

**Preliminary Draft****Four Factor Analysis and Facilities List****1 Focus of Controls**

Alaska is already very close to natural visibility in the CIAs and most visibility impairment is due to international and natural sources. To fulfil the reasonable progress requirement, the state must assess whether it would be reasonable to control sources or groups of sources by considering the four factors:

1. costs of compliance,
2. time necessary for compliance,
3. energy and non-air quality environmental impacts of compliance, and
4. remaining useful life of any potentially affected sources.

The state determined to base its source selection sources that are likely to have the highest impact on Class I areas. Theoretically, any control measures implemented on these facilities would result in the most reductions of impairment. The highest level of pollutant on the unadjusted and adjusted (international and natural emissions) most impaired days (MID) is SO<sub>4</sub>, followed by organic mass. See Figures F.1.1 and F.1.2. Because of this, the selection of sources to undergo a four-factor (FF) analyses are based on SO<sub>4</sub> emissions only.

Figure F.1. Extinction Composition

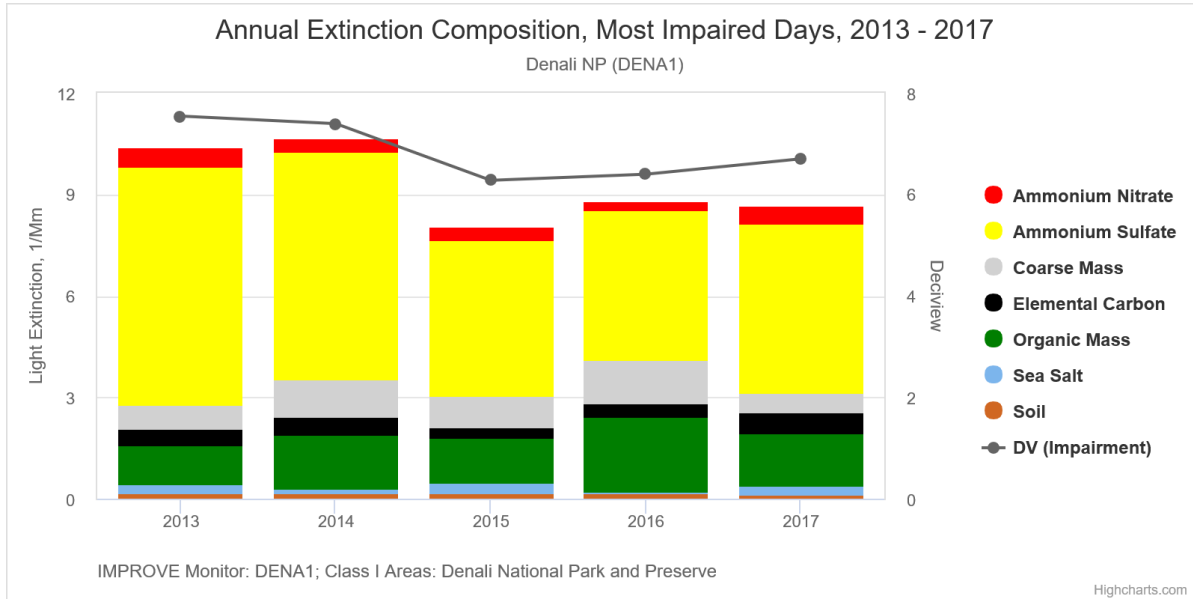
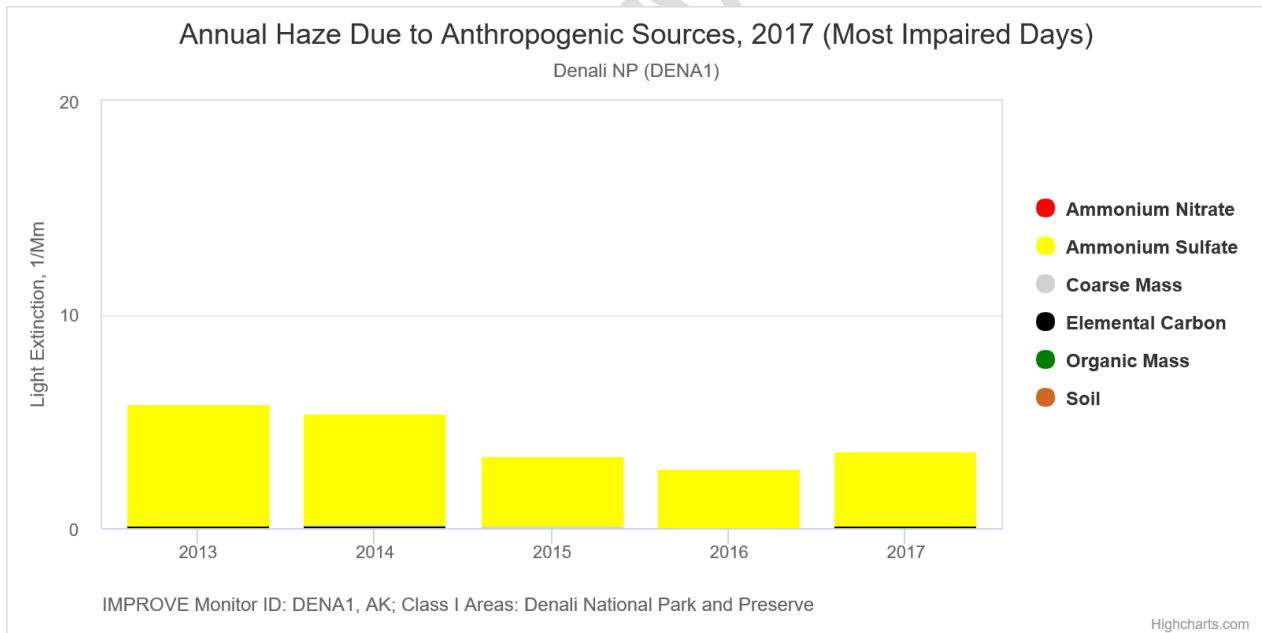


Figure F. 2 Adjusted Extinction Composition



## 2 Four Factor Source Selection Methodology

For the second planning period, EPA requires<sup>1</sup> the state to evaluate and determine the emission reduction measures necessary to make reasonable progress by considering the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected anthropogenic source of visibility impairment. The State should consider evaluating major and minor stationary sources or groups of sources, mobile sources and area sources to identify anthropogenic sources that are most likely impacting the 20 percent most impaired days (MID) at one or more Class I areas (CIAs).

Many states are selecting the sources using the Q/D method (quantity of emissions divided by distance to the IMPROVE monitor)<sup>2</sup>. In Alaska, we initially used the Q/D source selection based on the parameters that the Western Regional Air Partnership (WRAP) tool<sup>3</sup> used. The Excel Tool establishes a threshold of 10 tons per year per km (tpy/km) for Q/D and 25 tpy for Q and only facilities with distance less than 400 km were included. As noted in the EPA Guidance, the Q/D methodology does not take into consideration topography, transport direction/pathway and dispersion and photochemical processes.

Alaska contracted with Ramboll to run Hysplit back trajectories on the MID for Denali and Simeonof, and the MID and 20% highest days for Tuxedni CIA to model for the highest area of influence (AOI), emission weighted resident time (EWRT) and the weighted emission potential (WEP). A more complete analysis of the modeling is included in Section K.13.G (Modeling). The modeling used the facility emissions from the 2014 and 2017 emission inventories and provided the ability to select sources for analysis where control measures, if reasonable and cost effective, could result in a reduction of emissions and show reasonable progress toward natural visibility. Alaska used the AOI, EWRT and WEP results along with the emission inventories from 2014 and 2017 to determine the sources that are most likely contributing to visibility impairment.<sup>4</sup>

The methodology used in this section identifies how DEC selected select sources for the four factor analysis, identifies data sources used and provides an overview of the approach for analysis for those facilities that are eligible for a “limited” four-factor review.<sup>5</sup>

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<sup>1</sup> Guidance on State Implementation Plans for the 2<sup>nd</sup> Implementation Period, issued August 20, 2019

<sup>2</sup> August 20, 2019 Guidance. Step 3.

<sup>3</sup> Regional Haze Four-factor Analysis Screening tool developed by Ramboll.

<sup>4</sup> EPA Evaluation and analysis of OAQPS CMAQ modeling for an annual 2016 run covering AK, June 2020.

<sup>5</sup> August 20, 2019 Guidance. Step 3(f)

### 3 Analysis Period

EPA requires five years of reported data from the IMPROVE monitors and the five years must contain at least three complete years of data.<sup>6</sup> In general, the years used in the analysis were 2013 through 2017 however, there is no data for 2015 for Tuxedni when the monitor was moved to the Kenai Peninsula Borough (KPB01). No data is available for 2015 for either TUXE or KPB01; from 2014 to 2018 was used at Class I Areas (CIA) as this is the most current monitoring period. These dates include patched data for missing data. Tuxedni was the most patched monitoring site. Table F.1 identifies the years of the analysis period for each improve site.

Table F.1. Alaska Class I Areas and IMPROVE monitoring sites included in the Area of Influence and Weighted Emissions Potential analysis

<i>Class I Area</i>	<i>IMPROVE Site</i>	<i>Analysis Period</i>
<i>Denali National Park and Preserve</i>	Denali Headquarters Site (DENA1)	2014 - 2018
	Trapper Creek Site (TRCR1)	2014 - 2018
<i>Simeonof Wilderness Area</i>	Simeonof (SIME1)	2014 - 2018
<i>Tuxedni National Wildlife Refuge</i>	Tuxedni (TUXE1)	2012 – 2014
	Kenai Peninsula Borough (KPB01)*	2016 – 2018
Sources: <a href="https://dec.alaska.gov/air/air-monitoring/improve-network">https://dec.alaska.gov/air/air-monitoring/improve-network</a> , <a href="http://vista.cira.colostate.edu/Improve/improve-data/">http://vista.cira.colostate.edu/Improve/improve-data/</a>		
* The KPB01 IMPROVE monitor started operating in 2016 and was not included in the analysis of Most Impaired Days as no impairment metric data is available for the site.		

The 20% Highest days used for Tuxedni (TUXE and KPB01) do not include the patched data, the analysis period for TUXE and KPB01 included three years for each site as noted in Figure 1.

#### 3.1 Emissions Data

The AOI and WEP modeling used EPA generated gridded emissions (Alaska 27/9-km domains) based on 2016 NEI data. Point sources were ranked using the WEP and point and nonpoint source emissions provided by the ADEC for 2014 and 2017 NEI triennial years. The benefit of using two emission inventory years is that it provides an opportunity to identify changes in point source emissions that can be used in sector projections or CIA analysis.

#### 3.2 Point Source WEP ranked tables

Spreadsheets were developed that ranked facility emissions using the 2014 and 2017 NEI reported data and the WEP. The AOI/WEP analysis uses HYSPLIT back trajectories from Alaska IMPROVE sites to

<sup>6</sup> December 20, 2018 EPA Guidance, Technical Guidance on Tracking visibility progress for the Second Implementation Period. References 2003 Guidance for Tracking progress under Regional Haze Rule , Step 7 Data for Completeness, page 2-8.

get the frequency of occurrence, or residence time (RT), that air parcels originating from a particular location arrive at the IMPROVE site on a specific day. The RT or AOI analysis can then be weighted by sulfate extinction to generate (EWRT). The HYSPLIT derived sulfate EWRT can be overlaid on gridded sulfur emission to determine the sources of emissions within and near Alaska that are most likely to contribute to visibility impairment at IMPROVE sites on high sulfate extinction or the MID. The Point Source WEP Ranked spreadsheets can be sorted by quantity of emissions, Q/d, EWRT and WEP for each facility.

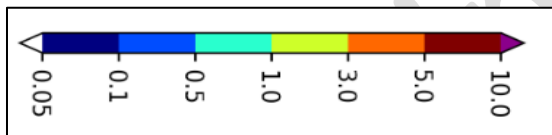
## 4 Identifying the Sources for the Four Factor Analysis

This section provides the steps that DEC used to select the initial list of sources to review for the four factor analysis. As noted in previously, our analysis focuses on the SO<sub>4</sub>. The WEP Tables and the Ranked Facility Plots used are located in the [TSS link](#) web site.

### Step 1: Weighted Emission Potential Area Selection

DEC used the SO<sub>x</sub> WEP plots for most the MID for each Class I area in the state. In addition, the 20% highest extinction days for SO<sub>x</sub> for the TUXE and KPB01 IMPROVE monitors was used, which provide a discontinuous data set for the Tuxedni site due to monitor relocation. DEC used the “all” plot elevations which incorporates both the 100-meter and 1000-meter plots.

For each emissions category (listed in Step 5) facilities inside the Extinction Weighted Residence Time boundaries that have a WEP of 5 percent (%) or more. These are reflected in brown and purple in the legend of each figure. The WEP graph units are based on the percentage (%) of time the back trajectories were in a certain area for the MID or 20% highest days.



### Step 2: Point Source Facility Selection

Stationary source selection is based on the highest WEP percentage with the reasoning that any controls implemented could have the potential to decrease visibility impacts in a Class I area. In many cases, the WEP analysis does not point to a specific facility, but rather an area where a variety of sources may potentially influence a Class I area.

Once a high WEP area is identified, the Division will use the Rank Point lists associated with the figures to identify a facility or group of facilities with the highest emissions that are likely contributing to the identified WEP area.

- a) **Rank Point List Filtering.** The facilities on the source list are filtered by the WEP SO<sub>4</sub> column and the selected sources for comparison to the WEP area are identified. In screening, the Division will choose the highest category of sources and compare these facilities to the WEP figures to identify the likely source. Only the highest emitting facilities are selected. Generally, there is a point that shows a sharp decline in WEP values. Table F.2 demonstrates this situation for Denali C1A where the steep decline from the WEP SO<sub>4</sub> rankings from approximately 4000 to

less than a 1000 that can be used to identify the highest emitting facilities. Each ranked table has a point where there is a steep decline that could be a logical cutoff point for facility consideration. It is possible that the WEP areas do not match with any of the highest emitting facilities and in that case, additional facilities can be considered.

- b) **Identify facilities that can already have emission control factors in place.** See Step 5.
- c) **Identify non-point and area sources.** Nonpoint facilities and mobile sources are removed from the four-factor analysis selection for point sources and will be addressed in the sector analysis. In some cases, DEC has regulatory authority and there is an existing permit, but the controllable emissions are limited for these facilities.
- d) **Combination of Facilities.** In some cases, there are many facilities located in a WEP defined area. This occurs in Cook Inlet and in the Fairbanks North Star Borough. For analysis, if any facility is within the WEP area of 5 percent or greater, they are all included in the selected sources.
- e) **Note reasoning for inconsistencies e.g. permit changes, etc.** Another process is used to identify facilities with extensive emission changes that may warrant further consideration related to their potential impacts. These can be seen when a facility appears in 2014 and is no longer listed in 2017. A review of permits issued by ADEC is used to see if there are substantial changes at that facility. An example of this is Clear Air Force Base. The point source emissions in 2014 included use of coal in their electrical generation units. By 2017, they had contracted to purchase electricity and their emissions had been drastically reduced. In all cases, 2017 inventories are considered closer to potential future emissions. EPA guidance Step 3, (b) Estimating baseline visibility impacts for source selection, page 18.<sup>7</sup>

Table F.2 Denali Ranked Point Facilities

	2014 Point Source Facilities	Q_SO2	QD_SO2	WEP_SO4
1	Healy Power Plant	444.94	31.69	971736.95
2	Clear Air Force Station	213.21	3.34	51285.79
3	Chena Power Plant	655.00	4.75	15752.70
4	Fort Wainwright (EGU)	654.74	4.76	15783.50
5	Eielson Air Force Base	268.05	1.93	7203.04
6	UAF Campus Power Plant	201.99	1.48	4895.97
7	GVEA North Pole Power Plant	148.37	1.09	4062.73

<sup>7</sup> EPA August 2019 guidance Step 3, (b) Estimating baseline visibility impacts for source selection, page 18.

8	TAPS PS #07	25.77	0.14	174.56
2017 Point Source Facilities		Q_SO2	QD_SO2	WEP_SO4
1	Healy Power Plant	296.40	21.11	647332.65
2	Chena Power Plant	627.60	4.55	15093.73
3	Fort Wainwright UGU	460.04	3.34	11089.97
4	Eielson Air Force Base	262.81	1.89	7062.19
5	GVEA North Pole Power Plant	247.24	1.81	6769.98
6	UAF Campus Power Plant	163.81	1.20	3970.65
7	GVEA Zehnder Facility	29.56	0.21	706.29

**Step 3 Nonpoint Facility Selection**

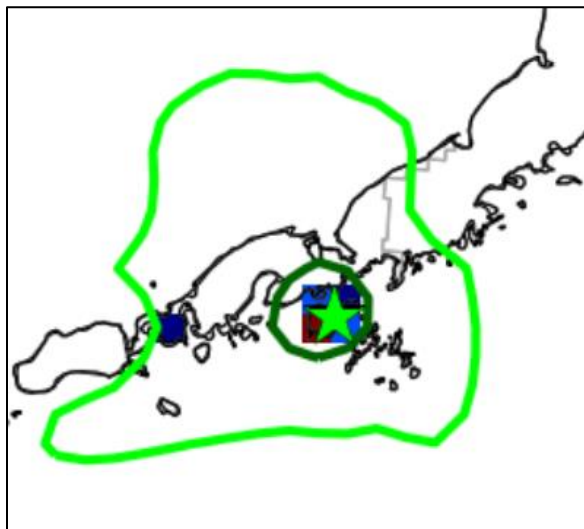
The Ranked sources lists include permitted facilities that were reported to EPA in the nonpoint category. If the facilities are close to a CIA, the contribution can still be significant. For example, in Table 3 the Trident Seafoods Sand Point facility emitted .089 tons of SO2 in 2017 but because of its proximity to the IMPROVE monitor, its WEP was the highest in the ranked facility list.

The second highest was the Monopod platform which emitted approximately 170 tons of SO2 in 2017. Because of its distance and transport, the WEP was significantly lowered. As such, the Sand Point Facility is included in the four-factor with the reasoning that if there were any potential controls that could be applied, the impact on visibility might be improved. The proximity to the IMPROVE monitor can be misleading since in Alaska, they are often miles away from the CIA.

*Table F.3 Sand Point - Minor Permit*

	Facility Name	Q_SO2	QD_SO2	EWRTxQ_SO4	WEP_SO4
1	Trident Seafoods; Sand Point Facility	0.089	0.073	736289.788	6047.653
2	Hilcorp - Monopod Platform	170	0.055	38.82	67.302

The following figure shows the only controllable point source with a WEP of 5% or more.

*Figure F.3 Simeonof WEP Ranking*

In some cases, no single nonpoint, nonroad or mobile source can be identified. In these cases, ADEC will determine the likely nonpoint sector contributor. These sources and controls will be addressed in the sector analysis. For example, east of the KPB01 IMPROVE monitor (Western Anchorage and north of Anchorage), there are three locations identified with a WEP of 5% or greater. In this specific example, the point sources located in the WEP area that may be contributors are low on the ranked list or there could be multiple contributing sources. To resolve some of these questions, DEC will look at the permit locations on GIS with relation to the WEP area to resolve. It is easy to assume the emissions are from nonroad and area sources such as airstrips, railroad, and marine port facilities which will be addressed as a sector.

#### **Step 4: Compiling the Source list Selection**

Facilities identified in the source list are compiled in a master list and those that appear at more than one IMPROVE monitor are noted. (See Table F.4) For these facilities, it is assumed that emission controls could result in improved visibility at more than one CIA.

Sources that have a high WEP in 2017 according to the facility ranking spreadsheets that do not appear in >5% WEP selection criteria are included since 2017 emissions were not included in the EPA modeling used for the WEP modeling.

The facilities in the WEP areas greater than 5% listed in in Table F.4 are then compared to GIS locations for the corresponding ADEC issued permits. This process confirms the sources within the WEP contribution areas and clarifies the nonroad and nonpoint sources.

See source selection list available on ADEC Regional Haze website.

#### **Step 5: Final Facility Screening and Identification of Limited Review Facilities.**

Once the initial selection is made, facilities are screened out of further review if they have emission control factors in place or identified if they qualify for a limited four-factor review. EPA guidance allows



limited reviews or an exception from review for many circumstances. Four of the most applicable exceptions are provided below.<sup>8</sup> The guidance includes additional exceptions:

1. New, reconstructed, or modified emission units subject to and complying with New Source Performance Standards (NSPS) that were promulgated or reviewed since July 31, 2013, and that regulate emissions of visibility-impairing pollutants, on a pollutant-specific basis.
2. BART-eligible units that installed and began operating controls to meet BART emission limits for the first implementation period, on a pollutant-specific basis. If a source is installed and is currently operating controls to meet BART emission limits, it may be unlikely that there will be further available reasonable controls for such sources.
3. Technology (BACT) review under the Prevention of Significant Deterioration (PSD) program or Lowest Achievable Emission Rate (LAER) review under the nonattainment new source review program for major sources and received a construction permit on or after July 31, 2013 on a pollutant-specific basis.
4. Combustion units that are restricted to using only distillate fuel with a sulfur content of no more than 0.0015 percent. This is the sulfur limit for ultra-low sulfur diesel fuel for mobile sources and is also the lowest limit adopted or advocated by any state for stationary sources using distillate fuel.

DEC will revise the Selected Facilities list and prepare comments for those facilities eliminated from review or subject to a limited review.

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<sup>8</sup> August 20, 2019 Guidance, Sources that already have effective emission control technology in place, Step Three (f), pages 22-23