Russell R. McMurry, P.E., Commissioner

GEORGIA DEPARTMENT OF TRANSPORTATION

One Georgia Center, 600 West Peachtree Street, NW
Atlanta, Georgia 30308
Telephone: (404) 631-1000

March 29, 2017

Mr. Rodney N. Barry, P.E.
Federal Highway Administration
61 Forsyth Street, SW
Suite 17T100
Atlanta, Georgia 30303-3104

ATTN: Katy Allen

Re: Programmatic Agreement for Project-Level Air Quality Analyses for Carbon Monoxide — CO Georgia 2015 Screening Model

Dear Mr. Barry:

The purpose of this letter is to request concurrence on the first Project-Level Carbon Monoxide (CO) Air Quality Studies Programmatic Agreement between the Georgia Department of Transportation (GDOT) and the Federal Highway Administration (FHWA). The new programmatic agreement (PA) will be executed upon signature of both parties on the attached signature page (Attachment 1). The proposed new PA and associated Technical Support Document (TSD) are provided as Attachments 2 and 3 respectively.

This new FHWA-GDOT PA provides for the use of a CO screening model for Georgia developed in 2015, based on the FHWA approved 2012 version currently used in Florida (other variations exist in Alabama and Colorado).

The FHWA-GDOT PA and TSD are based upon guidance provided by the University of Central Florida as well as the CO Georgia 2015 Near-Road CO Screen Model Tool Technical Report using recommendations from the following: 2014 FHWA Categorical CO Hot Spot Finding; National Cooperative Highway Research Program (NCHRP) study[1]; and the Virginia Department of Transportation (VDOT) TSD. The CO screening model for Georgia was designed to be applied using conservative background concentrations and persistence factors, as discussed in the TSD. This is the approach that we are proposing to follow as discussed in the accompanying PA and TSD, as it facilitates both the review and approval process and early implementation of this new CO screening model-based PA that uses similar formats as the NCHRP templates.

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[1]ICF International, Zamurs and Associates LLC, and Volpe Transportation Systems Center, *"Programmatic Agreements for Project-Level Air Quality Analyses"*, NCHRP 25-25 (7g), 2015. See: http://apps.trb.orR/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=331

This FHWA-GDOT PA and TSD is based on a CO screening model using Georgia-specific modeling input data, and is representative of local conditions. The GDOT screening model is based on emission factors from the latest models (e.g., MOVES2014a), including increases in emissions factors due to acceleration from a stop/idling condition to the maximum speed for the intersection, and provides options for road grade (the assumption to be used 1.1% unless a special case is encountered).

Finally, the reasons for using a screening model for CO air quality analyses that focuses on intersections/interchanges are as follows:

- Utilizing a valid, computerized screening model that incorporates the latest software, and is easy to use.
- Potentially works for all intersections/interchanges using conservative assumptions and built-in inputs, running a quick analysis of closely related standardized intersections in order to make "worst-case" assessments.
- If worst case intersections/interchanges pass the screening test provided by the screening model, no further work needs to be done; if it fails, a detailed time-intensive, microscale CO air quality analysis is required (process currently being used).
- A history of success with implementation in Florida, Alabama, and Colorado, saving tremendous time and resources for these states.
- Further discussions of the advantages of CO screening models are mentioned in Keely & Cooper (1999)[2].

If you have questions about the proposed PA, please contact Soli Shakshuki at (404) 631-1093, sshakshuki@dot.ga.gov. If you have technical questions about the TSD or the model, please contact Gil Grodzinsky at (404) 363-7123, gil.grodzinsky@dnr.state.ga.us.

Sincerely,

Eric Duff

Eric Duff
State Environmental Administrator

Attachments (including appendices referencing or including the Hot Spot Finding, CO Georgia 2015 Near-Road CO Screen Model Tool Technical Report):

1. Signature page to the 2017 FHWA-GDOT Programmatic Agreement
2. 2017 FHWA-GDOT Programmatic Agreement
3. Technical Support Document

[2]Keely, Debra K. and Cooper, C. David. "The Advancement of CO Screening Models", a paper presented at the 1999 Annual Meeting of the Air & Waste Management Association, St. Louis, Missouri, June 20-25, 1999.

Attachment 1

FHWA-GDOT Programmatic Agreement for
Project-Level Air Quality Analyses for Carbon Monoxide

By signature below, both parties agree to the terms and conditions specified in the FHWA-GDOT *Programmatic Agreement for Project-Level Air Quality Analyses for Carbon Monoxide* (February 2017).

Russell R McMurry

Russell McMurry, P.E., Commissioner
Georgia Department of Transportation

4/3/17
Date

Rodney N. Barry, P.E., Division Administrator
Federal Highway Administration, Georgia Division

4-6-17
Date

Attachment 2

FHWA-GDOT

Programmatic Agreement for Project-Level Air Quality Analyses for Carbon Monoxide

(Based on the recommended formats from the 2015 NCHRP 25-25 Task 78 Template)

February 2017

FHWA-GDOT

Programmatic Agreement for Project-Level Air Quality Analyses for Carbon Monoxide

This Programmatic Agreement (PA) between the Georgia Department of Transportation (GDOT) and the Georgia Division of the Federal Highway Administration (FHWA Georgia Division) specifies terms for using a CO screening model of highway project intersections/interchanges for potential carbon monoxide (CO) analysis that are currently completed to meet requirements of the National Environmental Policy Act (NEPA). This PA establishes the use of a CO screening model to provide a quick quantitative analysis determining whether the project has the potential to cause a localized violation of the National Ambient Air Quality Standards (NAAQS) for CO instead of utilizing a time-consuming, detailed, microscale CO analysis for every potential significant action, with built-in intersections/interchange configurations, integrated CAL3QHC2 dispersion model, and receptors to provide a streamlined "worst case" analysis. The only requirement to use the CO screening model is to provide speeds and volumes in each direction and for on-ramps if necessary. Before the availability of the Georgia 2015
Screening Model, each qualifying project for quantitative analysis included a separate, detailed, microscale CO air quality analysis with inputs compiled from traffic studies for CAL3QHC runs, and MOVES emission. This PA and Technical Support Document (TSD) verifies that the CO screening model not only reduces resources and workload from days to minutes, but produces more conservative CO concentrations than GDOT's current method (it incorporates "worst case" assumptions for MOVES and CAL3QHC2 modeling into the screening model). Lower ambient CO concentrations in the last decade and almost no cases of failing CO quantitative analyses support the use of less resources and time to accomplish this task. Maintaining a high quality of analysis via a quick screening tool, such as the Georgia 2015 CO screening model is optimal.

Basis of Agreement: This PA was developed based on GDOT's extensive history of modeling potential CO impacts for highway projects. In support of its transportation program, GDOT has been performing CO emissions analyses of highway projects for decades. These analyses have not resulted in identification of violations of CO air quality standards as a result of the completion of a highway project. As evidenced by ongoing reductions in monitored ambient CO concentrations and the continuing implementation of the Federal Motor Vehicle Emission Control Program, future project-level CO analyses are expected to find little, if any, possibility of potential violations of CO ambient air quality standards caused by the completion of a highway project.

Recent efforts at the national level reinforce this conclusion. The *Federal Highway Administration (FHWA) Carbon Monoxide (CO) Categorical Hot-Spot Finding* (FHWA, February, 2014)[1] documented conditions for urban intersections in CO maintenance areas that did not require a specific, detailed, time-consuming project-level conformity determination but could rely on screening from which to make a quick high quality project-level conformity determination. Based on the final report by the University of Florida to FDOT and accompanying thesis by Mark Ritner[2] (excerpts from the report in Appendix D in the TSD and from Mark Ritner's Masters Thesis[2]). Similarly, the National Cooperative Highway Research Project (NCHRP) study: *Programmatic Agreements for Project-Level Air Quality Analyses (2015)*[3], built upon the technical analysis presented in the 2014 categorical finding and examined a wider variety of project types and conditions in order to identify those project types and conditions that could not result in violation of current CO ambient air quality standards. These studies tested the remote possibility of a CO ambient air quality standard violation using worst-case modeling and following appropriate EPA guidance for modeling CO hot-spots (e.g., *Guideline for*

Modeling Carbon Monoxide from Roadway Intersections, U. S. EPA, EPA-454/R-92-005, November 1992;

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1 See: http://www.fhwa.dot.gov/environment/air_quality/conformity/policy_and_guidance/cmcf/

2 Ritner, Mark, D. (2012) "CO Florida 2012 A MOVES-Based, Near-Road Screening Model" (Master's thesis).

3 ICF International, Zamurs and Associates LLC, and Volpe Transportation Systems Center, *"Programmatic Agreements for Project-Level Air Quality Analyses"*, NCHRP 25-25 (78), 2015. See: http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3311

Using MOVES in Project-Level Carbon Monoxide Analyses, U.S.EPA, EPA-420-C-10-041 December 2010). The studies also used previously EPA-approved emission and dispersion models (MOVES2010b as the emission model and CAL3QHC (version 04244) as the dispersion model).

Value of the PA: The PA is beneficial to both GDOT and FHWA Georgia Division. It reduces costs by eliminating unnecessary intensive detailed air quality analyses, enhances efficiency and certainty in the environmental review process, and helps ensure project scope and scheduling.

Relationship to the *GDOT Environmental Procedures Manual*: Nothing in this PA precludes or is intended to preclude the application of the models, methods, protocols, assumptions and data specified or otherwise referenced in the *GDOT Environmental Procedures Manual* and its associated online data repository and their respective future updates. The CO screening model is only supposed to demonstrate a streamlined process to conduct a quantitative analysis that produces high CO concentration estimates to assure a project passing the screening model test would pass the current detailed, time-intensive GDOT modeling methodology.

Application of the PA (CO Screening Model):

1. For the project, after filling in project name and description, determine the project year and land use (urban, suburban, or rural) as shown in Attachment A. The impact of the land use choice on CAL3QHC2 inputs is demonstrated in Attachment B (also see Table 1 in Appendix F of the TSD which is the "User's Guide to CO Georgia 2015").

2. Choose the applicable county grouping. The counties in GA were split into four groupings by similar important variables in calculating emission factors such as vehicle age and whether they had a vehicle inspection and maintenance (I&M) program. Four emission factor tables are produced that are the best representations for these groups of counties, providing both conservative, but realistic CO concentrations from the screening model.

3. Select the intersection type and condition of interest, determined from the list of intersection/interchange types based on the intersection that most accurately applies. Attachment C contains all the intersections and methods list of inputting traffic data for each intersection type which consists of only peak hour approach volumes from each direction and ramp volumes in cases with freeways. The format imitates what users would do in collecting volume data for the current input methodology for CO air quality quantitative analyses.

4. After clicking the "Run" button, model produces at each of the receptors a CO 1-hr and 8-hr concentration; including the background concentration:

a. To determine the worst-case one-hour concentration for comparison to the applicable NAAQS, the CO screening model uses the following equation with values for Georgia for background concentration:
One-hour concentration (ppm) = One-Hour concentration from the project + Local Background Concentration (One-Hour) (based on land use choice as illustrated in Attachment B with 5 ppm for urban, 3.3 ppm for suburban, and 1.7 ppm for rural, which is conservative by taking the GDOT Procedures Manual recommended values of 3, 2, and 1 ppm and dividing by 0.6"the persistence factor").

b. To determine the corresponding worst-case eight-hour concentration for comparison to the NAAQS, the CO screening model uses the following equation with values for Georgia for background concentration and persistence factor:

Eight-hour concentration (ppm) = One-Hour concentration calculated from CAL3QHC2 x Local Persistence Factor (0.6 for Georgia as specified in the GDOT Environmental Procedures Manual) + Local Background Concentration (Eight-Hour) (3 ppm urban, 2 ppm suburban, and 1 ppm rural as specified in the GDOT Environmental Procedures Manual).

5. The screening model compares the calculated one- and eight-hour concentrations to the applicable NAAQS. If both concentrations are less than the applicable NAAQS, then the model declares that the project passes. The eight-hour NAAQS is the limiting value since the persistence factor is greater than 9/35 (the ratio of the 8-hr CO NAAQS/1-hr CO NAAQS). If the project fails, or exceeds the NAAQS requirements, the model recommends more detailed modeling (utilized by GDOT before the screening model was made available: see the *GDOT Environmental Procedures Manual* for more details) at: http://www.dot.ga.gov/PS/DesignManuals/EnvironmentalProcedures

Project Types and Conditions: This PA applies to the following project types and associated project conditions:

Freeways and Arterials
While this is a qualifying project condition, the worst CO cases are found at intersections/interchanges and therefore the CO screening model focuses on locations of the project as described in the next sections. Freeways and arterials apply only to those connected with intersections. As stated in the FHWA memo in 1985 *Discussion Paper on the Appropriate Level of Highway Air Quality Analysis for CE/EA/FONSI, and EIS* and 1987 memo *Guidance for Preparing and Processing Environmental and Section 4(f) Documents*, "CO is the primary pollutant for project level analysis and the worse polluted areas are intersections".

Intersections & Toll Plazas
Studies have determined that the highest CO concentrations are found at intersections; therefore all screening will involve the most congested intersections/interchanges. Toll plazas were included as well since they are areas of high CO. MOVES and CAL3QHC model inputs and assumptions were used as listed in Attachment D, taken from the *CO Georgia 2015 Near-Road CO Screen Model Tool Technical Report* (Appendix B of the TSD). The intersection analysis includes 13 different configurations (diverging diamonds are modeled by tweaking the traffic volume inputs for regular

diamonds "see Attachment C for details"). Attachment E shows a sample run report listing maximum 1-hr and 8-hr concentrations for urban land use selection for intersections (4x4 selected in this case) that, with an 8-hr CO background level of 3.0 ppm and a persistence factor of 0.6, do not produce CO concentrations that could result in exceedances of the 8-hr CO NAAQS. For application of the PA for other county groupings and land uses, the corresponding concentrations for those cases are determined by going back to the title and district/county grouping screens of the model and making the desired changes, hence changing background concentrations and emission factors. A 1.1% is the assumed grade. If there is a special case where the grade would be significantly higher on average in an intersection, one could substitute the 1.1% grade folder with emission factors for 2.2% or 5.5% that are available. For example, the corresponding worst-case concentrations for a given project in Georgia are obtained by following the procedure given in the section *"Application of the PA"* above and compared to the applicable NAAQS to determine compliance. If the applicable NAAQS are met, the project would pass the screening model's test and not require more detailed project-specific CO modeling to demonstrate compliance with the CO NAAQS.

Conversely a project that does not pass the CO screening would require detailed, project specific modeling and analysis to show compliance with the NAAQS.

Notes:

1) Highly congested intersections (where the approach speed is less than 15 mph) are not included in this PA.
2) While intersections with more than 6 lanes in each direction are not explicitly included in this PA, reasonable inferences may be made for their inclusion by combining legs.
3) For this PA, the intersections were modeled as 90 degree intersections, that is, with roadways intersecting at right angles.

Interchanges with an Adjacent Intersection

See previous section "intersections & toll plazas" which incorporate interchanges, especially on-ramps and bridges over freeways.

General Terms

Deference to Professional Judgment on Determinations of Substantive Differences: Consistent with our agreement for revising air studies, under this PA, FHWA will defer to the professional judgment of GDOT air quality staff to apply the agreement for projects that are substantively (as defined in the *GDOT Environmental Procedures Manual*) consistent with the intersection/interchange types and configurations specified in this agreement. For example, if an intersection has more than 6 lanes or an arrangement like a diverging diamond, this PA may be applied using the criteria for 6 lanes or regular diamond (with traffic approach volume splits that are adjusted for diverging diamonds) if the difference is not substantive in the professional opinion of GDOT air quality staff and therefore not expected to result in a modeled exceedance of the applicable NAAQS.

Projects of De Minimis Scope or Expected Impact: Projects that do not change (add, delete, relocate, or otherwise modify) roadway capacity, intermodal facilities, and/or transit service (i.e., are of de minims scope or expected impact) do not require either qualitative or quantitative project-level air quality analyses.

Exempt Projects: Projects that would qualify as exempt under one or more of the categories specified in the federal transportation conformity rule (whether or not conformity applies for the area in which the project is located) do not, under this agreement, require project-specific modeling for CO for purposes of NEPA. See the following link for qualified exempt projects: https://www.fhwa.dot.gov/environment/air_quality/conformity/laws_and_regs/rule.cfm#r126

Locally Administered Projects: This PA may also be applied for locally administered projects in Georgia. For the project's environmental document or record, the local agency will include a statement that the project under review meets the project or intersection types and configurations covered in the CO screening model, hence the PA (including data and information as necessary to support that determination) and will conclude with one of the statements (or a similar statement, as appropriate to the project) provided in the *Administrative Record* section below.

Project Types Not Covered by This PA: Examples of project types that are not specifically covered by this PA include but are not limited to: park and ride lots, parking garages, new intermodal transfer yards, tunnels, intersections that have more than four legs, and intersections with approach speeds less than 15 mph. If a project type is not covered by the PA, project-specific may be needed as is currently being done in Georgia for NEPA. For those project types and conditions where applicability of this PA is not certain, GDOT and FHWA Georgia Division will coordinate to determine its applicability.

Discretionary Modeling of Projects Otherwise Covered by this PA: This PA does not preclude GDOT from conducting, at its discretion, detailed project-specific modeling for CO for any project, even if the project would otherwise meet the criteria established in this agreement and therefore not require such modeling. Examples of such projects include (but are not limited to) ones for which an environmental impact statement (EIS) is being prepared and ones that may be considered higher profile, i.e., that involve or may involve a greater degree of public and/or stakeholder interest.

Years of Analysis: This PA is based on the CO Georgia 2015 screening model for project years ranging from 2016-2050, so it covers projects/intersections of the types and configurations listed above whose opening year (year of completion) is 2016 or later. This range covers the initial year of the project and the 2050 is the last future year for MOVES.

Technical Approach: The MOVES modeling conducted in support of the CO Georgia 2015 screening model and the screening model itself is described in detail in the accompanying TSD. In general, the CO screening model employs worst-case assumptions and approaches that parallel EPA and FHWA guidance as well as Georgia's CO Georgia 2015 Near-Road CO Screen Model Tool Technical Report (with input from Mark Ritner's thesis and University of Central Florida's report for FDOT, excerpts and more detailed references made in Appendix D in the TSD). EPA's MOVES2014a emission model and CAL3QHC2 dispersion model were applied in the CO screening model.

EPA's current guidance for modeling CO Hot-Spots (*Guideline for Modeling Carbon Monoxide from Roadway Intersections*, U. S. EPA, EPA-454/R-92-005, November 1992) was also referred to as support for the CO screening model MOVES inputs.

The assumptions and inputs used in the CO screening model were worst-case or highly conservative, leading to higher emission estimates and less dispersion (and therefore greater forecast ambient concentrations) than would be expected under typical real-world conditions (so still being realistic about vehicle characteristics and representing the age and I/M programs defining the county groupings "The counties were grouped based on similar age profiles and whether they had an inspection/maintenance program. For instance the Atlanta 20 county area (which is Atlanta's planning and travel demand model area) is split into the 13 and 7 counties listed because 13 counties have inspection/maintenance while the other 7 do not. The 12 "urban" counties are counties outside of Atlanta area that have distinctively younger vehicles than the remaining 127 counties" while still producing conservatively high CO concentrations versus GDOT's current method). Consequently, if a project does not cause a modeled exceedance of the NAAQS with these worst-case or conservative inputs and assumptions, then it may be stated with high confidence that an exceedance under average, real-world conditions would not be expected. Most importantly, these realistic, yet conservative assumptions will assure CO concentration estimates by the CO screening model will be higher than from the current, detailed GDOT CO analysis; thus replacing a lengthy, intensive, and expensive process with a quick and easy CO screening model where a passing screening assures no violation of the CO NAAQS due to the project.

Finally, GDOT consulted with the Georgia Environmental Protection Division (GAEPD) in development of its Environmental Procedures Manual, which includes separate guidance on background concentrations and persistence factors to be applied for projects in Georgia. These values are used under this PA to arrive at an eight-hour total CO concentration for comparison with the eight-hour CO NAAQS.

Administrative Record: For the project's environmental document or record, GDOT will include a statement that the project under review meets the project/intersection types and configurations covered in the PA and CO screening model (providing data and/or information as necessary to support that determination) and will conclude with one of the following statements (or a similar statement, as appropriate to the project):

> *Projects that qualify as exempt and/or for Programmatic Categorical Exclusions:*
> The project is identified as being exempt from the requirement to determine conformity according to the federal transportation conformity rule and/or qualifies for a Programmatic Categorical Exclusion (PCE) according to the PCE Agreement in effect between the Federal Highway Administration and the Georgia Department of Transportation. Accordingly, it is concluded that the project would not significantly impact air quality and would not cause or contribute to a new violation, increase the frequency or severity of an existing violation, or delay timely attainment of any National Ambient Air Quality Standard for carbon monoxide. The GDOT and FHWA entered into a Programmatic Categorical Exclusion Process Agreement on June 4, 2013 allowing GDOT to act on behalf of FHWA in ensuring compliance with all applicable federal and environmental related requirements for Class II – CE Actions as defined in Section 23 CFR 771.117 (as amended in the agreement).
>
> *Projects that meet the terms of this PA*:
> The project is consistent with (and does not exceed) the project types and conditions listed in the agreement between the Federal Highway Administration and the Georgia Department of Transportation for streamlining the project-level "An air quality analysis process for carbon monoxide". The Georgia 2015 CO screening model using "worst-case" parameters has been applied for these project/intersection types and conditions. It has been determined that projects such as this one would not significantly impact air quality and would not cause

or contribute to a new violation, increase the frequency or severity of an existing violation, or delay timely attainment of the National Ambient Air Quality Standard for carbon monoxide.

or

An air quality analysis is not necessary as this project will not increase traffic volumes, reduce source-receptor distances, or change other existing conditions to such a degree as to jeopardize attainment of the National Ambient Air Quality Standard for carbon monoxide.

Future Revisions: GDOT and FHWA Georgia Division recognize that the applicable NAAQS and/or project level air quality analysis methodologies may change over time. The latter may include new or updated emission or dispersion models, background CO levels, and/or associated worst-case modeling assumptions. GDOT will consult as appropriate with FHWA Georgia Division regarding any changes that may be recommended as a result.

Amendments and Agreement:

1. This agreement will take effect as of the effective date of the signature of the FHWA Georgia Division Administrator, who shall sign the PA last.

2. Either signatory to this Agreement may request that it be amended at any time, whereupon the parties will consult to reach a consensus on the proposed amendment. Where no consensus can be reached, the Agreement will not be amended.

Dispute Resolution:

The Dispute Resolution process described in the current Stewardship and Oversight Agreement between FHWA and GDOT will be implemented in the event of a dispute between the signatory parties to this Agreement.

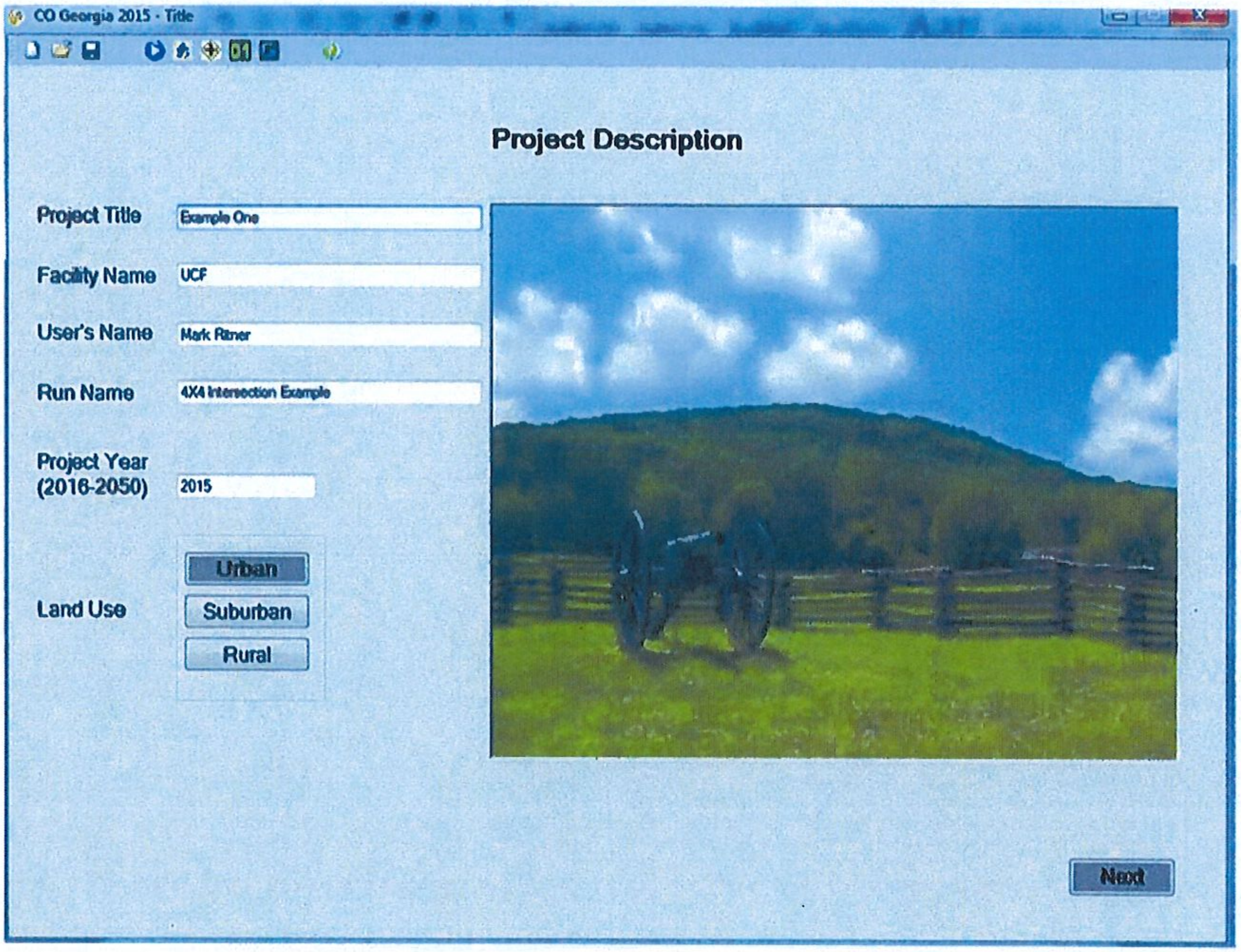
Termination:

Should either GDOT or FHWA Georgia Division determine that it is necessary to terminate the PA, they may do so by written notification to the other party. The PA will terminate 30 days after the date of the notification, provided that the parties consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. Projects that have been cleared on the basis of the PA before the effective termination date may maintain that clearance and not require detailed, intensive project-specific modeling for CO.

Attachments

Attachment A: Title Screen

Attachment A – Title Screen



Attachment B: Land Use

Attachment B

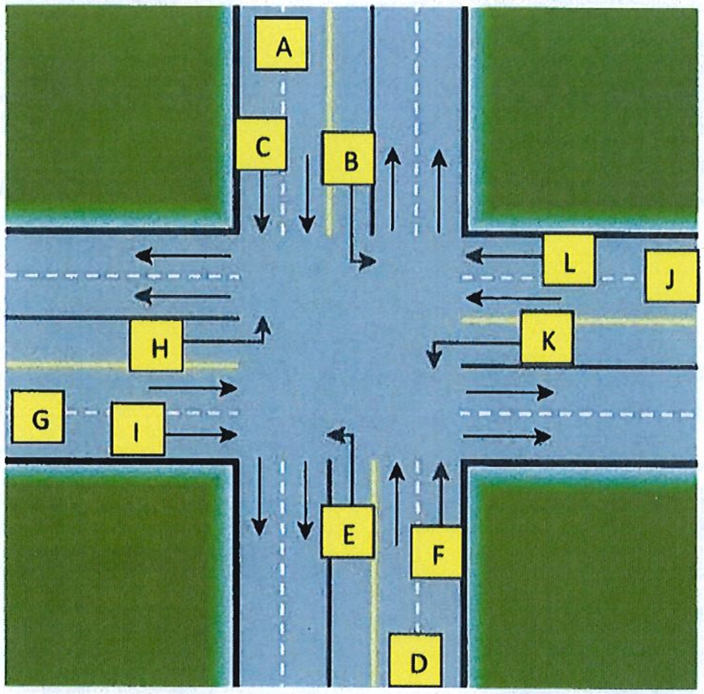
Table - Parameters Impacted by Land Use Type

Land Use Type	Surface Roughness (cm)	Atmospheric Stability Class	CO Background Concentration (ppm)	
			1-hour	8-hour
Urban	175	D	5.0	3.0
Suburban	108	D	3.3	2.0
Rural	10	E	1.7	1.0

Attachment C: Intersection Worksheet for COGA2015

4x4 Intersection

CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Northbound/Southbound Movement:
Eastbound/Westbound Movement:



Model Input Traffic

Year	Southbound			Northbound			Eastbound			Westbound		
	Thru (A)	LT (B)	RT (C)	Thru (D)	LT (E)	RT (F)	Thru (G)	LT (H)	RT (I)	Thru (J)	LT (K)	RT (L)
Existing Year ()												
Opening Year No-Build/Build ()												
Design Year No-Build/Build ()												

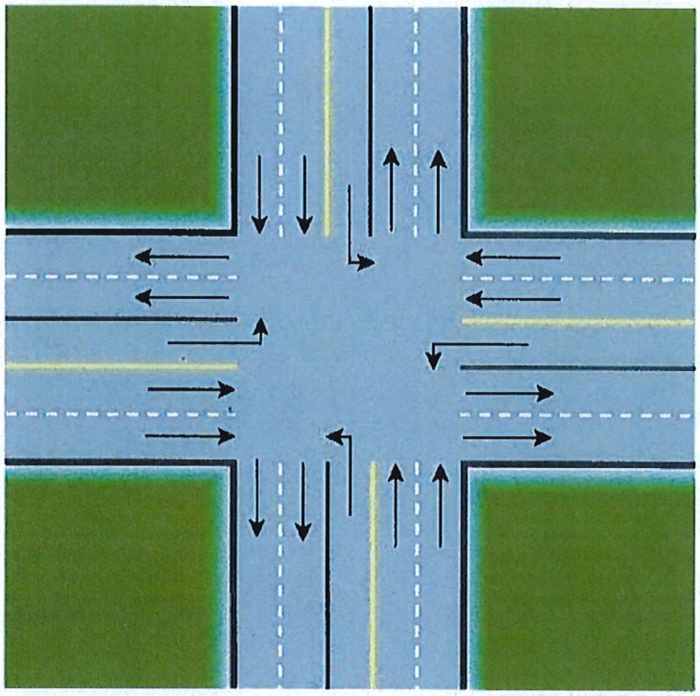
Southbound

Speed (mph):
Approach Traffic (veh/hr): (sum of A+B+C)

Eastbound

Speed (mph):

Approach Traffic (veh/hr): (sum of G+H+I)



Westbound

Speed (mph):

Approach Traffic (veh/hr): (sum of J+K+L)

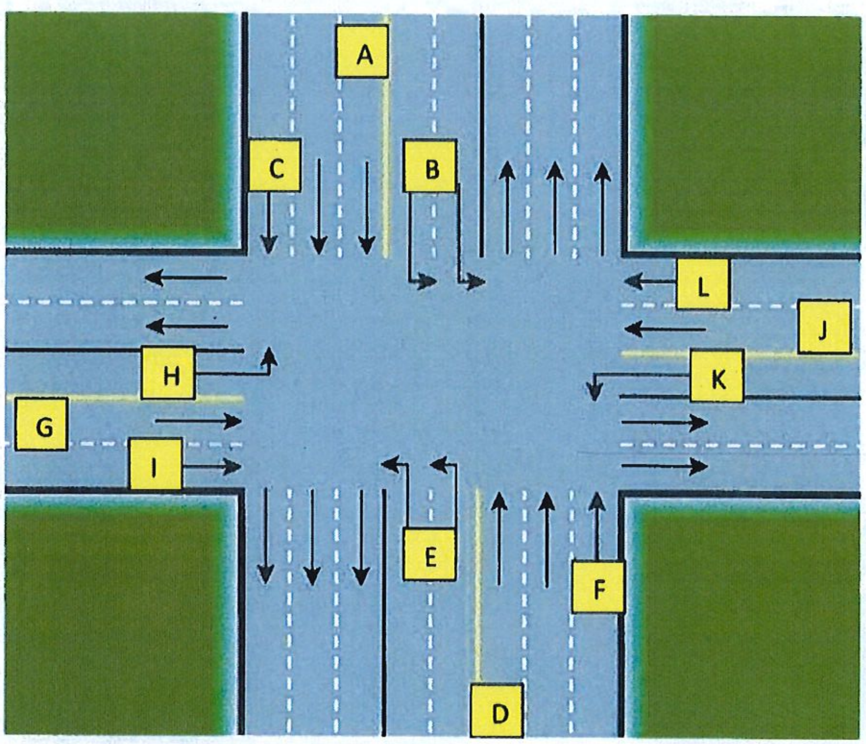
Northbound

Speed (mph):

Approach Traffic (veh/hr): (sum of D+E+F)

4x6 Intersection

CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Northbound/Southbound Movement:
Eastbound/Westbound Movement:



Model Input Traffic

Year	Southbound			Northbound			Eastbound			Westbound		
	Thru (A)	LT (B)	RT (C)	Thru (D)	LT (E)	RT (F)	Thru (G)	LT (H)	RT (I)	Thru (J)	LT (K)	RT (L)
Existing Year ()												
Opening Year No-Build/Build ()												
Design Year No-Build/Build ()												

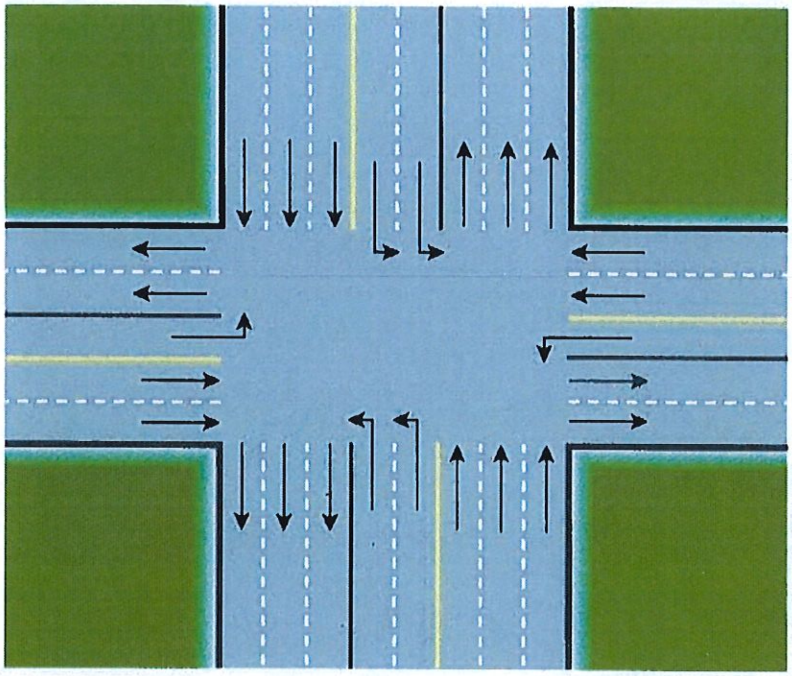
Southbound

Speed (mph):
Approach Traffic (veh/hr): (sum of A+B+C)

Eastbound

Speed (mph):

Approach Traffic (veh/hr):
(sum of G+H+I)



Westbound

Speed (mph):

Approach Traffic (veh/hr): (su
of J+K+L)

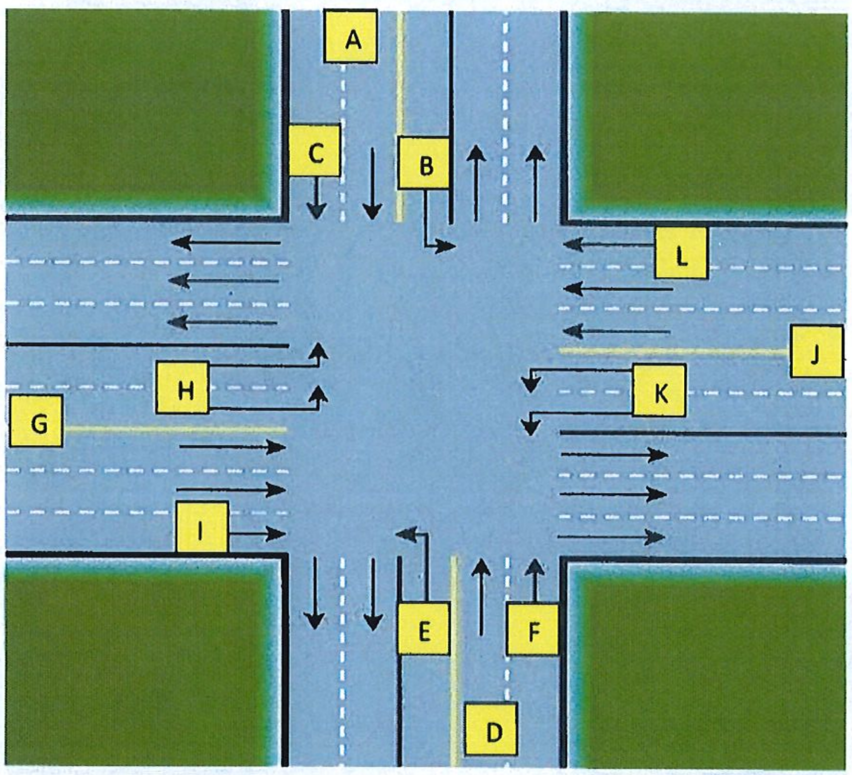
Northbound

Speed (mph):

Approach Traffic (veh/hr): (sum of D+E+F)

6x4 Intersection

CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Northbound/Southbound Movement:
Eastbound/Westbound Movement:



Model Input Traffic												
Year	Southbound			Northbound			Eastbound			Westbound		
	Thru (A)	LT (B)	RT (C)	Thru (D)	LT (E)	RT (F)	Thru (G)	LT (H)	RT (I)	Thru (J)	LT (K)	RT (L)
Existing Year ()												
Opening Year No-Build/Build ()												
Design Year No-Build/Build ()												

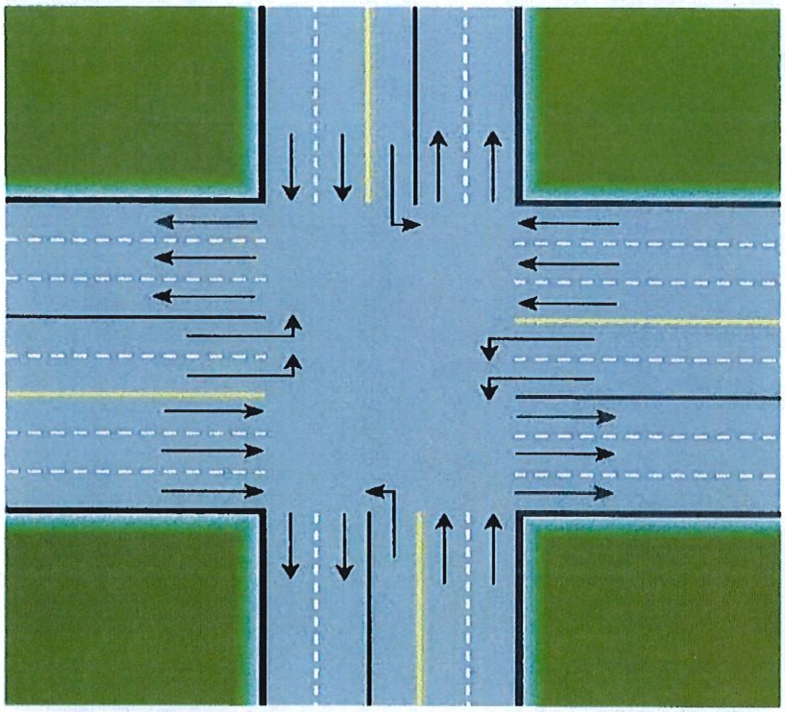
Southbound

Speed (mph):
Approach Traffic (veh/hr): (sum of A+B+C)

Eastbound

Speed (mph):

Approach Traffic (veh/hr):
(sum of G+H+I)



Westbound

Speed (mph):

Approach Traffic (veh/hr):
(sum of J+K+L)

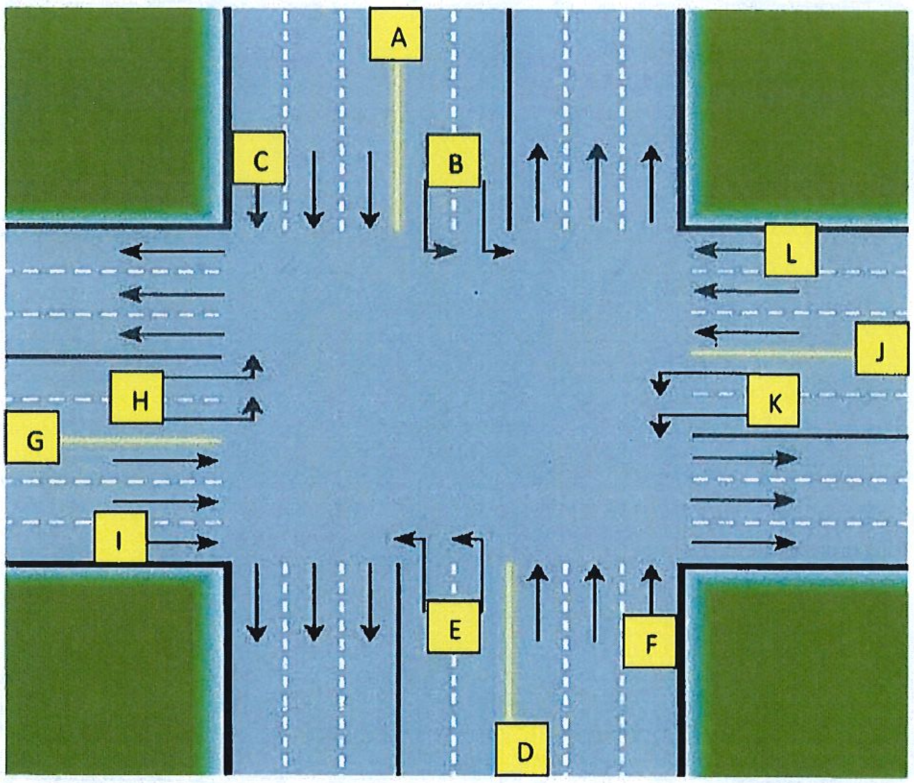
Northbound

Speed (mph):

Approach Traffic (veh/hr): (sum of D+E+F)

6x6 Intersection

CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Northbound/Southbound Movement:
Eastbound/Westbound Movement:



Model Input Traffic

Year	Southbound			Northbound			Eastbound			Westbound		
	Thru (A)	LT (B)	RT (C)	Thru (D)	LT (E)	RT (F)	Thru (G)	LT (H)	RT (I)	Thru (J)	LT (K)	RT (L)
Existing Year ()												
Opening Year No-Build/Build ()												
Design Year No-Build/Build ()												

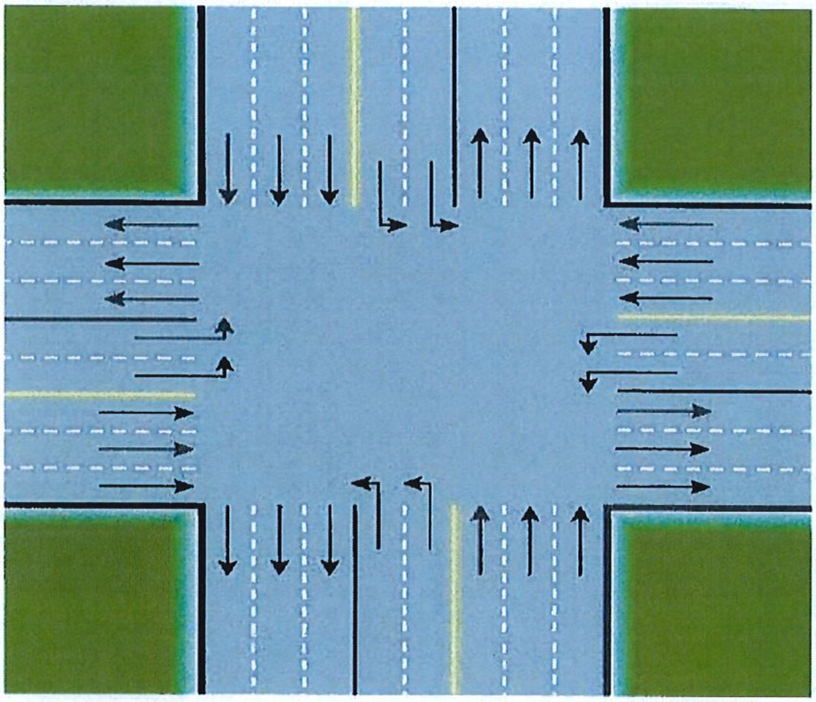
Southbound

Speed (mph):
Approach Traffic (veh/hr): (sum of A+B+C)

Eastbound

Speed (mph):

Approach Traffic (veh/hr):
(sum of G+H+I)



Westbound

Speed (mph):

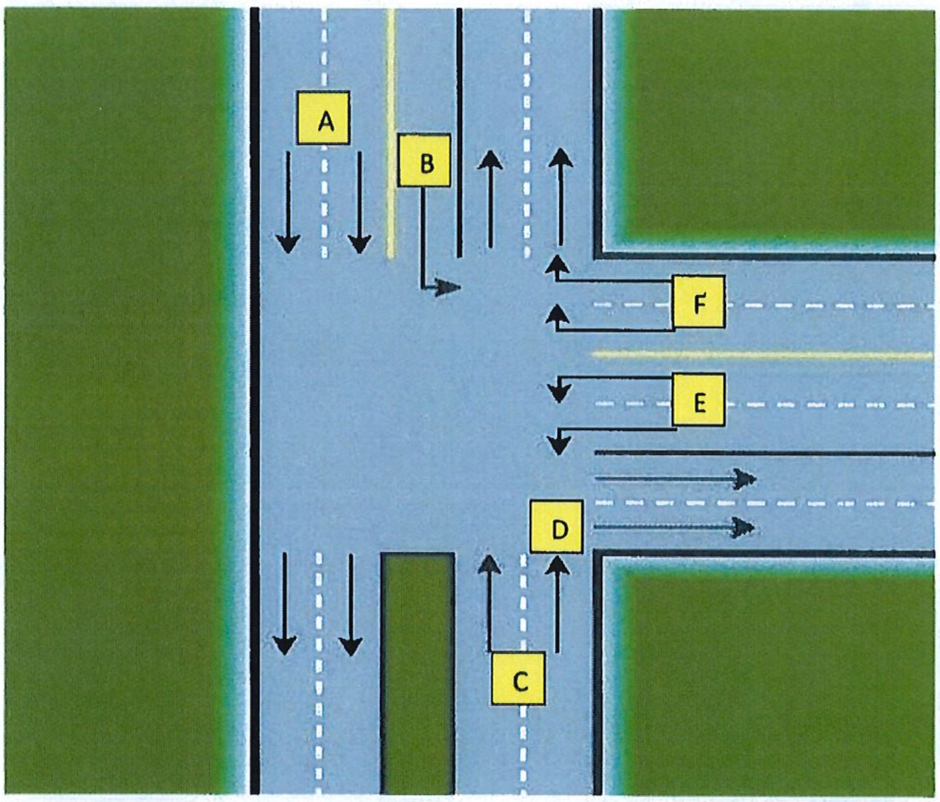
Approach Traffic (veh/hr): (s
of J+K+L)

Northbound

Speed (mph):
Approach Traffic (veh/hr): (sum of D+E+F)

East Tee Intersection

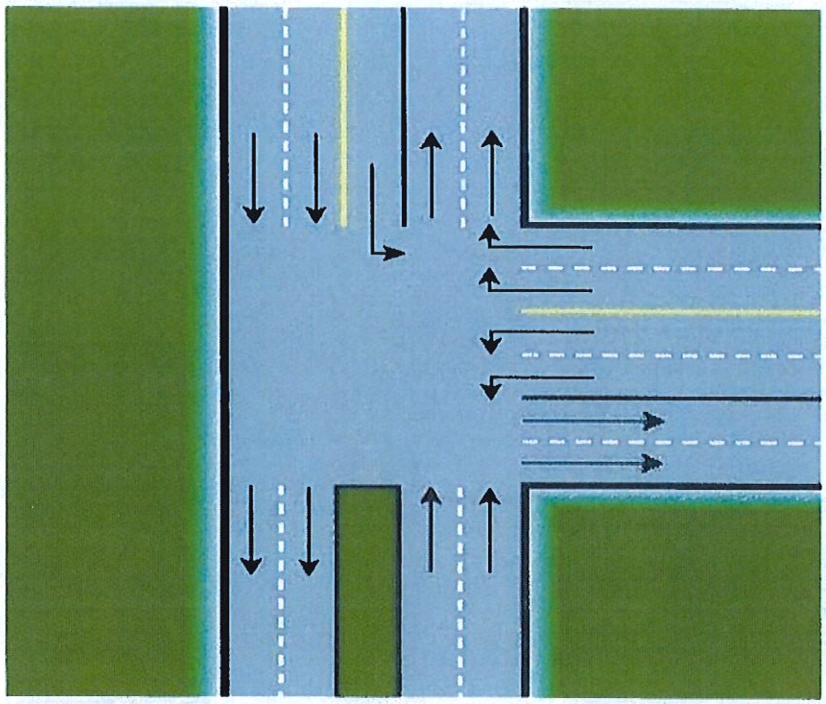
CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Northbound/Southbound Movement:
Westbound Movement:



Model Input Traffic						
Year	Southbound		Northbound		Westbound	
	Thru (A)	LT (B)	Thru (C)	RT (D)	LT (E)	RT (F)
Existing Year ()						
Opening Year No-Build/Build ()						
Design Year No-Build/Build ()						

Southbound

Speed (mph):
Approach Traffic (veh/hr): sum of A+B



Westbound

Speed (mph):

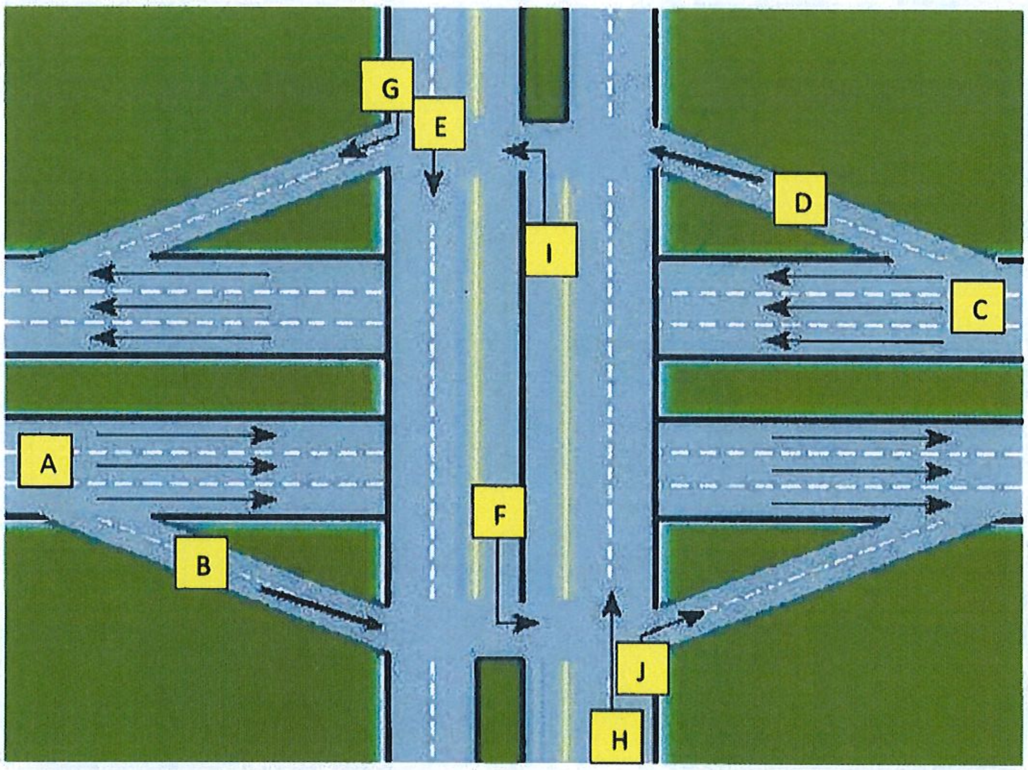
Approach Traffic (veh/hr):
of E+F

Northbound

Speed (mph):
Approach Traffic (veh/hr): sum of C+D

E-W Diamond Intersection

CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Northbound/Southbound Movement:
Eastbound/Westbound Movement:



Model Input Traffic

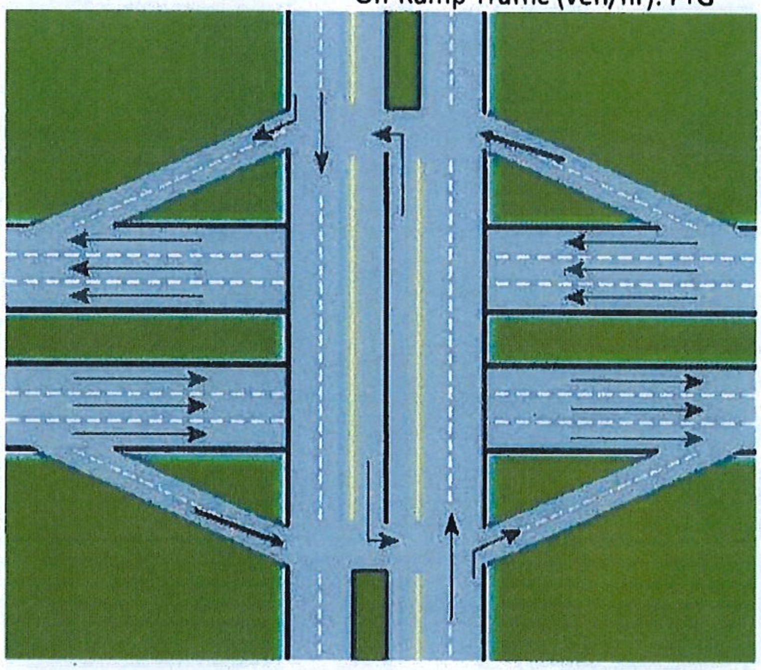
Year	Eastbound		Westbound		Northbound			Southbound		
	Thru (A)	Turn (B)	Thru (C)	Turn (D)	Thru (H)	LT (I)	RT (J)	Thru (E)	LT (F)	RT (G)
Existing Year ()										
Opening Year No-Build/Build ()										
Design Year No-Build/Build ()										

Southbound

Arterial Speed (mph):

Approach Traffic (veh/hr): E+F+G

On-Ramp Traffic (veh/hr): F+G



Eastbound

'eeway Speed (mph):

pproach Traffic (veh/hr): A+B

ff-Ramp Traffic (veh/hr): Use B

Westbound

Freeway Speed (mph):

Approach Traffic (veh/hr): C+[

Off-Ramp Traffic (veh/hr): Use

Northbound

Arterial Speed (mph):

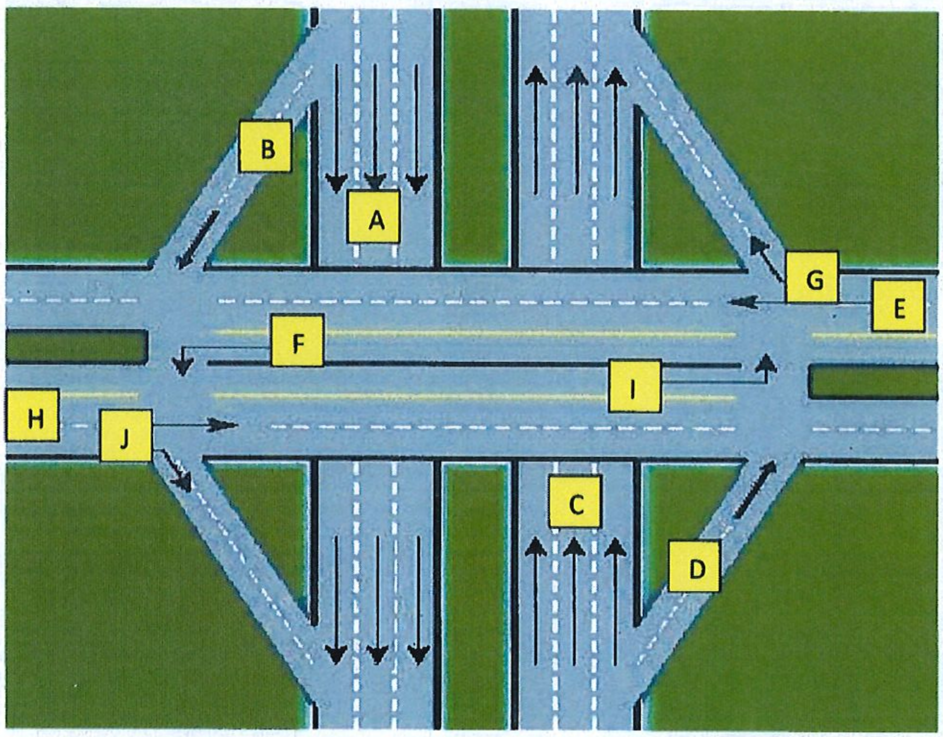
Approach Traffic (veh/hr): H+I+J

On-Ramp Traffic (veh/hr): I+J

**If want to imitate diverging diamond: Make "On-Ramp Traffic" just be J for the Northbound and G for Southbound since you aren't stopping/queuing when going left anymore, you go straight through to the interstate like you are "Thru traffic". This way you are running something "different" for diverging diamonds. Otherwise, you can go conservative and treat a diverging diamond as a regular diamond. However, if you want to convert from regular diamond to diverging diamond this above trick would demonstrate a benefit (less queuing/idling less emissions).

N-S Diamond Intersection

CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Northbound/Southbound Movement:
Eastbound/Westbound Movement:

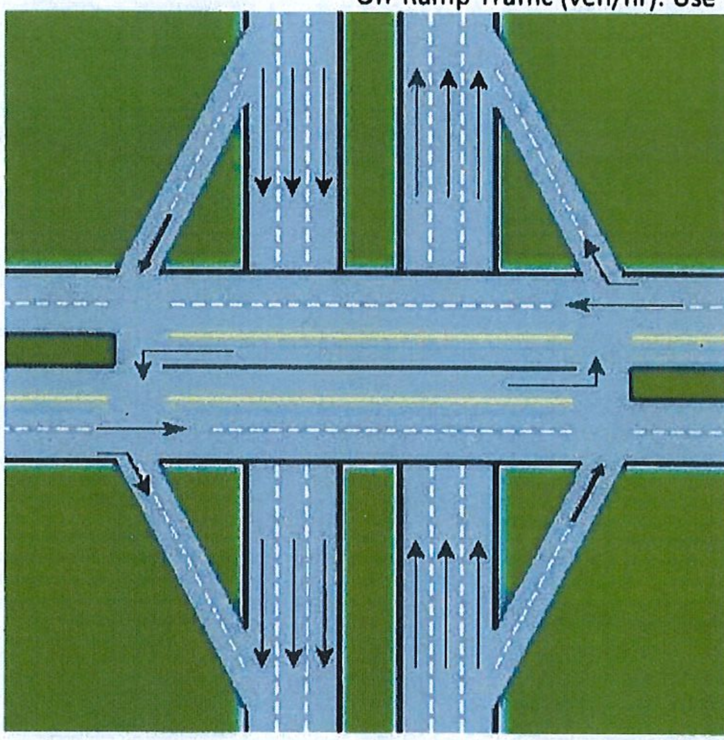


Model Input Traffic										
Year	Southbound		Northbound		Eastbound			Westbound		
	Thru (A)	Turn (B)	Thru (C)	Turn (D)	Thru (H)	LT (I)	RT (J)	Thru (E)	LT (F)	RT (G)
Existing Year ()										
Opening Year No-Build/Build ()										
Design Year No-Build/Build ()										

Southbound

Freeway Speed (mph):

Approach Traffic (veh/hr): A+B
Off-Ramp Traffic (veh/hr): Use B



Eastbound

Arterial Speed (mph):

Approach Traffic (veh/hr): H+I+J

On-Ramp Traffic (veh/hr): I+J

Westbound

Arterial Speed (mph):

Approach Traffic (veh/hr): E+F+

On-Ramp Traffic (veh/hr): F+G

Northbound

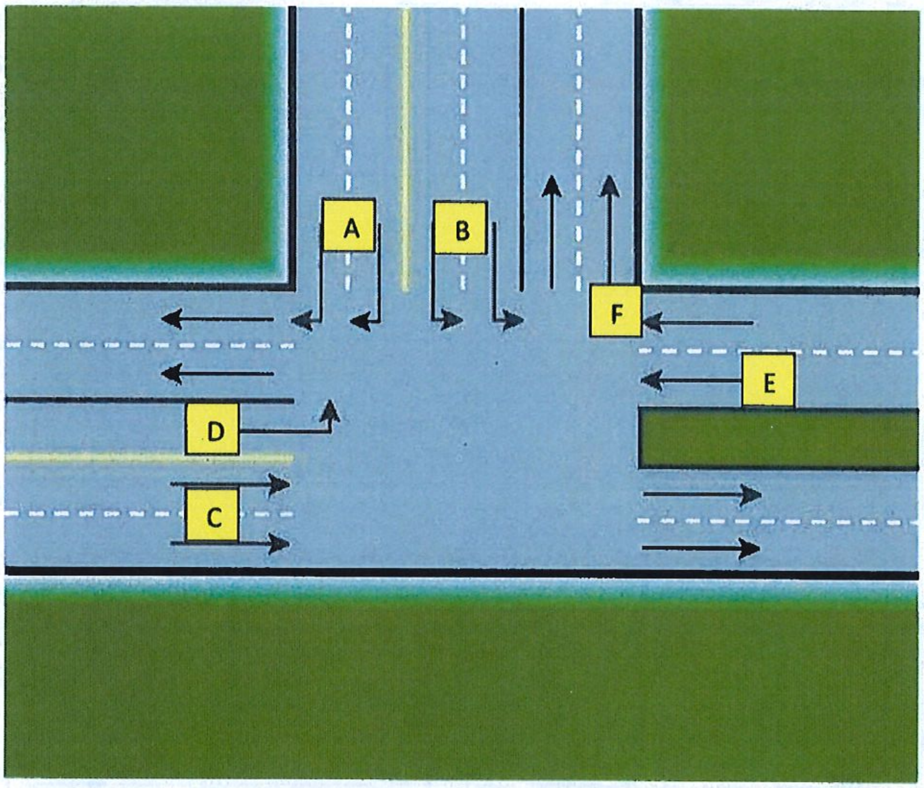
Freeway Speed (mph):

Approach Traffic (veh/hr): C+D
Off-Ramp Traffic (veh/hr): Use D

**If want to imitate diverging diamond: Make "On-Ramp Traffic" just be J for the Eastbound and G for Westbound since you aren't stopping/queuing when going left anymore, you go straight through to the interstate like you are "Thru traffic". This way you are running something "different" for diverging diamonds. Otherwise, you can go conservative and treat a diverging diamond as a regular diamond. However, if you want to convert from regular diamond to diverging diamond this above trick would demonstrate a benefit (less queuing/idling less emissions).

North Tee Intersection

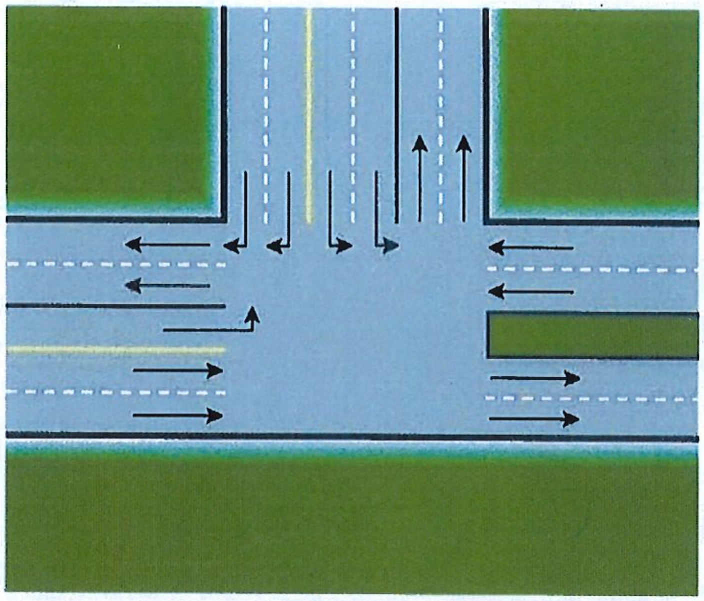
CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Southbound Movement:
Westbound/Eastbound Movement:



Model Input Traffic						
	Southbound		Eastbound		Westbound	
Year	RT (A)	LT (B)	Thru (C)	LT (D)	Thru (E)	RT (F)
Existing Year ()						
Opening Year No-Build/Build ()						
Design Year No-Build/Build ()						

Southbound

Speed (mph):
Approach Traffic (veh/hr): sum of A+B



Eastbound

ıeed (mph):

ɔproach Traffic (veh/hr): sum
C+D

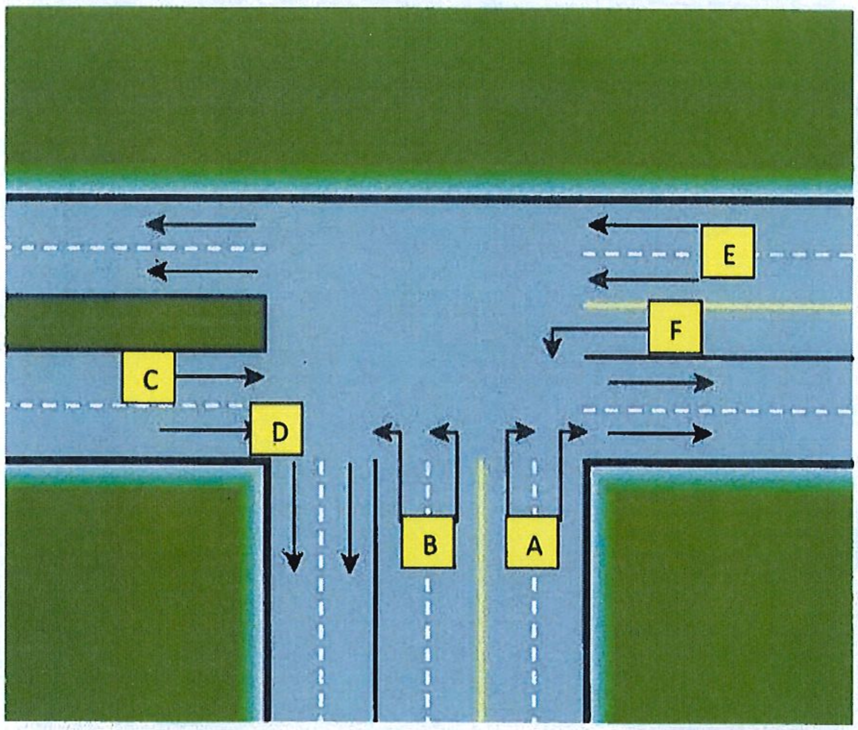
Westbound

Speed (mph):

Approach Traffic (veh/hr): sum of E+F

South Tee Intersection

CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Northbound Movement:
Westbound/Eastbound Movement:

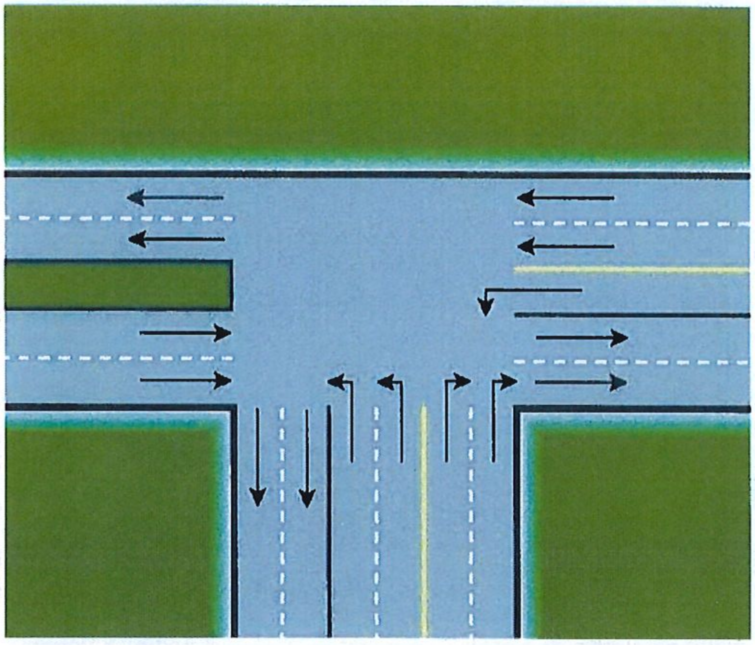


Model Input Traffic						
Year	Northbound		Eastbound		Westbound	
	RT (A)	LT (B)	Thru (C)	RT (D)	Thru (E)	LT (F)
Existing Year ()						
Opening Year No-Build/Build ()						
Design Year No-Build/Build ()						

Eastbound

ɪeed (mph):

ɔproach Traffic (veh/hr): sum C+D



Westbound

Speed (mph):

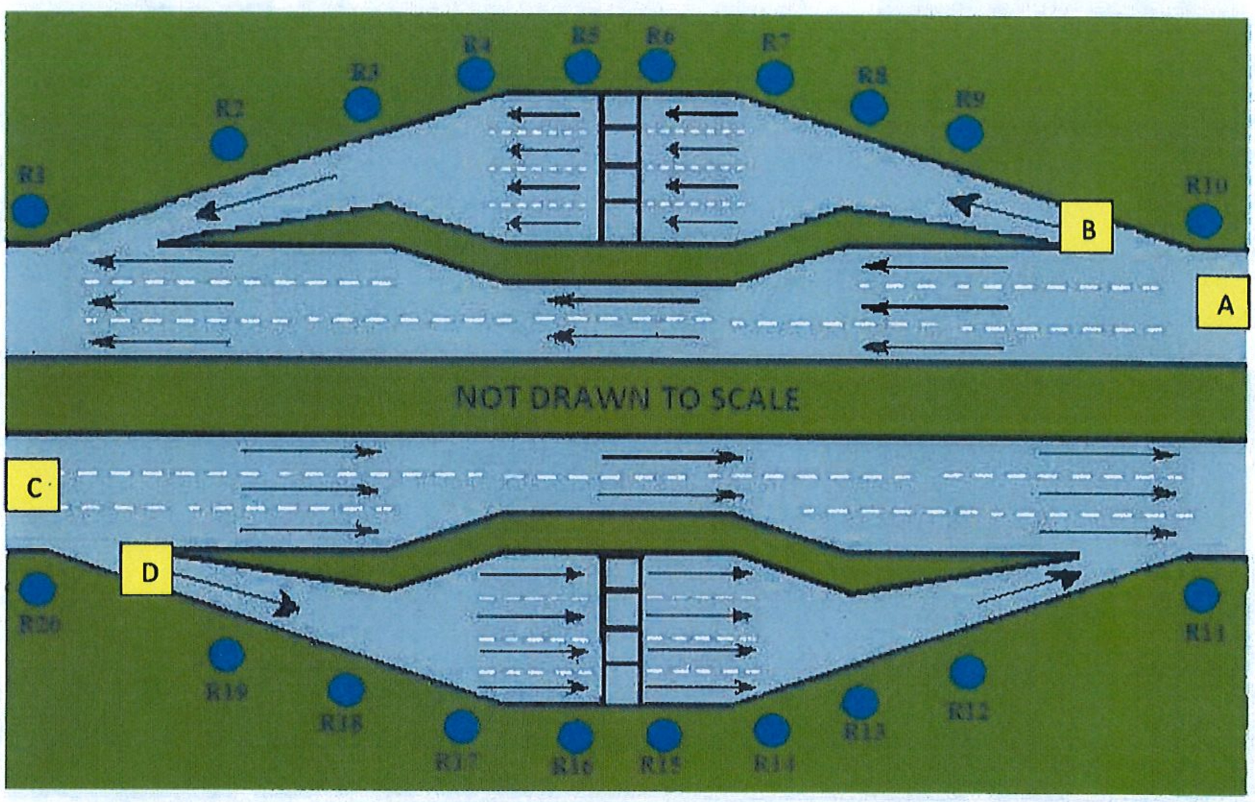
Approach Traffic (veh/hr): sı of E+F

Northbound

Speed (mph):
Approach Traffic (veh/hr): sum of A+B

Toll Plaza Interchange: E-W Freeway

CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Westbound/Eastbound Movement:



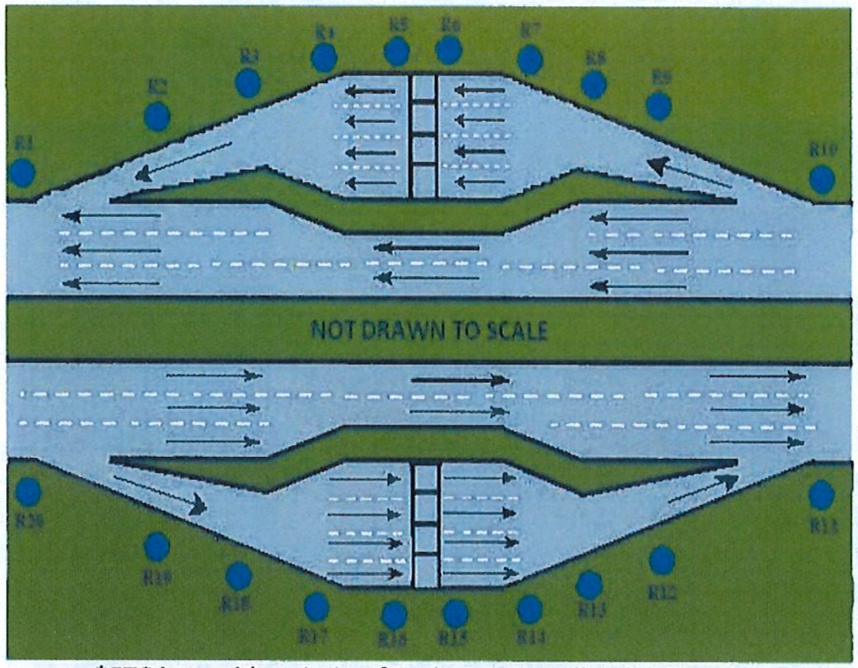
Model Input Traffic				
Year	Westbound		Eastbound	
	All (A)	ETC (B)	All (C)	ETC (D)
Existing Year ()				
Opening Year No-Build/Build ()				
Design Year No-Build/Build ()				

Eastbound

eeway Speed (mph):

proach Traffic (veh/hr):
se C

of Vehicles Using ETC-
nly Lanes: D/Cx100



Westbound

Freeway Speed (mph):

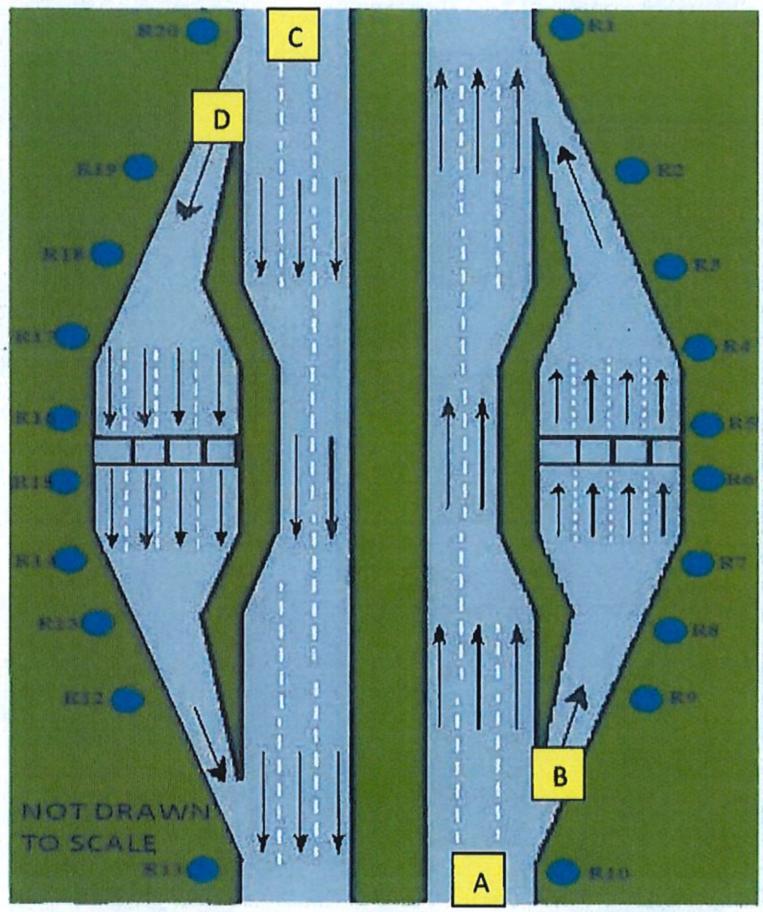
Approach Traffic (veh/hr):
Use A

% of Vehicles Using ETC-
Only Lanes: B/Ax100

*ETC is an abbreviation for Electronic Toll Collection

Toll Plaza Interchange: N-S Freeway (not in model directly, but can just shift 90 degrees)

CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Northbound/Southbound Movement:



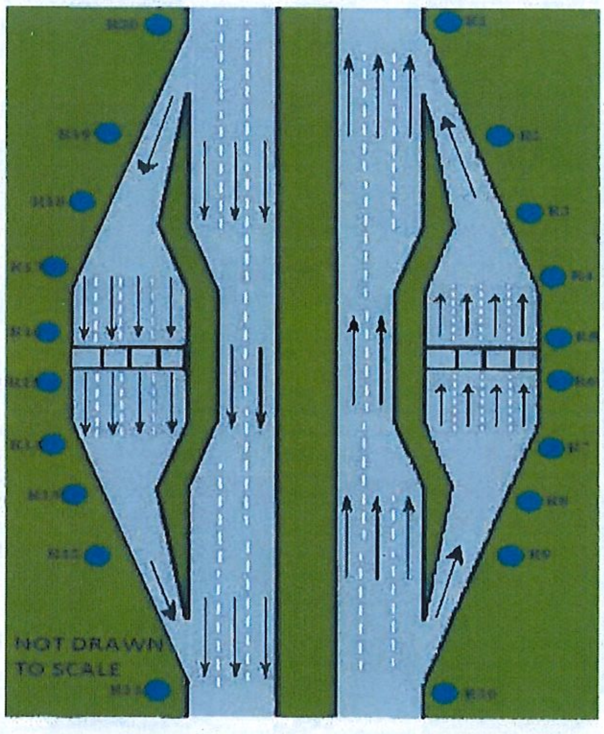
Model Input Traffic				
Year	Northbound		Southbound	
	All (A)	ETC (B)	All (C)	ETC (D)
Existing Year ()				
Opening Year No-Build/Build ()				
Design Year No-Build/Build ()				

Southbound

Freeway Speed (mph):

Approach Traffic (veh/hr):
Use C

% of Vehicles Using ETC-
Only Lanes: D/Cx100



*ETC is an abbreviation for Electronic Toll Collection

Northbound

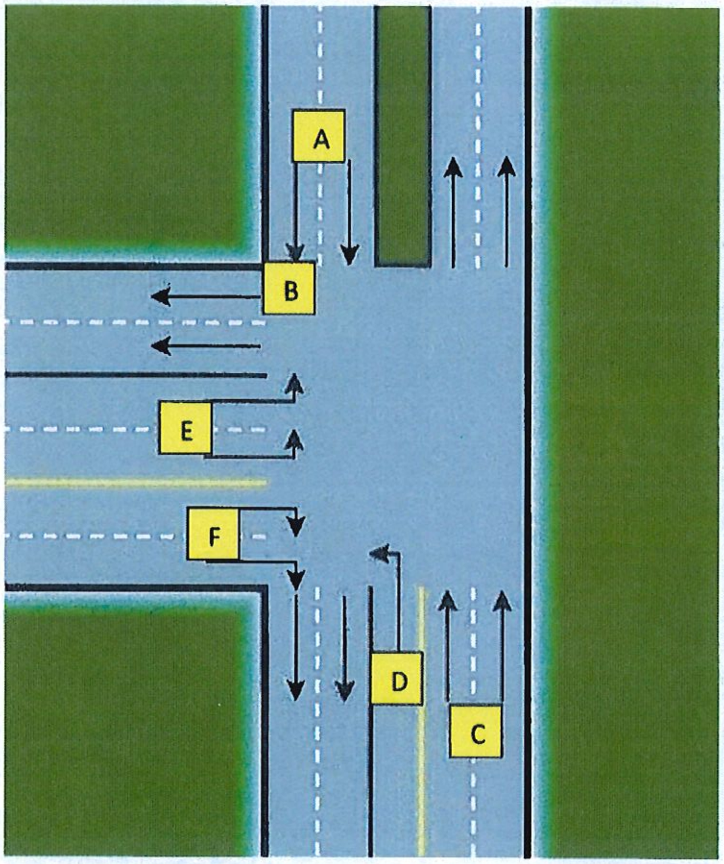
Freeway Speed (mph):

Approach Traffic (veh/hr):
Use A

% of Vehicles Using ETC-
Only Lanes: B/Ax100

West Tee Intersection

CO Georgia 2015 Air Quality Traffic Datasheet
PREPARED BY:
FPID No(s):
FAP No(s):
Project Description:
Intersection Analyzed:
Peak Traffic Period Analyzed:
Northbound/Southbound Movement:
Eastbound Movement:



Model Input Traffic						
Year	Southbound		Northbound		Eastbound	
	Thru (A)	RT (B)	Thru (C)	LT (D)	LT (E)	RT (F)
Existing Year ()						
Opening Year No-Build/Build ()						
Design Year No-Build/Build ()						

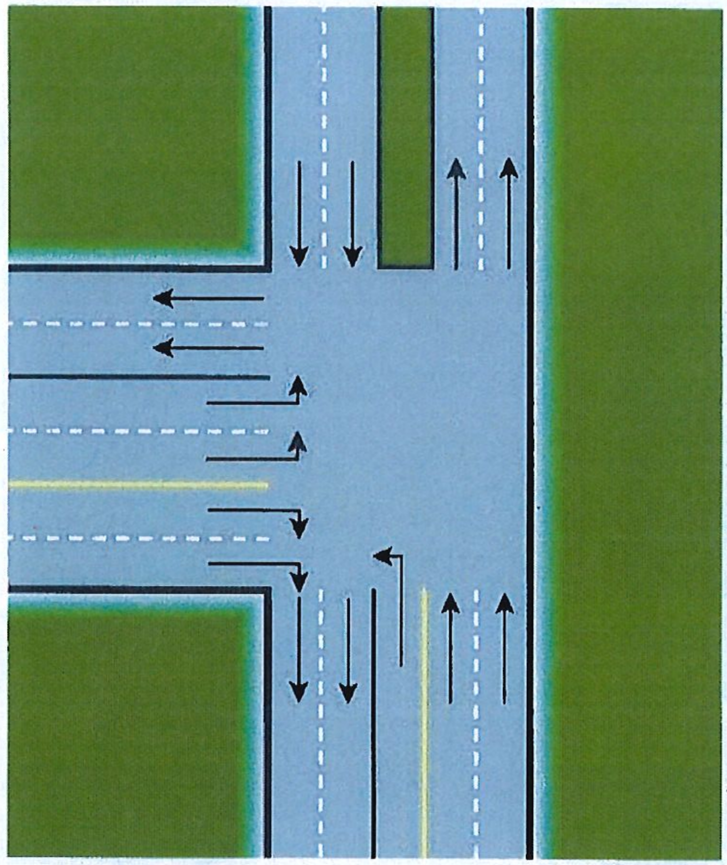
Southbound

Speed (mph):
Approach Traffic (veh/hr): sum of A+B

Eastbound

ıeed (mph):

ɔproach Traffic (veh/hr): sum
E+F



Northbound

Speed (mph):
Approach Traffic (veh/hr): sum of C+D

Attachment D: MOVES CALC INPUTS

Attachment D

Inputs to MOVES and CAL3QHC2 of Note

Table 1. MOVES General Inputs for Idle and Cruise Emission Factors

Input Tab	Input Value
Description	*** User Input ***
Scale Domain/scale Calculation type	 Project Inventory
Time Spans Time aggregation level Year of evaluation Month of evaluation Days of evaluation Evaluation hour	 Hour *** User Input *** January Weekdays 8:00-9:00 AM ("hour 9")
Geographical Bounds County Grouping (representative county)	County Grouping 1 (Fulton County) County Grouping 2 (Bartow County) County Grouping 3 (Chatham County) County Grouping 4 (Coffee County)
Vehicle/Equipment On Road Vehicles	 All applicable gasoline, diesel and CNG vehicles
Road Type	Urban unrestricted access
Pollutant and Processes	CO running exhaust, CO running crankcase exhaust
Manage Input Data Set Database	 *** User Input ***
Strategies	Default inputs
Output Mass units Energy units Distance units Activity Output emissions	 Grams (can be tons, but convert to grams) Joules Miles Distance traveled, population Emission process
Scenarios Calendar year Approach speed Left-turn speed Right-turn speed	 *** User Input *** *** User Input *** 20 mph 15 mph

Table 2. MOVES Project Data Manager Inputs (input database) for Idle and Cruise Emission Factors

Input Tab	Input Value
I/M Programs	County Grouping 1: 13 county Atlanta area I/M program Other 3 Groupings: n/a
Generic	n/a
Age Distribution	Local data purchased from and organized by IHS Automotive (was R.L Polk): each county grouping's vehicle age data was analyzed and placed into an age distribution from 0-30+ years, 2014 data assumed to remain the same in future years
Fuel	MOVES defaults for representative counties for each of the 4 groupings (for January, they would be the same)
Meteorology Data	60 deg F, 50% relative humidity
Link Drive Schedules	n/a except for runs including acceleration (see Table 6), then 0-maximum speed inputted (5 mph increments), assuming 6 mi/s increase, minimum final speed 15mph
Off-Network	n/a
Operating Mode Distribution	n/a
Links	See Table 3 in Appendix B ofTSD
Link Source Types	See Tables 4a-d in Appendix B of TSD

Table 2. CAL3QHC2 Input Parameter Values – Pre-set and User Inputs

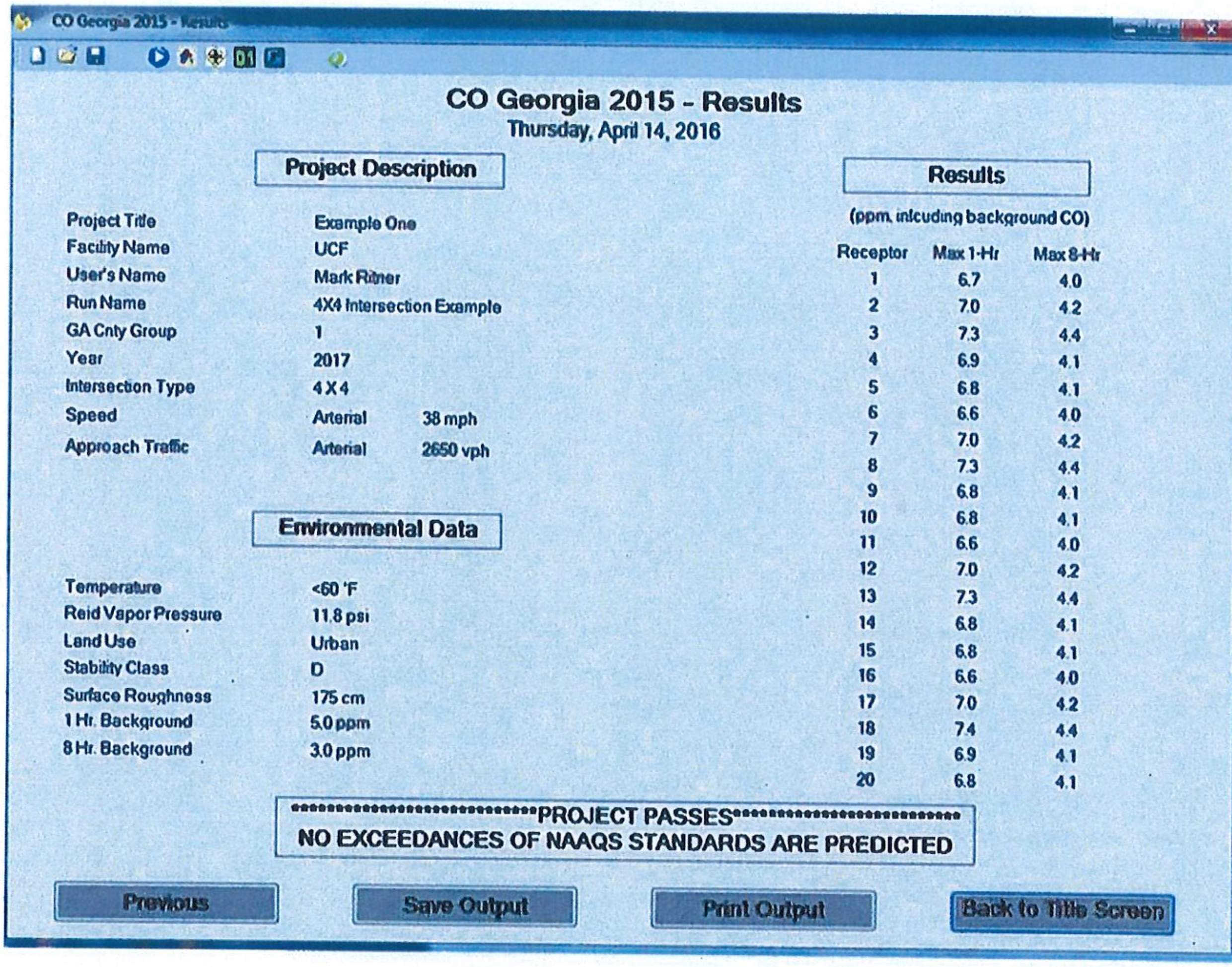
Input Tab	Input Value
Job Title	*** User Input ***
Averaging time	60 minutes
Surface Roughness Zo Urban Suburban Rural	 175 cm 108 cm 10 cm
Settling and Deposition Velocity	0 and 0
Number & Location of Receptors	Default (screening model only uses closest possible receptors to edge of road)
Receptor Height	6 ft. for all receptors
Queue Links	

Source height	0
Number of travel lanes in queue	Dependent on Intersection Type selected
	12 ft./lane x #lanes
Mixing zone width	120 sec
Average signal cycle length	See Table 7 in Appendix B of TSD
Average red time	3 sec
Clearance lost time	Default
Traffic volume	*** User Input ***
Idle emission factor	MOVES Look-up tables (EFTextFiles folder)
Saturation flow rate – arterial	1600 vph/lane
Saturation flow rate – off ramps	1500 vph/lane
Signal type	Pre-timed
Arrival rate	Average progression
Free Flow Links	
Traffic volume	*** User Input ***
Emission factor	MOVES Look-up tables (EFTextFiles folder)
Source height	0
Mixing zone width	12 ft./lane x #lanes + 20 ft.
Meteorology	
Wind speed	1.0 m/s
Wind angle	360° search
Wind angle variation data	By 5°
Stability class	
urban	D
suburban	D
rural	E
Mixing height	1000m
Ambient background CO (8-hr)	
urban	3.0 ppm
suburban	2.0 ppm
rural	1.0 ppm
Other Considerations	
Total persistence factor	0.6
% Left turn (except Tee intersections; see Table 8)	15

Attachment E: Run Screen

Attachment E

Run Screen



CO Georgia 2015 - Results

CO Georgia 2015 - Results

Thursday, April 14, 2016

Project Description

Project Title	Example One
Facility Name	UCF
User's Name	Mark Ritner
Run Name	4X4 Intersection Example
GA Cnty Group	1
Year	2017
Intersection Type	4 X 4
Speed	Arterial 38 mph
Approach Traffic	Arterial 2650 vph

Environmental Data

Temperature	<60 °F
Reid Vapor Pressure	11.8 psi
Land Use	Urban
Stability Class	D
Surface Roughness	175 cm
1 Hr. Background	5.0 ppm
8 Hr. Background	3.0 ppm

Results

(ppm, including background CO)

Receptor	Max 1-Hr	Max 8-Hr
1	6.7	4.0
2	7.0	4.2
3	7.3	4.4
4	6.9	4.1
5	6.8	4.1
6	6.6	4.0
7	7.0	4.2
8	7.3	4.4
9	6.8	4.1
10	6.8	4.1
11	6.6	4.0
12	7.0	4.2
13	7.3	4.4
14	6.8	4.1
15	6.8	4.1
16	6.6	4.0
17	7.0	4.2
18	7.4	4.4
19	6.9	4.1
20	6.8	4.1

****************************PROJECT PASSES****************************

NO EXCEEDANCES OF NAAQS STANDARDS ARE PREDICTED

Previous Save Output Print Output Back to Title Screen