



State of Utah

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DAQ-076-08

October 16, 2008

Callie Videtich, Director
Air and Radiation Program
U.S. EPA Region VIII
1595 Wynkoop Street
Denver, Colorado 80202-1129

Re: EPA's August 18, 2008, Proposal for PM_{2.5} Area Designations in the State of Utah

Dear Ms. Videtich

Thank you for providing us the opportunity to make further comment on your Region's proposal regarding the forthcoming area designations within our state for PM_{2.5}. We note that your office has carefully considered and agreed with much of our initial recommendation (December 18, 2007) concerning these designations. We also note that the official comment period for this action was intended for all other interested parties, but that you have nonetheless decided to solicit our opinions one final time.

Governor Huntsman has requested that we take this opportunity to present our concerns with the proposal, and asks that you take these into consideration before finalizing the area designations.

These concerns can be generally stated as three items: 1) the proposal to consolidate into a single nonattainment area two areas of the Wasatch Front that we had recommended as separate nonattainment areas, 2) the appendage of two other "satellite" areas that show design values in compliance with the 2006 standards, and 3) the establishment of a single multi-state nonattainment area in the Cache Valley. Each of these items will be discussed in further detail, but first I would like to quickly summarize our initial recommendation.

Along the Wasatch Front, Utah recommended the establishment of two distinct nonattainment areas: 1) a northern area that included all of Salt Lake County, all of Davis County, and all portions of Weber County essentially west of the Wasatch Mountains, and 2) a Utah Valley

nonattainment area that excluded from the county only a mountainous region to the East. There were several reasons to recommend this separation, not the least of which was the recognition that Utah Valley is a basin that traps its own air during stagnant winter-time temperature inversions. When looking at monitored PM_{2.5} values from Utah County north to Ogden City it may appear that there is a steady gradation in concentrations from one area to another, but an observer traveling from one area to the other will note areas of high concentration surrounding each of the urban centers. This difference is most pronounced between Utah and Salt Lake Counties where the two air basins are separated by a high promontory called Point of the Mountain.

Utah's recommendation also considered the impacts of several "satellite" regions surrounding the Wasatch Front. However, after evaluating the nine factors that were requisite to the analysis we concluded that there was insufficient reason to make these areas part of the northern nonattainment area. Utah still stands by its initial recommendation, and maintains that it was amply supported from a technical standpoint in the December 18, 2007, document.

By contrast, we have reviewed the technical basis provided with the EPA's proposal and concluded that it cannot be used to support the conclusions that were drawn. This proposal has seemingly relied on inappropriate wind trajectories, weather data collected from as far away as Pocatello, Idaho, erroneous emissions data, and misleading characterizations of commuting patterns to support a conclusion that is simply not evidenced by the facts. Our concerns regarding these technical issues have been compiled as an attachment hereto.

Utah County should be a separate nonattainment area, distinct from the remainder of the Wasatch Front.

Utah County is presently designated as a nonattainment area for PM₁₀, separate and distinct from the Salt Lake County nonattainment area, and there is nothing in this existing arrangement that has made it any more difficult to administer with respect to air quality concerns. Both PM₁₀ nonattainment areas were able to develop implementation plans that successfully met the goals and requirements of the Clean Air Act.

Other EPA Regions have retained a separation of nonattainment areas (based on the 1997 PM_{2.5} NAAQS), even where they might have been subsumed by other areas (for examples of these determinations see Canton, Ohio, and Pittsburgh-Beaver Valley.) Presumably, the agency did so recognizing that planning efforts would be simplified and thereby expedited by maintaining the same areas and hence the same collection of planning agencies.

When addressing the issue of jurisdictional boundaries, one of the "nine factors" identified in the guidance for making these area designations, EPA's proposal acknowledges that "consideration should be given to existing boundaries and organizations that may facilitate air quality planning and the implementation of control measures to attain the standard." It nevertheless seemed to ignore this principle in proposing to co-join two existing nonattainment areas. Any consideration of jurisdictional authority with respect to transportation planning seemed to be dismissed out of hand. The proposal simply stated that "UDAQ ... has State-wide overall planning and SIP development authority."

It is interesting to note that in some of these Eastern states there are often many more distinct nonattainment areas within a much smaller area than what Region VIII has proposed for Utah. Some examples are:

- the area encompassing Philadelphia to Harrisburg Pennsylvania, which includes five nonattainment areas in one 50 by 100 square-mile air basin,
- or Ohio, which designated three separate nonattainment areas within 80 miles (Cincinnati, Dayton, and Columbus),
- or even the Liberty/Clairton area of Pennsylvania which will have one nonattainment area completely surrounded by another nonattainment area!

By contrast, the single nonattainment area proposed for the greater Wasatch Front would extend 150 miles in length and encompass an area of roughly 3,800 square miles. While Utah appreciates that Region VIII was amenable to the State's approach of subdividing its counties (by township and range) for this purpose, this proposed area of nonattainment would still be larger than some Eastern states altogether. This seems inconsistent with some of the proposals made by other Regional Offices.

As technical justification for this portion of its proposal, EPA cites a 4-mile opening beneath a 6,000 foot inversion level operating as a geophysical connection between the two valleys. While the actual connectivity and degree of air transport under cold-pool conditions are difficult to quantify, we would ask you to consider the ambient air monitor at Herriman, a location near the divide. It has a design value of only 24 $\mu\text{g}/\text{m}^3$ (for 2005-2007) which suggests that the high values observed to the North and South are in fact the result of two distinct air-sheds dominated by two separate urban centers.

In recommending that these two areas be kept distinct from one another, the State pointed out that transportation planning in Utah County is done by one Metropolitan Planning Organization (MPO), while the rest of the Wasatch Front is addressed by another. Each is responsible for managing its portion of the transportation network and demonstrating conformity with an emissions budget for PM10.

Under EPA's proposal, where the entire area would be a single nonattainment area for PM2.5, an inadequate conformity finding due to the planning of either MPO would result in a lapse of federal funding that would encompass the areas administered by both. This creates a scenario under which one area could be held responsible for actions taken by an organization in which it had no representation.

EPA's proposal (which also includes other annex areas) would make transportation planning far more complicated and inefficient by involving numerous planning agencies from other jurisdictions at every level of decision-making. Collectively, there would be six counties, more than 60 cities, five emission testing programs, and at least two MPOs. This would only encumber the efforts to develop an air control plan and quite possibly delay any improvements to air quality.

Given these downsides, Utah sees very little (if any) benefit in combining these two areas into a single nonattainment area. EPA has suggested that other parts of the country have had multi-jurisdictional areas within one nonattainment area, and have pointed to the Denver regional area in Colorado and the South Coast Area in California as examples. Utah would have hoped that EPA could find an area that is actually achieving all of the NAAQS as a model of success.

The “satellite” areas of Tooele and Box Elder Counties should not be included in the Salt Lake City-Ogden-Clearfield CSA nonattainment area.

Concerning the proposal to include portions of Tooele and Box Elder Counties in the single nonattainment area for the Wasatch Front, Utah recognizes that EPA, in its evaluation of the “nine factors,” probably gave less weight to the actual monitored data than the State did, and arrived at a different conclusion. Nevertheless, we still feel it is appropriate to leave these areas out of the designated nonattainment area for the following reasons:

There is really nothing to be gained, in terms of air quality mitigation, by making a nonattainment designation in these areas. As pointed out in Utah’s recommendation to EPA, industrial sources are not excused from emission controls simply because they choose to locate outside a nonattainment area. Utah requires that even minor sources apply Best Available Control Strategy prior to obtaining a permit to construct or modify its facility. Concerning mobile sources, any meaningful improvements in emissions from motor vehicles are, at this juncture, really just the result of fleet turn-over. This will happen at its own pace regardless of what the designation for these areas may be. Another likely candidate for SIP control is a restriction on solid fuel heating. However, these areas are free to participate in the wood-burning control program even if they are designated as attainment. In fact, given the incentive to remain in good standing with the health standards, it is entirely likely that discussions with local officials concerning these restrictions could begin this winter. Weber County, as an example, has already elected to participate in this program.

Conversely, the establishment of one expansive nonattainment area raises the question of emission offsets and credits. Emission offsets generated in one nonattainment area are generally not available for use in another nonattainment area, and under Utah’s present designation status for PM10, this has prevented offset credits generated in Utah County from migrating into Salt Lake County. Will these permitting tools remain effective when trading would be allowed between sources located 150 miles apart?

Another consideration is the fact that these areas would be brought under the transportation conformity requirements. At this point, neither area is populous enough to require an MPO. The Utah Department of Transportation would be required to administer these areas, although other contractual arrangements are possible. This essentially introduces another jurisdictional boundary that should be considered in light of the nine-factor approach. Should there be a conformity lapse in another portion of the nonattainment area, these areas would be penalized despite having never violated the ambient air quality standards for PM2.5 and having no representation in the offending jurisdiction.

There is also a concern with respect to general conformity. EPA's proposal to annex a portion of Tooele County includes the Deseret Peak Wilderness area and surrounding lands under the jurisdiction of the U.S. Forest Service. Inclusion of this area into the Salt Lake City-Ogden-Clearfield CSA nonattainment area would force the Forest Service to compile an abundance of documentation as a matter of course in its routine management of this area. Given that inversions do not extend into the Deseret Peak Wilderness Area because of its elevation, it seems that applying conformity to this area is arbitrary.

On technical merit, EPA's own analysis suggests that neither Tooele nor Box Elder Counties is contributing to nonattainment in the core area. Table A.3-2 of the proposal provides the Contributing Emissions Score (CES) for each county, and on a scale of zero to one hundred, these counties ranked only two and seven respectively. By contrast, scores for Utah, Salt Lake, Davis, and Weber Counties were (again respectively): 77, 100, 100, and 60. This CES approach was developed by EPA's Office of Air Quality Planning and Standards subsequent to the "nine-factor guidance" that states and tribes used to make their recommendations, and although Region VIII seems to have largely disregarded its conclusions, it did receive significant attention in the document (42 of 89 pages.) Utah surmises that the output from this methodology was largely disregarded due to topographical features for which the CES algorithm did not account. In other words, in failing to account for a geophysical boundary, a high score did not automatically justify inclusion with the nonattainment area. This is apparent when looking at the results for counties surrounding the recommended Cache Valley nonattainment area. In that example (Table A.2-2), Franklin County Idaho scored 59 and was proposed for inclusion in the nonattainment area, while Bannock County Idaho and Weber County Utah each scored 100 and were not considered for inclusion. Clearly it was the mountainous boundaries that influenced the decision of the Region; and we would add, with good reason. However, in the particular case of Box Elder County and its consideration for attachment to the Salt Lake City-Ogden-Clearfield CSA, there is no such geographical feature. If there is one instance where the EPA might have considered its own analysis it would be this, and again Box Elder scored only seven out of a possible one hundred. It would seem that a *low* CES score would be a more reliable indicator of an area's potential contribution to ambient concentrations because the effects of geophysical boundaries would not bias the score in that direction.

Also concerning the Box Elder appendage, EPA had indicated that there will likely be an effort to "harmonize" areas of nonattainment for both PM_{2.5} and ozone. This area has measured ozone concentrations that are very close to the 2008 ozone standard, but only under meteorological conditions that include a steady wind from the South. This supports the notion that Brigham City is in fact being adversely impacted by the core area of ozone nonattainment. This is likely also the case with PM_{2.5}. EPA's proposal however, presumes the opposite; that Brigham City is adversely impacting on the core nonattainment area and should therefore become part of the nonattainment area.

As we have already noted, the application of backward wind trajectories used to justify the inclusion of not only these areas, but the appendage of Utah County as well, demonstrates a flawed understanding of meteorological processes at work in Utah. These trajectories do not recognize terrain effects or the trapping of the critical boundary layer, and thus are not representative of actual air flow. Furthermore, EPA's proposal did not include any technical

details in support of the trajectory model runs, making it difficult to understand some of the assumptions that were made.

In summary, Utah believes that air quality in these satellite areas will actually improve as the result of attaining the revised health standard in the core areas of nonattainment. However, should these areas ultimately be found to exceed the standards in their own right, they could be subsequently designated to nonattainment and addressed independently. In short, an area designation of attainment at this time in these areas does not preclude the ability of State or local agencies from improving air quality now or in the future.

Creation of a multi-state nonattainment area

Concerning the proposal to adjoin a portion of Franklin County Idaho with Utah's portion of the Cache Valley, we would like to at least point out that the planning process seems likely to be unnecessarily complicated by the duplication of agencies on either side of the border. We recognize that the transportation issue of a conformity lapse in one area affecting the other is less likely where the jurisdictional boundary is a state line, however it would still seem that each state could independently address its own issues with an equal likelihood of successfully resolving the air quality problem within the Valley. We note that Utah's recommendation was silent on that portion of the valley belonging to Idaho, and offer this now only as a suggestion.

In Summary

A common theme in each of the three items discussed above is the manageability of nonattainment areas that may be unnecessarily large in scope. We are also not persuaded by the technical work provided to support such an area. In closing, we would like to provide a long term perspective on the air quality management of nonattainment areas in general. Ultimately, the goal of the Plan Requirements for Nonattainment Areas (Part D of the Clean Air Act) is a permanent improvement in the air quality of an area, substantial enough that it could be designated back to "attainment."

Utah has many years of experience in this regard, and is proud to say that the implementation plans it has developed in partnership with the EPA have, in every instance, resulted in air quality that is in compliance with the respective health standard. Some of these areas have in fact been re-designated to attainment. These are now referred to as "maintenance" areas, which are not explicitly defined in the Clean Air Act but reflect a degree of pollution mitigation that is consistent with the "anti-backsliding" requirements of the Act.

Nevertheless, there are other instances where re-designation has been somewhat more difficult, and arguably from the State's perspective, this has been unnecessarily so. As an example, we would point to Utah County's status with respect to PM10. Despite the fact that this area has been attaining the PM10 NAAQS since 1996, we have found it difficult to re-designate Utah County to attainment, in large part because it was included in the same modeling demonstration that was used for Salt Lake County. Salt Lake County is admittedly a less suitable candidate for re-designation, and this illustrates a "guilt-by-association" situation that arose even under a regulatory structure wherein the two areas were administratively distinct. One can well imagine

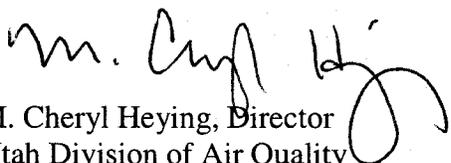
that the process would be even more untenable if the two areas were designated together as a single nonattainment area. Again, the ultimate goal of Part D is a permanent improvement in air quality that warrants re-designation to attainment. EPA's proposal to create one single nonattainment area seems to ensure that there will be no such pathway to success for Utah County, Ogden, or any other satellite region, so long as there remains a PM compliance issue within Salt Lake County. We believe that this goal would be more attainable if: 1) the identified portion of Utah County were designated as a distinctly separate nonattainment area from the area to the North identified as the Salt Lake City-Ogden-Clearfield CSA, and 2) the satellite regions of Tooele and Box Elder Counties were designated as attainment unless and until the ambient monitors in these areas record design values that violate the revised health standards. An area designation structure so described would allow for a "divide-and-conquer" approach to expeditiously resolving the State's air quality issues.

I would like to reiterate that we continue to believe that our initial recommendation of two nonattainment areas along the Wasatch Front makes the most sense for the State of Utah in terms of managing its air quality issues. Legal descriptions were provided in that recommendation of December 18, 2007, and all documentation supporting that recommendation is included in that submittal.

Furthermore, we believe that the technical basis underlying the EPA's proposal is incorrect in its use of back-trajectory analyses that fail to represent cold-pool conditions, meteorological data that was collected at the wrong locations, arbitrary inventories that were not even seasonally adjusted (and therefore overstate carbon emissions), and commuting patterns that were misrepresented by a factor of ten (see attachment.)

Again, we thank you for the opportunity to provide you with our perspective on this important issue and hope that you will give full consideration to our concerns.

Sincerely,



M. Cheryl Heying, Director
Utah Division of Air Quality

Attachment

cc: John M. Huntsman, Jr., Governor

A Utah Division of Air Quality Technical Rebuttal of EPA Region 8 Comments on Utah's PM2.5 SIP Initial Designation Request 9-Factor Analysis

The Utah Division of Air Quality (UDAQ) has reviewed EPA's technical analysis for Utah's PM2.5 SIP Initial Designation Request. The UDAQ has identified six technical issues where EPA Region 8 has presented an incorrect technical analysis. This appendix highlights in detail why the six technical issues are incorrect and reflect a poor understanding of the State of Utah's air quality challenges. Each of the issues corresponds to a specific "Factor" in EPA's "9-Factor Analysis" used for nonattainment designation. The six technical issues that will be addressed include:

- 1) Contributing Emissions Score analysis.
- 2) Episodic vs. annual emissions inventory.
- 3) VMT contribution from outlying counties.
- 4) Pollution rose diagrams.
- 5) Use and definition of mixing height.
- 6) Description, use, and applicability of back trajectories.

1) Contributing Emissions Score analysis – (Factor 1 & Attachment 4)

An argument is made throughout the 9-factor analysis for the nonattainment designation that emissions from the outlying counties contribute to elevated PM2.5 concentrations along the Wasatch Front during high pollution days. Most of these arguments are based on inferences of pollutant transport based on results of the HYSPLIT back trajectory model (please see the discussion on HYSPLIT back trajectories in Section 6 below). This is an inappropriate tool for conditions of high PM2.5 concentrations along the Wasatch Front and is discussed in greater detail in the discussion of technical issues 4-6.

Table A.3-2 on page 32 provides several examples of the problematic nature of this analysis. The analysis of the Contributing Emissions Score (CES) was apparently done by OAQPS. Since there is no documentation of the actual analysis itself, but only conceptual descriptions of the process at the web link provided by EPA, one assumes this was an analysis done for all of the nonattainment areas in the country. The fact that Morgan County receives a higher CES than Tooele County points out the limitations of the HYSPLIT model and a simple lack of focus on the details of the area. Such a result is in direct contradiction to the following statement found on page 46.

"The most prominent feature to observe in Figures A.3-12 and A.3-13 is the eastern boundary of the "Wasatch Front." Here, the Wasatch Mountain Range rises abruptly from the valley floor to heights of approximately 7,000 ft. MSL to well over 9,000 ft. MSL and defines the eastern boundaries of both the Salt Lake Valley to the north and the Utah Valley to the south. These valleys are bound on their respective western sides by the Oquirrh Mountains which also have heights of 7,000 ft. MSL to well over 9,000 ft. MSL. North of Salt Lake County, the Wasatch Mountain Range continues to act as a barrier to the east, while the Great Salt Lake serves as the western boundary.

Not only does the topography of the above regions act as a barrier to air movement during the conditions which lead to elevated concentrations of fine particulate, it also has acted as the primary factor in determining where the population is located.”

Thus, as we maintain, the HYSPLIT model is not a reliable method to evaluate pollution transport under winter inversion conditions and any conclusions based on the CES scores in Table A.3-2 are in question.

2) Episodic vs. annual emissions inventory – (Factor 1)

In Utah, high PM_{2.5} levels occur during winter temperature inversions when the air is cold, there is snow cover, and humidity is high. During the rest of the year PM_{2.5} levels are usually very low, except for exceptional events due to fire or wind. While it may be appropriate to use the annual NEI inventory for areas that have PM_{2.5} problems throughout the year, it is the wrong inventory to use for areas such as Utah that violate the 24-hour standard during the middle of winter. The differences between a seasonal inventory and an annual inventory are especially apparent in Box Elder and Tooele Counties, two rural areas that are adjacent to the urban area along the Wasatch Front. For example, in Box Elder County, 76% of the PM_{2.5} emissions in 2005 come from source categories that do not have emissions during the winter (primarily wildfires and agricultural burning). The following statement on page 31 of EPA’s analysis illustrates this point.

“We note that Tooele County also has the second highest direct carbon emission in the area”

However, on Page 64 in Appendix 2.A, EPA’s data show that 61% of those emissions are due to fires.

There are also spatial issues with the inventory. For example, 20% of annual NO_x emissions in Tooele County are due to trains. There is a major east/west line that runs through Tooele County, and at least 75% of those emissions occur in the west desert, far from the urban Salt Lake area. All of Summit County’s railroad emissions occur in the eastern part of the county. EPA’s analysis appears to have excluded stationary sources in those areas, but does not consider the spatial distribution of other categories.

Because the wrong inventory was used, the emissions component of the CES score for each county has little relationship to the actual PM_{2.5} problem in some counties. Table 1 shows how the annual inventory is changed if seasonal categories that do not occur in winter and train emissions in the west desert are excluded. Emissions that are clearly located in the west desert and eastern mountains are also excluded. This is a simplistic approach that does not account for seasonal activities that are concentrated in the winter, such as home heating. However, it does show the flaws in EPA’s use of the county-wide annual inventory.

	PM2.5				NOx			
	Annual	Non-winter ¹	West Desert & Eastern Mountains ²	Adjusted Annual	Annual	Non-winter	West Desert & Eastern Mountains	Adjusted Annual
Box Elder	2,455	1,876		578	5,617	421		5196
Cache	979	453		525	4,091	70		4020
Davis	1,224	135		1,089	10,741	2		10739
Juab	768	488		279	4,756	85		4670
Morgan	167	80		87	3,170	10		3160
Salt Lake	4,860	277		4,582	38,106	2		38104
Summit	464	149	18	296	4,162	12	1502	2647
Tooele	1,916	809	61	1,044	5,493	150	863	4480
Utah	2335	713		1,622	13,591	82		13509
Wasatch	186	54		131	1,227	2		1225
Weber	940	124		816	6,880	11		6868

Table 1.

The numbers in Table 2 are drawn from Utah’s 2005 inventory that was submitted to the NEI. This inventory does not match the 2005 inventory that EPA used in its analysis. It is difficult to understand EPA’s analysis because we do not know the source of the data that were used.

1. Categories include agriculture burning, prep, and harvesting; fugitive dust from unpaved roads due to snow cover, wildfire and prescribed fire, and home/commercial construction
2. Summit County sources: Whiting Oil Bridger Lake Plant, Utelite, Mountain Gas Resources Yellow Creek Plant, 100% railroad emissions. Tooele County sources: Dugway, 75% railroad emissions.

The State of Utah has extensive experience working with a wintertime seasonal inventory because this is the approach that we used to develop our successful PM10 SIP. The emission sources that contribute to high PM2.5 levels during winter temperature inversions are well known and are concentrated in the urban area along the Wasatch Front. EPA is not looking beyond the annual averages to understand what is really happening in this area. Wildfire, dust, and agricultural emissions in Tooele and Box Elder Counties are leading to a false impression of the contribution from these counties during winter temperature inversions.

3) VMT contribution from outlying counties (Factor 4)

The two sentence statement on page 36, following Table A.3-5 states a conclusion that is simply not supported by the data in the table.

“Many of the counties that are candidates for nonattainment show a higher percentage of commuters going to Salt Lake County than are commuting from Salt Lake to other counties. The counties of Box Elder at 24.1%, Tooele at 43.8% and Utah at 12.9% are all

higher than Salt Lake at 5.4% which shows that emissions related to traffic and commuting from those areas are contributing to violations of the PM2.5 standard.
(underline inserted by UDAQ)

Table 2 (located at the end of the document) clarifies the actual contribution of VMT, and thus emissions, to the proposed nonattainment area from Box Elder and Tooele Counties. The fact that outlying counties have a higher percentage of drivers commuting outside the county than does Salt Lake County does not mean that those counties are significant contributors to the mobile emissions inventory along the Wasatch Front.

Salt Lake County had an estimated 8.9 billion vehicle miles traveled per year in 2005. This is roughly ten times the VMT reported for either Box Elder or Tooele. Therefore, any comparison of these relative percentages is misleading. It is more appropriate to examine, in terms of actual VMT, the impact on the core nonattainment area that is due to these outlying regions. Table 1 shows that there is only about a 1.5% increase in VMT to each of the proposed nonattainment counties from commuters in Box Elder and Tooele Counties, hardly a compelling reason to conclude that this impact contributes to a violation in the nonattainment area. This is based on the assumption that approximately 27% of the annual VMT comes from driving to and from work¹.

4) Pollution rose diagrams – (Factor 6 & 7)

Other than exceptional wind and smoke events, elevated PM2.5 concentrations in Utah occur during wintertime quiescent ridge dominated synoptic conditions. The lack of synoptic scale forcing allows strong cold pools to form in basin or valley bottoms. Within and around these cold pools, weak large scale forcing allows terrain driven flow to develop and vertical mixing is weak to non-existent. Topography controls the wind during these conditions.

EPA produced pollution rose diagrams for the Cache Valley using non-local weather stations. Wind data from ASOS stations located at the Salt Lake City International Airport and Pocatello Regional Airport (both greater than 100 km away from the Cache Valley) were used as surrogates for wind in the Cache Valley. EPA did not discuss why local wind data from the AWOS station at Logan Airport (KLGU) or data from the DAQ Logan monitor was not used. The topography that controls the diurnal variations in wind speed and direction in the Cache Valley is completely different than that of the topography surrounding Salt Lake City and Pocatello. Further, using data from meteorological stations separated by over 200 km to represent wind conditions for locations separated by 35 km within the Cache Valley is not technically defensible (e.g., see the 90 degree difference in wind direction for pollution roses in Attachment 2, Appendix 1.B). For these reasons, the pollution rose diagrams produced by EPA must be removed as a technical justification for any argument put forth.

¹ See <http://www.iacdctransportation.com/research/vmtdrivinganalysis.pdf> “According to the 2001 National Household Travel Survey, traveling to and from work represents 27.0% of Vehicle Miles Traveled (VMT).” vmtdrivinganalysis.pdf”, page 3

Along the Wasatch Front, EPA's pollution rose diagrams were created using inappropriate wind data. Wind data from the Salt Lake City International Airport to create pollution rose diagrams for Utah County, Weber County, Davis County, and Toole County while wind data from Pocatello, Idaho was used to create a pollution rose diagram for Box Elder County, Utah. These pollution rose diagrams were then used as evidence to support the exchange of precursor emissions between outlying areas and the Salt Lake City-Ogden-Clearfield CSA and Provo-Orem CBSA's. The DAQ would again like to point out that because topography controls the wind, a wind rose from Salt Lake City is not representative of the wind rose in Ogden or Provo and a wind rose from Pocatello, Idaho (mountain ranges away) is completely inappropriate to be used for Box Elder County, Utah.

5) Use and definition of mixing height – (Factor 6)

As described by Utah, Idaho, and EPA, afternoon mixing height plays a key role in chemistry and the build-up of PM_{2.5} concentrations. Idaho's meteorological description of PM_{2.5} meteorological conditions references vertical profiles of ground surface temperature data collected by Dr. Randy Martin of Utah State University. Dr. Martin ran small surface based portable HOBO temperature data loggers along the mountain slope by hanging the loggers on small trees. This data is helpful in understanding the intensity of cold pools (inversion) and identifying the elevation at which stability begins to decrease (i.e., when temperature decreases with height).

EPA's response includes Figure A.2-8 which shows average vertical profiles of temperature with height near Logan, Utah for a 17 day period in January 2004. From this data, Idaho and EPA concluded that the average inversion height reaches approximately 5500 feet above sea level. This leads to the conclusion that the average mixing height during an inversion is about 1000 feet thick.

The DAQ offers a slightly different interpretation of the data. Dr. Martin's data clearly shows the coldest temperatures occur at the lowest elevation (starting at 300 feet above the Valley bottom) and monotonically increase with height until an elevation of about 6300 feet above sea level during all but the maximum solar heating hours. During the maximum solar heating hours, from noon to 3:00 p.m., the inversion may weaken, but depending on snow cover and/or the presence of low clouds and fog, the actual surface layers may not mix.

It is important to remember that because the thermometers were located on and along the mountain slope, solar heating of the mountain slope and resultant localized heating and vertical motions may alter the vertical temperature profile compared with the free atmosphere. If Dr. Martin's temperature data was extrapolated from the lowest elevation of 4700 feet down through the lower gradient topography to the Valley bottom at 4400 feet, it is likely that the data would show a strongly inverted 300 feet surface layer. As a result, the DAQ feels that the existence and height of the mixed layer in the Cache Valley is more complex than described by Idaho and EPA.

6) Description, use, and applicability of back trajectories – (Factor 6 & 7)

EPA ran and provided the results of backwards trajectories from NOAA's Air Resource Laboratory's HYSPLIT model for selected high PM_{2.5} days (inversion conditions). Unfortunately, specific model run details were not included in EPA's response. In order to properly interpret the results of the trajectories, it is critical to know the following:

What meteorological data set was used?

What meteorological data set resolution was used?

What vertical motion scheme was used?

What trajectory start height was used?

All of the available meteorological data sets on the HYSPLIT website have horizontal resolutions far too coarse to accurately depict a near-surface air parcel's trajectory in a cold pool. The coarse resolution of the meteorological data does not capture the topographically driven micro and meso scale features of the wind field. As mentioned in the pollution rose diagram section, topography controls the wind during quiescent ridge dominated synoptic conditions. For this reason, the backwards trajectories produced by EPA must be removed as a technical justification for any argument put forth.

Portion of original table from 08_UT_EPAMOD.pdf pg. 35				
County	2005 VMT (millions)	Commute within County (Persons)	Commute to other Counties (Persons)	% of Persons commuting to other Counties
Box Elder	1066	13570	4302	24**
Davis	2268	61208	50430	45
Morgan	138	1217	1930	163
Salt Lake	8917	411283	23521	5
Summit	740	10486	5279	34
Tooele	867	9784	7622	44**
Wasatch	300	3857	2947	43
Weber	1574	64671	25916	29
Assumption: 27% of annual average VMT comes from driving to/from work. Source:				
http://www.iacdctransportation.com/research/vmtdrivinganalysis.pdf				
http://www.iacdctransportation.com/				
County	2005 VMT (millions)	27% of VMT	Proportion of county VMT added to Wasatch Front Counties **	
Box Elder	1066	288	69	
Tooele	867	234	103	
Assuming work trips end in Salt Lake County, Box Elder County commute miles split evenly among Weber, Davis and Salt Lake Counties. All Tooele commute miles assigned to Salt Lake County				
County	Percentage VMT added to County from commuting outside the county			
Davis	1.0%			
Salt Lake	1.4%			
Weber	1.5%			

Table 2.