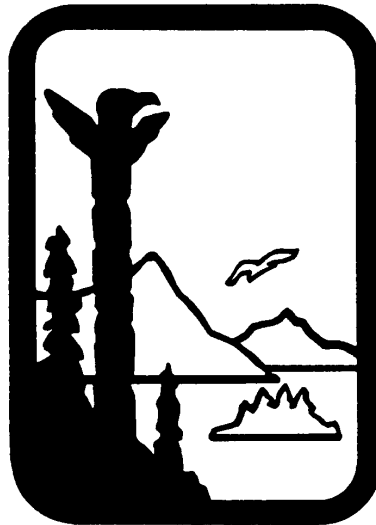


**ALASKA DEPARTMENT OF
ENVIRONMENTAL CONSERVATION**



**Fairbanks North Star Borough PM2.5
Moderate Area State Implementation Plan**

Quantitative Milestone Report

January 6, 2017

Bill Walker, Governor

Larry Hartig, Commissioner

Fairbanks 2017 Quantitative Milestone Report

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1. SUMMARY

1.1 Introduction

A portion of the Fairbanks North Star Borough (FNSB) that includes the cities of Fairbanks and North Pole as well as surrounding areas was designated as a National Ambient Air Quality Standard (NAAQS) fine particulate matter (PM_{2.5}) Moderate non-attainment area for violation of the 24-hour average standard enacted in 2006. In December 2014, the Alaska Department of Environmental Conservation (DEC) submitted a State Implementation Plan (SIP) for the Fairbanks Moderate PM_{2.5} area.

The key finding of that Plan (subsequently referred to as the Moderate SIP) was that attainment of the PM_{2.5} NAAQS by the December 31, 2015 target date was impracticable* in accordance with the Clean Air Act (CAA).

Section 172(c)(2) of the CAA requires that plans for non-attainment areas “shall require reasonable further progress” (RFP) and include a “current inventory of actual emissions from all sources of relevant pollutants in such area ... to assure that the requirements of this part are met.” The goal of RFP is to achieve generally linear progress toward attainment (as opposed to deferring implementation of some or all measures until projected attainment date). The Moderate SIP included a RFP demonstration that established quantitative milestones to be achieved no later than 7.5 years from the date of designation (December 2009). As required under 40 CFR § 51.1013 the first milestone date is calendar year 2017.

Moderate SIP RFP Demonstration – The Moderate SIP evaluated linear progress toward attainment beyond 2015 associated with implementation of Reasonably Available Control Measures (RACM) and Reasonably Available Control Technologies (RACT). The analysis determined whether forecasted controls (and their benefits) in 2017 would be sufficient to assess linear progress from 2015 to projected attainment in 2019.

To address this requirement, 2015 and 2019 SIP Control inventories were interpolated to 2017 to establish target emission levels representing a linear trajectory between the Moderate Area attainment deadline (2015) and the forecasted attainment year (2019).

Chapter 5.7 of the Moderate SIP provided a detailed discussion of RACM measures for Fairbanks. (All RACT measures have been implemented in Fairbanks.) Many of the RACM measures identified in Chapter 5.7 are either voluntary or were implemented prior to 2015. Thus, the remaining measures examined for RFP were measures slated for

* CAA Part D, subpart 4, Section 189(a)(1)(B)

implementation or phase-in after 2015 and correspond to the list of measures for which quantitative emission benefits were calculated and incorporated into the Control inventories. The entire set of control measures/programs is summarized below in Table 1-1, along with their respective implementation dates (or ranges).

Table 1-1 SIP Control Measures	
Control Measure	Implementation Date(s)
Voluntary Measures - Mobile Sources - Other Sources	2001-2015
Hydronic Heater Retrofits	2012
Woodstove Change Out Program	06/2010
State Wood Device Standards	2015
Dry Wood Measures - State Moisture Disclosure - State/Borough Dry Wood Programs	02/2015
Borough Mandatory Curtailment Program	03/2015
Energy Efficiency Measures	2008
Other, pre-2015 Requirements (18 AAC and Borough Code, Title 21): - Opacity Limit - Open Burning	2/2015
Other, post-2015 (setbacks, 2 nd conviction, no waivers for new buildings)	2015-2016
Motor Vehicle/Wood Device Turnover	n/a

n/a – not applicable

In light of the emission benefits of new measures adopted since the submittal of the Moderate SIP, Alaska has determined that it is appropriate to submit a Quantitative Milestone (QM) report at this time which examines RFP progress in 2017 based on current conditions and control measure implementation and compliance that has occurred since the December 2014 Moderate SIP submittal. As a result, this QM report reflects an updated analysis of implemented control measure benefits as of the end of 2016 and demonstrates that the milestones, “to be achieved no later than 3 years after December 31, 2014” have been met.

1.2 RFP Findings

Measures and Pollutants Addressed - Table 1-2 summarizes the individual control measures for which emission benefits were estimated in this QM report.

**Table 1-2
Control Measures Analyzed in QM Report**

Control Measure	2017 Benefits?	Pollutants for Which Benefits Calculated
Voluntary Measures - Mobile Sources - Other Sources	No	n/a
Hydronic Heater Retrofits	No	n/a
Woodstove Change Out Program	Yes	PM _{2.5} , SO ₂ , NO _x , NH ₃
State Wood Device Standards	Yes	PM _{2.5} , SO ₂ , NO _x , NH ₃
Dry Wood Measures - State Moisture Disclosure - State/Borough Dry Wood Programs	Yes	PM _{2.5} , SO ₂ , NO _x , NH ₃
Borough Mandatory Curtailment Program	Yes	PM _{2.5} , SO ₂
Energy Efficiency Measures	No	n/a
Other, pre-2015 Requirements (18 AAC and Borough Code, Title 21): - Opacity Limit - Open Burning	No	n/a
Other, post-2015 (setbacks, 2 nd conviction, no waivers for new buildings)	No	n/a
Motor Vehicle/Wood Device Turnover	PB	PB

n/a – not applicable

PB – Turnover benefits reflected in projected 2017 baseline inventory

Those measures marked “Yes” are those that were adopted after the December 2014 Moderate SIP submittal or provide additional incremental reductions in 2015 or 2016. This RFP analysis examined episodic emissions of directly emitted PM_{2.5} as well as precursor pollutants: sulfur dioxide (SO₂), nitrogen oxides (NO_x) and ammonia (NH₃). As noted in the rightmost column of Table 1-2, individual benefits were calculated for each pollutant, except NO_x and NH₃ benefits for the curtailment program. (As discussed later, although there are benefits for these pollutants, they were not needed to demonstrate that milestone targets were met.)

Quantitative Milestone Analysis – In a similar format to that presented in the Moderate SIP (for ease in comparison), Figure 1-1 presents the quantitative milestone analysis for directly emitted PM_{2.5}. The vertical bars labeled “2015 Ctl” and “2019 Ctl” represent the 2015 and 2019 Control inventories from the SIP. The 2015 Control inventory reflects benefits for control measures quantified in the SIP that were implemented prior to 2015. The 2019 Control inventory represents that for which attainment was modeled in the SIP by calendar year 2019. (Emission contributions from each source sector are shown for each inventory bar.) The middle bar, “2017 RFP” represents the linearly-interpolated 2017 quantitative milestone target from the 2015 and 2019 Control inventories. Projected 2017 emissions below this milestone target reflect a demonstration of

reasonable further progress toward attainment. (Projected 2017 emissions above the target would indicate that RFP is not being met.) The “2017 Ctl” bar represents projected 2017 emissions that reflect additional emission reductions from adopted and implemented control measures beyond the required 2015 attainment year for the Moderate SIP. As shown in Figure 1-1, total direct PM_{2.5} emissions within the nonattainment area were estimated to be 3.96 tons per day, meeting the 2017 target. Thus, reasonable further progress is demonstrated for PM_{2.5}.

Figure 1-1
Quantitative Milestone Analysis for PM_{2.5}

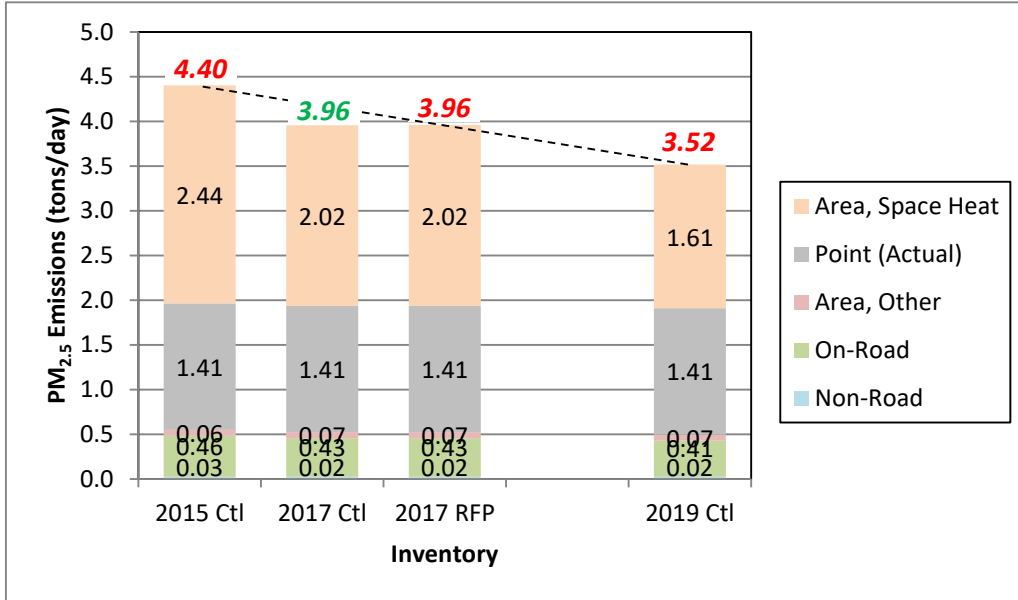
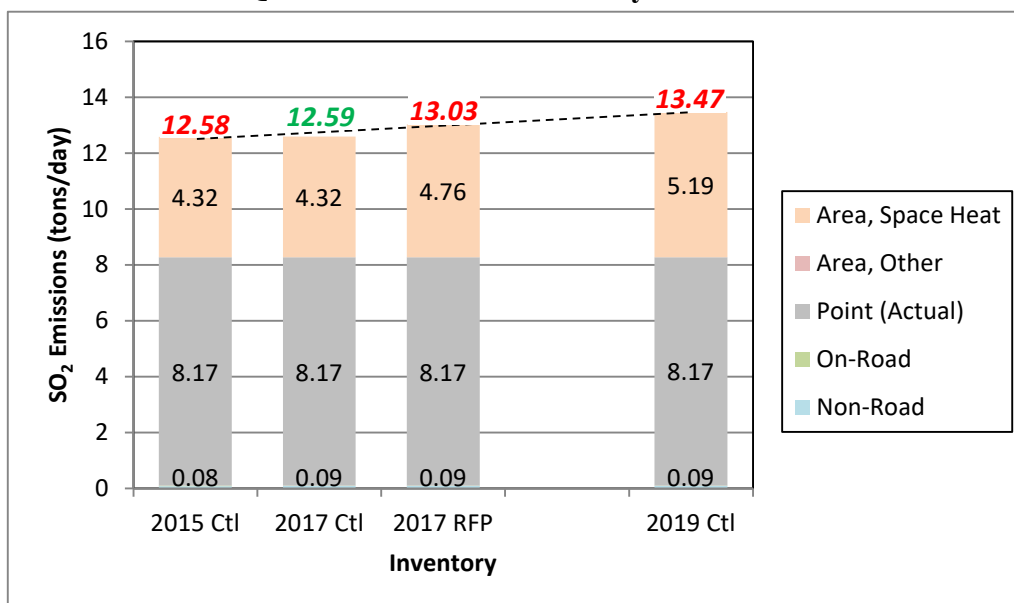


Figure 1-2 through Figure 1-4 present similar plots of reasonable further progress for precursor pollutant emissions of SO₂, NO_x and NH₃, respectively. For each pollutant, 2017 Control emissions are expected to be below the applicable milestone targets as seen in Figure 1-2 through Figure 1-4. For SO₂ (Figure 1-2) and NH₃ (Figure 1-4), the RFP slope is positive, representing slight increases in emissions. These upward trends for the two precursor pollutants are the result of control strategies in the 2019 attainment demonstration that in part reflect switching from wood to other heating fuels that are much lower in direct PM_{2.5} emissions, but result in nominal increases emissions from these precursors. (In Figure 1-2, the contribution for on-road SO₂ emissions is less than 0.02 tpd for all inventories and is too small to be displayed.)

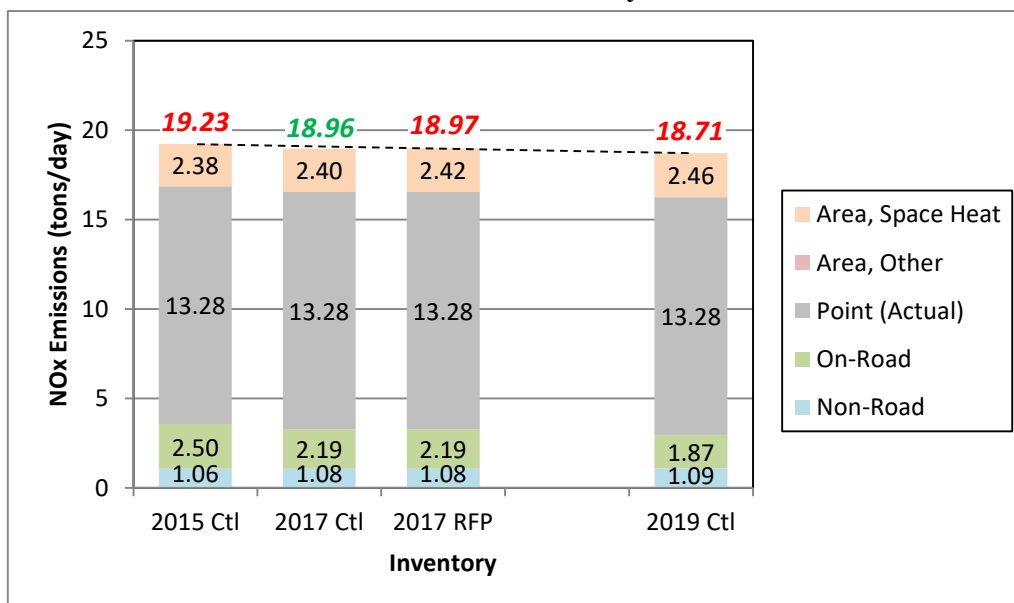
(Section 3 of this report discusses the calculation of the 2017 Control emissions in detail and includes detailed breakdowns of the emission benefits for each of the measures analyzed in the report.)

**Figure 1-2
Quantitative Milestone Analysis for SO₂**

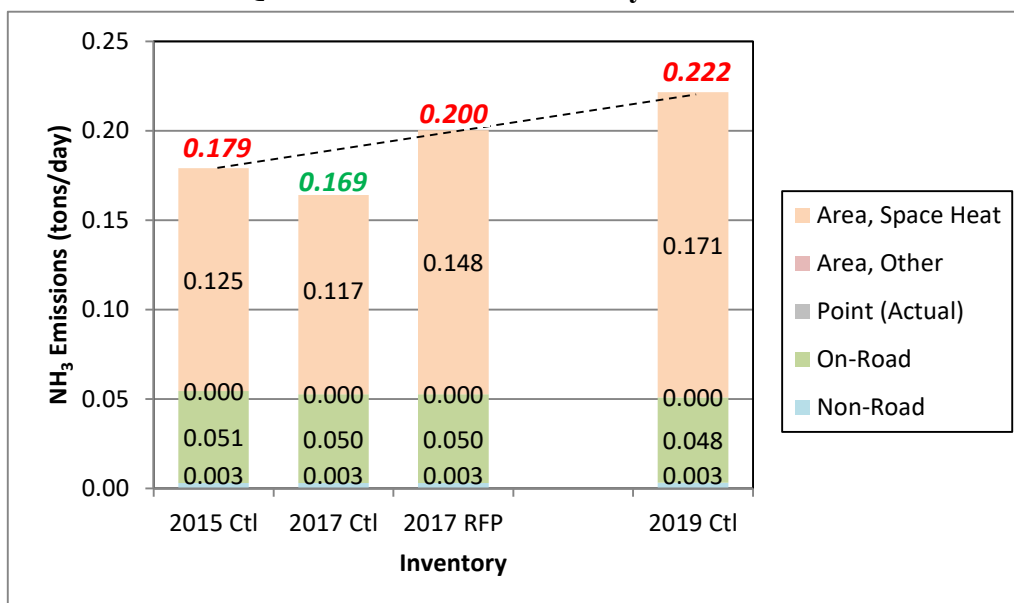


Note: 2015 Control inventory SO₂ emissions were incorrectly reported as 12.53 tons/day in Figure 5-6.28 of the SIP.

**Figure 1-3
Quantitative Milestone Analysis for NO_x**



**Figure 1-4
Quantitative Milestone Analysis for NH₃**



Note: NH₃ emissions data was not available for point sources at the time of preparation of the Moderate SIP inventory. Thus, point source contributions for NH₃ appear as zero.

1.3 Organization of the Report

Following this summary section, the remainder of the report is organized in a manner consistent with the quantitative milestone requirements listed in 40 CFR § 51.1013(4)(b).

Section 2 contains a certification by the Governor or Governor's designee that the SIP control strategy is being implemented consistent with the RFP plan. Section 3 describes supporting technical calculations sufficient to document and demonstrate that the quantitative milestones have been satisfied. It also describes how the emissions reductions achieved to date compare to those required or scheduled to meet RFP. Section 4 provides a discussion of whether the area will attain the applicable PM_{2.5} NAAQS by the projected attainment date for the area.

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2. SIP CONTROL STRATEGY CERTIFICATION



THE STATE
of **ALASKA**
GOVERNOR BILL WALKER

Department of Environmental Conservation

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January 3, 2016

Mr. Dennis McLerran, U.S. EPA Region 10
Regional Administrator's Office, Mail Code: RA-210
1200 Sixth Avenue, Suite 900
Seattle, WA 98101

Dear Mr. McLerran:

The Alaska Department of Environmental Conservation (DEC) in accordance with the Clean Air Act (CAA) 189(c)(2) and 40 CFR 51.1013(b) is submitting the enclosed Qualitative Milestone Report for the Fairbanks North Star Borough's (FNSB) PM2.5 nonattainment area. The Moderate Area State Implementation Plan (SIP) for the FNSB PM2.5 nonattainment area identified specific milestones to be reached in 2017. The enclosed report verifies that the 2017 milestone has been met.

Denise Koch is available to respond to any questions your staff might have or provide any additional information they might need. She can be reached at (907) 465-5109. As always, I would be pleased to discuss any of this with you.

Sincerely,

Larry Hartig
Commissioner

cc via email: Tim Hamlin, EPA Region 10 (w/o enclosures)
Debra Suzuki, EPA Region 10 (w/o enclosures)
Claudia Vaupel, EPA Region 10 (w/o enclosures)
Alice Edwards, Deputy Commissioner, DEC (w/o enclosures)
Denise Koch, Director, Division of Air Quality (w/o enclosures)
Cynthia Heil, Program Manager, ANPMS Program, DEC (w/o enclosures)

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3. SUPPORTING CALCULATIONS

This section of the QM report provides detailed discussions of the data, assumptions and methods used to calculate emission benefits attributed to each analyzed control measure. In the context of the SIP and reasonable further progress demonstration, control measures discussed in this section refer to state and Borough control measures/programs that were either adopted and implemented since the SIP was submitted or are projected to accumulate additional emission reductions between 2015 (the attainment target date) and the beginning of 2017 (the RFP milestone year).

After a discussion of the emission benefit calculations for each control measure, detailed tabular results for all pollutants are presented and their impacts in achieving the 2017 milestone targets are explained.

3.1 Control Measure Benefit Calculations

Emission benefit calculations are described in this sub-section for each individual control measure analyzed under this QM report. These calculations were performed in a serial order to avoid double counting of emission benefits where measure effects overlap. Since all the analyzed measures apply to the residential space heating source sector, it was necessary to account for measure overlap. Emission benefits for the first measure (Wood Stove Change Out or WSCO Program) were developed as increments to projected baseline emissions in 2017. Benefits for each subsequent measure were then developed as increments in space heating emissions from the previous measure.

It is noted that emission benefits presented here differ from those provided in DEC's Response to Clarification Request RACM analysis. Under the RACM analysis, benefit estimates were developed for a single year, 2015. This QM analysis calculates benefits for two years (2015 and 2016) and accounts for accumulation of benefits over multiple years from the WSCO Program as well as estimated improvements in compliance rates from one year to the next.

In addition, to meet the submittal schedule for this QM report, emission benefit estimates for NO_x and NH₃ were calculated based on scaling of benefits for directly emitted PM_{2.5}. Benefit calculations for PM_{2.5} and SO₂ were based on source classification code (SCC)-specific emission factors for those pollutants. Relative differences in emission factors for NO_x and NH₃ are similar to those for PM_{2.5} for the space heating source categories

represented in this analysis. Thus, the NO_x and NH₃ benefits are reasonable approximations of more rigorously calculated estimates.

Emission benefit methodologies are presented below by individual measure.

Wood Stove Change Out Program – As noted earlier, emission benefits from the Borough’s on-going WSCO Program accumulate over each year of operation as older higher emitting devices are removed or replaced with those certified to lower PM_{2.5} emission levels. The WSCO Program encompasses hydronic heaters, fireplaces, and fireplace inserts in addition to wood stoves. The program offers reimbursement incentives for replacing, removing or repairing solid fuel burning appliances (SFBAs) (i.e. wood or coal stoves; wood- or coal-fired furnaces; wood- or coal-fired hydronic heaters; fireplace inserts) or upgrading fireplaces. Replacement devices must be lower-emitting EPA-certified devices, generally with emission ratings at or below 2.0 grams/hour. Subsidies for device replacement range from up to \$5,000 for a wood or coal stove or insert and up to \$10,000 for a hydronic heater. (Higher subsidies up to \$14,000 are offered for removal and replacement with a home heating oil or natural gas-burning appliance.)

WSCO Program benefits for two years of change outs, 2015 and 2016, were estimated using the methods contained in the Moderate SIP and actual change out data collected by the Borough from continued operation of the program through November 2016. As described there, WSCO program transactions are projected to decrease over time as more and more uncertified or higher-emitting devices are replaced. Totals of 386 and 316 change outs (replacements and removals) were projected in the SIP for calendar years 2015 and 2016 respectively. From these projected change outs by device type (fireplaces, inserts, wood stoves, hydronic heaters) emission benefits upon replacement were calculated by replacing the SCC-level emission factor for the old, higher-emitting device with that for the new replacement device. Differences in net heating efficiency between replaced and new devices were also accounted for. For removals, emission impacts were calculated assuming the heating energy from the removed device was supplanted by that from a central oil furnace (and accounting for heating efficiency differences).

Average episodic emission reductions from continuation of the WSCO program from 2015 to 2017 were calculated to be 0.145 tpd for direct PM_{2.5}, <-0.001 tpd for SO₂, -0.055 tpd for NO_x and 0.002 tpd for NH₃. The negative value for SO₂ reflects the effects of device removal and assumed energy replacement by central oil, which has higher SO₂ emission per unit heating energy than wood devices. The nominal increase in NO_x emissions results from projected population growth between 2015 and 2017 (which is subsumed by other factors for the other pollutants).

State Standards in New Homes – Like the WSCO program, emission benefits for the state’s wood-fired device emission standards* (18 AAC 50.077) were calculated as increments in 2015 and 2016 based on effective implementation dates for these standards.

* <http://burnwise.alaska.gov/standards.htm>

The implementation dates are February 28, 2015 for hydronic heaters below 350,000 BTU/hour and all wood-fired devices above 350,000 BTU/hour and August 31, 2015 for wood stoves and most pellet stoves. These standards essentially require newly sold devices to meet certified 2.5 gram/hour PM_{2.5} emission levels. Emission benefits for these standards were calculated using methods consistent in the Moderate SIP. Benefits were determined based on projections of new home sales within the nonattainment area and developed from data compiled by the Borough in its Community Research Quarterly* publications. Incremental benefits were calculated based on the historical mix of wood device emission rates relative to rates that apply under these standards, coupled with the fraction of new homes in which wood-fired devices would be installed. (The wood device fraction was based on the 2011 Home Heating survey).

The incremental emission benefits for the state's wood device emission standards in 2015 and 2016 were estimated to be 0.021 tpd for direct PM_{2.5}, 0.000 tpd for SO₂, 0.004 tpd for NO_x and 0.001 tpd for NH₃. (SO₂ emission benefits are negligible because there is no difference in SO₂ emission factors for all wood device types.)

Dry Wood Measure – A series of state regulations and local ordinances have been adopted and implemented that work in concert to maximize the use of dry wood in the nonattainment area. (Dry wood reduces the amount of wood burned to supply a given amount of heat and reduces direct PM_{2.5} and secondary pollutant emissions). To assist in ensuring the use of dry wood, there are three elements:

1. Opacity – Local ordinance 21.28.030.C (established with Ordinance No. 2015-11 on February 27, 2015) states that emissions from solid fuel burning appliances may not create opacity greater than 20%, this is a year round requirement. The state program in 18 AAC 50.075 limits opacity to 20% during advisories and alerts.
2. *State Wood Seller Moisture Disclosure Program* – Under 18 AAC 51.076(d) the state has established a program whereby wood sellers must disclose in writing the moisture content of commercially sold wood in the nonattainment area.
3. *Dry Wood Requirement* – Year-round borough requirement and seasonal state requirement. The state and local program have adopted and implemented a regulation (18 AAC 50.076) and ordinance (21.28.030.F established with Ordinance No. 2015-11 on February 27, 2015) that requires the use of dry wood as a heating fuel in Fairbanks limiting solid fuels to: dry wood (20% moisture content or lower), pellets, or wood energy logs/pucks (which have moisture levels well below 20%).

These elements work under 18 AAC 50.076 in complementary fashion to maximize emission benefits. The disclosure program targets commercially sold wood while the seasonal dry wood requirement applies to wood cut directly by the user as well as commercially sold wood. The methods to calculate emission benefits from each of these

* <http://fnsb.us/cp/Pages/crc.aspx>

elements involved accounting for reductions in overall wood moisture content resulting from each element and properly accounting for the sector of wood use (commercially sold wood) where their benefits overlap. Calculations for each element described separately as follows.

State Wood Seller Moisture Disclosure Program – A “Wood Sales” database collected and maintained by DEC was used to estimate the effects of the Moisture Disclosure Program during the current voluntary phase of the program. Data were compiled by DEC for participating sellers in the program for a little over one year (starting in October 2015). For each record in the database, the amount of wood sold is provided (in cords) along with either a moisture level estimate (from three measurements as required under the program) or a designation that the wood was sold wet or frozen. These data were analyzed to develop an estimate of the change in average wood moisture for commercially sold wood with these disclosure requirements in place. It was found that average moisture content for commercially sold wood dropped from 64% (based on average moisture of commercially sold wood from a 2011 CCHRC study) to 33% based on analysis of the Wood Sales database. (Its effect increases compliance with the dry wood requirement)

Based on known commercial wood sellers in the nonattainment area, DEC staff has estimated that roughly 75% of these wood sellers are currently participating in the voluntary disclosure program (based on wood volume). Combining this estimated participation rate with the composite moisture levels from the Wood Sales database yields a reduction on average moisture content for all wood burned (including wood cut and stored by residents as well as the remaining 25% of commercially sold wood outside the disclosure program) from 36.4% to 30.3%. The increase in heating efficiency yields an estimated 4.5% reduction in wood use and emission reductions of 0.097 tpd for direct PM_{2.5}, 0.004 tpd for SO₂, 0.017 tpd for NO_x and 0.001 tpd for NH₃ by 2017.

Dry Wood Use Requirement – Using methods to translate changes in wood moisture content discussed elsewhere in the Moderate SIP and similar to those applied above, an estimate of emission reduction was developed for the state program (and Borough ordinance).

State and Borough staff estimated the compliance rate for the dry wood requirement to be 20% as of the end of 2016 (the second year of implementation).

Based on this estimated compliance rate and after accounting for the effects of the aforementioned Wood Seller Moisture Disclosure Program within the commercial wood use sector, this dry wood requirement results in an average wood moisture content for all wood burned in the nonattainment area of 28.3% and an additional 1.5% reduction in wood use.

This translates to emission reductions by 2017 of 0.032 tpd for direct PM_{2.5}, 0.001 tpd for SO₂, 0.006 tpd for NO_x and 0.001 tpd for NH₃.

Episodic SFBA Curtailment Program – The Borough’s Solid Fuel Burning Appliance (SFBA) Curtailment Program requires mandatory cessation of combustion from solid-fueled residential space heating devices during Stage 2 and Stage 3 alerts called by the Borough under specific ambient air quality and temperature regimes summarized as follows:

- Stage 2: $35 \mu\text{g}/\text{m}^3$ 24-hour $\text{PM}_{2.5} < 55 \mu\text{g}/\text{m}^3$
- Stage 3, $\geq -15^\circ\text{F}$: 24-hour $\text{PM}_{2.5} > 55 \mu\text{g}/\text{m}^3$, ambient temperature, $\geq -15^\circ\text{F}$
- Stage 3, $< -15^\circ\text{F}$: 24-hour $\text{PM}_{2.5} > 55 \mu\text{g}/\text{m}^3$, ambient temperature, $< -15^\circ\text{F}$

(The program also includes a Stage 1 voluntary component for which emission benefits were not analyzed.)

Under Stage 2, burning is permitted in all EPA-certified SFBA, EPA Phase II qualified hydronic heaters with emission ratings of 2.5 g/hour or less, masonry heaters, pellet-fueled appliances, cook stoves and fireplaces. Burning is prohibited from all other devices including non-EPA certified devices and waste oil devices.

Stage 3 includes separate restrictions depending on whether ambient temperatures are above or below -15°F (as measured in real time at the Fairbanks International Airport). Above -15°F , burning is prohibited in all SFBA, masonry heaters, pellet-fueled appliances, cook stoves, fireplaces and waste oil devices. When temperatures drop below -15°F , burning is permitted in EPA-certified SFBA, EPA Phase II qualified hydronic heaters with emission ratings of 2.5 g/hour or less, masonry heaters and pellet-fueled appliances. (Fireplaces are prohibited from operating under Stage 3 with temperatures $\leq -15^\circ\text{F}$.)

The alert stages can be called for two separate air quality control zones (AQCZs) within the nonattainment area:

- Fairbanks (covering all of the nonattainment area except the Goldstream Valley and North Pole); and
- North Pole (the portion of the nonattainment area largely south and east of Badger Road).

Since the alert stages are AQCZ-specific and occur under different ambient conditions, the first step in analyzing program benefits consisted of identifying the frequency of the days and average temperature conditions under which they occurred during calendar year 2015, separately for each stage and AQCZ. (The 182-day nonattainment season runs from October 1 through March 31.) In 2015, Fairbanks alerts were based on the NCORE monitor, while North Pole alerts were based on the North Pole Fire Station monitor.

Since daily space heating emissions are a function of the ambient temperature, Table 3-1 shows average daily temperatures associated with each alert stage and AQCZ. (Fairbanks had no Stage 3 days above -15°F in 2015). It also shows the alert frequencies

for each stage and AQCZ, expressed as the fraction of nonattainment season days each alert condition is expected to occur based on 2015 data.

Table 3-1 Curtailement Program Alert Conditions and Frequencies of Occurrence				
Alert Condition	Avg Daily Temp (°F)		Alert Frequencies (%)	
	Fairbanks	North Pole	Fairbanks	North Pole
Stage 2 - Days $\geq 35 \mu\text{g}/\text{m}^3$ and $< 55 \mu\text{g}/\text{m}^3$	-26.8	-4.7	6.6%	10.4%
Stage 3 - Days $\geq 55 \mu\text{g}/\text{m}^3$, Temp $\leq -15^\circ\text{F}$	-29.2	-19.8	1.6%	12.6%
Stage 3 - Days $\geq 55 \mu\text{g}/\text{m}^3$, Temp $> -15^\circ\text{F}$	n/a	-0.4	0.0%	4.4%

Data collected by the Borough for operation of the curtailment program in calendar years 2015 and 2016 were used to estimate the program’s compliance rate as of the end of 2016. The Borough developed a compliance rate estimate of 10% for the first year of operation (2015). Based on a doubling of the number of citizens signed up to receive electronic burn restriction alerts and a quadrupling of the number of air quality violation notices sent between 2015 and 2016, it was estimated that the program’s compliance rate by 2017 was 20%.

Baseline day-specific emissions by device/fuel under this set of temperatures were extracted from the episodic emission inventory and adjusted at the SCC level to reflect emission changes from the preceding control measures. Next, emission reductions (at assumed 20% compliance) were calculated for the day-specific emission levels of each AQCZ (Fairbanks and North Pole) and alert stage (S2, S3 >-15 , S3 <-15) by eliminating emissions from the specific devices and fuel for which burn restrictions occur under each stage. Logic was applied to account for emission increases associated with substitution of heating energy from curtailment-restricted devices to a substitute device/fuel: a central oil furnace. Heating efficiency (as well as emission factor) differences between each restricted device and central oil were also accounted for. In addition to account for the “No Other Available Source of Heat” (NOASH) waiver provisions in the curtailment program, an estimate of NOASH households was developed from Fairbanks Home Heating Survey data. In the combined 2011-2015 surveys, it was found that 5.6% of surveyed households only had wood-burning devices in the home; this percentage was used to estimate the fraction of potential NOASH households for which burn restrictions would be waived.

These emission calculations were performed separately for each AQCZ and accounted for the fact that the Goldstream Valley portion of the nonattainment area is not subject to these restrictions. (Goldstream Valley emissions were scaled from the nonattainment area total based on occupied household counts from block-level tabulations in the 2010 Census).

In the emission inventory (unlike for woodstoves and inserts), hydronic heaters were treated as a single source category weighted as 80% unqualified and 20% EPA Phase II qualified devices. To account for the fact that Phase II hydronic heaters with emission rates below 2.5 g/hour are allowed to operate during Stage 2 and Stage 3 (<-15°F) alerts, an estimate of the population of Phase II devices under 2.5 g/hour of 38% was developed from the list of Phase II qualified hydronic heaters from EPA’s “Burn Wise” database.

Using these inputs and assumptions, estimated average daily emission reductions for direct PM_{2.5} and SO₂ on days of each alert stage for each AQCZ are shown below in Table 3-2. (The negative values represent the marginal increase in SO₂ emissions associated with substituting wood-based heat with that from central oil.) Although North Pole has a higher fraction of wood-burning devices than Fairbanks, its average PM_{2.5} emission reductions under each stage are lower because warmer temperatures can still trigger alert stages there as shown earlier in Table 3-1.

Table 3-2 Alert Stage Curtailment Program Emission Reductions (20% Compliance)						
AQCZ	Stage-Specific Daily Emission Reductions (tons/day)					
	PM _{2.5} Reductions			SO ₂ Reductions		
	Stage 2	Stage 3 >-15°F	Stage 3 <-15°F	Stage 2	Stage 3 >-15°F	Stage 3 <-15°F
Fairbanks	0.048	0	0.096	-0.005	0	-0.005
North Pole	0.035	0.118	0.076	-0.002	-0.015	-0.002

These reductions are specific to those days (and areas) for which alerts were called. Using the frequencies of each alert stage for each area based on 2015 monitoring and meteorology data, nonattainment episodic average daily reductions are shown below. (Again, negative numbers reflect emission increases.)

Table 3-3 Curtailment Program Average Daily Emission Reductions (20% Compliance)			
Pollutant	Episodic Average Daily Emission Reductions (tons/day)		
	Fairbanks	North Pole	Nonattainment Area
PM _{2.5}	0.058	0.067	0.125
SO ₂	-0.005	-0.004	-0.009

Emission benefits for the curtailment program were not quantified for NO_x and NH₃. Although real reductions occurred for these pollutants, their benefits were not required to meet inventory milestone targets by 2017.

3.2 Summary of Emission Reductions

Table 3-4 summarizes the estimated 2015 and 2016 emission reductions for each of the control measures analyzed in this report. (Although all applicable measures are listed in Table 3-4, those for which additional reductions in this period were not quantified are noted with “.....” entries.) As denoted by “PB” entries at the bottom of Table 3-4, turnover reductions from motor vehicles and old uncertified woodstoves are not explicitly listed in the table but are incorporated with the 2017 baseline inventory.

Table 3-4 Summary of 2015 & 2016 Control Measure Emission Reductions				
Control Measure	Episodic Average Daily Emission Reductions (tons/day)			
	PM _{2.5}	SO ₂	NO _x	NH ₃
Voluntary Measures	.....	.....	.....	.....
Hydronic Heater Retrofits	.....	.....	.....	.....
Wood Stove Change Out Program	0.145	0.000	-0.055	0.002
State Standards in New Homes	0.021	0.000	0.004	0.001
Dry Wood – State Wood Seller Moisture Disclosure Program	0.097	0.004	0.017	0.004
Dry Wood Requirement	0.032	0.001	0.006	0.001
Borough SFBA Curtailment Program	0.125	-0.009	0.000	0.000
Energy Efficiency Measures	.....	.....	.....	.....
Other Pre-2015 Requirements	.....	.....	.....	.....
Other Post-2015 Requirements	.....	.....	.....	.....
Vehicle/Wood Device Turnover	PB	PB	PB	PB
Totals	0.421	-0.004	-0.028	0.008

PB – Accounted for within projected baseline inventory and not explicitly delineated.

As shown, total reductions across all measures (and accounting for applicable measures overlap) of 0.421 tpd for direct PM_{2.5}, -0.004 tpd for SO₂, -0.028 tpd for NO_x and 0.008 tpd for NH₃ as of the end of 2016.

All the analyzed control measures have been implemented and are contained within the Area Source, Space Heating sector of the emission inventory. These control benefits were applied to projected baseline emissions in 2017 for all inventory sectors and compared to the total milestone targets established in the Moderate SIP as shown below in Table 3-5 for each applicable pollutant. As shown in each of the pollutant-specific highlighted rows, the projected 2017 inventory with these controls shown in the “2015/16 Achieved” column meet or are below the 2017 milestone targets established in the SIP reflected in the “2017 RFP” column. This demonstrates that these controls will provide reasonable further progress toward attainment in 2017.

Table 3-5 Summary of 2015 & 2016 Control Measure Emission Reductions		
Source Sector	Episodic Average Daily Emissions (tons/day)	
	2017 Milestone	2015/16 Achieved
<i>PM_{2.5} Inventory</i>		
Point (Actual)	1.41	1.41
Area, Space Heating	2.02	2.02
Area, All Other	0.07	0.07
On-Road Mobile	0.43	0.43
Non-Road Mobile	0.02	0.02
Total PM_{2.5}	3.96	3.96
<i>SO₂ Inventory</i>		
Point (Actual)	8.17	8.17
Area, Space Heating	4.76	4.42
Area, All Other	0.00	0.00
On-Road Mobile	0.02	0.02
Non-Road Mobile	0.09	0.09
Total SO₂	13.03	12.59
<i>NO_x Inventory</i>		
Point (Actual)	13.28	13.28
Area, Space Heating	2.42	2.40
Area, All Other	0.00	0.00
On-Road Mobile	2.19	2.19
Non-Road Mobile	1.08	1.08
Total NO_{x2}	18.97	18.96
<i>NH₃ Inventory</i>		
Point (Actual)	n/a	n/a
Area, Space Heating	0.148	0.117
Area, All Other	0.000	0.000
On-Road Mobile	0.050	0.050
Non-Road Mobile	0.003	0.003
Total NH₃₂	0.200	0.169

n/a – not available; NH₃ emissions data was not available for point sources at the time of preparation of the SIP inventory.

Note: Table 3-5 reports emissions to two decimal digits for PM_{2.5}, SO₂ and NO_x and three decimal digits for NH₃. Totals for each pollutant across all inventory sectors are summed based on additional precision and rounded to two or three decimals. Thus, differences between the totals and the sum of sector-specific emissions are the result of rounding.

As noted in boldface, all of the analyzed control measure benefits are applied within the “Area, Space Heating” sector of the emission inventory.

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4. ATTAINMENT FINDINGS

As required in 40 CFR 51.1013(4)(b)(3) the quantitative milestone report must include a discussion of whether the area will attain the applicable PM_{2.5} NAAQS by the projected attainment date for that area. Pursuant to this requirement, DEC acknowledges that consistent with the impracticability demonstration in the Moderate SIP, the Fairbanks Moderate PM_{2.5} nonattainment area did not attain the ambient 24-hour PM_{2.5} NAQQS by December 31, 2015 as required.

However, this report demonstrates that continuation and addition of control measures implemented in 2015 and 2016 yields benefits resulting in inventory reductions that meet 2017 quantitative milestone targets for both directly emitted PM_{2.5} and all applicable precursors, ensuring reasonable further progress “no later than 3 years after December 31, 2014” requirements have been met.

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