K	388.7	
Total Exhaust Flow	ACFM	4265.8	
Selected exhaust diameter	in	17.5	
<i>Single Stack Effective Diameter</i>	ft	1.458	
<i>Single Stack Effective Diameter</i>	m	0.445	
<i>Single Stack Effective Velocity</i>	fps	42.565	
<i>Single Stack Effective Velocity</i>	mps	12.974	
Primary Building Height	ft	161.00	
<i>Stack Height (30' above roofline)</i>	ft	191.00	
<i>Stack Height</i>	m	58.22	

Children's Hospital Boston - 819 Beacon Street

Heating Boilers

			Notes
Source Name			
Make		TBD	
Model		TBD	
Qty.		3	from roof plan
Boiler Heat Input	MMBTU/hr (ea.):	3.000	assumed
Boiler Emission Rates	lb/MMBTU	g/s	
NOx	0.035	0.01323	ERP limits
CO	0.080	0.03024	ERP limits
VOC	0.030	0.01134	ERP limits
PM-2.5	0.010	0.00378	ERP limits Assume PM10=PM2.5
PM-10	0.010	0.00378	ERP limits Assume PM10=PM2.5
SO2	0.0006	0.00022	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
CO2	115.385	43.61442	AP42 Table 1.4-2 (assuming 1040 Btu/scf)
Gas Exit Temp	°F	170	Assumed
Gas Exit Temp	°K	349.8	
Exhaust air (CFM)	CFM	1486.44	Assumed
Gas Exit Velocity	fps	45.42	calculated, 40 fps minimum
Gas Exit Velocity	mps	13.84	
Roof Height	feet	110.00	from site plans
Stack height	feet above roofline	10	ERP minimum
Stack height	feet	120	calculated
Stack height	meters	36.576	
Stack Diameter	feet	0.833	Assumed
Stack Diameter	meters	0.254	

Cooling Towers

			Notes
Designation		819CT1-2	2 cooling towers
Make		Marley	
Model		NC8405NLN2	
Cooling Tower Rate	tons	350	from mfg
Tower Overall Dimensions	feet	20'W X 20'L X 12'H	from mfg
CT Stack Height (above roofline)	feet	12	from mfg
Primary Building Height (ft)	feet	110.00	from site plans
CT Stack Height	feet	122.0	calculated
CT Stack Height	meters	37.19	calculated
Number of cells (per tower)	#	2	from mfg
Cooling Tower Specs			
Cooling Tower Exhaust Flow	CFM	177780	from mfg
Cooling Tower Cell Exhaust Flow	CFM	88890	calculated (per cell)
Cooling Tower Cell Exhaust Flow	kg/s	46.8	calculated
Cooling Tower Exhaust Temp	°F	90.4	from mfg
Cooling Tower Exhaust Temp	K	305.6	calculated
Cooling Tower Cell Diameter	feet	9	Fan width
Cooling Tower Cell Diameter	meters	2.74	calculated
Cooling Tower Stack Velocity	fps	23.29	calculated (per cell)
Cooling Tower Stack Velocity	mps	7.10	calculated
Cooling Tower Drift			
Drift Rate	% of circ water	0.001	assumed
Circulating Water Rate	gpm	1,400	from Mfg
Circulating Water Rate	gph	84,000	calculated
TDS+TSS concentration in drift	mg/L	1,500	assumed
PM emission rate in drift (per cell)	lb/hr	0.005	calculated
PM emission rate in drift (per cell)	g/s	0.00066	calculated (per cell)

Children's Hospital Boston - 819 Beacon Street

Emergency Generator

			Notes
Designation		819EG1	
Number		1	
Electrical output	kilowatts	750	
Make		CAT	Assumed
model		C27 DITA	Assumed
Engine Horsepower	BHP	1141.00	Mfg data
Engine power	kilowatts	850.84	calculated
Fuel consumption @full load	gph	53.50	Mfg data
Heat Input	MMBTU/hr:	7.3295	calculated
Stack Parameters			
<i>Exhaust Temperature</i>	°F	949.8	Mfg data
<i>Exhaust Temperature</i>	°K	783.0	calculated
Total Exhaust Flow	ACFM	5646.8	Mfg data
Flange Diameter	in.	8	assumed
Maximum Backpressure	in. H2O	40.2	Mfg data
Maximum velocity	fpm	20208.39	calculated
Flow area required	sq. ft	0.279	calculated
Number of exhausts (typ. 1 or 2)	#	1	assumed
Selected silencer diameter	in	8	assumed
Actual silencer opening area	sq. ft each	0.349	calculated
Actual velocity	fpm each	16176.890	calculated
Actual velocity	fps each	269.615	calculated
<i>Single Stack Effective Diameter</i>	ft	0.667	calculated
<i>Single Stack Effective Diameter</i>	m	0.203	calculated
<i>Single Stack Effective Velocity</i>	fps	269.615	calculated
<i>Single Stack Effective Velocity</i>	mps	82.179	calculated
Primary Building Height	ft	110.00	from site plans
<i>Stack Height (15' above roofline)</i>	ft	125.00	calculated
<i>Stack Height</i>	m	38.10	calculated
Pollutant			
	Emission factor unit	Emission factor	
NOx	g/BHP-hr	5.32	EF from mfg data
CO	g/BHP-hr	0.24	EF from mfg data
VOC	g/BHP-hr	0.03	EF from mfg data
PM10	g/BHP-hr	0.02	EF from mfg data
PM2.5	g/BHP-hr	0.02	EF from mfg data
SO2	g/BHP-hr	0.004515408	15 ppm S mass conserved
HAPs	lb/MMBTU	0.00149	AP42 Table 3.4-4
CO2	g/BHP-hr	464.44	EF from mfg data
Short Term Emission Rate			
NOx	g/s	0.0578	uses EPA "intermittent" factor (300 hrs/yr)
CO	g/s	0.0769	calculated
VOC	g/s	0.0088	calculated
PM10	g/s	0.0063	calculated
PM2.5	g/s	0.0063	calculated
SO2	g/s	0.0014	calculated
Long Term (300 hr/yr) Emission Rate			
NOx	g/s	0.0578	calculated
CO	g/s	0.0026	calculated
VOC	g/s	0.0003	calculated
PM10	g/s	0.0002	calculated
PM2.5	g/s	0.0002	calculated
SO2	g/s	0.00005	calculated

Mesoscale and GHG Emissions Calculations

Mesoscale Emissions Summary

Children's Hospital (819 Beacon Street)

Roads

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	39.64	6.18	84.03	13.11	63570.59	9917.01
2022 No Build	27.31	4.26	30.10	4.69	75498.02	11777.69
delta from Existing	-12.33	-1.92	-53.94	-8.41	11927.43	1860.68
2022 Build	27.38	4.27	30.17	4.71	75679.59	11806.02
delta from No Build	0.07	0.01	0.07	0.01	181.56	28.32

Intersections

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	7.32	1.14	4.50	0.70	1857.13	289.71
2022 No Build	10.06	1.57	2.99	0.47	3999.15	623.87
delta from Existing	2.74	0.43	-1.50	-0.23	2142.02	334.16
2022 Build	11.05	1.72	3.29	0.51	4392.85	685.28
delta from No Build	0.99	0.15	0.29	0.05	393.70	61.42

Total

Pollutant	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	46.96	7.33	88.53	13.81	65427.72	10206.72
2022 No Build	37.37	5.83	33.09	5.16	79497.17	12401.56
delta from Existing	-9.59	-1.50	-55.44	-8.65	14069.45	2194.83
2022 Build	38.43	5.99	33.46	5.22	80072.44	12491.30
delta from No Build	1.06	0.17	0.37	0.06	575.27	89.74

Minor differences in sums and/or differences are due to rounding of individual values.
 Pound per day to tons per year is based on an 85% factor to account for peak daily to annual data.

Children's Hospital (819 Beacon Street)

	Case 1
	2022
	Build minus No Action
Net VMT, miles/day	142.5
Roadway GHG, tpy	28.3
Net Delay, hrs/day	125.5
Intersection GHG, tpy	61.4
Net GHG Emissions, tpy	89.7
Percent Change	--

Children's Hospital (819 Beacon Street)

Regional Mesoscale Emissions Analysis - Roadway Emissions

Link Data

Link Number	Roadway Segment	Link Distance (miles)	Average Speed (mph)	AM Peak Hour Volume			PM Peak Hour Volume			K-factor	Average Daily Traffic (ADT) Volumes		
				2012 Existing	2022 No-Build	2022 Build	2012 Existing	2022 No-Build	2022 Build		2012 Existing	2022 No-Build	2022 Build
1	Deerfield St	0.25	30	30	32	32	45	48	48	10.0%	450	480	480
2	Commonwealth Ave (W of Kenmore)	0.25	30	1,025	1,088	1,088	1,125	1,188	1,188	10.0%	11,250	11,880	11,880
3	Commonwealth Ave (E of Kenmore)	0.25	30	2,815	3,299	3,357	3,185	3,651	3,703	10.0%	31,850	36,510	37,030
4	Brookline Ave (Kenmore to Overland)	0.20	30	700	834	851	720	888	903	10.0%	7,200	8,880	9,030
5	Overland St	0.08	30	50	183	225	115	253	291	10.0%	1,150	2,530	2,910
6	Brookline Ave (Overland to Fullerton/Kilmarnock)	0.10	30	770	993	1,019	810	1,040	1,063	10.0%	8,100	10,400	10,630
7	Fullerton St	0.07	30	390	675	675	420	648	648	10.0%	4,200	6,750	6,750
8	Kilmarnock St.	0.25	30	260	301	301	305	364	364	10.0%	3,050	3,640	3,640
9	Brookline Ave (Fullerton to Boylston/Park)	0.13	30	945	1,265	1,292	990	1,310	1,334	10.0%	9,900	13,100	13,340
10	Boylston St.	0.25	30	2,065	2,470	2,470	2,110	2,534	2,534	10.0%	21,100	25,340	25,340
11	Park Dr. (S of Brookline)	0.25	30	835	936	959	1,015	973	977	10.0%	10,150	9,730	9,770
12	Park Dr. (Brookline to Landmark)	0.05	30	1,075	1,121	1,134	1,650	1,815	1,837	10.0%	16,500	18,150	18,370
13	Landmark Ctr	0.02	30	30	64	64	175	377	377	10.0%	1,750	3,770	3,770
14	Park Dr (NB to Riverway)	0.05	30	450	512	512	775	885	885	10.0%	7,750	8,850	8,850
15	Park Dr (Uturn to Fenway)	0.01	30	235	266	269	270	385	405	10.0%	2,700	3,850	4,050
16	Park Dri (SB to Riverway)	0.05	30	340	361	365	515	542	567	10.0%	5,150	5,420	5,670
17	Park Dr. (SB to Fenway)	0.10	30	760	907	911	745	928	955	10.0%	7,600	9,280	9,550
18	Riverway (to Fenway)	0.08	30	815	861	861	740	756	756	10.0%	8,150	8,610	8,610
19	Brookline Ave. (RH Left to Park NB)	0.06	30	120	0	0	170	0	0	10.0%	1,700	0	0
20	Riverway (direct to Park NB)	0.12	30	0	74	104	0	116	122	10.0%	0	1,160	1,220
20	Brookline Ave. (Park to Fenway)	0.06	30	2,360	3,006	3,016	2,075	2,638	2,640	10.0%	23,600	30,060	30,160
21	Brookline Ave. (S of Fenway)	0.25	30	1,960	2,410	2,420	1,765	2,210	2,220	10.0%	19,600	24,100	24,200
22	Riverway to Brookline	0.05	30	1,575	1,769	1,772	1,485	1,685	1,712	10.0%	15,750	17,690	17,720
23	Fenway (S of Brookline)	0.25	30	715	795	797	775	1,013	1,032	10.0%	7,750	10,130	10,320
24	Beacon St (Kenmore to Maitland)	0.25	30	1,395	1,650	1,690	1,490	1,821	1,859	10.0%	14,900	18,210	18,590
25	Maitland St	0.04	30	80	243	338	95	290	374	10.0%	950	2,900	3,740
26	Mountfort St (Beacon to Park)	0.27	30	55	107	120	70	152	164	10.0%	700	1,520	1,640
27	Beacon St (Maitland to Munson)	0.04	30	1,415	1,570	1,622	1,460	1,622	1,668	10.0%	14,600	16,220	16,680
28	Munson St	0.04	30	15	15	31	15	15	30	10.0%	150	150	310
29	Beacon St (Munson to Arundel/Miner)	0.04	30	1,415	1,569	1,624	1,470	1,632	1,682	10.0%	14,700	16,320	16,820
30	Arundel St	0.05	30	45	47	47	40	41	41	10.0%	450	470	470
31	Miner St	0.07	30	130	164	164	125	144	144	10.0%	1,300	1,640	1,640
32	Beacon St (Miner to Aberdeen)	0.04	30	1,480	1,640	1,695	1,485	1,649	1,699	10.0%	14,850	16,490	16,990
33	Aberdeen St	0.08	30	25	31	31	25	28	28	10.0%	250	310	310
34	Beacon St (Aberdeen to Park)	0.06	30	1,475	1,635	1,692	1,475	1,639	1,689	10.0%	14,750	16,390	16,920
35	Park Dr (Beacon to Riverway)	0.15	30	1,240	1,416	1,460	1,625	1,829	1,398	10.0%	16,250	18,290	14,600
36	Beacon (W of Park)	0.25	30	1,475	1,579	1,591	1,425	1,534	1,543	10.0%	14,750	15,790	15,910
37	Park Dr. (Beacon to Mountfort)	0.13	30	850	940	940	1,040	1,141	1,141	10.0%	10,400	11,410	11,410
38	Mountfort St. (W of Park)	0.12	30	910	1,020	1,033	1,120	1,301	1,313	10.0%	11,200	13,010	13,130

Children's Hospital (819 Beacon Street)

Regional Mesoscale Emissions Analysis - Roadway Emissions
2012 Existing

Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
1 Deerfield St	450	0.25	112.5	30	0.02	5.530	0.341	0.086	0.013	3.398	0.739	0.184	0.029	1403.250	561.300	139.601	21.778
2 Commonwealth Ave (W of Kenmore)	11,250	0.25	2812.5	30	0.02	5.530	0.341	2.152	0.336	3.398	0.739	4.606	0.718	1403.250	561.300	3490.027	544.444
3 Commonwealth Ave (E of Kenmore)	31,850	0.25	7962.5	30	0.02	5.530	0.341	6.094	0.951	3.398	0.739	13.039	2.034	1403.250	561.300	9880.655	1541.382
4 Brookline Ave (Kenmore to Overland)	7,200	0.20	1440.0	30	0.02	5.530	0.341	1.107	0.173	3.398	0.739	2.361	0.368	1403.250	561.300	1788.131	278.948
5 Overland St	1,150	0.08	94.7	30	0.02	5.530	0.341	0.075	0.012	3.398	0.739	0.157	0.024	1403.250	561.300	118.231	18.444
6 Brookline Ave (Overland to Fullerton/Kilmarnock)	8,100	0.10	843.8	30	0.02	5.530	0.341	0.662	0.103	3.398	0.739	1.392	0.217	1403.250	561.300	1051.069	163.967
7 Fullerton St	4,200	0.07	297.5	30	0.02	5.530	0.341	0.238	0.037	3.398	0.739	0.493	0.077	1403.250	561.300	371.754	57.994
8 Kilmarnock St.	3,050	0.25	762.5	30	0.02	5.530	0.341	0.584	0.091	3.398	0.739	1.249	0.195	1403.250	561.300	946.185	147.605
9 Brookline Ave (Fullerton to Boylston/Park)	9,900	0.13	1308.8	30	0.02	5.530	0.341	1.017	0.159	3.398	0.739	2.153	0.336	1403.250	561.300	1628.035	253.973
10 Boylston St.	21,100	0.25	5275.0	30	0.02	5.530	0.341	4.037	0.630	3.398	0.739	8.638	1.348	1403.250	561.300	6545.740	1021.135
11 Park Dr. (S of Brookline)	10,150	0.25	2537.5	30	0.02	5.530	0.341	1.942	0.303	3.398	0.739	4.155	0.648	1403.250	561.300	3148.780	491.210
12 Park Dr. (Brookline to Landmark)	16,500	0.05	834.4	30	0.02	5.530	0.341	0.683	0.107	3.398	0.739	1.394	0.217	1403.250	561.300	1046.686	163.283
13 Landmark Ctr	1,750	0.02	38.4	30	0.02	5.530	0.341	0.035	0.005	3.398	0.739	0.066	0.010	1403.250	561.300	49.080	7.657
14 Park Dr (NB to Riverway)	7,750	0.05	374.3	30	0.02	5.530	0.341	0.308	0.048	3.398	0.739	0.626	0.098	1403.250	561.300	469.829	73.293
15 Park Dr (Utturn to Fenway)	2,700	0.01	15.3	30	0.02	5.530	0.341	0.021	0.003	3.398	0.739	0.031	0.005	1403.250	561.300	21.304	3.323
16 Park Dr (SB to Riverway)	5,150	0.05	257.5	30	0.02	5.530	0.341	0.211	0.033	3.398	0.739	0.430	0.067	1403.250	561.300	323.072	50.399
17 Park Dr. (SB to Fenway)	7,600	0.10	725.5	30	0.02	5.530	0.341	0.571	0.089	3.398	0.739	1.198	0.187	1403.250	561.300	904.253	141.063
18 Riverway (to Fenway)	8,150	0.08	668.4	30	0.02	5.530	0.341	0.530	0.083	3.398	0.739	1.106	0.173	1403.250	561.300	834.075	130.116
19 Brookline Ave. (RH Left to Park NB)	1,700	0.06	106.9	30	0.02	5.530	0.341	0.086	0.013	3.398	0.739	0.178	0.028	1403.250	561.300	133.738	20.863
20 Riverway (direct to Park NB)	0	0.12	0.0	30	0.02	5.530	0.341	0.000	0.000	3.398	0.739	0.000	0.000	1403.250	561.300	0.000	0.000
20 Brookline Ave. (Park to Fenway)	23,600	0.06	1309.6	30	0.02	5.530	0.341	1.064	0.166	3.398	0.739	2.183	0.341	1403.250	561.300	1640.886	255.978
21 Brookline Ave. (S of Fenway)	19,600	0.25	4900.0	30	0.02	5.530	0.341	3.750	0.585	3.398	0.739	8.024	1.252	1403.250	561.300	6080.403	948.543
22 Riverway to Brookline	15,750	0.05	856.1	30	0.02	5.530	0.341	0.897	0.109	3.398	0.739	1.428	0.223	1403.250	561.300	1072.935	167.378
23 Fenway (S of Brookline)	7,750	0.25	1937.5	30	0.02	5.530	0.341	1.483	0.231	3.398	0.739	3.173	0.495	1403.250	561.300	2404.241	375.062
24 Beacon St (Kenmore to Maitland)	14,900	0.25	3795.5	30	0.02	5.530	0.341	2.904	0.453	3.398	0.739	6.215	0.970	1403.250	561.300	4709.649	734.705
25 Maitland St	950	0.04	41.6	30	0.02	5.530	0.341	0.034	0.005	3.398	0.739	0.070	0.011	1403.250	561.300	52.248	8.151
26 Mountfort St (Beacon to Park)	700	0.27	190.9	30	0.02	5.530	0.341	0.146	0.023	3.398	0.739	0.312	0.049	1403.250	561.300	236.844	36.948
27 Beacon St (Maitland to Munson)	14,600	0.04	622.2	30	0.02	5.530	0.341	0.517	0.081	3.398	0.739	1.044	0.163	1403.250	561.300	782.444	122.061
28 Munson St	150	0.04	5.5	30	0.02	5.530	0.341	0.005	0.001	3.398	0.739	0.009	0.001	1403.250	561.300	6.914	1.079
29 Beacon St (Munson to Arundel/Miner)	14,700	0.04	595.8	30	0.02	5.530	0.341	0.498	0.078	3.398	0.739	1.001	0.156	1403.250	561.300	749.906	116.985
30 Arundel St	450	0.05	21.3	30	0.02	5.530	0.341	0.018	0.003	3.398	0.739	0.036	0.006	1403.250	561.300	26.753	4.173
31 Miner St	1,300	0.07	95.0	30	0.02	5.530	0.341	0.076	0.012	3.398	0.739	0.158	0.025	1403.250	561.300	118.723	18.521
32 Beacon St (Miner to Aberdeen)	14,850	0.04	627.2	30	0.02	5.530	0.341	0.522	0.081	3.398	0.739	1.053	0.164	1403.250	561.300	788.881	123.066
33 Aberdeen St	250	0.08	19.3	30	0.02	5.530	0.341	0.015	0.002	3.398	0.739	0.032	0.005	1403.250	561.300	24.062	3.754
34 Beacon St (Aberdeen to Park)	14,750	0.06	838.1	30	0.02	5.530	0.341	0.880	0.106	3.398	0.739	1.396	0.218	1403.250	561.300	1049.752	163.761
35 Park Dr (Beacon to Riverway)	16,250	0.15	2462.1	30	0.02	5.530	0.341	1.906	0.297	3.398	0.739	4.045	0.631	1403.250	561.300	3060.744	477.476
36 Beacon (W of Park)	14,750	0.25	3687.5	30	0.02	5.530	0.341	2.822	0.440	3.398	0.739	6.038	0.942	1403.250	561.300	4575.813	713.827
37 Park Dr. (Beacon to Mountfort)	10,400	0.13	1329.5	30	0.02	5.530	0.341	1.035	0.161	3.398	0.739	2.188	0.341	1403.250	561.300	1654.198	258.055
38 Mountfort St. (W of Park)	11,200	0.12	1321.5	30	0.02	5.530	0.341	1.031	0.161	3.398	0.739	2.176	0.340	1403.250	561.300	1644.948	256.612
Total	356600.000	4.869	51124.148					39.642	6.184			84.035	13.109			63570.590	9917.012

Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Children's Hospital (819 Beacon Street)

**Regional Mesoscale Emissions Analysis - Roadway Emissions
2022 No Build**

Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
1 Deerfield St	480	0.25	120.0	30	0.02	3.580	0.200	0.054	0.008	1.065	0.226	0.060	0.009	1423.450	569.380	151.051	23.564
2 Commonwealth Ave (W of Kenmore)	11,880	0.25	2970.0	30	0.02	3.580	0.200	1.336	0.208	1.065	0.226	1.488	0.232	1423.450	569.380	3738.522	583.209
3 Commonwealth Ave (E of Kenmore)	36,510	0.25	9127.5	30	0.02	3.580	0.200	4.105	0.640	1.065	0.226	4.572	0.713	1423.450	569.380	11489.345	1792.338
4 Brookline Ave (Kenmore to Overland)	8,880	0.20	1776.0	30	0.02	3.580	0.200	0.803	0.125	1.065	0.226	0.891	0.139	1423.450	569.380	2237.109	348.989
5 Overland St	2,530	0.08	208.4	30	0.02	3.580	0.200	0.097	0.015	1.065	0.226	0.106	0.016	1423.450	569.380	263.852	41.161
6 Brookline Ave (Overland to Fullerton/Kilmarnock)	10,400	0.10	1083.3	30	0.02	3.580	0.200	0.500	0.078	1.065	0.226	0.547	0.085	1423.450	569.380	1368.947	213.556
7 Fullerton St	6,750	0.07	478.1	30	0.02	3.580	0.200	0.226	0.035	1.065	0.226	0.243	0.038	1423.450	569.380	606.062	94.546
8 Kilmarnock St.	3,640	0.25	910.0	30	0.02	3.580	0.200	0.409	0.064	1.065	0.226	0.456	0.071	1423.450	569.380	1145.473	178.694
9 Brookline Ave (Fullerton to Boylston/Park)	13,100	0.13	1731.8	30	0.02	3.580	0.200	0.792	0.124	1.065	0.226	0.871	0.136	1423.450	569.380	2185.279	340.904
10 Boylston St.	25,340	0.25	6335.0	30	0.02	3.580	0.200	2.849	0.444	1.065	0.226	3.173	0.495	1423.450	569.380	7974.254	1243.984
11 Park Dr. (S of Brookline)	9,730	0.25	2432.5	30	0.02	3.580	0.200	1.094	0.171	1.065	0.226	1.218	0.190	1423.450	569.380	3061.937	477.662
12 Park Dr. (Brookline to Landmark)	18,150	0.05	917.8	30	0.02	3.580	0.200	0.444	0.069	1.065	0.226	0.469	0.073	1423.450	569.380	1167.928	182.197
13 Landmark Ctr	3,770	0.02	82.8	30	0.02	3.580	0.200	0.045	0.007	1.065	0.226	0.044	0.007	1423.450	569.380	107.255	16.732
14 Park Dr (NB to Riverway)	8,850	0.05	427.4	30	0.02	3.580	0.200	0.208	0.032	1.065	0.226	0.219	0.034	1423.450	569.380	544.238	84.901
15 Park Dr (Uturn to Fenway)	3,850	0.01	21.9	30	0.02	3.580	0.200	0.018	0.003	1.065	0.226	0.013	0.002	1423.450	569.380	30.815	4.807
16 Park Dr (SB to Riverway)	5,420	0.05	271.0	30	0.02	3.580	0.200	0.131	0.020	1.065	0.226	0.139	0.022	1423.450	569.380	344.904	53.805
17 Park Dr. (SB to Fenway)	9,280	0.10	885.8	30	0.02	3.580	0.200	0.411	0.064	1.065	0.226	0.447	0.070	1423.450	569.380	1120.035	174.725
18 Riverway (to Fenway)	8,610	0.08	706.1	30	0.02	3.580	0.200	0.330	0.052	1.065	0.226	0.357	0.056	1423.450	569.380	893.836	139.438
19 Brookline Ave. (RH Left to Park NB)	0	0.06	0.0	30	0.02	3.580	0.200	0.000	0.000	1.065	0.226	0.000	0.000	1423.450	569.380	0.000	0.000
20 Riverway (direct to Park NB)	1,160	0.12	136.2	30	0.02	3.580	0.200	0.063	0.010	1.065	0.226	0.069	0.011	1423.450	569.380	171.995	26.831
20 Brookline Ave. (Park to Fenway)	30,060	0.06	1668.1	30	0.02	3.580	0.200	0.801	0.125	1.065	0.226	0.851	0.133	1423.450	569.380	2120.130	330.740
21 Brookline Ave. (S of Fenway)	24,100	0.25	6025.0	30	0.02	3.580	0.200	2.709	0.423	1.065	0.226	3.018	0.471	1423.450	569.380	7584.038	1183.110
22 Riverway to Brookline	17,690	0.05	961.6	30	0.02	3.580	0.200	0.463	0.072	1.065	0.226	0.491	0.077	1423.450	569.380	1222.441	190.701
23 Fenway (S of Brookline)	10,130	0.25	2532.5	30	0.02	3.580	0.200	1.139	0.178	1.065	0.226	1.268	0.198	1423.450	569.380	3187.813	497.299
24 Beacon St (Kenmore to Maitland)	18,210	0.25	4638.7	30	0.02	3.580	0.200	2.085	0.325	1.065	0.226	2.323	0.362	1423.450	569.380	5838.743	910.844
25 Maitland St	2,900	0.04	126.9	30	0.02	3.580	0.200	0.062	0.010	1.065	0.226	0.065	0.010	1423.450	569.380	161.791	25.239
26 Mountfort St (Beacon to Park)	1,520	0.27	414.5	30	0.02	3.580	0.200	0.186	0.029	1.065	0.226	0.208	0.032	1423.450	569.380	521.693	81.384
27 Beacon St (Maitland to Munson)	16,220	0.04	691.2	30	0.02	3.580	0.200	0.340	0.053	1.065	0.226	0.355	0.055	1423.450	569.380	881.777	137.557
28 Munson St	150	0.04	5.5	30	0.02	3.580	0.200	0.003	0.000	1.065	0.226	0.003	0.000	1423.450	569.380	7.013	1.094
29 Beacon St (Munson to Arundel/Miner)	16,320	0.04	661.5	30	0.02	3.580	0.200	0.327	0.051	1.065	0.226	0.340	0.053	1423.450	569.380	844.534	131.747
30 Arundel St	470	0.05	22.3	30	0.02	3.580	0.200	0.011	0.002	1.065	0.226	0.011	0.002	1423.450	569.380	28.344	4.422
31 Miner St	1,640	0.07	119.9	30	0.02	3.580	0.200	0.056	0.009	1.065	0.226	0.061	0.009	1423.450	569.380	151.929	23.701
32 Beacon St (Miner to Aberdeen)	16,490	0.04	696.5	30	0.02	3.580	0.200	0.343	0.054	1.065	0.226	0.358	0.056	1423.450	569.380	888.614	138.624
33 Aberdeen St	310	0.08	23.9	30	0.02	3.580	0.200	0.011	0.002	1.065	0.226	0.012	0.002	1423.450	569.380	30.266	4.722
34 Beacon St (Aberdeen to Park)	16,390	0.06	931.3	30	0.02	3.580	0.200	0.447	0.070	1.065	0.226	0.475	0.074	1423.450	569.380	1183.262	184.589
35 Park Dr (Beacon to Riverway)	18,290	0.15	2771.2	30	0.02	3.580	0.200	1.262	0.197	1.065	0.226	1.393	0.217	1423.450	569.380	3494.576	545.154
36 Beacon (W of Park)	15,790	0.25	3947.5	30	0.02	3.580	0.200	1.775	0.277	1.065	0.226	1.977	0.308	1423.450	569.380	4968.961	775.158
37 Park Dr. (Beacon to Mountfort)	11,410	0.13	1458.7	30	0.02	3.580	0.200	0.668	0.104	1.065	0.226	0.734	0.115	1423.450	569.380	1840.971	287.191
38 Mountfort St. (W of Park)	13,010	0.12	1535.1	30	0.02	3.580	0.200	0.705	0.110	1.065	0.226	0.773	0.121	1423.450	569.380	1938.290	302.373

Total	419430.000	4.869	59853.358					27.311	4.260			30.095	4.695			75498.024	11777.692
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Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Children's Hospital (819 Beacon Street)

**Regional Mesoscale Emissions Analysis - Roadway Emissions
2022 Build**

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
1	Deerfield St	480	0.25	120.0	30	0.02	3.580	0.200	0.054	0.008	1.065	0.226	0.060	0.009	1423.450	569.380	151.051	23.564
2	Commonwealth Ave (W of Kenmore)	11,880	0.25	2970.0	30	0.02	3.580	0.200	1.336	0.208	1.065	0.226	1.488	0.232	1423.450	569.380	3738.522	583.209
3	Commonwealth Ave (E of Kenmore)	37,030	0.25	9257.5	30	0.02	3.580	0.200	4.163	0.649	1.065	0.226	4.637	0.723	1423.450	569.380	11652.984	1817.866
4	Brookline Ave (Kenmore to Overland)	9,030	0.20	1806.0	30	0.02	3.580	0.200	0.816	0.127	1.065	0.226	0.906	0.141	1423.450	569.380	2274.898	354.884
5	Overland St	2,910	0.08	239.7	30	0.02	3.580	0.200	0.112	0.017	1.065	0.226	0.121	0.019	1423.450	569.380	303.482	47.343
6	Brookline Ave (Overland to Fullerton/Kilmarnock)	10,630	0.10	1107.3	30	0.02	3.580	0.200	0.512	0.080	1.065	0.226	0.559	0.087	1423.450	569.380	1399.221	218.279
7	Fullerton St	6,750	0.07	478.1	30	0.02	3.580	0.200	0.226	0.035	1.065	0.226	0.243	0.038	1423.450	569.380	606.062	94.546
8	Kilmarnock St.	3,640	0.25	910.0	30	0.02	3.580	0.200	0.409	0.064	1.065	0.226	0.456	0.071	1423.450	569.380	1145.473	178.694
9	Brookline Ave (Fullerton to Boylston/Park)	13,340	0.13	1763.5	30	0.02	3.580	0.200	0.807	0.126	1.065	0.226	0.887	0.138	1423.450	569.380	2225.315	347.149
10	Boylston St.	25,340	0.25	6335.0	30	0.02	3.580	0.200	2.849	0.444	1.065	0.226	3.173	0.495	1423.450	569.380	7974.254	1243.984
11	Park Dr. (S of Brookline)	9,770	0.25	2442.5	30	0.02	3.580	0.200	1.098	0.171	1.065	0.226	1.223	0.191	1423.450	569.380	3074.525	479.626
12	Park Dr. (Brookline to Landmark)	18,370	0.05	928.9	30	0.02	3.580	0.200	0.450	0.070	1.065	0.226	0.475	0.074	1423.450	569.380	1182.085	184.405
13	Landmark Ctr	3,770	0.02	82.8	30	0.02	3.580	0.200	0.045	0.007	1.065	0.226	0.044	0.007	1423.450	569.380	107.255	16.732
14	Park Dr (NB to Riverway)	8,850	0.05	427.4	30	0.02	3.580	0.200	0.208	0.032	1.065	0.226	0.219	0.034	1423.450	569.380	544.238	84.901
15	Park Dr (Uturn to Fenway)	4,050	0.01	23.0	30	0.02	3.580	0.200	0.019	0.003	1.065	0.226	0.014	0.002	1423.450	569.380	32.416	5.057
16	Park Dr (SB to Riverway)	5,670	0.05	283.5	30	0.02	3.580	0.200	0.137	0.021	1.065	0.226	0.145	0.023	1423.450	569.380	360.813	56.287
17	Park Dr. (SB to Fenway)	9,550	0.10	911.6	30	0.02	3.580	0.200	0.423	0.066	1.065	0.226	0.460	0.072	1423.450	569.380	1152.622	179.809
18	Riverway (to Fenway)	8,610	0.08	706.1	30	0.02	3.580	0.200	0.330	0.052	1.065	0.226	0.357	0.056	1423.450	569.380	893.836	139.438
19	Brookline Ave. (RH Left to Park NB)	0	0.06	0.0	30	0.02	3.580	0.200	0.000	0.000	1.065	0.226	0.000	0.000	1423.450	569.380	0.000	0.000
20	Riverway (direct to Park NB)	1,220	0.12	143.3	30	0.02	3.580	0.200	0.066	0.010	1.065	0.226	0.072	0.011	1423.450	569.380	180.891	28.219
20	Brookline Ave. (Park to Fenway)	30,160	0.06	1673.7	30	0.02	3.580	0.200	0.804	0.125	1.065	0.226	0.854	0.133	1423.450	569.380	2127.183	331.841
21	Brookline Ave. (S of Fenway)	24,200	0.25	6050.0	30	0.02	3.580	0.200	2.721	0.424	1.065	0.226	3.030	0.473	1423.450	569.380	7615.507	1188.019
22	Riverway to Brookline	17,720	0.05	963.2	30	0.02	3.580	0.200	0.464	0.072	1.065	0.226	0.491	0.077	1423.450	569.380	1224.514	191.024
23	Fenway (S of Brookline)	10,320	0.25	2580.0	30	0.02	3.580	0.200	1.160	0.181	1.065	0.226	1.292	0.202	1423.450	569.380	3247.605	506.626
24	Beacon St (Kenmore to Maitland)	18,590	0.25	4735.5	30	0.02	3.580	0.200	2.129	0.332	1.065	0.226	2.372	0.370	1423.450	569.380	5960.584	929.851
25	Maitland St	3,740	0.04	163.6	30	0.02	3.580	0.200	0.080	0.013	1.065	0.226	0.084	0.013	1423.450	569.380	208.655	32.550
26	Mountfort St (Beacon to Park)	1,640	0.27	447.3	30	0.02	3.580	0.200	0.201	0.031	1.065	0.226	0.224	0.035	1423.450	569.380	562.880	87.809
27	Beacon St (Maitland to Munson)	16,680	0.04	710.8	30	0.02	3.580	0.200	0.350	0.055	1.065	0.226	0.365	0.057	1423.450	569.380	906.784	141.458
28	Munson St	310	0.04	11.3	30	0.02	3.580	0.200	0.006	0.001	1.065	0.226	0.006	0.001	1423.450	569.380	14.494	2.261
29	Beacon St (Munson to Arundel/Miner)	16,820	0.04	681.7	30	0.02	3.580	0.200	0.337	0.053	1.065	0.226	0.351	0.055	1423.450	569.380	870.408	135.784
30	Arundel St	470	0.05	22.3	30	0.02	3.580	0.200	0.011	0.002	1.065	0.226	0.011	0.002	1423.450	569.380	28.344	4.422
31	Miner St	1,640	0.07	119.9	30	0.02	3.580	0.200	0.056	0.009	1.065	0.226	0.061	0.009	1423.450	569.380	151.929	23.701
32	Beacon St (Miner to Aberdeen)	16,990	0.04	717.6	30	0.02	3.580	0.200	0.354	0.055	1.065	0.226	0.369	0.058	1423.450	569.380	915.558	142.827
33	Aberdeen St	310	0.08	23.9	30	0.02	3.580	0.200	0.011	0.002	1.065	0.226	0.012	0.002	1423.450	569.380	30.266	4.722
34	Beacon St (Aberdeen to Park)	16,920	0.06	961.4	30	0.02	3.580	0.200	0.461	0.072	1.065	0.226	0.490	0.076	1423.450	569.380	1221.525	190.558
35	Park Dr (Beacon to Riverway)	14,600	0.15	2212.1	30	0.02	3.580	0.200	1.007	0.157	1.065	0.226	1.112	0.173	1423.450	569.380	2789.547	435.169
36	Beacon (W of Park)	15,910	0.25	3977.5	30	0.02	3.580	0.200	1.789	0.279	1.065	0.226	1.992	0.311	1423.450	569.380	5006.724	781.049
37	Park Dr. (Beacon to Mountfort)	11,410	0.13	1458.7	30	0.02	3.580	0.200	0.668	0.104	1.065	0.226	0.734	0.115	1423.450	569.380	1840.971	287.191
38	Mountfort St. (W of Park)	13,130	0.12	1549.2	30	0.02	3.580	0.200	0.712	0.111	1.065	0.226	0.780	0.122	1423.450	569.380	1956.168	305.162
Total		422450.000	4.869	59995.902					27.380	4.271			30.168	4.706			75679.588	11806.016

Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Children's Hospital DPIR - (819 Beacon Street)	2012 Existing AM Peak			2012 Existing PM Peak		
	LOS	Delay (Sec)	Traffic Volume	LOS	Delay (Sec)	Traffic Volume
Intersections (Signalized and Unsignalized)						
2. Beacon Street & Park Drive	C	34.2	2490	E	71.6	2795
6. Beacon St, Mountfort St, & Maitland St	B	0.9	1480	A	2.7	1545
7. Riverway & Park Drive	B	13.1	1565	C	23.0	2120
8. Riverway & Park Drive	C	4.6	1575	E	4.7	1485
9. Park Dr. & Park Drive	A	4.1	1105	A	8.7	1825
10. Brookline Avenue, Riverway & Fenway	C	25.6	3365	C	23.4	3135
11. Brookline Avenue, Park Drive & Boylston Street	C	33.5	3655	C	34.1	3925
12. Brookline Avenue, Fullerton Street, & Kilmarnock Street	B	19.7	1175	C	30.5	1260
14. Beacon Street, Brookline Ave, Commonwealth Ave, & Deerfield St.	E	57.2	2895	D	49.0	3235
15. Riverway Ext. & Park Drive	A	1.7	444	A	7.3	811
1. Park Drive & Mountfort St.	A	9.8	885	A	11.5	1125
3. Beacon St. & Aberdeen St	A	0.3	1490	A	0.2	1495
4. Beacon St, Arundel St, & Miner St	A	2.1	1540	B	3.1	1560
5. Beacon St & Munson St	A	0.1	1420	A	0.2	1470
13. Brookline Ave & Overland St.	B	1.5	800	B	2.4	835

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.

Color Code:

Red – Signalized intersections at LOS D or worse.

Green – Top 3 signalized intersections based on volume.

Dark Blue – Volume increase >20%

Light Blue – Volume increase > 10%

Yellow – Unsignalized intersection with delay > 150s. Capped at 150s

Gold – Unsignalized intersection with missing delay. Assigned value based on HCM LOS

A – 10s

B – 15s

C – 25s

D – 35s

E – 50s

F or worse – 80s

Pink – Not analyzed or calculated.. Assumed same as No Action.

Children's Hospital DPIR - (819 Beacon Street)	2022 No Action AM Peak			2022 No Action PM Peak		
	LOS	Delay (Sec)	Traffic Volume	LOS	Delay (Sec)	Traffic Volume
<i>Intersections (Signalized and Unsignalized)</i>						
2. Beacon Street & Park Drive	E	66.0	2755	C	24.2	3095
6. Beacon S, Mountfort St, & Maitland St	B	14.0	1801	C	25.5	1913
7. Riverway & Park Drive	C	28.4	1882	F	147.6	2641
8. Riverway & Park Drive	C	33.7	1768	C	20.1	1684
9. Park Dr. & Park Drive	B	10.2	1186	B	19.4	2192
10. Brookline Avenue, Riverway & Fenway	C	25.3	3984	C	24.2	3769
11. Brookline Avenue, Park Drive & Boylston Street	E	69.5	4509	F	93.4	4679
12. Brookline Avenue, Fullerton Street, & Kilmarnock Street	C	22.1	1613	C	33.5	1675
14. Beacon Street, Brookline Ave, Commonwealth Ave, & Deerfield St.	F	81.2	3394	F	92.6	3766
15. Riverway Ext. & Park Drive	A	1.7	444	A	7.3	811
1. Park Drive & Mountfort St.	A	4.5	1025	B	8.7	1306
3. Beacon St. & Aberdeen St	A	0.4	1650	A	0.2	1658
4. Beacon St, Arundel St, & Miner St	B	2.3	1708	B	3.0	1733
5. Beacon St & Munson St	A	0.1	1574	A	0.2	1632
13. Brookline Ave & Overland St.	D	3.6	1038	D	24.2	1110

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.

Color Code:

Red – Signalized intersections at LOS D or worse.

Green – Top 3 signalized intersections based on volume.

Dark Blue – Volume increase >20%

Light Blue – Volume increase > 10%

Yellow – Unsignalized intersection with delay > 150s. Capped at 150s

Gold – Unsignalized intersection with missing delay. Assigned value based on HCM LOS

A – 10s

B – 15s

C – 25s

D – 35s

E – 50s

F or worse – 80s

Pink – Not analyzed or calculated.. Assumed same as No Action.

Children's Hospital DPIR - (819 Beacon Street)	2022 Build AM Peak				2022 Build PM Peak			
	LOS	Delay (Sec)	Traffic Volume	No-Build to Build Volume % Increase	LOS	Delay (Sec)	Traffic Volume	No-Build to Build Volume % Increase
<i>2. Beacon Street & Park Drive</i>	E	67.8	2812	2%	C	26.0	3145	2%
<i>6. Beacon S, Mountfort St, & Maitland St</i>	C	23.0	1901	6%	D	38.7	2003	5%
<i>7. Riverway & Park Drive</i>	D	40.2	1920	2%	F	164.3	2700	2%
<i>8. Riverway & Park Drive</i>	C	33.6	1772	0%	C	20.0	1711	2%
<i>9. Park Dr. & Park Drive</i>	B	11.4	1199	1%	B	19.5	2214	1%
<i>10. Brookline Avenue, Riverway & Fenway</i>	C	25.4	3996	0%	C	24.4	3798	1%
<i>11. Brookline Avenue, Park Drive & Boylston Street</i>	E	72.1	4545	1%	F	98.9	4704	1%
<i>12. Brookline Avenue, Fullerton Street, & Kilmarnock Street</i>	C	22.1	1640	2%	C	34.1	1699	1%
<i>14. Beacon Street, Brookline Ave, Commonwealth Ave, & Deerfield St.</i>	F	81.7	3452	2%	F	101.1	3818	1%
<i>15. Riverway Ext. & Park Drive</i>	A	1.8	484	9%	A	7.4	819	1%
<i>1. Park Drive & Mountfort St.</i>	A	4.5	1038	1%	B	9.0	1318	1%
<i>3. Beacon St. & Aberdeen St</i>	A	0.4	1706	3%	B	0.2	1710	3%
<i>4. Beacon St, Arundel St, & Miner St</i>	B	2.8	1763	3%	B	3.1	1783	3%
<i>5. Beacon St & Munson St</i>	A	0.2	1636	4%	A	0.4	1687	3%
<i>13. Brookline Ave & Overland St.</i>	D	4.4	1080	4%	D	43.4	1148	3%

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.
 Color Code:
 Red – Signalized intersections at LOS D or worse.
 Green – Top 3 signalized intersections based on volume.
 Dark Blue – Volume increase >20%
 Light Blue – Volume increase > 10%
 Yellow – Unsignalized intersection with delay > 150s. Capped at 150s
 Gold – Unsignalized intersection with missing delay. Assigned value based on HCM LOS
 A – 10s
 B – 15s
 C – 25s
 D – 35s
 E – 50s
 F or worse – 80s
 Pink – Not analyzed or calculated.. Assumed same as No Action.

Children's Hospital DPIR - (819 Beacon Street)

2012 Existing

K Factor 10% factors peak hour vehicle volumes to daily volumes
 Peak hr delay to daily Factor (8hr/day) 33% Factors peak hour delay to daily delay
 Daily delay to annual Factor (6 days/wk, 52 wk/yr) 85% factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
2. Beacon Street & Park Drive	52.90	27950	5.530	1.67	0.26	3.398	1.03	0.160	1403.250	423.53	66.071
6. Beacon S, Mountfort St, & Maitland St	1.80	15450	5.530	0.03	0.00	3.398	0.02	0.003	1403.250	7.97	1.243
7. Riverway & Park Drive	18.05	21200	5.530	0.43	0.07	3.398	0.27	0.041	1403.250	109.61	17.100
8. Riverway & Park Drive	4.65	15750	5.530	0.08	0.01	3.398	0.05	0.008	1403.250	20.98	3.273
9. Park Dr. & Park Drive	6.40	18250	5.530	0.13	0.02	3.398	0.08	0.013	1403.250	33.46	5.219
10. Brookline Avenue, Riverway & Fenway	24.50	33650	5.530	0.93	0.15	3.398	0.57	0.089	1403.250	236.16	36.840
11. Brookline Avenue, Park Drive & Boylston Street	33.80	39250	5.530	1.50	0.23	3.398	0.92	0.144	1403.250	380.02	59.283
12. Brookline Avenue, Fullerton Street, & Kilmarnock Street	25.10	12600	5.530	0.36	0.06	3.398	0.22	0.034	1403.250	90.59	14.132
14. Beacon Street, Brookline Ave, Commonwealth Ave, & Deerfield St.	53.10	32350	5.530	1.94	0.30	3.398	1.19	0.186	1403.250	492.06	76.761
15. Riverway Ext. & Park Drive	4.50	8110	5.530	0.04	0.01	3.398	0.03	0.004	1403.250	10.45	1.631
1. Park Drive & Mountfort St.	10.65	11250	5.530	0.14	0.02	3.398	0.08	0.013	1403.250	34.32	5.354
3. Beacon St. & Aberdeen St	0.25	14950	5.530	0.00	0.00	3.398	0.00	0.000	1403.250	1.07	0.167
4. Beacon St, Arundel St, & Miner St	2.60	15600	5.530	0.05	0.01	3.398	0.03	0.004	1403.250	11.62	1.812
5. Beacon St & Munson St	0.15	14700	5.530	0.00	0.00	3.398	0.00	0.000	1403.250	0.63	0.099
13. Brookline Ave & Overland St.	1.95	8350	5.530	0.02	0.00	3.398	0.01	0.002	1403.250	4.66	0.728
Totals	hrs	600.3032		7.32	1.14		4.50	0.70		1857.13	289.71

Children's Hospital DPIR - (819 Beacon Street)
2022 No Build

K Factor 10% factors peak hour vehicle volumes to daily volumes
 Peak hr delay to daily Factor (8hr/day) 33% Factors peak hour delay to daily delay
 Daily delay to annual Factor (6 days/wk, 52 wk/yr) 85% factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
2. Beacon Street & Park Drive	45.10	30950	3.580	1.02	0.16	1.065	0.30	0.047	1423.400	405.58	63.271
6. Beacon S, Mountfort St, & Maitland St	19.75	19130	3.580	0.28	0.04	1.065	0.08	0.013	1423.400	109.78	17.126
7. Riverway & Park Drive	88.00	26410	3.580	1.70	0.26	1.065	0.51	0.079	1423.400	675.29	105.345
8. Riverway & Park Drive	26.90	17680	3.580	0.35	0.05	1.065	0.10	0.016	1423.400	138.19	21.558
9. Park Dr. & Park Drive	14.80	21920	3.580	0.24	0.04	1.065	0.07	0.011	1423.400	94.26	14.705
10. Brookline Avenue, Riverway & Fenway	24.75	39840	3.580	0.72	0.11	1.065	0.21	0.033	1423.400	286.51	44.695
11. Brookline Avenue, Park Drive & Boylston Street	81.45	46790	3.580	2.79	0.43	1.065	0.83	0.129	1423.400	1107.35	172.746
12. Brookline Avenue, Fullerton Street, & Kilmarnock Street	27.80	16750	3.580	0.34	0.05	1.065	0.10	0.016	1423.400	135.30	21.107
14. Beacon Street, Brookline Ave, Commonwealth Ave, & Deerfield St.	86.90	37660	3.580	2.39	0.37	1.065	0.71	0.111	1423.400	950.91	148.342
15. Riverway Ext. & Park Drive	4.50	8110	3.580	0.03	0.00	1.065	0.01	0.001	1423.400	10.60	1.654
1. Park Drive & Mountfort St.	6.60	13060	3.580	0.06	0.01	1.065	0.02	0.003	1423.400	25.05	3.907
3. Beacon St. & Aberdeen St	0.30	16580	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	1.45	0.225
4. Beacon St, Arundel St, & Miner St	2.65	17330	3.580	0.03	0.01	1.065	0.01	0.002	1423.400	13.34	2.082
5. Beacon St & Munson St	0.15	16320	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	0.71	0.111
13. Brookline Ave & Overland St.	13.90	11100	3.580	0.11	0.02	1.065	0.03	0.005	1423.400	44.83	6.994
Totals	hrs	1274.395		10.06	1.57		2.99	0.47		3999.15	623.87

Children's Hospital DPIR - (819 Beacon Street)
2022 Build

K Factor 10% factors peak hour vehicle volumes to daily volumes
 Peak hr delay to daily Factor (8hr/day) 33% Factors peak hour delay to daily delay
 Daily delay to annual Factor (6 days/wk, 52 wk/yr) 85% factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
2. Beacon Street & Park Drive	46.90	31450	3.580	1.08	0.17	1.065	0.32	0.050	1423.400	428.58	66.859
6. Beacon S, Mountfort St, & Maitland St	30.85	20030	3.580	0.45	0.07	1.065	0.13	0.021	1423.400	179.55	28.009
7. Riverway & Park Drive	102.25	27000	3.580	2.02	0.31	1.065	0.60	0.094	1423.400	802.17	125.139
8. Riverway & Park Drive	26.80	17720	3.580	0.35	0.05	1.065	0.10	0.016	1423.400	137.99	21.526
9. Park Dr. & Park Drive	15.45	22140	3.580	0.25	0.04	1.065	0.07	0.012	1423.400	99.39	15.505
10. Brookline Avenue, Riverway & Fenway	24.90	39960	3.580	0.73	0.11	1.065	0.22	0.034	1423.400	289.11	45.101
11. Brookline Avenue, Park Drive & Boylston Street	85.50	47040	3.580	2.94	0.46	1.065	0.87	0.136	1423.400	1168.62	182.305
12. Brookline Avenue, Fullerton Street, & Kilmarnock Street	28.10	16990	3.580	0.35	0.05	1.065	0.10	0.016	1423.400	138.72	21.640
14. Beacon Street, Brookline Ave, Commonwealth Ave, & Deerfield St.	91.40	38180	3.580	2.55	0.40	1.065	0.76	0.118	1423.400	1013.96	158.178
15. Riverway Ext. & Park Drive	4.60	8190	3.580	0.03	0.00	1.065	0.01	0.001	1423.400	10.95	1.708
1. Park Drive & Mountfort St.	6.75	13180	3.580	0.07	0.01	1.065	0.02	0.003	1423.400	25.85	4.033
3. Beacon St. & Aberdeen St	0.30	17100	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	1.49	0.233
4. Beacon St, Arundel St, & Miner St	2.95	17830	3.580	0.04	0.01	1.065	0.01	0.002	1423.400	15.28	2.384
5. Beacon St & Munson St	0.30	16870	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	1.47	0.229
13. Brookline Ave & Overland St.	23.90	11480	3.580	0.20	0.03	1.065	0.06	0.009	1423.400	79.72	12.437
Totals	hrs	1399.855		11.05	1.72		3.29	0.51		4392.85	685.28

Mesoscale Emissions Summary

Children's Hospital (CCB)

Roads

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	31.08	4.85	65.73	10.25	49699.53	7753.13
2022 No Build	20.65	3.22	22.69	3.54	56895.27	8875.66
delta from Existing	-10.43	-1.63	-43.04	-6.71	7195.74	1122.54
2022 Build	20.95	3.27	23.01	3.59	57704.27	9001.87
delta from No Build	0.30	0.05	0.32	0.05	809.00	126.20

Intersections

	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	15.58	2.43	9.57	1.49	3953.09	616.68
2022 No Build	16.36	2.55	4.87	0.76	6504.83	1014.75
delta from Existing	0.78	0.12	-4.70	-0.73	2551.73	398.07
2022 Build	16.98	2.65	5.05	0.79	6752.44	1053.38
delta from No Build	0.62	0.10	0.19	0.03	247.61	38.63

Total

Pollutant	VOC lbs/day	VOC tons/yr	NOx lbs/day	NOx tons/yr	CO2 lbs/day	CO2 tons/yr
2012 Existing	46.66	7.28	75.30	11.75	53652.62	8369.81
2022 No Build	37.01	5.77	27.56	4.30	63400.10	9890.42
delta from Existing	-9.64	-1.50	-47.74	-7.45	9747.48	1520.61
2022 Build	37.93	5.92	28.07	4.38	64456.70	10055.25
delta from No Build	0.92	0.14	0.51	0.08	1056.60	164.83

Minor differences in sums and/or differences are due to rounding of individual values.
 Pound per day to tons per year is based on an 85% factor to account for peak daily to annual data.

Children's Hospital (CCB)

	Case 1
	2022
	Build minus No Action
Net VMT, miles/day	639.5
Roadway GHG, tpy	126.2
Net Delay, hrs/day	78.9
Intersection GHG, tpy	38.6
Net GHG Emissions, tpy	164.8
Percent Change	--

Children's Hospital (Children's Clinical Bldg.)

**Regional Mesoscale Emissions Analysis - Roadway Emissions
Link Data**

Link Number	Roadway Segment	Link Distance (miles)	Average Speed (mph)	AM Peak Hour Volume			PM Peak Hour Volume			K-factor	Average Daily Traffic (ADT) Volumes		
				2012 Existing	2022 No-Build	2022 Build	2012 Existing	2022 No-Build	2022 Build		2012 Existing	2022 No-Build	2022 Build
1	Longwood Ave (W of Riverway)	0.14	30	1,030	1,145	1,149	1,070	1,094	1,097	10.0%	10,700	11,450	11,490
2	Riverway (N of Longwood)	0.15	30	1,785	1,962	1,962	1,835	2,089	2,089	10.0%	18,350	20,890	20,890
3	Longwood Ave (Riverway to Masco/Pilgrim)	0.10	30	795	931	936	655	882	885	10.0%	7,950	9,310	9,360
4	Pilgrim Rd	0.08	30	110	289	289	135	323	325	10.0%	1,350	3,230	3,250
5	Masco Dr.	0.03	30	240	463	463	185	421	421	10.0%	2,400	4,630	4,630
6	Longwood Ave (Pilgrim to Brookline)	0.07	30	700	1,038	1,043	585	993	997	10.0%	7,000	10,380	10,430
7	Brookline Ave (N of Longwood)	0.06	30	1,630	2,151	2,194	1,585	2,136	2,176	10.0%	16,300	21,510	21,940
8	Longwood Ave (Brookline to Binney)	0.07	30	905	1,009	1,072	1,045	1,142	1,204	10.0%	10,450	11,420	12,040
9	Binney St (N of Longwood)	0.13	30	410	414	414	355	348	353	10.0%	4,100	4,140	4,140
10	Longwood Ave (Binney to Blackfan)	0.06	30	875	1,001	1,068	925	1,028	1,091	10.0%	9,250	10,280	10,910
11	Main Entrance	0.06	30	155	163	226	250	262	320	10.0%	2,500	2,620	3,200
12	Blackfan Circle	0.25	30	230	237	283	430	468	530	10.0%	4,300	4,680	5,300
13	Longwood (Blackfan to Ave Louis Pasteur)	0.11	30	770	765	884	790	878	913	10.0%	7,900	8,780	9,130
14	Louis Pasteur (Longwood to Blackfan)	0.17	30	425	445	455	325	360	372	10.0%	4,250	4,450	4,550
15	Louis Pasteur (N of Blackfan)	0.08	30	790	836	860	495	508	534	10.0%	7,900	8,360	8,600
16	Longwood (Louis Pasteur to Palace)	0.13	30	730	817	845	780	847	890	10.0%	7,800	8,470	8,900
17	Palace Rd	0.07	30	245	258	258	85	90	90	10.0%	2,450	2,580	2,580
18	Longwood (Palace to Huntington)	0.04	30	930	816	1,056	785	870	896	10.0%	9,300	8,700	10,560
19	Huntington (N of Longwood)	0.13	30	1,570	1,678	1,687	1,630	1,734	1,743	10.0%	16,300	17,340	17,430
20	Huntington (S of Longwood)	0.26	30	1,270	1,338	1,338	1,350	1,420	1,420	10.0%	13,500	14,200	14,200
21	Longwood (E of Huntington)	0.03	30	595	648	667	600	607	634	10.0%	6,000	6,480	6,670
22	Riverway (Longwood to Brookline)	0.29	30	1,845	1,966	1,966	1,845	1,862	1,862	10.0%	18,450	19,660	19,660
23	Deaconess (W of Brookline)	0.06	30	125	130	130	150	179	179	10.0%	1,500	1,790	1,790
24	Jimmy Fund Way	0.08	30	200	211	211	355	373	373	10.0%	3,550	3,730	3,730
25	Childrens Way	0.06	30	35	37	37	85	88	88	10.0%	850	880	880
26	Brookline Ave (Deaconess to Longwood)	0.08	30	1,270	1,604	1,622	1,340	1,654	1,670	10.0%	13,400	16,540	16,700
27	Binney St (Childrens Way to Longwood)	0.08	30	355	399	402	310	356	359	10.0%	3,550	3,990	4,020
28	Brookline Ave (Francis to Deaconess)	0.08	30	1,330	1,665	1,682	1,525	1,808	1,825	10.0%	15,250	18,080	18,250
29	Francis St (W of Brookline)	0.06	30	285	301	301	280	295	295	10.0%	2,850	3,010	3,010
30	Francis St (Brookline to Binney)	0.08	30	635	667	670	815	857	859	10.0%	8,150	8,570	8,590
31	Francis St (E of Binney)	0.14	30	720	756	756	660	695	695	10.0%	7,200	7,560	7,560
32	Binney St (Childrens Way to Shattuck)	0.03	30	445	493	496	315	360	362	10.0%	4,450	4,930	4,960
33	Shattuck St	0.13	30	110	123	123	120	126	126	10.0%	1,200	1,260	1,260
34	Binney St (Francis to Shattuck)	0.06	30	540	594	598	455	509	511	10.0%	5,400	5,940	5,980
35	Binney St (S of Francis)	0.04	30	180	216	216	170	209	209	10.0%	1,800	2,160	2,160
36	Brookline Ave (Francis to Riverway)	0.06	30	1,385	1,606	1,626	1,680	2,070	2,090	10.0%	16,800	20,700	20,900
37	Brookline (S of Riverway)	0.25	30	990	1,254	1,260	1,130	1,449	1,456	10.0%	11,300	14,490	14,560
38	Riverway (S of Brookline)	0.25	30	1,880	2,186	2,200	2,270	2,586	2,598	10.0%	22,700	25,860	25,980

Children's Hospital (Children's Clinical Bldg.)

Regional Mesoscale Emissions Analysis - Roadway Emissions
2012 Existing

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
1	Longwood Ave (W of Riverway)	10,700	0.14	1469.2	30	0.02	5,530	0.341	1,141	0.178	3,398	0.739	2,416	0.377	1403.250	561.300	1827.302	285.059
2	Riverway (N of Longwood)	18,350	0.15	2703.8	30	0.02	5,530	0.341	2,095	0.327	3,398	0.739	4,443	0.683	1403.250	561.300	3361.672	524.421
3	Longwood Ave (Riverway to Masco/Pilgrim)	7,950	0.10	779.9	30	0.02	5,530	0.341	0,613	0.096	3,398	0.739	1,287	0.201	1403.250	561.300	971.981	151.629
4	Pilgrim Rd	1,350	0.08	111.2	30	0.02	5,530	0.341	0,088	0.014	3,398	0.739	0,184	0.029	1403.250	561.300	138.793	21.652
5	Masco Dr.	2,400	0.03	72.7	30	0.02	5,530	0.341	0,063	0.010	3,398	0.739	0,123	0.019	1403.250	561.300	92.060	14.361
6	Longwood Ave (Pilgrim to Brookline)	7,000	0.07	472.0	30	0.02	5,530	0.341	0,379	0.059	3,398	0.739	0,784	0.122	1403.250	561.300	590.060	92.049
7	Brookline Ave (N of Longwood)	16,300	0.06	1049.6	30	0.02	5,530	0.341	0,844	0.132	3,398	0.739	1,744	0.272	1403.250	561.300	1312.873	204.808
8	Longwood Ave (Brookline to Binney)	10,450	0.07	752.1	30	0.02	5,530	0.341	0,601	0.094	3,398	0.739	1,247	0.195	1403.250	561.300	939.654	146.586
9	Binney St (N of Longwood)	4,100	0.13	532.7	30	0.02	5,530	0.341	0,414	0.065	3,398	0.739	0,876	0.137	1403.250	561.300	662.706	103.382
10	Longwood Ave (Binney to Blackfan)	9,250	0.06	546.6	30	0.02	5,530	0.341	0,442	0.069	3,398	0.739	0,910	0.142	1403.250	561.300	684.334	106.756
11	Main Entrance	2,500	0.06	159.1	30	0.02	5,530	0.341	0,128	0.020	3,398	0.739	0,264	0.041	1403.250	561.300	199.017	31.047
12	Blackfan Circle	4,300	0.25	1071.7	30	0.02	5,530	0.341	0,820	0.128	3,398	0.739	1,755	0.274	1403.250	561.300	1329.935	207.470
13	Longwood (Blackfan to Ave Louis Pasteur)	7,900	0.11	879.8	30	0.02	5,530	0.341	0,688	0.107	3,398	0.739	1,450	0.226	1403.250	561.300	1095.473	170.894
14	Louis Pasteur (Longwood to Blackfan)	4,250	0.17	735.7	30	0.02	5,530	0.341	0,567	0.089	3,398	0.739	1,207	0.188	1403.250	561.300	914.053	142.592
15	Louis Pasteur (N of Blackfan)	7,900	0.08	644.9	30	0.02	5,530	0.341	0,512	0.080	3,398	0.739	1,067	0.166	1403.250	561.300	804.787	125.547
16	Longwood (Louis Pasteur to Palace)	7,800	0.13	1041.5	30	0.02	5,530	0.341	0,809	0.126	3,398	0.739	1,713	0.267	1403.250	561.300	1295.491	202.097
17	Palace Rd	2,450	0.07	162.9	30	0.02	5,530	0.341	0,131	0.020	3,398	0.739	0,270	0.042	1403.250	561.300	203.650	31.769
18	Longwood (Palace to Huntington)	9,300	0.04	384.0	30	0.02	5,530	0.341	0,320	0.050	3,398	0.739	0,645	0.101	1403.250	561.300	483.149	75.371
19	Huntington (N of Longwood)	16,300	0.13	2046.8	30	0.02	5,530	0.341	1,594	0.249	3,398	0.739	3,369	0.525	1403.250	561.300	2546.795	397.300
20	Huntington (S of Longwood)	13,500	0.26	3577.0	30	0.02	5,530	0.341	2,735	0.427	3,398	0.739	5,856	0.914	1403.250	561.300	4437.986	692.326
21	Longwood (E of Huntington)	6,000	0.03	205.7	30	0.02	5,530	0.341	0,175	0.027	3,398	0.739	0,348	0.054	1403.250	561.300	259.679	40.510
22	Riverway (Longwood to Brookline)	18,450	0.29	5335.8	30	0.02	5,530	0.341	4,074	0.636	3,398	0.739	8,732	1.362	1403.250	561.300	6618.730	1032.522
23	Deaconess (W of Brookline)	1,500	0.06	95.2	30	0.02	5,530	0.341	0,077	0.012	3,398	0.739	0,158	0.025	1403.250	561.300	119.059	18.573
24	Jimmy Fund Way	3,550	0.08	276.3	30	0.02	5,530	0.341	0,220	0.034	3,398	0.739	0,458	0.071	1403.250	561.300	345.005	53.821
25	Childrens Way	850	0.06	54.3	30	0.02	5,530	0.341	0,044	0.007	3,398	0.739	0,090	0.014	1403.250	561.300	67.865	10.587
26	Brookline Ave (Deaconess to Longwood)	13,400	0.08	1131.9	30	0.02	5,530	0.341	0,896	0.140	3,398	0.739	1,872	0.292	1403.250	561.300	1412.190	220.302
27	Binney St (Childrens Way to Longwood)	3,550	0.08	294.5	30	0.02	5,530	0.341	0,233	0.036	3,398	0.739	0,487	0.076	1403.250	561.300	367.469	57.325
28	Brookline Ave (Francis to Deaconess)	15,250	0.08	1291.1	30	0.02	5,530	0.341	1,022	0.159	3,398	0.739	2,135	0.333	1403.250	561.300	1610.731	251.274
29	Francis St (W of Brookline)	2,850	0.06	181.4	30	0.02	5,530	0.341	0,146	0.023	3,398	0.739	0,301	0.047	1403.250	561.300	226.880	35.393
30	Francis St (Brookline to Binney)	8,150	0.08	620.5	30	0.02	5,530	0.341	0,494	0.077	3,398	0.739	1,028	0.160	1403.250	561.300	774.862	120.879
31	Francis St (E of Binney)	7,200	0.14	1028.2	30	0.02	5,530	0.341	0,797	0.124	3,398	0.739	1,690	0.264	1403.250	561.300	1278.522	199.449
32	Binney St (Childrens Way to Shattuck)	4,450	0.03	128.1	30	0.02	5,530	0.341	0,111	0.017	3,398	0.739	0,218	0.034	1403.250	561.300	162.350	25.327
33	Shattuck St	1,200	0.13	157.5	30	0.02	5,530	0.341	0,122	0.019	3,398	0.739	0,259	0.040	1403.250	561.300	195.931	30.565
34	Binney St (Francis to Shattuck)	5,400	0.06	324.2	30	0.02	5,530	0.341	0,262	0.041	3,398	0.739	0,539	0.084	1403.250	561.300	405.831	63.310
35	Binney St (S of Francis)	1,800	0.04	77.4	30	0.02	5,530	0.341	0,064	0.010	3,398	0.739	0,130	0.020	1403.250	561.300	97.309	15.180
36	Brookline Ave (Francis to Riverway)	16,800	0.06	1053.2	30	0.02	5,530	0.341	0,849	0.132	3,398	0.739	1,751	0.273	1403.250	561.300	1317.709	205.563
37	Brookline (S of Riverway)	11,300	0.25	2825.0	30	0.02	5,530	0.341	2,162	0.337	3,398	0.739	4,626	0.722	1403.250	561.300	3505.538	546.864
38	Riverway (S of Brookline)	22,700	0.25	5675.0	30	0.02	5,530	0.341	4,343	0.678	3,398	0.739	9,293	1.450	1403.250	561.300	7042.099	1098.567
	Total	308450.000	4.088	39948.295					31.077	4.848			65.727	10.253			49699.529	7753.127

Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Children's Hospital (Children's Clinical Bldg.)

**Regional Mesoscale Emissions Analysis - Roadway Emissions
2022 No Build**

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
1	Longwood Ave (W of Riverway)	11,450	0.14	1572.2	30	0.02	3,580	0.200	0.718	0.112	1,065	0.226	0.791	0.123	1423.450	569.380	1983.532	309.431
2	Riverway (N of Longwood)	20,890	0.15	3078.1	30	0.02	3,580	0.200	1,403	0.219	1,065	0.226	1,547	0.241	1423.450	569.380	3882.083	605.605
3	Longwood Ave (Riverway to Masco/Pilgrim)	9,310	0.10	913.4	30	0.02	3,580	0.200	0.423	0.066	1,065	0.226	0.461	0.072	1423.450	569.380	1154.643	180.124
4	Pilgrim Rd	3,230	0.08	266.1	30	0.02	3,580	0.200	0.124	0.019	1,065	0.226	0.135	0.021	1423.450	569.380	336.854	52.549
5	Masco Dr.	4,630	0.03	140.3	30	0.02	3,580	0.200	0.072	0.011	1,065	0.226	0.073	0.011	1423.450	569.380	180.155	28.104
6	Longwood Ave (Pilgrim to Brookline)	10,380	0.07	699.9	30	0.02	3,580	0.200	0.331	0.052	1,065	0.226	0.355	0.055	1423.450	569.380	887.569	138.461
7	Brookline Ave (N of Longwood)	21,510	0.06	1385.1	30	0.02	3,580	0.200	0.658	0.103	1,065	0.226	0.704	0.110	1423.450	569.380	1757.449	274.162
8	Longwood Ave (Brookline to Binney)	11,420	0.07	821.9	30	0.02	3,580	0.200	0.387	0.060	1,065	0.226	0.417	0.065	1423.450	569.380	1041.658	162.499
9	Binney St (N of Longwood)	4,140	0.13	537.9	30	0.02	3,580	0.200	0.246	0.038	1,065	0.226	0.271	0.042	1423.450	569.380	678.804	105.893
10	Longwood Ave (Binney to Blackfan)	10,280	0.06	607.5	30	0.02	3,580	0.200	0.290	0.045	1,065	0.226	0.309	0.048	1423.450	569.380	771.484	120.351
11	Main Entrance	2,620	0.06	166.7	30	0.02	3,580	0.200	0.079	0.012	1,065	0.226	0.085	0.013	1423.450	569.380	211.572	33.005
12	Blackfan Circle	4,680	0.25	1166.5	30	0.02	3,580	0.200	0.525	0.082	1,065	0.226	0.584	0.091	1423.450	569.380	1468.300	229.055
13	Longwood (Blackfan to Ave Louis Pasteur)	8,780	0.11	977.8	30	0.02	3,580	0.200	0.450	0.070	1,065	0.226	0.493	0.077	1423.450	569.380	1235.027	192.664
14	Louis Pasteur (Longwood to Blackfan)	4,450	0.17	770.3	30	0.02	3,580	0.200	0.349	0.055	1,065	0.226	0.387	0.060	1423.450	569.380	970.845	151.452
15	Louis Pasteur (N of Blackfan)	8,360	0.08	682.4	30	0.02	3,580	0.200	0.319	0.050	1,065	0.226	0.345	0.054	1423.450	569.380	863.908	134.770
16	Longwood (Louis Pasteur to Palace)	8,470	0.13	1130.9	30	0.02	3,580	0.200	0.517	0.081	1,065	0.226	0.569	0.089	1423.450	569.380	1427.021	222.615
17	Palace Rd	2,580	0.07	171.5	30	0.02	3,580	0.200	0.081	0.013	1,065	0.226	0.087	0.014	1423.450	569.380	217.543	33.937
18	Longwood (Palace to Huntington)	8,700	0.04	359.2	30	0.02	3,580	0.200	0.177	0.028	1,065	0.226	0.185	0.029	1423.450	569.380	458.484	71.524
19	Huntington (N of Longwood)	17,340	0.13	2177.4	30	0.02	3,580	0.200	0.998	0.156	1,065	0.226	1.096	0.171	1423.450	569.380	2748.291	428.733
20	Huntington (S of Longwood)	14,200	0.26	3762.5	30	0.02	3,580	0.200	1.890	0.264	1,065	0.226	1.884	0.294	1423.450	569.380	4735.301	738.707
21	Longwood (E of Huntington)	6,480	0.03	222.1	30	0.02	3,580	0.200	0.112	0.017	1,065	0.226	0.115	0.018	1423.450	569.380	284.491	44.381
22	Riverway (Longwood to Brookline)	19,660	0.29	5685.8	30	0.02	3,580	0.200	2.550	0.398	1,065	0.226	2.846	0.444	1423.450	569.380	7154.330	1116.075
23	Deaconess (W of Brookline)	1,790	0.06	113.6	30	0.02	3,580	0.200	0.054	0.008	1,065	0.226	0.058	0.009	1423.450	569.380	144.122	22.483
24	Jimmy Fund Way	3,730	0.08	290.3	30	0.02	3,580	0.200	0.136	0.021	1,065	0.226	0.147	0.023	1423.450	569.380	367.716	57.364
25	Childrens Way	880	0.06	56.2	30	0.02	3,580	0.200	0.027	0.004	1,065	0.226	0.029	0.004	1423.450	569.380	71.272	11.118
26	Brookline Ave (Deaconess to Longwood)	16,540	0.08	1397.1	30	0.02	3,580	0.200	0.652	0.102	1,065	0.226	0.707	0.110	1423.450	569.380	1768.198	275.839
27	Binney St (Childrens Way to Longwood)	3,990	0.08	331.0	30	0.02	3,580	0.200	0.155	0.024	1,065	0.226	0.168	0.026	1423.450	569.380	418.960	65.358
28	Brookline Ave (Francis to Deaconess)	18,080	0.08	1530.6	30	0.02	3,580	0.200	0.715	0.111	1,065	0.226	0.774	0.121	1423.450	569.380	1937.130	302.192
29	Francis St (W of Brookline)	3,010	0.06	191.5	30	0.02	3,580	0.200	0.091	0.014	1,065	0.226	0.097	0.015	1423.450	569.380	243.066	37.918
30	Francis St (Brookline to Binney)	8,570	0.08	652.5	30	0.02	3,580	0.200	0.306	0.048	1,065	0.226	0.331	0.052	1423.450	569.380	826.523	128.938
31	Francis St (E of Binney)	7,560	0.14	1079.6	30	0.02	3,580	0.200	0.493	0.077	1,065	0.226	0.543	0.085	1423.450	569.380	1361.773	212.437
32	Binney St (Childrens Way to Shattuck)	4,930	0.03	141.9	30	0.02	3,580	0.200	0.073	0.011	1,065	0.226	0.074	0.012	1423.450	569.380	182.451	28.462
33	Shattuck St	1,280	0.13	165.4	30	0.02	3,580	0.200	0.076	0.012	1,065	0.226	0.083	0.013	1423.450	569.380	208.689	32.556
34	Binney St (Francis to Shattuck)	5,940	0.06	356.6	30	0.02	3,580	0.200	0.170	0.027	1,065	0.226	0.182	0.028	1423.450	569.380	452.840	70.643
35	Binney St (S of Francis)	2,160	0.04	92.9	30	0.02	3,580	0.200	0.046	0.007	1,065	0.226	0.048	0.007	1423.450	569.380	118.452	18.479
36	Brookline Ave (Francis to Riverway)	20,700	0.06	1297.7	30	0.02	3,580	0.200	0.618	0.096	1,065	0.226	0.660	0.103	1423.450	569.380	1646.977	256.928
37	Brookline (S of Riverway)	14,490	0.25	3622.5	30	0.02	3,580	0.200	1.629	0.254	1,065	0.226	1.814	0.283	1423.450	569.380	4559.863	711.339
38	Riverway (S of Brookline)	25,860	0.25	6465.0	30	0.02	3,580	0.200	2.907	0.454	1,065	0.226	3.238	0.505	1423.450	569.380	8137.893	1269.511
Total		353050.000	4.088	45079.786					20.651	3.222			22.691	3.540			56895.270	8875.662

Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Children's Hospital (Children's Clinical Bldg.)

**Regional Mesoscale Emissions Analysis - Roadway Emissions
2022 Build**

	Link	Daily Average Volumes	Miles Per Link	Miles Traveled	Vehicle Speed (mph)	Avg Idle Time (hr/veh)	Idle M6.2 VOC (g/hr)	M6.2 VOC (g/mile)	lbs/day	tons/year	Idle M6.2 NOX (g/hr)	M6.2 NOX (g/mile)	lbs/day	tons/year	Idle M6.2 CO2 (g/hr)	M6.2 CO2 (g/mile)	lbs/day	tons/year
1	Longwood Ave (W of Riverway)	11,490	0.14	1577.7	30	0.02	3,580	0.200	0.721	0.112	1.065	0.226	0.794	0.124	1423.450	569.380	1990.461	310.512
2	Riverway (N of Longwood)	20,890	0.15	3078.1	30	0.02	3,580	0.200	1.403	0.219	1.065	0.226	1.547	0.241	1423.450	569.380	3882.083	605.605
3	Longwood Ave (Riverway to Masco/Pilgrim)	9,360	0.10	918.3	30	0.02	3,580	0.200	0.425	0.066	1.065	0.226	0.464	0.072	1423.450	569.380	1160.844	181.092
4	Pilgrim Rd	3,250	0.08	267.8	30	0.02	3,580	0.200	0.125	0.020	1.065	0.226	0.136	0.021	1423.450	569.380	338.940	52.875
5	Masco Dr.	4,630	0.03	140.3	30	0.02	3,580	0.200	0.072	0.011	1.065	0.226	0.073	0.011	1423.450	569.380	180.155	28.104
6	Longwood Ave (Pilgrim to Brookline)	10,430	0.07	703.2	30	0.02	3,580	0.200	0.333	0.052	1.065	0.226	0.357	0.056	1423.450	569.380	891.845	139.128
7	Brookline Ave (N of Longwood)	21,940	0.06	1412.8	30	0.02	3,580	0.200	0.671	0.105	1.065	0.226	0.718	0.112	1423.450	569.380	1792.581	279.643
8	Longwood Ave (Brookline to Binney)	12,040	0.07	866.5	30	0.02	3,580	0.200	0.408	0.064	1.065	0.226	0.440	0.069	1423.450	569.380	1098.210	171.321
9	Binney St (N of Longwood)	4,140	0.13	537.9	30	0.02	3,580	0.200	0.246	0.038	1.065	0.226	0.271	0.042	1423.450	569.380	678.804	105.893
10	Longwood Ave (Binney to Blackfan)	10,910	0.06	644.7	30	0.02	3,580	0.200	0.308	0.048	1.065	0.226	0.328	0.051	1423.450	569.380	818.763	127.727
11	Main Entrance	3,200	0.06	203.6	30	0.02	3,580	0.200	0.097	0.015	1.065	0.226	0.104	0.016	1423.450	569.380	258.409	40.312
12	Blackfan Circle	5,300	0.25	1321.0	30	0.02	3,580	0.200	0.594	0.093	1.065	0.226	0.662	0.103	1423.450	569.380	1662.819	259.400
13	Longwood (Blackfan to Ave Louis Pasteur)	9,130	0.11	1016.8	30	0.02	3,580	0.200	0.468	0.073	1.065	0.226	0.513	0.080	1423.450	569.380	1284.259	200.344
14	Louis Pasteur (Longwood to Blackfan)	4,550	0.17	787.6	30	0.02	3,580	0.200	0.357	0.056	1.065	0.226	0.395	0.062	1423.450	569.380	992.661	154.855
15	Louis Pasteur (N of Blackfan)	8,500	0.08	702.0	30	0.02	3,580	0.200	0.328	0.051	1.065	0.226	0.355	0.055	1423.450	569.380	888.709	138.639
16	Longwood (Louis Pasteur to Palace)	8,900	0.13	1188.4	30	0.02	3,580	0.200	0.543	0.085	1.065	0.226	0.598	0.093	1423.450	569.380	1499.467	233.917
17	Palace Rd	2,580	0.07	171.5	30	0.02	3,580	0.200	0.081	0.013	1.065	0.226	0.087	0.014	1423.450	569.380	217.543	33.937
18	Longwood (Palace to Huntington)	10,560	0.04	436.0	30	0.02	3,580	0.200	0.215	0.034	1.065	0.226	0.224	0.035	1423.450	569.380	556.505	86.815
19	Huntington (N of Longwood)	17,430	0.13	2188.7	30	0.02	3,580	0.200	1.003	0.157	1.065	0.226	1.102	0.172	1423.450	569.380	2762.555	430.959
20	Huntington (S of Longwood)	14,200	0.26	3762.5	30	0.02	3,580	0.200	1.890	0.264	1.065	0.226	1.884	0.294	1423.450	569.380	4735.301	738.707
21	Longwood (E of Huntington)	6,670	0.03	228.6	30	0.02	3,580	0.200	0.115	0.018	1.065	0.226	0.118	0.018	1423.450	569.380	292.832	45.682
22	Riverway (Longwood to Brookline)	19,660	0.29	5685.8	30	0.02	3,580	0.200	2.550	0.398	1.065	0.226	2.846	0.444	1423.450	569.380	7154.330	1116.075
23	Deaconess (W of Brookline)	1,790	0.06	113.6	30	0.02	3,580	0.200	0.054	0.008	1.065	0.226	0.058	0.009	1423.450	569.380	144.122	22.483
24	Jimmy Fund Way	3,730	0.08	290.3	30	0.02	3,580	0.200	0.136	0.021	1.065	0.226	0.147	0.023	1423.450	569.380	367.716	57.364
25	Childrens Way	880	0.06	56.2	30	0.02	3,580	0.200	0.027	0.004	1.065	0.226	0.029	0.004	1423.450	569.380	71.272	11.118
26	Brookline Ave (Deaconess to Longwood)	16,700	0.08	1410.6	30	0.02	3,580	0.200	0.659	0.103	1.065	0.226	0.714	0.111	1423.450	569.380	1785.303	278.507
27	Binney St (Childrens Way to Longwood)	4,020	0.08	333.5	30	0.02	3,580	0.200	0.156	0.024	1.065	0.226	0.169	0.026	1423.450	569.380	422.110	65.849
28	Brookline Ave (Francis to Deaconess)	18,250	0.08	1545.0	30	0.02	3,580	0.200	0.721	0.113	1.065	0.226	0.782	0.122	1423.450	569.380	1955.344	305.034
29	Francis St (W of Brookline)	3,010	0.06	191.5	30	0.02	3,580	0.200	0.091	0.014	1.065	0.226	0.097	0.015	1423.450	569.380	243.066	37.918
30	Francis St (Brookline to Binney)	8,590	0.08	654.0	30	0.02	3,580	0.200	0.307	0.048	1.065	0.226	0.331	0.052	1423.450	569.380	828.452	129.238
31	Francis St (E of Binney)	7,560	0.14	1079.6	30	0.02	3,580	0.200	0.493	0.077	1.065	0.226	0.543	0.085	1423.450	569.380	1361.773	212.437
32	Binney St (Childrens Way to Shattuck)	4,960	0.03	142.8	30	0.02	3,580	0.200	0.074	0.012	1.065	0.226	0.074	0.012	1423.450	569.380	183.582	28.636
33	Shattuck St	1,280	0.13	165.4	30	0.02	3,580	0.200	0.076	0.012	1.065	0.226	0.083	0.013	1423.450	569.380	208.689	32.556
34	Binney St (Francis to Shattuck)	5,980	0.06	359.0	30	0.02	3,580	0.200	0.171	0.027	1.065	0.226	0.183	0.029	1423.450	569.380	455.890	71.119
35	Binney St (S of Francis)	2,160	0.04	92.9	30	0.02	3,580	0.200	0.046	0.007	1.065	0.226	0.048	0.007	1423.450	569.380	118.452	18.479
36	Brookline Ave (Francis to Riverway)	20,900	0.06	1310.2	30	0.02	3,580	0.200	0.624	0.097	1.065	0.226	0.666	0.104	1423.450	569.380	1662.890	259.411
37	Brookline (S of Riverway)	14,560	0.25	3640.0	30	0.02	3,580	0.200	1.637	0.255	1.065	0.226	1.823	0.284	1423.450	569.380	4581.892	714.775
38	Riverway (S of Brookline)	25,980	0.25	6495.0	30	0.02	3,580	0.200	2.921	0.456	1.065	0.226	3.253	0.507	1423.450	569.380	8175.656	1275.402
Total		360190.000	4.088	45719.305					20.949	3.268			23.014	3.590			57704.266	9001.865

Notes: Daily to annual factor (6 days/week * 52 weeks per year / 365 days per year) = 85%

Children's Hospital DPIR (CCB)	2012 Existing AM Peak			2012 Existing PM Peak		
	LOS	Delay (Sec)	Traffic Volume	LOS	Delay (Sec)	Traffic Volume
1. Riverway & Longwood Avenue	F	56.0	2775	F	56.8	2830
2. Longwood Avenue & Pilgrim Road/MASCO	A	325.9	890	A	133.7	745
3. Brookline Avenue & Riverway	F	181.1	2890	F	97.1	3395
4. Brookline Avenue & Francis Street	D	54.5	1850	C	22.2	2095
5. Brookline Avenue & Deaconess/Jimmy Fund	F	100.9	1540	C	33.7	1725
6. Brookline Avenue & Longwood Avenue	D	40.5	2270	D	42.9	2320
10. Binney Street & Longwood Avenue	C	28.1	1295	D	36.3	1355
11. BCH Driveway/Blackfan Circle & Longwood Avenue	C	22.7	1065	C	27.9	1180
16. Huntington Avenue & Longwood Avenue	F	73.7	2015	C	33.9	1660
7. Binney Street & Francis Street	D	35.0	1095	D	35.0	1005
8. Binney Street & Shattuck Street	A	5.0	490	A	4.2	375
9. Binney Street & Jimmy Fund Way/BCH Driveway	B	11.5	560	A	9.8	495
12 Unnamed	A	1.6	780	A	9.6	700
13. Avenue Louis Pasteur & Longwood Ave	A	14.9	855	A	15.3	845
14. Avenue Louis Pasteur & Blackfan Circle	A	3.4	865	A	3.9	550
24 Riverway & Nessel Way	A	0.3	1922	A	0.4	1922
38. Palace Road & Longwood Ave	B	1.2	980	A	0.7	835

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.

Color Code:

Red – Signalized intersections at LOS D or worse.

Green – Top 3 signalized intersections based on volume.

Dark Blue – Volume increase > 20%

Light Blue – Volume increase > 10%

Yellow – Unsignalized intersection with delay > 150s. Capped at 150s

Gold – Unsignalized intersection with missing delay. Assigned value based on HCM LOS

A – 10s

B – 15s

C – 25s

D – 35s

E – 50s

F or worse – 80s

Pink – Not analyzed or calculated.. Assumed same as No Action.

Children's Hospital DPIR (CCB)	2022 No Action AM Peak			2022 No Action PM Peak		
	LOS	Delay (Sec)	Traffic Volume	LOS	Delay (Sec)	Traffic Volume
Intersections (Signalized and Unsignalized)						
1. Riverway & Longwood Avenue	F	108.8	3058	F	88.2	3203
2. Longwood Avenue & Pilgrim Road/MASCO	B	18.0	1329	D	52.8	1269
3. Brookline Avenue & Riverway	F	223.5	3462	F	177.4	4030
4. Brookline Avenue & Francis Street	E	78.9	2002	C	21.6	2282
5. Brookline Avenue & Deaconess/Jimmy Fund	F	255.4	1972	D	42.9	2174
6. Brookline Avenue & Longwood Avenue	F	105.2	2913	F	98.9	3012
10. Binney Street & Longwood Avenue	C	28.3	1424	C	30.6	1475
11. BCH Driveway/Blackfan Circle & Longwood Avenue	C	22.9	1170	C	29.8	1292
16. Huntington Avenue & Longwood Avenue	F	104.0	2167	D	40.7	1751
7. Binney Street & Francis Street	E	50.0	1177	D	35.0	1088
8. Binney Street & Shattuck Street	A	2.5	541	A	4.2	425
9. Binney Street & Jimmy Fund Way/BCH Driveway	B	12.5	615	B	10.5	545
12 Unnamed	A	1.6	874	A	10.1	776
13. Avenue Louis Pasteur & Longwood Ave	A	19.4	944	A	19.0	938
14. Avenue Louis Pasteur & Blackfan Circle	A	4.1	923	A	4.2	578
24 Riverway & Nessel Way	A	0.3	1922	A	0.4	1922
38. Palace Road & Longwood Ave	B	1.4	1081	A	0.7	922

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.
 Color Code:
 Red – Signalized intersections at LOS D or worse.
 Green – Top 3 signalized intersections based on volume.
 Dark Blue – Volume increase > 20%
 Light Blue – Volume increase > 10%
 Yellow – Unsignalized intersection with delay > 150s. Capped at 150s
 Gold – Unsignalized intersection with missing delay. Assigned value based on HCM LOS
 A – 10s
 B – 15s
 C – 25s
 D – 35s
 E – 50s
 F or worse – 80s
 Pink – Not analyzed or calculated.. Assumed same as No Action.

Children's Hospital DPIR (CCB)	2022 Build AM Peak				2022 Build PM Peak			
	LOS	Delay (Sec)	Traffic Volume	No-Build to Build Volume % Increase	LOS	Delay (Sec)	Traffic Volume	No-Build to Build Volume % Increase
1. Riverway & Longwood Avenue	F	110.3	3062	0%	F	88.4	3206	0%
2. Longwood Avenue & Pilgrim Road/MASCO	B	16.8	1334	0%	D	52.7	1272	0%
3. Brookline Avenue & Riverway	F	223.7	3482	1%	F	179.6	4049	0%
4. Brookline Avenue & Francis Street	F	81.2	2022	1%	C	21.7	2302	1%
5. Brookline Avenue & Deaconess/Jimmy Fund	F	260.0	1990	1%	D	43.5	2191	1%
6. Brookline Avenue & Longwood Avenue	F	110.2	2978	2%	F	107.4	3073	2%
10. Binney Street & Longwood Avenue	C	29.4	1490	5%	C	30.3	1540	4%
11. BCH Driveway/Blackfan Circle & Longwood Avenue	C	24.8	1296	11%	C	29.9	1407	9%
16. Huntington Avenue & Longwood Avenue	F	116.4	2187	1%	D	42.8	1762	1%
7. Binney Street & Francis Street	E	50.0	1180	0%	D	35.0	1090	0%
8. Binney Street & Shattuck Street	A	2.4	545	1%	A	4.2	427	0%
9. Binney Street & Jimmy Fund Way/BCH Driveway	B	12.6	618	0%	B	10.5	547	0%
12 Unnamed	A	1.6	902	3%	B	10.3	802	3%
13. Avenue Louis Pasteur & Longwood Ave	A	25.7	980	4%	A	30.8	992	6%
14. Avenue Louis Pasteur & Blackfan Circle	A	4.8	947	3%	A	4.6	606	5%
24 Riverway & Nessel Way	A	0.3	1922		A	0.4	1922	
38. Palace Road & Longwood Ave	B	1.4	1108	2%	A	0.7	948	3%

LOS is HCM value for signalized intersections and ICU value for unsignalized intersections.
 Color Code:
 Red – Signalized intersections at LOS D or worse.
 Green – Top 3 signalized intersections based on volume.
 Dark Blue – Volume increase >20%
 Light Blue – Volume increase > 10%
 Yellow – Unsignalized intersection with delay > 150s. Capped at 150s
 Gold – Unsignalized intersection with missing delay. Assigned value based on HCM LOS
 A – 10s
 B – 15s
 C – 25s
 D – 35s
 E – 50 s
 F or worse – 80s
 Pink – Not analyzed or calculated.. Assumed same as No Action.

Children's Hospital DPIR (CCB)
2012 Existing

K Factor 10% factors peak hour vehicle volumes to daily volumes
 Peak hr delay to daily Factor (8hr/day) 33% Factors peak hour delay to daily delay
 Daily delay to annual Factor (6 days/wk, 52 wk/yr) 85% factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
1. Riverway & Longwood Avenue	56.40	28300	5.530	1.80	0.28	3.398	1.11	0.173	1403.250	457.21	71.324
2. Longwood Avenue & Pilgrim Road/MASCO	229.80	8900	5.530	2.31	0.36	3.398	1.42	0.221	1403.250	585.85	91.393
3. Brookline Avenue & Riverway	139.10	33950	5.530	5.33	0.83	3.398	3.28	0.511	1403.250	1352.74	211.028
4. Brookline Avenue & Francis Street	38.35	20950	5.530	0.91	0.14	3.398	0.56	0.087	1403.250	230.14	35.902
5. Brookline Avenue & Deaconess/Jimmy Fund	67.30	17250	5.530	1.31	0.20	3.398	0.81	0.126	1403.250	332.55	51.877
6. Brookline Avenue & Longwood Avenue	41.70	23200	5.530	1.09	0.17	3.398	0.67	0.105	1403.250	277.12	43.231
10. Binney Street & Longwood Avenue	32.20	13550	5.530	0.49	0.08	3.398	0.30	0.047	1403.250	124.98	19.497
11. BCH Driveway/Blackfan Circle & Longwood Avenue	25.30	11800	5.530	0.34	0.05	3.398	0.21	0.032	1403.250	85.52	13.341
16. Huntington Avenue & Longwood Avenue	53.80	20150	5.530	1.22	0.19	3.398	0.75	0.117	1403.250	310.53	48.443
7. Binney Street & Francis Street	35.00	10950	5.530	0.43	0.07	3.398	0.27	0.041	1403.250	109.78	17.126
8. Binney Street & Shattuck Street	4.60	4900	5.530	0.03	0.00	3.398	0.02	0.002	1403.250	6.46	1.007
9. Binney Street & Jimmy Fund Way/BCH Driveway	10.65	5600	5.530	0.07	0.01	3.398	0.04	0.006	1403.250	17.08	2.665
12 Unnamed	5.60	7800	5.530	0.05	0.01	3.398	0.03	0.005	1403.250	12.51	1.952
13. Avenue Louis Pasteur & Longwood Ave	15.10	8550	5.530	0.15	0.02	3.398	0.09	0.014	1403.250	36.98	5.769
14. Avenue Louis Pasteur & Blackfan Circle	3.65	8650	5.530	0.04	0.01	3.398	0.02	0.003	1403.250	9.04	1.411
24 Riverway & Nessel Way	0.35	19220	5.530	0.01	0.00	3.398	0.00	0.001	1403.250	1.93	0.301
38. Palace Road & Longwood Ave	0.95	9800	5.530	0.01	0.00	3.398	0.01	0.001	1403.250	2.67	0.416
Totals	hrs	1277.808		15.58	2.43		9.57	1.49		3953.09	616.68

Children's Hospital DPIR (CCB)
2022 No Build

K Factor 10% factors peak hour vehicle volumes to daily volumes
 Peak hr delay to daily Factor (8hr/day) 33% Factors peak hour delay to daily delay
 Daily delay to annual Factor (6 days/wk, 52 wk/yr) 85% factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
1. Riverway & Longwood Avenue	98.50	32030	3.580	2.31	0.36	1.065	0.69	0.107	1423.400	916.71	143.007
2. Longwood Avenue & Pilgrim Road/MASCO	35.40	13290	3.580	0.34	0.05	1.065	0.10	0.016	1423.400	136.70	21.325
3. Brookline Avenue & Riverway	200.45	40300	3.580	5.90	0.92	1.065	1.76	0.274	1423.400	2347.20	366.164
4. Brookline Avenue & Francis Street	50.25	22820	3.580	0.84	0.13	1.065	0.25	0.039	1423.400	333.19	51.978
5. Brookline Avenue & Deaconess/Jimmy Fund	149.15	21740	3.580	2.37	0.37	1.065	0.70	0.110	1423.400	942.16	146.976
6. Brookline Avenue & Longwood Avenue	102.05	30120	3.580	2.25	0.35	1.065	0.67	0.104	1423.400	893.12	139.326
10. Binney Street & Longwood Avenue	29.45	14750	3.580	0.32	0.05	1.065	0.09	0.015	1423.400	126.22	19.690
11. BCH Driveway/Blackfan Circle & Longwood Avenue	26.35	12920	3.580	0.25	0.04	1.065	0.07	0.012	1423.400	98.92	15.431
16. Huntington Avenue & Longwood Avenue	72.35	21670	3.580	1.15	0.18	1.065	0.34	0.053	1423.400	455.55	71.066
7. Binney Street & Francis Street	42.50	11770	3.580	0.37	0.06	1.065	0.11	0.017	1423.400	145.35	22.674
8. Binney Street & Shattuck Street	3.35	5410	3.580	0.01	0.00	1.065	0.00	0.001	1423.400	5.27	0.821
9. Binney Street & Jimmy Fund Way/BCH Driveway	11.50	6150	3.580	0.05	0.01	1.065	0.02	0.002	1423.400	20.55	3.206
12 Unnamed	5.85	8740	3.580	0.04	0.01	1.065	0.01	0.002	1423.400	14.86	2.318
13. Avenue Louis Pasteur & Longwood Ave	19.20	9440	3.580	0.13	0.02	1.065	0.04	0.006	1423.400	52.66	8.216
14. Avenue Louis Pasteur & Blackfan Circle	4.15	9230	3.580	0.03	0.00	1.065	0.01	0.001	1423.400	11.13	1.736
24 Riverway & Nessel Way	0.35	19220	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	1.95	0.305
38. Palace Road & Longwood Ave	1.05	10810	3.580	0.01	0.00	1.065	0.00	0.000	1423.400	3.30	0.514
Totals	hrs	2072.872		16.36	2.55		4.87	0.76		6504.83	1014.75

Children's Hospital DPIR (CCB)
2022 Build

K Factor 10% factors peak hour vehicle volumes to daily volumes
 Peak hr delay to daily Factor (8hr/day) 33% Factors peak hour delay to daily delay
 Daily delay to annual Factor (6 days/wk, 52 wk/yr) 85% factors peak daily delay to annual delay

Intersection	Average Peak Delay time (s)	Traffic Volume (adt)	Idle MOBILE6 VOC (g/hr)	VOC (lb/day)	VOC (tpy)	Idle MOBILE6 NOX (g/hr)	NOX (lb/day)	NOX (tpy)	Idle MOBILE6 CO2 (g/hr)	CO2 (lb/day)	CO2 (tpy)
1. Riverway & Longwood Avenue	99.35	32060	3.580	2.33	0.36	1.065	0.69	0.108	1423.400	925.49	144.376
2. Longwood Avenue & Pilgrim Road/MASCO	34.75	13340	3.580	0.34	0.05	1.065	0.10	0.016	1423.400	134.69	21.012
3. Brookline Avenue & Riverway	201.65	40490	3.580	5.97	0.93	1.065	1.78	0.277	1423.400	2372.39	370.093
4. Brookline Avenue & Francis Street	51.45	23020	3.580	0.87	0.14	1.065	0.26	0.040	1423.400	344.14	53.685
5. Brookline Avenue & Deaconess/Jimmy Fund	151.75	21910	3.580	2.43	0.38	1.065	0.72	0.113	1423.400	966.07	150.708
6. Brookline Avenue & Longwood Avenue	108.80	30730	3.580	2.44	0.38	1.065	0.73	0.113	1423.400	971.47	151.550
10. Binney Street & Longwood Avenue	29.85	15400	3.580	0.34	0.05	1.065	0.10	0.016	1423.400	133.57	20.837
11. BCH Driveway/Blackfan Circle & Longwood Avenue	27.35	14070	3.580	0.28	0.04	1.065	0.08	0.013	1423.400	111.81	17.443
16. Huntington Avenue & Longwood Avenue	79.60	21870	3.580	1.27	0.20	1.065	0.38	0.059	1423.400	505.83	78.909
7. Binney Street & Francis Street	42.50	11800	3.580	0.37	0.06	1.065	0.11	0.017	1423.400	145.72	22.732
8. Binney Street & Shattuck Street	3.30	5450	3.580	0.01	0.00	1.065	0.00	0.001	1423.400	5.23	0.815
9. Binney Street & Jimmy Fund Way/BCH Driveway	11.55	6180	3.580	0.05	0.01	1.065	0.02	0.002	1423.400	20.74	3.235
12 Unnamed	5.95	9020	3.580	0.04	0.01	1.065	0.01	0.002	1423.400	15.59	2.433
13. Avenue Louis Pasteur & Longwood Ave	28.25	9920	3.580	0.20	0.03	1.065	0.06	0.010	1423.400	81.43	12.703
14. Avenue Louis Pasteur & Blackfan Circle	4.70	9470	3.580	0.03	0.01	1.065	0.01	0.002	1423.400	12.93	2.017
24 Riverway & Nessel Way	0.35	19220	3.580	0.00	0.00	1.065	0.00	0.000	1423.400	1.95	0.305
38. Palace Road & Longwood Ave	1.05	11080	3.580	0.01	0.00	1.065	0.00	0.000	1423.400	3.38	0.527
Totals	hrs	2151.776		16.98	2.65		5.05	0.79		6752.44	1053.38

Mesoscale MOBILE6.2 Emission Factor Summary

Year	MAX Summer/Winter			
	Speed	VOC	NOX	CO2
2012	Idle	5.53	3.3975	1403.25
2012	2.5	2.212	1.359	561.3
2012	5	0.948	1.221	561.3
2012	10	0.574	1.021	561.3
2012	15	0.462	0.889	561.3
2012	20	0.399	0.812	561.3
2012	25	0.364	0.766	561.3
2012	30	0.341	0.739	561.3
2012	35	0.325	0.733	561.3
2012	40	0.317	0.75	561.3
2012	45	0.312	0.783	561.3
2012	50	0.307	0.832	561.3
2012	55	0.302	0.902	561.3
2012	60	0.301	1.001	561.3
2012	65	0.301	1.194	561.3
2022	Speed	VOC	NOX	CO2
2022	Idle	3.58	1.065	1423.45
2022	2.5	1.432	0.426	569.38
2022	5	0.601	0.375	569.38
2022	10	0.357	0.312	569.38
2022	15	0.284	0.27	569.38
2022	20	0.24	0.247	569.38
2022	25	0.216	0.234	569.38
2022	30	0.2	0.226	569.38
2022	35	0.188	0.223	569.38
2022	40	0.181	0.229	569.38
2022	45	0.178	0.238	569.38
2022	50	0.175	0.251	569.38
2022	55	0.173	0.268	569.38
2022	60	0.173	0.292	569.38
2022	65	0.174	0.325	569.38

All factors in grams/mile except Idle (grams/hour)

**MOBILE6.2 Microscale
Emission Factor Summary**

**Children's Hospital - Boston, MA
 Calculation of Microscale Modeling Emission Factors
 Summary of MOBILE6 Output**

Carbon Monoxide Only

Queues			Idle	
Free Flow			30 mph	
Right Turns			10 mph	
Left Turns			15 mph	
Winter	2012	2022		Units
Idle	50.215	45.893		g/hr
2.5 mph	20.086	18.357		g/mile
10 mph	10.834	10.310		g/mile
15 mph	9.736	9.364		g/mile
30 mph	8.682	8.468		g/mile

Note: Winter CO emission factors are higher than Summer and are conservatively used

Model Input/Output Files

Due to excessive size AERMOD, CAL3QHC, and MOBILE6.2 input and output files are available on digital media upon request.