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Chapter 22: Air Quality

FDM 22-1-1 Originator

August 15, 2019

The Chief of the Environmental Services Section within WisDOT's Division of Transportation System Development, Bureau of Technical Services is the originator of this chapter. Direct questions and comments on the contents of this chapter to the Environmental Services Section Chief at 608-264-7330.

FDM 22-1-2 Objectives

August 15, 2019

The objective of this chapter is to help project managers develop their projects in compliance with federal and state laws regarding air quality determination and mitigation. The chapter will explain to the user how to:

- Determine the different factors influencing air quality
- Conduct an analysis, if required
- Determine whether or not an air quality impact occurs
- If an impact occurs, determine if mitigation is feasible and implementable
- Involve the public in air quality decision making
- Properly document the results of an air quality analysis
- Coordinate with other agencies as necessary

FDM 22-1-3 Criteria Air Pollutants

August 15, 2019

An air pollutant is any substance in air that could, in high enough concentration, have adverse effects on human health and the environment. Such pollutants may be present as solid particles, liquid droplets, or gases. Air pollutants fall into two main groups: (1) those emitted from identifiable sources and, (2) those formed in the air by interaction between other pollutants.

The Clean Air Act requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants. These common air pollutants (also known as "criteria air pollutants") are found all over the United States. They are particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants can harm health, the environment and cause property damage. EPA calls these pollutants "criteria air pollutants" because it regulates them by developing human health-based and/or environmentally-based criteria (science-based guidelines) for setting permissible levels. Of the six pollutants, particle pollution and ground-level ozone are the most widespread threats to human health.

The set of limits based on human health is called primary standards. Another set of limits intended to prevent environmental and property damage for protection of public welfare is called secondary standards. In instances where a criteria pollutant is actually a group of pollutants (e.g., nitrogen oxides- NOx), the standards are set for a key or indicator pollutant within the group (e.g., nitrogen dioxide -NO_2). Thus, in regulating NO_2, most of NO_X pollution would be accounted for.

1. **Carbon Monoxide** (CO): CO is a colorless, odorless gas emitted from combustion processes. Nationally, and particularly in urban areas, the largest proportion of CO emissions in ambient air comes from mobile sources. CO can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues. EPA first set air quality standards for CO in 1971 for protection of both public health and welfare. In a review of CO standards completed in 1985, EPA revoked the secondary standard (for public welfare) due to a lack of evidence of adverse effects on public welfare at or near ambient concentrations.

2. **Lead** (Pb): Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been from fuels in on-road motor vehicles (such as cars and trucks) and industrial sources. As a result of EPA's regulatory efforts to remove lead from on-road motor vehicle gasoline, emissions of lead from the transportation sector dramatically declined by 95 percent between 1980 and 1999, and levels of lead in the air decreased by 94 percent between 1980 and 1999. The major sources of lead emissions to the air today are ore and metals processing and piston-engine aircraft operating on leaded aviation gasoline.

3. **Nitrogen Oxides** (NOx): Nitrogen dioxide (NO_2) is one of a group of highly reactive gasses known as "oxides of nitrogen," or "nitrogen oxides (NOx)." Other nitrogen oxides include nitrous acid and nitric acid. EPA's National Ambient Air Quality Standard uses NO_2 as the indicator for the larger group of nitrogen oxides. NO_2 forms quickly from emissions of cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level ozone, and fine particle pollution, NO_2 is linked with a number of adverse effects on the respiratory system.

   EPA first set uniform standards for NO_2 in 1971, setting both a primary standard (to protect health) and a secondary standard (to protect the public welfare) at 53 parts per billion (ppb), averaged annually. The Agency has reviewed the standards twice since that time but chose not to revise the annual standards at the conclusion of each review. In January 2010, EPA established an additional primary standard (100 ppb), averaged over one hour. Together the primary standards protect public health, including the health of sensitive populations - people with asthma, children, and the elderly. Los Angeles-South Coast Air Basin, CA, is the only area of the country that has violated the current NO_2 standards.

4. **Particulate Matter** (PM): Particulate matter, also known as particle pollution or PM, is a complex mixture of microscopic particles and liquid droplets suspended in the air. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, soil or dust particles and allergens. The chemical composition of particles depends on location, time of year, and weather. The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. Health studies have shown a significant association between exposure to fine particles and premature death from heart or lung disease. Fine particles can aggravate heart and lung diseases and have been linked to effects such as: cardiovascular symptoms; cardiac arrhythmias; heart attacks; respiratory symptoms; asthma attacks; and bronchitis.

   EPA groups particle pollution into two categories: PM_{10}, "inhalable coarse particles", such as those found near roadways and dusty industries, are smaller than 10 micrometers in diameter and larger than 2.5 micrometers. $PM_{2.5,}$ "fine particles", such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller, $1/30^{th}$ the diameter of a human hair. Fine particle pollution can be directly emitted from sources such as forest fires, or they can form secondarily in the atmosphere when gases emitted from power plants, industrial facilities, and automobiles react in the air, e.g. sulfates are a type of secondary particles formed from sulfur dioxide emissions from power plants and industrial facilities; Nitrates are formed from emissions of nitrogen oxides from power plants, automobiles, and other combustion sources.

5. **Sulfur Oxides** (SOx): Sulfur dioxide (SO_2) is one of a group of highly reactive gasses known as "oxides of sulfur," or "sulfur oxides (SOx)." Oxides of sulfur include sulfur monoxide (SO), sulfur trioxide (SO_3), disulfur dioxide (S_2O_2) and others. EPA's National Ambient Air Quality Standard uses SO_2 as the indicator for the larger group of sulfur oxides. The largest sources of SO_2 emissions are from fossil fuel combustion at power plants and other industrial facilities. Smaller sources of SO_2 emissions include industrial processes such as extracting metal from ore, and the burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment. Automobiles account for a minimal percent of SO_2 emissions because of the low levels of sulfur in gasoline. SO_2 exposure ranging from 5 minutes to 24 hours is linked with a number of adverse effects on the respiratory system including bronchoconstriction and increased asthma symptoms.

   EPA first set standards for SO_2 in 1971 setting a 24-hour primary standard at 140 ppb and an annual average standard at 30 ppb to protect health. EPA also set a 3-hour average secondary standard at 0.5 ppm to protect the public welfare. In 1996, EPA reviewed the SO_2 NAAQS and chose not to revise the standards. In 2010, EPA revised the primary SO_2 NAAQS by establishing a new 1-hour standard at a level of 75 parts per billion (ppb). EPA then revoked the two existing primary standards because they would not provide additional public health protection.

6. **Ozone** (O_3): Ozone is of greatest concern among a category of pollutants known as photochemical oxidants. Ozone occurs both in the Earth's upper atmosphere and at ground level. Stratospheric (good) ozone occurs naturally in the upper atmosphere, where it forms a protective layer that shields us from the sun's harmful ultraviolet rays. Tropospheric, ground level (bad), ozone, is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) when these pollutants emitted by cars, power plants, industrial boilers, refineries,

chemical plants, and other sources chemically react in the presence of sunlight. Ozone at ground level is a harmful air pollutant, because of its effects on people and the environment, and it is the main ingredient in “smog." Ozone is most likely to reach unhealthy levels on hot sunny days in urban environments, but can still reach high levels during colder months. Ozone can also be transported long distances by wind, so even rural areas can experience high ozone levels. O_3 reduces visibility and affects human health by producing eye irritations and a worsening of respiratory problems.

Breathing ozone can trigger a variety of health problems including chest pain, coughing, throat irritation, and airway inflammation, particularly for children, the elderly, and people of all ages who have lung diseases such as asthma, bronchitis and emphysema. Ground level ozone can also have harmful effects on sensitive vegetation during the growing season and on ecosystems including forests, parks, wildlife refuges and wilderness areas.

Historically, the ozone NAAQS have been changed more often than any other NAAQS. In 2015, EPA set a new uniform 8-hour primary and secondary ozone NAAQS at 0.070 parts per million (ppm) in the form of an annual fourth highest daily maximum 8-hr concentration, averaged over three years. Visit EPA (https://www.epa.gov/criteria-air-pollutants/naaqs-table) for current information on the NAAQS.

FDM 22-5-1 Clean Air Act and Amendments

August 15, 2019

The Clean Air Act (CAA) is a Federal law designed to control air pollution on a national level. The original CAA of 1963 established funding for the study and the cleanup of air pollution. But, there was no comprehensive federal response to address air pollution until Congress passed a much stronger CAA in 1970. That same year Congress created the U.S. Environmental Protection Agency (EPA) and gave the EPA the primary role in administering the CAA, in coordination with state, local, and tribal governments. Its implementing regulations are codified at 40 CFR Subchapter C, Parts 50-97.

In 1990, Congress dramatically revised and expanded the CAA, providing EPA even broader authority to implement and enforce regulations reducing air pollutant emissions. The 1990 amendments addressed acid rain, ozone depletion, and toxic air pollution, established a national permits program for stationary sources, and increased enforcement authority. The amendments also established new automobile gasoline reformulation requirements, set standards to control evaporative emissions from gasoline, and mandated new gasoline formulations to be sold from May to September in many states. The 1990 Amendments also placed an increased emphasis on more cost-effective approaches to reduce air pollution.

Congress also recognized that Indian Tribes have the authority to implement air pollution control programs. EPA's Tribal Authority Rule gives Tribes the ability to develop air quality management programs, write rules to reduce air pollution and implement and enforce their rules. While state and local agencies are responsible for all CAA requirements, Tribes may develop and implement only those parts of the Clean Air Act that are appropriate for their lands.

Under the CAA, EPA establishes National Ambient Air Quality Standards (NAAQS) for certain air pollutants, called criteria air pollutants. As National standards, the NAAQS set limits on the levels of air pollution to be found anywhere in the United States. This helps to ensure basic health and environmental protection from air pollution. The CAA also gives EPA the authority to limit emissions of air pollutants coming from stationary sources like chemical plants, utilities, and steel mills. Individual states or tribes may have stronger air pollution laws, but they may not have weaker pollution limits than those set by EPA.

States develop State Implementation Plans (SIPs) that outline how each state will control air pollution under the CAA. A SIP is a collection of the regulations, programs and policies that a state will use to clean up polluted areas. The states must involve the public and industries through hearings and opportunities to comment on the development of each state plan. EPA must approve state, tribal, and local agency plans for reducing air pollution. EPA can issue sanctions against the state and, if necessary, take over enforcing the CAA in that area. State, local, and tribal governments also monitor air quality, inspect facilities under their jurisdictions and enforce CAA regulations.

The CAA requires that transportation planning must be consistent with air quality goals in areas experiencing air quality problems. This is determined through the transportation conformity process. The concept of transportation conformity was introduced in the CAA through the inclusion of a provision to ensure that transportation investments conform to a State's air quality implementation plan (SIP) for meeting the Federal air quality standards. Conformity requirements were made substantially more rigorous in the CAA Amendments of 1990. The transportation conformity regulations, 23 CFR Parts 51 and 93, that detail implementation of the CAA requirements were first issued in November 1993, and have been amended several times. The regulations establish the criteria and procedures for transportation agencies to demonstrate that air pollutant emissions from metropolitan transportation plans, transportation improvement programs and projects are consistent with ("conform to") the State's air quality goals in the SIP. This process has required State and local transportation officials to make challenging decisions to meet both air quality and mobility goals. Where CAA goals were not being met, State and local transportation officials have pursued ways to reduce vehicle emissions by developing transportation plans, TIPs, and projects that will alter travel patterns, reduce the number of single-occupant vehicles, and make alternative modes of transportation (such as transit and bicycles) an increasingly important part of the transportation network.

FDM 22-5-2 40 CFR 51 and 40 CFR 93

August 15, 2019

Part 51 establishes that each State with nonattainment areas is responsible for developing plans by which they will comply with the national primary and secondary ambient air quality standards. These plans must be submitted to the U.S. Environmental Protection Agency (EPA) for review and acceptance.
These State Implementation Plans (SIPs) must include dates for attainment of standards, description of enforcement methods, procedures for handling violations and a designation of the agency responsible for enforcement of implementation. The plans may be modified and resubmitted for approval as circumstances change or as revisions to governing standards are adopted

TITLE 40—Protection of Environment, Chapter I—EPA (continued), Subchapter C—Air Programs

PART 51—Requirements for preparation, adoption, and submittal of Implementation Plans:

U.S. Government Publishing Office: Title 40 → Chapter I → Subchapter C → Part 51

Part 93 implements section 176(c) of the CAA with respect to the conformity of transportation plans, programs, and projects which are developed, funded, or approved by the United States Department of Transportation (DOT), and by metropolitan planning organizations (MPOs) or other recipients of funds under title 23 U.S.C. or the Federal Transit Laws (49 U.S.C. Chapter 53). It sets forth policy, criteria, and procedures for demonstrating and assuring conformity of such activities to an applicable implementation plan.

PART 93—Determining Conformity of Federal Actions to State or Federal Implementation Plans:

U.S. Government Publishing Office: Title 40 → Chapter I → Subchapter C → Part 93

FDM 22-5-3 FHWA Website

August 15, 2019

The Federal Highway Administration (FHWA) has created its Air Quality/Transportation & Toxic Air Pollutants web site to provide information/guidance on FHWA's air quality programs, including transportation conformity, air toxics, and the Congestion Mitigation and Air Quality Improvement (CMAQ) program.

Federal Highway Administration, Air Quality

FDM 22-5-4 Wisconsin DNR Air Pollution Control Rules

August 15, 2019

Wisconsin's State Legislature creates and revises the Wisconsin Statutes, while state agencies such as the Department of Natural Resources (DNR) create and revise the rules required and authorized by those statutes. These agency rules constitute the Wisconsin Administrative Code. The following link provides access to The Wisconsin DNR table which lists all current Wisconsin air pollution control rules:

http://dnr.wi.gov/topic/AirQuality/Rules.html

FDM 22-10-1 Introduction

August 15, 2019

EPA has established National Ambient Air Quality Standards (NAAQS) for six principal pollutants, which are called "criteria pollutants". They are a set of air pollutants that cause smog, acid rain, and other health hazards. Criteria pollutants are typically emitted from many sources in industry, mining, transportation, electricity generation and agriculture. In most cases they are the products of the combustion of fossil fuels or industrial processes. The NAAQS are listed: https://www.epa.gov/criteria-air-pollutants/naaqs-table. Only two of the six criteria pollutants-ozone (O_3) and particulate matter ($P.M._{2.5}$)-are important to Wisconsin.

Ozone is a form of molecular oxygen that consists of three oxygen atoms linked together. Ozone in the upper atmosphere (the "ozone layer") occurs naturally and protects life on earth by filtering out ultraviolet radiation from the sun. But ozone at ground level is a noxious pollutant. It is the major component of smog and presents this country's most difficult urban air quality problem.

Particle pollution, also called particulate matter or PM, consists of solid particles or liquid droplets suspended in the air. Fine particles ($PM_{2.5}$) may be emitted directly into the atmosphere but are more commonly created by reactions of other pollutants, such as nitrogen oxides (NOx), sulfur dioxide (SO_2), organic carbon and ammonia. Inhalable coarse particles (PM_{10}) usually result from some type of mechanical action such as crushing or grinding, or from wind-blown dust. Exposure to these suspended particles and droplets can cause serious health problems in humans, especially those with respiratory conditions such as asthma and cardiac disease.

FDM 22-10-2 Description

August 15, 2019

Ozone is not emitted directly but is formed in the atmosphere through a complex set of chemical reactions involving hydrocarbons, oxides of nitrogen, and sunlight. The rate at which the reactions proceed is related to both temperature and intensity of the sunlight. Because of this, problematic ozone levels occur most frequently on hot summer afternoons. Hydrocarbons and nitrogen oxides come from a great variety of industrial and combustion processes. In typical urban areas, at least half of those pollutants come from cars, buses, trucks, and off-highway mobile sources such as construction vehicles and boats.

Ozone is a severe irritant. It is responsible for the choking, coughing, and stinging eyes associated with smog. Ozone damages lung tissue, aggravates respiratory disease, and makes people more susceptible to respiratory infections. Children are especially vulnerable to ozone's harmful effects, as are adults with existing diseases. But even otherwise healthy individuals may experience impaired health from breathing ozone-polluted air. Elevated ozone levels also inhibit plant growth and can cause widespread damage to crops and forests. Unhealthy ozone levels are a problem across the United States, with many cities exceeding the U.S. Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) for ozone. The standard is based on the highest ozone exposure sensitive persons can tolerate.

Particle pollution includes fine particles with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), inhalable coarse particles with an aerodynamic diameter of 2.5 to 10 microns or less (PM_{10}). For a sense of scale, the average human hair is 70 microns in diameter. In Wisconsin, DNR monitors inhalable coarse and fine particles.

Fine particles ($PM_{2.5}$)

Sources of fine particle emissions include forest fires and wood stoves. Sources of the precursor pollutants that chemically react to form fine particles (NOx, SO_2, organic carbon and ammonia) include power plants, industries and automobiles. Wind can carry these particles hundreds of miles from their sources. Fine particle levels typically peak in winter but concentrations can also be high in summer.

Coarse particles (PM_{10})

Sources of inhalable coarse particles include roadways and dusty industries. These particles are typically not transported great distances.

FDM 22-10-3 Nonattainment Areas

August 15, 2019

A nonattainment area is a geographic area designated by EPA that exceeds a NAAQS threshold for at least one criteria pollutant. An area may be in attainment for one or more criteria pollutants and a nonattainment area for others. Current nonattainment areas for criteria pollutants are listed by pollutant type at: https://www.epa.gov/green-book

FDM 22-10-4 Conformity

August 15, 2019

The air quality provisions of the Clean Air Act (CAA) and the metropolitan transportation planning provisions of Title 23 and Title 49 of the United States Code require a planning process that integrates air quality planning and metropolitan transportation planning such that Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) funding and approvals are given to highway and public transportation projects that are consistent with ("conform to") the air quality goals of a given state. This process is known as transportation conformity and is carried out in accordance with 40 CFR Parts 51 and 93. The state establishes and articulates its air quality goals in its State Implementation Plan (SIP). A SIP is a collection of enforceable regulations covering implementation of control measures, or equipment, or processes, or actions used by a state to reduce air pollution. Taking cost into consideration, a SIP includes a best mix of control measures identified by the state to attain a given NAAQS. A SIP also spells out how emission reduction responsibilities will be allocated among emission sources and shows not only how a state will make progress toward attaining the NAAQS by CAA deadlines, but also how a state will attain and maintain the NAAQS.

The CAA requires that metropolitan transportation plans, transportation improvement programs (TIPs), Federally funded or approved projects, and other regionally significant projects, regardless of funding source, conform to the purpose of the SIP. Conformity to a SIP means that such activities will not cause or contribute to any new violations of the NAAQS; increase the frequency or severity of NAAQS violations; or delay timely attainment of the NAAQS or any required interim milestone. Conformity requirements apply in areas that either do not meet or previously have not met air quality standards. These areas are known as "nonattainment areas" or "maintenance areas" respectively. Under the CAA, a state is required to develop, adopt, and submit to the EPA for approval a SIP for each criteria air pollutant for which it has a nonattainment or maintenance area. For a complete list of nonattainment and maintenance areas for these and other pollutants see: https://www.epa.gov/green-book.

For a metropolitan area's transportation plan and TIP, a conformity determination demonstrates that the total emissions from on-road travel on an area's transportation system network are consistent with goals for air quality found in the SIP. Before a SIP is available, other tests of conformity are used. For project-level conformity, a project must come from a conforming metropolitan transportation plan and TIP, its design concept and scope must not have changed significantly from that in the metropolitan transportation plan and TIP, and that potential localized emissions impacts are addressed.

Isolated rural nonattainment and maintenance areas are defined in 40 CFR 93.101 as areas that do not contain or are not part of any metropolitan planning area as designated under the transportation planning regulations. These areas do not have federally required metropolitan transportation plans and TIPs and, as such, are not subject to the frequency requirements for conformity determinations of transportation plans and TIPs (40 CFR 93.104(b), (c), and (e)). Instead, in an isolated rural area, a conformity determination is required only when a non-exempt FHWA/FTA project(s) needs funding or approval, based on the conformity requirements for isolated rural areas at 40 CFR 93.109(g).

FDM 22-10-5 Determining Conformity of Transportation Plans, Programs, and Projects

August 15, 2019

Transportation conformity ("conformity") is a way to ensure that Federal funding and approval go to those transportation activities that are consistent with air quality goals. Conformity applies to transportation plans, transportation improvement programs (TIPs), and projects funded or approved by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA) in areas that do not meet or previously have not met air quality standards for ozone, carbon monoxide, particulate matter, or nitrogen dioxide-all transportation related, but only ozone and particulate matter are relevant to Wisconsin. These areas are known as "nonattainment areas" or "maintenance areas," respectively. Regulations governing transportation conformity are found in Title 40 of the Code of Federal Regulations (40 CFR Parts 51 and 93).

FDM 22-15-1 Introduction

August 15, 2019

Mobile source air toxics (MSAT), a subset of hazardous air pollutants, are compounds emitted from highway and non-road vehicles and equipment which are known to cause or suspected of causing serious health and environmental effects. No National Air Quality Standards (NAAQS) have been set for these substances. The Environmental Protection Agency (EPA) has identified seven compounds of significance from mobile sources that are specifically linked to cancer. These compounds are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM-the dominant MSAT of concern), formaldehyde, naphthalene, and polycyclic organic matter.

In deciding when and how to evaluate MSATs, review FHWA's Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents:
https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm

If a quantitative MSAT analysis is required under the NEPA review process, the latest version of EPA's MOVES model must be used to conduct emissions analyses.

FDM 22-15-2 Consideration of MSATs in NEPA documents

August 15, 2019

The FHWA guidance describes a three-tiered approach for evaluating MSATs in NEPA documents. The three tiers of analysis depend on specific project circumstances:

Tier 1: No Analysis Required for Projects with no Potential for Meaningful MSAT Effects, or Exempt Projects

The types of projects in this category included:

- Projects qualifying as a categorical exclusion under 23 CFR 771.117
- Projects exempt under the Clean Air Act conformity rule under 40 CFR 93.126, or
- Other projects with no meaningful impacts on traffic volume or mix.

These projects could typically include projects categorically excluded under 23 CFR 771.117(d) or exempt from certain conformity requirements under 40 CFR 93.126 and 40 CFR 93.127. No analysis or discussion of MSAT is necessary. Documentation sufficient to demonstrate that the project qualifies as a categorical exclusion and/or exempt project will suffice. For other projects with no or negligible traffic impacts, regardless of the class of NEPA environmental document, no MSAT analysis is recommended. However, the project record should document in the EA or EIS the basis for the determination of no meaningful potential impacts with a brief description of the factors considered. Appendix A of FHWA's interim guidance document provides example language to document exempt projects:
https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm
Example language tailored to be Wisconsin specific can be found in FDM 22-25.4.11.

Tier 2: Qualitative Analysis for Projects with Low Potential MSAT Effects

The types of projects that fall under this category are those that improve operations of highway, transit, or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions. Examples of these projects are minor widening projects, new interchanges, replacing a signalized intersection on a surface street, and projects where design year traffic is projected to be less than 140,000 to 150,000 annual average daily traffic (AADT). It is anticipated that most projects will fall under this category.

The qualitative assessment compares, in narrative form, the expected effect of the project on traffic volume, vehicles mix, or routing of traffic and the associated changes in MSAT for the project alternatives, including no-build, based on VMT, vehicle mix, and speed. The discussion should also include national trend data projecting substantial overall reductions in emissions due to stricter engine and fuel regulations issued by EPA.

Appendix B of FHWA's interim guidance document provides example language to document qualitative project level MSAT analysis for four types of projects: a minor widening project; a new interchange connecting an existing roadway with a new roadway; a new interchange connecting new roadways; and minor improvements or expansions to intermodal centers or other projects that affect truck traffic.
https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm

According to the updated Interim Guidance, a NEPA document for this category of projects must, in addition to the qualitative assessment, include a discussion of information that is incomplete or unavailable for a project-specific assessment of MSAT impacts, in compliance with the Council on Environmental Quality (CEQ) regulations (40 CFR 1502.22(b). This discussion should explain how current scientific techniques, tools, and data are not sufficient to accurately estimate human health impacts that could result from a transportation project in a way that would be useful to decision-makers. Also, in compliance with 40 CFR 150.22(b), it should contain information regarding the health impacts of MSAT.
https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm

Tier 3: Quantitative Analysis for Projects with Higher Potential MSAT Effect

This category includes projects that have the potential for meaningful differences in MSAT emissions among project alternatives. These are projects that:

- Create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location, involving a significant number of diesel vehicles for new projects or accommodating with a significant increase in the number of diesel vehicles for expansion projects; or
- Create new capacity or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volume where the AADT is projected to be in the range of 140000 to 150000 or greater by the design year; and also
- Proposed to be in proximity to populated areas.

Projects falling into this category should be more rigorously assessed for impacts. If a project falls within this category, the Department's Environmental Services Section Chief within Central Office's Bureau of Technical Services should be contacted. The Environmental Services Section Chief will initiate discussions with the FHWA division office, the Office of Natural Environment (HEPN) and the Office of Project Development and Environmental Review (HEPE) in FHWA Headquarters for assistance in developing a specific approach for assessing impacts. This approach would include a quantitative analysis to forecast local specific emission trends of the priority MSAT for each alternative to use as a basis for comparison. This analysis may also address the potential for cumulative impacts, where appropriate, based on local conditions. How and when cumulative impacts should be considered would be addressed as part of the assistance noted above. Contact the Environmental Services Section Chief for consultation on projects that do not fall into this category but have the potential to substantially increase MSAT emissions.

The NEPA document should also include relevant language regarding unavailable information as described in Appendix C of FHWA's interim guidance:
https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm

FDM 22-15-3 Mitigation Strategies

August 15, 2019

If the analysis for a Tier 3 project indicates meaningful differences in levels of MSAT emissions among alternatives, mitigation options should be identified and considered.

For mitigation strategies information see Appendix E of FHWA's interim guidance:
https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/index.cfm

FDM 22-20-1 Introduction

August 15, 2019

Heavy duty construction equipment is typically powered by diesel engines which emit NO_2 and $PM_{2.5}$. WisDOT is interested in minimizing short term air quality impacts from construction activities when possible to ensure that construction emissions do not contribute to violations of NO_2 and $PM_{2.5}$ air quality standards.
In this section WisDOT is providing a list of voluntary measures that project sponsors can consider to mitigate and control exhaust emissions on a project specific basis. It is important to collect data from participating sponsors to document the potential emissions reductions.

General categories of mitigation and control measures that could be considered include:

- Retrofitting, replacing vehicles/engines, rebuilding or repairing engines to a more recent standard with proper maintenance, and using cleaner fuels;
- Reducing idling;
- Controlling fugitive dust

FDM 22-20-2 Vehicle/Equipment Considerations

August 15, 2019

Diesel retrofit devices for after-treatment pollution control can be installed on new or existing vehicles and equipment to reduce particulate matter (PM), nitrogen oxides (NOx), hydrocarbons (HC), or carbon monoxide (CO) as well as other air pollutants. Retrofit devices can be installed on diesel truck fleets, and off-road construction equipment when applicable to lower emissions cost effectively.

- Diesel Particulate Filters (DPFs) are exhaust after-treatment devices that significantly reduce emissions from diesel-fueled vehicles and equipment. DPFs typically use a porous ceramic or cordierite substrate or metallic filter to physically trap particulate matter (PM) and remove it from the exhaust stream.
- Diesel Oxidation Catalysts (DOCs) are exhaust after-treatment devices that reduce emission from diesel engines. Typically packaged with the engine muffler, DOCs are widely used as a retrofit technology because they require little or no maintenance.

Replacing an entire vehicle or equipment may be the best option to reduce emissions and fuel consumption for equipment that is nearing the end of its useful life or was manufactured before stringent emissions standards were put in place. This can be done in several ways.

- Replacing older diesel equipment with newer diesel equipment: Replacing vehicles or equipment with uncontrolled engines, such as pre-1984 trucks or pre-1996 non-road equipment, with a new vehicle or equipment provides benefits in fuel efficiency, reliability, warranty, and maintenance costs.
- Replacing non-road equipment with certified on-highway equipment: On-highway equipment is cleaner than non-road equipment in comparable model years. Specifying on-highway engines in yard trucks and non-road equipment provides fuel savings and additional safety features while reducing emissions.
- Replacing diesel equipment with electric, hybrid or alternative fuel equipment (liquefied natural gas-LNG, compressed natural gas-CNG, liquefied petroleum gas-LPG or propane): Diesel equipment may be replaced with other technologies or fuels. Examples include hybrid switcher locomotives, electric cranes, LNG, CNG, LPG or propane yard tractors, forklifts or loaders. Replacements using natural gas may require changes to fueling infrastructure.

Repowering, the replacing of older engines with newer / cleaner engines, may be a cost-effective emissions reduction strategy when a vehicle or machine has a long useful life and the cost of the engine does not approach the cost of the entire vehicle or machine. Examples of good potential replacement candidates include marine vessels, locomotives, and large construction machines. Repowering could also include engines powered by alternatives fuels:

- Compressed natural gas (CNG)
- Liquefied natural gas (LNG)
- Biodiesel
- Electricity

Diesel engines sometimes can be rebuilt and continue to operate in the same capacity. An engine in need of rebuild may have low power, increased emissions and increased fuel consumption. Engine manufacturers often can supply rebuild kits as well as fully rebuilt engines.

- Engines can sometimes be rebuilt to comply with cleaner emission standards. An engine upgrade kit may contain replacement components that will improve the overall emission performance of the engine and in some cases, may also improve fuel economy.
- A recently rebuilt engine in proper operating condition is a good candidate for retrofit with an appropriately verified technology. An engine with low compression or high crankcase flow-by flow rate is not a good candidate for retrofit.

Both EPA and the Wisconsin Department of Natural Resources have recently had financial assistance programs (grants) to assist with the cost of retrofits or repowers

See EPA's National Clean Diesel Campaign website (http://www.epa.gov/cleandiesel/). It includes information about retrofitting vehicles, including lists of EPA-verified retrofit technologies and certified technologies; and clean fuels:

Reduced idling programs:

- Voluntary time limits or restrictions on vehicle idling for diesel powered vehicles may be relevant for projects where substantial numbers of diesel vehicles are congregating for extended periods of time.

FDM 22-20-3 Other Considerations, e.g. Dust Control Strategies

August 15, 2019

Substantial atmospheric dust arises from the mechanical disturbance of granular material exposed to the air. Dust generated from these open sources is termed "fugitive" because it is not discharged to the atmosphere in a confined flow stream, i.e. it is not emitted from a stack or vent. Fugitive dust is particulate matter which becomes airborne and has the potential to adversely affect human health and/or the environment. Common sources of fugitive dust include unpaved roads, mining, agricultural tilling operations, aggregate storage piles, and heavy construction operations.
(Wisconsin DNR Chapter 415.04: http://docs.legis.wisconsin.gov/code/admin_code/nr/400/415.pdf)

For the above sources of fugitive dust, the dust-generation process is caused by 2 basic physical phenomena:

- Pulverization and abrasion of surface materials by application of mechanical force through implements (wheels, blades, etc.).
- Entrainment of dust particles by the action of turbulent air currents, such as wind erosion of an exposed surface by wind speeds over 19 kilometers per hour (km/hr) (12 miles per hour [mph]).

Potential Fugitive dust control programs:

- A project sponsor could commit to cover any open trucks used in construction of the project.
- A project sponsor could employ or obtain a commitment from another local agency to implement a street cleaning program. There is a variety of equipment available for this purpose and such programs could include vacuuming or flushing techniques. There have been circumstances where municipalities have implemented street sweeping programs for air quality purposes.
- A site-watering program, which may be relevant during the construction phase of a project, is another option to reduce dust.
- Use of dust suppressing chemicals will tend to make project created dust less widespread and severe. Information regarding the use of chemicals such as magnesium chloride and calcium chloride can be found in the 2015 Standard Specifications (Spec) Section 623 Dust Control Surface Treatment: https://trust.dot.state.wi.us/static/standards/stndspec/ss-06-23.pdf .
- Additional fugitive dust information can be found in Wisconsin DNR Chapter NR 415: Control of Particle Emissions, 415.04 Fugitive Dust.

FDM 22-25-1 Documentation of Air Quality Impacts in WisDOT Environmental Documents

August 15, 2019

Documentation of air quality analyses in a project's NEPA or WEPA document discloses the project's potential air quality impacts. In non-attainment and maintenance areas, documentation of analyses must also demonstrate compliance with the conformity requirements of the Clean Air Act. The level of detail of the documentation is dependent upon several factors, including but not limited to:

a) The nature of the project (e.g., whether the project is a non-exempt project)

b) The type of document being prepared

c) The analyses needed to satisfy conformity requirements.

This section is written assuming non-attainment and maintenance areas are within Metropolitan Planning Organization (MPO) boundaries, within MPO boundaries the MPO and FHWA would be responsible for making Air Quality conformity determinations and demonstrating conformity through the Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP). If a project is outside a MPO boundary, WisDOT is the lead transportation agency and assumes MPO transportation planning responsibilities, a project level conformity analysis may be required.

The AASHTO Practitioner's Handbook: Addressing Air Quality Issues in the NEPA Process for Highway Projects published in June 2017 provides practical tips on documenting and presenting air quality analyses in a NEPA document. The Handbook can be found at: http://environment.transportation.org/pdf/programs/ph18-1-ol.pdf. Page 10 of the Handbook identifies key air quality issues to be considered in a NEPA document.

FDM 22-25-2 WisDOT Environmental Document Types and Requirements

August 15, 2019

This section describes how to document air quality analysis in each environmental document type. In addition to the information in this section, if the project may require an air quality analysis discuss with the Region Environmental Coordinator (REC) and Bureau of Technical Services (BTS) Environmental Process and Document Section (EPDS) Liaison and BTS Environmental Services Section (ESS) Air Quality Specialist.

FDM 22-25-3 Documentation for Projects in Attainment Areas

August 15, 2019

For projects in attainment areas, the air quality analysis is limited to a MSAT analysis as appropriate, i.e., only if certain threshold criterial are met. Refer to FDM 22-15 for guidance on how to consider MSAT impacts in NEPA documents.

FDM 22-25-4 Documentation for Projects in Nonattainment Areas

August 15, 2019

In non-attainment and maintenance areas, the air quality analyses are not limited to MSATs. The analyses must be broadened to include consideration of ozone and particulate matter, the two criteria pollutants of concern to Wisconsin.

4.1 Environmental Impact Statement (EIS)

The air quality discussion is included in Section 3, Existing Conditions, Environmental Impacts and Measures to Mitigate Adverse Impacts of the EIS. This discussion should begin with an overview of the Clean Air Act of 1970. Areas designated nonattainment and maintenance for ozone and particulate matter PM2.5 in the project area must be identified.

For projects located within an MPO boundary, evidence of project conformity with the approved regional transportation plan (RTP) and transportation improvement program (TIP) in areas designated non-attainment and maintenance for ozone and PM2.5 must be demonstrated for each alternative. For a new, non-exempt project that is not included in a currently conforming RTP and TIP (or a project approved in the NEPA process that was included but has changed in design concept and scope) it will be necessary for the respective Metropolitan Planning Organization (MPO) to amend the RTP and TIP to include the project. To meet Clean Air Act transportation conformity requirements, the MPO and FHWA must make a new conformity determination on the amended RTP and TIP.

For projects located in a rural nonattainment area, WisDOT is responsible for any conformity analysis. Contact

the REC and EPDS liaison for assistance.

Potential for carbon monoxide and PM2.5 hot-spot impacts must be evaluated as appropriate. Potential for mobile source air toxics (MSATs) must also be analyzed as appropriate. Mitigation of adverse impacts to air quality agreed upon during the inter-agency air quality consultation process should be identified. The discussion of potential construction-related air quality impact mitigation should be included as part of the Construction resource category.

4.1.1 Exempt project in a non-attainment or maintenance area

If the proposed project is in a non-attainment or maintenance area and is exempt under the Clean Air Act (CAA) Conformity Rule at 40 CFR 93.126 and 40 CFR 93.128, no analysis for ozone (or PM) is required. The following standard language should be used in the EIS:

As the lead Federal agency for air quality, the United States Environmental Protection Agency (USEPA) has established National Ambient Air Quality Standards (NAAQS) for six common air pollutants: carbon monoxide (CO), lead (Pb), ozone (O3), nitrogen dioxide (NO2), sulfur dioxide (SO2), and particulate matter (PM). These standards have been adopted by the Wisconsin Department of Natural Resources (WDNR), the lead air quality agency for the State of Wisconsin. Mobile sources are significant contributors to four of the six criteria pollutants: CO, O3, PM, and NO2. Of particular concern to Wisconsin are ozone (O3) and particulate matter (PM2.5).

The proposed (project name) transportation project is to (insert major deficiency that the project is meant to address) by constructing (insert major elements of the project). The project is located within (county name) County which is in non-attainment of the NAAQS for (name pollutant or pollutants). However, under 40 CFR 93.126 and 40 CFR 93.148 this project is exempt from the requirement to determine conformity.

In addition, this project has not been linked with any specific mobile source air toxic (MSAT) concerns. As such, this project will not result in changes in traffic volumes, vehicle mix, basic project location, or any other factor that would cause a meaningful increase in MSAT impacts of the project from that of the no-build alternative.

Moreover, EPA regulations for vehicle engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades. Based on regulations now in effect, an analysis of national trends with EPA's MOVES2014a model forecasts a combined reduction of over 90 percent in the total annual emission rate for the priority MSATs from 2010 to 2050 while vehicle-miles of travel are projected to increase by over 45 percent (Updated Interim Guidance on Mobile Source Air Toxic in NEPA Documents, Federal Highway Administration, October 18, 2016). This will both reduce the background level of MSAT as well as the possibility of even minor MSAT emissions from the project.

The standard language above has been modified the be Wisconsin specific from the original version which is included in Appendix A of the FHWA Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents.

4.1.2 Non-exempt project in a non-attainment or maintenance area

If the proposed project is within the boundaries of a MPO non-attainment or maintenance area and not exempt under the Clean Air Act (CAA) Conformity Rule at 40 CFR 93.126, the proposed project must be included in the MPO's conforming, fiscally constrained long-range transportation plan and TIP. Additionally, if the proposed project is within a PM2.5 nonattainment or maintenance area interagency consultation will need to be conducted to determine whether a hot spot analysis is required. Contact your REC and the BTS Air quality specialist for assistance.

If the proposed project is not within MPO boundaries contact your REC and the BTS Air quality specialist to begin interagency consultation and to determine whether the project is regionally significant and if a project level analysis is required.

If the proposed project is in a non-attainment or maintenance area and not exempt under the Clean Air Act (CAA) Conformity Rule at 40 CFR 93.126 and has Higher Potential for MSAT Effects a more rigorous assessment of impacts may be required.

Projects that fall into this category should:

- Create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel particulate matter in a single location, involving a significant number of diesel vehicles for new projects or accommodating with a significant increase in the number of diesel vehicles for expansion projects; or
- Create new capacity or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the AADT is projected to be in the range of 140,000 to 150,000 or greater by the design year;

- Be proposed to be in proximity to populated areas.

FHWA determined 140,000 – 150,000 AADT would result in emissions significantly lower than the Clean Air Act definition of a major hazardous air pollutant (HAP) source, i.e., 25 tons/yr. for all HAPs or 10 tons/yr. for any single HAP. Variations in conditions such as congestion or vehicle mix could warrant a different range for AADT; if this range does not seem appropriate for your project, contact your REC and BTS-EPDS or BTS-ESS.

If you think your project may fall into this category, contact your REC. Your REC will contact the appropriate BTS-EPDS and BTS-ESS Air Quality Specialist. You may also review FHWA's Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents.

4.2 Categorical Exclusion Checklist (CEC)

Section IX Air Quality of the CEC guides the document preparer through regional and project level conformity requirements. If the document preparer has questions on Section IX of the CEC discuss questions with your REC. If necessary, your REC will contact the appropriate BTS-EPDS Liaison or BTS-ESS Air Quality Specialist.

4.3 Programmatic Categorical Exclusion Checklist (PCE)

Section 3.7, Air Quality, of the PCE guides the document preparer through regional and project level conformity requirements and how to appropriately document in the PCE. This portion also includes document eligibility requirements. If the document preparer has questions on Section 3.7 of the PCE discuss questions with your REC. If necessary, your REC will contact the appropriate BTS-EPDS Liaison or BTS-ESS Air Quality Specialist.

4.4 Environmental Report (ER)

WisDOT ERs are prepared using the Environmental Report (ER) and Environmental Assessment (EA) Template and Factor Sheets. Guidance documents are available for the ER and EA Template and each Factor Sheet.

https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/environment/formsandtools.aspx

Every ER for a proposed project in a non-attainment or maintenance area for Ozone or PM2.5 is required to include the Air Quality Factor Sheet.

The Air Quality Factor Sheet and guidance language is intended to be self-explanatory. Guidance includes links and references to resources that will assist the document preparer complete the factor sheet appropriately for each project. If the document preparer has questions on the Air Quality Factor Sheet discuss with your REC. If necessary, your REC will contact the appropriate BTS-EPDS Liaison or BTS-ESS Air Quality Specialist.

4.5 Environmental Assessment (EA)

WisDOT EAs are prepared using the ER and EA Template and Factor Sheets. Guidance documents are available for the ER and EA Template and each Factor Sheet.

https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/environment/formsandtools.aspx

Every EA must include the Air Quality Factor Sheet.

The Air Quality Factor Sheet and guidance language is intended to be self-explanatory. Guidance includes links and references to resources that will assist the document preparer complete the factor sheet appropriately for each project. If the document preparer has questions on the Air Quality Factor Sheet discuss with your REC. If necessary, your REC will contact the appropriate BTS-EPDS Liaison or BTS-ESS Air Quality Specialist.