III.K.13.I REASONABLE PROGRESS GOALS

1. OVERVIEW

Title 40 CFR §51.308(f)(3) requires that states must establish goals (expressed in deciviews) for reasonable progress towards achieving natural visibility conditions for each mandatory Class I area located within the State. The RPGs must provide for an improvement in visibility for the MID over the period of the implementation plan and ensure no degradation in visibility for the clearest days over the same period. These RPGs reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period as a result of a state's own and other states' long-term strategies. Although an RPG is not an enforceable requirement of the RH Rule, it can be a useful metric for evaluating progress. States are given the flexibility to establish different RPGs for each Class I area.

Under 40 CFR §51.308(f)(3)(ii)(A), a state is required to analyze and determine the consistent rate of progress over time needed to attain natural visibility conditions on the 20 percent MID by the year 2064. This glidepath is referred to in this document as the uniform rate of progress (URP) line. The URP is the slope of this line. The state must then compare its RPGs for the 20 percent MID to the URP for each implementation period. In the first RH SIP, DEC established its RPGs for each of its Class I areas for the first implementation period (2018). In this second RH SIP, DEC is providing updates on its RPGs for the state Class I areas for the second implementation period (2028). The 2028 URP does not mandate a reduction target. States have the option to select RPGs with greater, equivalent, or lesser visibility improvements than established by the URP. If a state selects a visibility goal that results in visibility improvements less than needed to meet the URP, it must provide a robust explanation for why additional visibility improvement approaches have not been considered and how this meets emissions reduction targets through the end of the planning period.[1]

This chapter will identify ways to ensure that each of the Class I areas maintains progress towards natural conditions in 2064 while utilizing reasonable approaches that will not place undue burdens onto sources or groups of sources covered in previous chapters.

2. UNIFORM RATE OF PROGRESS

URP is the rate of improvement in visibility that would need to be maintained during each implementation period in order for the 20% MID to reach natural conditions by 2064, given a starting point of the 2000 through 2004 baseline MID visibility condition. Elements of the URP glidepath include:

- "Baseline conditions" represent visibility conditions for the 2000 to 2004 baseline period as the starting point for the URP glidepath, "Current conditions" represent the most recent

[1] For more information on these requirements, see 51.308(f)(3)(ii): "the State must demonstrate, based on the analysis required by paragraph (f)(2)(i) of this section (the 4- factors), that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the State that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the long-term strategy."

5-year monitoring period for which most recent quality assured visibility monitoring data are available (e.g., 2014 through 2018),

- "Natural conditions" is the URP glidepath end-point in 2064
- RPGs (interim) represent "reasonable progress" towards achieving natural conditions.

Baseline, current, and default natural conditions are described in detail in Section III.K.13.D.

The EPA calculated default natural visibility conditions for all Class I areas but allowed states to develop more refined calculations. States can optionally propose an adjustment of the 2064 URP endpoint to account for international anthropogenic impacts, if the adjustment has been developed using scientifically valid data and methods. The URP can be adjusted by adding an estimate of the visibility impact of international anthropogenic sources to the value of the natural visibility conditions to get an adjusted 2064 endpoint. Glidepaths based on the EPA's default natural conditions are termed 'unadjusted glidepaths' in this SIP. The EPA also estimated RPGs for Alaska using a CMAQ photochemical grid model for the base year 2016 and future year 2028 and developed alternative glidepaths that account for international anthropogenic contributions.

Alaska has interest in accounting for visibility impacts on the State from highly variable natural sources and international emissions. In addition to EPA's CMAQ modeling and EPA's H-CMAQ international contribution estimates, Alaska used GEOS-Chem modeling conducted by the University of Alaska Fairbanks (UAF) to provide alternative estimates of the contributions of international anthropogenic emissions to visibility. Detail on UAF's GEOS-Chem modeling is provided in Appendix III.K.13.I. Both EPA's H-CMAQ and UAF's GEOS-Chem used a "Zero-Out" modeling approach to quantify contributions from international sources outside of state control. For Alaska regulators, this form of modeling is useful due to trans-boundary pollution transfer and atmospheric transport which can carry visibility-impairing pollution from distant sources.

The RH Rule also requires states to determine the baseline (2000 through 2004) visibility condition for the 20% clearest days and requires that the LTS and RPG ensure no degradation in visibility for the clearest days since the baseline period.

3. REASONABLE PROGRESS GOALS FOR EACH CLASS I AREA

The RPGs for Alaska are based on the EPA's CMAQ modeling. The visibility projections follow the procedures in section 5 of the SIP Modeling Guidance. Based on the recommendation in the modeling guidance, the observed base period visibility data is linked to the base modeling year. This is the 5-year ambient data base period centered about the base modeling year. In this case, for a base modeling year of 2016, the ambient IMPROVE data is from the 2014-2018 period. However, the data for the TUXE1 monitor is only available for 2014 so only one year was used in the projection. Table III.K.13.I-1 shows the baseline and future year deciview values on the 20% clearest days and 20% MID at each Class I area for the future year 2028. DEC has determined to treat the KPBO1 and TUXE1 sites as different sites and not as a continuation. Data for the KPBO1 monitor is available from 2015 through the end of the current visibility period in 2018. It will be possible for the state to establish a formalized baseline and glideslope for clearest and MID at KPBO1 by the next progress report.

The EPA's CMAQ modeling includes a 2028 zero-out U.S. anthropogenic emissions CMAQ modeling scenario. The zero-out U.S. anthropogenic emission simulations exclude any anthropogenic emission sources located in the U.S. or territories to provide visibility conditions caused by international anthropogenic emissions and natural sources that are beyond the control of states preparing the RH SIP. At Simeonof, according to EPA's CMAQ modeling, reducing local emissions may not benefit visibility improvement as indicated by the 2028 projected MID being higher when all U.S. anthropogenic emissions are eliminated (13.6 dv versus 14.1 dv; see Figure 3-9-2 in EPA Technical Memo, June 3,2020, in Appendix III.K.13.I and Figure III.K.13.I-2 below).

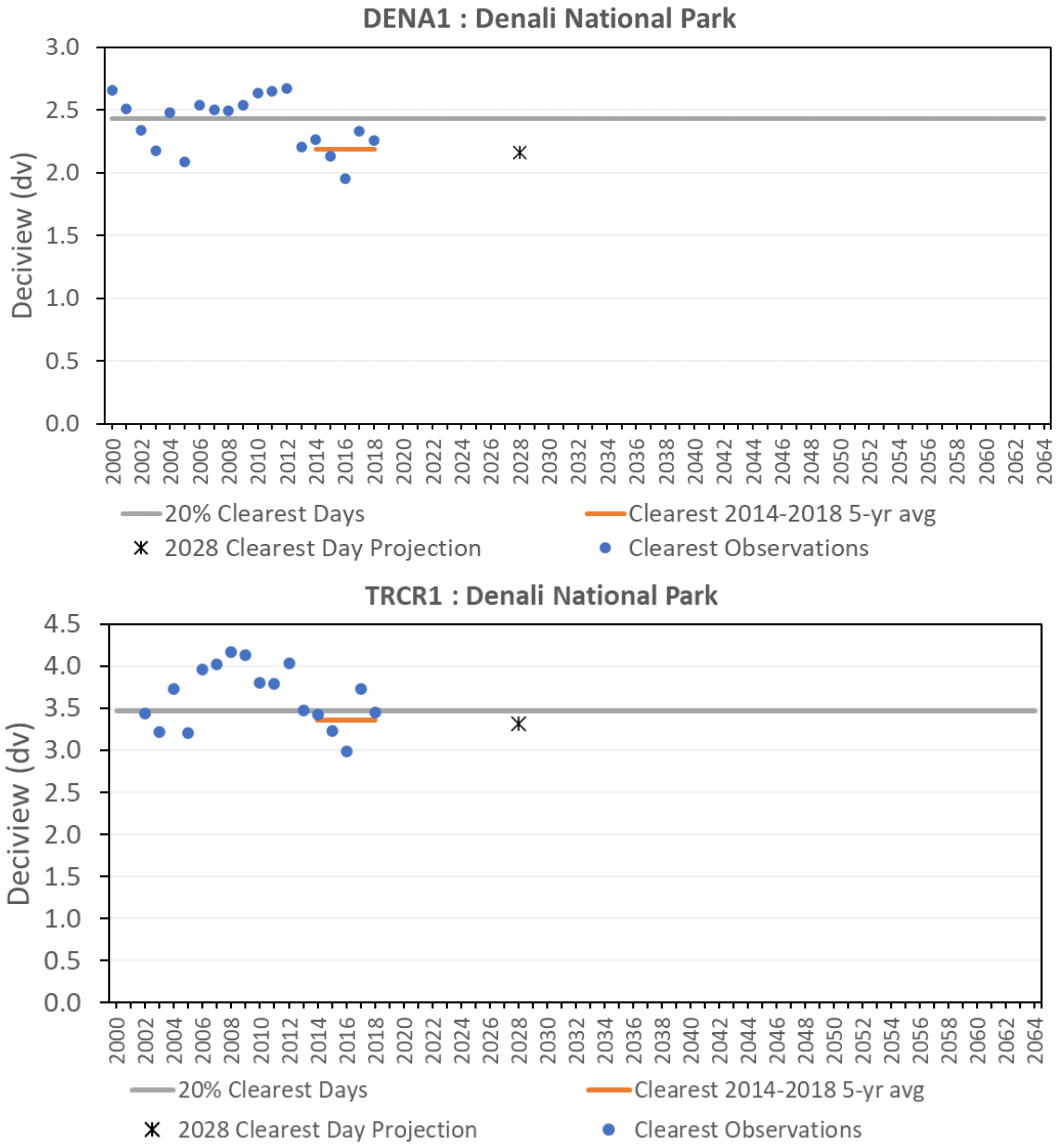
Table III.K.13.I-1. Projected 2028 future year visibility (deciview) on the 20% clearest days and 20% MID at each IMPROVE site representing Class I areas in Alaska.

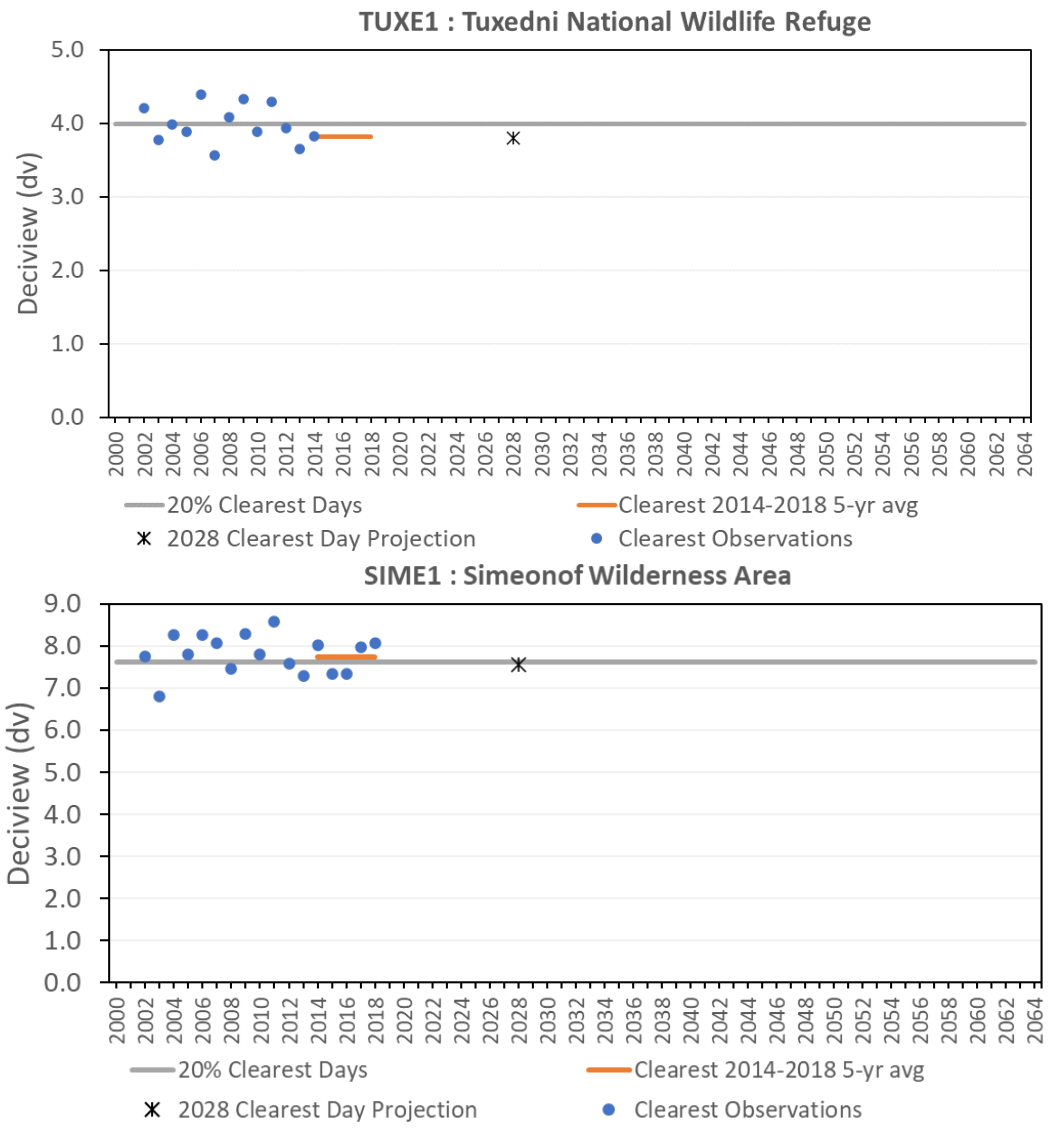
Class I Area	IMPROVE site	Future Year (2028) 20% Clearest Days (dv)	Future Year (2028) 20% MID (dv)	Zero-US Future Year (2028) 20% MID (dv)
Denali NP	DENA1	2.16	6.53	6.41
Denali NP	TRCR1	3.31	8.78	8.50
Tuxedni NWR	TUXE1	3.79	10.66	10.01
Simeonof WA	SIME1	7.56	13.57	14.05

4. COMPARING THE RPGS TO THE URP

The 2028 RPG for the 20% clearest days is to be compared to the 2000-2004 baseline period visibility condition for the 20% clearest days and must ensure that no visibility degradation from the baseline period is projected. For all Class I areas in Alaska, visibility on the 20% clearest days is projected to be below the baseline visibility condition satisfying the RH Rule requirement of no degradation in visibility for the clearest days since the baseline period. This finding is in agreement with the EPA Alaska CMAQ modeling TSD which used the ambient IMPROVE data from the 2014-2017 period. Glidepaths are shown for each of the Class I areas in Figure III.K.13.I-1.

Figure III.K.13.I-1. 2028 visibility projections for the clearest days compared to the 2000-2004 baseline (grey line) at each Class I area in Alaska.





The 2028 RPG for the MID is to be compared to the 2028 glidepath values that are adjusted to account for international contributions. The international contributions estimated by the EPA H-CMAQ and UAF GEOS-Chem provide a range of adjustment to the 2064 endpoint. The H-CMAQ estimate of international anthropogenic emissions contribution only includes sulfate while the GEOS-Chem estimates also include nitrate and primary PM components. Table III.K.13.I-2 shows the 2028 glidepath values (in dv) at each Class I area, including the 2000-2004 baseline deciview values. Both “adjusted” and “unadjusted” glidepath values for 2028 are also provided. There are two adjusted glidepath values for 2028; one is based on the EPA H-CMAQ modeling and another is based on the UAF GEOS-Chem modeling. Both adjusted glidepaths are less steep (almost flat) than the unadjusted glidepath signifying importance of sources outside of the state control to visibility progress in Alaska Class I areas. Glidepaths are shown for each of the Class I areas in Figure III.K.13.I-2.

The future year 2028 deciview projections are compared to the adjusted visibility "glidepath" at each Class I areas:

Denali NP (DENA1): The 2028 projection (6.5 dv) is below the GEOS-Chem adjusted glidepath (6.9 dv) and is right on the H-CMAQ adjusted glidepath (6.5 dv).

Denali NP (TRCR1): The 2028 projection (8.8 dv) is below the GEOS-Chem adjusted glidepath (9.0 dv) but slightly above the H-CMAQ adjusted glidepath (8.5 dv).

Tuxedni NWR (TUXE1): The 2028 projection (10.7 dv) is slightly above the GEOS-Chem adjusted glidepath (10.4 dv) and H-CMAQ adjusted glidepath (10.3 dv).

Simeonof NWA (SIME1): The 2028 projection (13.6 dv) is slightly above the H-CMAQ adjusted glidepath (13.4 dv) and the GEOS-Chem adjusted glidepath (13.0 dv).

Table III.K.13.I-2. 2000-2004 baseline visibility, 2028 projected visibility (based model period 2014-2018), and 2028 glidepath values (dv) for the MID.

Class I Area	IMPROVE site	Observed 2000-2004 Baseline	Projected 2028	Projected 2028 zero-US	2028 Unadjusted Glidepath	2028 H-CMAQ Adjusted Glidepath	2028 GEOS-Chem Adjusted Glidepath
Denali NP	DENA1	7.08	6.53	6.41	6.14	6.46	6.92
Denali NP	TRCR1	9.11	8.78	8.50	8.01	8.48	9.02
Tuxedni NWR	TUXE1	10.47	10.66	10.01	9.07	10.25	10.37
Simeonof WA	SIME1	13.67	13.57	14.05	11.60	13.35	13.04

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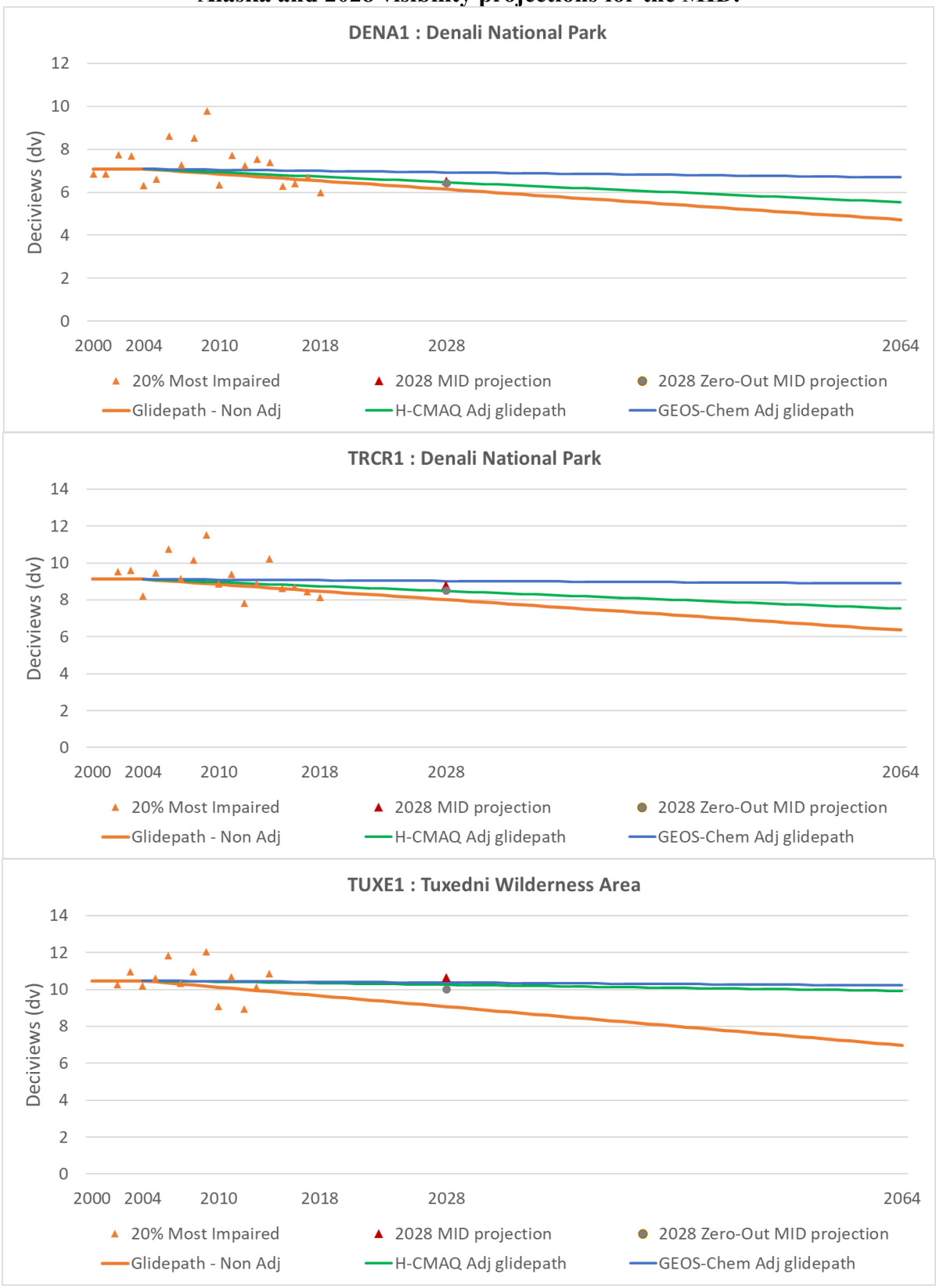
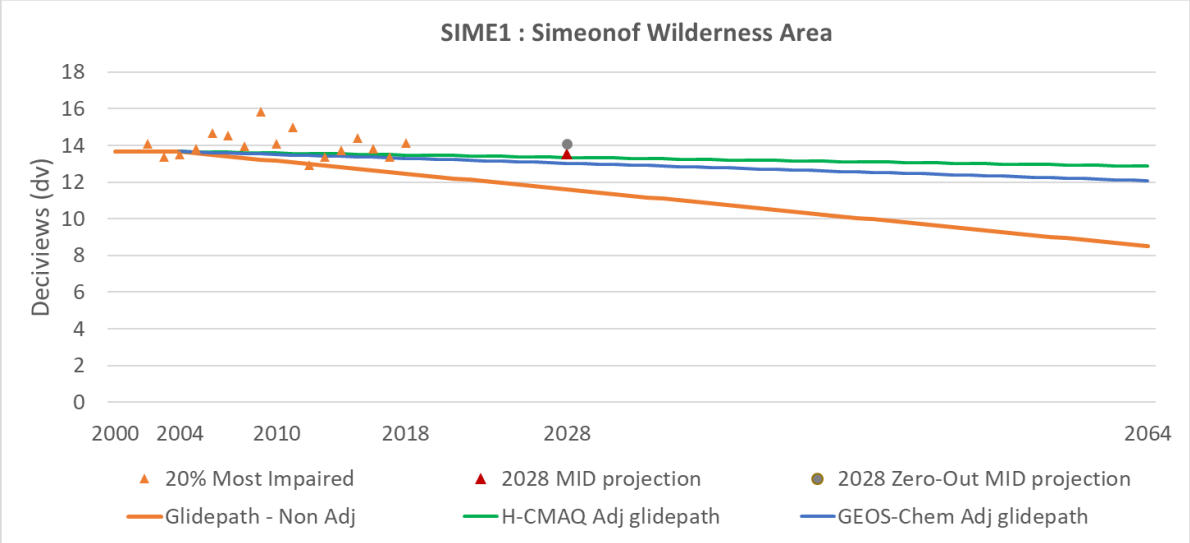
Figure III.K.13.I-2. Unadjusted and adjusted URP Glidepaths at each Class I area in Alaska and 2028 visibility projections for the MID.





Even when all U.S. anthropogenic emissions are eliminated, Alaska Class I areas see minimal visibility benefit. According to EPA's CMAQ modeling, Class I areas experience visibility disbenefit at SIME1 as indicated by the 2028 projected MID being higher. The visibility disbenefit is driven by different chemistry from lower SO_2 and NO_x emissions. The adjusted glidepath for TUXE1 and SIME1 are almost flat which signifies the importance of sources outside of the state control to visibility progress in Alaska Class I areas. Both glidepaths and the 2028 projections suggest that EPA's URP glidepath approach would not capture any efforts and success in reducing local emissions in Alaska.

EPA's URP glidepath approach was developed for use with Class I areas in the lower 48 states and has several issues when applied to Alaska as indicated above. Most importantly, it is the opinion of DEC that the IMPROVE MID approach is likely a flawed visibility impairment metric for Alaska since it potentially has a large component of natural $(NH_4)_2SO_4$ from volcanos and DMS. EPA's CMAQ modeling also did not include these important sources. Therefore, Alaska is also addressing the IMPROVE MID approach by screening out IMPROVE days with measured high $(NH_4)_2SO_4$ to account for volcano emission impacts in a similar way to how fire and dust contributions are screened out using carbon and crustal measurements as proxies. The adjusted URP glidepaths and RPGs were developed using the alternative MID with sulfur screening. The RPG on the 20% MID (taking into account what is believed to be natural-caused sulfate) is below the URP (taking into account international anthropogenic contributions) value for 2028. The sulfate-adjusted glidepaths and RPGs are presented in Appendix III.K.13.I.

Both the EPA and DEC sulfate-adjusted glidepaths show that the SIME1 monitoring station is above the adjusted glideslope (taking into account international anthropogenic contributions) in the last ten years indicating that the monitoring location has shown some level of visibility degradation over this period. It is the position of DEC that this degradation is likely a result of local marine emissions generated by commercial vessels utilizing international shipping routes which run south of the Simeonof Class I area. The only changes that could be implemented that would have any impact on visibility at the SIME1 monitoring station would be targeted at the

maritime industry. As much of the visibility impairment is caused by emissions from foreign-flagged vessels utilizing international shipping routes to transit the Pacific Ocean, there is nothing that DEC can do as a state agency. Any impact on this industry would come via communications with, and policy implementation by the EPA through other governmental agencies such as the Department of State due to the treaty aspect of IMO agreements. As the IMO regulations have been in place since January 2020, the state can analyze 2020 and newer IMPROVE data and revisit the issue during the progress report due in 2025. State regulators can communicate visibility progress to the EPA, though the possibility of any form of treaty or otherwise international agreement changes to meet Alaska requests are limited. Beyond this, given the small size and limited footprint of local anthropogenic installations, there is nothing that the state can do further to improve visibility at SIME1.

5. CONCLUSION

This RPG and URP comparison for each Class I area indicates the emission reduction measures necessary to make reasonable progress for the planning period are covered by this SIP revision. The derived RPGs reflect control measures included in the long-term strategy and state and federal programs already in place as described in Section III.K.13.H. DEC determined that the rate of visibility improvement by the end of the second planning period, 2028, is reasonable. For all Class I areas in Alaska, the RPG on the 20% clearest days is below the baseline visibility condition, satisfying the RH Rule requirement of no degradation in visibility for the clearest days. The RPG on the 20% MID is below the URP (taking into account international anthropogenic contributions) value for 2028 at Denali National Park, but slightly above the URP at Simeonof Wilderness Area and Tuxedni National Wildlife Refuge. However, as indicated by the EPA's CMAQ results, even when all U.S. anthropogenic emissions are eliminated these Class I areas see little visibility benefit at TUXE1 and even experience visibility disbenefit at SIME1. Both CMAQ and GEOS-Chem modeling suggest significant contributions from the international anthropogenic emissions. The adjusted glidepaths are almost flat so would not signify any efforts and success in reducing local emissions in Alaska. The disbenefit in the 2028 modeling, excluding all Alaska emissions, as seen at Simenof is due to the sources that are contributing not being local and is therefore not an issue with the modeling.

Setting RPGs and maintaining a reasonable progress following the EPA's glidepath approach is a challenge for Alaska. Volcanic emissions potentially constitute a significant fraction of sulfate at TUXE1 and SIME1 (see Section III.K.13.G WEP Analysis). The inclusion of DMS and volcanic emissions in the visibility degradation as well as international contributions in the glidepaths causes a plateauing of the visibility progress needed at these two sites. There is nothing that DEC can do to impact or control either category of these emissions. Given the likely presence of significant natural sulfur emissions that are highly variable and relatively small local anthropogenic emissions in the area, the concept of glidepath may not be appropriate for Simeonof Wilderness Area and Tuxedni National Wildlife Refuge. While sulfate screening within the 95th percentile threshold helps remove extreme volcano events, bringing 2028 projections closer to the unadjusted glidepath, it cannot effectively account for all contributions of volcano sulfate impacts from persistent degassing activities. Alaska will continue working with EPA to further identify and quantify the contribution of these natural

sources of visibility impairment. Some other key considerations in setting and maintaining RPGs are noted below:

- Simeonof Wilderness Area (SIME1): Meeting the RPG for the Simeonof Class I area will largely fall outside of the ability of state regulators, as there are few stationary sources with limited size located near the Class I area that can be controlled. There are no targeted reductions for sources under DEC jurisdiction which would result in the meeting of the RPG. Most anthropogenic pollution that affects visibility at Simeonof has been generated by international marine shipping utilizing major shipping routes located nearby. DEC will monitor visibility improvements over the second implementation period to observe whether the recent IMO low-sulfur marine fuel regulations promulgated January 2020 result in visibility improvements to meet state goals.

  Should IMO low-sulfur marine fuel regulations not result in the needed reductions to meet yearly progress goals between 2018 and 2028, DEC will revisit these goals during the progress report in 2025.

- Tuxedni National Wildlife Refuge (TUXE1 and KPBO1): The largest category of anthropogenically-generated impairment came from the oil and gas sector. DEC's proposed concept of a RH-VPA (see Section III.K.13.H.2.B) and increased permit program reporting and application requirements could assist in monitoring all new projects and ensure no significant degradation of visibility at the TUXE1 or KPBO1 monitoring sites. Together with the IMO low-sulfur marine fuel regulations, it is expected that visibility improvements at this Class I area will meet the RPG.

  DEC has determined to treat the new KPBO1 and TUXE1 sites as different sites and not as a continuation. At present, the state and EPA lack the necessary four years of data to accurately construct a visibility baseline or glideslope for the KPBO1 monitoring site. There is also an insufficient number of years at KPBO1 to apply the statistical technique to estimate the 20% MID. This will be rectified in the progress report, when enough data will be made available for state regulators to effectively calculate a new URP and glideslope for the KPBO1 monitor. It is likely that the progress goals will be changed at that time to meet the adjusted URP for the monitoring location.

- Denali National Park (DENA1 and TRCR1): DEC will work within its air quality division, and specifically its permitting program, to monitor all new projects and ensure no significant degradation of visibility at DENA1 and TRCR1. While this does not directly produce emissions reductions, it is a mechanism to ensure continued monitoring of new projects and tracking of potential visibility impacts from industry efforts. In addition, the TRCR1 monitoring site does register a small amount of visibility impairment which could be the result of marine emissions from Cook Inlet and more distantly from the Gulf of Alaska. DEC expects some visibility improvement at TRCR1 as a result of IMO low-sulfur marine fuel regulations. DENA1 site may see some benefits from emission reductions to address $PM_{2.5}$ attainment in the Fairbanks North Star Borough (FNSB) nonattainment area.

- Bering Sea National Wildlife Refuge: Due to the absence of monitoring data for this Class I area, DEC has neither a baseline nor a glideslope or yearly data by which to set the RPG.