Appendix B. Programmatic Agreement Template

The coloring scheme in the draft PA template, and its associated TSD, is as follows:

Black text = Text that generally will not need to be modified and can be used for a national PA and for individual state PAs;

Red text = Information (e.g. report or study citations) at a Federal or state level that is not yet complete and can be added at a later date when a national PA or state PA is finalized;

Blue text = Text to be added containing information relevant to a particular state in order to allow completion of a state –specific PA and its associated TSD.

STATE DOT LETTERHEAD

Date

From: Chief Engineer (or other appropriate Executive), State Department of Transportation

To: FHWA Division Administrator, State Division

The purpose of this memorandum is to establish a Programmatic Agreement (PA) between the STATE Department of Transportation (DOT) and the STATE Division of the Federal Highway Administration (FHWA). The PA is related to analysis of potential carbon monoxide (CO) impacts of certain highway projects currently undergoing environmental studies to meet requirements of the National Environmental Policy Act (NEPA). Other relevant agencies (list) have participated in the development and/or review of this PA and support its use. This PA establishes the types of projects and project conditions that will not require project-specific modeling or a quantitative air quality analysis to document that they do not cause a violation of the National Ambient Air Quality Standards (NAAQS) for CO. Rather, these project types and conditions will require only a general qualitative statement to meet project-level air quality requirements that references this agreement and the associated technical support document (TSD), which presents worst-case modeling results for CO that would cover the specific project type and condition.

**Basis of Agreement:** This PA was developed based on an extensive history of modeling potential CO impacts for highway projects. In support of its capital program, STATE DOT has been performing CO emissions analyses of highway projects since the late 1970s. These analyses, in the vast majority of cases, 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]](#footnote-1) documented conditions for urban intersections in CO maintenance areas that did not require a specific project-level conformity determination but could rely on the categorical finding to make a project-level conformity determination. Similarly, the National Cooperative Highway Research Project (NCHRP) study: *Programmatic Agreements for Project-Level Air Quality Analyses* *(2015)[[2]](#footnote-2)*, which provides the primary basis for this agreement, 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; *Using MOVES in Project-Level Carbon Monoxide Analyses*, U.S.EPA, EPA-420-C-10-041 December 2010). The studies also used EPA-approved emission and dispersion models. (MOVES2010b as the emission model and CAL3QHC (version 04244) as the dispersion model).

**Application of the PA:** The PA may be applied directly with no additional calculations if the following are applicable:

1. If the project meets the minimum technical criteria for the PA to be applied, namely:
   1. Background concentration not more than the default of 2.6 ppm (eight-hour standard) that was taken for this PA.
   2. Persistence factor not greater than the EPA default of 0.7 that was taken for this PA.
   3. The CO NAAQS have not changed from what was in effect at the time when this agreement was implemented and upon which the modeling was based (35 ppm for the one-hour and 9 ppm for the eight-hour.
2. If, for the project configuration and conditions of interest (road grade, speed, etc.), a one-hour concentration value is listed in the appropriate attached table (Table B-1 for freeways and arterials; Table B-2 for intersections; Table B-3 for interchanges). If it is listed, then the project is covered by the PA, provided that the minimum criteria specified above are also met.
3. If the project is covered by the PA, the qualitative text provided at the end of this document should be included (modified as appropriate for the project) in the project record and relevant environmental documents.

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

*Freeways and Arterials*

Table B-1, attached, shows the conditions for urban and rural arterials and freeways that would meet the one- and eight-hour NAAQS and would be covered by this PA[[3]](#footnote-3). The table shows one-hour concentrations, not including background concentrations. The populated cells of the table correspond to the lane and grade combinations for arterials and freeways which, even under worst-case conditions, would not result in exceedances of the 8-hour NAAQS for CO. Where the table entries are *blank*, the corresponding configuration would *not* meet the NAAQS based on worst-case modeling and would *not* be covered by this PA. Project-specific modeling would typically need to be conducted to show compliance with the NAAQS in these cases.

For example, for a transportation improvement project for a freeway for which the build scenario has 10 total lanes, average road grades of 2% or less, and peak hour (congested) operating speeds of 50 mph, Table B-1 shows a contribution of 8.0 ppm for the one-hour CO standard. Since a CO concentration is shown in the table for this project type and configuration, the project is covered by this PA and does not require project-specific modeling for CO. Conversely, the same freeway with 12-lanes would *not* be covered by this PA, as the table entry is *blank* for that configuration.

The values shown in Table B-1 were determined using conservative or worst-case modeling inputs and assumptions for MOVES and CAL3QHC (see Technical Approach discussion, below). Concentrations for comparison to the eight-hour NAAQS were determined from the one-hour values shown using a national average eight-hour background concentration of 2.6 ppm along with the EPA recommended persistence factor of 0.7. The resulting eight-hour concentrations were used to identify which arterial and freeway configurations would meet the eight-hour NAAQS.

Note: this PA covers lanes widths of 11 feet or more for freeway and arterial project types.

*Intersections*

Intersections were examined using the same approach (other than geometrics) as in freeway and arterial cases. That is, the same MOVES and CAL3QHC model inputs and assumptions were used. The intersection analysis assumes six approach lanes on each leg of the intersection, with two of the approach lanes becoming left-turn lanes at the intersection. Four lanes are assumed on each departure leg. The intersection case was modeled at a grade of 2%.

Table B-2, attached, shows the maximum 1-hour CO concentrations for urban and rural intersections that, with the applied 8-hour CO background level of 2.6 ppm and persistence factor of 0.7, do not produce modeled CO concentrations that could result in exceedances of the 8-hour CO NAAQS.

In other words, these findings indicate that a project for an intersection with a grade of 2% or less, six approach lanes or less, and forecast approach speeds not less than 15 mph would not produce modeled concentrations that would result in exceedances of the 8-hour CO NAAQS. Any such project would be covered by this PA and would not require project-specific CO modeling to demonstrate compliance with the CO NAAQS. Conversely, for example, a project with seven approach lanes, a 3% grade and/or a 10 mph approach speed would *not* be covered by this PA.

Note: The intersections were modeled as 90 degree intersections, that is, with roadways intersecting at right angles. Skewed intersections (those whose approaches do not intersect at right angles) are not included in PA. Similarly, highly congested intersections (where the approach speed is less than 15 mph) and intersections with five or more legs are also not included in the PA.

*Interchanges with an Adjacent Intersection*

Interchanges were analyzed using the MOVES and CALQHC models, with the same traffic inputs and assumptions as in the previous cases. The interchange scenarios were modeled at a 0% grade in an urban location. The total number of interchange lanes analyzed ranged from 2 to 22 in 2 lane increments. For the adjacent intersection, a variety of distances from the edge of the nearest freeway travel lane to the edge of the nearest travel lane on the interchange ramp were also examined. The geometry of the adjacent intersection was also modeled as having six approach lanes, including two left turn lanes, and four departure lanes.

Note: This is a very conservative approach for ramp intersections adjacent to freeway interchanges, which typically have only one- or two-lane ramps approaching or departing from the intersection.

Table B-3, attached, shows 1-hour CO concentrations for these interchange scenarios that, with the applied 8-hour CO background level and persistence factor, do not produce modeled concentrations that could result exceedances of the 8-hour NAAQS for CO. Where the table entries are *blank*, the corresponding configuration would *not* meet the NAAQS based on worst-case modeling and would *not* be covered by this PA. Project-specific modeling would typically need to be conducted to show compliance with the NAAQS in these cases.

For example, looking at the first section of Table B-3 for which approach speeds are not less than 15 mph, a 12-lane freeway with an adjacent intersection that is located not less than 150 feet from the nearest edge of the freeway lanes has a one-hour concentration listed of 9.1 ppm. Since a concentration is listed for this project type, approach speed and configuration, the project would be covered by this PA and not require project-specific modeling. Conversely, the table entry is *blank* for a 14 lane freeway with an intersection at 150 feet that has an approach speed of not less than 15 mph. Thus, that configuration would *not* be covered by this PA.

**A State DOT may consider the following text in a state-specific PA:**

Projects of De Minimis Scope: Projects that do not change (add, remove or relocate) roadway capacity or transit services do not require either qualitative or quantitative project-level air quality analyses for purposes of NEPA.

**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 require project-specific modeling for CO for purposes of NEPA. In the case of these exempt projects, a qualitative statement as provided below is to be included in the project environmental document or record.

**Project Alternatives:** This PA is intended to cover all build alternatives for the above-listed projects, as well as the no-build alternative. If one or more alternatives are not included in the list of project types above, STATE DOT and STATE Division of FHWA will coordinate to determine the applicability of the PA to that alternative(s). It may be that one alternative that is covered by the PA would effectively represent the worst-case for all of the alternatives, e.g., if one alternative has more congested conditions than the others. As appropriate and as both agencies agree, other agencies (such as the Regional EPA office or the STATE Air Agency) may be brought in to assist in the coordination.

**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 air quality modeling may be needed.

For those project types and conditions where applicability of this PA is not certain, STATE DOT and STATE Division of FHWA will coordinate to determine the applicability. As appropriate and as both agencies agree, other agencies (such as the Regional EPA office or the STATE Air Agency) may be brought in to assist in the coordination.

**Years of Analysis:** This PA covers projects of the types and conditions listed above whose opening year (year of completion) is 2015 or later.

**Technical Approach:** The modeling and the assumptions used in the modeling to support this PA are described in detail in the accompanying Technical Support Document (TSD). In general, a worst-case modeling approach was applied following EPA guidance. In all cases EPA’s MOVES2010b emission model was used to generate emission estimates and CAL3QHC (version 04244) was used for the dispersion analysis. 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 applied. The assumptions and inputs used in the model were worst-case or highly conservative, leading to higher emission estimates and less dispersion (that is, greater forecast ambient concentrations) than would be expected under real-world conditions. 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 real-world conditions would not be expected. Finally, STATE DOT consulted with the STATE AIR AGENCY to determine appropriate values for CO background concentrations and persistence factor. These values were used to arrive at an 8-hour total CO concentration for comparison with the 8-hour CO ambient air quality standard.

**Administrative Record:** For the project’s environmental document or record, the STATE DOT will include a statement that the project under review meets the project types and conditions covered in the PA and will conclude with one of the two following statements (or similar):

“The project does not exceed the project types and conditions listed in the agreement between the Federal Highway Administration and the STATE Department of Transportation for streamlining the project-level air quality analysis process for carbon monoxide. Modeling using "worst-case" parameters has been conducted for these project types and conditions. It has been determined that projects such as this one cannot significantly impact air quality and cannot 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 Standards 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:** STATE DOT and STATE Division of FHWA recognize that project level air quality analysis methodologies may change over time. This may include new or updated emission or dispersion models, background CO levels, and/or associated worst-case modeling assumptions. STATE DOT will consult as appropriate with STATE Division of FHWA regarding any changes.

**Termination of Agreement:** Should either the STATE DOT or the STATE Division of FHWA determine 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. Projects that have been cleared on the basis of the PA before the effective termination date may maintain that clearance and not require project-specific modeling for CO.

**Value of the PA:** The PA is beneficial to both STATE DOT and STATE Division of FHWA. It reduces costs by eliminating unnecessary analyses, enhances efficiency and certainty in the environmental review process, and helps ensure project scope and scheduling.

## Attachment to the Programmatic Agreement

Table B-1. One-hour CO concentrations (ppm) for freeways and arterials1 in urban and rural   
locations of varying lane and grade configuration (not including background concentrations)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | GRADE | | | |
| **FACILITY TYPE** | **LOCATION** | **LANES** | **0** | **2** | **4** | **7** |
| Arterial | Urban | 12 | 6.7 | 8.5 |  |  |
| Arterial | Urban | 10 | 6.0 | 7.6 |  |  |
| Arterial | Urban | 8 | 5.2 | 6.6 |  |  |
| Arterial | Urban | 6 | 4.3 | 5.4 | 7.5 |  |
| Arterial | Urban | 4 | 3.2 | 3.9 | 5.5 |  |
| Arterial | Urban | 2 | 1.8 | 2.2 | 3.0 |  |
|  |  |  |  |  |  |  |
| Arterial | Rural | 8 | 8.7 |  |  |  |
| Arterial | Rural | 6 | 7.2 | 8.6 |  |  |
| Arterial | Rural | 4 | 5.4 | 6.3 | 8.6 |  |
| Arterial | Rural | 2 | 3.1 | 3.6 | 4.9 |  |
|  |  |  |  |  |  |  |
| Freeway | Urban | 20 | 9.0 |  |  |  |
| Freeway | Urban | 18 | 8.6 |  |  |  |
| Freeway | Urban | 16 | 7.9 |  |  |  |
| Freeway | Urban | 14 | 7.2 |  |  |  |
| Freeway | Urban | 12 | 6.5 |  |  |  |
| Freeway | Urban | 10 | 5.6 | 8.0 |  |  |
| Freeway | Urban | 8 | 4.7 | 6.6 |  |  |
| Freeway | Urban | 6 | 3.7 | 5.1 | 7.2 |  |
| Freeway | Urban | 4 | 2.7 | 3.5 | 4.9 | 6.2 |
| Freeway | Urban | 2 | 1.4 | 1.7 | 2.4 | 3.1 |
|  |  |  |  |  |  |  |
| Freeway | Rural | 8 | 8.0 |  |  |  |
| Freeway | Rural | 6 | 6.4 | 8.6 |  |  |
| Freeway | Rural | 4 | 4.5 | 5.9 | 8.2 |  |
| Freeway | Rural | 2 | 2.4 | 3.0 | 4.2 | 5.3 |
| 1These findings apply to scenarios with average speed ranging from 45 to 56 mph for arterials and 19 to 74 mph for freeways | | | | | | |

Table B-2. One-hour CO concentrations (not including background concentrations) for rural and urban intersections at varying approach speeds for a six approach lane intersection for each leg at two percent grade.

|  |  |  |
| --- | --- | --- |
| LOCATION | APPROACH SPEED (MPH) | CONCENTRATION (PPM) |
| Urban | 15 | 6.5 |
| Urban | 25 | 5.7 |
| Urban | 35 | 5.2 |
|  |  |  |
| Rural | 25 | 8.8 |
| Rural | 35 | 8.4 |

Table B-3. One-hour CO concentrations at varying intersection approach speeds at varying distances from an urban freeway at varying lane configurations (not including background concentrations)

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Urban Freeway Contribution of CO (PPM) at 15 mph Approach Speed with Increasing Distance from Freeway Pavement Edge (ft) | | | | | | | | | | | | |
| **NUMBER OF LANES** | **10** | **20** | **30** | **60** | **80** | **100** | **125** | **150** | **175** | **300** | **500** | **1000** |
| 2 | 8.5 | 7.8 | 7.5 | 7.1 | 6.9 | 6.7 | 6.7 | 6.6 | 6.5 | 6.5 | 6.3 | 6.3 |
| 4 |  |  | 8.8 | 8 | 7.6 | 7.4 | 7.2 | 7.1 | 7.1 | 6.7 | 6.5 | 6.3 |
| 6 |  |  |  | 8.9 | 8.4 | 8.1 | 7.9 | 7.6 | 7.6 | 7.1 | 6.8 | 6.5 |
| 8 |  |  |  |  | 9.1 | 8.7 | 8.4 | 8.1 | 8 | 7.4 | 7.1 | 6.7 |
| 10 |  |  |  |  |  |  | 9 | 8.7 | 8.5 | 7.8 | 7.3 | 6.8 |
| 12 |  |  |  |  |  |  |  | 9.1 | 8.9 | 8.1 | 7.6 | 6.9 |
| 14 |  |  |  |  |  |  |  |  |  | 8.5 | 7.8 | 7.1 |
| 16 |  |  |  |  |  |  |  |  |  | 8.8 | 8 | 7.2 |
| 18 |  |  |  |  |  |  |  |  |  | 9.1 | 8.2 | 7.4 |
| 20 |  |  |  |  |  |  |  |  |  |  | 8.5 | 7.5 |
| 22 |  |  |  |  |  |  |  |  |  |  | 8.7 | 7.6 |
| **Urban Freeway Contribution of CO (PPM) at 25 mph Approach Speed with Increasing Distance from Freeway Pavement Edge (ft)** | | | | | | | | | | | | |
| **NUMBER OF LANES** | **10** | **20** | **30** | **60** | **80** | **100** | **125** | **150** | **175** | **300** | **500** | **1000** |
| 2 | 7.9 | 7.2 | 6.9 | 6.5 | 6.3 | 6.1 | 6.1 | 6 | 5.9 | 5.9 | 5.7 | 5.7 |
| 4 |  | 8.7 | 8.2 | 7.4 | 7 | 6.8 | 6.6 | 6.5 | 6.5 | 6.1 | 5.9 | 5.7 |
| 6 |  |  |  | 8.3 | 7.8 | 7.5 | 7.3 | 7 | 7 | 6.5 | 6.2 | 5.9 |
| 8 |  |  |  | 9.1 | 8.5 | 8.1 | 7.8 | 7.5 | 7.4 | 6.8 | 6.5 | 6.1 |
| 10 |  |  |  |  | 9.1 | 8.7 | 8.4 | 8.1 | 7.9 | 7.2 | 6.7 | 6.2 |
| 12 |  |  |  |  |  |  | 8.8 | 8.5 | 8.3 | 7.5 | 7 | 6.3 |
| 14 |  |  |  |  |  |  |  | 9 | 8.7 | 7.9 | 7.2 | 6.5 |
| 16 |  |  |  |  |  |  |  |  | 9.1 | 8.2 | 7.4 | 6.6 |
| 18 |  |  |  |  |  |  |  |  |  | 8.5 | 7.6 | 6.8 |
| 20 |  |  |  |  |  |  |  |  |  | 8.7 | 7.9 | 6.9 |
| 22 |  |  |  |  |  |  |  |  |  | 9.1 | 8.1 | 7 |
| **Urban Freeway Contribution of CO (PPM) at 35 mph Approach Speed with Increasing Distance from Freeway Pavement Edge (ft)** | | | | | | | | | | | | |
| **NUMBER OF LANES** | **10** | **20** | **30** | **60** | **80** | **100** | **125** | **150** | **175** | **300** | **500** | **1000** |
| 2 | 7.3 | 6.6 | 6.3 | 5.9 | 5.7 | 5.5 | 5.5 | 5.4 | 5.3 | 5.3 | 5.1 | 5.1 |
| 4 | 9 | 8.1 | 7.6 | 6.8 | 6.4 | 6.2 | 6 | 5.9 | 5.9 | 5.5 | 5.3 | 5.1 |
| 6 |  |  | 8.6 | 7.7 | 7.2 | 6.9 | 6.7 | 6.4 | 6.4 | 5.9 | 5.6 | 5.3 |
| 8 |  |  |  | 8.5 | 7.9 | 7.5 | 7.2 | 6.9 | 6.8 | 6.2 | 5.9 | 5.5 |
| 10 |  |  |  |  | 8.5 | 8.1 | 7.8 | 7.5 | 7.3 | 6.6 | 6.1 | 5.6 |
| 12 |  |  |  |  |  | 8.7 | 8.2 | 7.9 | 7.7 | 6.9 | 6.4 | 5.7 |
| 14 |  |  |  |  |  |  | 8.8 | 8.4 | 8.1 | 7.3 | 6.6 | 5.9 |
| 16 |  |  |  |  |  |  |  | 8.9 | 8.5 | 7.6 | 6.8 | 6 |
| 18 |  |  |  |  |  |  |  |  | 8.9 | 7.9 | 7 | 6.2 |
| 20 |  |  |  |  |  |  |  |  |  | 8.1 | 7.3 | 6.3 |
| 22 |  |  |  |  |  |  |  |  |  | 8.5 | 7.5 | 6.4 |



1. See: <http://www.fhwa.dot.gov/environment/air_quality/conformity/policy_and_guidance/cmcf/> [↑](#footnote-ref-1)
2. E. Carr, et al. NCHRP 25-25/Task 78, “*Programmatic Agreements for Project-Level Air Quality Analyses*”, 2015.

   See: <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3311> [↑](#footnote-ref-2)
3. These findings apply to scenarios with average speed ranging from 45 to 56 mph for arterials and 19 to 74 mph for freeways. [↑](#footnote-ref-3)