ATTACHMENT

Regional Haze Program Implementation in the Western United States

Introduction

This attachment is organized into several topic areas that cover the interests of the western states regarding successful Regional Haze Program implementation. These points could be addressed through guidance but they should be considered when Regional Haze Rule (RHR or rule) revisions occur. EPA, the Regional Planning Organizations, other state representatives, tribal representatives, and the Federal Land Managers (FLMs) recognize that the causes of regional haze in the western United States are different from the causes in eastern states. In the West, haze on the Worst Days (the quintile of days with the highest deciview levels annually) is predominantly due to natural sources, whereas in the East, Worst Days haze is largely due to anthropogenic sources. This distinction is important because the current rule does not fully account for the role natural sources play in western haze. These comments reflect western approaches to accommodate this basic difference.

EPA is considering guidance that could help western states demonstrate progress made in achieving the statutory goal of the Clean Air Act, to remedy and prevent anthropogenic impacts on visibility in Class I Areas, given the interference of natural emissions on Worst Days in the West. WESTAR's comments support alternative means for determining and tracking visibility improvements based on a reinterpretation of how Worst Days visibility is determined. Although the success of the program is currently judged by decreasing deciview averages for the Worst Days over time, western states will continue to work with EPA and others to demonstrate that other metrics indicate that visibility actually improves over time. Specifically, we should consider reductions in haze on the days *most impaired* by controllable anthropogenic sources at Class I Areas over time.

This attachment also brings forward some options that western states are considering for setting reasonable progress goals for SIPs, and what future work is needed. Whereas CAIR or CSAPR addressed the largest anthropogenic sources of haze precursors in the East, the western states must use different approaches because their precursor source mix is very different and has different impacts at individual western Class I Areas. When it comes to setting reasonable progress goals for each planning period, western states focus on reductions of anthropogenic emissions within their statutory control. Because these reductions do not always translate to improved visibility on Worst Days, both visibility tracking and setting reasonable progress goals in SIPs will have to be related to measurable visibility improvements in a different manner.

Flexibility: ***Visibility tracking metric guidance must allow states flexibility in adjusting and ranking monitored visibility data using site-specific and species-specific data.***

Forthcoming guidance from EPA should allow states maximum flexibility to analyze visibility progress in a form most appropriate for each Class I Area, taking into account its unique mix of

sources and visibility-impairing species causing haze. This flexibility can include the use of the current form of the metric (Worst Days in deciview averages) for those sites dominated by anthropogenic emissions, as required by the rule. For comparison, Western states will need alternative analyses that demonstrate visibility improvements, absent uncontrollable sources that contribute to Worst Days haze. In western states, fluctuations in contributions of each of the haze species, on a seasonal basis and over the years, tell the real story about haze and visibility improvements, rather than the annual or rolling deciview averages for the Worst Days. Therefore the deciview levels for Worst Days cannot be the sole means for tracking visibility improvements over time, especially when uncontrollable emissions contribute considerably to Worst Days haze.

Visibility tracking metrics should allow states to adjust and rank monitor visibility data using species-specific data. Western states recommend using speciated light extinction (1) to demonstrate visibility improvements, and (2) to assist with developing reasonable progress goals. In fact, western states focused their initial regional haze SIP planning efforts on reducing controllable anthropogenic sources of NOx and SOx, because higher sulfate and nitrate light extinction contributions to overall visibility impairment correlated with both inventories and modeling for NOx and SOx emissions. In the absence of wildfire smoke, these species were the principle contributors to haze on Worst Days in the first planning period and are expected to remain so in the next planning period. In contrast, other species (organic matter carbon, elemental carbon, fine soil, coarse mass, and sea salt) were rarely as prevalent, or were derived from natural sources. Light extinction contributions to total extinction and the extinction trends for individual haze species are key tools used by SIP writers for understanding haze at each Class I Area. The trendlines by species are informative for understanding progress, especially now that there are at least 10 years of data at all IMPROVE monitors.

EPA introduced the concept of "extreme episodic events" to name the routine, but somewhat unpredictable, natural wildfires, dust storms, and volcanic activity (geogenic emissions) that occur in western states and some eastern regions. Notably, very high organic matter carbon light extinction driving Worst Days haze correlates with days impacted by wildfire smoke and prescribed burning (operationally defined as natural events). Worst Days caused by dust storms exhibit considerably elevated levels of coarse mass and fine soil. These natural emissions can be high enough to cause Worst Days not driven by anthropogenic sources. The natural emissions also cause elevated contributions to haze by specific species, providing a means to differentiate types of impairment.

EPA and others also introduced several techniques for differentiating anthropogenic and natural impacts on visibility, in an effort to construct the 20% of days each year *most impaired* by anthropogenic sources. While these techniques are informative for tracking visibility improvements or impairment over time, they do not resolve the problems in setting reasonable progress goals on a glideslope to Natural Conditions. Natural Conditions, the visibility goals for the absence of human-caused impairment, currently use Worst Days deciview averages.

Additionally, states cannot control emissions from international sources, natural or anthropogenic, which contribute to visibility impairment on any day. While source apportionment modeling can be used to tease out these impacts, it is a costly process. Because

inventories change, modeling must be repeated every five years for each retrospective progress report and every proscriptive SIP to be accurate. For these source impacts, there must be some feasible method to recognize their variable contributions to haze at various Class I Areas. Further implications are discussed under the topics of Controllable Anthropogenic Emissions and Modeling Support.

The Worst Days for haze (overall visibility impairment) are not always the same as the days *most impaired* by anthropogenic haze. This means the metric for tracking visibility improvements over time described in the Regional Haze Rule should be adjusted, to select the days *most impaired* by anthropogenic sources. The rule needs an alternative means to link reducing anthropogenic impacts with the appropriate method for tracking visibility improvements.

Three alternative approaches discussed recently have merit for tracking visibility progress, using *most impaired* days. Guidance, if not the rule, should be flexible in allowing the use of alternative methods to demonstrate progress, as weight of evidence. While some challenged some methods because they use extinction data substitution prior to conversion to deciviews, the methods do not eliminate any days from the record. The alternative approaches can be used in conjunction with the conventional Regional Haze Rule analysis to explain anomalies in the deciview progress record, especially where it is clear that anthropogenic emissions reductions have occurred, while Worst Days deciview averages increase or remain the same. Due to the unique character of each monitor location and exposure, states should have the flexibility to select the adjustment and ranking methodology to use for comparison, taking site-specific characteristics into account. These alternatives have value for various purposes.

> **Median Method.** This method uses a statistical analysis, on an annual basis for each species light extinction at each monitoring site, to identify days which have 2x, or 3x the median species contribution for the year. This is a valuable, convenient, reproducible, and considerably accurate method for culling out the species contributions from extreme episodic events. Western states and others can use it for removing excess natural contributions from the daily deciview values so that the year can be ranked by *most impaired* days. States can utilize the same method for recalculating Natural Conditions using longer-term records that may more accurately reflect natural haze.
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> **Nitrate+Sulfate Method.** This method also uses light extinction rather than deciview values to determine the *most impaired* days. Summed light extinction for nitrate plus sulfate calculated for each day is used to rank the days of the year before conversion to deciviews. The deciview average for the days with the top 20% nitrate+sulfate light extinction in each year is used to create the rolling average to demonstrate that visibility is improving. This would be a better approximation of the days *most impaired* by anthropogenic sources in western states, and in some eastern states. Changes over time would also need to be compared with the state's inventory, if international emissions are a known contributor to haze.
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> **Modeled Source Attributions.** These methods use modeling to attribute species contributions to either anthropogenic, natural, or international categories. The latter two contributions to light extinction are removed and the remaining light extinction from

anthropogenic sources are converted to deciviews and ranked to get the 20% *most impaired* days in deciviews. This method is useful if modeling is current, but the contribution ratios per species will change over time, thereby forcing updates to modeled attributions.

Rather than use regional assumptions about individual species' contributions for any of the alternative approaches discussed above, site-specific data must be used. The importance of using site-specific data, rather than regional assumptions, was not fully understood until decades of monitoring data were amassed that clearly show site uniqueness. Since conditions change site-to-site, the requested flexibility to make adjustments on a site-specific basis is also very critical to the discussion of Natural Conditions.

Visibility improvements should be measurable in terms of reductions in light extinction due to reductions in controllable anthropogenic emissions. Western states need to plan a strategy for, and be judged by, improving visibility on the days *most impaired* by anthropogenic emissions not the Worst Days per the highest deciview quintile. That also means rethinking Worst Days at Natural Conditions as the endpoint that sets any glideslope.

Natural Conditions: ***Revisions to what constitutes Natural Conditions are needed to account for extreme, episodic natural events and contributions from international emission sources, and must be done on a site-by-site basis.***

The method for establishing Natural Conditions in deciviews was based on a statistical analysis that used averages for broad regions and then attached standard deviations to create Best and Worst Days. Many of the western states would like to recalculate Natural Conditions, because monitoring data analysis indicates that regional averages used for individual species do not reflect conditions at each very different monitoring location. The standard deviation used had no basis in actual, current, inter-annual variability, let alone long-term trends that may be affected by climate change and changes in historic forest health practices. Using the same statistical deviation to establish Worst and Best Days for the entire western United States, if not correct on a site-by-site basis, gives an artificial "Worst Days Natural Conditions" end point for each western glideslope.

After examining almost 25 years of IMPROVE data, the western states have realized that site–specific averages are more accurate than the regional ones used to develop the Natural Conditions default values. The averages for geographically broad scale variables are not relevant to specific sites due to the complex terrain, meteorology, and land use mix (emissions) impacting each site in the West. This uniqeness is true, even for sites close to each other, especially if they are in different airsheds. Site-specific data, not regional averages, are more appropriate for refining Natural Conditions, as well as for any of the previously discussed methods for analyzing progress or for setting reasonable progress goals.

With regard to regional haze and visibility impairment, the term "Natural Conditions" does not appear in the Clean Air Act[1]. Rather, it is a construct of the Regional Haze Rule. The construct sets the endpoint of a glideslope as a de facto goal for which states develop long-term strategies and against which progress is evaluated. In the Regional Haze Rule, Natural Conditions for Worst Days are deciview levels to reach by 2064. They are default values that operate in the absence of better data or alternative means of demonstrating visibility improvement.

The preamble to the Regional Haze Rule recognized that refinements could be made in the future.[2] As we review changes over time, we have learned that Natural Conditions are not static. As with criteria pollutants, when new data informs our understanding of health impacts, implementation can change accordingly. While it is difficult to implement any regulatory program when the goals change, it is realistic to make adjustments as we better understand the underlying facts.

As explained above, Worst Days ranked by deciviews, are not the *most* anthropogenically *impaired* days in the West, as they are at many eastern locations. This makes it difficult for western states to use Worst deciview Days as the parameter with which to set goals for anthropogenic emissions reductions. Until the deciview glideslope more accurately reflects Natural Conditions in the West, it will be misleading to use the deciview glideslope to set reasonable progress goals in western states. Western states are considering other practicable alternatives, recognizing that it may not be possible to use the same metric to track visibility progress and to set reasonable progress goals. The Regional Haze Rule preamble also recognized that "States may choose to express visibility changes in terms of other metrics, such as visual range or light extinction, as well as in terms of deciview."[3]

WESTAR has questioned the RHR Natural Conditions construct before. In 2013, we asked: "*Even if it were possible to eliminate all anthropogenic emissions, is that a practical and desirable goal? We rely on sources of anthropogenic emissions for sustenance, economic well-being, transportation and recreation."*[4] The goal of Natural Conditions should be viewed realistically as aspirational, not ultimately achievable. Once again, this notion is explored in the preamble to the Regional Haze Rule:

> "... the reasonable progress goal is a *goal* and not a mandatory standard which must be achieved by a particular date as is the case with the NAAQS. Once a State has adopted a reasonable progress goal and determined what progress will be made toward that goal over a 10-year period, the goal itself is not enforceable.

[1] Federal Clean Air Act, Section 169(A)(1): "Congress hereby declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution."

[2] Federal Register /Vol. 64, No. 126 /Thursday, July 1, 1999 /Rules and Regulations, p. 35729.

[3] Federal Register /Vol. 64, No. 126 /Thursday, July 1, 1999 /Rules and Regulations, p. 35727.

[4] Core Issue #2 – Achieving Natural Conditions and Reasonable Progress. WESTAR Regional Haze Workgroup. May 17, 2013. http://www.westar.org/rhpage.html

> All that is ‘‘enforceable’’ is the set of control measures which the State has adopted to meet that goal.”[5]

Perhaps more public outreach and education is needed to explain what has been achieved. Other metrics can be used to describe progress in improving visibility and reducing haze, other than in terms of changes in Worst Days deciview averages. That could include focusing on changes in other quintiles than the highest 20% values. Descriptions of progress should be relatable to the reductions in anthropogenic emissions, because actual visibility (no matter how it is measured) will still be impacted by natural sources.

For these same reasons, establishing an arbitrary end point of 0 to 1 deciview in place of a Natural Conditions goal may not be achievable and may even be unrealistic for Class I Areas close to highly urbanized population centers. It is no less arbitrary to set a limit of 0 to 1 deciview as a goal for *most impaired* days as to judge long-term strategies against a future without any anthropogenic emissions. As long as we attempt to achieve incremental visibility improvements by continuously reducing controllable anthropogenic emissions, in decadal planning horizons, we can succeed. If we judge the strategies or progress on the basis of glideslopes to highly uncertain and arbitrary endpoints, we will be setting unjustifiable interim goals. Further we will mislead the public with unrealistic expectations.

Even the Prevention of Significant Deterioration (PSD) program authorized in the Clean Air Act, allows some limited degradation of visibility, in apparent conflict with the national goal at section 169A(a)(1). The Clean Air Act goal of remedying existing, and preventing future, anthropogenic visibility impairment is paced by what is economically, legally, and technologically feasible in each planning period in the Regional Haze Rule. The rate at which visibility improves, or impairment by anthropogenic haze decreases, is not the sole consideration.

As long as Natural Conditions remains a part of the regulatory rubric and an aspirational goal, we all need to rethink what represents “natural” and how we get there. Improving visibility on the *most* (anthropogenically) *impaired* days conforms to the plain meaning of the Clean Air Act. Using total light extinction has the advantage of easy conversion to visual range, which is the public understands better than deciview values. The most useful and informative metric, whether for Worst Days, the middle quintile, Best Days, or *most impaired* days may vary by region in the United States. Western states retain the option to revise Natural Conditions goals, in the hopes of better approximating days without anthropogenic impairment, for planning and tracking purposes. In doing so, we offer to work with EPA, FLMs, and interested Tribal representatives to review protocols.

[5] Federal Register /Vol. 64, No. 126 /Thursday, July 1, 1999 /Rules and Regulations, p. 35733.

Controllable Anthropogenic Emissions: ***States cannot control all anthropogenic sources, but need to focus on controllable sources under state jurisdiction that have demonstrated contributions to visibility impairment.***

Modeling the causes of haze shows that many source categories, not under the control of western states, contribute to haze on Worst Days (highest by deciview values). These include international sources (natural and anthropogenic) and federally-controlled sources (most mobile sources, and those in interstate commerce and on federal lands). Some sources within Class I Areas, which are allowed and maintained by Federal Land Managers to support visitation, are close to the IMPROVE monitors and could be influencing the *most impaired* days at some locations. Additionally, some sources under state jurisdiction can't be controlled further in a given planning period. These include 1) sources already approved under PSD; 2) sources already at LAER, BACT, or BACM levels; and 3) sources for which no technology or feasible controls exist at the time. In some states, uncontrollable source emissions overwhelm the remaining inventory of potentially controllable haze-precursor emitters.

For SIP purposes, long-term strategies and emissions reductions depend on the inventory composition of controllable anthropogenic emissions, which is a different mix of categories in each western state. Western states can quantify the anthropogenic emissions under their control, but they cannot always demonstrate that visibility improves on the Worst Days as required by the Regional Haze Rule. From the SIP preparer's point of view, it is much more informative to examine the speciated light extinction record for the entire year, not just on worst deciview days. The effort involves comparing patterns of species-specific light extinction with the state's emissions inventory. Western states are struggling to convert the knowledge gained from evaluating sources of haze precursor species and haze species' measurements at the monitors into state-controlled reductions that improve visibility, especially when Worst deciview Days do not correspond to the reductions.

In the discussions of possible alternative tracking methods, EPA posed the question "*How important is the link between the metric used to track progress and measured visibility?"* The link is important, but the link in the current Regional Haze Rule is broken in the West. Any metric must account for visibility impairment due to haze from natural, international, and federally controlled sources. The current method for ranking the daily deciview value each year works neither as a visibility tracking metric nor as a diagnostic tool for state SIP purposes in the West. Measured visibility can always be expressed in deciviews, total light extinction, or visual range, but in the West, the 20% Worst Days averages do not track progress in states' efforts to improve visibility.

As a workaround, the species data trends (as light extinction or as relative share of total extinction) are more useful to the western state SIP preparer in tracking progress and measuring visibility than deciview levels on Worst Days. The middle quintile of ranked deciview days may sometimes be more representative of progress because it does not contain the days influenced by natural extreme episodic events. In keeping with the rubric of the Regional Haze Rule, long-term trends in species extinction for days *most impaired* by anthropogenic sources might be informative, if there is an accurate method to cull out uncontrollable anthropogenic emissions.

This back and forth of finding the daily, seasonal and annual haze drivers (by species), compared with the controllable sources, means that the planners writing SIPs think in terms of relative light extinction. In tracking visibility improvements, states want evidence of reduced visibility impairment clearly attributed to reducing anthropogenic emissions under their control. Reductions over time, in species extinction trends, better tracks the anthropogenic reductions. Setting goals on a speciated glide slope is more reliable, provided that the speciated glide slope is tied to a more accurate endpoint for Natural Conditions, whether it be an average for all days, the middle quintile, or for Worst Days.

The resolution of this issue may simply be to demonstrate in states' SIPs that there are continuous reductions planned for controllable anthropogenic emissions in the respective planning period. In subsequent Progress Reports, western states could use the alternative tracking approaches to explain why visibility has improved, irrespective of the Worst Days deciview averages. This could include demonstrating downward trends in light extinction for key haze species; or state emissions inventory reductions in anthropogenic precursors of haze species; or improvements in visual range for any quintile other than the worst quintile (which contains natural sources of extreme episodic events in the West). Since some sources under federal control will also be reduced, these reductions will also help offset emissions from source growth that cannot otherwise be controlled.

Setting Reasonable Progress Goals: ***Reasonable Progress Goals (RPGs) must be achievable and based on realistic Natural Conditions or some appropriate alternative measure of visibility improvement.***

Another important consideration for flexibility, is setting the reasonable progress goals for the next planning period ending in 2028. Simply stated, under the current visibility metric, Worst Days deciview averages go up and down, varying markedly both spatially and temporally across the West from sources beyond state control (wildfire, dust storms, volcanic activity, and international emissions). The current regulatory tracking metric, is not suitable for setting any bright line for reasonable progress goals in the West. There is too much uncertainty in the 2028 deciview benchmarks on the glideslopes to the default 2064 Natural Conditions deciview values to use them as the basis for a control strategy. Without rule amendments to the current methodology, western states need a different approach. For several reasons, de-coupling the tracking metric from the setting of reasonable progress goals may be a sensible approach for western states in the next planning period. Western states are interested in discussing alternatives for setting reasonable progress goals in the upcoming SIP cycle.

In the first planning period, western states selected 2018 RPGs using species-specific light extinction values calculated from modeled projections of growth and controls to 2018. These long-term strategies included assumptions for BART reductions. Daily total extinction was converted to daily deciview levels, and the 20% Worst Days averages for 2018 became the 2018 reasonable progress goals. For the first planning period, most western states had 2018 RPGs above the glideslopes to default Natural Conditions at 2064. The rates of reasonable progress in

the first planning period indicated it would take longer to reach Natural Conditions, despite considerable planned reductions in anthropogenic emissions. This is an important reason to examine Natural Conditions goals, to affirm they are accurate and appropriate, and to adjust them if they are not.

Since then, the interference of natural and international emissions has been recognized, although neither was anticipated in the development of the default Natural Conditions. Using deciview rolling averages for 2009-2013 Worst Days, only about half of the western monitors track the default glideslopes to 2064 Natural Conditions. Some western monitors are halfway towards their 2018 RPGs for Worst Days; a few are already at their 2018 goals. Some appear to be making slower progress towards their 2018 targets, due to extreme episodic events or international emissions. Others expect to achieve their 2018 goals as BART controls are applied. This situation has been misinterpreted by outside observers as inadequate progress in improving visibility, despite meeting goals set for reductions in anthropogenic emissions. In setting achievable reasonable progress goals for the next planning period, which ends in 2028, western states need additional considerations.

In the West, the days *most impaired* by anthropogenic emissions are usually the days with the highest combined nitrate and sulfate light extinction. Power plants are the largest state-controlled sources of nitrate and sulfate precursors in addition to the other BART-controlled facilities. Between 2000 and 2014, SOx and NOx from fossil fuel-fired electrical generating units in the 11-state Western Interconnect declined precipitously to roughly 50% of their emissions at the turn of the century. Other sources, stationary or otherwise, have fewer emissions and are more diffuse in the western landscape. There are anthropogenic sources over which the states, and even the federal government, have no control (e.g. emissions from other countries). For instance, as Pacific shipping increases, not all of the emissions will be offset by international maritime controls. Outside of California, the federal government possesses sole regulatory authority over mobile sources, an example of federally-controlled emissions. These are the challenges faced by western states that need to target the appropriate sources and relate any controls to real visibility improvements, which may not show up as Worst Day deciview changes.

Much of the analytic work during SIP development relies upon species light extinction. Species light extinction contributions to total extinction correlate better with the inventory changes than do deciview averages. Impacts from volcanic activity, off-shore shipping, and other international sources (natural and anthropogenic) can be detected as unexpected changes in the speciated data patterns, but must be confirmed by modeling and satellite photos.

The deciview values for Worst Days or for *most impaired* days, by themselves, do not explain relative contributions from haze species. It is much easier to target sources, select controls, set goals, and show progress using the species light extinction contributions. SIP preparers must analyze total light extinction by species contribution, then apportion species contributions by natural and anthropogenic causes, then determine which portion of the latter is under state-control. Days with high light extinction due to controllable anthropogenic sources, may also have a high natural contribution to light extinction on Worst Days, but not on *most* anthropogenically *impaired* days. It is more straightforward for the SIP preparer to start with

controllable sources and to develop control strategies to reduce precursor emissions for the species causing the most impairment. Species light extinction trendlines could be used to set near-term goals for precursor emissions reductions. This would enable a demonstration that feasible controls (species reductions) result in improved visibility by 2028 on the *most impaired* days.

Nitrate and sulfate are major components of western anthropogenic light extinction on most monitored days, not just Worst Deciview Days. Given that not all sources of haze precursors are under state control, reduced visibility impairment could be demonstrated in terms of reductions in controllable anthropogenic NOx and SOx. Except in volcanic situations, nitrate and sulfate are largely from anthropogenic sources. While organic carbon light extinction is high, much of that is due to natural sources, including biogenic emissions in heavily forested Class I Areas. Therefore western states would look for achievable NOx and SOx reductions having measurable visibility benefit by reducing nitrate and sulfate light extinction in the upcoming planning period.

From the perspective of the SIP development process (specifically in setting reasonable progress goals), western states will be examining their emissions inventory mix and the relative contributions of haze species to light extinction predicted at the monitors to determine reasonable reductions of anthropogenic emissions for the upcoming planning period. Different control strategies will be implemented in western states based on the unique inventory of anthropogenic sources that contribute to impairment within each state and in adjoining states. Federal on-the-way and on-the-books regulations will also produce visibility improvements.

The Regional Haze Rule is very specific with regard to the criteria for evaluating emission source controls. In establishing reasonable progress goals, states must consider 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 sources. This process is commonly referred to as the "4-factor analysis." WESTAR urges EPA to include a fifth factor, 'the degree of visibility improvement'.

Demonstrating continued anthropogenic emissions reductions or continuously improving visibility over time should be the overriding goal. While emissions from area, stationary and mobile sources are reduced over time, emissions driven by population growth will make the *prevention of any future* impairment a challenge over the time frame of any 10 year planning cycle. Sources of visibility-impairing pollution will continue to exist beyond 2064. At the same time, Natural Conditions may be changing more dramatically than anticipated due to climate change. This reality suggests we consider a more simplified and practical approach, such as continuous emissions reductions for improved visibility, whether or not Natural Conditions is achievable by 2064.

Modeling Support: ***Western regional haze planning requires modeling support, and that modeling requires adequate funding.***

Photochemical grid and source apportionment modeling for each planning period is essential to guide regional haze program planning decisions. Modeling will inform states of the degree to

which visibility improvements are occurring as a result of federal and state on-the-way and on-the-books regulations. Modeling will also assess the degree of visibility improvement resulting from the implementation of state implemented control programs. Modeling is important for determining contributions from international sources. EPA should commit to performing this modeling, or providing funds to the RPOs for this critical work. If EPA undertakes the modeling, modeling protocol development must include the affected states and RPOs.

In addition, EPA should conduct or fund source apportionment modeling to support Natural Conditions updates. Source apportionment modeling could also be used to exclude the daily contributions to visibility impairment by international emissions, boundary conditions, and other sources that are not under State jurisdiction. This would require improvements to the inventory of sources under federal or tribal jurisdiction. A one-time adjustment to the 2064 glidepath endpoint, to account for contributions from sources outside state jurisdiction, is unlikely to account for constantly changing international transport events. The EPA should also commit to performing or funding international inventory improvements for each planning period.

Work by the Task Force on Hemispheric Transport of Air Pollution (TF HTAP) was discussed at week-long meetings in May 2015 in Colorado, attended by several of the western states representatives working on regional haze. This exchange of modeling and inventory research is invaluable to Regional Haze SIP preparers and deserves continued support. As research shows, international transport is not just an issue for border states, especially because even small concentrations of particulate haze species, well-below health impact levels, travel over great distances and can impair visibility. This information is critical, especially as we focus on controllable anthropogenic emissions and quantifying the impacts of natural sources on visibility.

It may be that for the West, we would identify four inventory categories for western photochemical source apportionment modeling for the base year and for the respective future planning year, split out by species for the following categories: 1) federally controllable anthropogenic; 2) state controllable anthropogenic; 3) natural and operationally defined natural estimates; and, 4) international estimates. International emissions inventories are uncertain and incomplete, and separating out natural from anthropogenic is difficult. All of these categories need to be updated and modeled for every planning period for accurate source-apportionment. This would allow everyone to focus on controllable anthropogenic emissions that lead to visibility impairment in Class I Areas.

Modeling is critical, whether it is for determining current sources of haze or for projecting future impacts from growth or controls. It is a tremendous undertaking in the West where conventional models perform better as the grids are made smaller and where changes in terrain impact model performance. Modeling is integral to regional haze program implementation, and all the stakeholders must consider how to make it work, or agree to accept alternatives when funding is not feasible.