Appendix D8
Air Quality
Supplemental Information

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Acronyms

BRT ..... Bus Rapid Transit
CO ..... Carbon monoxide
CO_2e ..... Carbon dioxide equivalent
EPA ..... U.S. Environmental Protection Agency
GBNRTC ..... Greater Buffalo Niagara Regional Transportation Council
LRT ..... Light-Rail Transit
NAAQS ..... National Ambient Air Quality Standards
NYSDOT ..... New York State Department of Transportation
$PM_{2.5}$ ..... Particulate matter less than 2.5 micrometers in diameter
PM_{10} ..... Particulate matter less than 10 micrometers in diameter
VMT ..... Vehicle miles traveled

Appendix D. Air Quality Supplemental Information

This appendix includes additional technical details related to the regional emissions burden analysis and carbon monoxide microscale analysis that are presented in Air Quality Section 4.14.

D.1 REGIONAL CRITERIA POLLUTANT AND EMISSION BURDEN ANALYSIS

A regional (or mesoscale) analysis of a project determines a project's overall impact on regional air quality levels. A regional analysis was performed for the LRT Build Alternative and the BRT Build Alternative using methodology from FTA's Capital Investment Grants Policy Guidance[1]. The guidance provides information to predict the transit ridership and the associated reduction in vehicle miles traveled (VMT) due to riders replacing vehicle trips with transit trips. The guidance also provides emission factors to determine a project's environmental benefits. The Project's reduction in air pollutants were determined by multiplying the projected decrease in VMT in the Project corridor by emission factors for 20-year horizon estimates, as summarized in Table D-1. Emission Factors for 20-year Horizon Estimates in grams/VMT.

Table D-1. Emission Factors for 20-year Horizon Estimates in grams/VMT

Mode	CO	NOX	VOC	PM2.5	CO2e
Automobile	1.20	0.01	0.01	0.006	319

Source: FTA Capital Investment Grant Policy Guidance https://www.transit.dot.gov/sites/fta.dot.gov/files/2024-12/CIG-Policy-Guidance-December-2024.pdf

D.2 CARBON MONOXIDE MICROSCALE ANALYSIS

Microscale carbon monoxide (CO) air quality modeling was performed using EPA guidance to determine the potential concentrations at receptors in the vicinity of intersections in the project area. Modeling was performed with the CAL3QHC dispersion modeling, with local traffic data and MOVES emission factors used as inputs, as described in the following sections.

[1] Federal Transit Administration (FTA), Capital Investment Grants Policy Guidance. December 2024. https://www.transit.dot.gov/sites/fta.dot.gov/files/2024-12/CIG-Policy-Guidance-December-2024.pdf

D.2.1 CAL3QHC Model Options

The most recent version of the CAL3QHC (Version 2.0) air quality dispersion model (EPA 1995) was used with methodology outlined in EPA's *Guideline for Modeling Carbon Monoxide from Roadway Intersections.*[2].

Meteorological Options

The transport and concentration of pollutants emitted from motor vehicles are influenced by meteorological factors. The values for these parameters were chosen, in accordance with EPA's guidance, to maximize pollutant concentrations at each prediction site and establish a conservative, reasonable worst-case scenario. The values used for these parameters are summarized in Table D-2.

Table D-2. CAL3QHC Meteorological Inputs

Parameter	Value
Wind Speed	1 meter/second
Wind Direction	All wind angles from 0 to 360 degrees in 5-degree increments
Mixing Height	1,000 meters
Stability Class	D (neutral stability)
Surface Roughness	108 cm (suburban land use)
Background Concentration	0 (background concentrations were added to results)

Site Geometry

Traffic analysts provided volume and signal timing data for each intersection evaluated unique to each alternative. Emission sources were represented as free-flow links and queue links with locations based on aerial photos of each intersection. The width of queue links are equal to the width of the travel lanes. The length of the queue links are determined by the model based on peak hour volumes and signal timing. The width of free-flow links are the width of the lanes plus 3 meters on each side of the r4aodway to account for the mixing zone created by the dispersion of the plume generated by the wake of moving vehicles. Length of free-flow links extend to a distance of approximately 1,000 feet from the center of the intersection. EPA testing of the model indicates that links beyond 1,000 feet from the receptor locations will have a minor contribution to the results.

Concentrations were predicted at receptors placed along roadway edges where the public has access, no closer than 3 meters from the edge of the roadway to avoid the mixing zone. Figure D-1 through Figure D-4 show location of emission sources and receptors. There was no change to receptor or link locations between alternatives.

[2] U.S. Environmental Protection Agency (EPA), Guideline for Modeling Carbon Monoxide from Roadway Intersections. EPA-454/R-92-005. 1992. http://www.epa.gov/scram001/guidance/guide/coguide.pdf

Figure D-1. Maple Rd and Bailey Ave Receptor Locations and Free Flow Links

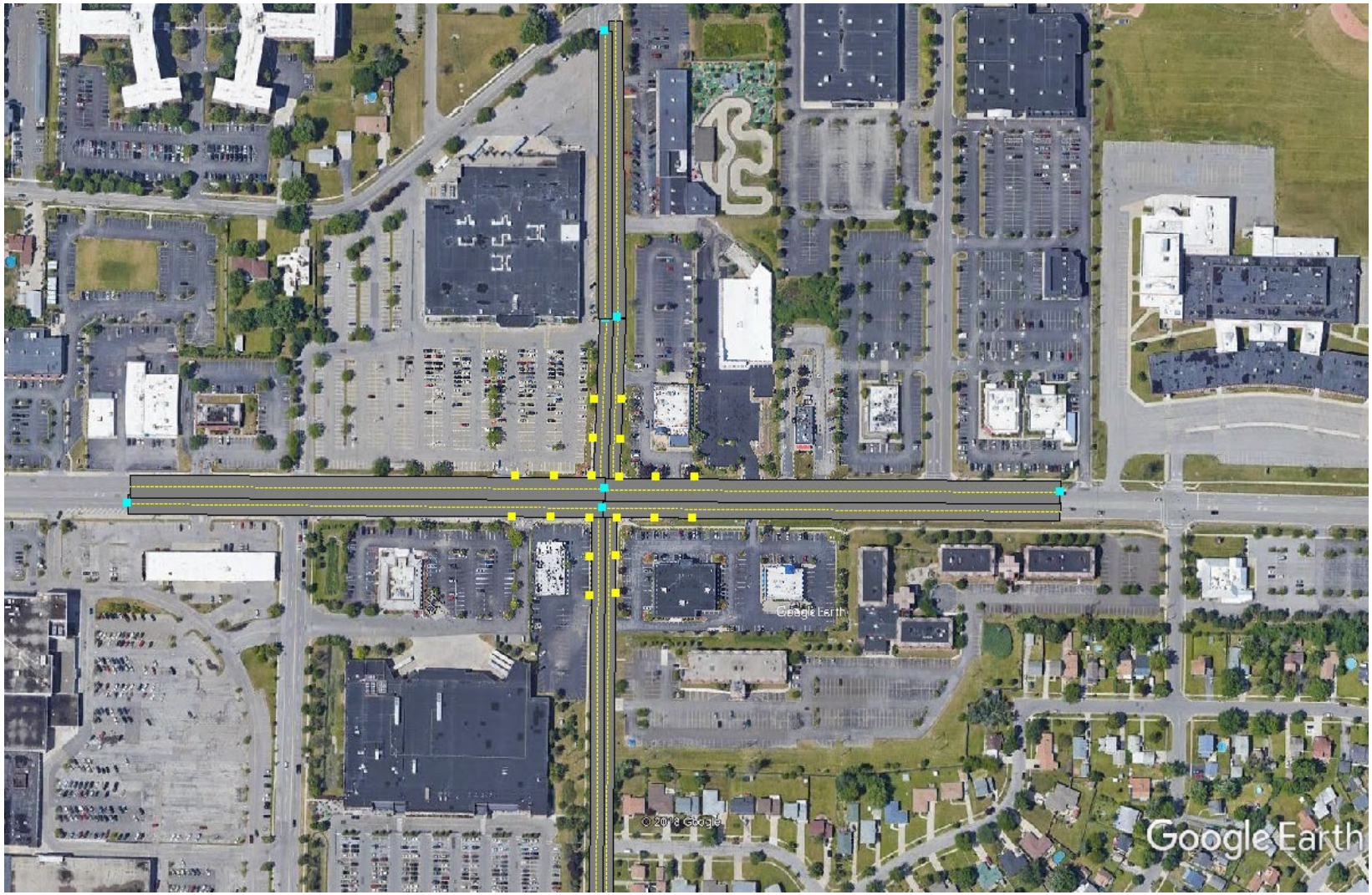


Figure D-2. Maple Rd and Bailey Ave Receptor Locations and Queue Links

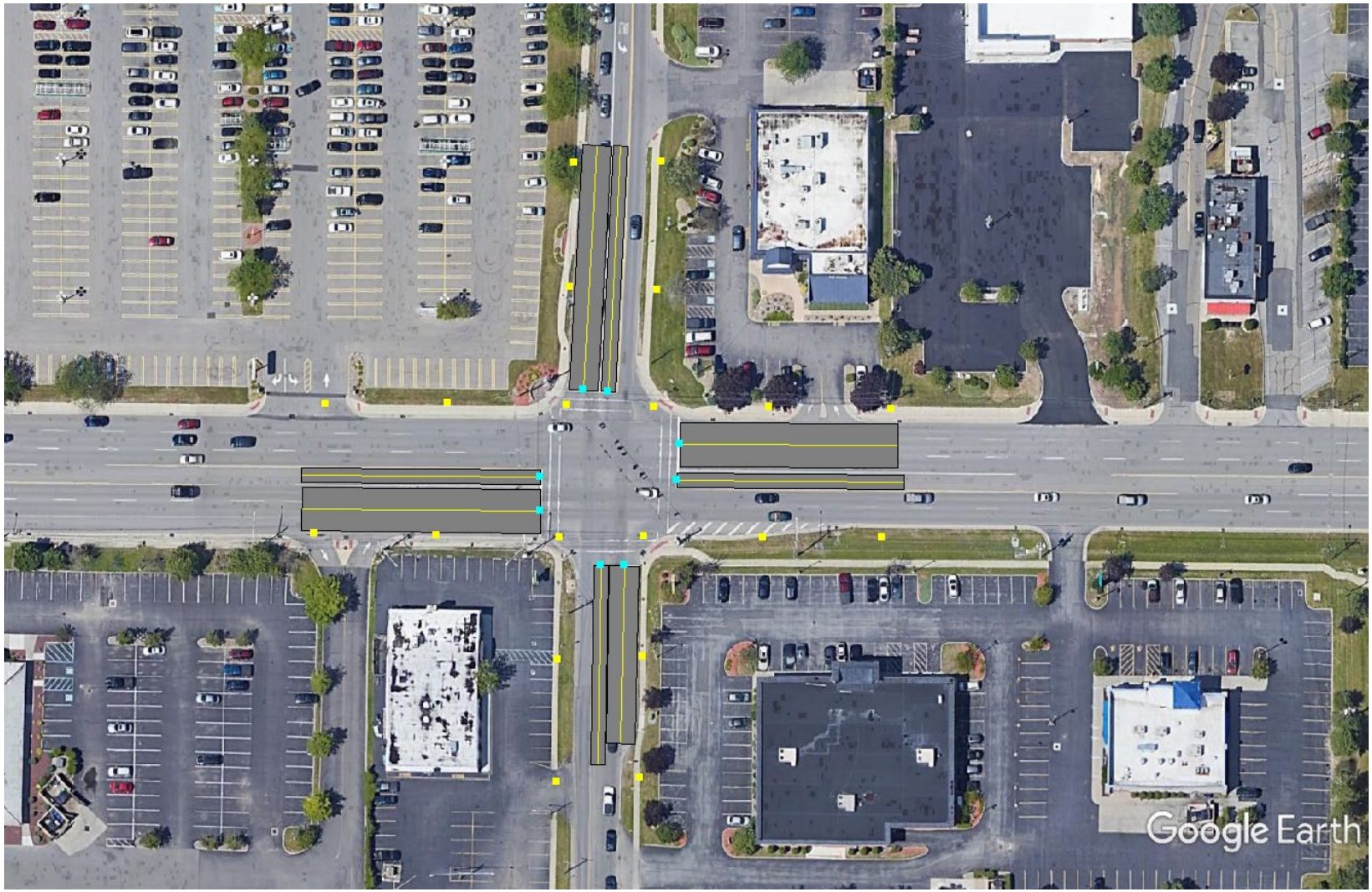
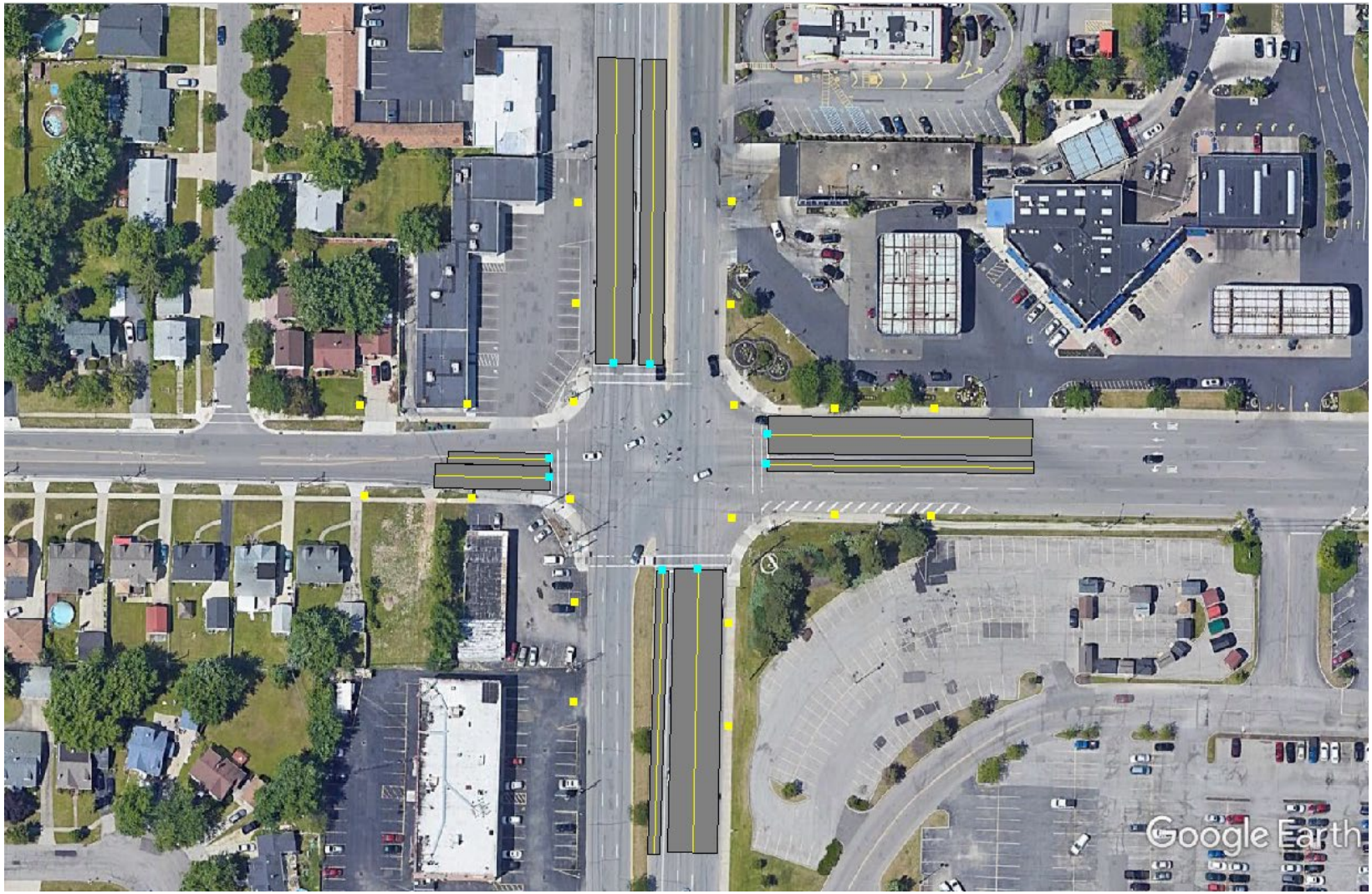


Figure D-3. Niagara Falls Blvd and Brighton Rd/Maple Rd Receptor Locations and Free Flow Links

Figure D-4. Niagara Falls Blvd and Brighton Rd/Maple Rd Receptor Locations and Queue Links



Emission Factor Development

Emission factors for each source were developed with MOVES2014b using county-specific consistent with the regional emissions analysis. MOVES2014b was run at the project scale with 5 links to determine an emission factor for each of five speeds. Links were entered with a distance of 1 mile and a volume of 1 vehicle. MOVES input specifications are summarized inTable D-3. Description of the link IDs and resulting emission factors are summarized in Table D-4.

Table D-3. MOVES Run Specifications Options for CO Analysis.

MOVES Tab	Model Selections
Scale	▪ Project scale ▪ Inventory calculation type
Time Span	▪ January weekday ▪ Analysis years 2018 and 2040 ▪ AM (hour 9), MD (hour 13), and PM (hour 18)
Geographic Bounds	▪ Erie County
Vehicles/Equipment	▪ All on-road vehicle and fuel type combinations
Road Type	▪ Rural restricted, rural unrestricted, urban restricted, and urban unrestricted
Pollutants and Processes	▪ CO ▪ Processes included running exhaust and crankcase running exhaust
Manage Input Data Sets	▪ The database provided by NYSDOT was imported to account for adoption of the state's Low Emission Vehicles (LEV) and Zero-Emission Vehicles (ZEV) plans
Output	▪ Output was hourly emissions quantity in grams for each link ID ▪ Post-processor was used to create a CALQHC emission factor table

Table D-4. Link IDs and Emission Factors from Project Scale MOVES Run

Link ID	Vehicle Speed	2018 Emission Factor	2040 Emission Factor
1	Idle	16.494 g/hour	3.48712 g/hour
2	30 mph	3.23482 g/mile	1.09252 g/mile
3	35 mph	2.99555 g/mile	1.05754 g/mile
4	40 mph	2.83532 g/mile	1.02839 g/mile
5	45 mph	2.73654 g/mile	1.01646 g/mile

D.2.2 Results Processing

Output files from CAL3QHC indicated the maximum hourly CO concentration for each scenario. For comparison to the 1-hour National Ambient Air Quality Standards (NAAQS), a 1-hour background concentration of 1.7 parts per million (ppm) was added to the maximum hourly model output. For comparison to the 8-hour NAAQS, the maximum hourly output was multiplied by a persistence factor of 0.7, as recommended in the EPA Guidance, and then added to the 8-hour background value of 1.4 ppm. This process is summarized in Table D-5.

Table D-5. Predicted Worst-Case One-Hour CO Concentrations (ppm)

Processing Step	Intersection	2018			2040								
		Existing			No Build Alternative			LRT Build Alternative			BRT Build Alternative		
		AM	MD	PM	AM	MD	PM	AM	MD	PM	AM	MD	PM
1-hour Maximum Modeled Concentration	Niagara Falls Blvd and Brighton Rd/ Maple Rd	0.5	0.8	0.8	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2
	Maple Rd and Bailey Ave	0.5	0.7	0.8	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2
1-hour Total Concentration	Niagara Falls Blvd and Brighton Rd/ Maple Rd	2.2	2.5	2.5	1.8	1.9	1.9	1.8	1.9	1.9	1.8	1.9	1.9
	Maple Rd and Bailey Ave	2.2	2.4	2.5	1.8	1.9	1.9	1.8	1.9	1.9	1.8	1.9	1.9
8-hour Total Concentration	Niagara Falls Blvd and Brighton Rd/ Maple Rd	1.8	2.0	2.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	Maple Rd and Bailey Ave	1.8	1.9	2.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

Notes: 1-hour total concentration = modeled result + 1-hour CO background. 8-hour total concentration = modeled result * persistence factor + 8-hour CO background. 1-hour CO background = 1.7 ppm; 8-hour CO background = 1.4 ppm, EPA persistence factor = 0.7. 1-hour CO standard = 35 ppm.

Abbreviations: AM = morning; MD = midday; PM = evening; ppm = parts per million.

D.3 AVAILABILITY OF ELECTRONIC FILES

Due to the large volume of input and output files created for this analysis, they are available electronically upon request.