

AIR QUALITY CONFORMITY

BERRIEN - MI AIR QUALITY CONFORMITY

The 1990 Federal Clean Air Act Amendments (CAAA) identified six pollutants for which air quality standards were established: Ozone (O₃), carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), "respirable" or breathable particulate matter (PM), and lead (Pb). Each one of these pollutants has benchmark levels that are considered allowable for public exposure. Beyond those benchmark levels, the air quality for that pollutant is considered dangerous. The EPA has termed these national standards as "national ambient air quality standards," or NAAQS. Transportation contributes to four of the six criteria pollutants: O₃, CO, PM, and NO₂.

In addition to establishing benchmark levels of exposure to pollutants, the CAAA of 1990 required that transportation plans and TIPs in non-attainment areas demonstrate "conformity" to the State Implementation Plan (SIP), which is intended to ensure that the state meets the National Ambient Air Quality Standards (NAAQS). In other words, transportation projects, such as the construction of highways and transit rail lines cannot be federally funded or approved unless they are consistent with state air quality goals. In addition, transportation projects must not cause or contribute to new violations of the air quality standards, worsen existing violations, or delay attainment of air quality standards.

Since 1990, the EPA's method of measuring ambient air quality has been studied and revised. In 1997, the standard for fine breathable particulate matter (PM) was increased to 2.5 microns (PM_{2.5}), and a more rigorous 8-hour ozone testing standard replaced the previous 1-hour ozone testing standard. The new standards were challenged in court and their adoption was postponed as the EPA awaited adjudication. In 2001, the U.S. Supreme Court upheld the constitutionality of the new EPA standards. Upon implementation of the new standards, Berrien County (including the TwinCATS and NATS area) was found to be in "non-attainment" for 8-hour ozone, meaning that the benchmark level for ozone was exceeded by the average measurement within the 8-hour testing period. On May 16, 2007, the EPA approved a request from the State of Michigan to re-designate Berrien County, among others, to attainment of the 8-hour ozone NAAQS. While the re-designation changes the area's non-attainment status, the

designation is now attainment-maintenance, and air quality conformity procedures must continue to be followed. It is worthwhile to note that on March 12, 2008, the EPA announced a new primary 8-hour ozone standard of 0.075 parts per million (ppm), down from the previous .085 ppm. With this change, it is possible that Berrien County will return to non-attainment status. For more information on transportation and air quality, visit the EPA online at <http://www.epa.gov/oms/>.

In maintenance areas, the FHWA and the EPA require that implementation of projects in transportation plans and TIPs do not result in mobile source emissions greater than the emissions budget. In order to demonstrate conformity, capacity expansion and regionally significant projects identified in the Plans as well as the 2008-2011 TIPs were analyzed. In addition, because air quality conformity analysis must be performed on a countywide basis, the State TIP was analyzed in order to determine emissions impacts for the non-urban portion of the maintenance area.

An Inter-Agency Work Group (IAWG), consisting of representatives from EPA, FHWA, FTA, MDOT, MDEQ, and the SWMPC, is charged with defining the criteria for identifying a capacity expansion and/or regionally significant project. Projects that may be subject to air quality conformity modeling are not exclusive to Federal aid eligible roads. Any project deemed "regionally significant" by the IAWG will be subject to modeling. On November 25, 2008, the TwinCATS IAWG convened to review the Plan, TIP projects and regionally significant projects. Because no projects resulted from model deficiencies, the majority of the listed LRTP projects come directly from the 2009-2011 years of the current TIP. The only non-TIP projects listed, include US-31 completion (FY 2035), Klock Road and Graham Avenue. The US-31 project, the I-94 BL/Main Street project in Benton Harbor (lane reduction, in the current TIP in FY 2009), Klock Road and Graham Avenue are the only projects identified as capacity expansion and/or regionally significant. Furthermore, no known capacity projects are planned outside the urban area boundaries in Berrien County.

Action years for air quality analyses were decided. Because analysis years can not be more than 10 years apart, the years 2006, 2013, 2018, 2025, and 2035 were chosen. The base year for the travel demand model is 2006. 2013 is the last year of the next TIP. The budget year is 2018. The year 2025 is a good middle point, and the horizon year is 2035.

SE data for each of the action years are the basis for forecasting in the travel demand models that, in turn, generate inputs required for air quality conformity analysis. These inputs are the amount of travel expressed as vehicle miles of travel (VMT) and average speed by National Functional Classification (NFC) by county. Individual NFCs by county are then grouped to provide the needed data structure for EPA's Mobile6.2.

Much of Berrien County is covered by the TwinCATS urban travel demand model, as discussed in the *Socioeconomic Data and Travel Demand Model Chapter*. The remaining portions of Berrien County are covered by the NATS and statewide travel demand models. The models are developed and calibrated by MDOT. They use the standard four-step transportation modeling process: 1) trip generation, 2) trip distribution, 3) mode choice, and 4) highway assignment. The VMT and speed data generated by the two models are normalized using County Highway Performance Monitoring System (HPMS) VMT figures, to provide the basis for the estimation of present and future VMT and speeds by NFC. The air quality conformity analysis performed assumes that transportation projects are included in the milestone year they are presumed to be open to traffic.

Air quality analysis was performed in January, 2009 on the 2035 Metropolitan Transportation Plan for the Benton Harbor/St. Joseph Area, the 2035 Niles/Buchanan/Cass Area Transportation Study Transportation Plan, both Benton Harbor/St. Joseph and Niles FY 2008 - 2011 Transportation Improvement Programs and on the State Transportation Improvement Program (STIP) for the non-urban portion of the non-attainment area in order to determine the impact of the transportation system improvements on vehicle emissions. The Federal Highway Administration (FHWA) and the United States Environmental Protection Agency (EPA) require that the implementation of projects in the Transportation Plans and TIPs do not result in mobile source emissions greater than the emissions budget. The conformity determination conducted for the Transportation Plans and 2008-2011 TIPs were prepared in accordance with EPA's transportation conformity rule. The conformity demonstration was performed by comparing emissions from year 2013, 2018, 2025, and 2035 to the emission budget.

AIR QUALITY ASSESSMENT CRITERIA

Benton Harbor/St. Joseph and Niles' 2035 Transportation Plans and 2008-2011 TIPs and the rural Berrien County proportion of the STIP conformity demonstration was made in compliance with all applicable conformity requirements and have been determined to satisfy the following conformity criteria and procedures set forth in the EPA's Transportation Conformity Rule:

1. The conformity demonstration was based on the latest planning assumptions.
2. The conformity demonstration was based on the latest emission model available. The conformity demonstration was made according to the consultation procedures of the final conformity rule and the SIP conformity procedures.
3. The demonstration was made that the LRTPs and TIPs do not increase the frequency or severity of the existing violation of the NAAQS for which the area is designated in non-attainment. Completing the components of the LRTPs and TIPs do not exceed the approved 8-hour conformity budget.
4. Each project contained in the LRTPs and TIPs was reviewed by the Interagency Work Group (IAWG), being consistent with the consultation procedures established in the SIP. During the review, a determination was made by the IAWG on each project as to whether it needed to be modeled or was exempt from emission modeling.

BACKGROUND

The following describes the procedures used to estimate and analyze travel demand for the Berrien - MI Maintenance Area. The Twin Cities Area Transportation Study (Twincats) and Niles/Buchanan/Cass Area Transportation Study (NATS) and the Michigan Department of Transportation (MDOT) developed socio-economic data for 2006, 2013, 2018, 2025 and 2035. These data are the basis for forecasting in the travel demand models which, in turn, generate the inputs required for the air quality conformity analysis. These inputs are the amount of travel expressed as vehicle miles of travel (VMT) and average speed by National Functional Classification (NFC) by county. Individual NFCs by county are then grouped to provide the needed data structure required for EPA's Mobile6.2.

Air quality conformity analysis must be performed on a countywide basis. The urban travel demand forecast models do not cover the whole of the county. In Berrien County, the Twincats urban travel demand model (using TransCAD) covers the cities of Benton Harbor, St. Joseph, Stevensville, Bridgman, Baroda, Berrien Springs, and the townships of Benton, Lincoln, Royalton, Sodus, Lake, Baroda, and Oronoko. The NATS urban travel demand model covers the cities of Niles, Buchanan, Edwardsburg and the townships of Buchanan, Niles, Howard, Bertrand, Milton and Ontwa. For the portion of Berrien County not covered by an urban travel demand model, the MDOT statewide model is used to estimate travel.

The VMT and speed data generated by the TwinCats model, NATS model, and the statewide model are normalized using county Highway Performance Monitoring System (HPMS) VMT figures to provide the basis for the estimation of present and future VMT and speeds by NFC for the county. The air quality conformity analysis performed assumes that transportation projects are included in the milestone year they are presumed to be open to traffic. The following table demonstrates and summarizes the data resulting in the conformity determination for the Twincats 2035 Transportation Plan and 2008 - 2011 TIP, the NATS 2035 Transportation Plan and FY 2008-2011 TIP, and the rural Berrien County portion in the STIP.

**RESULTS OF THE BERRIEN - MI MAINTENANCE AREA
8 HOUR OZONE STANDARD**

Scenario	Emissions in kilograms/day	
	VOC	NO_x
Attainment Budget	8309.95	13780.37
2013 Action	4568.5623	6985.8052
2018 Action	3095.2800	3856.0920
2025 Action	2481.6529	2750.2440
2035 Action	2511.1029	2376.4995

The remainder of this report provides additional technical details and documentation as necessary to support this determination.

MODELING PROCEDURES

MDOT developed and calibrated the travel demand models used in this analysis. Urban travel demand models were developed for parts of Berrien. The remainder of Berrien County was modeled with the statewide model. The travel demand models use the standard four-step transportation modeling process.

- 1- Trip generation model
- 2- Trip distribution model
- 3- Mode choice model
- 4- Highway assignment model

TWINCATS Urban Travel Demand Model

The *trip generation model* uses a combination of local and (NCHRP 365) trip generation rates. The trip generation variables used in the model are households, elementary and secondary school enrollment, retail employment, service employment, and non-retail or service employment. The trip production model uses a cross-classification table with area type variation. The trip attraction model is based on regression equations, incorporating the variables listed above. The *trip distribution model* uses the standard gravity model to estimate origin/destination tables. It also uses friction factors for trip attractiveness. The *mode choice model* is a single mode model. It uses vehicle occupancy rates to convert person trips to vehicle trips. The *trip assignment model* uses an equilibrium algorithm. The model

was calibrated according to the strict calibration standards used by MDOT and suggested by FHWA. The model includes 340 traffic analysis zones. The network is coded to output information based on area type, facility type, number-of-lanes, speeds, NFC, capacity, street names, and vehicle assignment.

NATS Urban Travel Demand Model

The *trip generation model* uses trip generation rates developed from the 2005 Michigan Household Travel Survey. The trip generation model was enhanced with the use of area type. The trip generation variables used in the model are population (not in group quarters), households, retail, service, and other employment, auto ownership, K-12 enrollment, and student population. The *trip distribution model* uses the standard gravity model to estimate origin/destination tables. It also uses friction factors for trip attractiveness. The *mode choice model* is a single mode model. It uses vehicle occupancy rates to convert person trips to vehicle trips. The *trip assignment model* uses an equilibrium algorithm. The model was calibrated according to the calibration standards used by MDOT and suggested by FHWA. The model included 241 traffic analysis zones. The network is coded to output information based on area type, facility type, number-of-lanes, speeds, NFC, capacity, street names, and vehicle assignment.

Statewide Travel Demand Model

The statewide model was used for the non-urban parts of Berrien County. The model was developed in TransCAD and calibrated for year 2005. The model covers all counties of the state and includes NFC collectors and above; local roads are excluded. *Trip generation* employs a cross classification lookup table with trip rates developed from a combination of local models, National Cooperative Highway Research Program Report 187, Nationwide Personal Transportation Survey (NPTS), and the Transportation Management Area (TMA) model trip generation rates. The trip generation variables used in the model are households by three income groups and five size categories along with six categories of employment. The *trip distribution model* uses a gravity model to estimate origin/destination tables. The *mode choice model* converts person trips to vehicle trips by removing transit trips and applying auto occupancy factors, which are sensitive to the length of the trip (longer trips having higher occupancies). The *trip assignment model* uses an all-or-nothing algorithm. The model was calibrated according to the strict calibration standards used by MDOT and suggested by FHWA. The model includes 2,392 traffic

analysis zones and the network is coded to provide as output VMT, VHT, and speeds by NFC.

HIGHWAY PERFORMANCE MONITORING SYSTEM (HPMS) DATA

The EPA and the United States Department of Transportation (USDOT) have both endorsed HPMS as the appropriate source of VMT estimates. HPMS is the FHWA's annual program to collect roadway data in all 50 states to assess the condition of the highway system in terms of traffic congestion, accessibility, and pavement condition. The FHWA requires counts to determine the area wide VMT for all Federal Aid Urban Areas (FAUA). MDOT supplements the counts outside the FAUA with additional counts in small cities, rural areas, and especially in rural areas of counties with non-attainment status. These supplemental counts follow the same random selection procedures as those inside the FAUA.

The HPMS data used is from MDOT's Universe file and is stratified by NFC. MDOT is currently undertaking a data improvement process to update the HPMS Universe, non-sample traffic data.

MODEL VEHICLE MILES OF TRAVEL (VMT)

HPMS Universe data provides the VMT estimates for the calibration year of the travel demand model, 2006 for Benton Harbor/St. Joseph and Niles models, and 2005 for the statewide model. To maintain consistency between HPMS and modeled VMT and among milestone years model VMT is scaled. The 2006 HPMS VMT distribution was used to scale the 2013, 2018, 2025, and 2035 VMT. Thus, the 2006 total HPMS VMT remained the same while future modeled VMT distributions changed to reflect the HPMS distribution. Then the scaled VMT by NFC are collapsed into four groups, to meet the requirements of Mobile6.2. These groups are: 1) rural interstate, 2) rural major and minor arterials/collectors/local streets, 3) urban interstate/freeway, and 4) urban principal and minor arterials/collectors/local streets. This is done for all interim and future analysis years. This same process is used for vehicle hours of travel (VHT). The following are the scaled travel demand modeled VMT for each county.

BERRIEN COUNTY VEHICLE MILES OF TRAVEL

NFC	HPMS 2006	2006	2013	2018	2025	2035
Rural Interstate/ Freeway	906,298	906,298	996,715	1,045,570	1,108,554	1,203,339
Rural Major & Minor Arterial/Co llector/Loc al Street	1,625,721	1,625,721	1,787,405	1,842,756	1,917,767	2,028,131
Urban Interstate/ Freeway	1,048,254	1,048,254	1,194,297	1,270,663	1,369,498	1,450,146
Urban Principal & Minor Arterial/Co llector/Loc al Street	2,001,924	2,001,924	2,150,553	2,211,365	2,283,546	2,341,035
Total	5,582,198	5,582,198	6,128,971	6,370,354	6,679,365	7,022,652

MODEL SPEED

The modeled speed is derived by dividing the total aggregated scaled VMT by the total aggregated scaled VHT, except for local roads estimated by the statewide model. Rural Berrien County speeds for local roads were estimated by averaging speeds generated by the urban models. The speeds are summarized below:

BERRIEN COUNTY SPEED

NFC	2006	2013	2018	2025	2035
Rural Interstate/Freeway	64.0	63.4	63.0	62.6	61.8
Rural Major & Minor Arterial/Collector/Local Street	47.7	47.7	47.6	47.6	47.7
Urban Interstate/Freeway	61.7	61.7	61.6	61.5	61.0
Urban Principal & Minor Arterial/Collector/Local Street	38.1	38.0	38.0	38.0	37.9

CONFORMITY ANALYSIS

The conformity analysis was performed using the Mobile6.2 program. Mobile6.2 is a computer program that estimates VOC and NOx emission factors for gasoline and diesel -fuels for on road motor vehicles. The model was developed by the USEPA.

Mobile6.2 calculates emission factors for eight individual vehicle types in two regions of the country. Mobile6.2 emission factor estimates depend on various conditions such as ambient temperatures, average travel speed, operating modes, fuel volatility, and mileage accrual rates. Many of the variables affecting vehicle emissions can be specified by the user. The analysis is based on comparing the emissions budget to the analysis years 2013, 2018, 2025, and 2035.

A summary of critical Mobile6.2 inputs assumptions are shown below:

- Temperature:

Ambient temperature = 86.8° F
 Maximum temperature = 95.0° F
 Minimum temperature = 65.0° F

- The Reid Vapor Pressure (RVP) value = 9.0
- Emission factors are based on an average day during the month of July.

Mobile6.2 - Inputs

The inputs to the Mobile6.2 emissions factor model are VMT and average speed by NFC grouped as shown in the previous tables.

Mobile6.2 - Results

The following table provides the results of Mobile6.2 emissions. The emission impact for each analysis year 2013, 2018, 2025, and 2035 is compared to the emission budget. To attain conformity, the emissions for the county must be less than the emission budget. Mobile6.2 result files are shown in the appendix section N.

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CONFORMITY DEMONSTRATION

The above table clearly demonstrates that the Transportation Plans, the Transportation Improvement Programs, and regionally significant projects result in lower emissions in each of the milestone years than the approved maintenance budget, consistent with USDOT/EPA conformity rules. These results support the determination of conformity with applicable requirements of the SIP following and in

accordance with the Clean Air Act and Transportation Efficiency Act for the Twenty First Century (TEA21), as amended and SAFETEA-LU.

MPO ACTION

A summary of the results was presented and considered by the Twincats and NATS Technical Committees and was also considered by their respective Policy Committees. Based on the materials contained in this document, the Twincats and NATS committees have determination that their respective 2035 Transportation Plans and 2008 - 2011 TIPs, and the rural Berrien County portion of the STIP demonstrate conformity with the SIP.