Preliminary Draft
Fairbanks Serious Area SIP 24-hour $PM_{2.5}$
Technical Analysis Protocol

(last update March 22, 2018)

1. Introduction

In 2006, the U.S. Environmental Protection Agency (EPA) adopted changes to the fine particulate ($PM_{2.5}$) NAAQS, which lowered the primary and secondary 24-hour standards from 65 μg/m^3 to 35 μg/m^3 (calculated as the three-year average of annual 98th percentile values). In 2009, the Fairbanks North Star Borough (FNSB) was designated as nonattainment[1] for the 2006 24-hour $PM_{2.5}$ standard, triggering a requirement for the submittal of a State Implementation Plan (SIP) with an attainment deadline of December 31, 2015. On January 29, 2015, the Alaska Department of Environmental Conservation (ADEC) submitted a Moderate nonattainment area SIP,[2] finding attainment to be impracticable by the end of 2015. EPA deemed the Moderate area SIP to be complete on February 18, 2015 and issued a final approval of the Moderate area SIP effective October 10, 2017.

EPA reclassified the entire FNSB nonattainment area to Serious effective June 9, 2017[3]. The rule cited 3-year average, 24-hour $PM_{2.5}$ 98th percentile concentrations of 124 μg/m^3 at the North Pole Fire Station (NPFS) monitor well in excess of the 35 μg/m^3 standard[4]. This reclassification triggers a requirement for the submittal of a Serious area attainment plan to EPA 18 months[5] after the effective date or December 9, 2018. New technical analyses beyond those included in the Moderate area SIP will be required for the Serious area Plan.

While the reclassification was triggered by exceedances at the NPFS monitor attainment can only be achieved when the design values at all compliance monitors in the nonattainment area is below the standard. For 2015 the design values calculated at the other two compliance monitor locations, State Office Building (SOB) and National Core

[1] See 74 FR 58690.

[2] State Air Quality Control, ADEC, December 2014.

[3] Determinations of Attainment by the Attainment Date, Determinations of Failure To Attain by the Attainment Date and Reclassification for Certain Nonattainment Areas for the 2006 24-Hour Fine Particulate Matter National Ambient Air Quality Standards; [EPA–HQ–OAR–2016–0515; FRL–9962–25–OAR]

[4] *Technical Support Document Regarding PM 2.5 Monitoring Data – Determinations of Attainment by the Attainment Date, Determinations of Failure to Attain by the Attainment Date and Reclassification for Certain Nonattainment Areas for the 2006 24-Hour Fine Particulate Matter National Ambient Air Quality Standards*, 19, April 2017, Air and Radiation Docket EPA-HQ-OAR-2016-0515

[5] The PM2.5 Implementation rule includes conflicting language on the due date.

Network (NCore), were 35 and 35 $\mu g/m^3$ respectively[6]. In 2016 the design values for all monitors were calculated as 37 $\mu g/m^3$ for SOB, 34 $\mu g/m^3$ for NCORE, and 106 $\mu g/m^3$ for NPFS. A fourth monitor site at the North Pole Elementary School (NPE) was discontinued in 2014. This site will be included in the Serious SIP's attainment plan, but it will not be a factor in the basis for redesignation of the area to attainment. The NPE site was found to have a design value of 45 $\mu g/m^3$ for 2014.

The Serious SIP Technical Analysis Protocol (TAP) builds on the technical work developed in the Moderate SIP. This document lays out the technical approach for elements of the Serious SIP. These areas include the analysis of ambient air quality data, emission inventory development, air quality modeling protocol, control measure analysis, attainment demonstration modeling, precursor demonstrations, and other supporting analyses.

One practical consideration that may impact the Serious SIP is DEC's letter to EPA dated November 20, 2015 requesting a separation of the nonattainment area. From a technical standpoint the technical analysis is expected to be minimally impacted by a possible separation into two nonattainment areas. The development of control strategies and documentation would require additional effort to cover two different nonattainment areas. Regardless of whether the area is designated as a single nonattainment area or as two separate nonattainment areas, the end technical goal remains the same. The technical analysis will result in a modelled attainment test at SOB, NCore, NPE, and NPFS monitors, which can be pursued through a single unified air quality modeling framework.

2. Schedule

The goal is to complete all technical elements and incorporate them into a draft SIP by the end of July 2018. Some additional technical elements may be revisited after that date, based on public comments. Work has commenced on the baseline inventory, modeling, speciation data analysis, and Best Available Control Technology/Best Available Control Measure (BACT/BACM). Outstanding issues include the full implementation of BACT/BACM, development of projected inventories, projected modeling, and final precursor analysis.

Highlights of the schedule were the completion of the preliminary baseline air quality modeling in early 2018, projected year modeling in Q1 2018 and control scenario modeling in Q2 2018. The protracted control scenario modeling has been assumed, based on past experience with the shifting nature of control modeling assumptions.

Detailed schedule summary table
<<< To be completed >>>

[6] These values were calculated for the Federal Reference Method (FRM) monitors using a 1 in 3 sampling frequency. State flagged exceptional events were removed though not all flagged days have received EPA concurrence.

3. Technical Overview

3.1. Summary

The Fairbanks $PM_{2.5}$ Serious area SIP will require new analysis beyond the work that was completed for the Moderate area SIP. Broadly speaking, the attainment test is being updated to reflect new base year conditions centered on 2013, assumptions informing projections through 2019 will be revised, and the speciated modeled attainment test (SMAT) will be expanded to include additional monitors at NCore, NPE, and NPFS. Additionally the monitoring data used in SMAT will be revised to use data gathered between 2011 and 2015. Revisions to the emissions inventory account for changes in home heating fuel costs and infrastructure in the base year and projection year. There is still uncertainty regarding the forecasts on natural gas availability that will be challenging to incorporate into any emissions projection. Guidance from EPA Region 10 has been sought in refining the technical analysis protocol especially elements regarding precursor demonstrations. The development of key components of the analysis for the Serious area SIP are described in brief below.

3.2. Air Quality Data

The SIP will summarize the current trends and speciation of $PM_{2.5}$ in Fairbanks at the SOB, NCore, NPE, and NPFS sites. These data inform the process of reclassification from Moderate to Serious nonattainment status, and are critical for the Speciated Model Attainment Test (SMAT).

3.3. Modeling Episodes

Two representative model episodes were selected as part of the Moderate area SIP process: January 23 – February 10, 2008; and November 2 – November 17 ,2008. These same two episodes will be maintained in the Serious area SIP attainment analysis. They still adequately represent meteorological conditions under which exceedances occur.

3.4. Model Domain

The air quality modeling domain was established as part of the meteorological modeling efforts for the Moderate area SIP. A horizontal 202x202 grid comprised of cells with an area of 1.33 km x 1.33 km and 38 layers was nested within two larger modeling domains for the purposes of simulating the severe winter episodes in the WRF model. For efficiency, the air quality domain may be slightly trimmed around the edges as long as it does not affect the integrity of the modeling.

3.5. Meteorological Modeling

Existing meteorological modeling outputs from the Moderate area SIP will be carried over into the modeling for the Serious area SIP. These fields were modeled at the time of the Moderate area SIP with a state-of-the-science configuration of the Weather Research Forecasting (WRF) model, with enhancements to capture the extreme stagnation present in the first modeling episode. Alaska DEC will examine the WRF modeling to assess whether it remains state-of-the-science for this modeling application. The Serious area SIP will justify the WRF modeling uses.

3.6. Emissions Inventory Development

Revisions to every source sector of the inventory will be required to adapt the inventories to the new base year of 2013 and to project emissions in 2019. Some further updates will be made in the event that new models are required (e.g. MOVES2014a and AEDT-2b), or where improved data are available (home heating surveys and new travel model outputs). Point source emissions will be revised to reflect actual emissions in 2013 and expected emissions in 2019.

3.7. Control Measures

The process for assessing Best Available Control Measures (BACM) for Fairbanks will be developed based upon successful examples, the Final $PM_{2.5}$ Implementation Rule, and discussion with EPA Region 10.

3.8. Modeling Protocol

Attainment modeling will follow the guidance established for SMAT in EPA's $PM_{2.5}$ modeling guidance. This will follow the same workflow used in the Moderate area SIP, with the addition of the NCORE, NPFS, and NPE sites as the monitors used for the attainment calculation. Supporting analyses that use air quality modeling will be developed to adhere to the modeling protocol.

3.9. Supporting Analyses

Additional analyses will be proposed and discussed with Region 10 throughout the development of the SIP. These technical analyses include the optional Precursor Demonstrations, model performance tests, model sensitivity tests, source apportionment, Unmonitored Area Analysis, and any other analysis that may support the findings of the SIP.

4. Air Quality Monitoring Data

4.1. Monitoring Network

The ambient air quality monitoring described in the Fairbanks Moderate Area SIP covers the monitors relevant for demonstrating attainment (those labeled as NAAQS comparable) for the Serious area SIP. Other relevant sites within the monitoring network in addition to the NAAQS comparable sites will be described in the final Serious area

SIP. Site names, installation dates, and designations are shown in Table 4.1-1. The types of monitors present are indicated by the Designation column. Detailed information on the sites is documented in Alaska's Air Monitoring Network Plan.[7] The geographic location of the monitors are shown in Figure 4.1-1

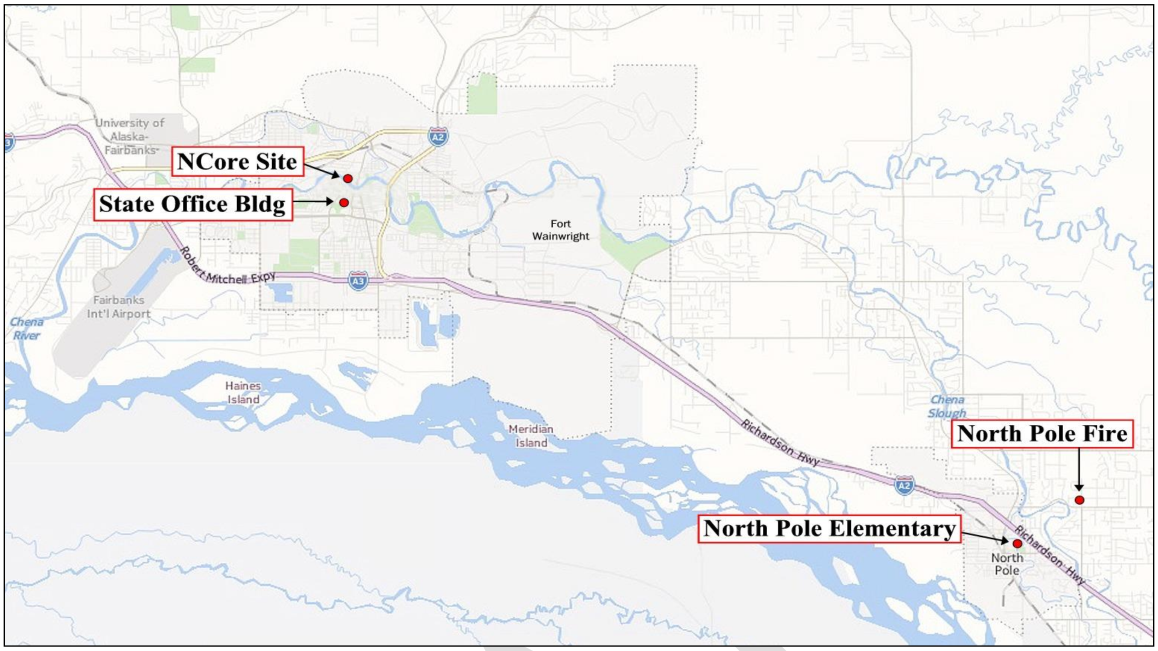
Table 4.1-1[8]
SLAMS[a] and SPM[b] Sites for $PM_{2.5}$ in FNSB

Site Name	Location	AQS-ID	Designation	Regulatory	Install Date	Scale
State Office Building	Fairbanks	02-090-0010	SLAMS/ STN[c]	NAAQS Comparable	Oct 1998	neighborhood
North Pole Elementary	North Pole	02-090-0033	SPM	N/A	Nov 2008	neighborhood
NCore	Fairbanks	02-090-0034	SPM	NAAQS Comparable	Oct 2009	neighborhood
North Pole Fire Station	North Pole	02-090-0035	SLAMS	NAAQS Comparable	Mar 2012	neighborhood

Notes:
[a] State and Local Air Monitoring Site (SLAMS)
[b] Speciation Trend Network (STN) site
[c] Special Purpose Monitoring (SPM) site

[7] "Alaska 2013 Air Monitoring Network Plan, Chapter 3, Fairbanks North Star Borough," Air Quality Division, Alaska Department of Environmental Conservation, available at: *https://dec.alaska.gov/air/am/AK-Monitoring-plans-docs/2013-Network-Review/2013-monitoring-plan-ch-3-fairbanks-final.pdf*
[8] State Air Quality Control Plan Section 5.4 Ambient Air Quality Data and Trends, ADEC, December 2014.

Figure 4.1-1
Location of Fixed Site $PM_{2.5}$ Monitors

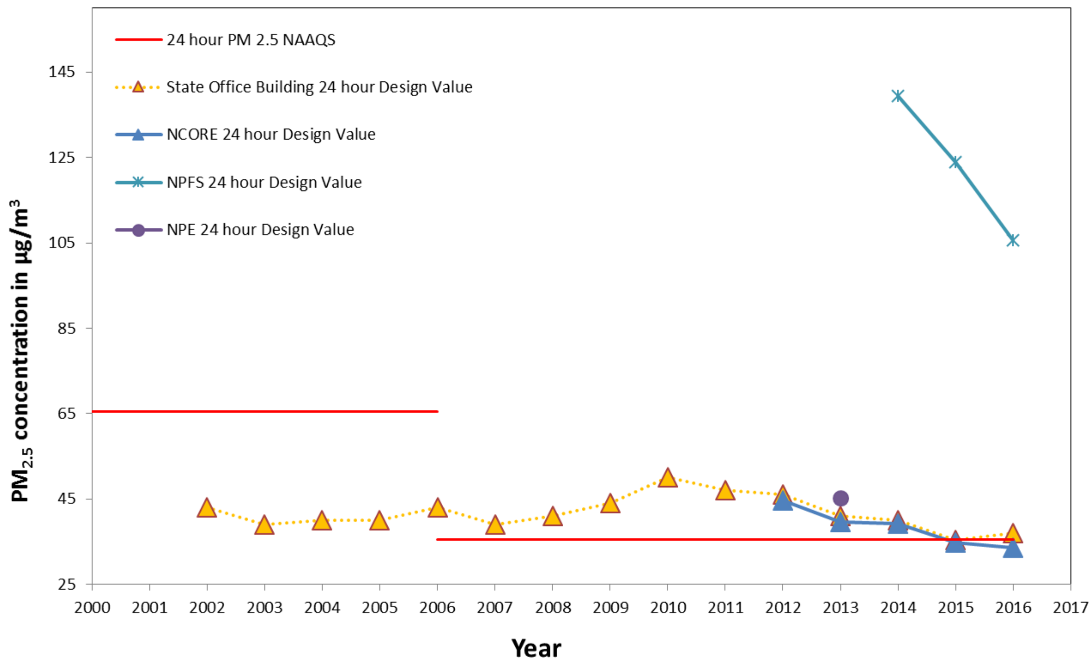


Source: State Air Quality Control Plan Section 5.4 Ambient Air Quality Data and Trends, ADEC, December 2014.

4.2. Ambient Air Quality Analysis

Air quality data covering the years 2011, 2012, 2013, 2014, and 2015 has been incorporated into the technical analysis for the Serious area SIP. The three year 24-hour $PM_{2.5}$ design values for all FRM monitors in the Fairbanks nonattainment area are shown in Figure 4.2-1 below. The $PM_{2.5}$ 24-hour NAAQS is shown at 65 µg/m^3 prior to 2006 and at the newer standard of 35 µg/m^3 for years 2006 and later.

Figure 4.2-1
Long-Term 98th percentile $PM_{2.5}$ Concentrations



The recent ambient air quality data from the active Federal Reference Method (FRM) monitors in the Fairbanks $PM_{2.5}$ nonattainment area are shown in Table 4.2-2. These values reflect the 98th percentile 24-hour averaged concentrations for the years 2011 through 2016 at the SOB, NCORE, NPFS, and NPE monitors. Three-year design values reflect the average of the past three years of 98th percentile concentrations. These values are provided across all monitors for 2013 through 2016 in Table 4.2-2. For 2013 at NPFS and 2014-2016 at NPE a three year design value cannot be calculated as the monitors were not operating for the full span of those three years.

Table 4.2-1 Annual 98th Percentile Concentrations (µg/m³) for 2011-2016						
	98th Percentile Concentrations					
Site	2011	2012	2013	2014	2015	2016
SOB	38.0	49.6	36.3	34.5	35.3	41.5
NCore	33.1	50.0	36.2	31.6	36.7	32.4
NPFS	N/A	158.4	121.6	138.3	111.6	66.8
NPE	20.6	68.1	47.2	N/A	N/A	N/A

Table 4.2-2 Three Year Design Values[9] (µg/m³) for 2013-2016				
	3-yr Design Values			
Site	2013	2014	2015	2016
SOB	41	40	35	37
NCore	40	39	35	34
NPFS	N/A	139	124	106
NPE	45	N/A	N/A	N/A

4.3. Speciation

The speciated $PM_{2.5}$ analysis was revised for the Serious area SIP to reflect data acquired between 2011 and 2015 at both the downtown Fairbanks monitor (i.e., the SOB and NCore) and the North Pole monitors (NPFS and NPE). The SANDWICH processed data for the four monitors is presented in Table 4.3-1. $PM_{2.5}$ is dominated by organic carbon (OC) at all monitors, a clear indication of the dominance of wood burning influencing concentrations throughout the nonattainment area. The concentration share of OC in the North Pole sites is drastically higher than those in Fairbanks suggesting that wood burning may be a stronger influence in North Pole area. Sulfate (SO_4) represents the second highest contributor at the Fairbanks monitor sites and third highest at the North Pole monitors. SO_4 concentrations are the result of distillate oil and coal combustion, and while SO_4 concentrations are much lower than OC it is still a significant contributor to the $PM_{2.5}$ totals. Elemental carbon (EC) is third highest component of $PM_{2.5}$ at the

[9] Design values are presented as rounded to the nearest 1 µg/m³ in accordance with 40 CFR part 50 Appendix N.

Fairbanks monitors and the second highest at the North Pole monitor. Common contributors to EC are diesel exhaust from vehicles and combustion of home heating oil. The remaining compounds each comprise less than 10% of total $PM_{2.5}$ these are in order of significance ammonium (NH_4), nitrate (NO_3), particle bound water (PBW), and other primary particulate (OPP).

Table 4.3-1
Speciation at Fairbanks Nonattainment area Monitors
2011-2015

SITE	OC	EC	SO4	NO3	NH4	OPP	PBW
SOB	54%	11%	17%	5%	7%	1%	5%
NCORE	56%	10%	17%	5%	7%	1%	5%
NPFS	80%	9%	6%	1%	2%	0%	2%
NPE	77%	8%	8%	2%	3%	0%	2%

An independent analysis of this data has been presented by Dr. Bill Simpson and K.C. Nattinger at the University of Alaska at Fairbanks (UAF), and is summarized below in Table 4.3-1. These data have not yet been fully processed through the SANDWICH method used in SMAT and do not include data through the end of 2015. The observed species generally agree with the findings of the SANDWICH processed speciation data though comparisons of potassium (K), OPP, and PBW cannot be made. Both data sets show some differences between the Fairbanks and North Pole portions of the nonattainment area with respect to the magnitude of the OC and SO4 shares of the $PM_{2.5}$ total. An additional point is that in the past five years the speciation at the downtown monitoring site has transitioned from the State Office Building site to the NCore location, but the two sites generally show good agreement.

Table 4.3-1
Preliminary Speciation at SOB and NPFS
Includes Data through 11/2014
(February 2015 Correlation)

PM Species	**SOB**	**NPFS**
OM (OC*1.4)	61.6%	82.9%
EC	7.7%	8.7%
SO4	18.1%	6.6%
NO3	4.5%	1.3%
NH4	8.6%	2.5%
K	0.51%	0.93%
Total[a]	101%	103%

Notes:

[a] The totals sum to over 100% due to the methodology employed to calculate the species contributions and then recalculate the total PM. From the presentation "Reconciling various particulate matter carbon (OC and EC) methods and samplers," B. Simpson, K.C. Nattinger, UAF, August 8th 2015.
This table is meant to reflect the state of the current understanding on speciation at SOB and NPFS through 2014 and will be revised once 2015 data are available.

4.4. Design Value

The design values of the base year used in the attainment test was established based on data from 2011 through 2015 for all monitors as part of the Serious area SIP. The calculation of the design values is based on guidance from EPA suggesting that these values be based on a five-year weighted average (2011–2015) centered on a base year (2013) for each compliance monitor in the nonattainment area: NCore, SOB, NPFS, and NPE. Due to the limited lifespan of the North Pole monitors, it is not possible to calculate a weighted, five-year average for those sites. Instead, an average from 2011-2013 is used for NPE and a weighted four-year average is used for NPFS (2012–2015).

Table 4.4-1
Five Year Design Values[10] (μg/m³) for 2013-2016

Site	3-yr Design Values[11]			Baseline Design Values
	2013	2014	2015	
SOB	41	40	35	38.9
NCore	40	39	35	38.0
NPFS	N/A	139	124	131.6
NPE	45	N/A	N/A	45.3

5. Modeling Episodes

In order to capture the range of meteorological conditions that lead to concentrations of $PM_{2.5}$ which exceed the 24-hour standard, two representative episodes were selected for the Moderate area SIP. These episodes cover January 23 through February 10, 2008; and November 2-17, 2008. The first episode was chosen due to the severe cold and stagnation that drove concentrations to values close to the Moderate area SIP design day concentrations of 42 μg/m³, as well as some concentrations in excess of that value. The

[10] Modeling baseline design values are presented as rounded to the nearest 0.1 μg/m³ per EPA's *Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze*, December 03, 2014. These were calculated from unrounded versions of the 3-year design values.
[11] Design values are presented as rounded to the nearest 1 μg/m³ in accordance with 40 CFR part 50 Appendix N.

November episode represents a more mild set of meteorological conditions, and includes monitoring data showing some exceedances of the 24-hour standard along with days reflecting lower concentrations. When combined, the conditions and concentrations from these two episodes are considered to be consistent with the driving forces behind historical and ongoing air quality standard exceedances.

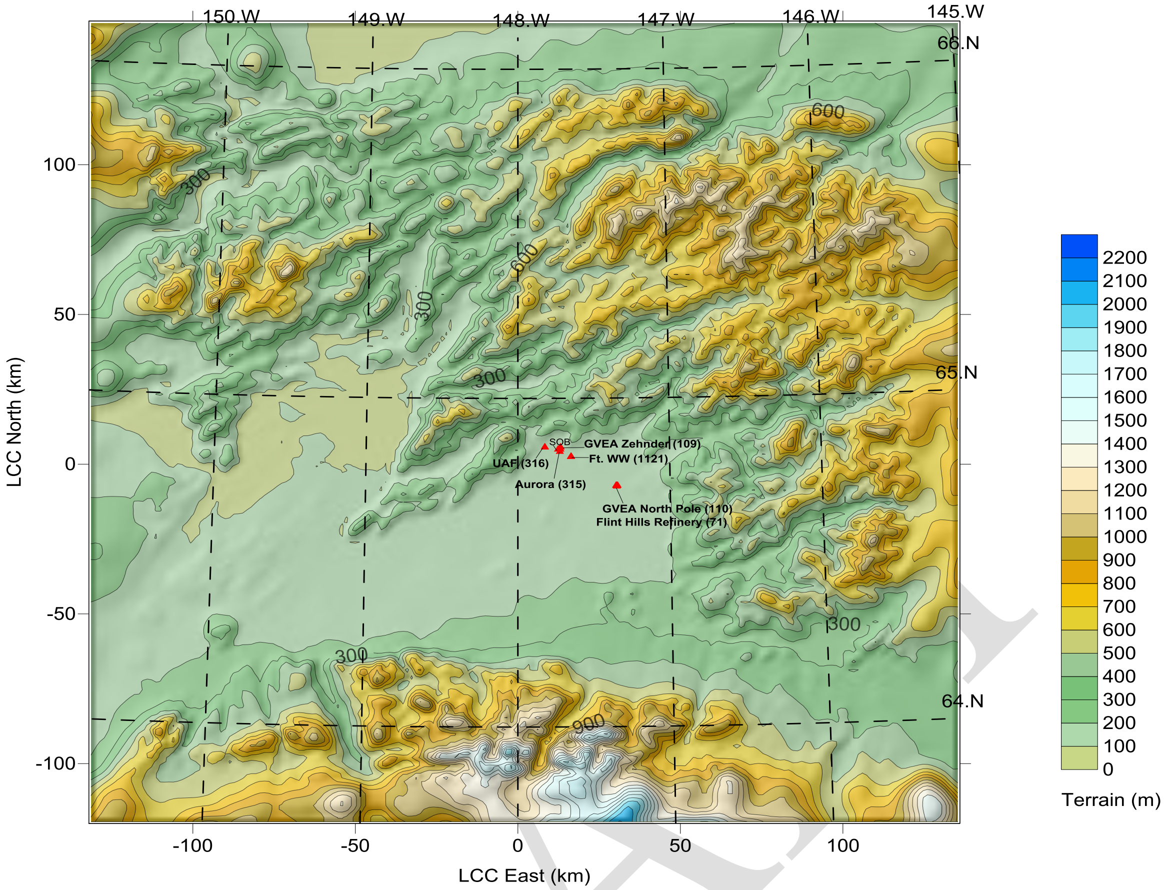
6. Modeling Domain

The modeling domain for the Fairbanks $PM_{2.5}$ nonattainment area is defined by the following values as established in the meteorological modeling. This domain is initially output as a 202 x 202 grid with 1.33 km x 1.33 km cells and 38 layers centered on the nonattainment area, trimmed to a 199 x199 domain upon processing through the Meteorology-Chemistry Input Processor (MCIP). This trimmed-down domain is carried through the emissions and photochemical modeling. The projection used to define the domain within WRF is defined in Table 6-1 and a contour map of the domain is shown in Figure 6-1.

Table 6-1
Grid-Independent WRF Preprocessor System (WPS) Features

Feature	Value
Projection	Lambert conformal
Reference latitude, longitude	64.8, -148.0
True latitudes	50.0, 70.0
Standard longitude	-148.0
Initial conditions	0.5 degree GFS analyses
Analysis interval (hr)	6

Figure 6-1
Contour Map Representation of the Modeling Domain with Major Point Sources



In Figure 6-1, the Fairbanks point source locations are represented by red triangles and are labeled by facility ID number and abbreviated name. The SOB (State Office Building) that houses the FRM (Federal Reference Method) monitor is labeled with a red triangle. The domain represented is 202 x 202, 1.33 km grid cells.

During technical analysis meetings in Juneau, the option to trim the modeling domain was discussed. A trimmed domain will be produced for review to ease the burden of data management and allow for faster processing time of the air quality modeling.

7. Meteorological Modeling

Meteorological modeling of the two air quality episodes was conducted by Brian Gaudet at Penn State University for the Moderate Area SIP.[12] The Weather Research Forecasting (WRF) modeling version 3.1 with nudging and data assimilation was configured[13] to

[12] State Air Quality Control Plan Chapter 5.8, ADEC, December 2014.
[13] Gaudet, B.J., and D.R. Stauffer, 2010: Stable boundary layer representation in meteorological models in extremely cold wintertime conditions. Final Report, Purchase Order EP08D000663, Environmental Protection Agency.

capture the low-wind conditions that dominate severe air quality conditions in the Fairbanks North Star Borough. The configuration consisted of three nested domains. Outputs from the 202 x 202 grid, 1.33 km x 1.33 km cell, 38 layer domain were used as inputs to the Meteorology-Chemistry Input Processor (MCIP) version 3.6. These processed meteorology files are then used as inputs to SMOKE, SMOKE-MOVES, and CMAQ.

8. Emissions Estimates Procedures

In conformance with 40 CFR[14] §51.1002(c), the applicable inventories will include emissions estimates for the following pollutants: $PM_{2.5}$, PM_{10}, SO_2 (SOx), NOx, VOC, and NH_3. Emissions for $PM_{2.5}$ and PM_{10} refer to direct emissions of both filterable and condensable particulate matter.

For this Serious Area $PM_{2.5}$ SIP, a specific set of planning and modeling inventories will be prepared to satisfy CAA (Sections 172(c)(3) and 189(b)(1)) and EPA regulatory requirements. Table 8-1 summarizes these applicable inventories.

Table 8-1
Inventories for Fairbanks Serious Area PM2.5 SIP[15]

Scenario	Requirement	Type	Year	Season	Domain
Serious Attainment 2019	Planning	Baseline	2013	Winter Season	PMNAA
		Control	2019		
	RFP	RFP	2017	Winter Season	PMNAA
		RFP	2020		
	Modeling	Basecase	2008	Episodic	Model Domain
		Baseline	2013		
		Projected	2019		
		Control	2019		
Serious Extension 2024	Planning	Control	2024	Winter Season	PMNAA
	RFP	RFP	2023	Winter Season	PMNAA
	Modeling	Projected	2024	Episodic	Model Domain
		Control	2024		

[14] Code of Federal Regulations.
[15] Inventory requirements are based on discussions with EPA Region 10 in Juneau, AK and the 2015 PIR.

Generally speaking, the emissions inventory (EI) for the Serious Area SIP will be a Level II inventory, as classified under the Emission Inventory Improvement Program (EIIP),[16] constructed similarly to the Moderate Area EI. The emission estimation methodologies (in particular, for the episodic modeling inventories) will generally be "bottom up" based, utilizing an array of locally measured emission factor and source activity data, particularly for the stationary point source space heating (area source), and on-road vehicle sectors. Many elements of these local data were already collected in support of the Moderate Area EI. The following sub-sections describe how emissions will be estimated within each source sector and highlight where revised or updated data (relative to the Moderate Area EI) will be investigated or used.

8.1. Point Sources

The same set of stationary point source facilities that were addressed in the Moderate Area EI will be included. ADEC uses the definition of a major source under Title V of the CAA (as specified in 40 CFR §51.20) to define the "major source" thresholds for reporting annual emissions as the potential to emit (PTE) emissions of 100 tons per year (TPY) for all relevant criteria air pollutants. For Serious Area EIs, CAA Section 189(b)(3) identifies major stationary sources as those with an annual PTE of at least 70 TPY of PM. Therefore, Natural Minor and Synthetic Minor facilities (between 5 and 99 TPY) reporting emissions under either New Source Review (NSR) or Prevention of Significant Deterioration (PSD) requirements will also be reviewed to identify any additional facilities above this 70 TPY PM threshold.

For the planning inventories, annual emissions will be developed based on reported actual and PTE levels from DEC's permit/reporting files and reported for an average season day.

For the modeling inventories, day- and hour-specific historical activity and emission factor data for the two 2008 modeling episodes under the Moderate Area EI will continue to be used to represent episodic point source emissions. However, an adjustment may be required in representing episodic actual emissions after the 2013 base year. In 2014, one of the facilities (Flint Hills Refinery) was shut down. Although it currently operates as a storage and transfer facility, refinery activity ceased in 2014. Its operator (Flint Hills Resources) still maintains an active permit. As such, future-year PTE emissions from Flint Hills will remain unchanged from the Moderate Area EI. However, since refinery operations have ceased, the impacts from fuels that used to be produced at the refinery and supplied to other point source facilities that are no longer available (most notably, Heavy Atmospheric Gas Oil, or HAGO) will be examined. Specifically, the facilities that previously used HAGO from Flint Hills (i.e., the GVEA North Pole and Zehnder Power Plants) will be contacted to determine "new" wintertime fuel usage in 2015 and later years, in the absence of HAGO.

[16] "Introduction to the Emission Inventory Improvement Program, Volume 1," prepared for Emission Inventory Improvement Program Steering Committee, prepared by Eastern Research Group, Inc., July 1997.

In addition to this fuel adjustment, long-term population forecasts for the Fairbanks North Star Borough will be used as a surrogate for activity growth in representing projected baseline actual emissions from the point source sector. Projections of electricity demand changes outside of these factors, such as appliance efficiency or weatherization, will be assessed. Long-term activity growth will be based on population and employment forecasts developed by the Fairbanks Borough to support socio-economic projections within the FMATS 2040 Metropolitan Transportation Plan (MTP). (Note that these population and employment forecasts are thus internally consistent with the vehicle travel growth in the MTP.)

8.2. Area Sources

All other stationary sources not treated as explicit point sources based on the annual PTE thresholds noted in the preceding sub-section are referred to as "Area" sources. Within the area source sector, two distinct source category specific approaches, with different levels of rigor, will be used to estimate emissions (consistent with the Moderate Area EI):

1. *Space Heating* – Residential and commercial space heating emissions are known to be the single largest category of directly emitted $PM_{2.5}$ within the nonattainment area during episodic wintertime conditions. Space heating emissions will be estimated based on a combination of locally collected activity and emission factor data used in the Moderate Area EI, with updated information described in more detail below under "Space Heating Inventory Revisions."

2. *All Other Area Sources* – All other area source categories—which include small stationary source fuel combustion, asphalt paving/roofing, solvent usage, petroleum storage/transfer, and fugitive road dust—will be based on an earlier 2009 Alaska criteria pollutant inventory study[17] sponsored by ADEC, in combination with category-specific estimates from EPA's NEI. (For example, the NEI includes commercial cooking emission estimates that were not included in the 2009 ADEC inventory.)

Space Heating Inventory Revisions – Residential space heating emissions in the Moderate Area EI were based on an exhaustive set of locally collected data in Fairbanks that were used to estimate episodic wintertime emissions by heating device type and fuel type. These local wintertime data and their use in generating space heating emissions are summarized below.

- *Fairbanks Winter Home Heating Energy Model* – A multivariate predictive model of household space heating energy use was developed, based on highly resolved (down to five-minute intervals) actual instrumented measurements of heating

[17] L. Williams, et al., "Criteria Pollutant Inventory for Anchorage, Fairbanks, and Juneau in 2002, 2005 and 2018," prepared for Alaska Department of Environmental Conservation, Sierra Research Report No. SR2009-02-01, February 2009.

device use in a sample of Fairbanks homes during winter 2011 that was collected by the Cold Climate Housing Research Center (CCHRC) in Fairbanks. The energy model was calibrated based on the CCHRC measurements and predicted energy use by day and hour as a function of household size (sq ft), heating devices present (fireplaces, wood stoves, outdoor hydronic heaters, and oil heating devices), and day type (weekday/weekend).

- *2011 and 2013 Special-Purpose Residential Heating Surveys* – Representations of area-specific[18] wintertime heating device uses and practices were developed from a series of annual telephone-based surveys of residential households within the nonattainment area, ranging in size from 300-700 households per survey. The results of these surveys were used to develop estimates of the types and number of heating devices used during winter, by ZIP code, within the nonattainment area. The survey data were also used to cross-check the energy model-based fuel use predictions as well as to identify and apportion wood use within key subgroups (e.g., certified vs. non-certified devices and purchased vs. user-cut wood, the latter of which reflects differences in moisture content that affects emissions).

- *Fairbanks Wood Species Energy Content and Moisture Measurements* – CCHRC performed an additional study that measured wood drying practices and moisture content of commonly used wood species for space heating in Fairbanks. These measurements were combined with published wood species specific energy content data and additional residential survey data (2013 Wood Tag Survey) under which respondents identified the types of wood they used to heat their homes. Birch, Spruce, and "Aspen" (i.e., Poplar) were identified as the three primary locally used wood species.

- *Laboratory-Measured Emission Factors for Fairbanks Heating Devices* – An accredited testing laboratory, OMNI-Test Laboratory (OMNI), was contracted to perform a series of heating device emission tests using a sample of wood-burning and oil heating devices commonly used in Fairbanks in conjunction with samples of locally collected wood and heating oil. The primary purpose of this testing was to evaluate and, if necessary, update AP-42-based emission factors that were generally based on heating device technology circa 1990. The OMNI study provided the first and most comprehensive systematic attempt to quantify Fairbanks-specific, current technology-based emission factors from space heating appliances and fuels. The laboratory-based emission testing study consisted of 35 tests of nine space heating appliances, using six typical Fairbanks fuels. Both direct PM and gaseous precursors (SO_2, NOx, NH_3) were measured, along with PM elemental profiles. Space heating emissions were estimated using OMNI-based results where available for specific devices and AP-42-based estimates for devices for which OMNI tests were not conducted.

[18] Based on ZIP code.

Several revisions/updates will be investigated under the Serious Area EI as follows:

- *Additional Home Heating Surveys* – Three additional Home Heating surveys (of roughly 700 households each) have been conducted since the earlier surveys used in the Moderate Area EI (in 2013, 2014, and 2015) and are in the process of being analyzed. They will be used to update device/fuel splits, certified/uncertified splits, and wood buy vs. cut own splits for the 2013 Baseline and projected baseline inventories.

- *Spatially Varying Ambient Temperatures* – Space heating emissions in the Moderate Area EI were calculated using historical day and hour-specific ambient temperatures from a single location, the Fairbanks International Airport. For the Serious Area EI, space heating emission calculations will be refined to utilize gridded hourly temperatures for the historical episodes as output from the Weather Research Forecasting (WRF) modeling runs. This will improve spatial representation of higher space heating emissions in areas of the modeling domain with colder ambient temperatures.

- *Updated Non-Residential Space Heating Estimates* – Non-residential space heating emissions in the Moderate Area EI were calculated based on an estimate of commercial building space energy intensity in Alaska provided by CCHRC,[19] coupled with commercial/industrial/government building size data from the FNSB Assessor's parcel database. Commercial space heating energy use was assumed to be allocated to two fuel types: (1) heating oil; and (2) natural gas. Based on usage data compiled for Fairbanks under the aforementioned 2009 inventory study, a split of 98% oil and 2% natural gas was assumed. The parcel database is known to exclude a number of tax-exempt structures, notably churches. Enforcement-related reconnaissance by Borough staff has identified a number of non-residential buildings (such as churches) that use wood or coal-heating devices. Non-residential space heating emission calculations will be updated under the Serious Area EI to incorporate wood and coal heat emissions from these sources. The need for an updated non-residential space heating survey will also be evaluated.

- *Use of Sub-ZIP Code Level Device Splits* – All three of the most recent residential Home Heating Survey datasets included address data for each of the sample respondents. In the Moderate Area EI, home heating survey responses were tabulated by ZIP code to develop and apply spatially distinct device usage splits. For the Serious Area EI, address data from the three recent surveys will be mapped via GIS and re-tabulated at the sub-ZIP code level to provide finer resolution of spatial device usage patterns. Care will be applied in ensuring statistically sufficient samples exist within each defined sub-ZIP code area. For example, device usage splits for North Pole were modeled using survey responses for the entire 99705 ZIP code. In the Serious Area EI, distinct usage patterns will be developed for separate areas within the 99705 ZIP code based on available

[19] Email from Colin Craven, Cold Climate Housing Research Center, April 27, 2009.

survey data. Grouping of data from all three surveys (2013, 2014, and 2015) will be considered for sample adequacy in developing these sub-ZIP area splits.

- *Recent Literature from Wood NSPS Docket* – Moderate Area EI space heating emissions were based on available literature circa 2012. EPA published its final NSPS Rule for new residential wood heaters in March 2015. A detailed review of the regulatory docket will be conducted to identify any additional literature on wood device emission testing or usage measurements that could be used to augment or update the existing OMNI-based wood device emission factors. Key topics potentially include differences in real world vs. laboratory (crib wood) emissions, usage studies, and moisture effects.

- *Forecasts of home heating fuel use and emissions* – The 2019 projections of fuel availability and prices used in the Moderate Area EI will need to be revisited. ADEC will develop a new methodology for projecting home heating fuel availability, pricing, and usage based on more recent data by mid-2016. Baseline projected Serious Area EIs will be based on these new forecasts.

8.3. On-Road Mobile Sources

On-road mobile source emissions in the Moderate Area EI were based on EPA's MOVES2010b model coupled with vehicle travel estimates from base year and forecasted TransCAD travel demand model-based activity in the FMATS 2012-2015 TIP. For the Serious Area EI, EPA's latest MOVES2014a model will be used in conjunction with more recently developed vehicle activity and speed distribution estimates prepared under FMATS' 2040 MTP (approved by FHWA in January 2015). The MTP includes both 2013 base year and 2040 forecasted travel.

Fleet characteristic inputs to MOVES (age distributions, vehicle type populations) will be based on updated vehicle registration data for Fairbanks based on a June 2014 Alaska DMV database.

Adjustments (both baseline and future year) to account for unique Fairbanks wintertime vehicle operating patterns (block heater plug-in use, warm-up idling, mild driving patterns) that can be modeled using the MOVES2014a input structures will be evaluated and implemented in consultation with EPA.

8.4. Nonroad Mobile Sources

Emissions from non-road vehicles and equipment (e.g., commercial and recreational off-road vehicles, commercial and industrial equipment, snowmobiles, etc.) will be developed using the "Nonroad" model component of the MOVES2014a model. A slate of comparative modeling runs for Fairbanks using both the earlier NONROAD2008a model and its implementation within MOVES2014, found that output emissions from each model are essentially identical when identical inputs are used. However, countyspecific defaults for Fairbanks within each model differ, in particular for fuel properties. Thus, MOVES2014a-based nonroad emissions will be generated using Fairbanks-specific fuel properties reflecting federal Ultra-Low Sulfur Diesel (ULSD) regulations. Population and seasonal activity adjustments for specific equipment types documented in the Moderate Area EI will be similarly applied.

8.5. Other Sources

Other emission sources include non-anthropogenic sources such as biogenic and geogenic emissions. Emissions from these natural sources will be assumed to be zero under episodic wintertime conditions. Annual planning inventory emissions for these categories will be based on NEI estimates, if available.

8.6. Emissions Processing

The Sparse Matrix Operator Kernel Emissions (SMOKE) model versions 3.6.5 and 2.7.5b will be used for the processing of emissions inventory data from sources outlined above for the photochemical modeling. It is anticipated that, due to emissions processing changes required for the Moderate area SIP in order to preserve hourly, pre-gridded home heating emissions, much of the work flow and code changes for SMOKE 2.7.5b will be maintained for the Serious area SIP, with the exception of the on-road mobile source emissions. Since MOVES2014a will be required for generating on-road mobile source emissions, the on-road portion of the inventory will utilize the latest SMOKE-MOVES processing tools incorporated into SMOKE 3.6.5. Initial tests have shown that the processed inventories for SMOKE 2.7.5b and 3.6.5 are compatible when the programs are configured identically using consistent speciation profiles. During the development of the emissions inventory, other source sectors will be assessed to see if a transition to SMOKE 3.6.5 is warranted.

9. Control Measures

9.1. BACM/BACT

The goal of the BACM analysis is to review all measures and technologies that have been implemented in other $PM_{2.5}$ nonattainment communities and to select those deemed best for implementation. The process for selecting BACM is defined in a series of steps detailed in the Final $PM_{2.5}$ Rule.[20] Those steps clarify and update PM_{10} control measure selection guidance presented in the Addendum to the General Preamble[21] for the selection of $PM_{2.5}$ controls for both Reasonably Available Control Measures (RACM), required for Moderate nonattainment areas and BACM for Serious nonattainment areas. The first step of the BACM analysis requires the preparation of a comprehensive emissions inventory

[20] https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf

[21] https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/19940816_59fr_41998-42017_addendum_general_preamble.pdf

of sources and sources categories of directly emitted $PM_{2.5}$ and $PM_{2.5}$ precursors. A detailed baseline emission inventory has been prepared for 2013. The sources and categories are the same as those identified in the RACM analysis[22]: wood burning, oil heating, mobile sources, and point sources. Early assessments of the NPFS versus NCORE sites indicate that there is a different source mix at these two monitors.[23] Based on the results of the Precursor Determination the BACM analysis is only addressing controls for directly emitted $PM_{2.5}$ and SO_2.

9.2. Methodology

Four additional BACM analysis steps are defined in the final rule. Step 2 examined mobile and area source control measures included in control programs from 29 separate communities. Because of the complexity of the control programs a decision was made to contrast elements of regulatory packages with those of the Borough and the State of Alaska (i.e., not contrast one entire program versus another). This resulted in the identification of 69 separate measures for the Step 3 technological feasibility analysis. The measures determined to be technologically feasible will be evaluated in Step 4 for economic feasibility and those with positive findings will be evaluated in Step 5 to determine the earliest date at which they can be implemented.

A BACT analysis is an evaluation of all technically available control technologies for equipment emitting the triggered pollutants and a process for selecting the best option based on feasibility, economics, energy, and other impacts. 40 CFR 52.21(b)(12) defines BACT as a site-specific determination on a case-by-case basis. The BACT analyses are completed for PM 2.5 and precursors (NOx, SO2, VOC, NH3) gases for all stationary sources that have a pollutant above the potential to emit 70 tons per year. The pollutant control technologies are evaluated by the US EPA's five-step top-down approach. Other important factors include identifying community characteristics that may be outside the norm when comparing pollutant control technologies used in other parts of the country. The detailed BACT methodology is outlined in the BACT determinations for each facility, which may be found at: http://dec.alaska.gov/air/anpms/communities/fbks-pm2-5-serious-sip-development

9.3. Additional Control Scenarios

ADEC is exploring various control measures including Most Stringent Measures (MSMs). BACM measures found to be economically infeasible for BACM may need to be reanalyzed for MSM.

[22] ADEC SIP December 2014.

[23] This is indicated by speciation and tracer work from Bill Simpson as well as analysis of inventory and air quality work produced for the Moderate area SIP.

10. Modeling Protocol

The framework by which the air quality modeling is conducted is described in this section of the TAP. The model configuration and use are applied to the modeling of attainment for the SIP as well as supporting analyses that rely on an air quality modeling. These supporting analyses include precursor demonstration, unmonitored area analysis, source contribution analysis, and sensitivity analysis.

10.1. Photochemical modeling

Attainment modeling will be accomplished with a Eulerian 3-D transport photochemical model, specifically the Community Multiscale Air Quality (CMAQ) model. At the time of drafting this document, the latest available version of CMAQ is 5.0.2.[24] Due to the effort invested in CMAQ version 4.7.1 to configure[25] and test the model for Fairbanks, and given that the nature of the revisions to version 5.0.2 will not materially change the attainment modeling outcomes, DEC will continue to use CMAQ 4.7.1 in the Serious Area SIP. DEC will continue to monitor the upcoming release of CMAQ 5.1[26] to determine if any changes in that version of the model would offer substantial improvements over the previous releases.

10.2. Performance

The model performance as assessed in the 2014 $PM_{2.5}$ SIP[27] will be carried over to the Serious Area SIP. There will be a gap in terms of assessing the performance at the North Pole Fire Station monitor in this approach, as there are no valid data representing the 2008 basecase concentrations outside of the State Office Building monitor. Figure 10.2-1 shows the time series of the model and observed conditions at the SOB over both winter episodes and demonstrates that the model can generally follow the daily time series. The magnitude of the difference between modeled and observed total $PM_{2.5}$ tends to suffer more in the second episode than in the first, although the peaks and valleys tend to agree overall.

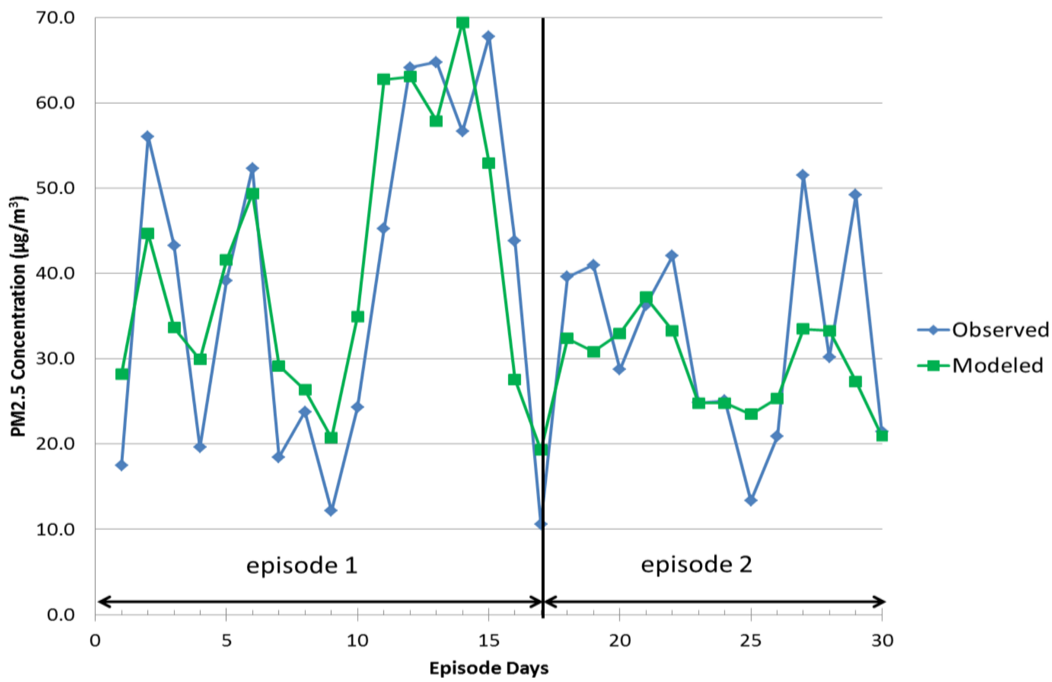
[24] See *www.cmascenter.org/cmaq/*

[25] "Fairbanks North Star Borough $PM_{2.5}$ Non-Attainment Area CMAQ Modeling: Final Report Phase I," Project: 398831 CMAQ-DEC, Mölders, N., Leelasakultum, K. University of Alaska Fairbanks, Geophysical Institute, College of Natural Science and Mathematics, Department of Atmospheric Sciences, December 1, 2011.

[26] See *www.airqualitymodeling.org/cmaqwiki/index.php?title=CMAQ_version_5.1_%28September_2015_beta_release%29_Technical_Documentation*

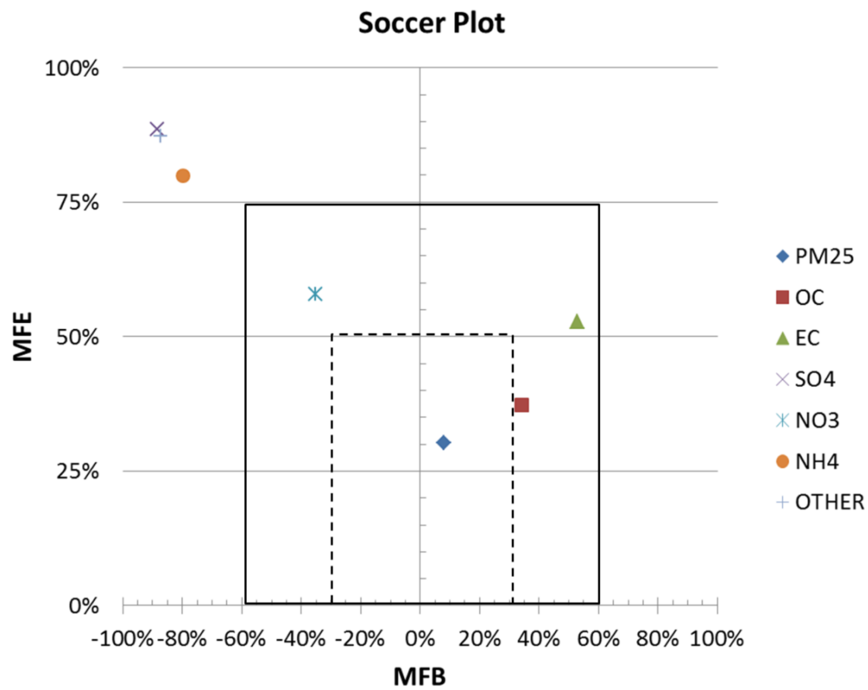
[27] State Air Quality Control Plan, ADEC, December 2014.

Figure 10.2-1
Modeled and Observed 24-hour Averaged $PM_{2.5}$ at the State Office Building Monitor for Both Winter Episodes



A soccer plot offers a more thorough examination of the SOB site $PM_{2.5}$ performance by aerosol species, as seen in Figure 10.2-2. Direct emitted PM (except for the "other" component) and nitrate meet the goal criteria (the solid outer box). Sulfate and ammonium suffer due to what is suspected to be a poor formation of secondary sulfate in the CMAQ model. Total $PM_{2.5}$ meets the good criteria (the dashed inner box), meaning the performance across both episodes is reasonable for attainment modeling purposes.

Figure 10.2-1
Soccer Plot of Mean Fractional Error and Bias at the State Office Building Monitor for Fairbanks 2008 $PM_{2.5}$ Winter Modeling Episodes



Impacts of Inventory Revisions on Model Performance <<< ***To be completed*** >>>

Model Performance Sensitivity Analysis <<< ***To be completed*** >>>

Model Performance at Unmonitored Cells <<< ***To be completed*** >>>

10.3. <u>Analysis Years</u>

The base analysis year was chosen to be 2013. This year was deemed the most suitable to fulfill the requirements of an emissions inventory base year. Those requirements are listed below.

- Attainment modeling and planning inventories are the same year.
- Moderate Area SIP requirements

- Base year is one of the three years used for reclassification.
- Actual emissions to be used for all sources
- Annual or average-season-day as required
  - Attainment modeling will use episodic inventory
  - Planning inventory will use an average-season-day inventory

The years 2013, 2014, and 2015 were used for reclassifying the area to Serious nonattainment status. Since actual data from point sources for 2015 was not yet available at the beginning of the base inventory creation, development of the base year inventory used 2013 and 2014 data. In analyzing the meteorological conditions of 2013 and 2014, it was clear that 2013 had conditions more representative of those used in the baseline modeling for the 2008 meteorological episodes. In the Moderate area SIP, these episodic meteorological conditions were determined to best reflect the range of temperatures under which the area experiences severe air pollution. The lowest daily average observed temperature in downtown Fairbanks was -28º F in 2014 and -35º F in 2013, while the first modeling episode reflects several days of -34° F to -40° F temperatures. Considering that the Serious area SIP modeling will continue to use these meteorological episodes, and that the meteorology impacts the emissions from point sources, it was a more reasonable choice to start with 2013 data. Another minor consideration is that the modeling design value used by SMAT is centered on 2013. When weighing all of these factors, 2013 was judged to be the best choice for a new base year.

The initial projected attainment year modeled is 2019 as a starting point, with adjustments made based on the result of the BACM analysis. It is possible that the attainment year will be earlier, or it is possible that 2019 will be used for an impracticability demonstration. This is established based on section 188 of the Clean Air Act, which states that for a Serious area "the attainment date shall be as expeditiously as practicable but no later than the end of the tenth calendar year beginning after the area's designation as nonattainment."

In the event of an impracticability demonstration for 2019, projected inventories for subsequent years would be prepared along with an MSM analysis to determine if attainment can be achieved between 2020 and 2024. Under this scenario, a year-by-year analysis of the inventory is required starting in 2020 and ending on the attainment year or the final extension year of 2024. Air quality modeling would be required for the attainment year or the final extension year of 2024. An RFP inventory would be required for 2020 and 2023.

10.4. SMAT

The method used for establishing the design value follows the first three steps of the SMAT process as performed in the Moderate area SIP. The most important difference for the Serious area SIP is that the process will be applied to four sites: SOB, NCore, NPE, and NPFS.

- **Step 1**: Establish the high concentration days and 98th percentile day for each year (2011-2015)

- **Step 2**: Develop representative chemical speciation profile of $PM_{2.5}$ for the 25% highest concentration days using SANDWICH as represented by Table 10.4-1. For the case of the NPE and NPFS monitors, DEC used all days over 35 μg/m^3 instead of the top 25% highest concentration days due to the higher number of exceedances.

- **Step 3**: Use the speciation profile to calculate speciation of the highest days

- **Step 4**: Calculate Relative Response Factors (RRFs) for each component of $PM_{2.5}$ at both monitors. RRFs are calculated as the future modeled concentrations divided by the baseline concentrations. The RRF values represent the fractional change in concentrations due to changes in population, activity, and control measures that occur between the base year and the attainment year.

- **Step 5-6**: Apply RRFs to quarterly observations (only Q1 and Q4 are relevant for Fairbanks and North Pole monitors)

- **Step 7**: Sum the RRF-adjusted species to obtain total daily $PM_{2.5}$

- **Step 8**: Determine the RRF-adjusted 98th percentile concentrations for each monitor

- **Step 9**: Calculate the future projected 5-year weighted 24-hr design value

<<< Details on steps 3-9 to be completed >>>

The speciated PM that is calculated through SANDWICH as a component of SMAT differs from the speciated values measured off of filters. The speciated design value is represented in the tables below for SOB, NCore, NPFS, and NPE monitors.A five year modeling design value was calculated for the SOB and NCore sites. Since the NPFS monitor was not in operation in 2011 a four year design value from 2012-2015 was calculated. The North Pole Elementary (NPE) site was discontinued in 2013, and as a result a three year design value for the NPE site was calculated from 2011-2013 data. The tables and figures below present the average speciated values developed in Step 2. Details on steps 3-9 will be completed when control scenarios are developed and modeled.

Table 10.4-1 SMAT Speciation for State Office Building Monitor 2011-2015

SOB (Highest 25% Speciation 2011-2015)									
PM 2.5 Species	Total	OC	EC	SO4	NO3	NH4	OPP	Blank	PBW
Percentage	100.0	53.0	11.1	16.3	4.7	7.0	1.3	1.6	5.2
SMAT	32.0	16.9	3.5	5.2	1.5	2.2	0.4	0.5	1.7
5-yr DV	38.9	20.7	4.3	6.4	1.8	2.7	0.5	0.5	2.0

Table 10.4-2 SMAT Speciation for NCore Monitor 2011-2015

NCORE (Highest 25% Speciation 2011-2015)									
PM 2.5 species	Total	OC	EC	SO4	NO3	NH4	OPP	Blank	PBW
Percentage	100.0	55.0	10.0	16.3	4.5	6.6	1.0	1.5	5.0
SMAT	32.9	18.1	3.3	5.4	1.5	2.2	0.3	0.5	1.6
5-yr DV	38.0	20.9	3.8	6.2	1.7	2.5	0.4	0.5	1.9

Table 10.4-3 SMAT Speciation for NPFS Monitor 2012-2015

NPFS (>35 $\mu g/m^3$ Speciation 2012-2015)									
PM 2.5 species	Total	OC	EC	SO4	NO3	NH4	OPP	Blank	PBW
Percentage	100.0	79.1	8.9	5.9	1.2	2.2	0.3	0.6	1.9
SMAT	83.6	66.1	7.5	4.9	1.0	1.8	0.2	0.5	1.6
4-yr DV	131.6	104.3	11.8	7.7	1.6	2.9	0.4	0.5	2.5

Table 10.4-4 SMAT Speciation for NPE Monitor 2011-2013

NPE (>35 $\mu g/m^3$ Speciation 2011-2013)									
PM 2.5 species	Total	OC	EC	SO4	NO3	NH4	OPP	Blank	PBW
Percentage	100.0	75.8	8.0	7.9	1.7	2.9	0.4	1.0	2.4
SMAT	50.1	38.0	4.0	4.0	0.9	1.4	0.2	0.5	1.2
3-yr DV	45.3	34.3	3.6	3.6	0.8	1.3	0.2	0.5	1.1

Figure 10.4-1 SMAT Speciation for State Office Building Monitor 2011-2015

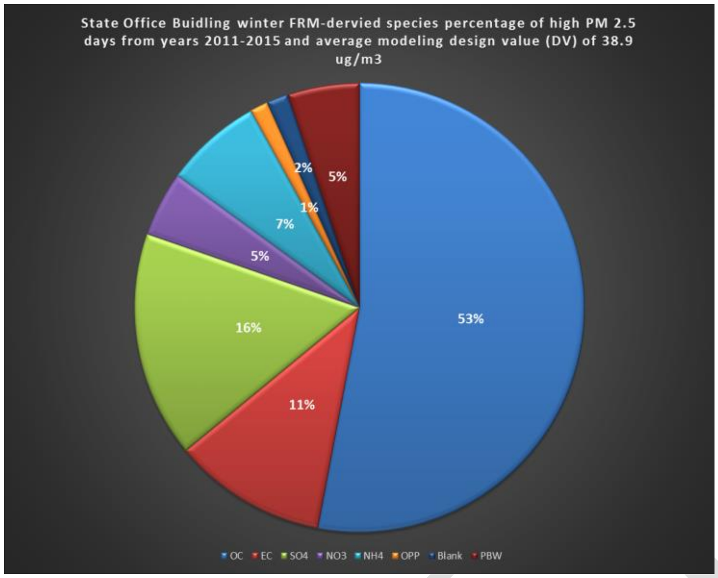


Figure 10.4-2 SMAT Speciation for NCore Monitor 2011-2015

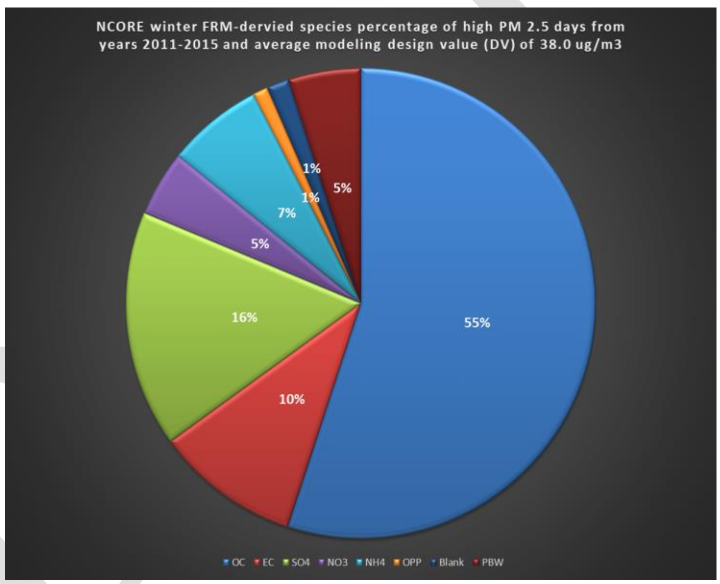


Figure 10.4-3 SMAT Speciation for NPFS Monitor 2012-2015

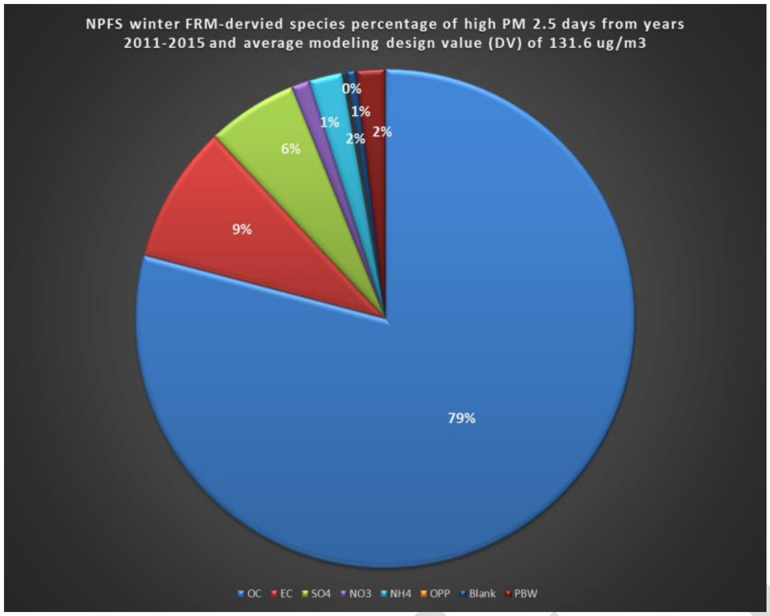
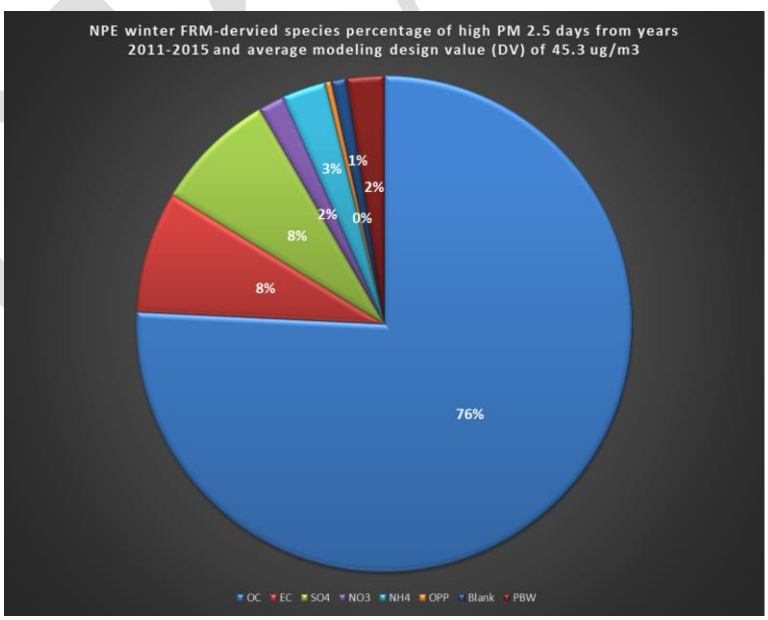


Figure 10.4-4 SMAT Speciation for NPE Monitor 2011-2013



11. Supporting Analyses

11.1. Precursor Demonstration

<<< ***Summary To be completed*** >>>

11.2. Unmonitored Area Analysis (UMAA)

The approach to UMAA is likely to differ from the Moderate are SIP. Although UMAA was included in the Moderate area SIP, it was inconsequential since attainment was demonstrated to be impracticable at the violating monitor. Depending on the outcome of the final implementation plan requirements rule, there are a number of possible forms that UMAA may take in the Serious area SIP. EPA Region 10 has provided a summary of temporary monitoring data and comparisons against the compliance monitors. This data will be used as a starting point for updating data in the UMAA analysis. Additional monitoring data will be sought from local and state agencies to fill in any gaps in the nonattainment area.

<<< ***To be completed*** >>>

11.3. Other Supporting Analysis

The Moderate area SIP employed a number of additional technical analyses to quantify the nature of the particulate matter present in the Fairbanks $PM_{2.5}$ nonattainment area. The methods employed were CALPUFF, PMF, CMB, C-14, and additional organics analysis. Ongoing analysis of speciation at the NPFS monitor would prove valuable in continuing to understand the conditions and contributions within North Pole. Due to funding constraints, it is uncertain whether that analysis can be continued. Aside from NPFS speciation no other additional analysis techniques are being proposed at this time. Relevant scientific studies conducted outside of the SIP process, such as the recent potassium tracer analysis performed by Dr. Bill Simpson at UAF, may be included in the final SIP.