



State of Utah

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DAQ-098-14

MEMORANDUM

TO: Air Quality Board

THROUGH: Bryce C. Bird, Executive Secretary

FROM: Bill Reiss, Environmental Engineer

DATE: November 25, 2014

SUBJECT: FINAL ADOPTION: Add new SIP Subsection IX.A.22: Control Measures for Area and Point Sources, Fine Particulate Matter, PM_{2.5} SIP for the Provo, UT Nonattainment Area.

On December 14, 2009, EPA made its designations concerning areas that were not attaining the 2006 National Ambient Air Quality Standard (NAAQS) for PM_{2.5}. Among those areas designated was the Provo, UT PM_{2.5} Nonattainment Area.

The Clean Air Act (CAA) required Utah to submit a nonattainment plan for the area. For several years, the Utah Division of Air Quality (UDAQ), in consultation with many stakeholders including EPA Region 8, worked to develop a State Implementation Plan (SIP) for the 2006 24-hour NAAQS for PM_{2.5}. On December 4, 2013, the Board adopted that SIP and it was subsequently submitted to EPA.

As the SIP was nearing completion, the D.C. Circuit Court of Appeals found that EPA had incorrectly interpreted the Clean Air Act when determining how to implement the NAAQS for PM_{2.5}. The January 4, 2013, court ruling held that EPA should have implemented the PM_{2.5} NAAQS based on *both* CAA Subpart 1 *and* Subpart 4 of Part D, Title I. It also remanded the 2007 PM_{2.5} Implementation Rule back to EPA so that the agency could address implementation of the PM_{2.5} NAAQS under Subpart 4.

Utah was therefore required to supplement its SIP in order to address the additional requirements of Subpart 4. The most fundamental departure of Subpart 4 is that it classifies PM nonattainment areas as either Moderate or Serious and includes somewhat different planning requirements for each.

In the wake of the court ruling, EPA issued a "Deadlines Rule" that: 1) classified the Provo, UT PM_{2.5} Nonattainment Area as a Moderate Area, 2) established a deadline of December 31, 2014 for Utah to submit the necessary SIP elements, and 3) established the attainment date for the area as December 31, 2015.

To meet this due-date in the Deadlines Rule, a SIP addressing the Subpart 4 planning requirements for Moderate Areas was proposed by the Board on September 3, 2014.

A 30-day public comment period was held, which included a public hearing. A summary of the comments received during the comment period along with the responses from UDAQ is attached.

One central point made throughout the responses to those comments is that there is still no new PM_{2.5} implementation rule to guide states in the development of their SIPs, even as those SIPs are now coming due.

Any recommended revision to SIP Subsection IX.A.22 resulting from these comments has been identified in the amended attachment using strikeout and underline.

Staff Recommendation: Staff recommends the Board adopt SIP Subsection IX.A.22: Control Measures for Area and Point Sources, Fine Particulate Matter, PM_{2.5} SIP for the Provo, UT Nonattainment Area as amended.

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UTAH
State Implementation Plan
Control Measures for Area and Point Sources, Fine Particulate Matter,
PM_{2.5} SIP for the Provo, UT Nonattainment Area

Section IX. Part A.22

Adopted by the Utah Air Quality Board

December 3, 2014

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Acronyms

| | | |
|----|--------------------------|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | BACT | Best Available Control Technology |
| 5 | CAA | Clean Air Act |
| 6 | CFR | Code of Federal Regulations |
| 7 | CMAQ | Community Multiscale Air Quality |
| 8 | CTG | Control Techniques Guideline Documents |
| 9 | DAQ | Utah Division of Air Quality (also UDAQ) |
| 10 | EPA | Environmental Protection Agency |
| 11 | FRM | Federal Reference Method |
| 12 | MACT | Maximum Available Control Technology |
| 13 | MATS | Model Attainment Test Software |
| 14 | MPO | Metropolitan Planning Organization |
| 15 | $\mu\text{g}/\text{m}^3$ | Micrograms Per Cubic Meter |
| 16 | Micron | One Millionth of a Meter |
| 17 | NAAQS | National Ambient Air Quality Standards |
| 18 | NESHAP | National Emissions Standards for Hazardous Air Pollutants |
| 19 | NH_3 | Ammonia |
| 20 | NO_x | Nitrogen Oxides |
| 21 | NSPS | New Source Performance Standard |
| 22 | NSR | New Source Review |
| 23 | PM | Particulate Matter |
| 24 | PM_{10} | Particulate Matter Smaller Than 10 Microns in Diameter |
| 25 | $\text{PM}_{2.5}$ | Particulate Matter Smaller Than 2.5 Microns in Diameter |

| | | |
|----|-----------------|---|
| 1 | RACM | Reasonably Available Control Measures |
| 2 | RACT | Reasonably Available Control Technology |
| 3 | RFP | Reasonable Further Progress |
| 4 | SIP | State Implementation Plan |
| 5 | SMOKE | Sparse Matrix Operator Kernel Emissions |
| 6 | SO ₂ | Sulfur Dioxide |
| 7 | SO _x | Sulfur Oxides |
| 8 | TSD | Technical Support Document |
| 9 | VOC | Volatile Organic Compounds |
| 10 | UAC | Utah Administrative Code |
| 11 | WRF | Weather Research and Forecasting |

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1 Chapter 1 – INTRODUCTION AND BACKGROUND

2

3 1.1 Fine Particulate Matter

4 According to EPA's website, particulate matter, or PM, is a complex mixture of extremely small particles
5 and liquid droplets. Particulate matter is made up of a number of components, including acids (such as
6 nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

7 The size of particles is directly linked to their potential for causing health problems. EPA is concerned
8 about particles that are 10 micrometers in diameter or smaller because those are the particles that
9 generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect
10 the heart and lungs and cause serious health effects. Other negative effects are reduced visibility and
11 accelerated deterioration of buildings.

12 EPA groups particle pollution into two categories:

- 13 • "Inhalable coarse particles," such as those found near roadways and dusty industries, are larger
14 than 2.5 micrometers and smaller than 10 micrometers in diameter. Utah has previously addressed
15 inhalable coarse particles as part of its PM₁₀ SIPs for Salt Lake and Utah Counties, but this fraction is
16 not measured as PM_{2.5} and will not be a subject for this nonattainment SIP.
17
- 18 • "Fine particles," such as those found in smoke and haze, are 2.5 micrometers in diameter and
19 smaller and thus denoted as PM_{2.5}. These particles can be directly emitted from sources such as
20 forest fires, or they can form when gases emitted from power plants, industries and automobiles
21 react in the air.

22 PM concentration is reported in micrograms per cubic meter or $\mu\text{g}/\text{m}^3$. The particulate is collected on a
23 filter and weighed. This weight is combined with the known amount of air that passed through the filter
24 to determine the concentration in the air.

25

26 1.2 Health and Welfare Impacts of PM_{2.5}

27 Numerous scientific studies have linked particle pollution exposure to a variety of problems, including:

- 28 • increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing,
29 for example;
- 30 • decreased lung function;
- 31 • aggravated asthma;
- 32 • development of chronic bronchitis;
- 33 • irregular heartbeat;

- 1 • nonfatal heart attacks; and
- 2 • pre-mature death in people with heart or lung disease.

3 People with heart or lung diseases, children and older adults are the most likely to be affected by
4 particle pollution exposure. However, even healthy people may experience temporary symptoms from
5 exposure to elevated levels of particle pollution.

6

7 **1.3 Fine Particulate Matter in Utah**

8 Excluding wind-blown desert dust events, wild land fires, and holiday related fireworks, elevated PM_{2.5}
9 in Utah occurs when stagnant cold pools develop during the winter season.

10 The synoptic conditions that lead to the formation of cold pools in Utah's nonattainment areas are:
11 synoptic scale ridging, subsidence, light winds, snow cover (often), and cool- to-cold surface
12 temperatures. These conditions occur during winter months, generally mid-November through early
13 March.

14 During a winter-time cold pool episode, emissions of PM_{2.5} precursors react relatively quickly to elevate
15 overall concentrations, and of course dispersion is very poor due to the very stable air mass. Episodes
16 may last from a few days to tens of days when meteorological conditions change to once again allow for
17 good mixing.

18 The scenario described above leads to exceedances and violations of the 24-hour health standard for
19 PM_{2.5}. In other parts of the year concentrations are generally low, and even with the high peaks
20 incurred during winter, are well within the annual health standard for PM_{2.5}.

21

22 **1.4 2006, NAAQS for PM_{2.5}**

23 In September of 2006, EPA revised the (1997) standards for PM_{2.5}. While the annual standard remained
24 unchanged at 15 µg/m³, the 24-hr standard was lowered from 65 µg/m³ to 35 µg/m³.

25 DAQ has monitored PM_{2.5} since 2000, and found that all areas within the state have been in compliance
26 with the 1997 standards. At this new 2006 level, all or parts of five counties have collected monitoring
27 data that is not in compliance with the 24-hr standard.

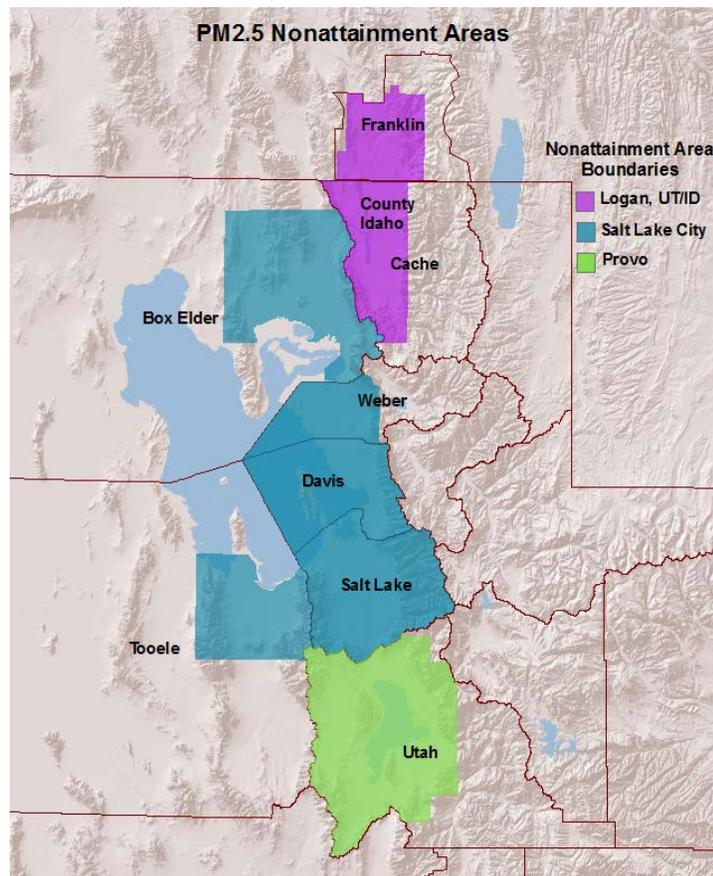
28 In 2013, EPA lowered the annual average to 12 µg/m³. Monitoring data shows no instances of
29 noncompliance with this revised standard.

1 **1.5 PM_{2.5} Nonattainment Areas in Utah**

2

3 There are two distinct nonattainment areas for the 2006, PM_{2.5} standards residing entirely within the
4 state of Utah. These are the Salt Lake City, UT, and Provo, UT nonattainment areas, which together
5 encompass what is referred to as the Wasatch Front. A third nonattainment area is more or less
6 geographically defined by the Cache Valley which straddles the border between Utah and Idaho (the
7 Logan, UT – ID nonattainment area.) Figure 1.1 below shows the geographic extent of these areas.

8 None of these three areas has violated the annual NAAQS for PM_{2.5}. Without exception, the
9 exceedances leading to 24-hr NAAQS violations are associated with relatively short-term meteorological
10 occurrences.



11

12

Figure 1.1, Nonattainment Areas for the 2006, PM_{2.5} NAAQS

13

1 Each of these three areas was designated, by the EPA, based on the weight of evidence of the following
2 nine factors recommended in its guidance and any other relevant information:

- 3 • pollutant emissions
- 4 • air quality data
- 5 • population density and degree of urbanization
- 6 • traffic and commuting patterns
- 7 • growth
- 8 • meteorology
- 9 • geography and topography
- 10 • jurisdictional boundaries
- 11 • level of control of emissions sources

12 EPA also used analytical tools and data such as pollution roses, fine particulate composition monitoring
13 data, back trajectory analyses, and the contributing emission score (CES) to evaluate these areas.

14 While the general meteorological characteristics are identical between the Wasatch Front and Cache
15 Valley, there are two important differences related to topography. First, the Cache Valley is a closed
16 basin while the Wasatch Front has many large outlets that connect it to the larger Great Basin. The
17 large outlets along the Wasatch Front provide the potential for greater advection of pollutants and for a
18 potentially weaker cold pool. Second, the Cache Valley is a narrow (<20 km) valley bordered by
19 extremely steep mountains. These topographical differences lead to faster forming, more intense, and
20 more persistent cold pools in Cache Valley relative to the Wasatch Front.

21 Because of these differences, the two Wasatch Front areas and the Cache Valley are designated as
22 separate nonattainment areas; however, they have all been modeled together within the same
23 modeling domain.

24

25 **1.6 PM_{2.5} Precursors**

26 The majority of ambient PM_{2.5} collected during a typical cold-pool episode of elevated concentration is
27 secondary particulate matter, born of precursor emissions. The precursor gasses associated with fine
28 particulate matter are SO₂, NO_x, volatile organic compounds (VOC), and ammonia (NH₃).

29 Clean Air Act Section 189(e) requires that the control requirements applicable in plans for major
30 stationary sources of PM₁₀ shall also apply to major stationary sources of PM₁₀ precursors, except where
31 the Administrator determines that such sources do not contribute significantly to PM₁₀ levels which
32 exceed the standard in the area.

33 As this paragraph now applies also to PM_{2.5} plans the following should be said about the way this plan is
34 structured.

1 CAA Section 172 does not include any specific applicability thresholds to identify the size of sources that
2 States and EPA must consider in the plan’s RACT and RACM analysis. In developing the emissions
3 inventories underlying the SIP, the criteria of 40 CFR 51 for air emissions reporting requirements was
4 used to establish a 100 ton per year threshold for identifying a sub-group of stationary point sources
5 that would be evaluated individually. For the Salt Lake City, UT nonattainment area, there are 28
6 stationary point sources that met or meet the criteria of 100 tons per year for PM_{2.5} or any PM_{2.5}
7 precursor.

8 The control evaluations for each of these sources included PM_{2.5} as well as PM_{2.5} precursors. This
9 principle was extended to the non-stationary source categories as well.

10 When evaluating the cost per ton necessary to reduce emissions, consideration was given to the
11 resulting PM_{2.5} concentrations. Through this process, reasonable controls were identified affecting
12 PM_{2.5}, SO₂, NO_x and VOC.

13 No such controls were identified for ammonia. Ammonia occurs in such abundance that PM_{2.5}
14 concentrations are not sensitive to reductions in ammonia unless those reductions are very large.
15 Within the stationary source category, there really were no significant amounts of ammonia to evaluate.
16 The largest contributor to the ammonia inventory was the agricultural sector, and the maximum
17 possible amount of ammonia reduction from that sector would still not be enough to affect a reduction
18 in PM_{2.5}.

19 Additional information regarding control measures may be found in Chapter 6 as well as the Technical
20 Support Document (TSD).

21

22

1 **Chapter 2 – REQUIREMENTS FOR 2006, PM_{2.5} PLAN REVISIONS**

2

3 **2.1 Requirements for Nonattainment SIPs**

4 Section 110 of the Clean Air Act lists the requirements for implementation plans. Many of these
5 requirements speak to the administration of an air program in general. Section 172 of the Act contains
6 the plan requirements for nonattainment areas. Some of the more notable requirements identified in
7 these sections of the Act that pertain to this SIP include:

- 8 • Implementation of Reasonably Available Control Measures (RACM) as expeditiously as
9 practicable
- 10 • Reasonable Further Progress (RFP) toward attainment of the National Ambient Air Quality
11 Standards by the applicable attainment date
- 12 • Enforceable emission limits as well as schedules for compliance
- 13 • A comprehensive inventory of actual emissions
- 14 • Contingency measures to be undertaken if the area fails to make reasonable further progress or
15 attain the NAAQS by the applicable attainment date

16 On January 4, 2013, D.C. Circuit Court of Appeals found that EPA had incorrectly interpreted the Clean
17 Air Act when determining how to implement the National Ambient Air Quality Standards (NAAQS) for
18 PM_{2.5}. The January 4, 2013 court ruling held that the EPA should have implemented the PM_{2.5} NAAQS
19 based on *both* Clean Air Act (CAA) Subpart 1 (“Nonattainment Areas in General” of “Part D – Plan
20 Requirements for Nonattainment Areas”) *and* Subpart 4 (“Additional Provisions for Particulate Matter
21 Nonattainment Areas”) of Part D, title 1. EPA had (incorrectly) required states to develop their SIPs
22 based only on Subpart 1. Therefore, as of January 4, 2013, Subpart 4 also applies.

23 Under Subpart 4, nonattainment areas for particulate matter may carry the classification of either
24 moderate or serious. Subpart 4 addresses the attainment dates and planning provisions for both
25 moderate and serious PM nonattainment areas.

26 In the wake of the decision by the D.C. Circuit, EPA has promulgated a “Deadlines Rule” that identifies
27 each of Utah’s three PM_{2.5} nonattainment areas as moderate. It specifies December 31, 2014 as the SIP
28 submission deadline for these moderate PM_{2.5} nonattainment areas, and further specifies December 31,
29 2015 as the attainment date for each area.

30 More specific requirements for the preparation, adoption, and submittal of implementation plans are
31 specified in 40 CFR Part 51. Subpart Z of Part 51 had contained provisions for Implementation of PM_{2.5}
32 National Ambient Air Quality Standards. However, one consequence of the January 4, 2013 Court ruling
33 was to revoke Subpart Z. This leaves only the more general requirements of Part 51.

34

1 **2.2 PM_{2.5} SIP Guidance**

2 Beyond what had been codified in Subpart Z of Part 51 concerning the Implementation of the PM_{2.5}
3 NAAQS, EPA had provided additional clarification and guidance in its Clean Air Particulate
4 Implementation Rule for the 1997, PM_{2.5} NAAQS (FR 72, 20586) and its subsequent Implementation
5 Guidance for the 2006, 24-Hour Fine Particle NAAQS (March 2, 2012). This too was revoked by the D.C.
6 Circuit Court’s decision. Until such time as a new implementation rule for PM_{2.5} is promulgated, the
7 Deadlines Rule recommends the General Preamble, EPA’s longstanding general guidance that interprets
8 the 1990 amendments to the CAA, as the applicable guidance for states to follow while preparing SIPs
9 for PM_{2.5} nonattainment areas.

10

11 **2.3 Summary of this SIP Proposal**

12 This implementation plan was developed to meet the requirements specified in the law, rule, and
13 appropriate guidance documents identified above. Discussed in the following chapters are: air
14 monitoring, reasonably available control measures, modeled attainment demonstration, emission
15 inventories, reasonable further progress toward attainment, transportation conformity, and
16 contingency measures. Additional information is provided in the technical support document (TSD).

1 **Chapter 3 – Ambient Air Quality Data**

2

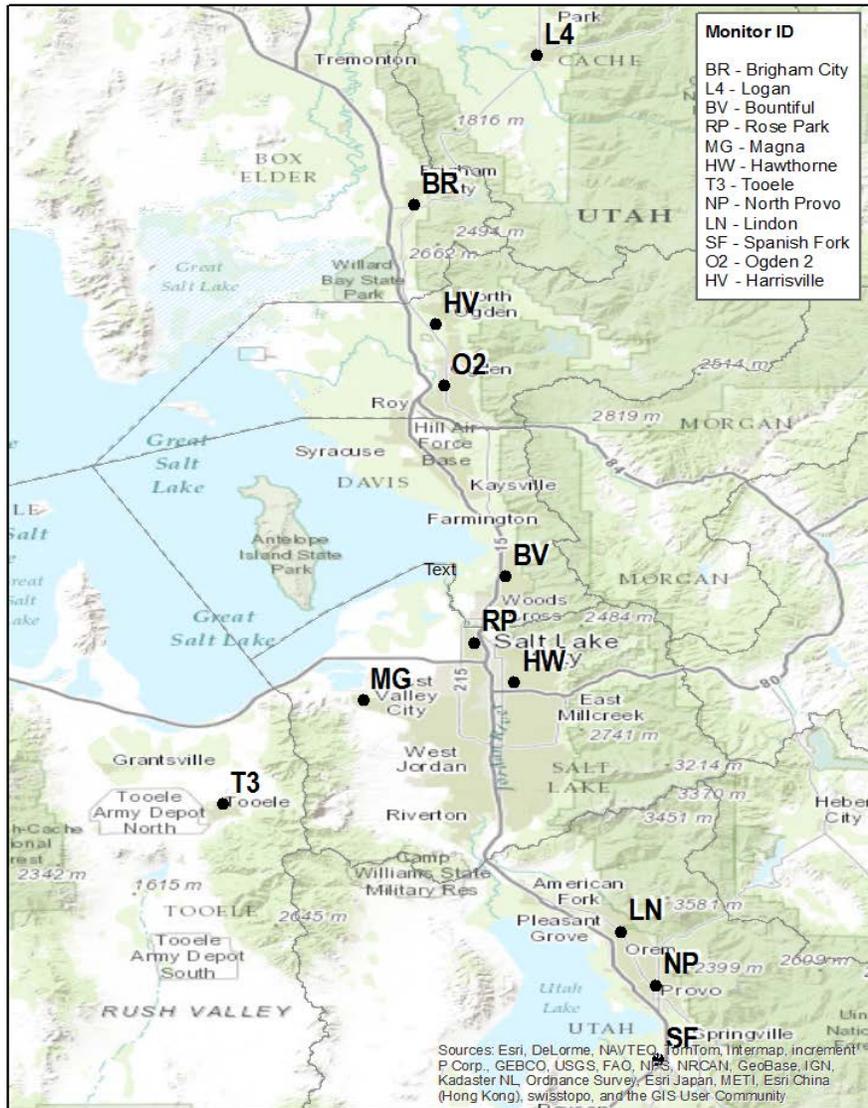
3 **3.1 Measuring Fine Particle Pollution in the Atmosphere**

4 Utah has monitored PM_{2.5} in its airsheds since 2000 following the promulgation of the 1997, PM_{2.5}
5 NAAQS which was set at 65 µg/m³ for a 24-hour averaging period. PM_{2.5} monitoring sites were initially
6 located based on concentrations of PM₁₀, which historically were measured at sites located based on
7 emissions of primary particles. PM_{2.5} concentrations, especially during Utah’s wintertime valley
8 temperature inversions, tend to be distributed more homogenously within a specific airshed.
9 Homogeneity of PM_{2.5} concentrations means that one or two monitors are adequate to determine
10 compliance with the NAAQS in specific airsheds. DAQ’s monitors are appropriately located to assess
11 concentration, trends, and changes in PM_{2.5} concentrations. During Utah’s wintertime cold-pool
12 episodes, every day sampling and real time monitoring are needed for modeling and public notification.

13

14 **3.2 Utah’s Air Monitoring Network**

15 The Air Monitoring Center (AMC) maintains an ambient air monitoring network in Utah that collects
16 both air quality and meteorological data. Figure 3.1 shows the location of sites along the Wasatch Front
17 that collect PM_{2.5} data. Twelve sites collect PM_{2.5} data using the Federal Reference Method (FRM);
18 PM_{2.5} is collected on filters over a 24 hour period and its mass is measured gravimetrically. Seven of
19 those sites also measure PM_{2.5} concentrations continuously in real-time. Real-time PM_{2.5} data is useful
20 both for pollution forecasting and to compare with 24-hour concentrations of PM_{2.5} collected on filters.
21 Of the twelve sites that use the FRM to measure PM_{2.5}, six sites collect PM_{2.5} data daily and six sites
22 collect PM_{2.5} data on every third day. Three sites along the Wasatch Front collect speciated PM_{2.5}.
23 Particulate matter on the speciated PM_{2.5} filters is analyzed for organic and inorganic carbon and a list of
24 48 elements. PM_{2.5} speciation data is particularly useful in helping to identify sources of particulate
25 matter. The ambient air quality monitoring network along Utah’s Wasatch Front and in the Cache Valley
26 meets EPA requirements for monitoring networks.



1

2

Figure 3.1, Utah’s PM_{2.5} Air Monitoring Network

3

4 3.3 Annual PM_{2.5} – Mean Concentrations

5 The procedure for evaluating PM_{2.5} data with respect to the NAAQS is specified in Appendix N to 40 CFR
 6 Part 50. Generally speaking, the annual PM_{2.5} standard is met when a three-year average of annual

1 mean values is less than or equal to 12.0 $\mu\text{g}/\text{m}^3$. Each annual mean is itself an average of four quarterly
 2 averages.

3 Table 3.1, below shows the running 3-year averages of annual mean values for each of Utah’s
 4 monitoring locations. The data in the table spans the years 2008 through 2012. These are the years
 5 surrounding 2010, the year for which the baseline modeling inventory was prepared. It can be seen
 6 from the data that there are no locations at which the annual NAAQS was violated. It should be noted
 7 that the conclusion would be no different if the most recent data from 2013 were considered.

8

| Location | County | 3-Year Average of Annual Mean Concentrations | | |
|----------------------------|-----------|--|---------|---------|
| | | 08 - 10 | 09 - 11 | 10 - 12 |
| Logan (Combined POC 1 & 2) | Cache | 10.0 | 9.7 | 8.7 |
| Brigham City | Box Elder | 8.3 | 8.2 | 7.7 |
| Ogden 2 (POC 1) | Weber | 9.7 | 9.5 | 9.1 |
| Harrisville | Weber | 8.6 | 8.3 | 7.6 |
| Bountiful | Davis | 9.8 | 9.2 | 8.3 |
| Rose Park (POC 1) | Salt Lake | 10.4 | 9.7 | 9.2 |
| Magna | Salt Lake | 8.5 | 8.4 | 7.7 |
| Hawthorn (POC 1) | Salt Lake | 10.4 | 9.7 | 8.8 |
| Tooele | Tooele | 6.8 | 6.8 | 6.3 |
| Lindon (POC 1) | Utah | 9.8 | 9.1 | 8.3 |
| North Provo | Utah | 9.4 | 8.7 | 8.1 |
| Spanish Fork | Utah | 8.8 | 8.5 | 7.7 |

9

10 **Table 3.1, PM_{2.5} Annual Mean Concentrations**

11 **3.4 Daily PM_{2.5} – Averages of 98th Percentiles and Design Values**

12 The procedure for evaluating PM_{2.5} data with respect to the NAAQS is specified in Appendix N to 40 CFR
 13 Part 50. Generally speaking, the 24-hr. PM_{2.5} standard is met when a three-year average of 98th
 14 percentile values is less than or equal to 35 $\mu\text{g}/\text{m}^3$. Each year’s 98th percentile is the daily value below
 15 which 98% of all daily values fall.

16 Table 3.2, below shows the running 3-year averages of 98th percentile values for each of Utah’s
 17 monitoring locations. Again, the data in the table spans the years 2008 through 2012 which are the
 18 years surrounding 2010, the baseline modeling inventory. It can be seen from the data that there are
 19 many locations at which the 24-hr. NAAQS has been violated, and this SIP has been structured to
 20 specifically address the 24-hr. standard.

1

| Site-Specific Baseline Design Values: | | 3-Year Average of 98th Percentiles | | | Baseline Design Value |
|---------------------------------------|-----------|------------------------------------|---------|---------|-----------------------|
| Location | County | 08 - 10 | 09 - 11 | 10 - 12 | |
| Logan (Combined POC 1 & 2) | Cache | 42.6 | 42.4 | 37.2 | 40.7 |
| Brigham City | Box Elder | 42.5 | 40.1 | 37.2 | 39.9 |
| Ogden 2 (POC 1) | Weber | 37.0 | 41.1 | 37.4 | 38.5 |
| Harrisville | Weber | 35.6 | 36.6 | 33.2 | 35.1 |
| Bountiful | Davis | 37.7 | 40.3 | 34.4 | 37.5 |
| Rose Park (POC 1) | Salt Lake | 40.9 | 40.7 | 35.4 | 39.0 |
| Magna | Salt Lake | 32.8 | 34.5 | 30.3 | 32.5 |
| Hawthorn (POC 1) | Salt Lake | 43.6 | 44.5 | 38.1 | 42.1 |
| Tooele | Tooele | 25.9 | 27.1 | 24.4 | 25.8 |
| Lindon (POC 1) | Utah | 40.5 | 40.9 | 32.4 | 37.9 |
| North Provo | Utah | 36.4 | 35.1 | 28.6 | 33.4 |
| Spanish Fork | Utah | 39.3 | 41.7 | 34.6 | 38.5 |

2

3 **Table 3.2, 24-hour PM_{2.5} Monitored Design Values**

4 As mentioned in the foregoing paragraph, this SIP is structured to address the 24-hr. PM_{2.5} NAAQS. As
 5 such the modeled attainment test must consider monitored baseline design values from each of these
 6 locations. EPA’s modeling guidance¹ recommends this be calculated using three-year averages of the
 7 98th percentile values. To calculate the monitored baseline design value, EPA recommends an average
 8 of three such three-year averages that straddle the baseline inventory. 2010 is the year represented by
 9 the baseline inventory. Therefore, the three-year average of 98th percentile values collected from 2008-
 10 2010 would be averaged together with the three-year averages for 2009-2011 and 2010-2012 to arrive
 11 at the site-specific monitored baseline design values. These values are also shown in Table 3.2².

12

13 **3.5 Composition of Fine Particle Pollution – Speciated Monitoring Data**

14 DAQ operates three PM_{2.5} speciation sites. The Hawthorne site in Salt Lake County is one of 54
 15 Speciation Trends Network (STN) sites operated nationwide on an every-third-day sampling schedule.
 16 Sites at Bountiful/Viewmont in Davis County and Lindon in Utah County are State and Local Air
 17 Monitoring Stations (SLAMS) PM_{2.5} speciation sites that operate on an every-sixth-day sampling
 18 schedule.

¹ Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze (EPA -454B-07-002, April 2007)

² Recalculating the design values by replacing the 98th percentiles from 2008 with the most recent 98th percentiles from 2013 has a mixed effect throughout the monitoring network, with some sites increasing and others decreasing. The design value for Lindon, the controlling monitor, would increase by 1.3 µg/m³. This increase only further supports the conclusion drawn in Section 5.9.

1 Filters are prepared by the EPA contract laboratory and shipped to Utah for sampling. Samples are
2 collected for particulate mass, elemental analysis, identification of major cations and anions, and
3 concentrations of elemental and organic carbon as well as crustal material present in PM_{2.5}. Carbon
4 sampling and analysis changed in 2007 to match the Interagency Monitoring of Protected Visual
5 Environments (IMPROVE) method using a modified IMPROVE sampler at all sites.

6 The PM_{2.5} is collected on three types of filters: Teflon, nylon, and quartz. Teflon filters are used to
7 characterize the inorganic contents of PM_{2.5}. Nylon filters are used to quantify the amount of
8 ammonium nitrate, and quartz filters are used to quantify the organic and inorganic carbon content in
9 the ambient PM_{2.5}.

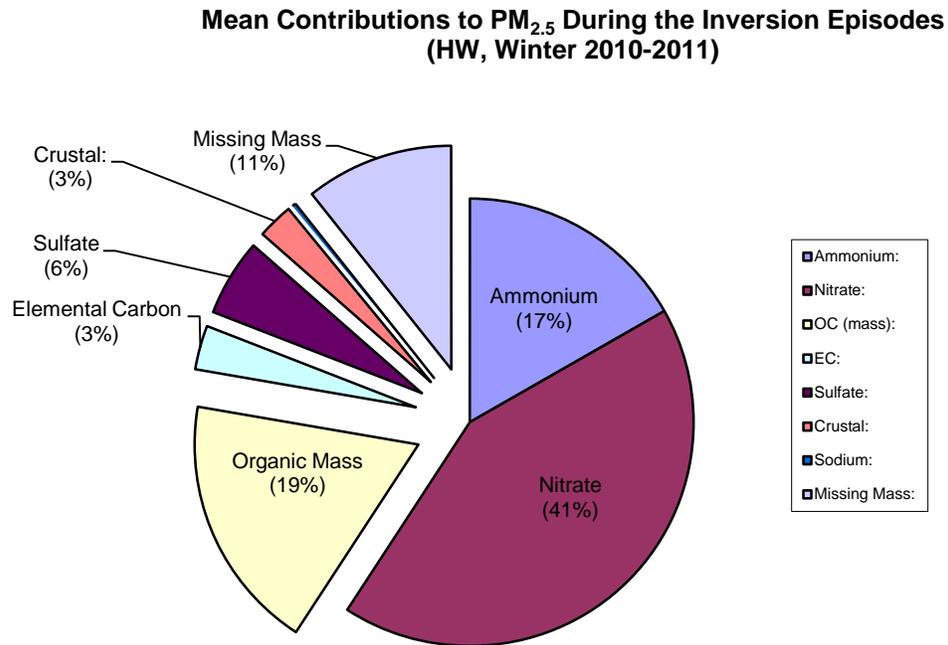
10 Data from the speciation network show the importance of volatile secondary particulates during the
11 colder months. These particles are significantly lost in FRM PM_{2.5} sampling.

12 During the winter periods between 2009 and 2011, DAQ conducted special winter speciation studies
13 aimed at better characterization of PM_{2.5} during the high pollution episodes. These studies were
14 accomplished by shifting the sampling of the Chemical Speciation Network monitors to 1-in-2-day
15 schedule during the months of January and February. Speciation monitoring during the winter high-
16 pollution episodes produced similar results in PM_{2.5} composition each year.

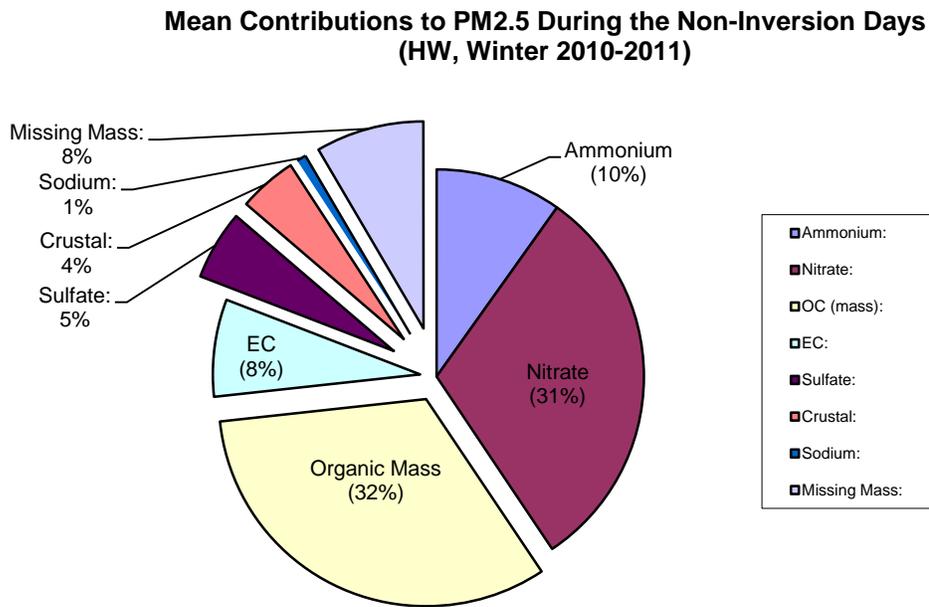
17 The results of the speciation studies lead to the conclusion that the exceedances of the PM_{2.5} NAAQS
18 are a result of the increased portion of the secondary PM_{2.5} that was chemically formed in the air and
19 not primary PM_{2.5} emitted directly into the troposphere.

1 Figure 3.2 below shows the contribution of the identified compounds from the speciation sampler both
 2 during a winter temperature inversion period and during a well-mixed winter period.

3



4



5

6 e 3.2, Composite Wintertime PM_{2.5} Speciation Profiles

Figur

1 **3.6 PCAP Study**

2 The Persistent Cold Air Pooling Study (PCAPS) is a National Science Foundation-funded project
3 conducted by the University of Utah to investigate the processes leading to the formation, maintenance
4 and destruction of persistent temperature inversions in Salt Lake Valley. The study ended in March of
5 2014. Field work for the project was conducted in the winter of 2010-2011 and focused on the
6 meteorological dynamics of temperature inversions in the Salt Lake Valley and in the Bingham Canyon
7 pit mine in the southwest corner of Salt Lake Valley. In addition to identifying key meteorological
8 processes involved in the dynamics of temperature inversions in Salt Lake Valley, the other primary
9 objectives of PCAPS is to determine how persistent temperature inversions affect air pollution transport
10 and diffusion in urban basins and to develop more accurate meteorological models describing the
11 formation, persistence and dispersion of temperature inversions in Salt Lake Valley.

12 Analyses of most data sets collected during the PCAPS are still underway. However, one study
13 examining PM_{2.5} concentrations along an elevation gradient north of Salt Lake City (1300-1750 meters)
14 showed that PM_{2.5} concentrations generally decreased with altitude and increased with time during a
15 single temperature inversion event.¹ Final results from PCAPS will help DAQ understand both how
16 persistent temperature inversions affect PM_{2.5} concentrations along the Wasatch Front and will enhance
17 DAQ's ability to accurately forecast the formation and breakup of temperature inversion that lead to
18 poor wintertime air quality.

19

20 **3.7 Ammonia (NH₃) Studies**

21 The Division of Air Quality deployed an ammonia monitor as a part of the special winter study for 2009.
22 A URG 9000 instrument was used to record hourly values of ambient ammonia between the months of
23 December and February.

24 The resulting measurements showed that the ambient concentration of ammonia tended to be
25 generally an order of magnitude higher than those of nitric acid: 12-17 ppbv and 1-2 ppbv, respectively.

26 Unfortunately, the use of the instrument proved to be excessively labor intensive due to the high
27 frequency of calibrations and corrections for drift. The data obtained during the winter of 2009, albeit
28 valuable for rough estimation of the ambient ammonia concentrations, contained an abnormal amount
29 of error for accurate mechanistic analysis.

¹ Silcox, G.D., K.E. Kelly, E.T. Crosman, C.D. Whiteman, and B.L. Allen, 2012: Wintertime PM_{2.5} concentrations in Utah's Salt Lake Valley during persistent multi-day cold air pools. *Atmospheric Environment*, 46, 17-24.

1 **Chapter 4 – EMISSION INVENTORY DATA**

2

3 **4.1 Introduction**

4 The emissions inventory is one means used by the state to assess the level of pollutants and precursors
5 released into the air from various sources. The methods by which emissions inventories are collected
6 and calculated are constantly improving in response to better analysis and more comprehensive rules.
7 The inventories underlying this SIP were compiled using the best information available.

8 The sources of emissions that were inventoried may be discussed as belonging to four general
9 categories: industrial point sources; on-road mobile sources; off-road mobile sources; and area sources
10 which represent a collection of smaller, more numerous point sources, residential activities such a
11 home heating, and in some cases biogenic emissions.

12 This SIP is concerned with PM_{2.5}, both primary in its origin and secondary, referring to its formation
13 removed in time and space from the point of origin for certain precursor gasses. Hence, the pollutants
14 of concern, at least for inventory development purposes, included PM_{2.5}, SO₂, NO_x, VOC, and NH₃.

15 On-road mobile sources are inventoried using EPA’s MOVES2010 model, in conjunction with information
16 generated by travel demand models such as vehicle speeds and miles traveled. The inventory
17 information is calculated in units of tons per day, adjusted for winter conditions. Emissions from the
18 other three categories are calculated in terms of tons per year.

19 Prior to use in the air quality model, the emissions are pre-processed to account for the seasonality of
20 Utah’s difficulty with secondary PM_{2.5} formation during winter months. These temporal adjustments
21 also account for daily and weekly activity patterns that affect the generation of these emissions.

22 To acknowledge the episodic and seasonal nature of Utah’s elevated PM_{2.5} concentrations, inventory
23 information presented herein is, unless otherwise noted, a reflection of the temporal adjustments made
24 prior to air quality modeling. This makes more appropriate the use of these inventories for such
25 purposes as correlation with measured PM_{2.5} concentrations, control strategy evaluation, establishing
26 budgets for transportation conformity, and tracking rates of progress.

27 There are various time horizons that are significant to the development of this SIP. It is first necessary to
28 look at past episodes of elevated PM_{2.5} concentrations in order to develop the air quality model. The
29 episodes studied as part of the SIP occurred in 2007, 2008, 2009, and 2010. It is then necessary to look
30 several years into the future when developing emission control strategies. The significant time horizon
31 for this plan relates to the statutory attainment date, December 31, 2015. A projected inventory for
32 2015 is prepared and compared with a baseline inventory that is contemporaneous with the monitored
33 design values discussed in Section 3.4. This baseline is represented by the year 2010. Inventories must
34 be prepared to evaluate all of these time horizons.

1

2 **4.2 The 2008 Emissions Inventory**

3 The forgoing paragraph identified numerous points in time for which an understanding of emissions to
4 the air is important to plan development. The basis for each of these assessments was the 2008 tri-
5 annual inventory. This inventory represented, at the time it was selected for use, the most recent
6 comprehensive inventory compiled by UDAQ. In addition to the large major point sources that are
7 required to report emissions every year, the tri-annual inventories consider emissions from many more,
8 smaller point sources. These inventories are collected in accordance with state and federal rules that
9 ensure proper methods and comprehensive quality assurance.

10 Thus, to develop other inventories for each of the years discussed above, the 2008 inventory was either
11 back-cast and adjusted for certain episodic conditions, or forecast to represent more typical conditions.

12

13 **4.3 Characterization of Utah's Airsheds**

14 As said at the outset, an emissions inventory provides a means to assess the level of pollutants and
15 precursors released into the air from various sources. This in turn allows for an overall assessment of a
16 particular airshed or even a comparison of one airshed to another.

17 The modeling analysis used to support this SIP considers a regional domain that encompasses three
18 distinct airsheds belonging to three distinct PM_{2.5} nonattainment areas; The Cache Valley (the Logan
19 UT/ID nonattainment area), the central Wasatch Front (Salt Lake City, UT nonattainment area), and the
20 southern Wasatch Front (Provo, UT nonattainment area).

21 The inventories developed for each of these three areas illustrate many similarities but also a few
22 notable differences. All three areas are more or less dominated by a combination of on-road mobile and
23 area sources. However, emissions from large point sources are non-existent in the Cache Valley. These
24 emissions are mostly situated along the Wasatch Front, and primarily exhibited in the Salt Lake City
25 nonattainment area. Conversely, most of the agricultural emissions are located in the Cache Valley.

26 The tables presented below provide a broad overview of the emissions in the respective areas. They are
27 organized to show the relative contributions of emissions by source category (e.g. point / area / mobile).

28

1 Table 4.1 shows the 2010 Baseline emissions in each area of the modeling domain.

2

| NA-Area | | Source Category | PM2.5 | NOX | VOC | NH3 | SO2 |
|--------------------------------|---------------------------|-----------------|--------------|---------------|---------------|--------------|--------------|
| 2010 Sum of Emissions (tpd) | Logan, UT-ID | | | | | | |
| | | Area Sources | 0.54 | 1.63 | 4.16 | 4.31 | 0.26 |
| | | Mobile Sources | 0.37 | 6.48 | 4.99 | 0.12 | 0.04 |
| | | NonRoad | 0.13 | 1.15 | 2.28 | 0.00 | 0.02 |
| | | Point Sources | 0.00 | 0.02 | 0.63 | 0.00 | 0.00 |
| | Total | | 1.05 | 9.28 | 12.06 | 4.43 | 0.32 |
| 2010 Sum of Emissions (tpd) | Provo, UT | | | | | | |
| | | Area Sources | 1.86 | 5.56 | 12.77 | 6.53 | 0.28 |
| | | Mobile Sources | 1.38 | 25.39 | 15.62 | 0.44 | 0.16 |
| | | NonRoad | 0.31 | 4.40 | 1.71 | 0.00 | 0.09 |
| | | Point Sources | 0.26 | 0.93 | 0.67 | 0.29 | 0.03 |
| | Total | | 3.81 | 36.28 | 30.78 | 7.26 | 0.56 |
| 2010 Sum of Emissions (tpd) | Salt Lake City, UT | | | | | | |
| | | Area Sources | 5.87 | 17.71 | 51.53 | 17.96 | 0.88 |
| | | Mobile Sources | 5.49 | 99.60 | 62.49 | 1.86 | 0.62 |
| | | NonRoad | 1.27 | 23.04 | 9.50 | 0.01 | 0.66 |
| | | Point Sources | 3.89 | 20.14 | 6.48 | 0.64 | 10.64 |
| | Total | | 16.52 | 160.48 | 130.01 | 20.47 | 12.81 |
| 2010 Sum of Emissions (tpd) | Surrounding Areas | | | | | | |
| | | Area Sources | 1.78 | 3.08 | 13.95 | 34.29 | 1.13 |
| | | Mobile Sources | 1.34 | 28.88 | 11.03 | 0.33 | 0.15 |
| | | NonRoad | 0.57 | 7.73 | 10.66 | 0.00 | 0.14 |
| | | Point Sources | 3.39 | 129.34 | 2.92 | 0.75 | 43.43 |
| | Total | | 7.07 | 169.03 | 38.56 | 35.38 | 44.85 |
| 2010 Total | | | | | | | |

3

4

| NA-Area | | Source Category | PM2.5 | NOX | VOC | NH3 | SO2 |
|------------------------|--------------------|-----------------|--------------|---------------|---------------|--------------|--------------|
| 2010 | Logan, UT-ID | | | | | | |
| Sum of Emissions (tpd) | | Area Sources | 0.54 | 1.63 | 4.16 | 4.31 | 0.26 |
| | | Mobile Sources | <u>0.67</u> | <u>6.48</u> | <u>4.99</u> | <u>0.12</u> | <u>0.04</u> |
| | | NonRoad | 0.13 | 1.15 | 2.28 | 0.00 | 0.02 |
| | | Point Sources | 0.00 | 0.02 | 0.63 | 0.00 | 0.00 |
| | | Total | 1.35 | 9.28 | 12.06 | 4.43 | 0.32 |
| 2010 | Provo, UT | | | | | | |
| Sum of Emissions (tpd) | | Area Sources | 1.86 | 5.56 | 12.77 | 6.53 | 0.28 |
| | | Mobile Sources | <u>2.20</u> | <u>25.39</u> | <u>15.63</u> | <u>0.44</u> | <u>0.16</u> |
| | | NonRoad | 0.31 | 4.40 | 1.71 | 0.00 | 0.09 |
| | | Point Sources | 0.26 | 0.93 | 0.67 | 0.29 | 0.03 |
| | | Total | 4.63 | 36.29 | 30.78 | 7.26 | 0.56 |
| 2010 | Salt Lake City, UT | | | | | | |
| Sum of Emissions (tpd) | | Area Sources | 5.87 | 17.71 | 51.53 | 17.96 | 0.88 |
| | | Mobile Sources | <u>8.59</u> | <u>99.63</u> | <u>62.51</u> | <u>1.86</u> | <u>0.63</u> |
| | | NonRoad | 1.27 | 23.04 | 9.50 | 0.01 | 0.66 |
| | | Point Sources | 3.89 | 20.14 | 6.48 | 0.64 | 10.64 |
| | | Total | 19.62 | 160.51 | 130.02 | 20.47 | 12.81 |
| 2010 | Surrounding Areas | | | | | | |
| Sum of Emissions (tpd) | | Area Sources | 1.78 | 3.08 | 13.95 | 34.29 | 1.13 |
| | | Mobile Sources | <u>2.31</u> | <u>28.89</u> | <u>11.03</u> | <u>0.33</u> | <u>0.15</u> |
| | | NonRoad | 0.57 | 7.73 | 10.66 | 0.00 | 0.14 |
| | | Point Sources | 3.39 | 129.34 | 2.92 | 0.75 | 43.43 |
| | | Total | 8.04 | 169.03 | 38.57 | 35.38 | 44.85 |
| 2010 Total | | | | | | | |

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Table 4.1, Emissions Summary for 2010 (SMOKE). Emissions are presented in tons per average winter day. Mobile source emissions summaries are from the AP-42 (road dust) and MOVES model output. PM_{2.5} for mobile sources includes tire and brake wear, sulfate, elemental and organic carbon, and road dust. VOC for mobile sources includes refueling spillage and displacement vapor loss emissions.

1 Table 4.2 is specific to the Provo, UT nonattainment area, and shows emissions for both the baseline
 2 year and the attainment year. These totals include projections concerning growth in population, vehicle
 3 miles traveled, and the economy. They also include the effects of emissions control strategies that are
 4 either already promulgated or were required as part of the SIP.

5

| | NA-Area | Source Category | PM2.5 | NOX | VOC | NH3 | SO2 |
|--------------------------------|-----------|-----------------|-------|-------|-------|------|------|
| 2010 Sum of Emissions (tpd) | Provo, UT | | | | | | |
| | | Area Sources | 1.86 | 5.56 | 12.77 | 6.53 | 0.28 |
| | | Mobile Sources | 1.38 | 25.39 | 15.62 | 0.44 | 0.16 |
| | | NonRoad | 0.31 | 4.40 | 1.71 | 0.00 | 0.09 |
| | | Point Sources | 0.26 | 0.93 | 0.67 | 0.29 | 0.03 |
| | Total | | 3.81 | 36.28 | 30.78 | 7.26 | 0.56 |
| 2015 Sum of Emissions (tpd) | Provo, UT | | | | | | |
| | | Area Sources | 1.86 | 4.59 | 10.66 | 6.41 | 0.30 |
| | | Mobile Sources | 1.26 | 21.48 | 13.11 | 0.45 | 0.16 |
| | | NonRoad | 0.24 | 3.40 | 1.37 | 0.00 | 0.04 |
| | | Point Sources | 1.22 | 2.88 | 1.09 | 0.53 | 0.14 |
| | Total | | 4.58 | 32.34 | 26.23 | 7.39 | 0.64 |

6
7

| | NA-Area | Source Category | PM2.5 | NOX | VOC | NH3 | SO2 |
|--------------------------------|-----------|-----------------|-------|-------|-------|------|------|
| 2010 Sum of Emissions (tpd) | Provo, UT | | | | | | |
| | | Area Sources | 1.86 | 5.56 | 12.77 | 6.53 | 0.28 |
| | | Mobile Sources | 2.20 | 25.39 | 15.63 | 0.44 | 0.16 |
| | | NonRoad | 0.31 | 4.40 | 1.71 | 0.00 | 0.09 |
| | | Point Sources | 0.26 | 0.93 | 0.67 | 0.29 | 0.03 |
| | Total | | 4.63 | 36.29 | 30.78 | 7.26 | 0.56 |
| 2015 Sum of Emissions (tpd) | Provo, UT | | | | | | |
| | | Area Sources | 1.86 | 4.59 | 10.66 | 6.41 | 0.30 |
| | | Mobile Sources | 2.37 | 21.48 | 13.11 | 0.45 | 0.16 |
| | | NonRoad | 0.24 | 3.40 | 1.37 | 0.00 | 0.04 |
| | | Point Sources | 1.22 | 2.88 | 1.09 | 0.53 | 0.14 |
| | Total | | 5.69 | 32.35 | 26.23 | 7.39 | 0.64 |

8
9

10 Table 4.2, Emissions Summaries for the Salt Lake City, UT Nonattainment Area; Baseline, RFP and Attainment
 11 Years (SMOKE). Emissions are presented in tons per average winter day. Mobile source emissions summaries
 12 are from the AP-42 (road dust) and MOVES model output. PM_{2.5} for mobile sources includes tire and brake
 13 wear, sulfate, elemental and organic carbon, and road dust. VOC for mobile sources includes refueling spillage
 14 and displacement vapor loss emissions.

15
16

17 The 2010 Baseline and 2015 projected emissions estimates are calculated from the Sparse Matrix
 18 Operator Kernel Model (SMOKE). More detailed inventory information may be found in the Technical
 19 Support Document (TSD).

1 **Chapter 5 – ATTAINMENT DEMONSTRATION**

2

3 **5.1 Introduction**

4 UDAQ conducted a technical analysis to support the development of Utah’s 24-hr PM_{2.5} State
5 Implementation Plan (SIP). The analyses include preparation of emissions inventories and
6 meteorological data, and the evaluation and application of regional photochemical model. An analysis
7 using observational datasets will be shown to detail the chemical regimes of Utah’s Nonattainment
8 areas.

9

10 **5.2 Photochemical Modeling**

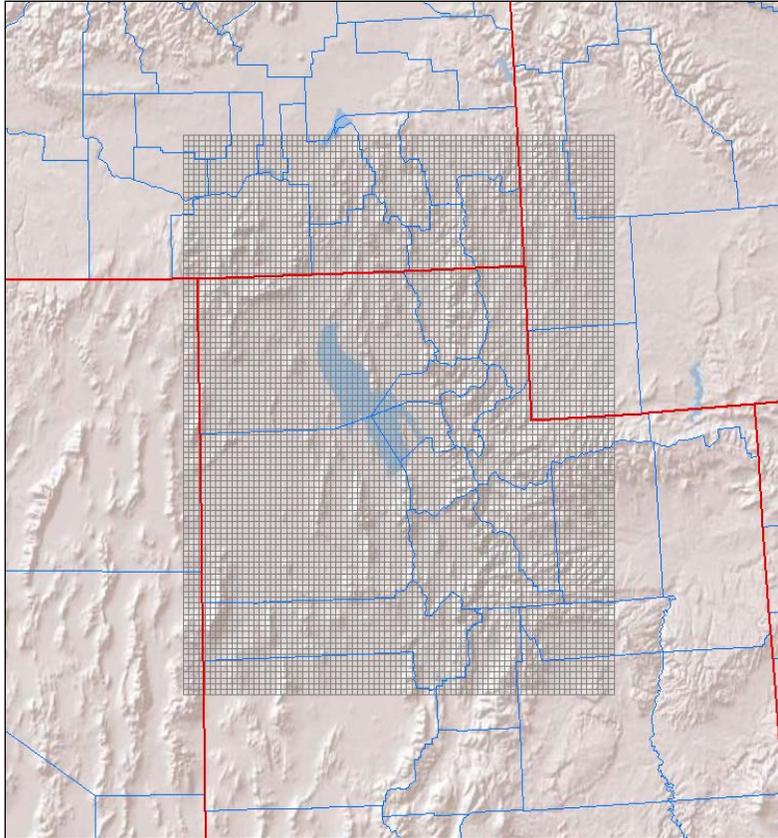
11 Photochemical models are relied upon by federal and state regulatory agencies to support their
12 planning efforts. Used properly, models can assist policy makers in deciding which control programs are
13 most effective in improving air quality, and meeting specific goals and objectives.

14 The air quality analyses were conducted with the Community Multiscale Air Quality (CMAQ) Model
15 version 4.7.1, with emissions and meteorology inputs generated using SMOKE and WRF, respectively.
16 CMAQ was selected because it is the open source atmospheric chemistry model co-sponsored by EPA
17 and the National Oceanic Atmospheric Administration (NOAA), thus approved by EPA for this plan.

18

19 **5.3 Domain/Grid Resolution**

20 UDAQ selected a high resolution 4-km modeling domain to cover all of northern Utah including the
21 portion of southern Idaho extending north of Franklin County and west to the Nevada border (Figure
22 5.1). This 97 x 79 horizontal grid cell domain was selected to ensure that all of the major emissions
23 sources that have the potential to impact the nonattainment areas were included. The vertical
24 resolution in the air quality model consists of 17 layers extending up to 15 km, with higher resolution in
25 the boundary layer.



1

2 **Figure 5.1: Northern Utah photochemical modeling domain.**

3

4 **5.4 Episode Selection**

5 According to EPA's April 2007 "Guidance on the Use of Models and Other Analyses for Demonstrating
6 Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze" the selection of SIP episodes for
7 modeling should consider the following 4 criteria:

- 8 1. Select episodes that represent a variety of meteorological conditions that lead to elevated
9 PM_{2.5}.
- 10 2. Select episodes during which observed concentrations are close to the baseline design value.
- 11 3. Select episodes that have extensive air quality data bases.
- 12 4. Select enough episodes such that the model attainment test is based on multiple days at each
13 monitor violating NAAQS.

14

1 In general, UDAQ wanted to select episodes with hourly $PM_{2.5}$ concentrations that are reflective of
2 conditions that lead to 24-hour NAAQS exceedances. From a synoptic meteorology point of view, each
3 selected episode features a similar pattern. The typical pattern includes a deep trough over the eastern
4 United States with a building and eastward moving ridge over the western United States. The episodes
5 typically begin as the ridge begins to build eastward, near surface winds weaken, and rapid stabilization
6 due to warm advection and subsidence dominate. As the ridge centers over Utah and subsidence peaks,
7 the atmosphere becomes extremely stable and a subsidence inversion descends towards the surface.
8 During this time, weak insolation, light winds, and cold temperatures promote the development of a
9 persistent cold air pool. Not until the ridge moves eastward or breaks down from north to south is there
10 enough mixing in the atmosphere to completely erode the persistent cold air pool.

11 From the most recent 5-year period of 2007-2011, UDAQ developed a long list of candidate $PM_{2.5}$
12 wintertime episodes. Three episodes were selected. An episode was selected from January 2007, an
13 episode from February 2008, and an episode during the winter of 2009-2010 that features multi-event
14 episodes of $PM_{2.5}$ buildup and washout. Further detail of the episodes is below:

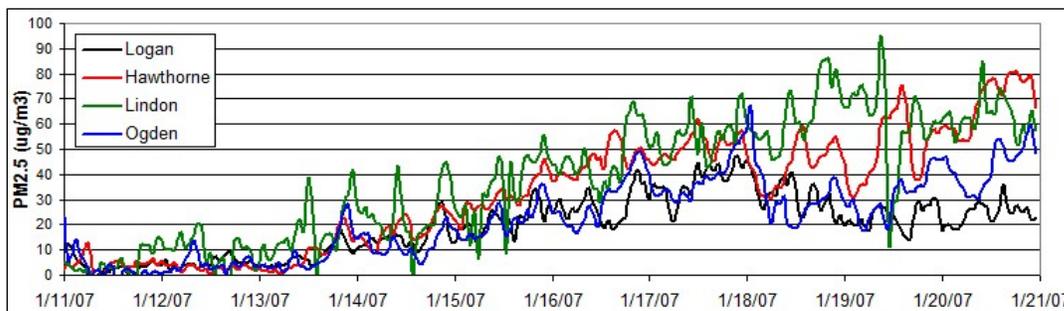
15

16 • **Episode 1: January 11-20, 2007**

17 A cold front passed through Utah during the early portion of the episode and brought very cold
18 temperatures and several inches of fresh snow to the Wasatch Front. The trough was quickly followed
19 by a ridge that built north into British Columbia and began expanding east into Utah. This ridge did not
20 fully center itself over Utah, but the associated light winds, cold temperatures, fresh snow, and
21 subsidence inversion produced very stagnant conditions along the Wasatch Front. High temperatures in
22 Salt Lake City throughout the episode were in the high teens to mid-20's Fahrenheit.

23 Figure 5.2 shows hourly $PM_{2.5}$ concentrations from Utah's 4 $PM_{2.5}$ monitors for January 11-20, 2007.
24 The first 6 to 8 days of this episode are suited for modeling. The episode becomes less suited after
25 January 18 because of the complexities in the meteorological conditions leading to temporary $PM_{2.5}$
26 reductions.

27



28

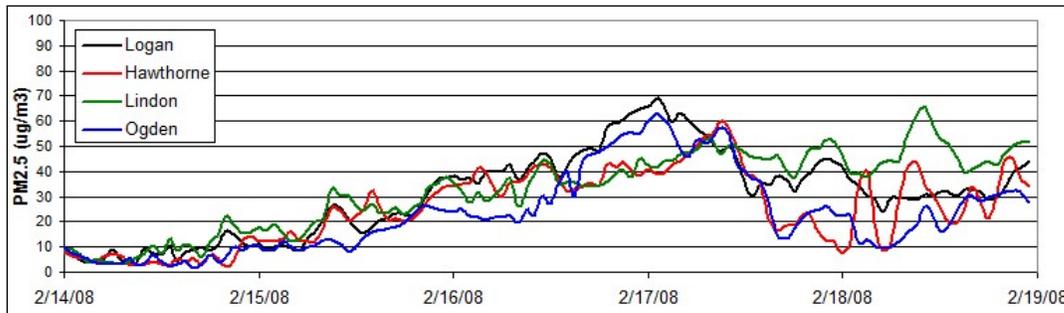
29 **Figure 5.2: Hourly $PM_{2.5}$ concentrations for January 11-20, 2007**

1 • **Episode 2: February 14-18, 2008**

2 The February 2008 episode features a cold front passage at the start of the episode that brought
3 significant new snow to the Wasatch Front. A ridge began building eastward from the Pacific Coast and
4 centered itself over Utah on Feb 20th. During this time a subsidence inversion lowered significantly
5 from February 16 to February 19. Temperatures during this episode were mild with high temperatures
6 at SLC in the upper 30's and lower 40's Fahrenheit.

7 The 24-hour average PM_{2.5} exceedances observed during the proposed modeling period of February 14-
8 19, 2008 were not exceptionally high. What makes this episode a good candidate for modeling are the
9 high hourly values and smooth concentration build-up. The first 24-hour exceedances occurred on
10 February 16 and were followed by a rapid increase in PM_{2.5} through the first half of February 17 (Figure
11 5.3). During the second half of February 17, a subtle meteorological feature produced a mid-morning
12 partial mix-out of particulate matter and forced 24-hour averages to fall. After February 18, the
13 atmosphere began to stabilize again and resulted in even higher PM_{2.5} concentrations during February
14 20, 21, and 22. Modeling the 14th through the 19th of this episode should successfully capture these
15 dynamics. The smooth gradual build-up of hourly PM_{2.5} is ideal for modeling.

16



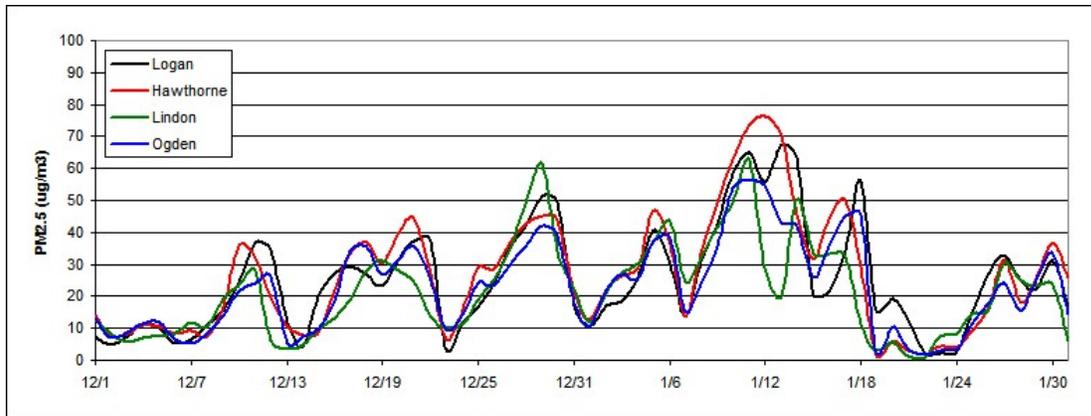
17

18 **Figure 5.3: Hourly PM_{2.5} concentrations for February 14-19, 2008**

19

20 • **Episode 3: December 13, 2009 – January 18, 2010**

21 The third episode that was selected is more similar to a “season” than a single PM_{2.5} episode (Figure
22 5.4). During the winter of 2009 and 2010, Utah was dominated by a semi-permanent ridge of high
23 pressure that prevented strong storms from crossing Utah. This 35 day period was characterized by 4 to
24 5 individual PM_{2.5} episodes each followed by a partial PM_{2.5} mix out when a weak weather system
25 passed through the ridge. The long length of the episode and repetitive PM_{2.5} build-up and mix-out
26 cycles makes it ideal for evaluating model strengths and weaknesses and PM_{2.5} control strategies.



1

2 **Figure 5.4: 24-hour average PM_{2.5} concentrations for December-January, 2009-10.**

3

4 **5.5 Meteorological Data**

5 Meteorological inputs were derived using the Weather Research and Forecasting (WRF), Advanced
 6 Research WRF (WRF-ARW) model version 3.2. WRF contains separate modules to compute different
 7 physical processes such as surface energy budgets and soil interactions, turbulence, cloud microphysics,
 8 and atmospheric radiation. Within WRF, the user has many options for selecting the different schemes
 9 for each type of physical process. There is also a WRF Preprocessing System (WPS) that generates the
 10 initial and boundary conditions used by WRF, based on topographic datasets, land use information, and
 11 larger-scale atmospheric and oceanic models.

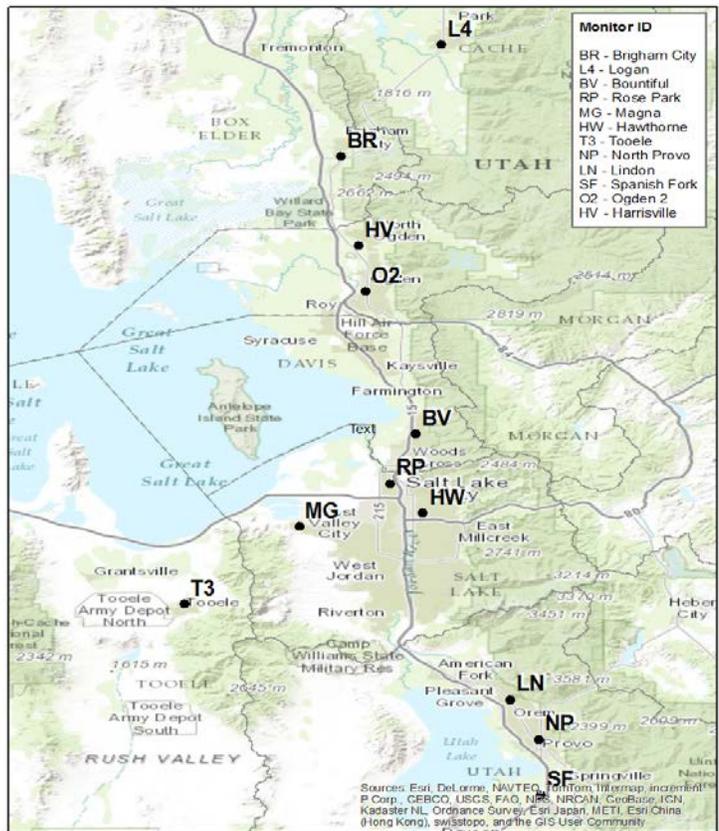
12 Model performance of WRF was assessed against observations at sites maintained by the Utah Air
 13 Monitoring Center. A summary of the performance evaluation results for WRF are presented below:

- 14
- 15 • The biggest issue with meteorological performance is the existence of a warm bias in surface
 16 temperatures during high PM_{2.5} episodes. This warm bias is a common trait of WRF modeling
 during Utah wintertime inversions.
 - 17 • WRF does a good job of replicating the light wind speeds (< 5 mph) that occur during high PM_{2.5}
 18 episodes.
 - 19 • WRF is able to simulate the diurnal wind flows common during high PM_{2.5} episodes. WRF
 20 captures the overnight downslope and daytime upslope wind flow that occurs in Utah valley
 21 basins.
 - 22 • WRF has reasonable ability to replicate the vertical temperature structure of the boundary
 23 layer (i.e., the temperature inversion), although it is difficult for WRF to reproduce the inversion
 24 when the inversion is shallow and strong (i.e., an 8 degree temperature increase over 100
 25 vertical meters).

1 **5.6 Photochemical Model Performance Evaluation**

2 The model performance evaluation focused on the magnitude, spatial pattern, and temporal variation of
3 modeled and measured concentrations. This exercise was intended to assess whether, and to what
4 degree, confidence in the model is warranted (and to assess whether model improvements are
5 necessary).

6 CMAQ model performance was assessed with observed air quality datasets at UDAQ-maintained air
7 monitoring sites (Figure 5.5). Measurements of observed PM_{2.5} concentrations along with gaseous
8 precursors of secondary particulate (e.g., NO_x, ozone) and carbon monoxide are made throughout
9 winter at most of the locations in Figure 5.5. PM_{2.5} speciation performance was assessed using the
10 three Speciation Monitoring Network Sites (STN) located at the Hawthorne site in Salt Lake City, the
11 Bountiful site in Davis County, and the Lindon site in Utah County.



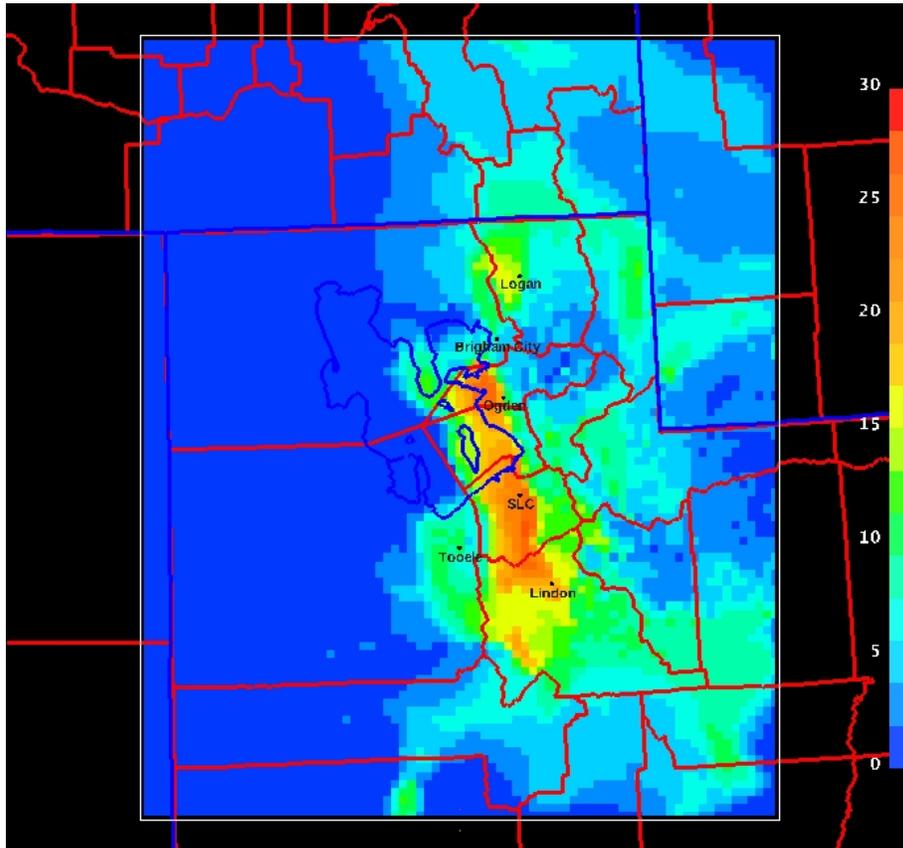
12

13 **Figure 5.5: UDAQ monitoring network.**

1 A spatial plot is provided for modeled 24-hr $PM_{2.5}$ for 2010 January 03 in Figure 5.6. The spatial plot
2 shows the model does a reasonable job reproducing the high $PM_{2.5}$ values, and keeping those high
3 values confined in the valley locations where emissions occur.

4

5



6

7 **Figure 5.6: Spatial plot of CMAQ modeled 24-hr $PM_{2.5}$ ($\mu\text{g}/\text{m}^3$) for 2010 Jan. 03.**

8

9 Time series of 24-hr $PM_{2.5}$ concentrations for the 13 Dec. 2009 – 15 Jan. 2010 modeling period are
10 shown in Figs. 5.7 – 5.10 at the Hawthorne site in Salt Lake City (Fig. 5.7), the Ogden site in Weber
11 County (Fig 5.8), the Lindon site in Utah County (Fig. 5.9), and the Logan site in Cache County (Fig. 5.10).
12 For the most part, CMAQ replicates the buildup and washout of each individual episode. While CMAQ
13 builds 24-hr $PM_{2.5}$ concentrations during the 08 Jan. – 14 Jan. 2010 episode, it was not able to produce
14 the $> 60 \mu\text{g}/\text{m}^3$ concentrations observed at the monitoring locations.

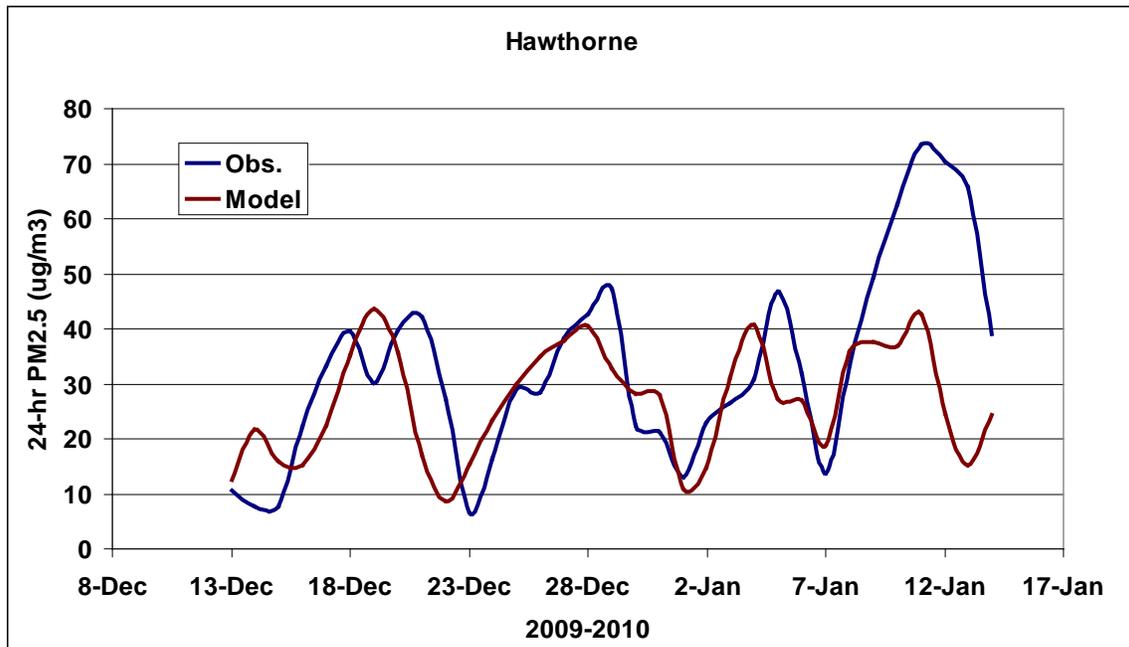
15 It is often seen that CMAQ “washes” out the $PM_{2.5}$ episode a day or two earlier than that seen in the
16 observations. For example, on the day 21 Dec. 2009, the concentration of $PM_{2.5}$ continues to build
17 while CMAQ has already cleaned the valley basins of high $PM_{2.5}$ concentrations. At these times, the
18 observed cold pool that holds the $PM_{2.5}$ is often very shallow and winds just above this cold pool are

1 southerly and strong before the approaching cold front. This situation is very difficult for a
2 meteorological and photochemical model to reproduce. An example of this situation is shown in Fig.
3 5.11, where the lowest part of the Salt Lake Valley is still under a very shallow stable cold pool, yet
4 higher elevations of the valley have already been cleared of the high $PM_{2.5}$ concentrations.

5 During the 24 – 30 Dec. 2009 episode, a weak meteorological disturbance brushes through the
6 northernmost portion of Utah. It is noticeable in the observations at the Ogden monitor at 25 Dec. as
7 $PM_{2.5}$ concentrations drop on this day before resuming an increase through Dec. 30. The meteorological
8 model and thus CMAQ correctly pick up this disturbance, but completely clears out the building $PM_{2.5}$;
9 and thus performance suffers at the most northern Utah monitors (e.g. Ogden, Logan). The monitors to
10 the south (Hawthorne, Lindon) are not influence by this disturbance and building of $PM_{2.5}$ is replicated
11 by CMAQ. This highlights another challenge of modeling $PM_{2.5}$ episodes in Utah. Often during cold pool
12 events, weak disturbances will pass through Utah that will de-stabilize the valley inversion and cause a
13 partial clear out of $PM_{2.5}$. However, the $PM_{2.5}$ is not completely cleared out, and after the disturbance
14 exits, the valley inversion strengthens and the $PM_{2.5}$ concentrations continue to build. Typically, CMAQ
15 completely mixes out the valley inversion during these weak disturbances.

16

17

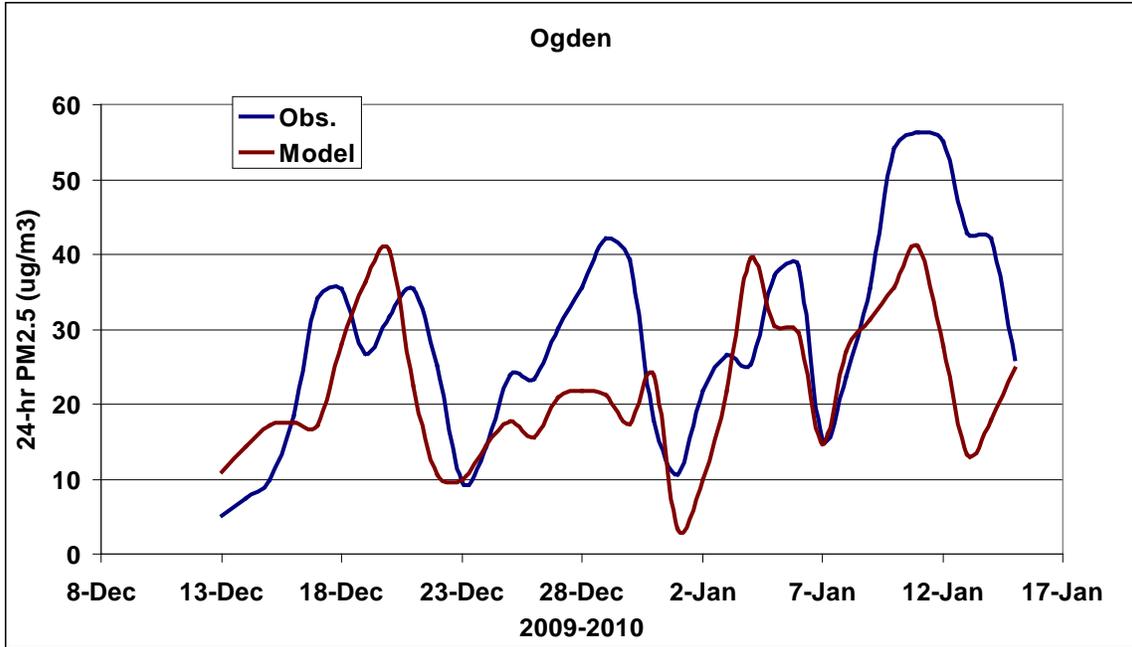


18

19 **Figure 5.7: 24-hr $PM_{2.5}$ time series (Hawthorne). Observed 24-hr $PM_{2.5}$ (blue trace) and CMAQ modeled 24-hr**
20 **$PM_{2.5}$ (red trace).**

21

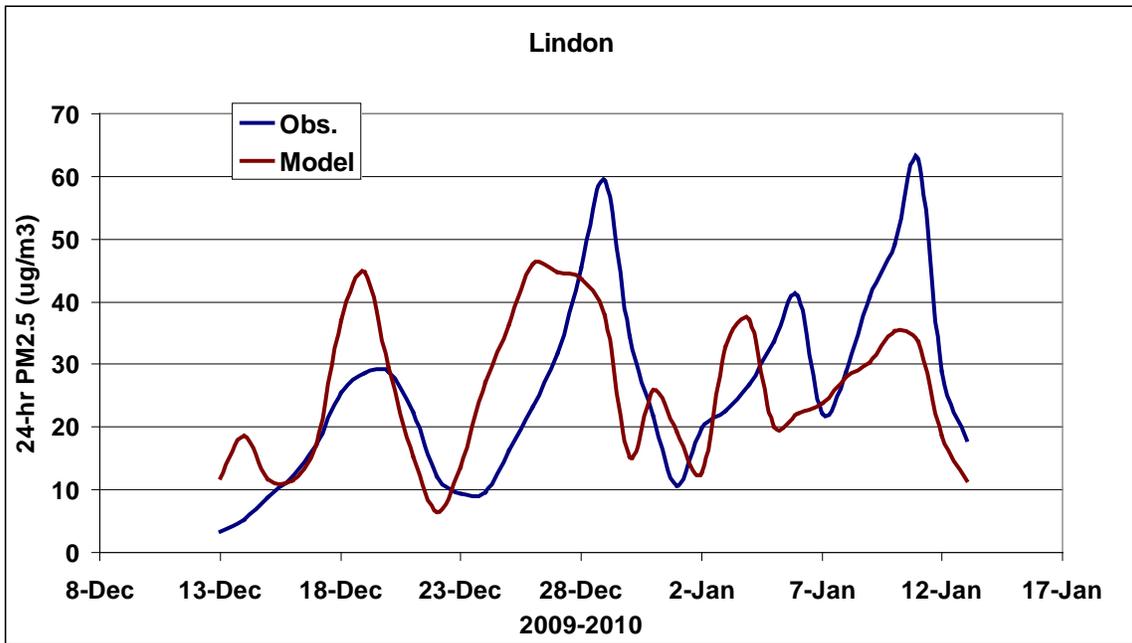
22



1

2 Figure 5.8: 24-hr PM_{2.5} time series (Ogden). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5}
 3 (red trace).

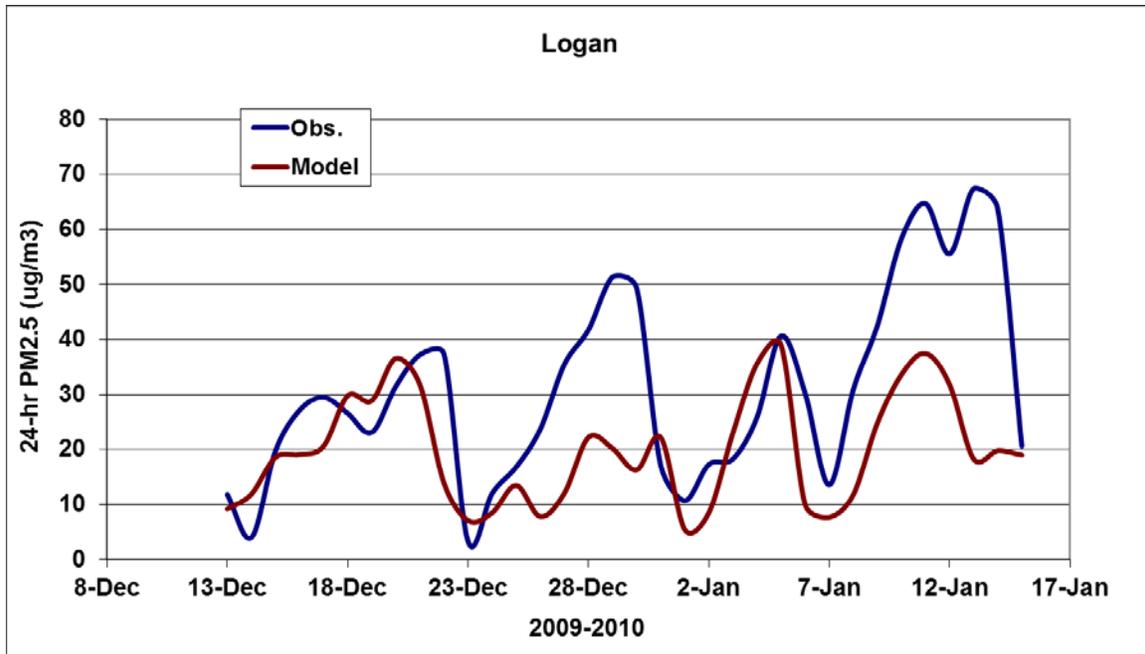
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5

6 Figure 5.9: 24-hr PM_{2.5} time series (Lindon). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5}
 7 (red trace).

8



1

2 Figure 5.10: 24-hr PM_{2.5} time series (Logan). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5}
 3 (red trace).

4



5

6 Figure 5.11: An example of the Salt Lake Valley at the end of a high PM_{2.5} episode. The lowest elevations of the
 7 Salt Lake Valley are still experiencing an inversion and elevated PM_{2.5} concentrations while the PM_{2.5} has been
 8 'cleared out' throughout the rest of the valley. These 'end of episode' clear out periods are difficult to replicate
 9 in the photochemical model.

10

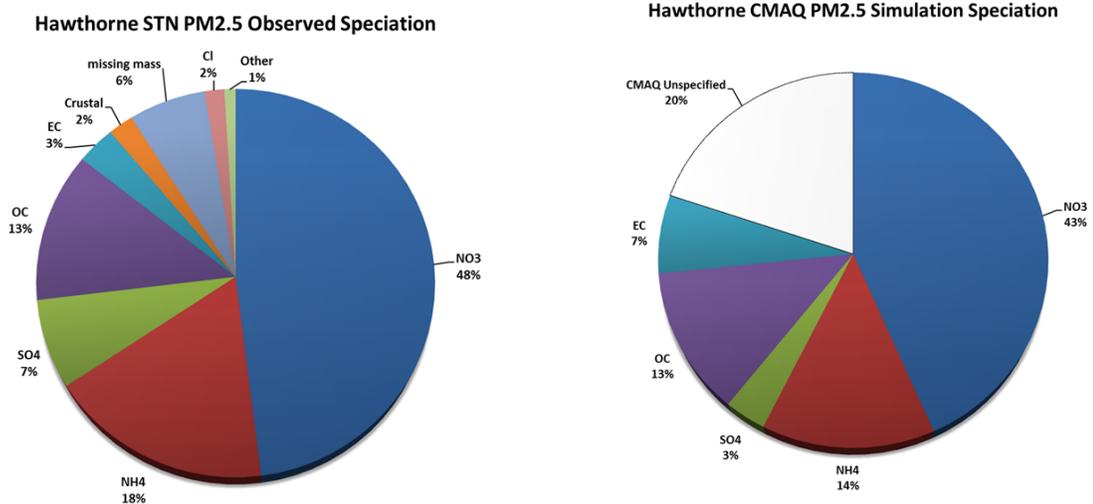
1 Generally, the performance of CMAQ to replicate the buildup and clear out of PM_{2.5} is good. However, it
 2 is important to verify that CMAQ is replicating the components of PM_{2.5} concentrations. PM_{2.5}
 3 simulated and observed speciation is shown at the 3 STN sites in Figures 5.12 – 5.14. The observed
 4 speciation is constructed using days in which the STN filter 24-hr PM_{2.5} concentration was > 35 µg/m³.
 5 For the 2009-2010 modeling period, the observed speciation pie charts were created using 8 filter days
 6 at Hawthorne, 6 days at Lindon, and 4 days at Bountiful. The speciation of this small dataset appears
 7 similar to a comparison of a larger dataset of STN filter speciated data from 2005-2010 for high
 8 wintertime PM_{2.5} days (see Figure 3.2 for one of these at Hawthorne).

9 The simulated speciation is constructed using modeling days that produced 24-hr PM_{2.5} concentrations >
 10 35 µg/m³. Using this criterion, the simulated speciation pie chart is created from 18 modeling days for
 11 Hawthorne, 14 days at Lindon, and 14 days at Bountiful.

12 At all 3 STN sites, the percentage of simulated nitrate is greater than 40%, while the simulated
 13 ammonium percentage is at ~15%. This indicates that the model is able to replicate the secondarily
 14 formed particulates that typically make up the majority of the measured PM_{2.5} on the STN filters during
 15 wintertime pollution events.

16 The percentage of model simulated organic carbon is ~13% at all STN sites, which is in agreement with
 17 the observed speciation of organic carbon at Hawthorne and slightly overestimated (by ~3%) at Lindon
 18 and Bountiful.

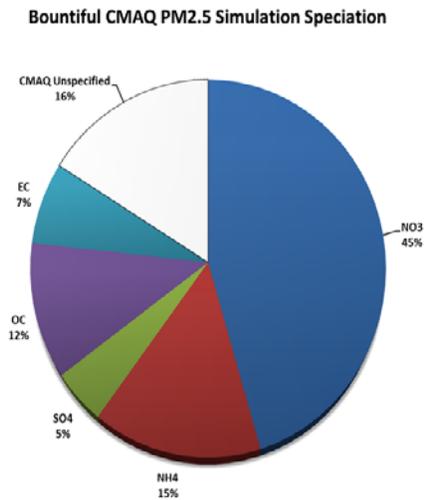
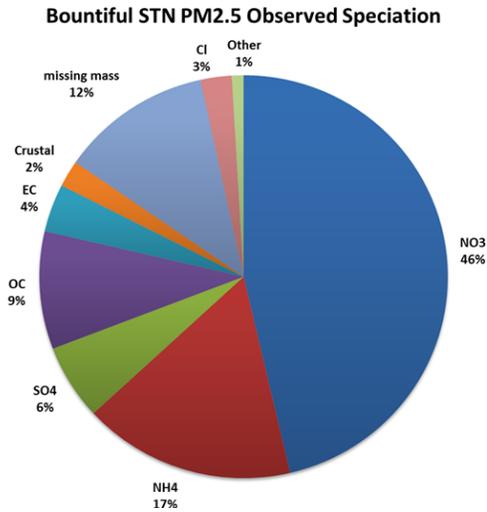
19 There is no STN site in the Logan nonattainment area, and very little speciation information available in
 20 the Cache Valley. Figure 5.15 shows the model simulated speciation at Logan. Ammonium (17%) and
 21 nitrate (56%) make up a higher percentage of the simulated PM_{2.5} at Logan when compared to sites
 22 along the Wasatch Front.



23

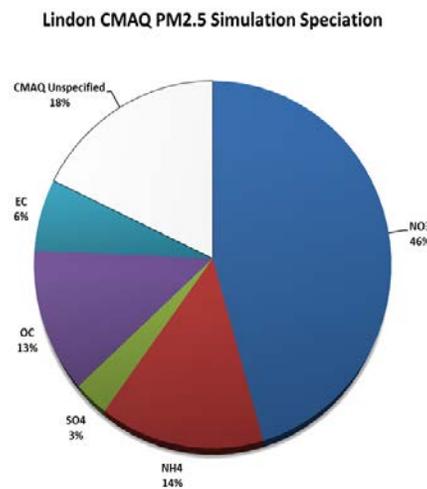
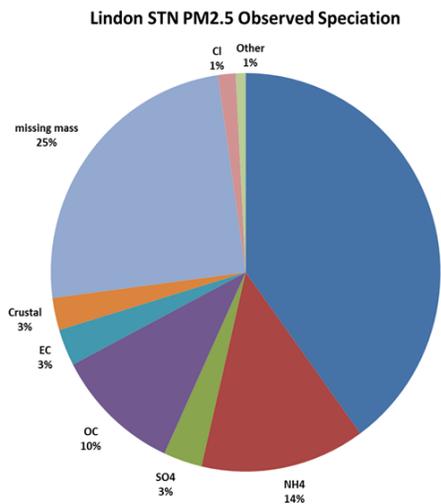
24 **Figure 5.12: The composition of observed and model simulated average 24-hr PM_{2.5} speciation averaged over**
 25 **days when an observed and modeled day had 24-hr concentrations > 35 µg/m³ at the Hawthorne STN site.**

26



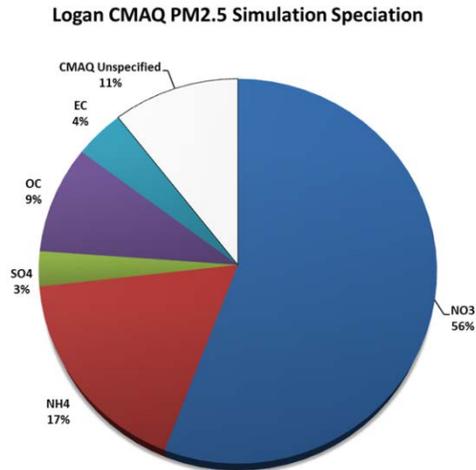
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Figure 5.13: The composition of observed and model simulated average 24-hr PM_{2.5} speciation averaged over days when an observed and modeled day had 24-hr concentrations > 35 µg/m³ at the Bountiful STN site.



6
7
8
9

Figure 5.14: The composition of observed and model simulated average 24-hr PM_{2.5} speciation averaged over days when an observed and modeled day had 24-hr concentrations > 35 µg/m³ at the Lindon STN site.



1

2 **Figure 5.15: The composition of model simulated average 24-hr PM_{2.5} speciation averaged over days when a**
 3 **modeled day had 24-hr concentrations > 35 µg/m³ at the Logan monitoring site. No observed speciation data is**
 4 **available for Logan.**

5

6

7 **5.7 Summary of Model Performance**

8 Model performance for 24-hr PM_{2.5} is good and generally acceptable and can be characterized as
 9 follows:

- 10 • Good replication of the episodic buildup and clear out of PM_{2.5}. Often the model will clear out
 11 the simulated PM_{2.5} a day too early at the end of an episode. This clear out time period is
 12 difficult to model (i.e., Figure 5.11).
- 13 • Good agreement in the magnitude of PM_{2.5}, as the model can consistently produce the high
 14 concentrations of PM_{2.5} that coincide with observed high concentrations.
- 15 • Spatial patterns of modeled 24-hr PM_{2.5}, show for the most part, that the PM_{2.5} is being
 16 confined in the valley basins, consistent to what is observed.
- 17 • Speciation and composition of the modeled PM_{2.5} matches the observed speciation quite well.
 18 Modeled and observed nitrate are between 40% and 50% of the PM_{2.5}. Ammonium is between
 19 15% and 20% for both modeled and observed PM_{2.5}, while modeled and observed organic
 20 carbon falls between 10% to 13% of the total PM_{2.5}.

21

1 Several observations should be noted on the implications of these model performance findings on the
2 attainment modeling presented in the following section. First, it has been demonstrated that model
3 performance overall is acceptable and, thus, the model can be used for air quality planning purposes.
4 Second, consistent with EPA guidance, the model is used in a relative sense to project future year
5 values. EPA suggests that this approach “should reduce some of the uncertainty attendant with using
6 absolute model predictions alone.” Furthermore, the attainment modeling is supplemented by
7 additional information to provide a weight of evidence determination.

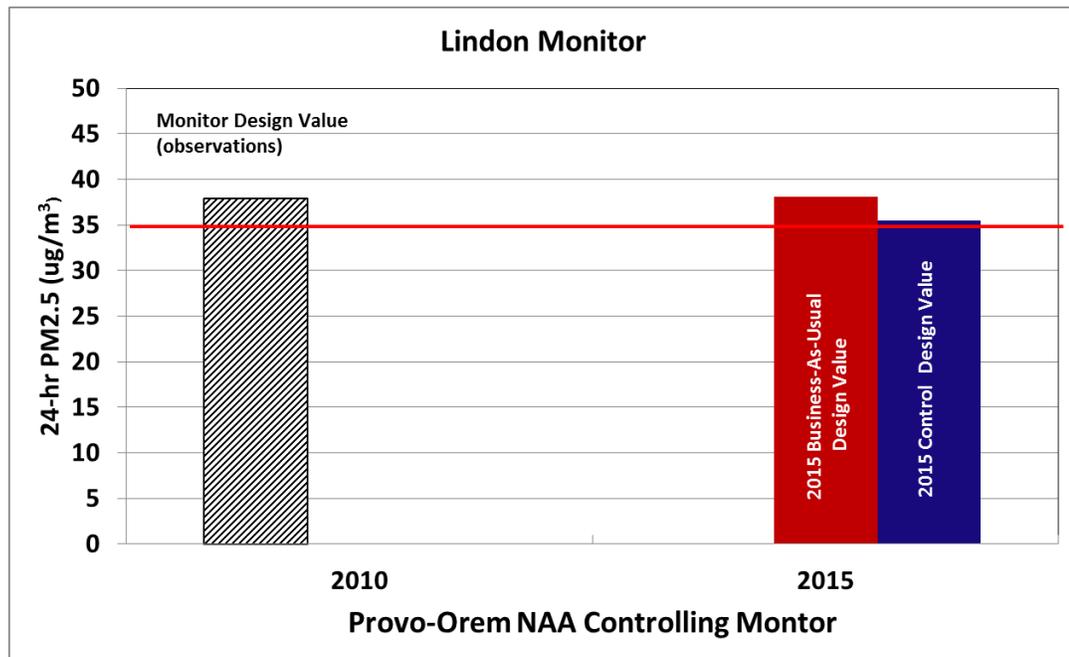
8

9 5.8 Modeled Attainment Test

10 UDAQ employed Model Attainment Test Software (MATS) for the modeled attainment test at grid cells
11 near monitors. MATS is designed to interpolate the species fractions of the PM mass from the Speciation
12 Trends Network (STN) monitors to the FRM monitors. The model also calculates the relative response
13 factor (RRF) for grid cells near each monitor and uses these to calculate a future year design value for
14 these cells.

15 MATS results for future year modeling is presented in Figure 5.16. The future year design values are
16 presented with and without SIP controls for 2015 (the attainment year). For comparison purposes, the
17 monitored design value is also presented for the base year, 2010.

18



19

20 Figure 5.16, Model Results for the Provo, UT Nonattainment Area

21

1 Table 5.1 presents the same information in tabular form, and also includes any additional monitoring
2 locations in the nonattainment area.

| | 2010 | 2015 | |
|--------------|----------|-------------------|----------------|
| | Observed | Business-As-Usual | Control Basket |
| Lindon | 38 | 38 | 36 |
| N. Provo | 33 | 33 | 31 |
| Spanish Fork | 39 | 38 | 34 |

3

4 **Table 5.1, Modeled Concentrations ($\mu\text{g}/\text{m}^3$) for the Provo, UT Nonattainment Area**

5

6 The "Control Basket" inventory that is presented in Table 5.1 consists of a combination of SIP reductions
7 on point sources and new rules to be implemented that will affect smaller commercial and industrial
8 businesses. All of these changes are detailed in Chapter 6 - Control Measures. Summary tables of the
9 emission inventories that result from the Control Basket reductions are available in the TSD: Section 3
10 Baseline and Control Strategies.

11

12 **5.9 Air Quality as of the Attainment Date**

13 The attainment date for this moderate $\text{PM}_{2.5}$ nonattainment area is December 31, 2015. The plan
14 provisions for moderate areas call, in Section 189(a)(1)(B), for either a demonstration that the plan will
15 provide for attainment by the applicable attainment date or a demonstration that attainment by such
16 date is impracticable.

17 *As shown in the modeled attainment test, the emissions reductions achievable in 2015 do not allow for
18 a demonstration that the Provo, UT nonattainment area can attain the 24-hour $\text{PM}_{2.5}$ NAAQS. Although
19 predictions at two of the three monitors are less than $35 \mu\text{g}/\text{m}^3$, the predicted concentration at the
20 Lindon monitor is still above the standard.*

21 *As discussed in Section 6.6, the emissions modeled in the "control basket" scenario reflect (at least) all
22 RACM and RACT measures achievable in practice by the statutory implementation date (December 14,
23 2014). Therefore, what has been demonstrated is that attainment of the 24-hour standard by
24 December 31, 2015 is impracticable.*

25

1 **Chapter 6 – CONTROL MEASURES**

2

3 **6.1 Introduction**

4 Attaining the 2006, 24-hour NAAQS for PM_{2.5} will require emission controls from directly emitted PM_{2.5}
5 as well as PM_{2.5} precursors (SO₂, NO_x and VOC). It will involve emission sources from each of the four
6 sectors identified in the discussion on emission inventories (stationary point sources, area sources, on-
7 road mobile sources and off-road mobile sources). Furthermore, it will entail control measures of two
8 basic types: existing measures; and measures imposed through this SIP.

9 This chapter summarizes the overall control strategy for the plan. Additional detail concerning
10 individual emission control measures, including the emissions reductions to be expected, is contained in
11 the Technical Support Document.

12

13 **6.2 Utah Stakeholder Workgroup Efforts**

14 In response to increasing interest in Utah’s air quality problems and the need for greater participation in
15 reducing air emissions, the Utah Division of Air Quality (DAQ) created a significant and meaningful role
16 for public participation in the PM_{2.5} SIP development process. The public involvement process was
17 driven by a need for transparency and inclusivity of public health and business interests impacted by air
18 quality issues.

19 DAQ’s measures of success for the public involvement process were:

- 20
- 21 • Buy-in from public, stakeholders, and elected officials,
 - 22 • SIP recommendations that are championed and implemented, and ;
 - 23 • Close working relationship with partner organizations to deliver a unified message.

24 Measures of success for participants were:

- 25 • Having a say in plans that impacted their communities,
- 26 • Access to information and time to understand issues and provide input,
- 27 • Access to DAQ staff and the SIP development process,
- 28 • Meaningful participation in the process, and;
- Transparency of the process.

1 Public participation centered on creating workgroups with members from each county within the PM_{2.5}
2 nonattainment area—Box Elder, Cache, Davis, Salt Lake, Tooele, Utah, and Weber. More than 100
3 people from agriculture, academia, environmental groups, state and local elected officials, industry, and
4 the public volunteered to participate. Their participation ensured that the SIP development process
5 would have grassroots-level input about strategies and their impacts on a countywide level.

6 Workgroup members were engaged in four rounds of meetings created to provide and gather
7 information. After providing a baseline level of knowledge during Meeting One, draft emissions
8 reductions were discussed during Meetings Two and Three, each followed by a survey to capture new
9 ideas and feedback. Responses from the survey, and other feedback received during the process, were
10 used to refine emissions inventories, in some cases significantly, refine mitigation strategies, provide
11 new strategies, and provide ideas for implementation. Meeting Four was an opportunity for workgroup
12 members to introduce the SIP package to the public and talk about the development process before one
13 of several public comment hearings held in the nonattainment counties.

14 The public participation process was not without challenges. One of the most difficult was providing
15 information that could get a diverse group of stakeholders to understand very complex and technical air
16 quality and emissions reductions issues. Despite the challenges, the process was successful and
17 contributed to a well-rounded and well-vetted SIP package.

18

19 **6.3 Identification of Measures**

20 In considering the suite of control measures that could be implemented as part of this plan several
21 important principles were applied to expedite the analysis.

22 Filter data shows that secondary particulate is the portion of mass most responsible for exceedances of
23 the standard on episode days, and specifically shows that ammonium nitrate is the single largest
24 component of that material. In addition, it shows that organic carbon represents the bulk of primary
25 PM_{2.5}.

26 Priority was given to those source categories or pollutants responsible for relatively larger percentages
27 of the emissions leading to exceedances of the PM_{2.5} NAAQS. The emissions inventory compiled to
28 represent base-year conditions was useful in identifying the contributors to these emissions, particularly
29 in their relation to the formation of ammonium nitrate.

30 At the same time, the air quality modeling shed light on the sensitivity of the airshed in its response to
31 changes in different pollutants. VOC was immediately identified as a significant contributor to elevated
32 PM_{2.5} concentrations, and proved to be more limiting in the overall atmospheric chemistry than NO_x.
33 This pointed the search for viable control strategies toward VOC emissions, and somewhat away from
34 NO_x. It also became apparent that directly emitted PM_{2.5}, while a relatively small portion of the overall
35 filter mass, is independent of the non-linear chemical transformation to particulate matter. Therefore,

1 any reduction in PM_{2.5} emissions will directly improve future PM_{2.5} concentrations, and like VOC, made
2 these emissions an attractive target for potential control measures. Subsequent modeling revealed
3 that, as time progressed and the relative concentrations of NO_x and VOC changed, controlling for NO_x
4 would yield more benefit in terms of controlling PM_{2.5}. Ammonia is also prominent in chemical
5 reactions that produce secondary PM_{2.5}, but it occurs in such abundance that PM_{2.5} concentrations are
6 sensitive only to unachievable reductions in ammonia.

7

8 **6.4 Existing Control Measures**

9 Since about 1970 there have been regulations at both state and federal levels to mitigate air
10 contaminants. It follows that the estimates of emissions used in modeled attainment demonstration for
11 this Plan take into account the effectiveness of existing control measures. These measures affect not
12 only the levels of current emissions, but some continue to affect emissions trends as well.

13 An example of the former would be the effectiveness of an add-on control device at a stationary point
14 source. It is presently effective in controlling emissions, and will continue to be that effective five years
15 from now.

16 An example of the latter would be a federal rule that affects the manufacture of engines. The engines
17 already sold into the airshed are effective in reducing emissions, but the number of these engines
18 replacing older, higher emitting engines is increasing. Therefore, a rule such as this also affects the
19 trend of emissions for that source category in a positive way.

20 The effectiveness of any control measure that was in place, and enforceable, at the time this Plan was
21 written has been accounted for in the tabulation of baseline emissions and projected emissions.

22 The following paragraphs discuss some of the more important control strategies that are already in
23 place for the four basic sectors of the emissions inventory.

24 Stationary Point Sources:

25 Utah's permitting rules require a review of new and modified major stationary sources in nonattainment
26 areas, as is required by Section 173 of the Clean Air Act. Beyond that however, even minor sources and
27 minor modifications to major sources planning to locate anywhere in the state are required to undergo
28 a new source review analysis and receive an approval order to construct. Part of this review is an
29 analysis to ensure the application of Best Available Control Technology (BACT). This requirement is
30 ongoing and ensures that Utah's industry is well controlled.

31 In Utah County, stationary sources were required to reduce emissions in the early 1990s to address fine
32 particulate matter, regulated as PM₁₀ at that time. As with PM_{2.5}, much of the problem was attributed
33 to secondary PM, and controls were applied to SO₂ and NO_x in addition to primary PM₁₀.

1 Any of the source-specific emission controls or operating practices that has been required as a result of
2 the forgoing has been reflected in the baseline emissions calculated for the large stationary sources, and
3 therefore evaluated in the modeled demonstration.

4 Area sources:

5 Stage 1 vapor control was introduced in Salt Lake and Davis Counties as part of the 1981 ozone SIP. This
6 is a method of collecting VOC vapors, as underground gasoline storage tanks are filled at gas stations,
7 and returning those vapors to a facility where they are collected and recycled. Since that time it has
8 been extended to include the entire state.

9 Part of the PM₁₀ control for Salt Lake and Davis Counties in the early 1990s was a program to curtail
10 woodsmoke emissions during periods of atmospheric stagnation. Woodsmoke is rich in VOC emissions
11 in addition to the particulate matter which is almost entirely within the PM_{2.5} size fraction. In 2006 the
12 woodburning program was extended to include the western half of Weber County as well.

13 CTGs adopted into Utah's air quality rules to control VOC emissions in Salt Lake and Davis Counties, as
14 part of the 1981 ozone SIP, are also effective in controlling emissions from area sources.

15 Energy Efficiency

16 EPA recognizes the benefits of including energy efficiency programs in SIP's as a low cost means of
17 reducing emissions. Two established energy efficiency programs that result in direct emission reductions
18 within the Wasatch Front are already in place.

19 *Questar Gas ThermWise Rebate Programs*

20 Questar started the ThermWise Rebate Programs on January 1, 2007 as a way to promote the use of
21 energy-efficient appliances and practices among its customers. The ThermWise Programs offer rebates
22 to help offset the initial cost of energy-efficient appliances and weatherization. There are also rebates
23 available for energy efficient new construction. The cost of rebates is built into the Questar gas rate. The
24 rebates are vetted by the Utah Public Service Commission's strict "cost-effectiveness" tests. To pass
25 these tests, Questar must prove that the energy cost savings produced by the ThermWise Programs
26 exceeds the cost of the rebates. There is no scheduled end to the ThermWise Programs. According to
27 the Questar program information, the program will remain in place as long as rebates remain cost-
28 effective.

29 UDAQ calculates area source emissions for natural gas by multiplying emission factors against actual and
30 projected yearly gas usage data submitted by Questar. In this way, actual realized program reductions
31 are expressed in the past year (baseline) emission inventory. Future investment in energy efficiency is
32 not captured in our projected future gas usage. Continuance of this program will result in future gas
33 emissions that are lower than projected.

34

1 *Weatherization Assistance Program*

2 The Weatherization Assistance Program helps low-income individuals and families reduce energy costs.
3 Individuals, families, the elderly and the disabled who are making no more than 200 percent of the
4 current federal poverty income level are eligible for help. However, priority is given to the elderly and
5 disabled, households with high-energy consumption, emergency situations and homes with preschool-
6 age children.

7 The Utah Division of Housing and Community Development administer the program statewide through
8 eight government and nonprofit agencies. Benefits are provided in the form of noncash grants to eligible
9 households to make energy-efficiency improvements to those homes.

10 The energy efficiency realized from this program is also imbedded within the gas usage data UDAQ
11 receives from Questar.

12

1 On-road mobile sources:

2 The federal motor vehicle control program has been one of the most significant control strategies
 3 affecting emissions that lead to PM_{2.5}. Since 1968, the program has required newer vehicles to meet
 4 ever more stringent emission standards for CO, NO_x, and VOC. Tier 1 standards were established in the
 5 early 1990s and were fully implemented by 1997. The Tier 1 emission standards can be found in Table
 6 6.1. The EPA created a voluntary clean car program on January 7, 1998 (63 FR January 7, 1998), which
 7 was called the National Low Emission Vehicle (NLEV) program. This program asked auto manufacturers
 8 to commit to meet tailpipe standards for light duty vehicles that were more stringent than Tier 1
 9 standards.

| EPA Tier 1 Emission Standards for Passenger Cars and Light-Duty Trucks, FTP 75, g/mi | | | | | | |
|--|-------------------------------------|------|-----|--|-----------------------------|-----------------|
| Category | 100,000 miles/10 years ¹ | | | | | |
| | THC | NMHC | CO | NO _x ² diesel | NO _x gasoline | PM ³ |
| Passenger cars | - | 0.31 | 4.2 | 1.25 | 0.6 | 0.1 |
| LLDT, LVW <3,750 lbs | 0.8 | 0.31 | 4.2 | 1.25 | 0.6 | 0.1 |
| LLDT, LVW >3,750 lbs | 0.8 | 0.4 | 5.5 | 0.97 | 0.97 | 0.1 |
| HLDT, ALVW <5,750 lbs | 0.8 | 0.46 | 6.4 | 0.98 | 0.98 | 0.1 |
| HLDT, ALVW > 5,750 lbs | 0.8 | 0.56 | 7.3 | 1.53 | 1.53 | 0.12 |

1 - Useful life 120,000 miles/11 years for all HLDT standards and for THC standards for LDT
 2 - More relaxed NO_x limits for diesels applicable to vehicles through 2003 model year
 3 - PM standards applicable to diesel vehicles only

Abbreviations:
 LVW - loaded vehicle weight (curb weight + 300 lbs)
 ALVW - adjusted LVW (the numerical average of the curb weight and the GVWR)
 LLDT - light light-duty truck (below 6,000 lbs GVWR)
 HLDT - heavy light-duty truck (above 6,000 lbs GVWR)

10 **Table 6.1, Tier 1 Emission Standards**

11

1 Shortly thereafter, EPA promulgated the Tier 2 program. This program went into effect on April 10,
 2 2000 (65 FR 6698 February 10, 2000) and was phased in between 2004 and 2008. Tier 2 introduced
 3 more stringent numerical emission limits compared to the previous program (Tier 1). Tier 2 set a single
 4 set of standards for all light duty vehicles. The Tier 2 emission standards are structured into 8
 5 permanent and 3 temporary certification levels of different stringency, called “certification bins,” and an
 6 average fleet standard for NO_x emissions. Vehicle manufacturers have a choice to certify particular
 7 vehicles to any of the available bins. The program also required refiners to reduce gasoline sulfur levels
 8 nationwide, which was fully implemented in 2007. The sulfur levels need to be reduced so that Tier 2
 9 vehicles could run correctly and maintain their effectiveness. The EPA estimated that the Tier 2 program
 10 will reduce oxides of nitrogen emissions by at least 2,220,000 tons per year nationwide in 2020¹. Tier 2
 11 has also contributed in reducing VOC and direct PM emissions from light duty vehicles. Tier 2 standards
 12 are summarized in Table 6.2 below.

13

| Tier 2 Emission Standards, FTP 75, g/mi | | | | | |
|---|------------------|-----------|-------------------|------|---------------|
| Bin# | Full Useful Life | | | | |
| | NMOG* | CO | NO _x † | PM | HCHO |
| Temporary Bins | | | | | |
| 11 MDPV ^c | 0.28 | 7.3 | 0.9 | 0.12 | 0.032 |
| 10 ^{a,b,d} | 0.156 (0.230) | 4.2 (6.4) | 0.6 | 0.08 | 0.018 (0.027) |
| 9 ^{a,b,e} | 0.090 (0.180) | 4.2 | 0.3 | 0.06 | 0.018 |
| Permanent Bins | | | | | |
| 8 ^b | 0.125 (0.156) | 4.2 | 0.2 | 0.02 | 0.018 |
| 7 | 0.09 | 4.2 | 0.15 | 0.02 | 0.018 |
| 6 | 0.09 | 4.2 | 0.1 | 0.01 | 0.018 |
| 5 | 0.09 | 4.2 | 0.07 | 0.01 | 0.018 |
| 4 | 0.07 | 2.1 | 0.04 | 0.01 | 0.011 |
| 3 | 0.055 | 2.1 | 0.03 | 0.01 | 0.011 |
| 2 | 0.01 | 2.1 | 0.02 | 0.01 | 0.004 |
| 1 | 0 | 0 | 0 | 0 | 0 |
| * for diesel fueled vehicle, NMOG (non-methane organic gases) means NMHC (non-methane hydrocarbons) | | | | | |
| † average manufacturer fleet NO _x standard is 0.07 g/mi for Tier 2 vehicles | | | | | |

¹ 65 FR 6698 February 10, 2000

- a - Bin deleted at end of 2006 model year (2008 for HLDTs)
- b - The higher temporary NMOG, CO and HCHO values apply only to HLDTs and MDPVs and expire after 2008
- c - An additional temporary bin restricted to MDPVs, expires after model year 2008
- d - Optional temporary NMOG standard of 0.280 g/mi (full useful life) applies for qualifying LDT4s and MDPVs only
- e - Optional temporary NMOG standard of 0.130 g/mi (full useful life) applies for qualifying LDT2s only

Abbreviations:

LDT2 – light duty trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)

LDT4 – light duty trucks 4 (6,001-8,500 lbs. GVWR, 5,751 lbs. and greater ALVW)

MDPV – medium duty passenger vehicle

HLDT - heavy light duty truck (above 6,000 lbs GVWR)

1 **Table 6.2, Tier 2 Emission Standards**

2

3 In addition to the benefits from Tier 2 in the current emissions inventories, the emission projections for
 4 2015 in this SIP continue to reflect significant improvements in both VOC and NO_x as older vehicles are
 5 replaced with Tier 2 vehicles. This trend may be seen in the inventory projections for on-road mobile
 6 sources despite the growth in vehicles and vehicle miles traveled that are factored into the same
 7 projections.

8 Additional on-road mobile source emissions improvement stemmed from federal regulations for heavy-
 9 duty diesel vehicles. The Highway Diesel Rule, which aimed at reducing pollution from heavy-duty diesel
 10 highway vehicles, was finalized in January 2001. Under the rule, beginning in 2007 (with a phase-in
 11 through 2010) heavy-duty diesel highway vehicle emissions were required to be reduced by as much 90
 12 percent with a goal of complete fleet replacement by 2030. In order to enable the updated emission-
 13 reduction technologies necessitated by the rule, beginning in 2006 (with a phase-in through 2009)
 14 refiners were required to begin producing cleaner-burning ultra-low sulfur diesel fuel. Specifically, the
 15 rule required a 97 percent reduction in sulfur content from 500 parts per million (ppm) to 15 ppm. The
 16 overall nationwide effect of the rule is estimated to be equivalent to removing the pollution from over
 17 90 percent of trucks and buses when the fleet turnover is completed in 2030.

18 To supplement the federal motor vehicle control program, Inspection / Maintenance (I/M) Programs
 19 were implemented in [~~Salt Lake and Davis Counties in 1984~~Utah County in 1986. [A program for Weber
 20 County was added in 1990.] Th[ese]is program[s] ha[ve]s been effective in identifying vehicles that no
 21 longer meet the emission specifications for their respective makes and models, and in ensuring that
 22 those vehicles are repaired in a timely manner.

23

1 Off-road mobile sources:

2 Several significant regulatory programs enacted at the federal level will affect emissions from non-road
3 mobile emission sources. This category of emitters includes airplanes, locomotives, hand-held engines,
4 and larger portable engines such as generators and construction equipment. The effectiveness of these
5 controls has been incorporated into the "NONROAD" model UDAQ uses to compile the inventory
6 information for this source category. Thus, the controls have already been factored into the projection
7 inventories used in the modeled attainment demonstration.

8 EPA rules for non-road equipment and vehicles are grouped into various "tiers" in a manner similar to
9 the tiers established for on-road motor vehicles. To date, non-road rules have been promulgated for
10 Tiers 0 through IV, where the oldest equipment group is designated "Tier 0" and the newest equipment,
11 some of which has yet to be manufactured, falls into "Tier IV."

12 Of note are the following:

13 Locomotives

14 Locomotive engine regulation began with Tier 0 standards promulgated in 1998, which apply to model
15 year 2001 engines.

16 In addition, because of the very long lifetimes of these engines, often up to forty years, Tier 0 standards
17 include remanufacturing standards, which apply to locomotive engines of model years 1973 through
18 2001.

19 Subsequent tier standards for line-haul locomotives apply as follows:

| 20 | Tier | Applicable Model Years |
|----|----------|------------------------|
| 21 | Tier I | 2002 - 2004 |
| 22 | Tier II | 2005 - 2011 |
| 23 | Tier III | 2012 - 2014 |
| 24 | Tier IV | 2015 - newer |

25

26 Yard or "switch" locomotives are regulated under different standards than line-haul locomotives.

27 Lastly, EPA has promulgated remanufacturing standards for Tier I and 2 locomotive engines to date.

28 Large Engines

29 Large non-road engines are usually diesel-powered but include some gasoline-powered equipment.

1 Large land-based diesel equipment (> 37 kw or 50 hp) used in agricultural, construction and industrial
2 applications are regulated under Tier I rules, which apply to model years 1996 through 2000.
3 Subsequent Tier II through IV rules apply to newer model-year equipment.

4 Some large non-road engines are gasoline-powered (spark-ignition). These include equipment such as
5 forklifts, some airport ground support equipment, recreational equipment such as ATVs, motorcycles
6 and snowmobiles. These are regulated under various tiers in a manner similar to diesel equipment.

7 Small Engines

8 Small engines are generally gasoline-powered (spark-ignition). Equipment includes handheld and larger
9 non-handheld types. Handheld equipment includes lawn and garden power tools such as shrub
10 trimmers, saws and dust blowers. Non-handheld equipment includes equipment such as lawnmowers
11 and lawn tractors. From an emissions standpoint, smaller engine size is offset by the large number of
12 pieces of equipment in use by households and commercial establishments. This equipment is regulated
13 under a tiered structure as well.

14 Emissions Benefit

15 Each major revision of the non-road tier standards results in a large reduction of carbon monoxide,
16 hydrocarbons, nitrogen oxides and particulate matter.

17 For example, the Non-road Diesel Tier II and III Rule, which regulates model-year 2001 through 2008
18 diesel equipment (> 37 kw or 50 hp) is estimated by EPA, in its Regulatory Announcement for this rule
19 dated August 1998, to decrease NO_x emissions by a million tons per year by 2010, the equivalent of
20 taking 35 million passenger cars off the road.

21 EPA further estimates, in its Regulatory Announcement dated May 2004, that the Tier IV non-road diesel
22 rule is expected to decrease exhaust emissions per piece of equipment by over 90 percent compared to
23 older equipment.

24 Low-Sulfur Diesel

25 Non-road diesel equipment is required to operate on diesel fuel with a sulfur content of no greater than
26 500 ppm beginning June 1, 2007.

27 Beginning June 1, 2010, non-road diesel equipment must operate on "ultra-low" sulfur diesel with a
28 sulfur content of no more than 15 ppm.

29 Locomotives and certain marine engines must operate on ultra-low sulfur diesel by June 1, 2012.

1 **6.5 SIP Controls**

2 Beyond the benefits attributable to the controls already in place, there are new controls identified by
3 this SIP that provide additional benefit toward reaching attainment. A summary of the plan strategy is
4 presented here for each of the emission source sectors.

5 Overall, within the Provo – UT nonattainment area, the strategy to reduce emissions results in 7.07 tons
6 per day of combined PM_{2.5}, SO₂, NO_x and VOC in 2015.

7

8 **6.6 Reasonably Available Control Measures (RACM/RACT)**

9 Section 172 of the CAA requires that each attainment plan “provide for the implementation of all
10 reasonably available control measures (RACM) as expeditiously as practicable (including such reductions
11 in emissions from existing sources in the area as may be obtained through the adoption, at a minimum,
12 of reasonably available control technology (RACT)), and shall provide for attainment of the NAAQS.”

13 Now that the Courts have determined that Subpart 4 applies to PM_{2.5} nonattainment areas, it is also
14 instructive to consider paragraph 189(a)(1)(C), which requires that “provisions to assure that reasonably
15 available control measures ... shall be implemented no later than ... 4 years after designation in the case
16 of an area classified as moderate after the date of the enactment of the Clean Air Act Amendments of
17 1990.” All three of Utah’s nonattainment areas for PM_{2.5} were designated so on December 14, 2009.
18 Hence, December 14, 2013 was the date by which all RACM was to have been implemented.

19 EPA interprets RACM as referring to measures of any type that may be applicable to a wide range of
20 sources (mobile, area, or stationary), whereas RACT refers to measures applicable to stationary sources.
21 Thus, RACT is a type of RACM specifically designed for stationary sources. For both RACT and RACM,
22 potential control measures must be shown to be both technologically and economically feasible.

23 Pollutants to be addressed by States in establishing RACT and RACM limits in their PM_{2.5} attainment
24 plans will include primary PM_{2.5} as well as precursors to PM_{2.5}. For the control strategy in this plan,
25 those pollutants include SO₂, NO_x and VOC.

26 In general, the combined approach to RACT and RACM includes the following steps: 1) identification of
27 potential measures that are reasonable, 2) modeling to test the control strategy, and 3) selection of
28 RACT and RACM.

29 This basic process was applied to each of the four basic sectors of the emissions inventory:

30 Stationary Point sources:

31 *Reasonably Available Control Technology* – As stated above, RACT refers to measures applicable to
32 stationary sources. Thus, RACT is a type of RACM specifically designed for stationary sources.

1 Section 172 does not include any specific applicability thresholds to identify the size of sources that
2 States and EPA must consider in the RACT and RACM analysis. In developing the emissions inventories
3 underlying the SIP, the criteria of 40 CFR 51 for air emissions reporting requirements was used to
4 establish a 100 ton per year threshold for identifying a sub-group of stationary point sources that would
5 be evaluated individually. The cut-off was applied to either a sources reported emissions for 2008 or for
6 its potential to emit in a given year. The rest of the point sources were assumed to represent a portion
7 of the overall area source inventory.

8 Sources meeting the criteria described above were individually evaluated to determine whether their
9 operations would be consistent with RACT.

10 SIPs for PM_{2.5} must assure that the RACT requirement is met, either through a new RACT determination
11 or a certification that previously required RACT controls (e.g. for another pollutant such as PM₁₀)
12 represent RACT for PM_{2.5}.

13 In conducting the analysis, UDAQ found that, as a whole, the large stationary sources were already
14 operating with a high degree of emission control. It follows that the percentage of SIP related emissions
15 reductions is not large relative to the overall quantity of emissions. As stated before, many of these
16 sources were required to reduce emissions to address nonattainment issues with SO₂, ozone and PM₁₀.
17 Routine permitting in these areas of nonattainment already includes BACT as an ongoing standard of
18 review, even for minor sources and modifications. In order to find additional emission reductions at
19 these sources, UDAQ identified a level of emission control that goes beyond reasonable, or RACT, and
20 achieves the best available control.

21 Additional information regarding the RACT analysis for each of the sources in the nonattainment area
22 may be found in the Technical Support Document.

23

1 For the Provo, UT nonattainment area, there are seven stationary point sources that met or meet the
2 criteria of 100 tons per year for PM_{2.5} or any attainment plan precursor. The emissions from these
3 sources that were modeled for the 2010 baseline as well as the 2015 attainment year are shown below
4 in Table 6.3.¹ Note that these emissions also include the growth projections that were applied.
5 Information is provided in the TSD regarding the emissions reductions specific to reduction strategies
6 resulting from the SIP.

7

¹ As noted above, the RACT implementation date given in CAA section 189(a)(1)(c), in Subpart 4, was December 14, 2013. As an editorial note, UDAQ had initially prepared this SIP under guidance pointing only to Subpart 1 of the CAA. That reading of the Act had resulted in a SIP with a different construct. It had identified an attainment date that was as expeditious as practicable, yet that date would have required all of the additional 5 years availed under section 172(a)(2)(A). Implementation of RACM and RACT, under that construct, was also to be as expeditious as practicable but in no case later than one year prior to the attainment date identified in the plan. Thus, RACT measures could have been implemented as late as December 14, 2018. Additionally, the requirement to address reasonable further progress (RFP) had identified two earlier milestones (2014 and 2017), and these presented additional targets for RACT implementation. Thus, the overall plan had incorporated a phased-in implementation schedule for measures identified as RACT.

When Subpart 4 superseded the more general planning requirements of Subpart 1, it was no longer permissible to request an extension of the attainment date. Instead, it became incumbent on the planning agency to determine either that the plan will provide for attainment by the applicable attainment date, or that attainment by such date is impracticable.

The attainment date for this moderate nonattainment area is December 31, 2015 and the RACT implementation date (having passed) was December 14, 2013. Many of the control strategies initially identified, under only Subpart 1, as RACT cannot be implemented by that prescribed date. This raises the question as to whether such measures would even be considered reasonable, either technologically or economically.

Nevertheless, UDAQ has retained this portion of the control strategy in the Emission Limits section of this State Implementation Plan. UDAQ is also demonstrating in this plan that attainment of the 2006, 24-hour NAAQS for PM_{2.5} is impracticable by the attainment date. As part of that showing, the emissions reductions associated with all of the technologies and measures identified as RACT under only Subpart 1 were reflected in the emissions inventory modeled for the year 2015. This overstates the degree of control in 2015, however, from the standpoint of demonstrating that it is impracticable to attain the standard in 2015, provides a measure of conservatism to the overall conclusion.

| Typical Winter Inversion Weekday | | | 2010_(R2) | | | | | 2015_(R9) | | | | |
|----------------------------------|-----------|--|-----------|-------|-------|-------|-------|------------------|-------|-------|-------|-------|
| Emissions (tpd) | | | Baseline | | | | | Growth & Control | | | | |
| Source Category | NA-Area | Site | PM2.5 | NOX | VOC | NH3 | SO2 | PM2.5 | NOX | VOC | NH3 | SO2 |
| Point Sources | Provo, UT | | | | | | | | | | | |
| | | BYU Main Campus | 0.005 | 0.083 | 0.024 | 0.002 | 0.001 | 0.007 | 0.081 | 0.029 | 0.002 | 0.003 |
| | | Geneva Nitrogen Plant | 0.055 | 0.331 | 0.000 | 0.008 | 0.000 | 0.062 | 0.420 | 0.000 | 0.010 | 0.000 |
| | | Pacific States | 0.017 | 0.215 | 0.577 | 0.002 | 0.006 | 0.022 | 0.237 | 0.386 | 0.003 | 0.008 |
| | | Pacificorp Lakeside Power Plant | 0.183 | 0.269 | 0.062 | 0.276 | 0.018 | 0.470 | 0.623 | 0.305 | 0.518 | 0.089 |
| | | Payson City | 0.000 | 0.012 | 0.006 | 0.000 | 0.000 | 0.020 | 0.808 | 0.227 | 0.000 | 0.017 |
| | | Provo Power Plant | 0.000 | 0.024 | 0.003 | | 0.000 | 0.004 | 0.313 | 0.015 | | 0.000 |
| | | Springville City Whitehead Power Plant | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.639 | 0.397 | 0.126 | 0.001 | 0.028 |
| | | Provo, UT Total | 0.261 | 0.934 | 0.673 | 0.287 | 0.026 | 1.224 | 2.880 | 1.088 | 0.535 | 0.145 |

Table 6.3, Point Source Emissions; Baseline and Projections with Growth and Control

New Source Review / Banked Emission Reduction Credits – Under Utah’s new source review rules in R307-403-8, banking of emission reduction credits (ERCs) is permitted to the fullest extent allowed by applicable Federal Law as identified in 40 CFR 51, Appendix S, among other documents. Under Appendix S, Section IV.C.5, a permitting authority may allow banked ERCs to be used under the preconstruction review program (R307-403) as long as the banked ERCs are identified and accounted for in the SIP control strategy. In the past, Utah has accounted for existing banked ERCs in SIP control strategies, ensuring that a pool of ERCs was available for new or modified sources in nonattainment areas. For the PM_{2.5} SIP, however, it was not possible to include banked ERCs in the attainment demonstration. The PM_{2.5} SIP adopted by the Air Quality Board on December 4, 2013 did not include banked PM_{2.5} or PM_{2.5} precursor ERCs in the attainment demonstration¹ and therefore under R307-403-8 any ERCs that were banked prior to December 4, 2013 may not be used as PM_{2.5} major source or major modification emission offsets for PM_{2.5} nonattainment areas. The use of these existing banked ERCs to meet the requirements of existing SIPs for PM₁₀, SO₂ and ozone are not affected by the PM_{2.5} SIP and would be evaluated according to the provisions of those SIPs. Any ERCs generated after December 4, 2013 for PM_{2.5} or PM_{2.5} precursors would have been accounted for in the PM_{2.5} attainment demonstration and are eligible to be used as emission offsets for PM_{2.5} or PM_{2.5} precursors. DAQ has established a new registry for PM_{2.5} ERCs generated after December 4, 2013 to ensure that qualifying ERCs are tracked.

Area sources:

The area source RACM analysis consisted of a thorough review of the entire area source inventory for anthropocentrically derived direct PM_{2.5} and precursors constituents. There was no emission threshold level established in the review process; instead, the analysis centered on whether reasonable control measures are available for a given source category. The following table identifies these categories as well as the pollutant(s) likely to be controlled, and provides some remarks as to whether a control

¹ The SIP revision adopted by the Utah Air Quality Board on December 4, 2013 had demonstrated attainment by December 14, 2019. This SIP revision includes a demonstration under CAA Section 189(a)(1)(B) that it is impracticable to attain the NAAQS in 2015. Banked emission credits were not included in this demonstration either.

1 strategy was ultimately pursued. In considering what source categories might be considered, Utah
 2 made use of EPA recommendations included in Control Techniques Guideline Documents (CTG's), as
 3 well as control strategies from other states. DAQ evaluated each strategy for technical feasibility as part
 4 of the RACM analysis. The screening column in the table identifies whether or not a strategy was
 5 retained for rulemaking or screened out for impracticability.

6
 7
 8

9 **Table 6.4 Area Source Strategy Screening**

| Strategy | Constituent(s) | Screening Status | Remarks |
|---|----------------------------------|--------------------|--|
| 1. Repeal current surface coating rule, R307-340. Replace this rule with individual rules for each category. New rules include PM _{2.5} nonattainment areas. New rules update applicability and control limits to most current CTG. Current rule includes, paper, fabric and vinyl, metal furniture, large appliance, magnet wire, flat wood, miscellaneous metal parts and graphic arts. | VOC | Retained | R307-340 previously applied to Davis and Salt Lake counties. R307-340 was withdrawn and re-enacted as separate rules for each existing category. The new rules were expanded to nonattainment areas and updated to the most current RACT based limit(s). |
| 2. New separate surface coating rules for following sources: a. Aerospace b. High performance c. Architectural d. Marine e. Sheet, strip & coil f. Traffic markings g. Plastic parts | VOC | See Remarks Column | Aerospace – retained High performance – not retained, regulated under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Architectural – initially not retained, further research indicated that adopting the Ozone Transport Commission model rule is feasible. Marine – not retained, only 1.2 tpy Sheet, strip & coil – retained Traffic markings – not retained, regulated under FIFRA Plastic parts - retained |
| 3. Agricultural practices using Natural Resources Conservation Service (NRSC) practice standards | VOC, PM _{2.5} , ammonia | Not Retained | The NRCS has already enrolled most farmers in the erodible regions in their program thereby negating the need for rulemaking |
| 4. Consumer products rule regulating VOC content | VOC | Retained | |
| 5. Adhesives and sealant rule | VOC | Retained | |
| 6. Expand current solvent degreasing rule R307-335 to PM _{2.5} nonattainment areas and add a new section on industrial solvent cleaning | VOC | Retained | |
| 7. Automobile refinishing rule | VOC | Retained | |
| 8. Expand wood furniture manufacturing rule to PM _{2.5} nonattainment areas. Update to most current CTG. | VOC | Retained | |

| Strategy | Constituent(s) | Screening Status | Remarks |
|--|--|---|---|
| 9. Lower the no burn cut point for residential use of solid fuel burning devices. Require new sale of EPA certified stoves/fireplaces. Prohibit the sale/resale of noncertified stoves in nonattainment areas. | VOC, PM _{2.5} , NO _x , SO _x , ammonia | Retained | |
| 10. Ban new sales of stick type outdoor wood boilers in nonattainment areas. | VOC, PM _{2.5} , NO _x , SO _x , ammonia | Retained | |
| 11. Industrial bakery rule | VOC | Initially Retained | Screened out after analysis of public comment, cost benefit analysis does not support rulemaking, high cost-low VOC reduction |
| 12. Restaurant charbroiler emission control: - Chain-driven - Underfire | VOC, PM _{2.5} | Chain-driven Retained Underfire-Not Retained | No reasonable control measures available at this time for underfire charbroiling |
| 13. Appliance pilot light phase out | VOC, PM _{2.5} , NO _x , SO _x , ammonia | Retained | |
| 14. Expand current fugitive dust rule, R307-309 to PM _{2.5} nonattainment areas. Require BMP's for dust plans. | PM _{2.5} | Retained | |
| 15. Amend fugitive dust rule to include cattle feed lot | PM _{2.5} | Not Retained | Sizeable feed lots are not located in nonattainment areas |
| 16. Ultra-low NO _x burners in commercial, industrial, and institutional boilers | NO _x | Tentatively Retained for Future Consideration | Developing technology not readily available at this time |
| 17. Ultra-low NO _x burners in water heaters | NO _x | Tentatively Retained for Future Consideration | High cost and availability concerns |
| 18. Manure management | VOC, ammonia | Not Retained | NRCS best management practices already encourages manure management. Limited viable options during winter months and treatment options are costly with low control efficiency that would not yield significant ammonia reduction in an ammonia rich inventory |
| 19. Ban testing of back-up generators on red-alert days | VOC, PM _{2.5} , NO _x , SO _x | Initially Retained | Screened out after review of public comment, rule implementation was more complicated than anticipated, generators cannot be easily re-programmed |
| 20. Prohibit use of cutback asphalt | VOC | Not Retained | Cities and highway administration personnel need stockpile for winter time road repair. Very small inventory. |
| 21. Control limits on aggregate processing operations and asphalt manufacturing | PM _{2.5} , NO _x , SO _x | Retained | |
| 22. R307-307 Road Salt and Sanding | PM | Retained | Expand current rule to nonattainment areas |

1

2 EPA published CTGs and Alternative Control Techniques documents (ACTs) for VOCs for a host of
3 emission sources. The CTGs are used to presumptively define VOC RACT. The VOC ACTs describe
4 available control techniques and their cost effectiveness, but do not define presumptive RACT levels as
5 the CTGs do. Therefore, CTG's are given highest priority in rule development.

1 Where a CTG does not exist for an emission source or where a CTG is so dated that it no longer
2 represents current industry practice, UDAQ considered rules from other states as reference sources.

3 Additional reference sources include the Ozone Transport Commission (OTC) and the Northeast States
4 for Coordinated Air Use Management.

5 As noted above, many CTGs were previously adopted into Utah's air quality rules to address ozone
6 nonattainment in Salt Lake and Davis Counties. In conducting this evaluation, consideration was given
7 to whether an expansion of applicability for an existing CTG into additional counties would provide a
8 benefit for PM_{2.5}, and whether a strengthening of existing CTG requirements in Salt Lake and Davis
9 Counties would result in an incremental benefit that was economically feasible. Furthermore, EPA has
10 updated some of its existing CTGs and added some new ones to the list.

11 As part of this SIP, Utah has identified relevant source categories covered by CTGs, and promulgated
12 rules based on the CTGs for reducing emissions from these categories. These rules apply to the
13 following source categories:

- 14 • Control of Volatile Organic Emissions from Surface Coating of Cans, Coils, Paper, Fabrics,
15 Automobiles, and Light-Duty Trucks
- 16 • Control of Volatile Organic Emissions from Solvent Metal Cleaning
- 17 • Control of Volatile Organic Emissions from Surface Coating of Insulation of Magnet Wire
- 18 • Control of Volatile Organic Emissions from Graphic Arts
- 19 • Control of Volatile Organic Compound Emissions from Wood Furniture Manufacturing
20 Operations
- 21 • Control Techniques Guidelines for Industrial Cleaning Solvents
- 22 • Control Techniques Guidelines for Flat Wood Paneling Coatings
- 23 • Control Techniques Guidelines for Paper, Film, and Foil Coatings
- 24 • Control Techniques Guidelines for Large Appliance Coatings
- 25 • Control Techniques Guidelines for Metal Furniture Coatings
- 26 • Control Techniques Guidelines for Miscellaneous Metal and Plastic Parts Coatings
- 27 • Control of Volatile Organic Emissions from Coating Operations at Aerospace Manufacturing and
28 Rework Operations

29 While most VOC sources are addressed by CTGs, the remaining emission sources must be evaluated by
30 engineering analysis, including an evaluation of rulings by other states including model rules developed
31 by the Ozone Transport Commission. These include VOCs from autobody refinishing, restaurant
32 charbroiling, and phasing out appliance pilot lights.

33 CTGs for PM_{2.5} emissions sources do not exist. RACT for PM_{2.5} has been established through information
34 from varied EPA and other state SIP sources. A useful source of data is the AP 42 Compilation of Air
35 Pollutant Emission Factors, first published by the US Public Health Service in 1968. In 1972, it was
36 revised and issued as the second edition by the EPA. The emission factor/control information was
37 applied to fugitive dust and mining strategies.

1 Table 6.5 shows the effectiveness of the area source SIP control strategy for the Provo, UT
 2 nonattainment area by indicating the quantities of emissions eliminated from the inventory in 2015.
 3 Most of these rules became effective January 1, 2014.

4

| Provo, UT Nonattainment Area | | | | |
|--|----------------------|--------------|-----------|--------------|
| | 2015 lbs/day reduced | | | |
| | NOX | PM2.5 | SOX | VOC |
| Area Source Rules | | | | |
| R307-302, Solid fuel burning | 137 | 1,141 | 22 | 1,432 |
| R307-303, Commercial cooking | | 119 | | 31 |
| R307-309, Fugitive dust | | | | |
| R307-312, Aggregate processing operations | | 3 | | |
| R307-335, Degreasing | | | | 524 |
| R307-342, Adhesives & sealants | | | | 696 |
| R307-343, Wood manufacturing | | | | 213 |
| R307-344, Paper, film & foil coating | | | | |
| R307-345, Fabric & vinyl coating | | | | 242 |
| R307-346, Metal furniture coating | | | | 93 |
| R307-347, Large appliance coating | | | | 48 |
| R307-348, Magnet wire coating | | | | 0 |
| R307-349, Flat wood panel coating | | | | 21 |
| R307-350 Miscellaneous metal parts coating | | | | 255 |
| machinery | | | | 44 |
| other transportation | | | | 18 |
| Special | | | | 3 |
| R307-351, Graphic arts | | | | 370 |
| R307-352, Metal containers | | | | |
| R307-353, Plastic coating | | | | 92 |
| R307-354, Auto body refinishing | | | | 520 |
| R307-355, Aerospace coatings | | | | 30 |
| R307-356, Appliance pilot light | 203 | 1 | 1 | 12 |
| R307-357, Consumer products | | | | 1,198 |
| R307-361, Architectural coatings | | | | 2,647 |
| Grand Totals | 356 | 1,398 | 26 | 8,654 |

5

6

7 **Table 6.5, Emissions Reductions from Area Source SIP Controls**

8

9 On-road mobile sources:

10 [~~A decentralized, test-and-repair program was evaluated for Box Elder and Tooele counties within the~~
 11 ~~nonattainment area. For the evaluation, all model year 1968 and newer vehicles would be subject to a~~
 12 ~~biennial test except for exempt vehicles. The program would exempt vehicles less than four years old as~~

1 ~~of January 1 on any given year from an emissions inspection. Year 1996 and newer vehicles would be~~
2 ~~subject to an On-Board Diagnostics (OBD) inspection. Year 1995 and older vehicles would be subject to~~
3 ~~a two-speed idle inspection (TSI). Based on this evaluation, this program was not included because it~~
4 ~~was determined that implementation of such a program would not affect PM 2.5 concentrations at the~~
5 ~~controlling monitor (Hawthorne) for the Salt Lake-Ogden-Clearfield nonattainment area. Additional~~
6 ~~information is provided in the Technical Support Document.]~~

7 Beyond the existing I/M program in Utah County, there are no emission controls that were implemented
8 for this source category.

9

10

11 Off-road mobile sources:

12 Beyond the existing controls reflected in the projection-year inventories and the air quality modeling
13 there are no emission controls that would apply to this source category.

14

1 **Chapter 7 – TRANSPORTATION CONFORMITY**

2 **7.1 Introduction**

3 The federal Clean Air Act (CAA) requires that transportation plans and programs within the Provo, Utah
4 PM_{2.5} nonattainment area conform to the air quality plans in the region prior to being approved by the
5 Mountainland Association of Governments (MAG) Metropolitan Planning Organization. Demonstration
6 of transportation conformity is a condition to receive federal funding for transportation activities that
7 are consistent with air quality goals established in the Utah State Implementation Plan (SIP).

8 Transportation conformity requirements are intended to ensure that transportation activities do not
9 interfere with air quality progress. Conformity applies to on-road mobile source emissions from regional
10 transportation plans (RTPs), transportation improvement programs (TIPs), and projects funded or
11 approved by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA) in
12 areas that do not meet or previously have not met the National Ambient Air Quality Standards (NAAQS)
13 for ozone, carbon monoxide, particulate matter less than 10 micrometers in diameter (PM₁₀),
14 particulate matter 2.5 micrometers in diameter or less (PM_{2.5}), or nitrogen dioxide.

15 The Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFTEA-LU) and
16 section 176(c)(2)(A) of the CAA require that all regionally significant highway and transit projects in air
17 quality nonattainment areas be derived from a “conforming” transportation plan. Section 176(c) of the
18 CAA requires that transportation plans, programs, and projects conform to applicable air quality plans
19 before being approved by an MPO. Conformity to an implementation plan means that proposed
20 activities must not (1) cause or contribute to any new violation of any standard in any area, (2) increase
21 the frequency or severity of any existing violation of any standard in any area, or (3) delay timely
22 attainment of any standard or any required interim emission reductions or other milestones in any area.

23 The plans and programs produced by the transportation planning process of the MAG are required to
24 conform to the on-road mobile source emissions budgets established in the SIP, or absent an approved
25 or adequate budget, required to meet the interim conformity test. Approval of conformity is
26 determined by the FHWA and FTA.

27 **7.2 Consultation**

28 The Interagency Consultation Team (ICT) is an air quality workgroup in Utah that makes technical and
29 policy recommendations regarding transportation conformity issues related to the SIP development and
30 transportation planning process. Section XII of the Utah SIP established the ICT workgroup and defines
31 the roles and responsibilities of the participating agencies. Members of the ICT workgroup collaborated
32 on a regular basis during the development of the PM_{2.5} SIP. They also meet on a regular basis regarding
33 transportation conformity and air quality issues. The ICT workgroup is comprised of management and
34 technical staff members from the affected agencies associated directly with transportation conformity.

35

1 **ICT Workgroup Agencies**

2

- 3 • Utah Division of Air Quality (UDAQ)
- 4 • Metropolitan Planning Organizations MPOs
 - 5 ▪ Cache MPO
 - 6 ▪ Wasatch Front Regional Council
 - 7 ▪ Mountainland Association of Governments
- 8 • Utah Department of Transportation (UDOT)
- 9 • Utah Local Public Transit Agencies
- 10 • Federal Highway Administration (FHWA)
- 11 • Federal Transit Administration (FTA)
- 12 • U.S. Environmental Protection Agency (EPA)

13

14 During the SIP development process the MAG coordinated with the ICT workgroup and developed PM_{2.5}
15 SIP motor vehicle emissions inventories using the latest planning assumptions and tools for traffic
16 analysis and the EPA-approved Motor Vehicle Emission Simulator (MOVES2010) emissions model. Local
17 MOVES2010 modeling data inputs were cooperatively developed by MAG and the ICT workgroup using
18 EPA-recommended methods where applicable.

19 **7.3 Regional Emission Analysis**

20 The regional emissions analysis is the primary component of transportation conformity and is
21 administered by the lead transportation agency located in the EPA designated air quality nonattainment
22 area. In December 2009, EPA designated part of Utah County as the Provo, Utah PM_{2.5} nonattainment
23 area. The Deadlines Rule (signed April 25, 2014) later classified this as a moderate PM_{2.5} nonattainment
24 area. The responsible transportation planning organization for the Provo, UT nonattainment area is the
25 Mountainland Association of Governments (MAG).

26 As a condition to receive federal transportation funding, transportation plans, programs, and projects
27 are required to meet the criteria and procedures for demonstrating and assuring conformity to the
28 applicable implementation plan developed pursuant to Section 110 and Part D of the CAA. **The criteria,
29 specified in 40 CFR 93.109, differ based on the action under review and the status of the
30 implementation plan. The satisfaction of criteria and procedures, for implementation plans submitted**

1 under Section 189(a)(1)(B)(ii) of the CAA, which demonstrate the impracticability of demonstrating
2 attainment of the applicable NAAQS by the applicable attainment date, are addressed in paragraph
3 93.109(g)(4) of the conformity rule. For such implementation plan revisions, it is the interim emissions
4 tests which must be satisfied, as specified in Section 93.119.

5

6 **7.4 Interim PM_{2.5} Conformity Test**

7 The EPA interim conformity test, for the purposes of this plan revision, will require that NO_x, VOC, and
8 direct PM_{2.5} (elemental carbon, organic carbon, SO₄, brake and tire wear) emissions from RTPs, TIPs,
9 and projects funded or approved by the FHWA or the FTA not exceed 2008 levels.

10 VOC is included because UDAQ has identified volatile organic compounds (VOCs) as a PM_{2.5} precursor
11 that significantly impacts PM_{2.5} concentrations.

12 The EPA conformity rule presumes that PM_{2.5} re-entrained road dust does not need to be included in
13 the interim conformity test unless either the State or EPA decides that re-entrained road dust emissions
14 are a significant contributor to the PM_{2.5} nonattainment problem. The UDAQ conducted a re-entrained
15 road dust study that concluded that PM_{2.5} re-entrained road dust emissions are negligible in the Provo,
16 Utah PM_{2.5} nonattainment area, and thus meet the criteria of 40 CFR 93.102(b)(3). EPA Region 8
17 reviewed the study and concurred with the UDAQ's findings.

18

1 **Chapter 8 – REASONABLE FURTHER PROGRESS**

2 **8.1 Introduction**

3 Clean Air Act Section 172(c)(2) requires that plans for nonattainment areas “shall require reasonable
4 further progress (RFP).” The definition of RFP is given in Section 171 of the CAA. It means “such annual
5 incremental reductions in emissions of the relevant air pollutant as are required by this part or may
6 reasonably be required by the Administrator for the purpose of ensuring attainment of the applicable
7 national ambient air quality standard by the applicable date.”

8 In general terms, the goal of these RFP requirements is for areas to achieve generally linear progress
9 toward attainment, as opposed to deferring implementation of all measures, where possible, until the
10 end.

11 The pollutants to be addressed in the RFP plan are those pollutants that are identified for purposes of
12 control measures in the attainment plan: PM_{2.5}, SO₂, NO_x, and VOC.

13

14 **8.2 Moderate Area Planning Requirements**

15 Within the context of the moderate area planning requirements given in Subparts 1 and 4 of the CAA,
16 RFP must be considered in light of the attainment date as well as the date by which all RACT and RACM
17 must be implemented. The attainment date for all three of Utah’s moderate PM_{2.5} nonattainment areas
18 was established in EPA’s Deadlines Rule. That date is December 31, 2015. The deadline for
19 implementation of all RACT and RACM is described in paragraph 189(a)(1)(C) as four years from the date
20 these areas were designated nonattainment. That date for implementation of RACM was thus
21 December 14, 2013.

22 There are other moderate area planning requirements in Subpart 4 that relate to the showing of RFP.
23 Paragraph 189(a)(1)(B) requires “either (i) a demonstration (including air quality modeling) that the plan
24 will provide for attainment by the applicable attainment date; or (ii) a demonstration that attainment by
25 such date is impracticable.”

26 This plan demonstrates the latter; that despite the implementation of all reasonably available controls,
27 the area still will not attain the 2006, 24-hour standard for PM_{2.5} by December 31, 2015.

28 Paragraph 189(c) discusses “milestones ... which demonstrate reasonable further progress ... toward
29 attainment by the applicable date”, but these are to be submitted with “plan revisions demonstrating
30 attainment.” Since this plan does not demonstrate attainment, the RFP showing will instead be
31 addressed herein, as part of this plan revision.

32

1 **8.3 RFP for the Provo, UT Nonattainment Area**

2 Past Guidance on RFP, for showing generally linear progress towards attainment by the applicable
3 attainment date, has described a straight line with a downward trend, ending at the attainment date
4 and representing, there, a level of emissions that is consistent with attainment of the applicable NAAQS.

5 Since this plan does not show attainment of the standard by the attainment date (December 31, 2015),
6 and furthermore does not show when or how attainment might be achieved, the “reductions in
7 emissions of the relevant air pollutant as are required by this part” are left undefined. In terms of the
8 straight line, the drop of the line, over its length, is an unknown quantity.

9 Furthermore, since PM_{2.5} has a secondary component born of non-linear chemical reactions involving
10 precursor gasses, it is not practical to extrapolate what reductions in which emissions would be
11 necessary to attain the standard at some future date.

12 The magnitude then, for this plan revision, of emissions reductions required for a showing of RFP, must
13 have the meaning of those that “may reasonably be required by the Administrator.”

14 Since RFP considers the overall magnitude of emissions reductions “for the purpose of ensuring
15 attainment ... by the applicable date,” it is also necessary to define a period of time over which this
16 determination will be made.

17 The starting point for evaluating RFP should be the baseline year used in the modeling analysis. This is a
18 year (2010) selected to coincide with the period used to establish the monitored design value for the
19 modeling analysis; a period in which the area is violating the applicable NAAQS.

20 Thus, the magnitude of emissions reductions should be evaluated over a period spanning from 2010
21 through 2015, though it should be recognized that meaningful SIP controls were not required until 2014.

22 Quantitatively, the following assessment of emissions and incremental emissions reductions in Table 8.1
23 will show that RFP is met using the criteria discussed above:

24

| Reasonable Further Progress | | | | | | |
|--|------|------------------------------------|------|------------|-----------------------|------|
| Provo, UT PM2.5 Nonattainment Area | | | | | | |
| *Emissions / Year | 2010 | 2015 | | Difference | RFP | |
| | | projected with growth and controls | | | Annualized Difference | |
| PM2.5 | 3.8 | | 4.6 | -0.8 | | -0.2 |
| NOx | 36.3 | | 32.3 | 3.9 | | 0.8 |
| SO2 | 0.6 | | 0.6 | -0.1 | | 0.0 |
| VOC | 30.8 | | 26.2 | 4.5 | | 0.9 |
| Plan precursors | 67.6 | | 59.2 | 8.4 | | 1.7 |
| Total | 71.4 | | 63.8 | 7.6 | | 1.5 |
| **Concentration (ug/m3) | 38 | | 36 | 2.4 | | 0.5 |
| * Emissions are presented in tons per average winter day | | | | | | |
| **Value for 2010 is Baseline design value for the Lindon monitor | | | | | | |

1

| Reasonable Further Progress | | | | | |
|--|-------------|------------------------------------|--|-------------|-----------------------|
| Provo, UT PM2.5 Nonattainment Area | | | | | |
| *Emissions / Year | 2010 | 2015 | | Difference | RFP |
| | | projected with growth and controls | | | Annualized Difference |
| PM2.5 | <u>4.6</u> | <u>5.7</u> | | <u>-1.1</u> | <u>-0.2</u> |
| NOx | <u>36.3</u> | <u>32.4</u> | | <u>3.9</u> | <u>0.8</u> |
| SO2 | <u>0.6</u> | <u>0.6</u> | | <u>-0.1</u> | <u>0.0</u> |
| VOC | <u>30.8</u> | <u>26.2</u> | | <u>4.5</u> | <u>0.9</u> |
| Plan precursors | <u>67.6</u> | <u>59.3</u> | | <u>8.4</u> | <u>1.7</u> |
| Total | <u>72.3</u> | <u>64.9</u> | | <u>7.3</u> | <u>1.5</u> |
| **Concentration (ug/m3) | 38 | 36 | | 2.4 | 0.5 |
| * Emissions are presented in tons per average winter day | | | | | |
| **Value for 2010 is Baseline design value for the Lindon monitor | | | | | |

1

2 **Table 8.1, Reasonable Further Progress in the Provo, UT nonattainment area**

3 In addition to the emissions totals, the table also includes the 2010 baseline design value for the
 4 controlling monitor in the nonattainment area (Hawthorne) and the predicted PM_{2.5} concentration in
 5 2015. These concentrations are presented as another metric to establish progress toward meeting the
 6 24-hour standard.

7 **Control Measures**

8 The inventory for 2015 “with growth and controls” reflects the implementation of all the reasonably
 9 available control measures and reasonably available control technologies identified in this plan (up to
 10 and beyond the attainment date¹), as well as all pre-existing control measures. As such, this inventory
 11 takes into account all controls that “may reasonably be required by the Administrator.”

¹ The RACT measures for stationary sources include controls to be implemented past the implementation date of December 14, 2013. For reasons articulated in section 6.6 of this plan, these measures were retained in transitioning from the planning requirements of only Subpart 1 to those also including Subpart 4. These additional measures are not relied upon for a showing of attainment. Rather, their inclusion in the modeling analysis underscores that attainment by December 31, 2015 is impracticable. For the purposes of RFP however, it is not appropriate to include the effectiveness of control measures with implementation dates not required until after the attainment date (December 31, 2015.) Thus, the 2015 emissions shown in Table 8.1 differ from the emissions shown in Table 4.2 by the amount of these controls. Nevertheless, from a qualitative standpoint, their inclusion in the Emission Limitations portion of this plan also underscores the fact that this plan continues to require measures to further the progress toward attainment, even beyond the applicable attainment date.

- 1 For a complete discussion of RACM & RACT, and the control measures factored into the modeled
- 2 demonstration for 2015, see Chapter 6 of the Plan.
- 3

1 **Chapter 9 – CONTINGENCY MEASURES**

2 **9.1 Background**

3 Consistent with section 172(c)(9) of the Act, the State must submit in each attainment plan specific
4 contingency measures to be undertaken if the area fails to make reasonable further progress, or fails to
5 attain the PM_{2.5} NAAQS by its attainment date. The contingency measures must take effect without
6 significant further action by the State or EPA.

7 Nothing in the statute precludes a State from implementing such measures before they are triggered,
8 but the credit for a contingency measure may not be used in either the attainment or reasonable further
9 progress demonstrations.

10 The SIP should contain trigger mechanisms for the contingency measures, specify a schedule for
11 implementation, and indicate that the measures will be implemented without further action by the
12 State or by EPA.

13 The CAA does not include the specific level of emission reductions that must be adopted to meet the
14 contingency measures requirement under section 172(c)(9). Nevertheless, in the preamble to the Clean
15 Air Fine Particulate Rule (see 72 FR 20643) EPA recommends that the “emissions reductions anticipated
16 by the contingency measures should be equal to approximately 1 year’s worth of emissions reductions
17 necessary to achieve RFP for the area.”

18 **9.2 Contingency Measures and Implementation Schedules for the Nonattainment Area**

19 The following measures have been set aside for contingency purposes:

20 Woodburning Control –As part of the control strategy for the SIP, rule R307-302 has been amended to
21 change the no-burn call from 35 µg/m³ to 25 µg/m³. Credit for this change is included in the modeled
22 attainment demonstration as well as the RFP demonstration. However, R307-302 also includes a
23 mechanism to further revise the no-burn call to only 15 µg/m³ should a contingency situation arise. The
24 benefit of this rule is to prevent a buildup of particulate matter due to woodsmoke during periods of
25 poor atmospheric mixing which typically precede exceedances of the 24-hour PM_{2.5} NAAQS. This rule
26 has been adopted, and can take effect immediately if so required.

27 This contingency measure will be triggered by an EPA determination that: 1) the area has failed to make
28 RFP; or 2) has failed to attain the NAAQS by the applicable attainment date.

29

30

1 **9.3 Conclusions**

2 Control measures developed to meet increasingly stringent ozone and fine PM_{2.5} standards in Utah's
3 urbanized areas have likewise become increasingly stringent, and still it is a challenge to attain the 2006,
4 PM_{2.5} NAAQS. This leaves little room for additional reductions that can be set aside as contingency
5 measures.

6 The control strategy analysis summarized in Chapter 6 shows that stationary sources already meet or
7 exceed RACT, and represent less than 10% of the emissions contributing to excessive PM_{2.5}
8 concentrations during winter. By contrast, area sources and on-road mobile sources contribute most of
9 the emissions, but further emission control in these categories extends beyond the authorities of UDAQ.
10 The most meaningful reductions in future emissions of VOC, an important PM_{2.5} precursor, will likely
11 result from additional restrictions of VOC in consumer products, and from what will likely result from
12 Tier 3 of the federal motor vehicle control program.

FOR SUMMARY OF COMMENTS
AND RESPONSES, PLEASE REFER
TO THE SET OF COMMENTS AND
RESPONSES AT THE END OF TAB
VII, PM2.5 SIP FOR THE SALT LAKE
CITY NONATTAINMENT AREA.