

**ALASKA DEPARTMENT OF
ENVIRONMENTAL CONSERVATION**



**Fairbanks North Star Borough PM2.5
Serious Area 2020 Amendments State Implementation Plan**

Quantitative Milestone Report

March 26, 2021

Mike Dunleavy, Governor

Jason W. Brune, Commissioner

Fairbanks 2021 Quantitative Milestone Report

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1. SUMMARY

1.1 Introduction

Relevant Regulatory Actions –A portion of the Fairbanks North Star Borough (Borough or FNSB) that includes the cities of Fairbanks and North Pole as well as surrounding areas was classified as a Moderate PM_{2.5} nonattainment area in November 2009* for violation of the 24-hour average standard (35 µg/m³) enacted in 2006. The Alaska Department of Environmental Conservation (DEC) was given until December 2014 to prepare and submit a State Implementation Plan (SIP) that included a strategy to attain the PM_{2.5} National Ambient Air Quality Standards (NAAQS) in the FNSB area. In compliance with U.S. Environmental Protection Agency (EPA) requirements, the Moderate Area SIP evaluated whether attainment could be demonstrated by December 31, 2015 or if not, explain why attainment by that date was impracticable. Emission inventories were prepared, control strategies were developed and evaluated, and air quality modeling was conducted under the Moderate SIP. This analysis led the State of Alaska to conclude that the level of emission reductions required to attain the PM_{2.5} NAAQS could not be achieved by that December 2015 date. Thus, the Moderate SIP found that attainment of the 24-hour PM_{2.5} standard by 2015 was impracticable.

As a result of the FNSB area’s failure to attain the 24-hour PM_{2.5} standard by 2015, the EPA reclassified† the area (effective June 9, 2017) as a Serious PM_{2.5} nonattainment area, for which attainment by 2019 must be evaluated and a more stringent analysis of control measures conducted and tracked within the inventory.

On July 29, 2016, EPA also promulgated‡ the PM_{2.5} Implementation Rule (subsequently referred to as the PM Rule) which interprets the statutory requirements that apply to PM_{2.5} NAAQS nonattainment areas under subparts 1 and 4 of the nonattainment provisions of the CAA. These requirements govern both attainment plans and nonattainment new source review (NNSR) permitting programs and specify planning requirements that include:

- plan due dates, attainment dates and attainment date extension criteria;
- the process for determining control strategies, including Reasonably Available Control Measures/Reasonably Available Control Technology (RACM/RACT) for Moderate areas and Best Available Control Measures/Best Available Control Technology (BACM/BACT) and Most Stringent Measures (MSM) for Serious areas;
- guidelines for attainment demonstrations for areas that can attain by the statutory attainment date, and “impracticability” demonstrations for areas that cannot practicably attain by the statutory attainment date;
- Reasonable Further Progress (RFP) and quantitative milestones (QM) for demonstrating RFP; and
- contingency measures for areas that fail to meet RFP or fail to attain the NAAQS by the attainment date.

* Federal Register, Vol. 74, No. 218, November 13, 2009 (74 FR 58688).

† Federal Register, Vol. 82, No. 89, May 10, 2017 (82 FR 21711).

‡ Federal Register, Vol. 81, No. 164, August 24, 2016 (81 FR 58010).

On September 8, 2017, EPA approved the FNSB PM_{2.5} Moderate Area SIP (effective October 10, 2017) which was originally submitted by DEC in December 2014 (and included supplemental clarifying information). EPA found that the Moderate SIP met all statutory and regulatory requirements including those for base-year and projected emissions inventories as well as those associated with Reasonable Further Progress, Quantitative Milestone and Motor Vehicle Emission Budget (MVEB) requirements.

On December 13, 2019, DEC submitted the Fairbanks PM_{2.5} Serious Area SIP to EPA. Its key finding was that attainment by the statutorily required date of December 31, 2019 was not possible. As clarified in the PM Rule and in accordance with CAA section 189(d), Fairbanks was then required to submit a plan revision to EPA within 12 months of failing to attain by December 2019. This plan revision required annual reductions in PM_{2.5} or precursor emissions within the area of not less than 5 percent of the amount of such emissions as reported in the most recent inventory prepared for Fairbanks.

On December 15, 2020, DEC submitted this revised Plan, the 2020 Amendments to the Serious Area SIP (or 2020 Amendments Plan) to EPA. It accounted for incorporation of more recent ambient monitoring data (from 2016 through 2019) and an associated 2019 Base Year into the attainment modeling analysis as required under the PM Rule for Serious nonattainment areas that fail to attain the NAAQS. This recent monitoring data showed steady decreases in ambient PM_{2.5} concentrations that resulted in a significantly lower baseline “design value” in the nonattainment area than applied in the Serious SIP. Thus, the attainment analysis in the 2020 Amendments Plan was able to model attainment by December 31, 2024. Updated emission inventories and an updated RFP/QM analysis were also included in the 2020 Amendments Plan.

Thus, the 2020 Amendments Plan is the single, comprehensive plan for the Fairbanks PM_{2.5} nonattainment area currently before EPA and serves at the basis for this RFP report as explained below.

2020 Amendments Plan RFP Requirements – Section 189(c)(1) of the CAA requires PM implementation plans to include Quantitative Milestones which are to be achieved every 3 years until the area is re-designated attainment and which demonstrate reasonable further progress toward attainment by the applicable date. QM requirements for PM_{2.5} for the 2020 Amendments SIP are given in 40 C.F.R. § 51.1013(a)(3) and 40 C.F.R. § 51.1013(a)(4). Based on the 2019 Base Year and 2024 Attainment Year reflected in that Plan, Table 1-1 lists the applicable RFP and QM analysis years.

**Table 1-1
FNSB Reasonable Further Progress and Quantitative Milestone Analysis Years**

Base Year	Attainment Year	RFP and QM Analysis Years
2019	2024	2020, 2023, 2026

As required under 40 C.F.R. § 51.1013(b), not later than 90 days after the date on which a milestone applicable to a PM_{2.5} nonattainment area occurs, each state in which all or part of such area is located shall submit to the EPA Administrator a milestone report that contains all of the following elements:

1. A certification by the Governor or Governor's designee that the attainment plan control strategy is being implemented consistent with the RFP plan, as described in the applicable attainment plan;

2. Technical support, including calculations, sufficient to document completion statistics for appropriate milestones and to demonstrate that the quantitative milestones have been satisfied and how the emissions reductions achieved to date compare to those required or scheduled to meet RFP; and,
3. A discussion of whether the area will attain the applicable PM_{2.5} NAAQS by the projected attainment date for the area.

This RFP report (subsequently referred to as the 2021 RFP report) reflects the State of Alaska's commitment to fulfilling these reporting requirements as they pertain to satisfying QM requirements for the progress toward attainment of the 2006 PM_{2.5} NAAQS in the FNSB nonattainment area.

RFP Metric and Applicable Pollutants – As explained within Section III.D.7-10 of the 2020 Amendments Plan, Alaska has chosen to use EPA's preferred metric: emission reductions achieved compared to projected emission reductions to track and report on RFP. As also explained within Section III.D.7-10 of the 2020 Amendments Plan, pollutants for which RFP must be reported for the Fairbanks PM_{2.5} nonattainment area consist of directly emitted PM_{2.5}, and precursor pollutants, sulfur dioxide (SO₂) and ammonia (NH₃).

Control Measures Evaluated – The control measures for which RFP was evaluated under this report are listed in Table 1-2 along with the implementation/phase-in schedule for each measure by RFP year. This list of control measures corresponds to those presented in Sections III.D.7.9 (Attainment Demonstration) and III.D.7.10 (RFP/QM) for emission benefits were quantified and thus represents a subset of the BACM and BACT controls adopted as State of Alaska air quality regulations with the 2020 Amendments Plan under 18 AAC 50.*

* <https://www.epa.gov/sites/production/files/2017-10/documents/sip-ak-approved-regulations-18-aac-50.pdf>

**Table 1-2
Control Measure Implementation/Phase-In Schedule**

Measure Abbrev	Measure Description	Start Year	Implementation Parameter	Phase-In Schedule by RFP Year		
				2020	2023	2026
WSCO	WSCO Program	2010, On-going	No. of Changeouts	2,791	3,853	5,114
CURT	Curtailment Program	2016, On-going ^a	Compliance Rate	30%	45%	50%
STF-12	Shift #2 to #1 Oil	2023	Combined Penetration/Compliance Rate	n/a	100%	100%
STF-13	Commercial Dry Wood	2022	Combined Penetration/Compliance Rate	n/a	75%	75%
STF-17	Wood Device Removal	2024	Combined Penetration/Compliance Rate	n/a	n/a	50%
BACM-R8	Wood Emission Rates	2020	Combined Penetration/Compliance Rate	100%	100%	100%
BACM-48	Remove Coal Devices	2024	Combined Penetration/Compliance Rate	n/a	n/a	75%
STF-22	No Primary Wood Heat	2020	Combined Penetration/Compliance Rate	80%, 100%	80%, 100%	80%, 100%
STF-23	NOASH/Exmptn Requirements	2020	Combined Penetration/Compliance Rate	0%	50%	100%
NGE	Natural Gas Expansion	2020	New Customers/Conversions	85	294	294
BACT	Point Source SO ₂ BACT	2021	Sector-Averaged Reduction Factor	n/a	22%	53%

n/a – Not applicable

^a Includes lowering of alert stage thresholds from 25 µg/m³ and 35 µg/m³ to 20 µg/m³ and 30 µg/m³ for Stages 1 and 2, respectively, effective January 8, 2020 as adopted under State regulations.

For each measure, Table 1-2 lists the start year (first full calendar year from planned implementation date), the parameter used to describe measure penetration or phase-in and their forecasted values in each RFP year. For most measures listed in Table 1-2, the implementation parameter is the combined compliance and penetration rate forecasted for the measure in each applicable year. For the Wood Stove Change Out (WSCO) Program, which also included the Borough-funded Oil-To-Gas Conversion (OGC) Program as discussed in detail in Section III.D.7.6.8.1 of the 2020 Amendments Plan, the implementation parameter listed is the expected number of change-outs.

At the bottom of Table 1-2, the implementation parameter listed is the point source sector-averaged SO₂ reduction factor. These factors (22% in 2023 and 53% in 2026) represent percentage reductions in emissions totaled across all facilities in the nonattainment area from BACT controls adopted by the state that begin phasing in by calendar year 2021. Since DEC has determined some facilities will not require additional BACT controls, these reduction factors represent total SO₂ reductions across all operating point source facilities (including those without additional controls). They are internally consistent with the facility and emission unit specific reduction factors presented in Section III.D.7.6.8.1 of the 2020 Amendments Plan under “Point Source Controls.”

Updates to 2020 Amendments Plan Control Inventories - Given the short time period between preparation and submittal of the 2020 Amendments Plan (in December 2020) and this 2021 RFP report, the implementation start years and projected phase-in levels match those contained in Section III.D.7.10 (Table 7.10-4) of the 2020 Amendments Plan and continue to reflect the State’s current implementation schedule with two exceptions highlighted in Table 1-2:

1. the Wood Stove Change Out (WSCO) Program operated locally by FNSB; and
2. Natural Gas Expansion (NGE).

Actual WSCO data representing completed/validated change out transactions through calendar year 2020 were incorporated into this evaluation along with updated change out forecasts beyond 2020 that account for WSCO Program funding under the recently awarded 2019-2020 Alaska Targeted Airshed Grant (TAG) from EPA. (Under the 2020 Amendments Plan, actual WSCO data through calendar year 2019 were available. Forecasted change-outs in later years were based on these actual data through 2019, coupled with projections based on TAG funding in hand at the time the Plan was prepared, which did not include the latest 2019-2020 TAG award.)

As explained in further detail in Section 3 of this 2021 RFP report, this additional year of historical WSCO data and revised WSCO projections that reflected funding from the 2019-2020 TAG were incorporated into the control inventories supporting the RFP analysis. As shown in Table 1-2 the historical change outs in RFP year 2020 (reflected completed transactions through calendar year 2019) remain unchanged relative to control inventories in the 2020 Amendments Plan. The revised numbers highlighted for RFP years 2023 and 2026 reflect these adjustments.

Natural gas expansion has been included in Fairbank PM_{2.5} Plans since the Moderate SIP as the State has continued to look for ways to expand use of natural gas for residential and commercial space heating within the nonattainment. In the 2020 Amendments Plan, the state did not include any near-term quantitative benefits for expanded use of natural gas beyond the roughly 1,100 residential and commercial customers (circa 2013) within a subset of the nonattainment area initially served by Fairbanks Natural Gas (FNG) and more recently, the Interior Gas Utility (IGU), a public corporation. Instead, benefits were only forecasted beyond 2026 based on IGU expansion projections given the historical difficulty in achieving large-scale natural gas expansion within the Fairbanks area and the resulting uncertainty of these forecasts. Thus, in the 2020 Amendments Plan no expansion of natural gas use was assumed in modeling attainment by 2024.

IGU has completed construction of a 5 million gallon liquified natural gas (LNG) storage tank and as of August 2020, had transported just over 2 million gallons of LNG inventory* from the Cook Inlet near Anchorage. IGU is also contracting infrastructure projects to expand natural gas service areas within Fairbanks and North Pole.

Data on new residential and commercial natural gas customers added by calendar year from 2014 through 2020 were obtained from IGU† and incorporated into the RFP inventory analysis. The counts shown in the NGE row of Table 1-2 reflect cumulative counts of new customers (residential and commercial) as of the start of each RFP year based on these IGU data. As explained in Section III.D.7.6 of the 2020 Amendments Plan, its emission inventories did not account for any new customers or expanded natural gas usage since 2013 (in part due to the accelerated schedule for its development). As explained in greater detail in Section 3 of this report, these recently obtained natural gas customer data were incorporated into this RFP analysis.

MOVES Model Version – Effective January 7, 2021‡, EPA released a new version of its MOVES mobile source vehicle emissions model, MOVES3 for use in SIP and conformity applications. The

* Interior Gas Utility 2020 Q3 Quarterly Report to the Fairbanks North Star Borough Assembly, <https://www.interiorgas.com/fnsb-quarterly-reports/>

† Email from Elena Sudduth, IGU to Nick Czarnecki, FNSB, January 22, 2021.

‡ Federal Register, Vol. 86, No. 4, Thursday, January 7, 2021

prior version, MOVES2014b was used to develop the emission inventories, attainment modeling and quantitative milestone targets in the 2020 Amendments Plan. DEC has continued to use MOVES2014b to represent mobile source emissions for this RFP report to maintain consistency with the milestone emission targets established in the 2020 Amendments Plan, which are based on that version of the model.

Other Data Examined – In addition to revising the control inventory projections in the 2020 Amendments related to the WSCO Program and additional natural gas customers as discussed above, DEC also evaluated available data from its Commercial Wood Seller Moisture Disclosure database and information provided by Aurora Energy* regarding initial operation of its wood drying kiln in 2020. As discussed later in Section 3, these wood seller moisture and drying kiln sales data were evaluated to verify projections made by DEC regarding penetration/compliance assumptions for its Commercial Dry Wood control measure (STF-13 in Table 1-2) contained in 18 AAC 50.076.

Moreover, DEC also reviewed assumptions and penetration/compliance rate projections for all other measures listed earlier in Table 1-2 and confirms they remain unchanged from the submitted 2020 Amendments Plan.

1.2 RFP Findings

Emission Reduction Targets – Based on the control measures and implementation/phase-in schedule presented earlier in Table 1-2 projected emission reductions for each applicable pollutant in each calendar year were calculated and compared to targets in milestone years (2020, 2023 and 2026) to evaluate linear progress toward attainment. Table 1-3 (reprinted from Table 7.10-3 of the 2020 Amendments Plan) shows calculated RFP/QM milestone year emission reduction targets based on linear progress towards attainment by 2024, along with 2019 Base Year and 2024 Attainment Year emissions for the nonattainment area.

**Table 1-3
Linear Milestone Year Emission Reduction Targets (tons/day)**

Pollutant	Emissions (tons/day)		Reduction Targets (tons/day)		
	2019	2024	2020	2023	2026
Direct PM _{2.5}	3.17	1.99	0.24	0.94	1.18
SO ₂	15.01	10.71	0.86	3.44	4.30
NH ₃	0.293	0.316	-0.005	-0.018	-0.023

The linear emission reduction targets in each milestone year are highlighted in the rightmost columns of Table 1-3. Emissions and emission reductions reflect daily averages over the modeled nonattainment episode days.

The negative reductions for NH₃ reflect population growth-projected emission increases between 2019 and 2024 coupled with the fact that NH₃ emission benefits were not quantified from controls within the sectors evaluated given the uncertainty of underlying NH₃-specific emission factors as explained in greater detail in Section III.D.7.10.3.1 of the 2020 Amendments Plan. There it is noted

* Email from Chad Schumacher, Aurora Energy Solutions to Steven Hoke, DEC, January, 22, 2021.

that NH₃ emission factors for wood-burning devices have a particularly high level of uncertainty, but comparisons between emission factors for wood-burning vs. heating oil or natural gas burning space heating devices indicate controls that shift wood use to liquid and/or gaseous fueled devices provide significant reductions in NH₃ emissions, despite the uncertainty associated with wood burning devices. These emission factor comparisons in the 2020 Amendments Plan, clearly demonstrate that the State’s control measures would be expected to provide NH₃ co-benefits at levels like those for PM_{2.5} if quantified.

Calculated Emission Reductions – Based on the control measure phase-in schedule presented earlier in Table 1-2 (with revisions to the WSCO and NGE elements relative to the 2020 Amendments forecasts), projected emission reductions for each applicable pollutant in each milestone year were calculated and compared to their targets to provide an updated evaluation of linear progress toward attainment. These comparisons are summarized in Table 1-4 (in a format consistent with that reported in Table 7.10-5 of the 2020 Amendments Plan).

The target reductions shown in Table 1-4 are from Table 1-3. Achieved reductions were calculated for each milestone year based on individual measure projected implementation and phase-in. Achievement of linear progress in a given milestone year is indicated by a “Yes” or “No” in the “Linear Progress Met?” row for each pollutant.

As shown in the upper third of Table 1-4, direct PM_{2.5} emission reductions achieved within each milestone year are projected to meet or exceed linear progress toward estimated attainment by 2024 (and through 2026).

**Table 1-4
Projected Progress toward Linear Emission Reduction Targets (tons/day)**

Pollutant	Metric	2020	2023	2024	2026
Direct PM _{2.5}	Target Reduction	0.24	0.94	<i>1.18</i>	1.18
	Achieved Reduction	0.35	1.08	<i>1.29</i>	1.63
	Linear Progress Met?	Yes	Yes	<i>Yes</i>	Yes
SO ₂	Target Reduction	0.86	3.44	<i>4.30</i>	4.30
	Achieved Reduction	-0.27	2.44	<i>4.32</i>	4.19
	Linear Progress Met?	No	No	<i>Yes</i>	No
NH ₃	Target Reduction	-0.005	-0.018	<i>-0.023</i>	-0.023
	Achieved Reduction	-0.005	-0.020	<i>-0.023</i>	-0.028
	Linear Progress Met?	Yes	No	<i>Yes</i>	No

The middle portion of Table 1-4 indicates that progress toward attainment for secondary pollutant SO₂ is expected to be non-linear. This non-linearity in control measure reductions for SO₂ is due to two causes. First, most of the measures designed to reduce direct PM_{2.5} through removal, curtailment or replacement of solid-fuel devices trigger a shift in heating energy to higher SO₂ emitting heating oil. Second, decreases in SO₂ emissions reflected in Table 1-4 to offset these increases are the result of the following SO₂-specific measures:

- Shift from #2 to #1 Oil (STF-12) for space heating by 2023; and
- Point source SO₂ BACT controls that phase in from 2021-2024.

Thus, control measure emission reductions for SO₂ exhibit stepwise rather than linear progress. The explanation above justifies this stepwise progress as required under 40 CFR 51.1012(4).

Finally, progress for NH₃ is shown in the lower portion of Table 1-4 and indicates that linearly established targets for will be met in RFP year 2020 (and the forecasted 2024 attainment year). The emission reductions for NH₃ shown in Table 1-4 are not due to control measures benefits. As noted earlier, control measure reductions were only quantified for direct PM_{2.5} and SO₂.) The State plans to more formally evaluate benefits from NH₃ controls in the future once its significance as a PM_{2.5} precursor in Fairbanks is better understood.

Graphical Comparisons – Figure 1-1 through Figure 1-3 provide visual pictures of forecasted emission reduction progress for direct PM_{2.5}, SO₂ and NH₃, respectively between the 2019 base year, the 2024 attainment year, and the applicable 2020, 2023 and 2026 QM years. Emission targets established with the 2020 Amendments Plan for each QM year are plotted as blue circles; the linear progress trajectory between the 2019 Base Year and the 2024 Attainment Year is shown as a dashed red line. Finally, the updated emission projections developed under this report are shown in green.

Forecasted PM_{2.5} emissions as shown Figure 1-1 are below the linear progress line in each QM year from 2020 through 2026. In Figure 1-1, these updated PM_{2.5} emissions are also slightly below the milestone targets in 2023 and later years due largely to the increase in projected WSCO Program changeouts resulting from the additional 2019-2020 TAG funding.

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

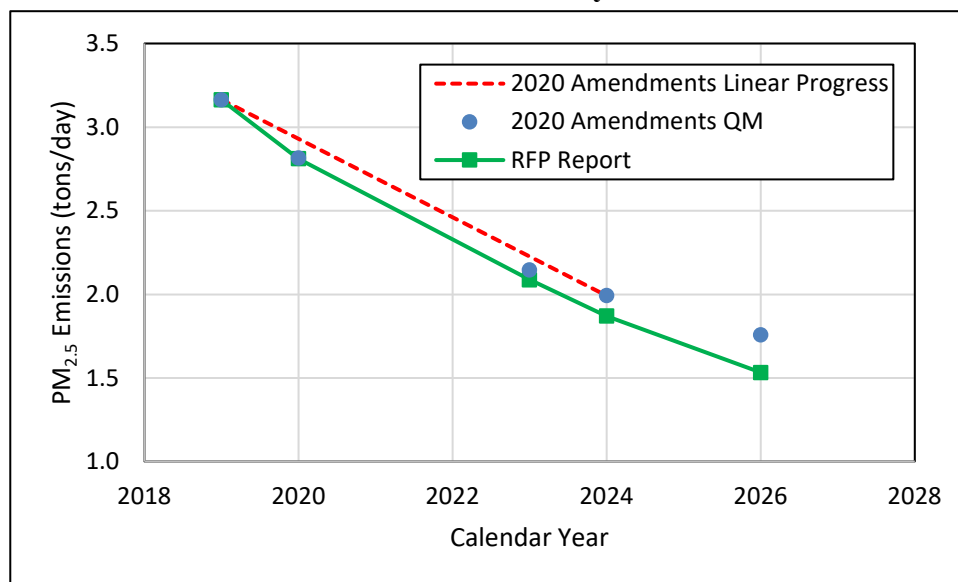
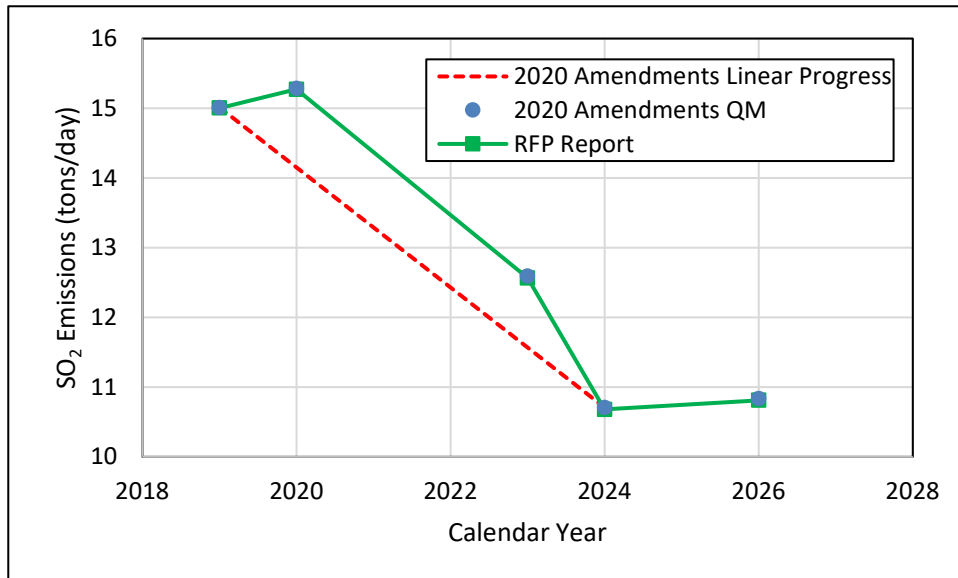


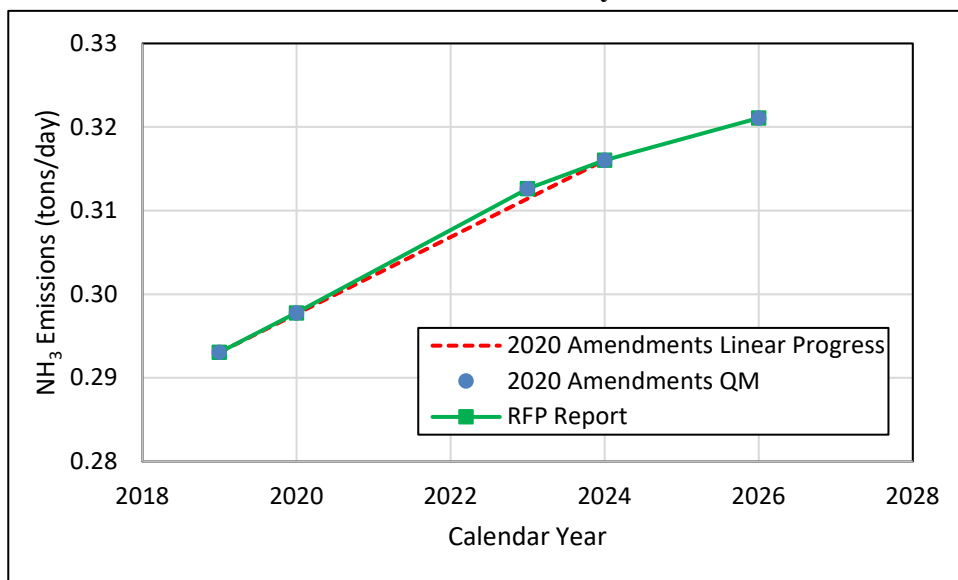
Figure 1-2 illustrates the stepwise progress toward 2024 attainment for SO₂ emissions in the nonattainment area.

Figure 1-2
Quantitative Milestone Analysis for SO₂



Finally, in Figure 1-3 NH₃ emissions are close to the linear progress line in each applicable QM year.

Figure 1-3
Quantitative Milestone Analysis for NH₃



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.

Appendix A provides a discussion of on-going activities and programs at the State and Borough levels that promote emission reductions beyond those measures and data directly analyzed in the body of this RFP report.

###



THE STATE
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March 26, 2021

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

Dear Ms. Pirzadeh:

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 Quantitative Milestone Report for the Fairbanks North Star Borough's (FNSB) PM2.5 nonattainment area. The State Implementation Plan (SIP) for the FNSB PM2.5 nonattainment area identified specific milestones to be reached in 2020. The enclosed report verifies that the 2020 milestones have been met.

Alice Edwards 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,

A handwritten signature in cursive script, appearing to read "Jason Brune".

Jason Brune
Commissioner

cc: Krishna Viswanathan, EPA Region 10 (w/o enclosures)
Debra Suzuki, EPA Region 10 (w/o enclosures)
Matt Jentgen, EPA Region 10 (w/o enclosures)
Alice Edwards, Director, Division of Air Quality (w/o enclosures)
Cynthia Heil, Program Manager, ANPMS Program (w/o enclosures)

3. SUPPORTING CALCULATIONS

This section of the 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 2020 Amendments Plan 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 Plan was submitted or are projected to accumulate additional emission reductions beyond the 2019 Base Year of the Plan through the applicable QM years (2020, 2023 and 2026) and the attainment year (2024).

As noted earlier, given the roughly three-month period between submittal of the 2020 Amendments Plan to EPA and the preparation of this RFP report (due to EPA by March 21, 2021), the supporting calculation details discussed in this section focus solely on the three measures/programs for which additional data could be obtained and analyzed within this timeframe: WSCO Program, STF-13 (Require Commercially Sold Wood to be Dry) and NGE (Natural Gas Expansion).

Detailed calculations and supporting assumptions and data for the other control measures for which emission benefits were quantified are presented by reference within the 2020 Amendments Plan as follows:

- Section III.D.7.6.8 – Provides a discussion of the control measures and activity data and methods used to estimate emission reductions in the 2024 attainment year.
- Section III.D.7.9.2.2 – Contains summaries of calculated emission reductions by individual control measure/program and combined “packaged” benefits (that avoid double counting of benefits where measures overlap) for attainment year 2024 and 2023 (the year used to evaluate expeditious attainment).
- Appendix III.D.7.6 – Spreadsheets included with this Emission Inventory appendix that provide documented step-by-step calculation of the PM_{2.5} and SO₂ emission benefits from each of the measures (and the methodology to account for measure overlap) in each year from 2020 through 2029.

3.1 Updated Control Measure Benefit Calculations

Control Measures Analyzed and Implementation/Penetration Schedules – Table 3-1 (adapted from Table 7.9-2 of the 2020 Amendments Plan) lists the control measures for which emission benefits were quantified along with the initial implementation year for each measure as adopted within the 2020 Amendments Plan. Highlighted rows refer to measures for which updated data was evaluated under this RFP report.

**Table 3-1
List of Control Measures for Which Emission Benefits Were Quantified**

Source Sector	Measure ID	Measure Summary	Start Year
Area, Space Heat	WSCO	Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding ^a	On-going, thru 2025
	Curtailement	Solid Fuel Burning Appliance (SFBA) Episodic Curtailement Program, reflects enhanced compliance by future attainment date	On-going
	STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	2023
	STF-13, Modified BACM 31, 32	Requires commercially sold wood to be dry before sale	2022
	STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified devices and cordwood outdoor hydronic heaters (OHHs)	2024
	BACM R8, R9, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU (hydronic heaters) certified PM emission rates for new or re-conveyed wood devices	2020
	BACM 48, 49	Removal of coal heaters	2024
	STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	2020
	STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	2020
Point	n/a	BACT SO ₂ controls	2021

^a Reflects WSCO program funding through 2016, 2017, 2018 and 2019-2020 EPA-awarded Targeted Airshed Grants (TAGs).

The column labeled “Start Year” in Table 3-1 identifies the initial year scheduled for implementation. This is defined as the first full year for which a measure is in place. (For example, a measure implemented in October 2021 has a start year of 2022.)

The Borough’s Wood Stove Change Out (WSCO) Program is shown at the top of Table 3-1. It will continue to provide benefits from change outs projected through 2025 based on currently available funding, which as discussed in detail later now includes the 2019-2020 TAG award to Alaska. Measures below the WSCO Program reflect State measures for which benefits were quantified and included in the 2020 Amendments control inventories and this RFP report. (Table 7.7-7 of Section III.D.7.7 of the 2020 Amendments Plan provides a more detailed description of each measure along with a cross walk to adopted State regulation sections.) Point source SO₂ controls determined as BACT by DEC are listed at the bottom of Table 3-1 and were also included in the 2020 Amendments Plan control inventories and this RFP report.

Emission reductions were also estimated from historical data obtained related to Natural Gas Expansion (NGE as listed earlier in Table 1-2). Since it is not a formal control measure, it was not listed in Table 3-1, but emission reductions from added natural gas customers relative to those accounted for in the 2020 Amendments Plan inventories were estimated as described later in this subsection.

Table 3-2 (adapted from Table 7.9-3 in the 2020 Amendments Plan) summarizes forecasted measure penetration phase-in rates for each measure. Beyond those measures for which additional data were obtained and analyzed under this RFP report, DEC also re-evaluated these penetration

rates and believes they remain unchanged from the schedule listed in Table 3-2 (and the 2020 Amendments Plan).

**Table 3-2
Control Measure Phase-In Forecast for Inventory Years 2020-2026**

Source Sector	Measure Summary and ID	Phase-In Percentages (%) by Year						
		2020	2021	2022	2023	2024	2025	2026
Area, Space Heat	Borough Wood Stove Change Out Program (WSCO)	2,791 ^a	3,111 ^a	3,428 ^a	3,645 ^a	3,754 ^a	3,791 ^a	3,791 ^a
	SFBA Episodic Curtailment Program (Curtailment) ^b	30%	30%	40%	45%	45%	45%	45%
	(Shift space heating from #2 to #1 oil (STF-12))	n/a	n/a	n/a	100%	100%	100%	100%
	Requires commercially sold wood to be dry before sale (STF-13)	n/a	n/a	50%	75%	75%	75%	75%
	Removal of all uncertified devices & cordwood OHHs (STF-17)	n/a	n/a	n/a	n/a	15%	15%	15%
	2.0 g/hr and 0.10 lb/mmBTU certified emission rates for new or re-conveyed wood devices (BACM-R8)	100%	100%	100%	100%	100%	100%	100%
	Removal of coal heaters (BACM-48)	n/a	n/a	n/a	n/a	25%	25%	25%
	Wood-fired devices may not be primary or only heating source (STF-22)	80%, 100% ^c	80%, 100% ^c	80%, 100% ^c	80%, 100% ^c	80%, 100% ^c	80%, 100% ^c	80%, 100% ^c
	NOASH/Exemption requirements (STF-23)	0%	10%	30%	50%	70%	70%	70%
Point	BACT SO ₂ controls	n/a	20% ^d	20% ^d	22% ^d	53% ^d	53% ^d	53% ^d

n/a – Not applicable in years preceding start year.

^a WSCO program phase-in metric is cumulative change outs since program inception (July 2010) and reflects projected device change-outs/conversions developed by the Borough based on funding secured through preparation of the 2020 Amendments Plan. It excludes updated change-outs forecasted from the recently awarded 2019-2020 TAG.

^b Metric shown for Curtailment Program is the compliance rate. Although not shown in the table, the emission benefits analysis also includes State revisions to Curtailment program strengthening alert stage thresholds from 25 and 35 µg/m³ to 20 and 30 µg/m³ for Stages 1 and 2, respectively, effective January 2020.

^c Paired percentages for Measure STF-22 reflect compliance/penetration rates for existing and new home components of the measure, respectively.

^d Metric for BACT SO₂ control phase-in is the point source sector-wide control reduction in each year from BACT controls required for specific facilities/fuels in that year.

The “n/a” (Not Applicable) indicators in Table 3-2 reflect initial implementation dates for each measure (as listed in the “Start Year” column of Table 3-1) as evaluated by DEC to support expeditious attainment. As explained in further detail in Sections III.D.7.7 and III.D.7.9 of the 2020 Amendments Plan, DEC evaluated lead-time requirements (where applicable for specific measures such as shifting to #1 heating oil) in establishing the earliest feasible implementation dates for each measure.

As also explained in the 2020 Amendments Plan (starting on page III.D.7.9-9), the rationale for the improvements/changes in penetration rates over time is provided separately by measure as follows:

- *Wood Stove Change Out Program* – The projected change outs listed in Table 3-2 are based on funding from the 2016, 2017 and 2018 and the newly-awarded 2019-2020 TAGs. The additional 2019-2020 TAG funding will also incentivize compliance/penetration for other measures as noted below.
- *Curtailment Program* – Though not shown in Table 3-2, the compliance rate for the curtailment program was believed to have increased from 20% in 2017 to 30% in 2019 based on limited compliance survey data collected by the Borough and DEC during winter season 2018-2019. Under that survey, field observations for roughly 100 residences were conducted to identify wood smoke plumes during curtailment episodes. Although there was some sample bias for the selected residences and field observations were generally made during daylight hours (to better discern wood smoke plumes), nearly 80% of the observations were found to comply with the curtailment restrictions. Based on this limited field survey, DEC conservatively estimated that overall compliance with the curtailment program had risen to 30% as of early 2018, driven by on-going public education about the program since its inception.

The expected increase in compliance from 30% in 2019 to 45% in 2023 and 2024 is driven by funding anticipated under the 2019-2020 TAG. Funding under the TAG will be used to: 1) deploy roadway dynamic message sign (DMS) systems within the nonattainment area to increase public awareness of curtailment alerts; 2) purchase and use of infrared camera to enhance enforcement under dark/low-light winter conditions; 3) increase compliance staffing; and 4) perform additional in-field curtailment compliance assessment and enforcement surveys.

- *Shift to #1 Oil (STF-12)* – This measure requires a one-time shift from the current mix of #2 and #1 heating oil refined and sold in the nonattainment area by September 2022. Thus, the 100% penetration rate in 2023 and later calendar years reflect that shift.
- *Commercially-Sold Dry Wood (STF-13)* – Regulations adopted under the Serious SIP (18 AAC 50.076) require commercially sold wood after October 1, 2021 to be dry, or if sold as 8-ft length rounds, to require proof of proper/adequate storage for drying by the buyer. Based on moisture data currently being collected from commercial wood sellers (who must currently measure and disclose the moisture levels of their wood sales to DEC), DEC has estimated initial compliance in 2022 (first full year) of 50%. This accounts for current levels of dry wood sold, rounds vs. split log volume and “operational transitions” sellers have to mechanically dry wood on site or establish seasoning/drying practices. After this first year, compliance is forecasted to increase to 75% as these operational transitions are completed and DEC has a full year of sales data in hand, coupled with its on-going practice of periodically visiting commercial wood sellers and performing on-site moisture verification measurements.
- *Solid-Fuel Device Removal Measures (STF-17, BACM-48)* – Compliance rates in the first full year of implementation (2024) of these uncertified wood and coal heating device measures were estimated at 15% and 25% respectively based on existing/on-going public education/outreach efforts. Though not shown in Table 3-2, they are forecasted to increase after 2024 associated with further removal incentivization and compliance survey funding available through the expected 2019-2020 TAG award.
- *Wood Device Emission Rates (BACM-R8)* – The 100% compliance/penetration rate estimated for this measure reflects the volume of home sales (projected from historical data) coupled with

DEC's adoption of 18 AAC 50.077(h), which requires registration of wood-fired heating devices upon sale or conveyance of a property.

- *Prohibit Wood Devices as Primary Heat Source (STF-22)* – Similar to the measure above, the compliance/penetration rates of 80%/100% for new sales and reconveyance transactions are based on enforcement through the registration requirements under 18 AAC 50.077(h). The new sales compliance rate is discounted from 100% to 80% to account for the estimated fraction of large lot (greater than 2 acre) cabins which are exempted from this requirement.
- *NOASH/Exemption Requirements (STF-23)* – The rates given in Table 3-2 for this measure reflect projected penetration rate increases associated with annual renewal and device registration requirements, proper installation and maintenance determinations from third-party verifiers, and requirements for catalyst replacement when manufacturer recommended catalyst useful life is reached (estimated at six years averaged across manufacturers). These elements are also coupled with projected impacts from the NOASH reduction program funded under the anticipated 2019-2020 TAG.
- *BACT SO₂ Controls (Point Sources)* – Finally, the phase-in percentages shown for the point source BACT controls reflect the relative SO₂ emission reductions (summed across the entire Point Source sector) projected in each year from these fuel and technology controls.

The remainder of this subsection describes the analyses and updated emission benefit calculations from the additionally obtained data since the 2020 Amendments Plan was prepared and submitted to EPA.

Wood Stove Change Out Program (WSCO) – Section III.D.7.6.8.1 of the 2020 Amendments Plan provides a detailed discussion of the operation of and provisions within the Wood Stove Change Out (WSCO) Program operated by the Borough since July 2010. In short, it offers cash incentives to residents within the nonattainment areas for replacement (or repair) of older, higher-polluting residential wood-burning devices with new cleaner devices or removal of the old devices.

In addition, the Borough appropriated funding in 2020 for an additional Oil-To-Gas Conversion (OGC) Program designed to incentivize conversions in homes using heating oil to natural gas-fueled heating systems. The activity and emissions benefits for the WSCO Program also include this OGC component for 2020 and later years.

Similar to the emission benefit calculation methodology employed in the 2020 Amendments Plan, data on completed/verified changeout transactions were obtained from the Borough and broken down into change-out types for which average emission benefits per device were calculated from historical data. These change-out types are defined as follows:

- SFBA-N>Y – Replacement of uncertified SFBA with EPA-certified SFBA
- SFBA-Y>Y – Replacement of EPA-certified SFBA with cleaner (<2 g/hr) EPA-certified SFBA
- Conv-All – Conversion of SFBA to heating oil, natural gas or emergency power/electric device
- FNSB O>G – Conversion of heating oil to natural gas device (under OGC Program)
- Removal – Removal of SFBA with no replacement
- Bounty – Non-deeded removal from anywhere in nonattainment area

- Repair – Repair of existing SFBA
- NOASH Red – Replace/repair/upgrade of SFBAs in NOASH (No Other Adequate Source of Heat) households.

As explained in the 2020 Amendments Plan, change-outs of EPA-certified to cleaner certified SFBA's have been de-prioritized and no further transactions of this type (SFBA,Y>Y) are projected in 2020 and later years. In addition, the Bounty and NOASH Reduction change-outs were added to the 2019-2020 TAG application and are forecasted to begin sometime in 2021.

A Bounty transaction consists of non-deeded removal of an existing SFBA with eligibility throughout the nonattainment area. Currently, deeded SFBA removals are only allowed within the Air Quality Control Zone (AQCZ) portions of the nonattainment area. Lower reimbursements would be offered for Bounty transactions (relative to deeded Removals) to ensure deeded Removals are still incentivized. A NOASH Reduction change-out targets reductions in solid-fuel emissions from households that have no other adequate heat source (NOASH), and are currently granted a waiver from the Curtailment Program, when approved as a NOASH household. The NOASH Reduction element is intended to incentivize shifts from solid fuel burning in these households to cleaner fuel, assumed to be heating oil.

Within the 2020 Amendments Plan, actual historical data from the WSCO used to analyze emission benefits included all completed transactions through the end of calendar year 2019. Projections developed by the Borough on future transactions in 2020 and later years were then based on funding in-hand from the 2016, 2017 and 2018 TAGs at the time the Plan was developed, coupled with staffing capacity-based annual throughput limits.

These projected future WSCO transactions within the 2020 Amendments Plan were developed in mid-March 2020, prior to the onset of the COVID-19 pandemic.

For this 2021 RFP report, the Borough provided actual, completed WSCO data for another full calendar year, through the end of 2020, and evaluated and updated its forecasted future change-out projections to account for two factors:

1. The effects of the pandemic on WSCO Program activity; and
2. Additional funding from EPA's awarded 2019-2020 TAG.

Although the pandemic resulted in a number of WSCO applications being queued for a longer period than normal due to the fact that inspectors could not visit homes to verify proper installation of new devices and removal of old devices, the Borough remained as pro-active as possible in continuing public education and communication efforts regarding the WSCO Program through this time. Within the 2020 Amendments Plan, the Borough had forecasted a total of 320 completed change-outs in calendar year 2020. Due to the effects of the pandemic, that number was reduced to 264 actual change-outs, with the shortfall amount (~60) still queued for verification as of the end of 2020 but dwindling rapidly as the stiff pandemic lockdowns are lifted.

The Borough's updated WSCO projections for this RFP report reflects its expectation that pandemic impacts dissipate in 2021 and that additional funding from the 2019-2020 TAG (not accounted for in the 2020 Amendments Plan) will provide increases in WSCO activity in 2023 and later years.

Table 3-3 presents a comparison of these updated WSCO projections to those contained in the 2020 Amendments Plan by calendar year from 2020 through 2025. (Recall that activity related to a control measure that occurs within a calendar year is not applied until the beginning of the following calendar year, consistent with SIP accounting practices. For example, change-outs in calendar year 2020 are applied to the 2021 SIP or RFP control inventories.)

As shown in the bottom row of Table 3-3, the shortfall in WSCO Program activity in 2020 due to the pandemic is expected to be overcome by the end of 2021. And increases in change-outs in calendar 2022 and later years are anticipated from the additional 2019-2020 TAG funding.

**Table 3-3
Current and 2020 Amendments Plan Projected WSCO Program Activity**

Change-Out Type	Current (March 2021) Projected WSCO Program Activity						2020 Amendments Plan (March 2020) Projected WSCO Program Activity					
	2020 ^a	2021	2022	2023	2024	2025	2020	2021	2022	2023	2024	2025
SFBA-N>Y	7	18	45	35	45	51	15	10	0	0	0	0
SFBA-Y>Y	0	0	0	0	0	0	0	0	0	0	0	0
Conv-All	178	309	326	301	283	321	236	239	190	103	35	0
FNSB O>G	72	15	0	0	0	0	50	50	17	0	0	0
Removal	6	28	26	36	30	35	19	18	10	6	2	0
Repair	1	7	14	23	28	32	0	0	0	0	0	0
Bounty	0	0	1	1	2	2	0	0	0	0	0	0
NOASH Red	0	3	6	10	12	14	0	0	0	0	0	0
Annual Totals	264	380	418	406	400	455	320	317	217	109	37	0
Cumulative Totals	264	644	1,062	1,468	1,868	2,323	320	637	854	963	1,000	1,000
Cumulative Totals Relative to 2020 Plan	-56	+7	+208	+505	+868	+1,323						

^a Actual, rather than forecasted transactions are given in 2020 for these updated forecasts.

One other methodological change was applied in calculating WSCO program emission reductions for this report relative to the 2020 Amendments Plan. As explained in detail in the 2020 Amendments Plan, average emission benefits per transaction for each change-out type were calculated from historical average emission reductions for each change-out within the group. (Although the groups were defined in a manner that reflected significant difference in average emission benefits from one group to the next – for example, conversions from wood to oil, gas or electric heat vs. wood-to-wood change-outs – there are smaller variations in reductions for each change-out within the group.) For the 2020 Amendments Plan, average reductions per change-out within each group were based on historical data from 2017-2019. For this RFP report, historical data from 2017-2020 were used. The impact of this adjustment was minor, resulting in changes in average reductions for each change-out type of less than 8%.

Commercially Sold Dry Wood Requirement (STF-13) – As noted in Section 1, data from DEC’s Commercial Wood Seller Moisture Disclosure database and information provided by Aurora Energy regarding initial operation of its wood drying kiln in 2020 were evaluated to assess the State’s projected compliance/penetration estimates for this control measure, adopted as a state regulation under 18 AAC 50.076.

Analysis and tabulation of the individual sales transactions for commercially sold wood for calendar year 2020 indicated that the relative volume of sold wood that is seasoned/dried has continued to significantly increase relative to prior years. In addition, the average moisture level

of wood sold as seasoned was found to be just over 10%, well below the 20% moisture level requirement for dried wood under 18 AAC 50.076.

Separately, Aurora Energy Solutions, LLC provided usage data for their wood drying kiln as operated in 2020 (but not for the entire year). Aurora indicated that a total of 548 cords of kiln-dried wood was sold in 2020 with an average moisture content of 15%.

Collectively, these reported and tabulated results for the volume and moisture level of commercial sold wood are consistent with and support DEC’s assumptions regarding implementation of the control measure starting in 2022 per Table 3-2 with a first-year compliance/penetration rate of 50%.

Natural Gas Expansion (NGE) – Finally, data on new residential and commercial natural gas customers added by calendar year from 2014 through 2020 obtained from IGU* were incorporated into the RFP inventory analysis. Table 3-4 summarizes these data, showing added residential and commercial natural gas customers and average gas usage per customer (in mmBTU per episode day). The added customers represent cumulative additional customers relative to 2013 (which reflects the amount of natural gas customers modeled in the 2020 Amendments Plan inventories). As noted earlier, the control inventory year (highlighted in Table 3-4) is the year following the calendar year these customers were added.

**Table 3-4
Added IGU Natural Gas Customers and Fuel Usage 2019-2020**

End Year	2019	2020
Control Inventory Year	2020	2021
Added Customers over Base – Resid	39	185
Added Customers over Base – Comm	46	109
Added Customers over Base – Total	85	294
New Customer Usage - Residential (mmBTU/ep day)	23.03	84.33
New Customer Usage - Commercial (mmBTU/ep day)	173.70	378.17

Emission benefits for PM_{2.5} and SO₂ were then calculated relative to the 2020 Amendments Plan control inventories for 2020 and 2021 by assuming these customers represented conversions (i.e., existing households and commercial businesses that signed up for natural gas service) and that the heating energy from natural gas replaced that of the average mix of residential and commercial devices/fuels mix). Differences in heating efficiency between natural gas and other heating devices/fuels based on assumptions in Appendix III.D.7.6 of the 2020 Amendments Plan were also accounted for.

Table 3-5 shows the resulting calculated emission reductions in each inventory year. 2021 reductions were carried forward to QM years 2023 and 2026, reflecting no additional conversions until actual data are available for these years.

* *Ibid.*

**Table 3-5
Nonattainment Area Emission Reductions (tons/episode day) from
Added Natural Gas Usage**

Emissions Reductions from Added Natural Gas Usage	2020	2021
PM _{2.5} Emission Reductions (tons/episode day)	0.0058	0.0106
SO ₂ Emission Reductions (tons/episode day)	0.0216	0.0264

3.2 Summary of Emission Reductions

Table 3-6 presents the projected PM_{2.5} emission benefits associated with the updated control measure analysis reflected in this RFP report by measure and milestone year (including the 2024 attainment year). Table 3-7 presents a similar summary for SO₂ emission benefits. (Negative numbers reflect emission increases for specific measures.) Yellow highlighted rows in each table refer to measures for which updated activity data were analyzed.

No reductions were calculated for the other precursor pollutants. The benefits shown for each individual measure are discounted to account for the overlap of measures controlling the same sources within the combined control package.

Combined measure benefits shown at the bottom of Table 3-6 also properly account for measure overlap within the combined control package (eliminating double counting of benefits).

**Table 3-6
PM_{2.5} Emission Reductions from Post-2019 Control Measures by Milestone Year**

Measure ID	Measure Summary	Emission Reductions ^a (tons/episodic day)			
		2020	2023	2024	2026
WSCO	Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding	0.28	0.74	0.86	1.03
Curtailement	Solid Fuel Burning Application Episodic Curtailement Program, reflects enhanced compliance by future attainment date	0.29	0.31	0.23	0.11
STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	n/a	0.01	0.01	0.01
STF-13, Modified BACM 31, 32	Required commercially sold wood to be dry before sale	n/a	0.10	0.09	0.08
STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified device and cordwood outdoor hydronic heaters	n/a	n/a	0.15	0.42
BACM R8, R9, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU certified emission rates for new of re-conveyed wood devices	0.09	0.33	0.38	0.41
BACM 48, 49	Removal of coal heaters	n/a	n/a	0.02	0.03
STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	0.29	0.34	0.34	0.33
STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	<0.01	<0.01	<0.01	<0.01
n/a	IGU natural gas expansion based on added customers through 2020	<0.01	0.02	0.02	0.02
Combined Total, Area Space Heating (accounting for measure overlap)		0.95	1.84	2.09	2.47
n/a	Point Source fuel-based sulfur controls	n/a	n/a	n/a	n/a
Combined Total, Point Sources		n/a	n/a	n/a	n/a

^a Emission reductions shown for each measure account for effects of overlap within the combined control package.
n/a – Not Applicable.

**Table 3-7
SO₂ Emission Reductions from Post-2019 Control Measures by Milestone Year**

Measure ID	Measure Summary	Emission Reductions ^a (tons/episodic day)			
		2020	2023	2024	2026
WSCO	Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding	<0.01	0.01	0.01	0.01
Curtailement	Solid Fuel Burning Application Episodic Curtailement Program, reflects enhanced compliance by future attainment date	-0.06	-0.08	-0.09	-0.10
STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	n/a	1.92	1.94	1.96
STF-13, Modified BACM 31, 32	Required commercially sold wood to be dry before sale	n/a	<0.01	<0.01	<0.01
STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified device and cordwood outdoor hydronic heaters	n/a	n/a	<0.01	0.01
BACM R8, R9, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU certified emission rates for new of re-conveyed wood devices	<0.01	0.01	0.01	0.01
BACM 48, 49	Removal of coal heaters	n/a	n/a	0.02	0.07
STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	<0.01	-0.01	-0.01	-0.02
STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	<0.01	<0.01	<0.01	<0.01
n/a	IGU natural gas expansion based on added customers through 2020	0.01	0.03	0.03	0.03
Combined Total, Area Space Heating (accounting for measure overlap)		-0.04	1.88	1.91	1.97
n/a	Point Source fuel-based sulfur controls	n/a	1.39	3.34	3.34
Combined Total, Point Sources		n/a	1.39	3.34	3.34

^a Emission reductions shown for each measure account for effects of overlap within the combined control package.
n/a – Not Applicable.

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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 finds that the Fairbanks Serious PM_{2.5} nonattainment area is still projected to attain the 24-hour PM_{2.5} NAAQS by December 31, 2024 the projected attainment date in the applicable 2020 Amendments Plan.

As demonstrated earlier in this report, emission inventory projections based on control measures evaluated and adopted under the 2020 Amendments Plan, and where available updated with more recent information, show that reasonable further progress toward that attainment date is being achieved.

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Appendix

The Alaska Department of Environmental Conservation (DEC) and the Fairbanks North Star Borough (FNSB) Air Quality Program developed this appendix to document additional emission information that goes beyond the specific elements needed to meet the formal Reasonable Further Progress (RFP) Report and Quantitative Milestone requirements. The agencies believe the information in this appendix further supports RFP and the emission milestones while providing additional context regarding emission reductions occurring within the community,

Information on Local Wood Drying Kiln

DEC has programs to promote dry wood sales within the nonattainment area and a regulatory requirement will become effective October 1, 2021 requiring only dry wood be sold (except for 8-foot logs under specific conditions). In 2020, Aurora Energy Solutions, LLC installed and began operation of a wood drying kiln in Fairbanks. Aurora indicated that a total of 548 cords of kiln-dried wood was sold in 2020 with an average moisture content of 15%. The availability of additional dry wood to the local market assists in bolstering compliance with dry wood burning requirements.

Information on Natural Gas Hookups

Conversion of homes and commercial structures to natural gas space heating provides important, permanent emission reductions of PM_{2.5} and precursor pollutants by supplanting the combustion of fuel oil or solid fuels. The past few years, significant progress was made in local efforts to expand natural gas storage infrastructure to allow for additional natural gas customers within the nonattainment area. As of August 2020, IGU had completed the construction of the 5.25 million gallon liquefied natural gas (LNG) storage tank in Fairbanks and had transported over 2 million gallons of LNG inventory* from the Cook Inlet near Anchorage. To further enhance the steady supply of natural gas, IGU, on January 19, 2021, purchased an initial five-year term agreement with Hilcorp, Alaska LLC, an experienced Cook Inlet operator. † This contract has an option of extension for two additional three-year terms.

On February 25, 2021, IGU, despite the turmoil of COVID-19, opened the 150,000-gallon storage tanks in North Pole. ‡ These two 75,000-gallon storage tanks had been moved on July 17, 2020, from Fairbanks. The opening of these 150,000-gallon storage tanks will increase the availability of the affordable clean-burning natural gas to the North Pole residents.

As part of the woodstove change-out program, the FNSB runs a conversion program, funded with the \$1 million appropriated by FNSB Assembly in 2019, to help residents convert from oil to natural gas or propane burning appliances. As of the end of 2020 4th Quarter (December 31, 2020), a total of 110 changeouts has been completed. The schedule for completion of these conversions

* Interior Gas Utility 2020 Q3 Quarterly Report to the Fairbanks North Star Borough Assembly,

<https://www.interiorgas.com/fnsb-quarterly-reports/>

† <https://www.interiorgas.com/interior-gas-utility-announces-long-term-sale-and-purchase-agreement-with-hilcorp/>

‡ <https://www.webcenterfairbanks.com/2021/02/26/interior-gas-utility-opens-natural-gas-storage-facility-in-north-pole/>

is the 1st Quarter of 2022. The Interior Gas Utility (IGU) has been working in parallel to the Borough by digging and putting in lines to satisfy the backlog of Borough funded conversions and pending owner conversion applications.

Implementation of Wood Heater Emission Standards – Wood Heater Certification Issues

Woodsmoke is the largest contributing source of primary PM2.5 in the FNSB nonattainment area. The Serious SIP included more restrictive requirements for wood heaters being installed within the area. In order to timely implement the new regulations, during 2020 DEC undertook a review of EPA wood heater certification test data to ensure that the state’s requirements were met and that the underlying certification data did not contain concerning anomalies. DEC’s review of the EPA woodstove certification program and implementation of the 2015 New Source Performance Standards (NSPS), found significant issues and concerns. It appears that flaws within the federal program have led to many wood and pellet stoves being certified as meeting certification standards when the available test data does not support that certification. Manipulation of test methods, lack of method specificity, deviation from testing protocols, failure to report required elements, and lack of transparency regarding the oversight by the International Organization for Standardization (ISO) 3rd party reviewers and EPA in certifying test reports have resulted in a certification program that cannot be relied upon to accurately identify the emission rates of wood heaters for the public and states. It is difficult to impossible to discern cleaner burning wood heaters using only the EPA certification list, making implementation of DEC’s rules for new wood heaters very challenging and time consuming.

Results of certification test report review

DEC’s review consisted of obtaining the formal certification test reports from manufacturer websites. Posting of test reports is a requirement of the NSPS. DEC and Northeast States for Coordinated Air Use Management (NESCAUM) staff conducted the reviews using a standardized review tool to ensure consistency. Staff reviews averaged approximately 2-3 hours per test and were considered desk audits. The review of the certification test reports focused on the NSPS requirements and DEC standards. A regulatory basis document was developed that identified each NSPS reporting element that corresponded with a finding in the test report summary. The test report summary for all the reviews were posted online. Manufacturers were encouraged to identify any errors and to provide corrections. Verified corrections were reflected on updated summary sheets. As noted, as of February 2021, 131 cordwood tests were reviewed and 96 pellet stove tests.

Cordwood Wood Stove Review

Overall Summary Statistics						
	# of Reports Reviewed	Disapproved (emission threshold)	Disapproved (unable to verify)	No Determination (Report Issues)	Approved/ Pending	Approved w/ Flags
ASTM E3053	67	32	2	33	0	0
EPA M28R	62	23	2	8	29	0
Not reported	2	0	2	0	0	0
Total	131	55	6	41	29	0

Pellet Stove Review

Overall Summary Statistics						
	# of Reports Reviewed	Disapproved (emission threshold)	Disapproved (unable to verify)	No Determination (Report Issues)	Approved/Pending	Approved w/ Flags
Other (ATM)	2	0	0	0	2	0
ASTM 2779	83	3	5	34	41	0
Not reported	11	0	11	0	0	0
Total	96	3	16	34	43	0

Of the cordwood wood stove test reports, more than 50% of the reports were missing significant portions of the report. Many of the missing elements are mandatory reporting elements. For example, 18% of the test reports were missing the 1-hr filter data and 2 had negative values for a 1-hr filter. 23% reported no data for the required carbon monoxide (CO) measurements. Reviewers also found contradictory information between the owner’s manual that is given to the public for operations and the instructions given to laboratories to test the device. Furthermore, reviewers found many instances when the test method used in the certification test was not followed. 50% of those tests conducted using the federal reference method (M28) failed to follow fueling requirements. 54% did not follow the low burn rate requirements. 98% did not report sufficient data to ensure that aging was done properly.

Example of contradictory information between marketing material to the public and certification test report.

Source of data	Manufacturer Marketing Materials	EPA Cert. Report	Source of data	Manufacturer Marketing Materials	EPA Cert. Report
PM emissions (g/h)	1.26	1.26	PM emissions (g/h)	1.3	1.3
HHV efficiency (%)	78	70	HHV efficiency (%)	60.3	60.3
Firebox volume (ft ³)	1.9	1.44	Firebox volume (ft ³)	4.4	4.04
Max heat output (Btu/hr)	65,000	23,330	Max heat output (Btu/hr)	95,000	34,057
Log length (in)	18	16	Log length (in)	24	16

The review found that contradictory information is fairly widespread across the cordwood test reports (please note that data below is from earlier statistics than the data supplied above as only 130 woodstove certification test reports are included):

- 130 certification test reports assessed
- Firebox volume
 - 45% (59) report a different firebox volume in their materials than used in testing
 - 18% (23) do not have firebox dimension in marketing materials
 - 37% (48) matched
- Heat output
 - 72% (93) do not match
 - 6% (8) did not report
 - 22% (29) match
- Efficiency
 - 24% (31) did not match
 - 11% (14) did not report
 - 65% (85) matched

For the pellet stove test reports, more than 50% of the reports were also missing significant portions of the report. Pellet stove test reports were also failing to report mandatory elements. 17 devices were missing the particulate matter (PM) measurement information such as 1-hr filter data. 17 devices have no data for CO measurements and 13 reported 0 for CO emissions. Contradictory information for marketing material also exists. 77% did not match the BTU output from high load testing vs the BTU output advertised. Regarding test method adherence, pellet devices also have issues. 33% did not meet the medium burn rate requirement. 68% did not meet or did not provide

sufficient data regarding the low burn rate requirement. 77% did not report sufficient information to determine if the aging requirement was met.

A NESCAUM review of the central heating/boiler units also found problems with the EPA certification program for these heaters. For this sector, the review found that no reports contained a complete dataset. Therefore, it was impossible to determine how the devices operated during certification testing. For cordwood boilers, 3 out of the 9 reports had negative 1-hr filter values. For pellet boilers, most reports only provided summary data. One report used an inappropriate method, and EPA accepted an alternate test method (ATM) that didn't require low load testing. All reports were also incomplete – 75% with serious deficiencies. 29% were missing the 1-hr filter data. 29% of the reports have no CO measurement data. 95% did not meet the requirement or did not provide sufficient data regarding the low burn rate requirement. 77% did not report sufficient data regarding the aging requirement. All reports contained missing information and a full review was unable to be completed.

Conclusions

Based on the desk audit of the certification test reports with respect to the NSPS requirements, zero test reports publicly posted were complete. 94% of reports raised issues that appear to trigger revocation elements in the NSPS which are: failure to follow test method procedures, manufacturer materials contradict test report data, non-representative testing, or negative PM emission rates. 6% of the reports were deemed to have incomplete test reports. On average 21 deficiencies were identified per test report for cordwood stoves and on average 16.5 deficiencies for pellet stoves.

25 reports underwent a more in-depth review. Of these, 50% found data that conflicted with information in the summary review. As mentioned, the summary review was cursory and depended on the summary data provided in the report. The in-depth review found that the summary data provided by the test reports conflicted with the actual data or written explanation. Additional in-depth review would likely uncover additional problems.

There are also indications that some manufacturers did not modify their units between Step 1 and Step 2, rather they modified how they fueled the unit for certification testing. It appears that EPA's program has flaws that need to be addressed to ensure rule requirements and intent are being followed. Overall, the certification test report review has raised significant concerns about EPA program integrity:

- Serious rule deviations were not caught during EPA review.
- Issues exist across labs and manufacturers.
- Issues impact the emission performance of devices.
- Issues exist with EPA-accepted test methods developed by industry.

The review suggests that there is insufficient oversight of the program to ensure that it is achieving the intended emission reductions. For example, EPA has not completed a single compliance audit in 30 years or revoked a certification for any stove. Research conducted by NESCAUM coupled with the certification test report review, indicates states cannot rely on the federal program to identify cleaner devices critical to ensure local program effectiveness. NESCAUM data has shown that there are cleaner burning devices, but they are difficult to identify by simply relying on EPA's certified device list.

DEC's efforts to implement the new wood heater emission requirements from the Serious SIP have resulted in a significant reduction in the number of appliances on the Approved device list for the area. This has been a significant effort on the part of the State and the Borough to identify clean burning devices, a use of resources that could have been lowered and avoided moving forward had the EPA program been implemented in a more robust and effective manner. The State's verification of cleaner burning devices and resultant reduction in approved devices for installation will result in real emission benefits as the identified cleaner devices will actually assist the goal in reaching attainment for the area. The Borough has also been proactively adjusting the Wood Stove Change Out Program to ensure that only clean burning devices or conversions are funded.