Area Source Baseline Inventory

Updated 4/10/18

Area Source Baseline Inventory

This section of the Technical Support Documentation (TSD) gives information describing how the Area Baseline and Projection Inventories are developed. Note that this TSD may refer to projections and other elements that are not applicable to the currently submitted inventory and may be disregarded.

The **base year inventory** is the primary inventory from which other inventories are derived. Thus, all inventories are consistent with data provided in the base year inventory. The Clean Air Act requires State agencies to ensure that the base year inventory is comprehensive, accurate, and current for all actual emissions. The inventory includes emissions estimates from stationary point and area sources, onroad mobile sources, and nonroad mobile sources.

Every 3 years, State agencies are required to develop periodic inventories called the **3-year cycle inventories** based on actual emissions. State and local agencies have the option to report smaller point sources every three years. This option is not available for reporting emissions for a designated base year inventory.

The year 2014 was selected as the base year for this SIP. The 2014 base year harmonizes dates for the reporting requirements of the National Emissions Inventory that requires agencies to submit emission inventories for all criteria pollutants and their precursors every 3 years, on a schedule that includes the emission year 2014.

The **projection year inventories** project future air pollution emissions. The goal in developing emission projections is to attempt to account for as many of the important variables that affect future year emissions as possible. Emission projections provide a basis for developing control strategies for this State Implementation Plans (SIPs), conducting attainment analyses, and tracking progress towards meeting air quality standards.

Emission projections are a function of change in activity (growth or decline) combined with changes in the emission rate or controls applicable to the source. To a large extent, projection inventories are based on forecasts of industrial growth, population growth, changes in land use patterns, and transportation growth.

The way the area source categories were projected is explained in Section 3.c.iv.B of the TSD.

PROJECTION INPUT DATA

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ACTIVITY DATA FOR PROJECTIONS

Control strategy projections are estimates of future year emissions that also include the expected impact of modified or additional control regulations. State and local planners should determine if any future scheduled regulations, whether at the Federal, State, or local level, apply to sources in their area. Note that this TSD may refer to projections and other elements that are not applicable to the currently submitted inventory and may be disregarded.

Future year emissions may also be affected by fuel switching, fuel efficiency improvements, improvements in performance due to economic influences, or any occurrence that alters the emission producing process. Programs other than those aimed at reducing the emissions of the criteria pollutants of interest may affect the future year emissions. These may include energy efficiency programs, pollution prevention programs, and greenhouse gas or global warming initiatives. These should all be reflected in the projections through the future year control factor, emission factor, or in some cases, by adjusting the activity growth forecast.

Control factors and emission factors vary by source category and are continuously being revised and improved based on field and laboratory measurements. State and local agencies should maintain close coordination with the appropriate EPA Regional Office to ensure that all factors reflect current EPA guidance. States must also examine the future year control factor or emission factor in relation to the base year value to ensure any existing controls are not double-counted by taking additional credit in the future year. The control factor and emission factor may also be a weighted composite in some cases, such as diesel construction engines versus each individual equipment type within the category.

Technical documents from EPA, including Alternative Control Techniques (ACT) documents and Control Techniques Guidelines (CTG) documents, are collected at the Clean Air Technology Center on EPA's TTN web site: h**ttp://www.epa.gov/ttn/catc/products.html**. ACT documents provide technical information, based on data collected from model plants, for use by State and local agencies to develop and implement regulatory programs to control emissions. The model plants in the ACT documents represent typical emitters; area-specific factors may cause discrepancies and deviations and should be accounted for when comparing ACT document costs to actual performance. CTG documents provide federal guidelines to State and local agencies to assist those areas when formulating a plan to meet federal air quality requirements.

In determining the future year control factor or emission factor, three basic parameters must be quantified: regulation control, rule effectiveness, and rule penetration. Regulation control is the level of reduction expected by assuming a fully complied measure. Rule effectiveness accounts for the level of expected compliance with the

regulation. Rule penetration indicates the fraction of emissions within a source category which are subject to the regulation, accounting for size cutoffs and other exemptions.

Emissions from area sources are nearly always estimated using some type of calculation procedure. Direct measurement of area source emissions is hardly ever practical because of technical and cost considerations.

There are four basic approaches for developing an area source emission estimate:

- _ Extrapolation from a sample set of the sources (surveys, permit files, or other databases);
- _ Material balance method
- _ Mathematical models; and
- _ Emission factors applied to activity levels.

The calculation procedures determine what data is used to estimate the area source emissions. A list of the individual data tables and sources of the data used in the calculation processes is included in the relevant Excel input workbook. This data are used in the calculations to estimate emissions for area sources.

Area sources collectively represent individual sources that have not been inventoried as specific point or mobile sources. These sources are typically too small, numerous, or difficult to inventory using the methods for the other classes of sources. Area sources represent a collection of emission points for a specific geographic area, most commonly at the county level; however, any area can be used to define the boundaries of an area source.

Area sources are both natural and manmade sources of pollution and can encompass such wide ranging activities as consumer solvents, agricultural burning, roadway paving, residential heaters, wildfires, and wind erosion. Area source emissions are typically identified at the county level by its Area Source Classification code (ASC). A complete listing of 10-digit ASCs can be found at: **http://www.epa.gov/ttn/chief/scccodes.html**. EPA's *Compilation of Air Pollutant Emission Factors* (AP-42) contains extensive data on area sources (referred to in the document as "miscellaneous sources"), including types of area sources and pollutants produced by them, and can be found at: **http://www.epa.gov/ttn/chief/ap42.html**. Further information on area sources can be found at the EIIP Area Source Committee site: **http://www.epa.gov/ttn/chief/eiip/eiip_ar.htm**.

3.1 Overview of Projection Methods

Emission projections for area sources depend upon the change in source level activity and changes in the emission factor applicable to the source. For area sources, the most appropriate equation used to project emissions is:

$E_{fy} = E_{by} * G * C$ (Equation 3.1-1)

where E_{fy} = projection year emissions
E_{by} = base year emissions
G = growth factor
C = control factor, accounting for changes in emission factors or controls

The base year activity (fuel use, employment, population) will vary depending on the source category. The growth activity indicator should align with the base year activity indicator as closely as possible. The above equation is only an example of the necessary calculation for emission projections; further complicating factors required for an accurate projection may require the development of a more vigorous equation.

3.1.1 GROWTH FACTOR

As with point sources, area source projections can be made using local studies or surveys or through surrogate growth indicators, to approximate the rise and fall in expected activity. The most commonly used surrogate growth indicators are those parameters typically projected by local metropolitan planning organizations (MPOs) such as population, housing, land use, and employment.

Area sources rarely have detailed information based on surveys of individual emitters. Generally surrogate growth rates, as characterized by source type, must be used. While surrogate growth indicators such as employment and population are reasonable estimators of future air pollution generating activity for traditional area source emitters (manufacturing, population-based activities), other indicators may be more appropriate for non-traditional emitters. Policy changes which may lead to increased or decreased activity in a category must also be considered. For example, future emissions from agricultural tilling will be affected by trends towards conservation tillage as well as total acres tilled. Projections of total acres tilled may not trend with agricultural earnings as operations due to changes in crop yields. The amount of prescribed burning which takes place each year is driven by the policy of Federal and State forest and land management agencies. For these nontraditional area source emitters, Federal, State, and local trade associations and agencies should be consulted to identify the best indicators of future activity.
Specific growth indicators for projecting emissions for various area source categories can be found in the included area source Excel input and calculation workbooks.

3.1.2 CONTROL FACTORS

The projection year control factor for area sources should account for both changes in emissions due to new levels of control required by regulations and process modifications or technology improvements. Emitters in the manufacturing sector, such as industrial, commercial, and institutional fuel combustion, may be assigned a traditional control measure to limit emissions. However, for many area sources, conventional control methods are often inapplicable; instead, control of area source emissions may involve process modifications such as limiting agricultural burning practices, paving with emulsified asphalt or concrete, or stabilization of dirt roads. The control factors should also account for market-driven process changes, such as the move toward lower-solvent

or water-based paints (this can be both market and regulatory-driven) and conservation tillage.

Technical documents from EPA, including Alternative Control Techniques (ACT) documents and Control Techniques Guidelines (CTG) documents, are collected at the Clean Air Technology Center on EPA's TTN web site: **http://www.epa.gov/ttn/catc/products.html**.

ACT documents provide technical information, based on data collected from model sites, for use by State and local agencies to develop and implement regulatory programs to control emissions. The model sites in the ACT documents represent typical emitters; area-specific factors may cause discrepancies and deviations and should be accounted for when comparing ACT document costs to actual performance. CTG documents provide federal guidelines to State and local agencies to assist those areas in planning and meeting federal air quality requirements.

Area source projections should account for Federal, State, and local regulations. For federally mandated controls, the EPA documents and the models referenced in the following sections will be the best available resources for determining the appropriate emission factor to apply in projected inventories. The latest regulatory actions from the Office of Air and Radiation (OAR) can be found at: **http://www.epa.gov/ttn/oarpg/new.html**. OAR also provides a page devoted to policy, guidance, and regulations, sorted by the Title of the Clean Air Act Amendments (CAAA) to which they apply: **http://www.epa.gov/ttn/oarpg/amend.html**.

3.1.3 OTHER CONSIDERATIONS

Spatial issues may also impact area source projections. Urban sprawl may result in decreases in area source emissions related to farming, such as agricultural tillage and managed burning. Conversely, urban sprawl may then result in increases in other area source emissions associated with residential areas, such as dry cleaning and consumer solvent use.

3.1.4 AVAILABLE MODELS AND RESOURCES

Table 3.1-2 delineates available resources and models related to area source emission projections.

3.2 ALTERNATIVE METHODS

Area sources are normally calculated using a variety of estimation procedures that include related, but cumbersome, estimation tools to derive either a "top-down" estimate or a county-level "bottom-up" emissions inventory for area sources.

3.3 REFERENCES

ERG, 1996: Eastern Research Group, Inc., *Introduction to Area Source Emission InventoryDevelopment*, Eastern Research Group, Inc., Prepared for: Area Sources Committee, Emission Inventory Improvement Program, August 1996.

EPA, 1991b: U.S. Environmental Protection Agency, *Procedures for Preparing Emissions Projections*, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, July 1991.

EPA, 1993: U.S. Environmental Protection Agency, *Guidance for Growth Factors, Projections, and Control Strategies for the 15 Percent Rate-of-Progress Plans*, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, March, 1993.
EPA, 1995: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors: Fifth Edition*, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, January 1995. 3-5

Pechan-Avanti, 1997: The Pechan-Avanti Group, *The Emission Reduction and Cost Analysis Model for NOx (ERCAM-NOx)*, E.H. Pechan & Associates, Inc, prepared for the U.S. Environmental Protection Agency, Ozone Policy and Strategies Group, September 1997.

TABLE 3.1-2
AVAILABLE MODELS AND RESOURCES

Resource Where To Go	**Brief Description**
National Air Pollutant Emission Trends Report (Trends) **https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data**	Report contains a general approach for developing projections estimates for national criteria pollutants.
Multiple Projections System (MPS) **http://www.epa.gov/ttn/chief/ei_data.html#PS**	Stand-alone computer program designed to facilitate the projection of future emissions of ozone precursors, specifically carbon monoxide (CO), volatile organic compounds (VOCs), and oxides of nitrogen (NOx).
California Emission Forecasting System (CEFS) **http://www.arb.ca.gov/emisinv/pubs/pubs.htm**	Computer analysis program capable of predicting future emission levels in the State of California.

Baseline Year

2014

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This section provides information on how the baseline inventory was calculated. Refer to the included Excel calculation and input workbooks to view the estimation methods, calculations, equations, references, and activity data used for each category.

The summaries were extracted from workbooks that were developed to calculate emissions for the baseline year using the appropriate data tables. The calculation workbook calculates annual emissions for various categories using the data tables found in the input workbook. The spreadsheets within the calculation workbook contain assumptions, emission factors, and estimates of pollutants by area category. The calculations are made within the spreadsheets with links to the input workbook data tables.

SUMMARY TABLES

SUMMARY TABLES

The baseline (2014) calculation workbook is included in this submission along with two other workbooks and source files: an input workbook with activity data used in the calculation workbook, sources files (appendices) for the activity data, and a model data workbook with outputs for use in SMOKE (note: oil and gas emission calculation files are not included as no oil and gas sources occur in the area of interest). Included in the calculation workbook, are the annual emissions that were input into SMOKE for the various area source categories. They do not include the effectiveness of any of the control strategies applied as a result of the SIP. SMOKE also adjusts the calculation workbook emissions from tons per year by county to the episode timeframe of interest as well as boundary/area of interest. An explanation of how the various area source categories were calculated is found in the "Area Source Categories" section of the TSD.

Emissions [tons/year]	Region	Sector	CO	NH3	NOx	PM10	PM2_5	SO2	VOC
2014	Utah County	Area Sources	6247.2	6956.3	1473.8	12962.5	1821.3	16.1	23591.0

AREA SOURCE CATEGORIES

Individual reports for the area source categories are found in the category spreadsheets for the baseline year are included in the Excel calculation workbook. These spreadsheets calculate the emissions and contain a list of assumptions, emission factors, equations and references for the specific categories and are included in this submission

Some categories that are included in the workbook were not used in the SMOKE process because emissions from these categories do not occur in the county and/or during the time period of interest. The categories not included in are indicated by their absence in the SMOKE output.