AIR QUALITY CONFORMITY

The Louisville, KY-IN transportation planning study area consists of Clark and Floyd counties and 0.1 square miles of Harrison County in Indiana, and Bullitt, Jefferson, and Oldham counties in Kentucky. Much of this area coincides with an air quality maintenance area and/or an air quality nonattainment area. The Louisville 8-hour ozone maintenance area consists of Clark and Floyd counties, IN, and Bullitt, Jefferson, and Oldham counties, KY. In June 2004, it was designated as a basic nonattainment area under the 8-hour standard for the pollutant ozone. The area was redesignated as an attainment area with a maintenance status during July, 2007. The Louisville fine particulate matter (PM 2.5) nonattainment area consists of Clark and Floyd counties and the Madison Township of Jefferson County, IN, and Bullitt and Jefferson counties, KY. In April 2005, it was designated as a nonattainment area under the PM 2.5 standard (based on average annual concentration).

KIPDA is amending *Horizon 2030*, the long range transportation plan and the FY 2007 – FY 2011 Transportation Improvement Program (TIP). This conformity analysis will support conformity determinations by the metropolitan planning organization and the U. S. Department of Transportation agencies for both documents. This analysis is intended to support determinations of conformity under both the 8-hour ozone standard and the annual PM 2.5 standard.

CONFORMITY UNDER THE 8-HOUR OZONE STANDARD

Subsequent to being designated as nonattainment of the 8-hour ozone standard and prior to being redesignated as attainment of the standard, the Louisville area relied on the use of interim tests to demonstrate conformity. These tests had been established during a 2004 update to the federal conformity rule. Interim tests are used between the time an area is designated as nonattainment and the time motor vehicle emission budgets (MVEBs) are established. The MVEBs limit the amount of a pollutant or precursor that can be emitted.

When the local area was designated as nonattainment of the 8-hour ozone standard, the air quality agencies with responsibility for the local area were charged with the additional responsibility to develop a set of actions that could be taken to reduce pollutant/precursor emissions. Since the Louisville nonattainment area is a bi-state area, these sets of the actions to reduce precursor emissions were to be incorporated into the Indiana and Kentucky State Implementation Plans (SIPs). Originally, the plans including these sets of action were to be included in an attainment demonstration, which would show how the local area would reach the standard. While these plans were being developed, the data from the air quality monitors in the area indicated that the 8-hour ozone standard had been met. With this data in hand, the air quality agencies were able to submit a redesignation request instead. The establishment of the MVEBs was one of the components of the redesignation request. Since the MVEBs were included in the redesignation request for ozone, the MVEBs are established for its precursors, volatile organic compounds and oxides of Nitrogen.

CONFORMITY UNDER THE PM 2.5 STANDARD

In April 2005, when the local area was designated as being in nonattainment of the fine particulate matter standard, there were no previous budgets. In addition, there were no counties which had been previously divided on an attainment/ nonattainment basis for the PM 2.5 standard. The counties which were designated as nonattainment under the PM 2.5 standard were all designated in their entirety with the exception of the Madison Township of Jefferson County, IN which had not been previously designated as nonattainment for any pollutant.

During 2005, along with the designation of PM 2.5 nonattainment areas, EPA promulgated an update to the federal conformity rule (40 CFR 93). This update established new interim tests to be applied when an area sought to determine conformity after being designated as nonattainment under the PM 2.5 standard and before SIPs were developed establishing new budgets for PM 2.5 and its precursors.

CONSULTATION FOR THE AMENDMENT OF *HORIZON 2030*

The first step in determining conformity of *Horizon 2030* was to consult with the interagency consultation (IAC/ICG) partners concerning matters not explicitly determined by the conformity rule. Since conformity under both the 8-hour ozone and PM 2.5 standards had been previously determined, many of the issues normally arising in conformity had already undergone consultation. Since these issues were not raised during consultation this time, the portions of the analysis involving those issues were accomplished consistent with established practice. The initial consultation involved a review of the following items:

(a) important dates in the schedule for the amendment;

September 14	-- Public Review begins.
October 14	-- Action by the Transportation Technical Coordinating Committee
October 22	-- Action by the Transportation Policy Committee
October 23	-- Documentation sent to review agencies for federal conformity determination

(b) a draft list of projects/project changes—see accompanying list of project changes;

(c) the horizon year of the transportation plan—2030;

(d) the proposed conformity test methodology/ies and analysis years—see the ESTABLISHED PRACTICE section;

(e) the pollutant(s)/precursor(s) of concern and the motor vehicle emissions budget(s), if applicable—see tables 2 and 4 at the end of the report;

(f) information concerning changes to the inputs for the travel demand model and the approved emissions model—see accompanying list of project changes; and

(g) a listing of any transportation control measures (TCMs) in SIPs, if applicable—there are none.

Issues

Discussion of Project Changes
There was some discussion of the project changes. As a result of this discussion, additional information concerning some of the projects was provided by the project sponsors and included in the accompanying list of project changes. With respect to the way the project changes were reflected in the regional emissions analysis, the recommendations of KIPDA staff were accepted.

Conclusion: The IAC/ICG members accepted the recommendations of KIPDA staff concerning the incorporation of the project changes into the regional emissions analysis.

ESTABLISHED PRACTICE

In addition to the issues discussed during consultation, there were several issues which were not explicitly discussed but which had impacts on the analysis. Many of these issues had been discussed during previous consultations. These issues were handled in a manner consistent with the previous established practice. The more prominent issues are discussed in the following section.

Issues affecting both Ozone and PM 2.5

Source of Bullitt County and Oldham County VMT and Speeds
Originally, the Kentucky Transportation Cabinet (KYTC) had provided the VMT and speeds to be used in estimating pollutant emissions for Bullitt and Oldham counties in the analyses supporting conformity determinations. During 2006, it was mentioned that the KIPDA travel model included those counties. As a consequence, it was stated that KIPDA should supply that information starting with the next conformity analysis, and KIPDA agreed to do this. KIPDA has provided this data since that time.

Conclusion: The established practice is that KIPDA will provide VMT and speed information to the Kentucky Division for Air Quality (KYDAQ) for the determination of emission estimates for Bullitt and Oldham counties.

Analysis Years and Conformity Tests

Motor Vehicle Emissions Budgets (MVEBs) for the 8-hour ozone standard were approved by EPA in July, 2007. The MVEBs were for the precursors of ozone, volatile organic compounds (VOCs) and oxides of Nitrogen (NOx), The Federal Register notice can be found at 72 FR 36601. The budgets are shown in Table 2 at the end of this document. Since there are MVEBs for the ozone precursors, the conformity rule requires that ozone analyses be done for the attainment year and the last year of the transportation plan. In addition, other intermittent year(s) are required such that no two analysis years are more than ten years apart.

Since there are not MVEBs available for PM 2.5 and its precursor (oxides of Nitrogen), the conformity rule requires that PM 2.5 analyses be done for the last year of the transportation plan and for a year within five years of the present. In addition, other intermittent year(s) are required such that no two analysis years are more than ten years apart.

The established practice for analysis years and conformity tests are outlined in this and the following paragraph. Since the MVEBs are available for the ozone precursors, the conformity tests can be budget tests. For the budget tests, the estimated emission levels must be less than or equal to the applicable MVEBs. Since budgets have been established for 2003 and 2020, the 2003 budgets will be used for analysis years prior to 2020, and the 2020 budgets will be used for 2020 and later analysis years.

Since there are no applicable MVEBs for PM 2.5 and NOx (as a PM 2.5 precursor), the conformity rule requires the use of an interim emission test. The interim emission test must be either of the following:

(1) build emissions no greater than no-build emissions, or
(2) analysis year emissions no greater than 2002 emissions.

The established practice is to use the 2002 baseline or “no greater than 2002” test. The 2002 baseline test would be applied to the entire PM 2.5 nonattainment area for all analysis years.

Conclusion: The established practice is that the analysis years and conformity tests for the regional emissions analysis is as shown in the tables below.

8-hour Ozone Standard	
Analysis Year	**Conformity Test(s)**
2009	Budget test using the 2003 MVEBs for the 8-hour maintenance area
2012	Budget test using the 2003 MVEBs for the 8-hour maintenance area
2020	Budget test using the 2020 MVEBs for the 8-hour maintenance area
2030	Budget test using the 2020 MVEBs for the 8-hour maintenance area

Annual PM 2.5 Standard	
Analysis Year	**Conformity Test(s)**
2009	2002 Baseline test for the PM 2.5 nonattainment area
2012	2002 Baseline test for the PM 2.5 nonattainment area
2020	2002 Baseline test for the PM 2.5 nonattainment area
2030	2002 Baseline test for the PM 2.5 nonattainment area

Other PM 2.5 Issues

Pollutants and Precursors

The conformity rule requires that direct vehicle PM 2.5 from the tailpipe and brake and tire wear be analyzed. The rule also requires that oxides of Nitrogen (NOx) (one of the PM 2.5 precursors) must be analyzed unless EPA and the respective state air agency make findings that its influence is insignificant. PM 2.5 from road dust and the other precursors (volatile organic compounds, oxides of Sulfur, and ammonia) do not have to be considered because neither EPA nor the respective state air agency has made a finding of significance for them. PM 2.5 from construction dust does not have to be considered because there is no State Implementation Plan (SIP) indicating its influence is significant.

Conclusion: The established practice is that only direct PM 2.5 from the tailpipe and brake and tire wear and NOx will be considered in the analysis.

Approaches for Developing Annual Emission Estimates

As stated above, the local area was designated as nonattainment of the PM 2.5 standard because it was exceeding the annual average concentration allowed by the standard. This means that the conformity analysis will need to be based on an estimate of annual direct PM 2.5 and NOx emissions rather than an estimate of daily emissions as is used in the conformity analysis for ozone.

Four approaches were included in the guidance. They are the:

- Single-run approach,
- Two-season approach,
- Four-season approach, and
- Monthly approach.

These vary in complexity and effort. The single-run approach is the simplest, requiring the least amount of time and effort. The guidance indicated that this approach is applicable when input conditions do not vary significantly throughout the year. Other factors that were to be considered included (1) consistency with a SIP budget or base year emissions, (2) availability and quality of seasonal or monthly data, and (3) resource implications.

To help assess the applicable factors, sensitivity analyses performed for other areas were reviewed by the IAC/ICG members during the initial consultations concerning this issue. During the discussion of these analyses, the difficulty of finding representative

values for some MOBILE 6 inputs was discussed. After those discussions, the recommendation to the IAC/ICG was to use (or continue to use) the single-run approach. The use of the single-run approach is now the established practice.

Conclusion: The established practice is to use the single-run approach for calculating annual direct PM 2.5 and NOx emissions.

CONFORMITY OF *HORIZON 2030*

The long-range plan, *Horizon* 2030, was examined to determine if it meets the requirements of the conformity rule under both the 8-hour ozone standard and the annual PM 2.5 standard. In general, examinations for conformity have two major components:

(1) an air quality (regional emissions) analysis to determine that air pollutant emissions do not exceed the budgets (for ozone) set in the SIPs or the emission levels for a given base year such as 2002 (for PM 2.5); and
(2) a monitoring of the progress in implementation of the Transportation Control Measures (TCMs) contained in the SIPs.

In the past, consultation with the state and local air quality agencies and EPA had determined that there are no approved TCMs in the SIPs of Indiana and Kentucky. Therefore, it is possible to show conformity of *Horizon* 2030 simply by determining that the air pollutant emissions do not exceed the budgets in the SIPs or the base year emissions.

In general, the calculation of the regional emissions for 2002 and the analysis years involved three steps. First, the VMT and speeds were determined. Second, the MOBILE 6.2 emissions model was used to determine the emission factors for the pollutants and precursors. Third, the VMT was multiplied by the emission factors to determine the emissions for each county. The use of these three steps in Bullitt and Oldham counties and the Madison Township of Jefferson County (IN) varied slightly from their use in Clark, Floyd, and Jefferson (KY) counties, but essentially the same steps were undertaken for all portions of the nonattainment areas. The details of their use are discussed in the Regional Emissions Analysis section below.

KIPDA TRAVEL DEMAND MODEL

The KIPDA travel demand model is a mathematical model which relates travel to the transportation system and basic socioeconomic information. The domain of the model is a study area which includes the Louisville (KY-IN) Metropolitan Planning Area. The Louisville (KY-IN) Metropolitan Planning Area consists of Clark and Floyd counties, and 0.1 square miles in Harrison County, IN, and Bullitt, Jefferson, and Oldham counties, KY. This area is divided into 807 smaller units called traffic analysis zones.

Most of the KIPDA travel demand model was updated and calibrated during 2004-2005. This update established 2000 as the new base year for the model. The model update

utilized the information incorporated into the travel model during previous updates. In addition, information from the 2000 Census, the 2000 KIPDA Household Travel Survey, and the 2004 on-board survey of transit riders by the Transit Authority of River City was also incorporated. During the update, the model parameters were adjusted such that the model output matched—within reason—three main calibration criteria based on measured data. These criteria were: (1) daily VMT for all highway facilities except local roads for the region; (2) the distribution of trip lengths (duration in time); and (3) highway traffic volumes crossing the Ohio River screenline. The result of the update was a travel model which replicated travel in the Louisville area for 2000. The updated travel model was used in the regional air quality analysis.

The KIPDA travel demand model uses the standard four steps of modeling: trip generation, trip distribution, mode choice, and trip assignment. In addition, it considers travel by vehicles entering, leaving, and crossing the study area. These types of trips are known as external-internal, internal-external, and external-external, respectively. The internal ends of these trips are determined by the methods described below for internal-internal travel. The external ends are determined from the volume of traffic crossing the study area boundary at any of the 48 external stations.

Trip generation is the process of determining the number of unlinked trip ends--called productions and attractions--and their spatial distribution based on socioeconomic variables such as households and employment. Trip rates used to define these relationships were derived from the travel data collection efforts described above. This information was supplemented by use of the *National Cooperative Highway Research Program Report #365* and the Institute of Transportation Engineers' *Trip Generation Report*. The KIPDA travel demand model uses three internal-internal trip purposes and utilizes different trip rates for each. Internal-internal trips are those which have both ends inside the modeling domain. The three purposes are home-based work, home-based other, and non home-based.

Trip distribution is the process of linking the trip ends thereby creating trips which traverse the area. The KIPDA travel model uses a gravity model to link all trips except the external-external ones. The gravity model is based on the principle that productions are linked to attractions as a direct function of the number of attractions of a zone and as an inverse function of the travel time between zones. This inverse function of travel time is used to generate parameters called friction factors which, in turn, direct the gravity model. The friction factors used in the gravity model were developed as part of the calibration effort performed during the model update. In addition, information from a study which investigated the behavior of travelers crossing the Ohio River and traffic count information from 2000 were utilized to develop additional parameters called K-factors. The K-factors are used by the model to ensure that it is predicting the correct volume of traffic crossing the Ohio River.

Mode choice is the process used to separate the trips which use transit from those which use automobiles. It is also used to separate the auto drive-alone trips from auto shared-ride trips. In the previous KIPDA travel demand model, mode choice was based primarily on information provided by the *TARC Travel Forecasting Study*. In that model, the user's

benefit or utility was calculated for each mode based on zonal socioeconomic characteristics and the cost and time of the trip using the various modes. A nested logit model was used to determine the probability of the trip being made by each of the modes. This probability was then multiplied by the number of trips between zones to determine the number of trips by each mode.

As previously stated, the conformity analysis for *Horizon 2030* utilizes transit information from the previous travel demand model. The results of the 2004 TARC on-board survey were used to supplement the previous information. This was deemed acceptable for several reasons. The primary reason was that the transit network envisioned by *Horizon 2030* is essentially the same as the existing one. In addition, the number of total trips from the two models was similar. Therefore, the use of the transit trip information from the previous travel model did not change significantly the proportion of trips allocated to transit. Finally, the proportion of trips utilizing transit is less than 2% of the total trips. So small differences in the number of transit trips should provide a negligible effect on overall travel.

Trip assignment is the process used to determine which links of the network a trip will use. There are several assignment schemes which may be used. Two of the more common schemes are All-or-Nothing (AON)--in which all trips between two zones follow the shortest time path--and Stochastic--in which trips between two zones may be assigned to several paths based on their impedances or travel times. It is not uncommon for travel models to use several assignment schemes in sequence to converge to a better assignment. A sequence commonly used involves using several AONs with the traffic volumes reported at the end of each scheme being a weighted average of the volumes from the most recent scheme and the volumes from the previous schemes. A capacity restraint provision is used to adjust travel times between assignment schemes. This sequence is called an equilibrium assignment. The KIPDA travel model uses an equilibrium assignment which converges when the change in system-wide travel time over successive iterations is estimated to be within 0.1 percent of the minimum (optimal) value or less.

The output from the KIPDA travel model is in the form of a series of links with each link having certain associated data such as number of lanes, capacity, facility type, area type, functional class, and volume. This data allows for the calculation of other link information such as VMT. The VMT can be calculated as the product of the volume of traffic using a link times the distance of the link.

Adjustment Factors for Travel Model Output

The VMT and speeds from the travel demand model were adjusted before being used in the calculation of regional emissions. The purpose of these adjustments was to reconcile the model output with travel estimates from other sources, such as the Highway Performance Monitoring System (HPMS) estimates of VMT. To perform this adjustment, factors were developed for the year of the HPMS or other estimates and applied to model output for other years.

The development of the VMT adjustment factors involved comparing the VMT outputs of the travel demand model to the HPMS VMT estimates for 2000. Factors were developed to

adjust the model output to account for variation between the model and HPMS within each of the counties. To do this, the VMT from the 2000 model run was tabulated by county and functional classification. The VMT estimates derived from the model were then compared to the HPMS VMT estimates for 2000 to develop adjustment factors to be applied to the model output for subsequent years. The 8-hour ozone analysis is based on a level of traffic and the accompanying emissions expected on a typical summer weekday. For that analysis, the adjustment factors were increased by 2.9% to reflect the higher volume of traffic that can be expected on a typical summer weekday relative to the annual average daily traffic. The PM 2.5 analysis is based on annual traffic and the accompanying annual emissions. Therefore, the adjustment factors for that analysis were not increased; rather they were based on the annual average daily traffic. The adjustment factors for VMT were developed on a functional classification basis for each county.

The development of the speed adjustment factors involved a similar process. The outputs of the travel demand model were compared to estimates of speed based on: (1) the equations of the Highway Economic Reporting System (HERS) and (2) the use of data from the Automatic Continuous Traffic Recorders (ATRs) of the Kentucky Transportation Cabinet (KYTC) for 2001-2002.

The HERS equations were used to estimate speeds on 402 sections of urban roadways for five functional classifications. The speeds from these roadway sections were used to determine the average speed for each of five functional classes. The speeds used in the travel model were also averaged for each urban functional class. The speed adjustment factor for each urban functional class was calculated as the ratio of the average speed using the HERS equations to the average speed using the travel model data.

The KYTC ATR data was used to estimate speeds on 84 sections of rural roadways for four functional classifications. The speeds from these roadway sections were used to determine the average speed for each of four functional classes. The speeds used in the travel model were also averaged for each rural functional class. The speed adjustment factor for each rural functional class was calculated as the ratio of the average speed using the ATR data to the average speed using the travel model data.

The procedures described above produced speed adjustment factors for all functional classes except rural minor collectors and rural and urban local roads and ramps. (Ramps are not officially a separate functional class, but the speed behavior of traffic on ramps is not expected to be like that of any other functional class. Therefore, the ramps were treated as a separate “functional class.”) There was not sufficient data to estimate speeds for the roadways of these classes. For the rural minor collectors and rural and local roads, the speed adjustment factor of the next higher functional class was used. For ramps, the speeds in the travel model were used without adjustment (i.e. the speed adjustment factor for ramps = 1).

MOBILE 6.2 EMISSION FACTOR MODEL

In addition to the VMT, emission factors are the other component in calculating emissions. As previously mentioned, the Louisville region is a nonattainment area for the pollutants ozone and PM 2.5 and must therefore control direct PM 2.5 and the precursors of ozone and PM 2.5, VOCs and NOx. The emission factors for VOCs, NOx, and PM 2.5 were determined using the MOBILE 6.2 emissions model. The Louisville Metro Air Pollution Control District (APCD) produced the emission factors for Clark and Floyd counties, IN and Jefferson County, KY. The emission factors and emission estimates for Bullitt and Oldham counties, KY were developed by the Kentucky Division for Air Quality (KYDAQ). The emission factors and emission estimates for the Madison Township of Jefferson County, IN were developed by the Indiana Department of Transportation (INDOT). The procedures used in calculating these emission estimates are discussed below.

There are a number of factors affecting the emission factors developed from the MOBILE model. These factors include the fuel used by the vehicles driven in each county, and until recently, the presence of inspection/ maintenance (I/M) programs in some of the counties. In the past, the VMT generated in Clark, Floyd, and Jefferson (KY) counties came from some vehicles subject to an I/M program and from some vehicles which not subject to an I/M program. The I/M program in Clark and Floyd counties was discontinued at the end of 2006. The I/M program in Jefferson County (KY) was discontinued in 2003. Therefore, these programs were modeled as being in existence in 2002 but not for the other analysis years. The fuels which are used in Clark, Floyd, and Jefferson counties include reformulated gasoline (RFG) and reduced Reid vapor pressure gasoline (RVP). Unregulated gasoline is used in the new nonattainment areas of Bullitt and Oldham counties and the areas adjacent to the nonattainment area, and vehicles from these areas can be expected to travel in the Clark, Floyd, and Jefferson (KY) counties also. The emission factors for Clark, Floyd, and Jefferson (KY) counties used in the air quality analysis vary by county because they represent a VMT-weighted composite based on an estimate of travel in each county by vehicles from the various portions of the region. The assumptions used in developing the composites were consistent with those of the appropriate air quality agency for each of the counties. For Clark and Floyd counties, the assumptions of the Indiana Department of Environmental Management (IDEM) were used, and for Jefferson County (KY), the assumptions of the APCD were used. These assumptions had been previously reviewed and accepted by the IAC partners.

The assumptions used in developing the emission factors for Clark, Floyd, and Jefferson (KY) counties were the same as those that were used in developing the updated VOC and NOx budgets (in 2003) with a few exceptions where newer data was incorporated during October, 2004. The changes made in October, 2004 which affected the VOC and NOx emissions were:

(1) the incorporation of the new vehicle registration data for Clark and Floyd counties (provided by IDEM),
(2) the development and use of new vehicle registration data for Jefferson County (KY), and
(3) the use of arterial emission factors with VMT for rural local roads,

The vehicle registration data for Jefferson County (KY) was updated again in 2009 for this regional emissions analysis.

The first two of these changes were direct inputs to the MOBILE model. In addition, they were used with other available data to adjust the VMT mix input to the MOBILE model. As previously mentioned, the new vehicle registration for Clark and Floyd counties was made available to APCD from IDEM through KIPDA. The new vehicle registration data for Jefferson County was developed using information collected by the I/M program (known as the Vehicle Emissions Testing or VET program) through January, 2003. This data was based primarily on 2002 data, which was the last full year the VET was in operation.

The third change did not affect the emission factors from the MOBILE model but rather their application. MOBILE recognizes four facility types of roadways—freeways, arterials, local roads, and ramps. The previous practice was to use local road emission factors for VMT for local roads. However, the emission factors for local roads were restricted to only one speed, which EPA has recently judged to be inappropriate for rural local roads. The recent EPA guidance has recommended that arterial emission factors for the appropriate speed or speed bin be used with local road VMT, and this recommendation was incorporated into the analysis in 2006.

The emission factors for Bullitt and Oldham counties were developed by KYDAQ. KYDAQ used the more traditional approach to developing emission factors. Most of the inputs to the MOBILE 6 model were defaults and/or data used in previous SIPs. Neither the maintenance nor the new nonattainment portions of Bullitt and Oldham counties has an I/M program. So it was not necessary to have I/M input information for MOBILE 6. However, reformulated gasoline (RFG) is required for the maintenance portions of Bullitt and Oldham counties while unregulated gasoline is used in the new nonattainment areas of the two counties. Input data was provided to the MOBILE 6 model to reflect this difference. KYDAQ received VMT and speed information by functional class from KIPDA. Using the representative speed provided by KIPDA, KYDAQ developed an emission factor for each functional classification for each portion of the counties.

As with the emission estimates and factors developed for Clark, Floyd, and Jefferson counties, the assumptions used for Bullitt and Oldham counties were the same as those for the 2003 budget updates with a few exceptions. The exceptions were that new VMT and speed estimates had been developed for this amendment of *Horizon 2030,* and these were used.

The PM 2.5 emission factors for the Madison Township of Jefferson County, IN were developed by INDOT. INDOT used an approach to developing emission factors that was similar to the method used by APCD. However, since there is no travel model for Madison Township, determining the origin of the travel in that township required another source of information. The estimates of the origin of tripmaking (and therefore gasoline specifications and the presence/ absence of I/M programs) on data from 2000 Census. In addition, other data was “borrowed” from the Floyd County data developed by APCD. This data was adjusted to account for conditions typical of the Madison Township (e.g. no freeways or

ramps). The result was that four (five for 2002) combinations of emission factors were generated to account for the various categories (based on trip origin and associated gasoline and/or I/M program) of VMT. For this analysis, INDOT updated the MOBILE input data to reflect the changes made by APCD and the new VMT data provided by KIPDA.

AIR QUALITY ANALYSIS PROCEDURES

The air quality analysis involved three steps. The first step was to review the projects to determine which projects were “regionally significant” and needed to be included in the regional emissions analysis and to have this list of projects reviewed and accepted by the IAC/ICG. The second step was to develop estimates of travel behavior. The final step was to calculate the emissions associated with the travel. The second and third steps collectively are the Regional Emissions Analysis. Each of these steps is discussed below in greater detail.

Project Review

The first step involved determining which transportation plan projects were "regionally significant" and therefore to be included in the regional emissions analysis. During the development of *Horizon 2030*, a group of projects have been proposed for the plan, reviewed by conformity partners, and incorporated into the plan. The projects reviewed since the previous conformity determination were discussed in the section concerning consultation. The discussion below concerns projects in *Horizon 2030* previous to this amendment.

As in prior plans, some of the projects in *Horizon 2030* have been excluded from the regional emissions analysis. Most of the projects which were excluded were exempt projects as defined in the Code of Federal Regulations in 40 CFR 93.126 and 40 CFR 93.127. In addition, a few projects were excluded from the regional emissions analysis due to a lack of sufficiently detailed information. They include:

1. Transportation System Management (TSM) Projects

   Incident Management Program:
   This project involves providing the motorist with information concerning lane closures, due to accidents, construction, etc., which reduce the capacity of the facility. At this time, the route for diversion is totally at the discretion of the motorist. Therefore, there is insufficient information to quantify the emission impacts using the travel demand model approach.

   Spot Improvements:
   This is a funding mechanism for undetermined intersection improvements which would have minimal air quality impacts. No projects with air quality impacts are currently proposing use of these funds.

2. TSM Corridors
   A group of corridors was identified for improvements utilizing TSM. At this point, sufficient detail is lacking for inclusion in the air quality conformity analysis.

3. Roadway Projects
   I-264 / Muhammad Ali Blvd. / River Park Dr. interchange:
   At this point, sufficient detail is lacking for inclusion of this project in the air quality conformity analysis.

These projects continue to be excluded from the regional emissions analysis.

Regional Emissions Analysis

As previously mentioned, the procedures in Bullitt and Oldham counties and the Madison Township of Jefferson County (IN) varied slightly from those used in Clark, Floyd, and Jefferson (KY) counties. In addition, there were three projects which could not be analyzed using the travel model. These were evaluated using spreadsheet methods. The procedures for each portion of the nonattainment area and for the other projects follow.

The emission estimates for Clark and Floyd counties, IN and Jefferson County, KY were determined in the following manner. First, the KIPDA travel demand forecasting model was used to estimate travel behavior in the region. Second, the output from the travel model was adjusted using the adjustment factors discussed previously, and the adjusted VMT was placed in five miles per hour speed bins compatible with the MOBILE emission factor model. Third, the VMT in each of the speed bins was multiplied by the appropriate MOBILE emission factor to determine the emission levels for VOCs, NOx, and PM 2.5. It should be noted that the second (adjusting the travel model output) and third (calculating the emissions) steps were done separately for the 8-hour ozone and PM 2.5 analyses. As previously noted, the adjustment factors for the 8-hour ozone analysis were 2.9% larger than the adjustment factors for the PM 2.5 analysis. This resulted in slightly different VMT levels and slightly different distributions when the VMT was placed in the speed bins. In addition, the PM 2.5 emissions were initially calculated as daily emissions. Therefore, they were converted to annual emissions by multiplying by 365 days/year.

Several projects in Clark and Jefferson counties could not be included in the travel model. These included projects involving the Louisville Traffic Signal Improvement Program (in Jefferson County) and TARC's new and restructured transit service (in Clark and Jefferson counties). Estimates of the emission reductions of these projects were developed using spreadsheet methodologies. The emission reductions from these projects are minor and were included in the calculation of the emissions for Clark and Jefferson counties.

The emission estimates for Bullitt and Oldham counties were developed by the KYDAQ in the following manner. The KIPDA travel model was the source of the VMT and speed estimates. However, for Bullitt and Oldham counties, the results of the travel model efforts were summarized into total VMT and an average speed for each functional classification. This information was provided for each county for each of the analysis years. For the ozone portion of the analysis, the VMT for each class was divided into an estimate of the VMT in

the portion of the county which was required to have RFG and an estimate of the VMT in the portion of the county which is not required to have RFG. As previously mentioned, KYDAQ developed an emission factor for each functional classification for each of the counties. For each functional class, the two VMT estimates were each multiplied by the appropriate emission factor to determine the emission estimate for that class and portion of the county. The emissions for the various functional classes were summed for each portion for each county. For the PM 2.5 portion of the analysis, a similar procedure was used. However, since Oldham County was not in the PM 2.5 nonattainment area, the emission estimates were only calculated for Bullitt County.

One project in Bullitt County and one project in Oldham County could not be included in the travel model. The project in Bullitt County was the relocated (southern) section of US 31E. This project, which was discussed during consultation in the past, involved the relocation of a small (0.18 mile) section of US 31E from Nelson County (outside of the nonattainment area) to Bullitt County (inside both the 8-hour ozone maintenance and PM 2.5 nonattainment areas) during the reconstruction of that road. Estimates of the VMT for this project were developed using a spreadsheet approach. The VMT estimates were the product of the estimated traffic volumes for each of the analysis years and the length of the relocated section in Bullitt County. The VMT estimates for this project were then added to other Bullitt County VMT estimates of the same functional class. Consequently, the VMT estimates from this project were included with the other Bullitt County VMT, and the emissions in Bullitt County associated with this project were included in the overall emission estimates for Bullitt County. The project in Oldham County was a new park-and-ride lot. The emission reductions from this project were estimated using a spreadsheet method similar to those used for the off-model projects in Clark and Jefferson counties.

The PM 2.5 emission estimates for the Madison Township of Jefferson County, IN were developed by INDOT in the following manner.
(1) VMT was estimated from a countywide estimate (using an updated growth rate).
(2) VMT was identified by source (origin) county.
(3) The proportion of each source county's VMT of total county VMT was used to weight emission factors reflecting control and fuel programs for that source county.
(4) The weighted, composite emission factors were applied to the Madison Township VMT to calculate criterion pollutant burdens.

The VOC and NOx, summer daily emission values provided by APCD and KYDAQ were summed to determine the emission totals for each pollutant for the 8-hour ozone maintenance area. The PM 2.5 and NOx emission values provided by APCD, INDOT, and KYDAQ were summed to determine the emission totals for each pollutant for the PM 2.5 nonattainment area.

RESULTS OF THE ANALYSIS

The transportation plan, *Horizon 2030,* has been examined to determine if it is in conformity with the SIPs of Indiana and Kentucky and fulfills the criteria in the federal conformity rule

(found in 40 CFR 93). The examination has been based on an air quality analysis to determine that air pollutant emissions of the appropriate areas did not exceed the budgets set in the SIPs or 2002 emission levels.

As previously mentioned, the other criterion for determining conformity would have been the progress in implementation of the Transportation Control Measures (TCMs) contained in the SIPs. However, since previous consultation had determined that there were no approved TCMs, that criterion did not affect the determination of conformity. The results of the regional emissions analyses for ozone and PM 2.5 are discussed below.

8-hour Ozone Analysis

The eight-hour ozone maintenance SIPs of Indiana and Kentucky contain emission budgets for the precursors of ozone, volatile organic compounds (VOCs) and oxides of Nitrogen (NOx). The regional emissions analysis was conducted to provide estimates of the levels of emissions of VOCs and NOx for the various analysis years. These emission levels were then compared to the budgets in the SIPs to determine if the conformity tests were passed.

The results of the regional emissions analysis are summarized in Tables 1 and 2. Table 1 shows the summer weekday vehicle-miles-traveled from the analysis. Table 2 shows that for 2009, 2012, 2020, and 2030, the summer weekday VOC and NOx emission levels for the 8-hour maintenance area are less than the emission budgets established in the 8-hour maintenance SIP.

PM 2.5 Analysis

There are no emission budgets for fine particulate matter, PM 2.5, or oxides of Nitrogen, one of its precursors. The regional emissions analysis was conducted to provide estimates of the levels of emissions of PM 2.5 and NOx for the various analysis years. These emission levels for the years after 2002 were then compared to the emission levels in 2002 to determine if the conformity tests were passed.

The results of the regional emissions analysis are summarized in Tables 3 and 4. Table 3 shows the annual vehicle-miles-traveled from the analysis. Table 4 shows that for 2009, 2012, 2020, and 2030, the annual PM 2.5 and NOx emission levels for the local PM 2.5 nonattainment area are less than those for 2002.

Conclusions – 8-hour Ozone and PM 2.5

The regional emissions analysis of the projects in *Horizon 2030*, as amended, indicates that the plan is consistent with the goals and emission budgets established in the State Implementation Plans of Indiana and Kentucky. The cumulative effect of the results shown in Table 2 indicates that *Horizon 2030* has met the requirements of conformity under the 8-hour ozone standard. The effect of the results shown in Table 4 indicates that *Horizon 2030* has met the requirements of conformity under the PM 2.5 standard. In summary, it can be concluded that *Horizon 2030* conforms to the SIPs and meets the requirements of the federal conformity rule.

TABLE 1

SUMMER WEEKDAY VEHICLE-MILES-TRAVELED (VMT) ESTIMATED FOR THE 8-HOUR OZONE NONATTAINMENT AREA (in 1000's of vmt/day)			
YEAR	**INDIANA**	**KENTUCKY**	**TOTAL**
2002	**6483**	**23880**	**30363**
2009	**7247**	**26223**	**33470**
2012	**7606**	**27304**	**34910**
2020	**8593**	**29419**	**38012**
2030	**9695**	**32491**	**42186**

TABLE 2

SUMMER WEEKDAY EMISSIONS FOR THE 8-HOUR MAINTENANCE AREA (kg/day)				
EMISSION LEVELS FOR VARIOUS YEARS				
YEAR	**Area**	**VOCs**	**NOx**	**PASS**
2009	**Regional**	**27022**	**58002**	**YES**
2012		**22151**	**41034**	**YES**
2020		**14914**	**18518**	**YES**
2030		**14545**	**14708**	**YES**

NOTE: The criteria for conformity are as follows:

2009 and 2012 Regional emission levels for VOCs must be below the maintenance plan emission budget of 40.97 tons/day or 37,168 kg/day.

2009 and 2012 Regional emission levels for NOx must be below the maintenance plan emission budget of 95.51 tons/day or 86,647 kg/day.

2020 and 2030 Regional emission levels for VOCs must be below the maintenance plan emission budget of 22.92 tons/day or 20,793 kg/day.

2020 and 2030 Regional emission levels for NOx must be below the maintenance plan emission budget of 29.46.13 tons/day or 26,726 kg/day.

TABLE 3

ANNUAL AVERAGE DAILY VEHICLE-MILES-TRAVELED (VMT) ESTIMATED FOR THE PM 2.5 NONATTAINMENT AREA (in 1,000,000's of vmt/year)			
YEAR	**INDIANA**	**KENTUCKY**	**TOTAL**
2002	**2482**	**8004**	**10486**
2009	**2752**	**8751**	**11503**
2012	**2884**	**9096**	**11980**
2020	**3245**	**9744**	**12989**
2030	**3650**	**10702**	**14352**

TABLE 4

ANNUAL EMISSIONS FOR THE LOUISVILLE PM 2.5 NONATTAINMENT AREA (in 1000's of kg/year)			
EMISSION LEVELS FOR VARIOUS YEARS			
YEAR	**PM 2.5**	**NOx**	**PASS**
2002	**473**	**31926**	**-------**
2009	**325**	**20083**	**YES**
2012	**259**	**14146**	**YES**
2020	**186**	**6287**	**YES**
2030	**193**	**4952**	**YES**

NOTE: The criteria for conformity are as follows:

The emission levels for 2009, 2012, 2020, and 2030 must be no greater than those for 2002.