

# Congestion Mitigation and Air Quality Control (CMAQ)

## Line by line instructions for CMAQ emissions calculation worksheets and CMAQ program grant applications with examples

### **Introduction:**

This workbook was created to help the user navigate through the CMAQ program application process. This guide includes each of the worksheets used to calculate the emission benefits from qualified CMAQ projects, and examples of completed emission worksheets to use as reference. [The actual worksheets to be completed by the applicant are provided electronically from the CMAQ Program Manager.] The applicant should use the information within as reference for quickly finding the appropriate worksheet(s) for your project. Each applicant should use this workbook as a reference while filling out the electronic forms provided. (DO NOT USE THESE HARDCOPIES TO APPLY). In addition, it is important for the applicant to use the most current, up-to-date, information concerning emission factors and approved technologies. Reference to these should be made in the “additional comments” section of the emissions worksheet.

Remember, the application form and worksheet **MUST** be accurately completed **IN ITS ENTIRETY** for a project to be considered for funding or it will be sent back without processing.

## Table of Contents

MDOT Administered CMAQ Grant Program: .....	3
General directions: .....	3
Instructions:.....	3
Identifying the Correct Worksheet(s): .....	4
Multiple Worksheets:.....	5
Worksheet selection and completion: .....	6
Worksheet # 00 - WS00 cost module for multiple worksheet projects .....	6
Worksheet # 1 - WS01_Intersection Improvements on One Approach .....	7
Worksheet # 2 - WS02_Intersection Improvements on Adjacent Approaches .....	10
Worksheet # 3 - WS03_Intersection Improvements on Opposite Approaches .....	14
Worksheet # 4 - WS04 IVHS Freeway Systems Development-General Approach .....	18
Worksheet # 5 - WS05 Park and Ride Development Improvements.....	21
Worksheet # 6 - WS06 Standard Rideshare Program.....	23
Worksheet # 7 - WS07 Enhanced Rideshare Promotion .....	24
Worksheet # 8 - WS08 Automated Traffic Monitoring Progression ATMS.....	26
Worksheet # 9 - WS09 traffic signalization modernization, or optimization.....	29
Worksheet # 10 - WS10 bus purchase .....	32
Worksheet # 11 - WS11 travel demand management program .....	35
Worksheet #12 - operation of new public transit services .....	36
Worksheet # 13 - WS13 construct non motorized pathway .....	38
Worksheet # 14 - WS14 signal timing revisions at one location.....	40
Worksheet #15 - WS15 diesel retrofit verified technology .....	42
Completing the Application:.....	44
Part 7 REQUIRED APPLICATION form.....	44
What to do if Sent Back:.....	47
Available Worksheets: .....	48

## **MDOT Administered CMAQ Grant Program:**

CMAQ is administered as a grant program.

Funding grants are awarded to individual jobs based on its emission benefits and work scope. The grants belong to the jobs and not the agency and are not transferable to other jobs within the same agency. Funding new jobs requires action by the project selection process which applies to your area.

Grant numbers are assigned to a project after the project has been approved for eligibility by the Federal Highway Administration. TIP/STIP amendments are required before obligation of the project's funding can occur.

In the event a CMAQ project can not proceed, the money is returned to the program and reassigned to the next highest prioritized project (typically within the same non-attainment area) according to the applicable selection process.

### **General directions:**

All projects submitted for consideration of CMAQ funding, must include an application, the appropriate emission calculating worksheet(s), more than one may be necessary, and the cost effectiveness calculation. All required fields of the application should be completely and correctly filled out, clearly identifying the change in emissions, the cost effectiveness, and the name and phone number of the person that can provide additional information about the project if the CMAQ program manager has questions.

### **Instructions:**

This workbook includes samples of one application form, 15 worksheets, 15 example worksheets, a summary cost effectiveness worksheet for projects that require more than one emissions worksheet, and the emission factor lists, one for SEMCOG and one for all other areas. If you're in the 7 County regions for the South East Michigan Council of Governments

(SEMCOG), Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne, you will need to use the SEMCOG emission factors, all other areas will need to use the emission factors list entitled “Non-SEMCOG”. Please note that the emission factors have been updated from Mobile 5.1 to Mobile 6.2.

The emission calculating worksheets are password protected. The applicant can only manipulate the data being entered in the cells that are highlighted in yellow. The grayed cells automatically calculate the information the applicant has input and provide the information needed in order to complete the application form. That information is found in the brown cells in units of [kg/day].

**Note:** The number in the brown cell MUST match the number entered on the application form. If field calculations need to be done, the mathematical equations that are used in the locked cells use are written out within those cells. This method is not recommended and is only indented to assist with the gathering of information to be later filled in on the electronic forms.

The design life of a project is utilized in the cost effectiveness section of the worksheet. This section calculates the emission benefits compared to the cost of the project over that project's expected life span. A project's expected life span is the time (in years) the project is expected to provide these benefits. The applicant should use verified information and reference it or provide an experienced estimate with explanation.

## **Identifying the Correct Worksheet(s):**

Worksheet selection should be based on the applicant's general knowledge of the project. This, along with the applicant's basic understanding of the CMAQ Program Guidelines, will allow the applicant to evaluate the list of worksheets below to determine which of them is appropriate for their project. For instance, if the project description states the intentions of constructing a non-motorized pathway for pedestrians to utilize rather than automobile transportation, then worksheet 13 should be used.

In some cases a project may require more than one worksheet to be filled out. For example, if the project calls for the signal upgrade at 4 different intersections along an individual corridor, then 4

different emission calculation worksheets must be completed and their results compiled for use on a single application. In addition, the cost effectiveness section at the bottom of the emission calculation worksheets is to be disregarded in this case and instead, the use of the cost effectiveness worksheet will be necessary. For this, the applicant will need to add up the changes in emissions from the separate worksheets and use that sum in both the cost effectiveness worksheet and on the application form.

Please keep in mind however, that if the project is part of a larger project, which adds capacity, even if it is eligible by itself, it is not eligible due to the capacity increase of the entire project. For example, if adding a lane to a federal aid system road requires signal install/up-grade and retiming, the signal install/up-grade and timing, which by itself qualifies, will not be eligible for CMAQ funding. No capacity increasing project will be approved for federal CMAQ funds.

## **Multiple Worksheets:**

There is a minimum of two forms which need to be filled out and sent in; the application and the emission calculation worksheet.

Some jobs however, may require more than one emission calculation worksheet. When this is the case, the cost effectiveness worksheet will then also need to be used. An example would be a project applying for CMAQ funding to supply diesel retrofit devices to several vehicles of different make, model, or year. For this case, a change in emissions must be calculated for each vehicle on separate worksheets using the benefit ratings provided by the manufacturer, or from the Environmental Protection Agency's (EPA) Approved Technologies List.

<http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm>

In addition, the sum of the estimated changes in emissions will then need to be used in worksheet # 00, to calculate this projects cost effectiveness. Furthermore, the applicant is required to provide the CMAQ program manager with references of the benefit ratings used. This can be done by attaching any necessary information to the application, or filling in the information in the "comment:" box.

## **Worksheet selection and completion:**

### ***Worksheet # 00 - WS00 cost module for multiple worksheet projects***

If the project being considered for CMAQ funding has multiple intersections, the submitter will need to use worksheet #00 to calculate the cost effectiveness of the projects emission reduction. This is done in place of the cost calculations at the bottom of the individual emission calculating worksheets. When each of the emissions from the multiple worksheets is compiled, the sum is used in this worksheet to predict the cost per kilogram over the life of the project. Please note that worksheet #00 has two nearly identical cost effectiveness calculators. They are NOT identical, and both do NOT have to be filled out. The top calculator is for projects that provide benefits for 340 days of the year and the bottom one is identical except that is one calculates the cost effectiveness over a 240 day per year effectiveness. Once the applicant determines the correct number of days per year that the project will provide an emission reduction, proceed to the following instructions for filling out your correct calculator.

#### **Step one:**

Read the directions.

#### **Step two:**

In the first of the 4 yellow highlighted cells at the top of the worksheet, enter the name of the project.

#### **Step three:**

In the second cell labeled “submitter”, enter the name of the person the CMAQ program manager can contact for more information.

#### **Step four:**

The fiscal year that the application is being turned in for consideration is the year entered in this cell.

#### **Step five:**

The fourth cell down, highlighted in yellow, needs to have the total number of worksheets associated with this projects application. If there are 4 intersections each of which has been

calculated with a separate worksheet, then the number “4” must be entered here. In addition, this and the application must be accompanied by 4 emission calculating worksheets.

**Step six:** (Line No. 1)

Enter in this cell, the total number of years this project is designed to produce the emission reductions that are being reported on the application.

**Step seven:** (Line No. 2)

In the cells corresponding to line 2, enter the total project cost. This includes all CMAQ funding and any match funds.

**Step eight:** (Line No. 8)

The results provided in the brown shaded cells in line 8 should be entered on the project application in units of cost per kilogram over the life of the project.

**Worksheet # 1 - WS01 Intersection Improvements on One Approach**

If your project involves making improvements to an intersection in only one approach, or if there are multiple intersections in your project, please select worksheet # 1. If there are multiple intersections you will also need worksheet # 00. In addition, you will need the emission factors provided by the CMAQ Program Manager for either the SEMCOG or non-SEMCOG areas.

**Step one:**

Determine if this worksheet being completed is for a project involving more than one intersection. If so, you will need to complete an emission calculation worksheet for each of the intersections and add up those values for the application and the cost effectiveness worksheet.

**Step two:**

Copy and save the electronic version of worksheet # 1 to your hard drive renaming it the same as the project name. If you have multiple intersections, you will need to repeat this step, renaming them all differently for each intersection.

**Step three:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step four:**

Begin filling out ALL the cells highlighted in yellow. Start with filling in the project name then the name of the intersection, followed by the name of the person submitting the application, and the fiscal year the application is being submitted.

**Step five:** (Line No. 1)

For each intersection you complete a worksheet for you will need to use that intersections total length the project improvements will affect.

**Step six:** (Line No. 2)

In this cell, enter the volume of traffic calculated in both directions of this intersection. If you're not sure what that volume is, conduct a traffic count.

**Step seven:** (Line No. 3)

Enter into the yellow, highlighted cell corresponding to this line the decimal equivalent of the percentage of the 24-hour traffic volume counted in that intersection that travels through during peak periods. This is a number greater than zero but less than 1. For example, if 70% of the 24-hour traffic flow passes through this intersection during the peak period, you would enter 0.70 in this cell.

**Step eight:** (Line No. 6)

This cell is to contain the average speed through or at this intersection before the implementation of the project during peak hours of traffic flow.

**Step nine:** (Line No. 7)

This cell is to contain the average speed through or at this intersection before the implementation of the project during off-peak hours of traffic flow.

**Step ten:** (Line No. 8)

Fill in this cell with the expected increase in speed during peak hours due to implementation of the project. The expected increase cannot increase beyond the posted speed limit.

**Step eleven:** (Line No. 9)

In this cell you need to enter the expected increase in speed due to implementation in the off-peak hours.



**Step twelve:** (Line No. 12)

Enter in this cell, the information obtained from the emission factors worksheet, for the appropriate area in which the project is located. Use the peak emission factors for the speed you entered on Line No. 6. (Before Implementation) This will be in units of (grams/mile).

**Step thirteen:** (Line No. 13)

Enter in this cell, the information obtained from the emission factors worksheet, for the appropriate area in which the project is located. Use the peak emission factors for the speed you entered on Line No. 10. (After Implementation) This will be in units of (grams/mile).

**Step fourteen:** (Line No. 22)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers. The only circumstance that permits otherwise is if the project has multiple intersections. In that case, the number in these brown cells for each intersection need to be added up and that sum is recorded on the application.

**Step fifteen:** (Comments)

The box labeled “Comments” is provided for question, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative arguments or data relating to or involving the comparisons made.

**Step sixteen:** (Line No. 23)

Once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**NOTE:** If the project has multiple intersections, disregard steps sixteen and seventeen and proceed to **worksheet #00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each intersection.

**Step seventeen:** (Line No. 24)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form.

## **Worksheet # 2 - WS02 Intersection Improvements on Adjacent Approaches**

If your project involves making improvements to an intersection on two adjacent approaches, such as the north bound and east bound, please select worksheet # 2. If there are multiple intersections you will also need worksheet # 00. In addition, you will need the emission factors provided by the CMAQ Program Manager for either the SEMCOG or non-SEMCOG areas.

### **Step one:**

Determine if this worksheet is being completed is for a project involving more than one intersection. If so, you will need to complete an emission calculation worksheet for each of the intersections and add up those values for the application and the cost effectiveness worksheet.

### **Step two:**

Copy and save the electronic version of worksheet # 2 to your hard drive renaming it the same as the project name. If you have multiple intersections, you will need to repeat this step, renaming them differently for each intersection.

### **Step three:**

Read through the entire worksheet. Pay particular attention to all the directions.

### **Step four:**

Begin filling out ALL the cells highlighted in yellow. Start with filling in the project name then the name of the intersecting roads, followed by the name of the person submitting the application, and the fiscal year the application is being submitted.

### **Step five:** (Line No. 1)

For each of the intersections you complete a worksheet for you will need to measure the vehicle miles traveled for the affected traffic. This is done for each approach by multiplying the length in that approach by the Average Daily Traffic (ADT) through that intersection. This number is then entered in the cell on line number 1.

### **Step six:** (Line No. 2)

The improvement length for the second arterial approach in the intersection is calculated the same way and entered in line number 2.

**Step seven:** (Line No. 3)

Enter into the yellow, highlighted cell corresponding to this line the decimal equivalent of the percentage of the 24-hour traffic volume that travels through the intersection using approach one during peak periods. This is a number greater than zero but less than 1. For example, if 70% of the 24-hour traffic flow passes through this intersection during the peak period, you would enter 0.70 in this cell.

**Step eight:** (Line No. 4)

Enter into the yellow, highlighted cell corresponding to this line the decimal equivalent of the percentage of the 24-hour traffic volume that travels through the intersection using approach two during peak periods. This is a number greater than zero but less than 1. For example, if 70% of the 24-hour traffic flow passes through this intersection during the peak period, you would enter 0.70 in this cell.

**Step nine:** (Line No. 9)

This cell is to contain the average travel speed of approach **one before** the implementation of the project during **peak** hours of traffic flow.

**Step ten:** (Line No. 10)

This cell is to contain the average travel speed of approach **two before** the implementation of the project during **peak** hours of traffic flow.

**Step eleven:** (Line No. 11)

In this cell you need to enter the average **off-peak** travel speed for approach **one before** implementation of the project.

**Step twelve:** (Line No. 12)

In the cell for line 12, you need to enter the average **off-peak** travel speed for approach **two before** implementation of the project.

**Step thirteen:** (Line No. 13)

Fill in this cell with the expected increase in speed through approach **one** during **peak** hours due to implementation of the project.

**Note:** If at any point the sum of the expected increase in speed and the average speed is greater than the legal, posted limits, this project will not qualify.

**Step fourteen:** (Line No. 14)

Fill in this cell with the expected increase in speed through approach **two** during **peak** hours due to implementation of the project.

**Step fifteen:** (Line No. 15)

Fill in this cell with the expected increase in speed through approach **one** during **off-peak** hours due to implementation of the project.

**Step sixteen:** (Line No. 16)

Fill in this cell with the expected increase in speed through approach **two** during **off-peak** hours due to implementation of the project.

**Step seventeen:** (Line No. 21)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 9, the **before** implementation **peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step eighteen:** (Line No. 22)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 10, the **before** implementation **peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step nineteen:** (Line No. 23)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 17, the **after** implementation **peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step twenty:** (Line No. 24)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 19, the **after** implementation **peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step twenty one:** (Line No. 27)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 11, the **before** implementation **off-peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step twenty two:** (Line No. 28)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 18, the **after** implementation **off-peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step twenty three:** (Line No. 29)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 12, the **before** implementation **off-peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step twenty four:** (Line No. 30)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 20, the **after** implementation **off-peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step twenty five:** (Line No. 40)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers. The only circumstance that permits otherwise is if the project has multiple intersections. In that case, the number in these brown cells for each intersection need to be added up and that sum is recorded on the application.

**Step twenty six:**

The box labeled “Comments” is provided for questions, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**NOTE:** If the project has multiple intersections, disregard steps twenty seven and twenty eight and proceed to **worksheet #00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each intersection.

**Step twenty seven:** (Line No. 41)

For this step, consider the time, once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**Step twenty eight:** (Line No. 42)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form.

**Worksheet # 3 - WS03 Intersection Improvements on Opposite Approaches**

If your project involves making improvements to an intersection on two opposite approaches, such as the north bound and south bound, please select worksheet # 3.

**Step one:**

Determine if this worksheet is being completed is for a project involving more than one intersection. If so, you will need to complete an emission calculation worksheet for each of the intersections and add up those values for the application and the cost effectiveness worksheet.

**Step two:**

Copy and save the electronic version of worksheet # 2 to your hard drive renaming it the same as the project name. If you have multiple intersections, you will need to repeat this step, renaming them differently for each intersection.

**Step three:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step four:**

Begin filling out ALL the cells highlighted in yellow. Start with filling in the project name then the name of the intersecting roads, followed by the name of the person submitting the application, and the fiscal year the application is being submitted.

**Step five:** (Line No. 1)

For each of the intersections you complete a worksheet for you will need to measure the length within that intersection that the project improvements will affect. This is done for each approach by multiplying the length in that approach by the Average Daily Traffic (ADT) through that intersection. This number is then entered in the cell on line number 1.

**Step six:** (Line No. 2)

The improvement length for the second arterial approach in the intersection is calculated the same way and entered in line number 2.

**Step seven:** (Line No. 3)

Enter into the yellow, highlighted cell corresponding to this line the decimal equivalent of the percentage of the 24-hour traffic volume that travels through the intersection using approach one during peak periods. This is a number greater than zero but less than 1. For example, if 70% of the 24-hour traffic flow passes through this intersection during the peak period, you would enter 0.70 in this cell.

**Step eight:** (Line No. 4)

Enter into the yellow, highlighted cell corresponding to this line the decimal equivalent of the percentage of the 24-hour traffic volume that travels through the intersection using approach two during peak periods. This is a number greater than zero but less than 1. For example, if 70% of the 24-hour traffic flow passes through this intersection during the peak period, you would enter 0.70 in this cell.

**Step nine:** (Line No. 9)

This cell is to contain the average travel speed of approach **one, before** the implementation of the project during **peak** hours of traffic flow.

**Step ten:** (Line No. 10)

This cell is to contain the average travel speed of approach **two, before** the implementation of the project during **peak** hours of traffic flow.

**Step eleven:** (Line No. 11)

In this cell you need to enter the average **off-peak** travel speed for approach **one, before** implementation of the project.

**Step twelve:** (Line No. 12)

In the cell for line 12, you need to enter the average **off-peak** travel speed for approach **two**, **before** implementation of the project.

**Step thirteen:** (Line No. 13)

Fill in this cell with the expected increase in speed through approach **one** during **peak** hours due to implementation of the project.

**Note:** If at any time the sum of the expected increase in speed and the average speed is greater than the legal, posted limits, this project will not qualify.

**Step fourteen:** (Line No. 14)

Fill in this cell with the expected increase in speed through approach **two** during **peak** hours due to implementation of the project.

**Step fifteen:** (Line No. 15)

Fill in this cell with the expected increase in speed through approach **one** during **off-peak** hours due to implementation of the project.

**Step sixteen:** (Line No. 16)

Fill in this cell with the expected increase in speed through approach **two** during **off-peak** hours due to implementation of the project.

**Step seventeen:** (Line No. 21)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 9, the **before** implementation **peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step eighteen:** (Line No. 22)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 10, the **before** implementation **peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step nineteen:** (Line No. 23)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 17, the **after** implementation **peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).



**Step twenty:** (Line No. 24)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 19, the **after** implementation **peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step twenty one:** (Line No. 27)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 11, the **before** implementation **off-peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step twenty two:** (Line No. 28)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 18, the **after** implementation **off-peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step twenty three:** (Line No. 29)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 12, the **before** implementation **off-peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step twenty four:** (Line No. 30)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 20, the **after** implementation **off-peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step twenty five:** (Line No. 40)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers. The only circumstance that permits otherwise is if the project has multiple intersections. In that case, the number in these brown cells for each intersection need to be added up and that sum is recorded on the application.

**Step twenty six:**

The box labeled “Comments” is provided for questions, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter

or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**NOTE:** If the project has multiple intersections, disregard steps twenty seven and twenty eight and proceed to **worksheet #00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each intersection.

**Step twenty seven:** (Line No. 41)

For this step, consider the time, once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**Step twenty eight:** (Line No. 42)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form.

**Worksheet # 4 - WS04 IVHS Freeway Systems Development-General Approach**

If your project involves IVHS freeway development, please select worksheet # 4.

**Step one:**

Determine if this worksheet is being completed is for a project involving more than one facility. If so, you will need to complete an emission calculation worksheet for each of the facilities and add up those values for the application and the cost effectiveness worksheet.

**Step two:**

Copy and save the electronic version of worksheet # 4 to your hard drive renaming it the same as the project name. If you have multiple facilities, you will need to repeat this step, renaming them differently for each one.

**Step three:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step four:**

Begin filling out ALL the cells highlighted in yellow. Start with filling in the project name then the name of the intersecting roads of facility, followed by the name of the person submitting the application, and the fiscal year the application is being submitted.

**Step five:** (Line No. 1)

This cell has the number one entered into it already, go to step six.

**Step six:** (Line No. 2)

The cell for line 2 needs to have the Vehicle Miles Traveled (VMT) over the affected facility per 24-hour day.

**Step seven:** (Line No. 3)

Next, enter the decimal equivalent of travel during peak periods in the cell for line 3. This number can not exceed 1.

**Step eight & nine:** (Line No. 6 & 7)

Fill the next two yellow highlighted cells with the **before** implementation average **peak** and **off-peak** speeds, respectively.

**Step ten & eleven:** (Line No. 8 & 9)

Next, fill these two corresponding cells with the expected increase in speed during **peak** and **off-peak** travel, respectively.

**Note:** If at any time the sum of the expected increase in speed and the average speed is greater than the legal, posted limits, this project will not qualify.

**Step twelve:** (Line No. 12)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 6, the **before** implementation **peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step thirteen:** (Line No. 13)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 10, the **after** implementation **peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step fourteen:** (Line No. 15)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 7, the **before** implementation **off-peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

Step fifteen: (Line No. 16)

Enter in this cell, the information obtained from the emission factors worksheet for the speed you entered on Line No. 11, the **after** implementation **off-peak** speed. Be sure to use the emission factors for the appropriate area in which the project is located, recorded in (grams/mile).

**Step fifteen:** (Line No. 22)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers. The only circumstance that permits otherwise is if the project has multiple intersections. In that case, the number in these brown cells for each intersection need to be added up and that sum is recorded on the application.

**Step sixteen:**

The box labeled “Comments” is provided for questions, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**NOTE:** If the project has multiple intersections, disregard steps twenty seven and twenty eight and proceed to **worksheet #00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each intersection.

**Step seventeen:** (Line No. 23)

For this step, consider the time, once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**Step eighteen:** (Line No. 24)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form.

**Worksheet # 5 - WS05 Park and Ride Development Improvements**

If your project involves improving an existing park and ride parking lot, or developing a new park and ride lot, please select worksheet # 5

**Step one:**

Copy and save the electronic version of worksheet # 4 to your hard drive renaming it the same as the project name. If you have multiple facilities, you will need to repeat this step, renaming them differently for each one.

**Step two:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step three:**

Begin filling out ALL the cells highlighted in yellow. Start with filling in the person submitting the application, the project name, followed by the fiscal year the application is being submitted.

**Step four:** (Line No. 1)

Entered into this cell should be the number of spaces in the lot.

**Step five:** (Line No. 2)

Here, enter the decimal percent of the spaces that are occupied on average. This is a number less than or equal to 1.

**Step six:** (Line No. 4)

The cell for line 4 needs to have the estimated Vehicle Miles Traveled (VMT) diverted from driving alone per 24-hour day.

**Step seven:** (Line No. 6)

Next, enter the speed to be used for the emission factor. Use local street speed to simulate congested conditions.

**Step eight:** (Line No. 7)

This cell should be given the emission factor for the estimated speed entered on line 6. Use the light duty gas vehicle classification, recorded in (grams per mile).

**Step nine:** (Line No. 10)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers. The only circumstance that permits otherwise is if the project has multiple lots. In that case, the number in these brown cells for each of the lots need to be added up and that sum is recorded on the application.

**Step ten:**

The box labeled “Comments” is provided for questions, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**NOTE:** If the project has multiple lots, disregard steps twenty seven and twenty eight and proceed to **worksheet #00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each lot. Note: you should use the 240 day portion of worksheet #00.

**Step eleven:** (Line No. 11)

For this step, consider the time, once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**Step twelve:** (Line No. 12)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form.

**Worksheet # 6 - WS06 Standard Rideshare Program**

If your project involves the promotion of a standard rideshare program, please select worksheet # 6

**Step one:**

Copy and save the electronic version of worksheet # 6 to your hard drive renaming it the same as the project name.

**Step two:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step three:**

Begin filling out ALL the cells highlighted in yellow. Start with filling in the person submitting the application, the project name, followed by the fiscal year the application is being submitted.

**Step four:** (Line No. 1)

Enter the number of daily vehicle trips saved through the promotion of this program in this cell.

**Step five:** (Line No. 2)

In this cell, enter the average number of diverted Vehicle Miles Traveled per trip.

**Step six:** (Line No. 4)

Next, enter in this cell, the average speed for the diverted trips.

**Step seven:** (Line No. 5)

This cell should be given the emission factor for the estimated speed entered on line 4. Use the light duty gas vehicle classification, recorded in (grams per mile) and be sure to use the correct emission factors for the appropriate area the project is located in.

**Step eight:** (Line No. 7)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers.

**Step nine:**

The box labeled “Comments” is provided for questions, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**Step ten:** (Line No. 8)

For this step, consider the time, once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**Step eleven:** (Line No. 9)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form.

**Worksheet # 7 - WS07 Enhanced Rideshare Promotion**

If your project involves the promotion of an enhanced rideshare program including telecommuting and flexible work hours, please select worksheet # 7.

**Step one:**

Copy and save the electronic version of worksheet # 7 to your hard drive renaming it the same as the project name.

**Step two:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step three:**



Begin filling out ALL the cells highlighted in yellow. Start with filling in the project name, person submitting the application, followed by the fiscal year the application is being submitted.

**Step four:** (Line No. 1)

Enter the number of match lists distributed in the previous fiscal year. This should equate to 1 list per person.

**Step five:** (Line No. 4)

In this cell, enter the average roundtrip carpool trip length.

**Step six:** (Line No. 7)

For, vanpool VMT calculations; enter the number of vanpools in service in this cell.

**Step seven:** (Line No. 8)

Here, enter the average number of occupants per rideshare van.

**Step eight:** (Line No. 9)

In this cell, enter the average number of miles that each roundtrip is equal to.

**Step nine:** (Line No. 12)

For the cell on line 12, enter the regional daily average speed. (1990 Final Base Emission Inventory) or a weighted average speed of the road classes involved by multiplying the VMT times the speed of each road class, and dividing the sum of all by the total VMT.

**Step ten:** (Line No. 13)

This cell should be given the emission factor for the estimated speed entered on line 12. Use the light duty gas vehicle classification, recorded in (grams per mile) and be sure to use the correct emission factors for the appropriate area the project is located in.

**Step eleven:** (Line No. 16)

For telecommuting; enter the estimated number of persons employed in major office centers.

**Step twelve:** (Line No. 17)

Enter into this lines corresponding highlighted cell, the decimal percentage of people estimated to be participating.

**Step thirteen:** (Line No. 19)

Enter the number of days per week that telecommuting is active'

**Step fourteen:** (Line No. 20)

Enter here, the number of assumed, roundtrip miles.

**Step fifteen:** (Line No. 22)

In the cell highlighted in yellow for line 22, enter the regional daily average speed.

**Step sixteen:** (Line No. 23)

This cell should be given the emission factor for the estimated speed entered on line 22. Use the light duty gas vehicle classification, recorded in (grams per mile) and be sure to use the correct emission factors for the appropriate area the project is located in.

**Step seventeen:** (Line No. 28)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers.

**Step eighteen:**

The box labeled “Comments” is provided for questions, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**Step nineteen:** (Line No. 29)

For this step, consider the time, once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell. For rideshare programs, this is typically 1 year.

**Step twenty:** (Line No. 30)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form.

**Worksheet # 8 - WS08 Automated Traffic Monitoring Progression ATMS**

If your program involves traffic monitoring progression improvements – automated (ATMS), please select worksheet # 8

**Step one:**

Determine if this worksheet is being completed is for a project involving more than one intersection. If so, you will need to complete an emission calculation worksheet for each of the intersections and add up those values for the application and the cost effectiveness worksheet.

**Step two:**

Copy and save the electronic version of worksheet # 8 to your hard drive renaming it the same as the project name. If you have multiple intersections, you will need to repeat this step, renaming them differently for each intersection.

**Step three:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step four:**

Begin filling out ALL the cells highlighted in yellow. Start with filling in the project name then the name of the intersecting roads, followed by the name of the person submitting the application, and the fiscal year the application is being submitted.

**Step five:** (Line No. 1)

For the Vehicle Miles traveled (VMT), first enter the number of miles for the principal arterial Freeway.

**Step six:** (Line No. 2)

Next, enter the number of miles on the projects principal arterial non-freeway.

**Step seven:** (Line No. 3)

In this lines cell, enter the number of miles on the minor arterial.

**Step eight:** (Line No. 4)

Next, enter the number corresponding to the collector.

**Step nine:** (Line No. 5)

Then enter in line 5, the number corresponding to local.

**Step ten:** (Line No. 6)

For the daily travel speeds, enter in this lines cell the current speed associated with the principal arterial freeway.

**Step eleven:** (Line No. 7)

Next, enter the current average speed for the principal arterial non-freeway.

**Step twelve:** (Line No. 8)

In this step, enter the speed corresponding to the minor arterial.

**Step thirteen:** (Line No. 9)

In the cell for line nine, enter the speed on the collector.

**Step fourteen:** (Line No. 10)

Enter the local speed in this step.

**Step fifteen:** (Line No. 11)

For the cell associated with this step, enter the value of the expected increase in ALL travel speeds.

**Step sixteen:** (Line No. 17)

For the cells associated with line 17, enter the emission factors for the **before** speed of the principal arterial freeway entered on line 6. Be sure to use the emission factors the correctly correspond to the area in which the project is located.

**Step seventeen:** (Line No. 18)

In this cell, enter the emission factors for the speed that was entered on Line 7, the principal arterial non-freeway.

**Step eighteen:** (Line No. 19)

For the step, enter the emission factor for the speed in line 8, the minor arterial.

**Step nineteen:** (Line 20)

Enter the emission factor for the speed of the collector in this lines cell.

**Step twenty:** (Line No. 21)

Finally, for this step, enter the emission factor for the speed that was entered on line 10, the local speed.

**Step twenty one:** (Line No. 22)

For the cells associated with line 22, enter the emission factors for the **after** speed of the principal arterial freeway entered on line 12. Be sure to use the emission factors the correctly correspond to the area in which the project is located.

**Step twenty two:** (Line No. 23)

In this cell, enter the emission factors for the speed that was entered on Line 13, the principal arterial non-freeway.

**Step twenty three:** (Line No. 24)

For the step, enter the emission factor for the speed in line 14, the minor arterial.

**Step twenty four:** (Line 25)

Enter the emission factor for the speed of the collector, line 15, in this lines cell.

**Step twenty five:** (Line No. 26)

Finally, for this step, enter the emission factor for the speed that was entered on line 16, the local speed after implementation.

**Step twenty six:** (Line No. 39)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers.

**Step twenty seven:**

The box labeled “Comments” is provided for questions, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**Step twenty eight:** (Line No. 40)

For this step, consider the time, once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell. The normal values for this are 2, 3 or 5 years.

**Step twenty nine:** (Line No. 41)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form.

**Worksheet # 9 - WS09 traffic signalization modernization, or optimization**

If your project involves traffic signal interconnection, modernizations, and/or optimization, please select worksheet # 9.

**Step one:**

Determine if this worksheet being completed is for a project involving more than one traffic signal. If so, you will need to complete an emission calculation worksheet for each of the intersections and add up those values for the application and the cost effectiveness worksheet.

**Step two:**

Copy and save the electronic version of worksheet # 9 to your hard drive renaming it the same as the project name. If you have multiple intersections, you will need to repeat this step, renaming them all differently for each intersection.

**Step three:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step four:**

Begin filling out ALL the cells highlighted in yellow. Start with filling in the project name then the name of the intersection, followed by the name of the person submitting the application, and the fiscal year the application is being submitted.

**Step five:** (Line No. 1)

In this yellow highlighted cell, enter the number of miles of arterials affected.

**Step six:** (Line No. 2)

In this cell, enter the volume of traffic calculated in both directions of this intersection. If you're not sure what that volume is, conduct a traffic count.

**Step seven:** (Line No. 3)

Enter into the yellow, highlighted cell corresponding to this line, the decimal equivalent of the percentage of the 24-hour traffic volume counted in that intersection that travels through during peak periods. This is a number greater than zero but less than 1. For example, if 70% of the 24-hour traffic flow passes through this intersection during the peak period, you would enter 0.70 in this cell. There may be more than one peak period, and if so, you should add them up to get one percentage value for peak period traffic.

**Step eight:** (Line No. 6)

This cell is to contain the average speed through the arterial or intersection **before** the implementation of the project during **peak** hours of traffic flow. If the peak speed differs

significantly from AM peak to PM peak, you may use two worksheets and add the results together using worksheet #00.

**Step nine:** (Line No. 7)

This cell is to contain the average speed along the arterial or through the intersection **before** the implementation of the project during **off-peak** hours of traffic flow.

**Step ten:** (Line No. 8)

Fill in this cell with the expected increase in speed during **peak** hours due to implementation of the project.

**Step eleven:** (Line No. 9)

In this cell you need to enter the expected increase in speed due to implementation in the **off-peak** hours.

**Step twelve:** (Line No. 12)

Enter in this cell, the information obtained from the emission factors worksheet, for the appropriate area in which the project is located. Use the **peak** emission factors for the speed you entered on Line No. 6. (**Before** Implementation) This will be in units of (grams/mile).

**Step thirteen:** (Line No. 13)

Enter in this cell, the information obtained from the emission factors worksheet, for the appropriate area in which the project is located. Use the **peak** emission factors for the speed you entered on Line No. 10. (**After** Implementation) This will be in units of (grams/mile).

**Step fourteen:** (Line No. 15)

Enter in this cell, the information obtained from the emission factors worksheet, for the appropriate area in which the project is located. Use the **off-peak** emission factors for the speed you entered on Line No. 6. (**Before** Implementation) This will be in units of (grams/mile).

**Step fifteen:** (Line No. 16)

Enter in this cell, the information obtained from the emission factors worksheet, for the appropriate area in which the project is located. Use the **off-peak** emission factors for the speed you entered on Line No. 10. (**After** Implementation) This will be in units of (grams/mile).

**Step sixteen:** (Line No. 23)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers. The only circumstance that permits otherwise is if the project has multiple intersection upgrades. In that

case, the numbers in these brown cells for each intersection need to be added up and that sum is recorded on the application.

**Step seventeen:** (Comments)

The box labeled “Comments” is provided for question, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**Step eighteen:** (Line No. 24)

Once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**NOTE:** If the project has multiple intersections, or has significant differences in the character of multiple peak times, disregard steps sixteen and seventeen and proceed to **worksheet # 00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each intersection.

**Step nineteen:** (Line No. 25)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form

**Worksheet # 10 - WS10 bus purchase**

If your project involves the purchase or replacement of a bus, please select worksheet # 10.

**Step one:**

Copy and save the electronic version of worksheet # 10 to your hard drive renaming it the same as the project name. If you have multiple bus purchases, you will need to repeat this step, renaming them differently for each one.

**Step two:**

Read through the entire worksheet. Pay particular attention to all the directions.



**Step three:**

Begin filling out ALL the cells highlighted in yellow. Start with the project name then include the name of the person submitting the application, followed by the fiscal year the application is being submitted.

**Step four:** (Line No. 1)

In line one; enter the number of new, clean buses to be purchased. If the buses are not exactly the same, multiple worksheets will need to be completed, one for each bus that has different specs.

**Step five:** (Line No. 2)

In this step, the annual (yearly) number of hours per bus needs to be entered in the yellow, highlighted cell. This is recorded in units of (hours).

**Step six:** (Line No. 3)

In the cells corresponding to line three, provide the vehicle brake horsepower rating in units of (bbp). This is to be obtained by the applicant from the manufacturer. This application will not be processed without documentation verifying its accuracy and authenticity. These references MUST be attached to the application. In the event that you cannot obtain the rating from the manufacturer a suitable surrogate value can be used, providing that you submit a statement with your arguments suggesting that the surrogate is a good substitute. You can also contact other transit agencies for values of recently replaced buses from their applications. In most cases the brake horsepower ratings are available.

**Step seven:** (Line No. 4)

Enter in this cell the new HC emission factor. This is to be obtained by the applicant from the manufacturer. This application will not be processed without documentation verifying its accuracy and authenticity. These references MUST be attached to the application.

**Step eight:** (Line No. 6)

This cell should have the number of old diesel buses to be replaced.

**Step nine:** (Line No. 7)

Enter the annual vehicle hours per bus for the buses being replaced.

**Step ten:** (Line No. 8)

In this line's cell, enter the old vehicle's brake horsepower rating. It is the applicant's responsibility to verify this number with proper documentation and said documentation MUST be attached to the application.

**Step eleven:** (Line No. 9)

Provide in this cell the old bus HC emission factor. Again, it is the applicant's responsibility to verify this number with proper documentation and said documentation **MUST** be attached to the application.

**Step twelve:** (Line No. 13)

Enter in this cell the number of service equivalent days per year. This is calculated by dividing the Annual revenue hours by the Daily Revenue hours (the number of hours the bus is in active service on an average day).

**Step thirteen:** (Line No. 14)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers. The only circumstance that permits otherwise is if the project has multiple bus purchases. In that case, the numbers in these brown cells for each worksheet need to be added up and that sum is recorded on the application.

**Step fourteen:** (Comments)

The box labeled "Comments" is provided for question, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**NOTE:** If the project has multiple buses, disregard steps eighteen and nineteen and proceed to **worksheet # 00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each bus.

**Step fifteen:** (Line No. 15)

Once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**Step sixteen:** (Line No. 16)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form\

### **Worksheet # 11 - WS11 travel demand management program**

If your project involves a travel demand management program (TDM), please select worksheet # 11.

#### **Step one:**

Copy and save the electronic version of worksheet # 11 to your hard drive renaming it the same as the project name. If you have multiple locations, you will need to repeat this step, renaming them differently for each one.

#### **Step two:**

Read through the entire worksheet. Pay particular attention to all the directions.

#### **Step three:**

Begin filling out ALL the cells highlighted in yellow. Start with the project name then include the name of the person submitting the application, followed by the fiscal year the application is being submitted.

#### **Step four:** (Line No. 1)

Enter the Daily Vehicle Miles Traveled in the area covered by the program.

#### **Step five:** (Line No. 2)

Enter the decimal equivalent of the daily VMT during the peak period.

#### **Step six:** (Line No. 5)

Use the local street speed to simulate congestion conditions and enter that speed here.

#### **Step seven:** (Line No. 6)

Enter the emission factor here for the speed entered in the yellow, highlighted cell of line five. Be sure to use the correct emission factors for the area the project is located in.

#### **Step eight:** (Line No. 10)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application MUST match these numbers. The only circumstance that permits otherwise is if the project has multiple bus purchases. In that case, the

numbers in these brown cells for each worksheet need to be added up and that sum is recorded on the application.

**Step nine:** (Comments)

The box labeled “Comments” is provided for question, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**NOTE:** If the project has multiple areas covered in the same program, disregard steps ten and eleven and proceed to **worksheet # 00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each of the project areas.

**Step ten:** (Line No. 11)

Once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**Step eleven:** (Line No. 12)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form

**Worksheet #12 - operation of new public transit services**

If your project involves the operation of a new public transit service, please select worksheet # 12.

**Step one:**

Copy and save the electronic version of worksheet # 12 to your hard drive renaming it the same as the project name. If you have multiple size buses, you will need to repeat this step, renaming them differently for each one.

**Step two:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step three:**

Begin filling out ALL the cells highlighted in yellow. Start with the project name then include the name of the person submitting the application, followed by the fiscal year the application is being submitted.

**Step four:** (Line No. 1)

Enter the number of new buses that will be in service in this yellow, highlighted cell.

**Step five:** (Line No. 2)

This cell should have the average number of occupants per bus entered into it.

**Step six:** (Line No. 3)

Enter here, the average number for the total round trip in miles.

**Step seven:** (Line No. 5)

The yellow, highlighted cell for this step should have the regional daily speed entered into it. This is obtained from the 1990 final base inventory or from a suitable transportation travel demand model applicable to your area..

**Step eight:** (Line No. 6)

Enter the emission factor for light duty gas vehicles here, using the speed entered in the cell on line five.

**Step nine:** (Line No. 10)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application MUST match these numbers. The only circumstance that permits otherwise is if the project has multiple bus purchases. In that case, the numbers in these brown cells for each worksheet need to be added up and that sum is recorded on the application.

**Step ten:** (Comments)

The box labeled “Comments” is provided for question, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made. Transit operating assistance projects are only eligible for funding for 3

years. You must state in the comments and on the required application which year's operating assistance you are calculating, for each route involved.

**NOTE:** If the project has multiple areas covered in the same program, disregard steps eleven and twelve and proceed to **worksheet # 00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each of the project areas.

**Step eleven:** (Line No. 11)

Once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**Step twelve:** (Line No. 12)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form

### **Worksheet # 13 - WS13 construct non motorized pathway**

If your project involves the construction of a non motorized pathway along an approved federal aid system road, please select worksheet # 13.

**Step one:**

Copy and save the electronic version of worksheet # 13 to your hard drive renaming it the same as the project name. If you have multiple, unconnected pathways, you will need to repeat this step, renaming them differently for each one.

**Step two:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step three:**

Begin filling out ALL the cells highlighted in yellow. Start with the project name then include the name of the person submitting the application, followed by the fiscal year the application is being submitted.

**Step four:** (Line No. 1)

Fill in this cell with the length of the pathway being constructed.

**Step five:** (Line No. 2)

Enter the average daily traffic along the impacted roadway in this cell. This is the amount of traffic that will be affected on the eligible road along the pathway.

**Step six:** (Line No. 4)

The cell corresponding to this step should have the decimal percentage of pedestrian and bicycle travel entered into it that would otherwise be using the road in a motorized vehicle. This is a number between 0 and 1.

**Step seven:** (Line No. 6)

Enter the average speed along the impacted roadway here.

**Step eight:** (Line No. 7)

This step requires the emission factor for light duty vehicles at the speed entered on line 6 to be entered in the yellow, highlighted cell.

**Step nine:** (Line No. 11)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers. The only circumstance that permits otherwise is if the project has multiple unconnected pathways. In that case, the numbers in these brown cells for each worksheet need to be added up and that sum is recorded on the application.

**Step ten:** (Comments)

The box labeled “Comments” is provided for question, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**NOTE:** If the project has multiple pathways covered in the same program, disregard steps eleven and twelve and proceed to **worksheet # 00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each of the pathways.

**Step eleven:** (Line No. 11)

Once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**Step twelve:** (Line No. 12)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form

**Worksheet # 14 - WS14 signal timing revisions at one location**

If your project involves traffic signal timing revisions at one location, select worksheet # 14.

**Step one:**

Determine if this worksheet being completed is for a project involving more than one traffic signal. If so, you will need to complete an emission calculation worksheet for each of the intersections and add up those values for the application and the cost effectiveness worksheet.

**Step two:**

Copy and save the electronic version of worksheet # 14 to your hard drive renaming it the same as the project name. If you have multiple intersections, you will need to repeat this step, renaming them all differently for each intersection.

**Step three:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step four:**

Begin filling out ALL the cells highlighted in yellow. Start with filling in the project name then the name of the intersection, followed by the name of the person submitting the application, and the fiscal year the application is being submitted.

**Step five:** (Line No. 1)

Take a 24-hour traffic count of the intersection, entering from all approaches, and fill in that number in this step.

**Step six:** (Line No. 2)



Enter into this cell the decimal equivalent of the peak period traffic through this intersection. This number can not exceed 1.

**Step seven:** (Line No. 5)

In this step, add up the delay time (yellow + red) during peak traffic flow before the project is implemented and report the results in this cell in units of second per car.

**Step eight:** (Line No. 6)

This step requires the same procedure as the previous step only you'll be adding up the delay time in seconds per car for the off-peak traffic flow period before the project is implemented.

**Step nine:** (Line No. 7)

Enter in this cell the peak period idle emission factor for the speed of 2.5 mph. This factor is obtained from the tables. This represents the emissions factor for idling vehicles during the delay times.

**Step ten:** (Line No. 8)

The information needed to be entered into this cell, is the off-peak emission factor, from the tables, for the speed of 2.5 mph. This represents the emissions factor for idling vehicles during the delay times.

**Step eleven:** (Line No. 11)

In this step, add up the delay time (yellow + red) during peak traffic flow after the project is implemented and report the results in this cell in units of second per car.

**Step twelve:** (Line No. 12)

This step requires the same procedure as the previous step only you'll be adding up the delay time in seconds per car for the off-peak traffic flow period after the project is implemented.

**Step thirteen:** (Line No. 19)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application **MUST** match these numbers. The only circumstance that permits otherwise is if the project has multiple unconnected pathways. In that case, the numbers in these brown cells for each worksheet need to be added up and that sum is recorded on the application.

**Step fourteen:** (Comments)

The box labeled "Comments" is provided for question, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid

references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**NOTE:** If the project has multiple intersections in the same corridor, disregard steps fourteen and fifteen and proceed to **worksheet # 00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each of the intersection.

**Step fifteen:** (Line No. 11)

Once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell. Typically, a signal timing revision will last 2, 3 or 5 years.

**Step sixteen:** (Line No. 12)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form

**Worksheet #15 - WS15 diesel retrofit verified technology**

If your project involves diesel retrofit of a verified technology, please use worksheet # 15.

**Step one:**

Copy and save the electronic version of worksheet # 15 to your hard drive renaming it the same as the project name. If you have multiple sized vehicles producing different emissions, you will need to repeat this step, renaming them differently for each one.

**Step two:**

Read through the entire worksheet. Pay particular attention to all the directions.

**Step three:**

Begin filling out ALL the cells highlighted in yellow. Start with the project name then the project area, followed by the fiscal year the application is being submitted.

**Step four:** (Line No. 1)

Fill in this cell with the number of fleet trucks, of the same class, size, and family, that are to receive the technology.

**Step five:** (Line No. 2)

Enter in this cell the average number of miles each truck travels per day.

**Step six:** (Line No. 3)

Enter the average speed the fleet travels in this cell.

**Step seven:** (Line No. 4)

Enter the current emission factor, for the speed entered in step six, based on the scale provided in the look-up table. [Comments: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm](http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm)

**Step eight:** (Line No. 7)

Enter in this cell, the estimated efficiency from the EPA's verified technology list. (given in decimal equivalent)

**Step nine:** (Line No. 11)

The numbers in these brown shaded cells are the numbers you will need for the application. The emission reduction reported on the application MUST match these numbers. The only circumstance that permits otherwise is if the project has multiple size vehicles. In that case, the numbers in these brown cells for each worksheet need to be added up and that sum is recorded on the application.

**Step ten:** (Comments)

The box labeled "Comments" is provided for question, explanations, and references. All quantitative information used to calculate an emission reduction must be verified with valid references. If a qualitative analysis is required for an emission reduction estimate, the submitter or project manager has to provide, in writing, the qualitative data relating to or involving the comparisons made.

**NOTE:** If the project has multiple sized vehicles in the same fleet, disregard steps eleven and twelve and proceed to **worksheet # 00\_cost effectiveness** utilizing the numbers in the brown cells that have been calculated for each of the vehicles.

**Step eleven:** (Line No. 12)

Once the project is complete and can be considered functioning, how many years will it provide the reported reductions in emissions? That is the number entered in this cell.

**Step twelve:** (Line No. 13)

The total project cost needs to be entered in this cell. The cells below it will automatically calculate the cost effectiveness of this project in the units of cost per kilogram over the life of the project. This too is needed for the application and should match exactly.

Finally, save all your work and proceed to the application form

## **Completing the Application:**

### Part 7 REQUIRED APPLICATION form

The application form must be filled out completely and accurately. It must be accompanied by all emission calculation worksheets and all supporting documentation required, i.e. cost effectiveness worksheet, the verified technology information, and all references. This application must not be altered or modified in any way. Please do not use older forms of the application.

They will be returned to you for updating.

Now that you've completed the emission calculation and cost effectiveness worksheets (if necessary), it's time to fill out the grant application. Remember, if any of the required fields are not correctly filled in, the entire application will be sent back without any type of processing. If you do not know what information is being requested, or where to obtain that information from, ask your Engineering Supervisor.

**Step one:**

Save this application to your hard drive and rename it while doing so.

**Step two:**

Read through and review the entire form.

**Step three:**

Begin by filling in the fiscal year that the application will be turned in for consideration of CMAQ funding. For State applications.

**Step four:**

As you move right, across the application, the next cell to fill in is the Phase. This may not be applicable to Local Application. The phase entered will be the A-phase, B-phase, or C-phase indicating the appropriate fiscal year for each phase e.g. C07/A08.

**Step five:**

Next, the control section will need to be entered. This too may not be applicable to Local jobs. If you already know the control section number, go ahead and enter it. If not, you can use the **MapX** or **CS/PR List** tool in MPINS to find and enter the proper numbers. All applications MUST have a control section number if applicable.

**Step six:**

Enter the Beginning Mile Point (BMP) of the project area. This is the starting point of the area directly influenced by the project.

**Step seven:**

Enter the Ending Mile Point (EMP) of the project area. This is the ending point of the area directly influenced by the project.

**Step eight:**

Enter the total length that the project will affect. This is the total length of the project that, once completed, will influence the emissions.

**Step nine:**

Enter the County the project is located in.

**Step ten:**

Next, enter the Michigan Department of Transportation (MDOT) Region name the project is located in. If you do not know, ask your Region Manager, the MPO or your Regional Task Force Coordinator.

**Step eleven:**

In the area provided for the Location Description, enter a short description of where the project is located. For example, you might state what two mile markers the project falls between. The description should define the limits of the project and the specific location: e.g. Putnam Street (aka Williamston Road) from Church Street heading south to I-96. If the street has more than one name, please give them both.

**Step twelve:**

In the Work Description area, provide a project description with sufficient detail for review by the CMAQ program manager, Department of Environmental Quality (DEQ), and the Federal Highway Administration (FHWA) to determine eligibility. Be aware, certain wording will disqualify a project for funding, such as “recreation”, “widening”, and “increased capacity”. This field must define the “workscape” of the project and if a grant is awarded, only this workscope will be eligible for funding. Revisions to the workscope or projects limits require a revised application and emissions analysis for the entire project before any changes can be made to the TIP or STIP for the proposed changes.

**Step thirteen:**

In the box next to “Applicant/Phone” enter the name and phone number of the project manager, or the person who can provide additional information about the project if the CMAQ program manager has questions. Remember, if any of these cells are not correctly filled in, the entire application will be sent back without processing.

**Step fourteen:**

In this step, enter which jurisdiction the project falls within, state, local, or transit. Please note that if your project involves work in the jurisdiction of another agency, you must get approval or permission from that agency for the grant application to be accepted.

**Step fifteen:**

Next, the information about the project costs/funding should be entered. The applicant must provide the financial information about the project, the total cost, the total amount being applied for, and the match and overmatch (any non-participating funds involved in the project) required, if applicable. There are three boxes available to enter the cost information. Each box should have the appropriate dollar amount that each entity is contributing. These three amounts should equal the total project amount. This should be the same under the “total” column. For state projects with C and A phases in different years, please divide the phase funding into two lines, one representing each phase e.g.:

Project cost	Federal	State	Local	Total
C07	\$80,000	\$20,000	-----	\$100,000
A08	\$160,000	\$40,000	-----	\$200,000

**Step sixteen:**

The next step is to enter the change in emissions calculated in the worksheets. Be sure to enter them in the correct columns and be sure to use the appropriate sign (positive shows an increase, and negative shows a decrease). Also, remember to add up the changes in emissions if they were calculated on separate worksheets due to multiple intersections. In addition, the emission calculating worksheets MUST be attached to the application or the application will be returned without any type of processing.

**Step seventeen:**

The amount to be entered here is entered in units of cost per kilogram per day of emission reduction which the completed project will provide. Proceed with entering the cost effectiveness of the project for each of the pollutants listed on the application, VOC, NO<sub>x</sub>, CO, and PM 2.5. This information can be obtained from the bottom of the emission calculating worksheet, or the cost effectiveness worksheet used when there are multiple intersections. Please note that VOC and NO<sub>x</sub> calculations are required in all nonattainment area applications. PM calculations are desirable as are CO calculations.

**What to do if Sent Back:**

If your application has been returned to you, (1) please re-read the directions, (2) review the information provided on the worksheet (s) and application for completeness and accuracy. If you are unaware of the types of jobs that qualify, or do not qualify, and the wording needed to avoid disqualification of a normally qualifying project, please refer to the

<http://www.fhwa.dot.gov/environment/cmaqpgs/>

Your packet of information should contain the 1999 published guidance which contains a list of projects that are eligible for CMAQ funding and the guidelines under which they are evaluated. Note also that some project applications may be sent back for corrections to the funding.

Rideshare, Michivan and ITS signal timing projects are eligible to be funded at 100% Federal.

All other projects are eligible to be funded at 80% Federal and 20 percent Match. Match funds in addition to 20% permitted.

## **Appendix A**

### **Available Worksheets:**

#### **Emission Calculators**

- WS01\_intersection improvements on one approach
- WS02\_intersection improvements on adjacent approaches
- WS03\_intersection improvements on opposite approaches
- WS04\_IVHS freeway systems development\_general approach
- WS05\_park and ride development improvements
- WS06\_standard rideshare promotion
- WS07\_enhanced rideshare promotion
- WS08\_Automated traffic monitoring progression\_ATMS
- WS09\_traffic signalization\_modernization or optimization
- WS10\_bus purchase
- WS11\_travel demand management program
- WS12\_operation of new public transit services
- WS13\_construct non motorized pathway
- WS14\_signal timing revisions at one location
- WS15\_diesel retrofit verified technology

#### **Emission Factors**

- Part 8a emissions\_factors\_2006\_08CFP\_NON\_SEMCOG
- Part 8b emissions\_factors\_2006\_08CFP\_SEMCOG\_ONLY