



State of Utah

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Department of
Environmental Quality

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DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQ-047-15

MEMORANDUM

TO: Air Quality Board

THROUGH: Bryce C. Bird, Executive Secretary

FROM: Bill Reiss, Environmental Engineer

DATE: August 21, 2015

SUBJECT: PROPOSE FOR PUBLIC COMMENT: [Repeal of Existing SIP Subsection IX.A10 and Re-enact with SIP Subsection IX.A.10: PM₁₀ Maintenance Provisions for Salt Lake County.](#)

Introduction:

This item concerns a proposed State Implementation Plan (SIP) revision to address Utah's three nonattainment areas for PM₁₀. These areas have been attaining the PM₁₀ standard for a long time, and this revision demonstrates that they will continue to do so through the year 2030.

The revision is structured as a maintenance plan, which will allow Utah to request that EPA change the area designations back to attainment for PM₁₀. These areas include Salt Lake County, Utah County, and Ogden City.

The existing SIP for PM₁₀ affecting Salt Lake and Utah Counties was adopted in 1991 and resulted in attainment of the 1987 National Ambient Air Quality Standards (NAAQS) in both areas by 1996. Since that time, PM_{2.5} has supplanted PM₁₀ as the indicator of fine particulate matter. Though PM₁₀ also includes the coarse fraction of PM, Utah's difficulties with PM₁₀ were characterized by the same winter time episodes that lead to elevated PM_{2.5} levels.

Essentially, this SIP revision would close the book on PM₁₀ and allow Utah to focus on meeting the PM_{2.5} standard. All three of the affected areas are currently designated nonattainment for PM_{2.5}.

Scope:

There are two parts to the SIP revision. (This) Section IX. Part A is the SIP document itself, and addresses

the criteria necessary to request redesignation. It includes the actual Maintenance Plan, which includes the quantitative demonstration of continued attainment.

Some of the items addressed in Part A include:

- monitored attainment of the PM₁₀ NAAQS
- establishment of motor vehicle emission budgets for purposes of transportation conformity
- consideration of emission reduction credits, and
- contingency measures

The second piece is SIP Section IX, Part H. It includes the emission limits for certain specific stationary sources. Including these limits in the SIP makes them federally enforceable.

The list of stationary sources to be included in Part H was updated as part of this proposal. It includes sources located in any of the nonattainment areas with actual emissions (in 2011), or potentials to emit, that are at least 100 tons per year for PM₁₀, SO₂, or NO_x.

Using these criteria means that some sources will not be retained in the revised Part H, while other new sources, that did not exist when the original SIP was written, will be added.

SIP Organization:

As originally written in 1991, the PM₁₀ nonattainment SIP for Salt Lake and Utah Counties resides at Section IX.A. 1-8 of the Utah SIP. This plan had projected attainment of the NAAQS through the year 2003.

In 2005, Utah prepared a revision to the plan that showed continued attainment in [Salt Lake County](#) through the year 2017. This revision, also structured as a maintenance plan, was placed into the SIP at Section [IX.A.10](#). Subsections IX.A.11 and 12 were also added as the maintenance plan provisions for Utah County and Ogden City respectively.

At this time, DAQ staff is proposing to replace each of these three subsections of the SIP in separate actions. Since there is a large amount of redundant material in the three documents, they have been prepared using color coding to denote which parts of each plan are specific to the respective nonattainment areas. In reviewing the proposals, the reader should note that [blue text](#) is specific to the [Salt Lake County](#) nonattainment area. Likewise, [green text](#) and [purple text](#) are specific to Utah County and Ogden City respectively.

Staff Recommendation: Staff recommends that the Board propose for public comment to repeal existing SIP Subsection [IX.A.10](#), and re-enact with SIP Subsection [IX.A.10](#): PM₁₀ Maintenance Provisions for [Salt Lake County](#), as proposed.

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UTAH

PM₁₀ Maintenance Provisions for Salt Lake County

Section IX.A.10

Adopted by the Air Quality Board
December 2, 2015

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Section IX.A. 10 PM₁₀ Maintenance Provisions for Salt Lake County

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6

IX.A.10.a Introduction

7 The State of Utah is requesting that the U.S. Environmental Protection Agency (EPA) redesignate
8 the [Salt Lake County](#) nonattainment area to attainment status for the 24-hour PM₁₀ National
9 Ambient Air Quality Standard (NAAQS).

10
11 The foregoing Subsections 1-9 of Part IX.A of the Utah State Implementation Plans (SIP) were
12 written in 1991 to address violations of the NAAQS for PM₁₀ in both Utah County and Salt Lake
13 County. These areas were each classified as Initial Moderate PM₁₀ Nonattainment Areas, and as
14 such required “nonattainment SIPs” to bring them into compliance with the NAAQS by a
15 statutory attainment date. The control measures adopted as part of those plans have proven
16 successful in that regard, and at the time of this writing (2015) each of these areas continues to
17 show compliance with the federal health standards for PM₁₀.

18
19 This [Subsection 10](#) of Part IX.A of the Utah SIP represents the second chapter of the PM₁₀ story
20 for [Salt Lake County](#), and demonstrates that the area has achieved compliance with the PM₁₀
21 NAAQS and will continue to maintain that standard through the year 2030. As such, it is written
22 in accordance with Section 175A (42 U.S.C. 7505a) of the federal Clean Air Act (the Act), and
23 should serve to satisfy the requirement of Section 107(d)(3)(E)(iv) of the Act.

24
25 This section is hereafter referred to as the “Maintenance Plan” or “the Plan,” and contains the
26 maintenance provisions of the PM₁₀ SIP for [Salt Lake County](#).

27
28 While the Maintenance Plan could be written to replace all that had come before, it is presented
29 herein as an addendum to Subsections 1-9 in the interest of providing the reader with some sense
30 of historical perspective. Subsections 1-9 are retained for historical purposes, while existing
31 subsection 10 (transportation conformity for Utah County) [is herein replaced](#). [A more current](#)
32 [evaluation of transportation conformity for Utah County is presented in Section IX.A.11](#).

33
34 In a similar way, any references to the Technical Support Document (TSD) in this section means
35 actually Supplement IV-15 to the Technical Support Document for the PM₁₀ SIP.

36
37
38 **Background**

39
40 The Act requires areas failing to meet the federal ambient PM₁₀ standard to develop SIP revisions
41 with sufficient control requirements to expeditiously attain and maintain the standard. On July 1,
42 1987, EPA promulgated a new NAAQS for particulate matter with a diameter of 10 microns or
43 less (PM₁₀), and listed [Salt Lake County](#) as a Group I area for PM₁₀. This designation was based
44 on historical data for the previous standard, total suspended particulate, and indicated there was a
45 95% probability the area would exceed the new PM₁₀ standard. Group I area SIPs were due in
46 April 1988, but Utah was unable to complete the SIP by that date. In 1989, several citizens
47 groups sued EPA (*Preservation Counsel v. Reilly*, civil Action (No. 89-C262-G (D, Utah)) for
48 failure to implement a Federal Implementation Plan (FIP) under provisions of §110(c)(1) of the
49 Clean Air Act (42 U.S.C. 7410(c)(1)).

1
2 A settlement agreement in January 1990 called for Utah to submit a SIP and for EPA to approve
3 it by December 31, 1991. In August 1991, the parties voluntarily agreed to dismiss the lawsuit
4 and the complaint and vacate the settlement agreement.
5

6 The Clean Air Act Amendments of November 1990 redesignated Group I areas as initial
7 moderate nonattainment areas and required that SIPs be submitted by November 15, 1991. These
8 moderate area SIPs were to require installation of Reasonably Available Control Measures
9 (RACM) on industrial sources by December 10, 1993 and a demonstration the NAAQS would be
10 attained no later than December 31, 1994.
11

12 **(1) The PM₁₀ SIP**

13
14 On November 14, 1991, Utah submitted a SIP for Salt Lake and Utah Counties that demonstrated
15 attainment of the PM₁₀ standards in Salt Lake and Utah Counties for 10 years, 1993 through
16 2003. EPA published approval of the SIP on July 8, 1994 (59 FR 35036).
17

18 **(2) Supplemental History of SIP Approval - PM₁₀**

19
20 Utah's SIP included two provisions that promised additional action by the state: 1) a road salting
21 and sanding program, and 2) a diesel vehicle emissions inspection and maintenance program.
22

23 On February 3, 1995, Utah submitted amendments to the SIP to specify the details of the road
24 salting and sanding program promised as a control measure. EPA published approval of the road
25 salting and sanding provisions on December 6, 1999 (64 FR 68031).
26

27 On February 6, 1996, Utah submitted to EPA a new SIP Section XXI, a diesel vehicle inspection
28 and maintenance program.
29

30 Also, in April 1992, EPA published the "General Preamble," describing EPA's views on
31 reviewing state SIP submittals. One of the requirements was that moderate nonattainment area
32 states must submit contingency plans by November 15, 1993.
33

34 On July 31, 1994, Utah submitted an amendment to the PM₁₀ SIP that required lowering the
35 threshold for calling no-burn days as a contingency measure for Salt Lake, Davis and Utah
36 Counties.
37

38 On July 18, 1997, EPA promulgated a new form of the PM₁₀ standard. As a way to simplify
39 EPA's process of revoking the old PM₁₀ standard, EPA requested on April 6, 1998, that Utah
40 withdraw its submittals of contingency measures. Utah submitted a letter requesting withdrawal
41 on November 9, 1998, and EPA returned the submittals on January 29, 1999.
42

43 **(3) Attainment of the PM₁₀ Standard and Reasonable Further Progress**

44
45 By statute, EPA was to determine whether Initial Moderate Areas were attaining the standard as
46 of December 31, 1994. This determination requires an examination of the three previous calendar
47 years of monitoring data (in this case 1992, 1993 and 1994). The 24-hour NAAQS allows no
48 more than three expected exceedances of the 24-hour standard at any monitor in this 3-year
49 period. Since the statutory deadline for the implementation of RACM was not until the end of
50 1993, it was reasonable to presume that the area might not be able to show attainment with a 3-
51 year data set until the end of 1996 even if the control measures were having the desired effect.
52 Presumably for this reason, Section 188(d) of the Act, (42 U.S.C. 7513(d)) allows a state to

1 request up to two 1-year extensions of the attainment date. In doing so, the state must show that
2 it has met all requirements of the SIP, that no more than one exceedance of the 24-hour PM₁₀
3 NAAQS has been observed in the year prior to the request, and that the annual mean
4 concentration for such year is less than or equal to the annual standard.

5
6 EPA's Office of Air Quality Planning and Standards issued a guidance memorandum concerning
7 extension requests (November 14, 1994), clarifying that the authority delegated to the
8 Administrator for extending moderate area attainment dates is discretionary. In exercising this
9 discretionary authority, it says, EPA will examine the air quality planning progress made in the
10 area, and in addition to the two criteria specified in Section 188(d), EPA will be disinclined to
11 grant an attainment date extension unless a state has, in substantial part, addressed its moderate
12 PM₁₀ planning obligations for the area. The EPA will expect the State to have adopted and
13 substantially implemented control measures submitted to address the requirement for
14 implementing RACM/RACT in the moderate nonattainment area, as this was the central control
15 requirement applicable to such areas. Furthermore it said, "EPA believes this request is
16 appropriate, as it provides a reliable indication that any improvement in air quality evidenced by a
17 low number of exceedances reflects the application of permanent steps to improve the air quality
18 in the region, rather than temporary economic or meteorological changes." As part of this
19 showing, EPA expected the State to demonstrate that the PM₁₀ nonattainment area has made
20 emission reductions amounting to reasonable further progress (RFP) toward attainment of the
21 NAAQS, as defined in Section 171(1) of the Act.

22
23 On May 11, 1995, Utah requested one-year extensions of the attainment date for both Salt Lake
24 and Utah Counties. On October 18, 1995, EPA sent a letter granting the requests for extensions,
25 and on January 25, 1996, sent a letter indicating that EPA would publish a rulemaking action on
26 the extension requests.

27
28 Along with the extension requests in 1995, Utah submitted a milestone report as required under
29 Section 172(1) of the Act, (42 U.S.C. 7501(1)) to assess progress toward attainment. This
30 milestone report addressed two issues: 1) that all control measures in the approved plan had been
31 implemented, and 2) that reasonable further progress (RFP) had been made toward attainment of
32 the standard in terms of reducing emissions. As defined in Section 171(1), RFP means such
33 annual incremental reductions in emissions of the relevant air pollutant as are required to ensure
34 attainment of the applicable NAAQS by the applicable date.

35
36 On June 18, 2001, EPA published notice in the Federal Register (66 FR 32752) that Utah's
37 extension requests were granted, that Salt Lake County attained the PM₁₀ standard by December
38 31, 1995, and that Utah County attained the standard by December 31, 1996. The notice stated
39 that these areas remain moderate nonattainment areas and are not subject to the additional
40 requirements of serious nonattainment areas.

41 42 43 44 **IX.A.10.b Pre-requisites to Area Redesignation**

45
46 Section 107(d)(3)(E) of the Act outlines five requirements that must be satisfied in order that a
47 state may petition the Administrator to redesignate a nonattainment area back to attainment.
48 These requirements are summarized as follows: 1) the Administrator determines that the area has
49 attained the applicable NAAQS, 2) the Administrator has fully approved the applicable
50 implementation plan for the area under §110(k) of the Act, 3) the Administrator determines that
51 the improvement in air quality is due to permanent and enforceable reductions in emissions

1 resulting from implementation of the applicable implementation plan ... and other permanent and
 2 enforceable reductions, 4) the Administrator has fully approved a maintenance plan for the area
 3 as meeting the requirements of §175A of the Act, and 5) the State containing such area has met
 4 all requirements applicable to the area under §110 and Part D of the Act.

5
 6 Each of these requirements will be addressed below. Certainly, the central element from this list
 7 is the maintenance plan found at Subsection IX.A.10.c below. Section 175A of the Act contains
 8 the necessary requirements of a maintenance plan, and EPA policy based on the Act requires
 9 additional elements in order that such plan be federally approvable. Table IX.A.10. 1 identifies
 10 the prerequisites that must be fulfilled before a nonattainment area may be redesignated to
 11 attainment under Section 107(d)(3)(E) of the Act.

12
 13
 14

Table IX.A.10. 1 Prerequisites to Redesignation in the federal Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Attainment of Standard	Three consecutive years of PM ₁₀ monitoring data must show that violations of the standard are no longer occurring.	CAA §107(d)(3)(E)(i)	IX.A.10.b(1)
Approved State Implementation Plan	The SIP for the area must be fully approved.	CAA §107(d)(3)(E)(ii)	IX.A.10.b(2)
Permanent and Enforceable Emissions Reductions	The State must be able to reasonably attribute the improvement in air quality to emission reductions that are permanent and enforceable	CAA §107(d)(3)(E)(iii), Calcagni memo (Sect 3, para 2)	IX.A.10.b(3)
Section 110 and Part D requirements	The State must verify that the area has met all requirements applicable to the area under section 110 and Part D.	CAA: §107(d)(3)(E)(v), §110(a)(2), Sec 171	IX.A.10.b(4)
Maintenance Plan	The Administrator has fully approved the Maintenance Plan for the area as meeting the requirements of CAA §175A	CAA: §107(d)(3)(E)(iv)	IX.A.10.b(5) and IX.A.10.c

15
 16
 17 **(1) The Area Has Attained the PM₁₀ NAAQS**

18 CAA 107(d)(3)(E)(i) - *The Administrator determines that the area has attained the national*
 19 *ambient air quality standard.* To satisfy this requirement, the State must show that the area is
 20 attaining the applicable NAAQS. According to EPA's guidance concerning area redesignations
 21 (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni to
 22 Regional Air Directors, September 4, 1992 [or, Calcagni]), there are generally two components
 23 involved in making this demonstration. The first relies upon ambient air quality data which
 24 should be representative of the area of highest concentration and should be collected and quality
 25 assured in accordance with 40 CFR 58. The second component relies upon supplemental air
 26 quality modeling. Each will be discussed in turn.

27 **(a) Ambient Air Quality Data (Monitoring)**
 28

29 In 1987 EPA promulgated the National Ambient Air Quality Standard (NAAQS) for PM₁₀. The
 30 NAAQS for PM₁₀ is listed in 40 CFR 50.6 along with the criteria for attaining the standard. The

1 24-hour NAAQS is 150 micrograms per cubic meter (ug/m^3) for a 24-hour period, measured from
2 midnight to midnight. The 24-hour standard is attained when the expected number of days per
3 calendar year with a 24-hour average concentration above $150 \text{ ug}/\text{m}^3$, as determined in
4 accordance with Appendix K to that part, is equal to or less than one. In other words, each
5 monitoring site is allowed up to three expected exceedances of the 24-hour standard within a
6 period of three calendar years. More than three expected exceedances in that three-year period is
7 a violation of the NAAQS.

8
9 There also had been an annual standard of $50 \text{ ug}/\text{m}^3$. The annual standard was attained if the
10 three-year average of individual annual averages was less than $50 \text{ ug}/\text{m}^3$. Utah never violated the
11 annual standard at any of its monitoring stations, and the annual average was not retained as a
12 PM_{10} standard when the NAAQS was revised in 2006. Nevertheless, an annual average still
13 provides a useful metric to evaluate long-term trends in PM_{10} concentrations here in Utah where
14 short-term meteorology has such an influence on high 24-hour concentrations during the winter
15 season.

16
17 40 CFR 58 Appendix K, Interpretation of the National Ambient Air Quality Standards for
18 Particulate Matter, acknowledges the uncertainty inherent in measuring ambient PM_{10}
19 concentrations by specifying that an *observed exceedance* of the ($150 \text{ ug}/\text{m}^3$) 24-hour health
20 standard means a daily value that is above the level of the 24-hour standard after rounding to the
21 nearest $10 \text{ ug}/\text{m}^3$ (e.g., values ending in 5 or greater are to be rounded up).

22
23 The term *expected exceedance* accounts for the possibility of missing data. Missing data can
24 occur when a monitor is being repaired, calibrated, or is malfunctioning, leaving a time gap in the
25 monitored readings. EPA discounts these gaps if the highest recorded PM_{10} reading at the
26 affected monitor on the day before or after the gap is not more than 75 percent of the standard,
27 and no measured exceedance has occurred during the year.

28
29 Expected exceedances are calculated from the Aerometric Information and Retrieval System
30 (AIRS) data base according to procedures contained in 40 CFR Part 50, Appendix K. The State
31 relied on the expected exceedance values contained in the AIRS Quick Look Report (AMP 450)
32 to determine if a violation of the standard had occurred.

33
34 Data may also be flagged when circumstances indicate that it would represent an outlier in the
35 data set and not be indicative of the entire airshed or the efforts to reasonably mitigate air
36 pollution within. Appendix N to Part 50 – “Interpretation of the National Ambient Air Quality
37 Standards for Particulate Matter” anticipates this and states: “Data resulting from uncontrollable
38 or natural events, for example structural fires or high winds, may require special consideration.
39 In some cases, it may be appropriate to exclude these data because they could result in
40 inappropriate values to compare with the levels of the PM standards.” The protocol for data
41 handling dictates that flagging is initiated by the state or local agency, and then the EPA either
42 concurs or indicates that it has not concurred. Some discussion will be provided to help the
43 reader understand the occasional occurrence of wind-blown dust events that affect these
44 nonattainment areas, and how the resulting data should be interpreted with respect to the control
45 measures enacted to address the 24-hour NAAQS.

46
47 Using the criteria from 40 CFR 58 Appendix K, data was compiled for all PM_{10} monitors
48 within the [Salt Lake County](#) nonattainment area that recorded a four-year data set comprising
49 the years 2011 – 2014. For each monitor, the number of expected exceedances is reported for
50 each year, and then the average number of expected exceedances is reported for the overlapping
51 three-year periods. If this average number of expected exceedances is less than or equal to 1.0,
52 then that particular monitor is said to be in compliance with the 24-hour standard for PM_{10} . In

1 order for an area to be in compliance with the NAAQS, every monitor within that area must be in
 2 compliance.

3
 4 As illustrated in the table below, the results of this exercise show that the Salt Lake County
 5 PM₁₀ nonattainment area is presently attaining the NAAQS.

6
 7 **Table IX.A.10. 2 PM₁₀ Compliance in Salt Lake County, 2011-2014**
 8

Hawthorne 49-035-3006	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	0.0 / 0.0*	0.0 / 0.0*

9

North Salt Lake 49-035-0012	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	NA**	NA**

10

Magna 49-035-1001	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	0.0 / 0.0*	0.0 / 0.0*

11
 12 * The second set of numbers shows what would be the effect of including all of the data that has
 13 been flagged by DAQ and not yet concurred with by EPA.

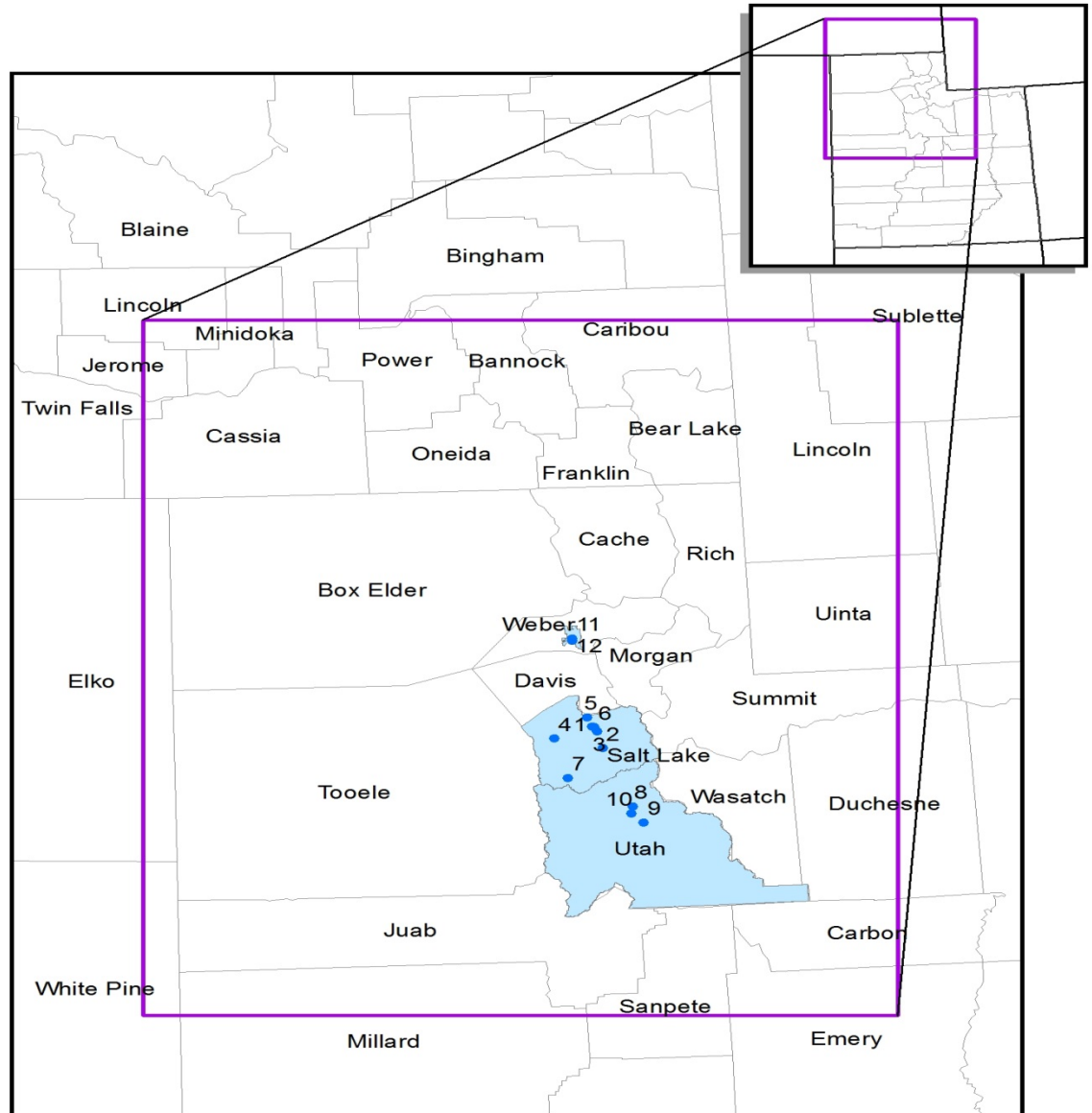
14
 15 ** The North Salt Lake monitor was closed in September of 2013.

16
 17
 18 **(b) PM₁₀ Monitoring Network**
 19

20 The overall assessments made in the preceding paragraph were based on data collected at
 21 monitoring stations located throughout the nonattainment area. The Utah DAQ maintains a
 22 network of PM₁₀ monitoring stations in accordance with 40 CFR 58. These stations are referred
 23 to as SLAMS sites, meaning that they are State and Local Air Monitoring Stations. In
 24 consultation with EPA, an Annual Monitoring Network Plan is developed to address the
 25 adequacy of the monitoring network for all criteria pollutants. Within the network, individual
 26 stations may be situated so as to monitor large sources of PM₁₀, capture the highest
 27 concentrations in the area, represent residential areas, or assess regional concentrations of PM₁₀.
 28 Collectively, these monitors make up Utah's PM₁₀ monitoring network. The following
 29 paragraphs describe the network in each of Utah's three nonattainment areas for PM₁₀.
 30

1 Provided in Figure IX.A.10. 1 is a map of the modeling domain that shows the existing PM₁₀
2 nonattainment areas and the locations of the monitors therein. Some of the monitors at these
3 locations are no longer operational, but they have been included for informational purposes.
4

5 **Figure IX.A.10. 1 Modeling Domain**



6
7 The following PM₁₀ monitoring stations operated in the Salt Lake County PM₁₀ nonattainment
8 area from 1985 through 2015. They are numbered as they appear on the map:
9

- 10 1. Air Monitoring Center (AMC) (AIRS number 49-035-0010): This site was located in an
11 urban city center, near an area of high vehicle use. It was closed in 1999 when DAQ lost
12 its lease on the building.
13

- 1 2. Cottonwood (AIRS number 49-035-0003): This site was located in a suburban
2 residential area. It collected data from 1986 - 2011. It was closed in 2011 due to siting
3 criteria violations as well as safety concerns.
4
- 5 3. Hawthorne (AIRS number 49-035-3006): This site is located in a suburban residential
6 area. It began collecting data in 1997, and is the NCORE site for Utah.
7
- 8 4. Magna (AIRS number 49-035-1001): This site is located in a suburban residential area.
9 It was historically impacted periodically by blowing dust from a large tailings
10 impoundment, and as such is anomalous with respect to the typical wintertime scenario
11 that otherwise characterizes the nonattainment area. It has been collecting data since
12 1987.
13
- 14 5. North Salt Lake (AIRS number 49-035-0012): This site was located in an industrial area
15 that is impacted by sand and gravel operations, freeway traffic, and several refineries. It
16 was near a residential area as well. It collected data from 1985 - 2013. The monitor was
17 situated over a sewer main, and service of that main required its removal in September
18 2013 and following the service, the site owner did not allow the monitor to return.
19
- 20 6. Salt Lake City (AIRS number 49-035-3001): This site was situated in an urban city
21 center. It was discontinued in 1994 because of modifications that were made to the air
22 conditioning on the roof-top.
23
- 24 7. Herriman #3 (AIRS number 49-035-3012): This site is located in a suburban residential
25 area. It began collecting data in 2015.
26
27

28 The following PM₁₀ monitoring stations operated in the Utah County PM₁₀ nonattainment area
29 from 1985 through 2015. They are numbered as they appear on the map:
30

- 31 8. Lindon (AIRS number 49-049-4001): This site is designed to measure population
32 exposure to PM₁₀. It is located in a suburban residential area affected by both industrial
33 and vehicle emissions. PM₁₀ has been measured at this site since 1985, and the readings
34 taken here have consistently been the highest in Utah County. Area source emissions,
35 primarily wood smoke, also affect the site.
36
- 37 9. North Provo (AIRS number 49-049-0002): This is a neighborhood site in a mixed
38 residential-commercial area in Provo, Utah. It began collecting data in 1986.
39
- 40 10. West Orem (AIRS number 49-049-5001): This site was originally located in a residential
41 area adjacent to a large steel mill which has since closed. It is a neighborhood site. It
42 was situated based on computer modeling, and has historically reported high PM₁₀
43 values, but not consistently as high as those observed at the Lindon site. The site was
44 closed at the end of 1997 for this reason.
45

46 The following PM₁₀ monitoring stations operated in the Ogden City PM₁₀ nonattainment area
47 from 1986 through 2015. They are numbered as they appear on the map:
48

- 49 11. Ogden 1 (AIRS number 49-057-0001): This site was situated in an urban city center. It
50 was discontinued in 2000 because DAQ lost its lease on the building.
51

1 12. Ogden 2 (AIRS number 49-057-0002): This site began collecting data in 2001, as a
2 replacement for the Ogden 1 location. It, too, is situated in an urban city center.
3

4 **(c) Modeling Element**
5

6 EPA guidance concerning redesignation requests and maintenance plans (Calcagni) discusses the
7 requirement that the area has attained the standard, and notes that air quality modeling may be
8 necessary to determine the representativeness of the monitored data.
9

10 Information concerning PM₁₀ monitoring in Utah is included in the Annual Monitoring Network
11 Review and The 5 Year Network Plan. Since the early 1980's, the network review has been
12 updated annually and submitted to EPA for approval. EPA has concurred with the annual
13 network reviews and agreed that the PM₁₀ network is adequate. EPA personnel have also visited
14 the monitor sites on several occasions to verify compliance with federal siting requirements.
15 Therefore, additional modeling will not be necessary to determine the representativeness of the
16 monitored data.
17

18 The Calcagni memo goes on to say that areas that were designated nonattainment based on
19 modeling will generally not be redesignated to attainment unless an acceptable modeling analysis
20 indicates attainment.
21

22 Though none of Utah's three PM₁₀ nonattainment areas was designated based on modeling,
23 Calcagni also states that (when dealing with PM₁₀) dispersion modeling will generally be
24 necessary to evaluate comprehensively sources' impacts and to determine the areas of expected
25 high concentrations based upon current conditions. Air quality modeling was conducted for the
26 purpose of this maintenance demonstration. It shows that all three nonattainment areas are
27 presently in compliance, and will continue to comply with the PM₁₀ NAAQS through the year
28 2030.
29

30 **(d) EPA Acknowledgement**
31

32 The data presented in the preceding paragraphs shows quite clearly that the [Salt Lake County](#)
33 PM₁₀ nonattainment area is attaining the NAAQS. As discussed before, the EPA acknowledged
34 in the Federal Register that both Utah County and Salt Lake County had already attained.
35

36 On June 18, 2001, EPA published notice in the Federal Register (66 FR 32752) that Utah's
37 extension requests were granted, [\[and\] that Salt Lake County attained the PM₁₀ standard by](#)
38 [December 31, 1995](#). The notice stated that the area would remain a moderate nonattainment
39 area and would not be subject to the additional requirements of serious nonattainment areas.
40
41

42 **(2) Fully Approved Attainment Plan for PM₁₀**

43 CAA 107(d)(3)(E)(ii) - *The Administrator has fully approved the applicable implementation plan*
44 *for the area under section 110(k).*

45 On November 14, 1991, Utah submitted a SIP for Salt Lake and Utah Counties that demonstrated
46 attainment for Salt Lake and Utah Counties for 10 years, 1993 through 2003. EPA published
47 approval of the SIP on July 8, 1994 (59 FR 35036).
48

1 **(3) Improvements in Air Quality Due to Permanent and Enforceable Reductions in**
2 **Emissions**

3
4 CAA 107(d)(3)(E)(iii) - *The Administrator determines that the improvement in air quality is due*
5 *to permanent and enforceable reductions in emissions resulting from implementation of the*
6 *applicable implementation plan and applicable Federal air pollutant control regulations and*
7 *other permanent and enforceable reductions.* Speaking further on the issue, EPA guidance
8 (Calcagni) reads that the State must be able to reasonably attribute the improvement in air quality
9 to emission reductions which are permanent and enforceable. In the following sections, both the
10 improvement in air quality and the emission reductions themselves will be discussed.

11
12 **(a) Improvement in Air Quality**

13
14 The improvement in air quality with respect to PM₁₀ can be shown in a number of ways.
15 Improvement, in this case, is relative to the various control strategies that affected the airshed.

16
17 For the [Salt Lake County nonattainment area](#), these control measures were implemented as the
18 result of the nonattainment PM₁₀ SIP promulgated in 1991. As discussed below, the actual
19 implementation of the control strategies required therein first exhibits itself in the observable data
20 in 1994. The ambient air quality data presented below includes values prior to 1994 in order to
21 give a representation of the air quality prior to the application of any control measures. It then
22 includes data collected from then until the present time to illustrate the effect of these controls. In
23 considering the data presented below, it is important to keep this distinction in mind: data through
24 1993 represents pre-SIP conditions, and data collected from 1994 through the present represents
25 post-SIP conditions.

26
27 Additionally, a downturn in the economy is clearly not responsible for the improvement in
28 ambient particulate levels in Salt Lake County, Utah County, and Ogden City areas. From 2001
29 to present, the areas have experienced strong growth while at the same time achieving continuous
30 attainment of the 24-hour and annual PM₁₀ NAAQS. Data was analyzed for the Salt Lake City
31 Metropolitan Statistical Area from the US Department of Commerce, Bureau of Economic
32 Analysis. According to this data, job growth from 2011 through 2013 increased by 5.5 percent,
33 population increased by 3 percent, and personal income increased by approximately 10 percent.
34 The estimated VMT increase was 12 percent from 2011 to present.

35
36 Expected Exceedances – Referring back to the discussion of the PM₁₀ NAAQS in Subsection
37 IX.A.10.b(1), it is apparent that the number of expected exceedances of the 24-hour standard is an
38 important indicator. As such, this information has been tabulated for each of the monitors located
39 in each of the nonattainment areas. The data in Table IX.A.10. 3 below reveals a marked decline
40 in the number of these expected exceedances, and therefore that the [Salt Lake County](#) PM₁₀
41 nonattainment area has experienced significant improvements in air quality. The gray cells
42 indicate that the monitor was not in operation. This improvement is especially revealing in light
43 of the significant growth experienced during this same period in time.

1 **Table IX.A.10. 3 Salt Lake County: Expected Exceedances Per-Year, 1985-2014**
 2

Salt Lake County Nonattainment Area					
Monitor:	Cottonwood	AMC	North Salt Lake	Magna	Hawthorne
1986	0.0				
1987	0.0		0.0	2.4	
1988	0.0		5.8	2.2	
1989	0.0	8.7	3.3	0.0	
1990	0.0	0.0	0.0	0.0	
1991	6.0	15.9	13.5	0.0	
1992	0.0	8.6	3.2	0.0	
1993	0.0	0.0	0.0	0.0	
1994	0.0	1.0	8.6	0.0	
1995	0.0	0.0	0.0	0.0	
1996	0.0	0.0	2.3	0.0	
1997	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0
2000	0.0		0.0	0.0	0.0
2001	0.0		0.0	6.4	0.0
2002	0.0		0.0	0.0	0.0
2003	0.0		3.1	1.6	2.1
2004	0.0		1.0	0.0	0.0
2005	0.0		0.0	3.4	0.0
2006	0.0		2.2	0.0	0.0
2007	0.0		4.3	0.0	0.0
2008	3.6		2.1	0.0	2.0
2009	0.0		1.0	0.0	0.0
2010			2.0	3.0	2.1
2011			0.0	0.0	0.0
2012			0.0	0.0	0.0
2013			0.0	0.0	0.0
2014				0.0	0.0

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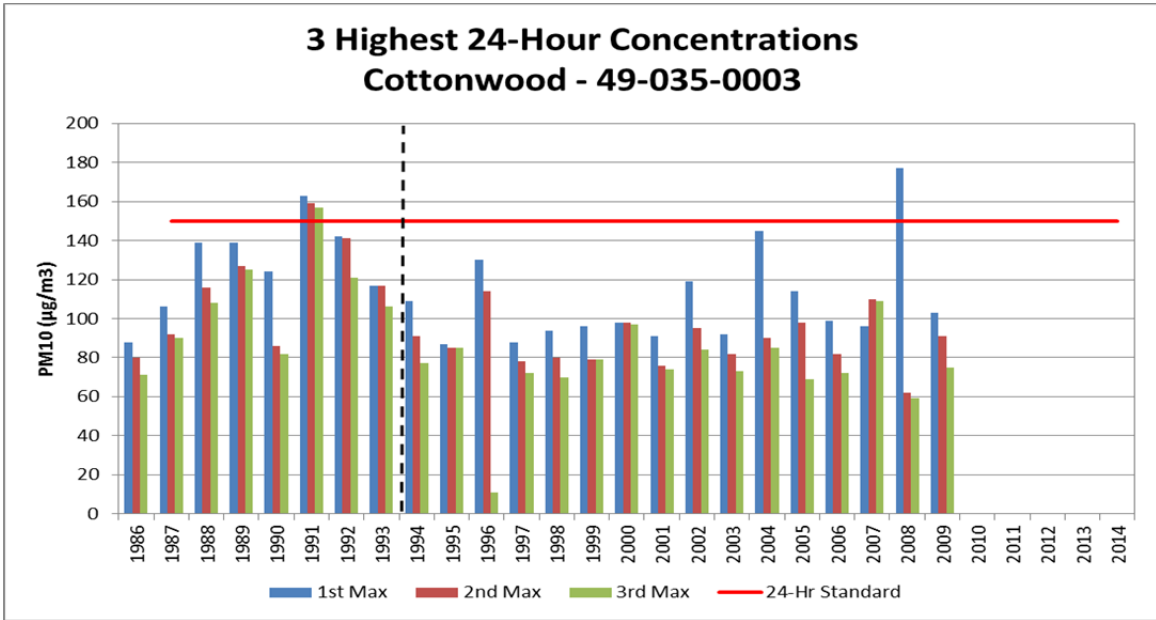
As discussed before in section IX.A.10.b(1), the number of expected exceedances may include data which had been flagged by DAQ as being influenced by an exceptional event; most typically, a wind-blown dust event. Data is flagged when circumstances indicate that it would represent an outlier in the data set and not be indicative of the entire airshed or the efforts to reasonably mitigate air pollution within.

As such, two things should be noted: 1) The focus of the control strategy developed for the 1991 PM₁₀ SIP was directed at episodes characterized by wintertime temperature inversions, elevated concentrations of secondary aerosol, and low wind speed. Under these conditions, blowing dust is generally nonexistent. Therefore, in evaluating the effectiveness of these types of controls, the inclusion of several high wind events may bias the conclusion. 2) Even with the inclusion of these values, the conclusion remains essentially the same; that since 1994 when the 1991 SIP controls were fully implemented, there has been a marked improvement in monitored air quality.

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Highest Values – Also indicative of improvement in air quality with respect to the 24-hour standard, is the magnitude of the excessive concentrations that are observed. This is illustrated in Figures IX.A.10. 2 - 6, which show the three highest 24-hour concentrations observed at each monitor in a particular year.

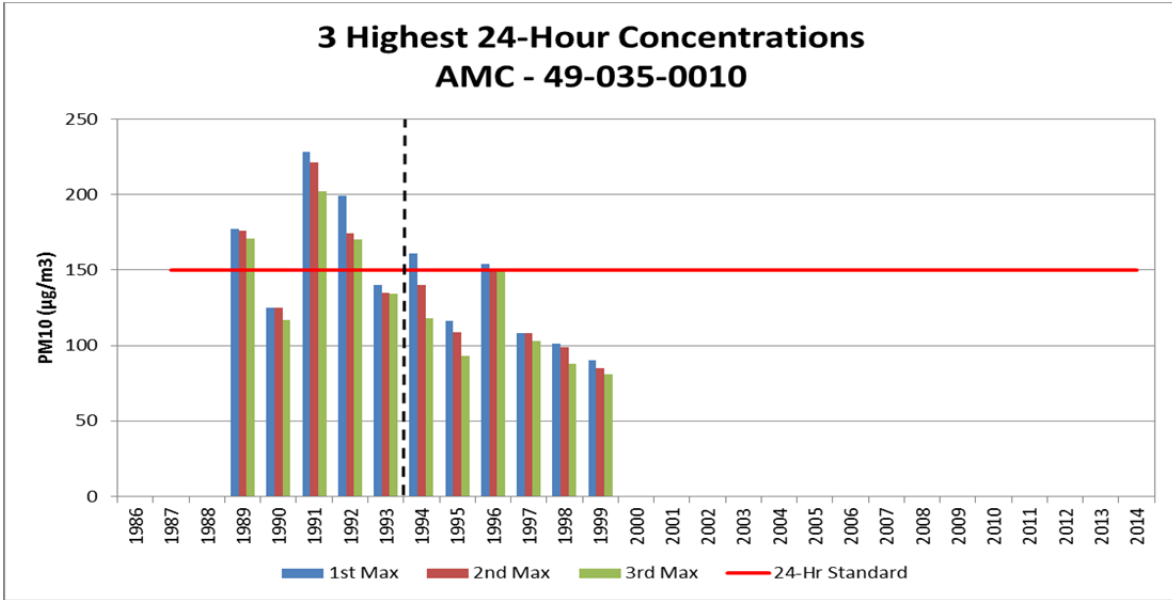
Figure IX.A.10. 2 3 Highest 24-hr PM₁₀ Concentrations; Cottonwood



(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

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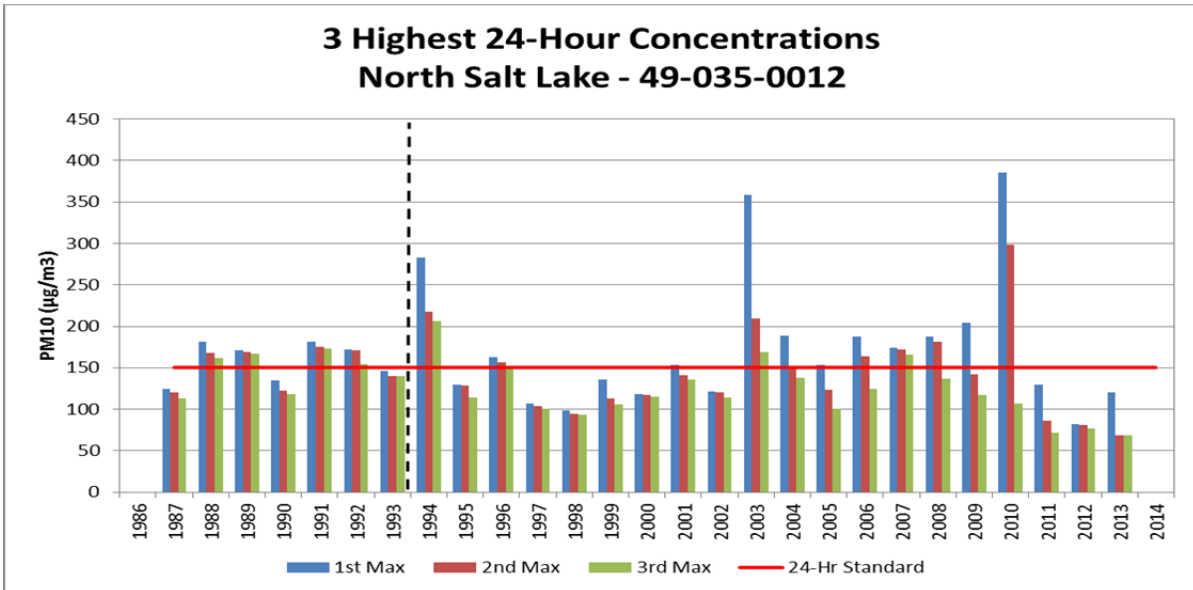
1 **Figure IX.A.10.3 3 Highest 24-hr PM₁₀ Concentrations; AMC**
 2



(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

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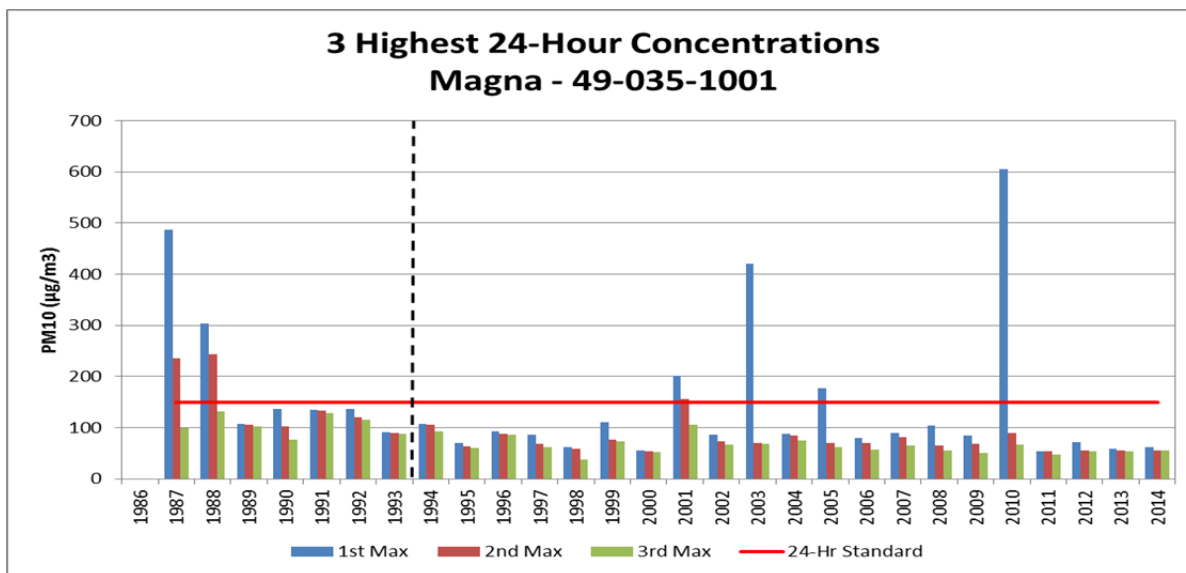
Figure IX.A.10.4 3 Highest 24-hr PM₁₀ Concentrations; North Salt Lake



(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

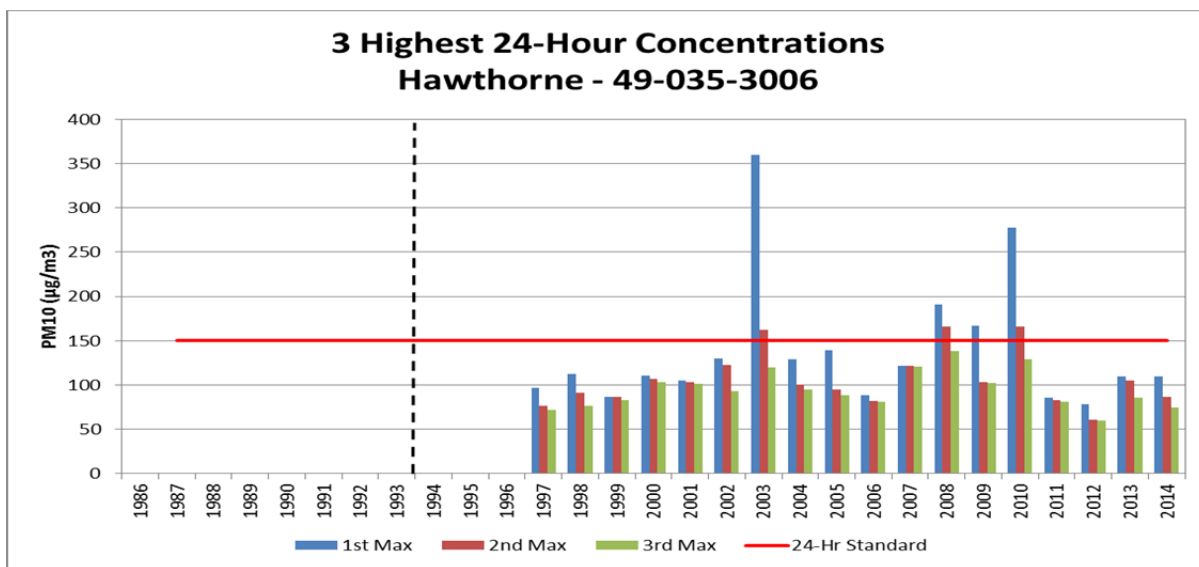
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2 **Figure IX.A.10. 5 3 Highest 24-hr PM₁₀ Concentrations; Magna**
3



4
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6 (Vertical dotted line indicates complete implementation of 1991 SIP control measures.)
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10 **Figure IX.A.10. 6 3 Highest 24-hr PM₁₀ Concentrations; Hawthorne**
11

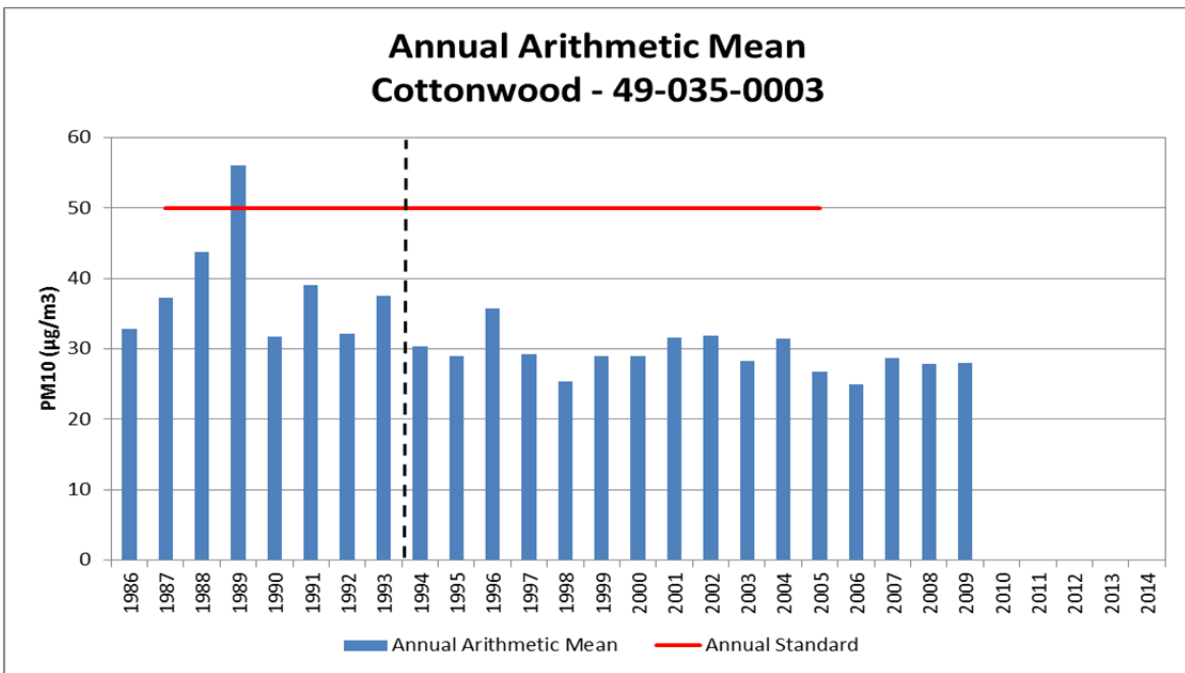


12
13
14 (Vertical dotted line indicates complete implementation of 1991 SIP control measures.)
15
16

17 Again there is a noticeable improvement in the magnitude of these concentrations. It must be
18 kept in mind, however, that some of these concentrations may have resulted from windblown dust
19 events that occur outside of the typical scenario of wintertime air stagnation. As such, the
20 effectiveness of any control measures directed at the precursors to PM₁₀ would not be evident.
21

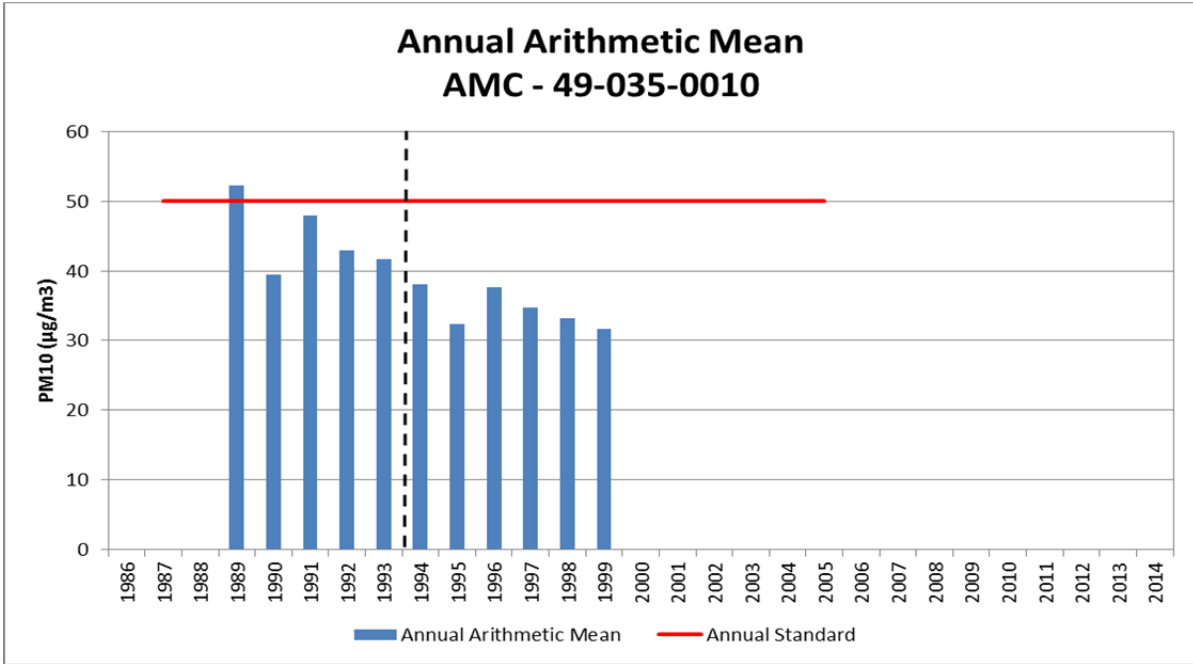
1 Annual Mean – Although there is no longer an annual PM₁₀ standard, the annual arithmetic mean
2 is also a significant parameter to consider. This is especially so given one of the assumptions
3 made in the original nonattainment SIP for **Salt Lake County**. The SIP was developed to address
4 the 24-hour standard for PM₁₀, but it was assumed that by controlling for the wintertime 24-hour
5 standard, the annual arithmetic mean concentrations would also be reduced such that the annual
6 standard would be protected (even though it had never been violated). Annual arithmetic means
7 have been plotted in **Figures IX.A.10 7 - 11**, and the data reveals a noticeable decline in the
8 values of these annual means. This supports the validity of the assumption made in the SIP, and
9 indicates that there have been significant improvements in air quality in the **Salt Lake County**
10 nonattainment area.

11
12
13 **Figure IX.A.10.7 Annual Arithmetic Mean; Cottonwood**



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18 (Vertical dotted line indicates complete implementation of 1991 SIP control measures.)
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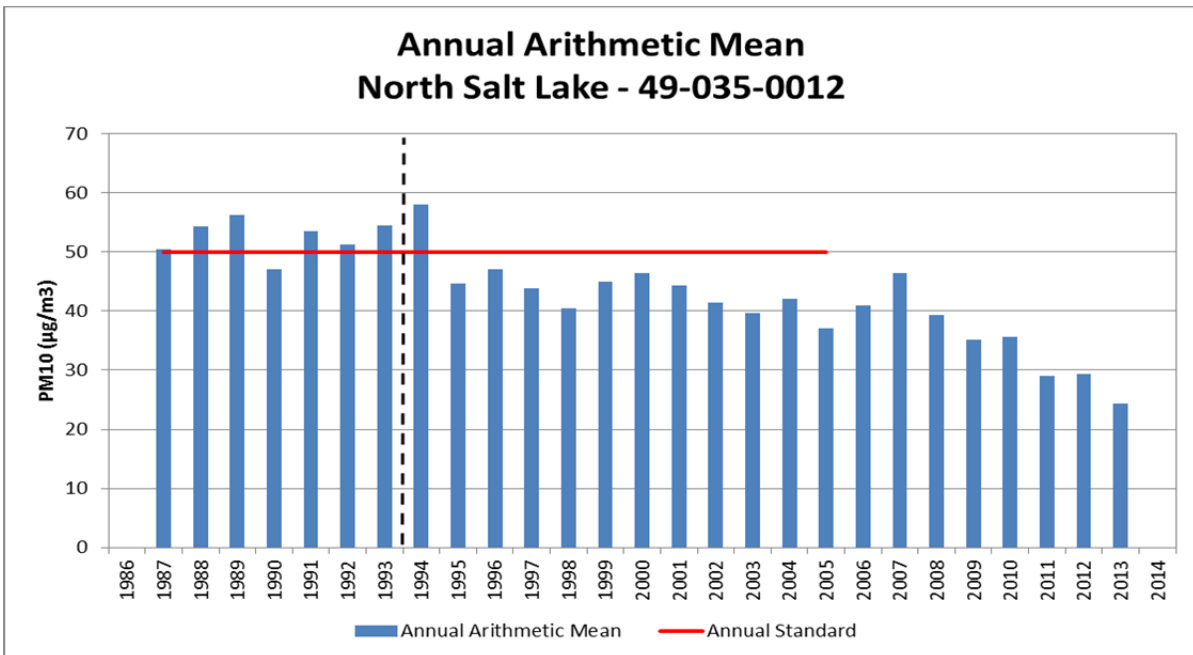
1 **Figure IX.A.10.8 Annual Arithmetic Mean; Cottonwood**
2



(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

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Figure IX.A.10.9 Annual Arithmetic Mean; North Salt Lake

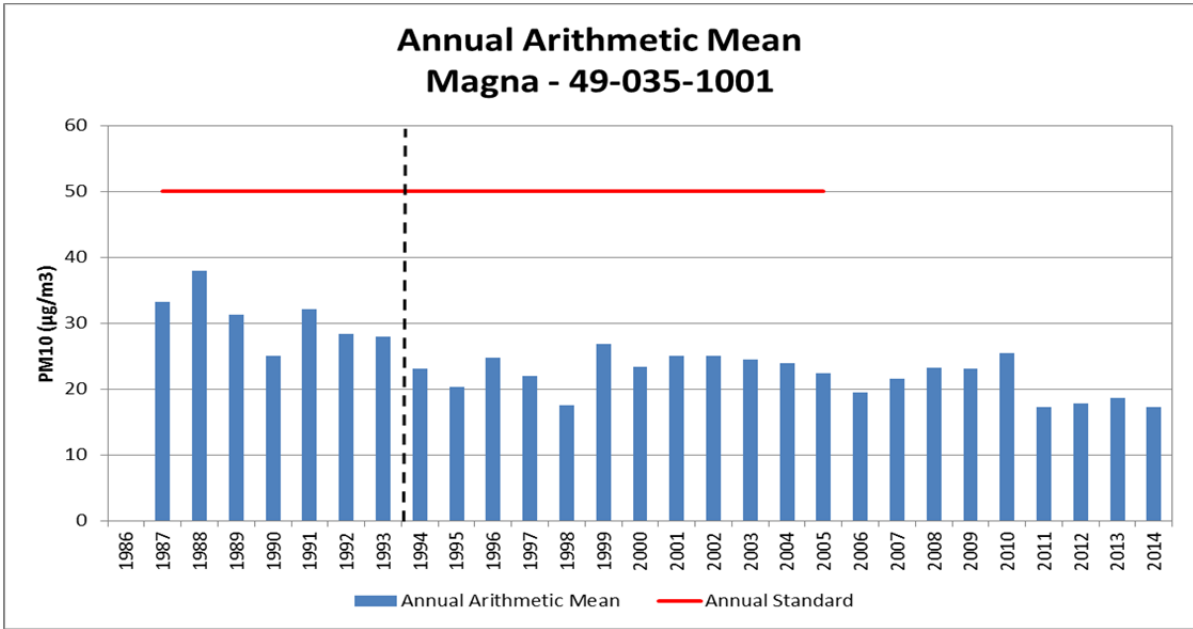


(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

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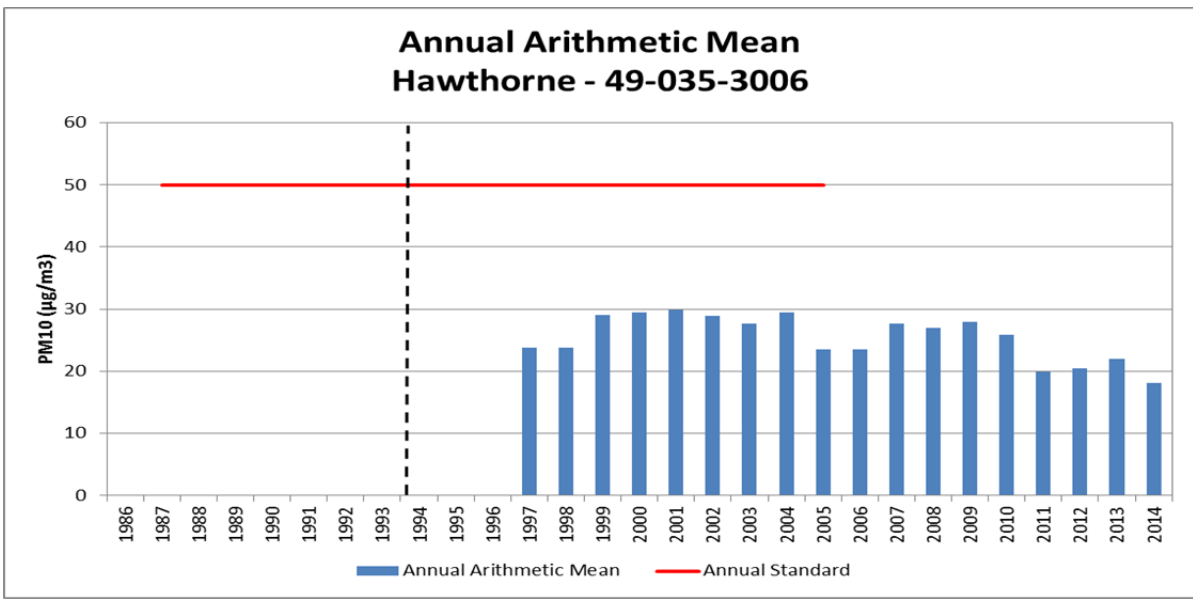
Figure IX.A.10. 10 Annual Arithmetic Mean; Magna



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(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

Figure IX.A.10. 11 Annual Arithmetic Mean; Hawthorne



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18

(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

1 As with the number of expected exceedances and the three highest values, the data in Figures
2 [IX.A.10. 7 - 11](#) may include data which had been flagged by DAQ as being influenced by wind-
3 blown dust events. Nevertheless, the annual averaging period tends to make these data points less
4 significant. The downward trend of these annual mean values is truly indicative of improvements
5 in air quality, particularly during the winter inversion season.

6
7
8 **(b) Reduction in Emissions**
9

10 As stated above, EPA guidance (Calcagni) says that the State must be able to reasonably attribute
11 the improvement in air quality to emission reductions that are permanent and enforceable. In
12 making this showing, the State should estimate the percent reduction (from the year that was used
13 to determine the design value) achieved by Federal measures such as motor vehicle control, as
14 well as by control measures that have been adopted and implemented by the State.

15
16 In [Salt Lake County](#), the design values at each of the representative monitors were measured in
17 1988 or 1989 (see SIP Subsections IX.A.3-5).

18
19 As mentioned before, the ambient air quality data presented in Subsection IX.A.10.b(3)(a) above
20 includes values prior to these dates in order to give a representation of the air quality prior to the
21 application of any control measures. It then includes data collected from then until the present
22 time to illustrate the lasting effect of these controls. In discussing the effect of the controls, as
23 well as the control measures themselves, however, it is important to keep in mind the time
24 necessary for their implementation.

25
26 The nonattainment SIPs for all initial moderate PM₁₀ nonattainment areas included a statutory
27 date for the implementation of reasonably available control measures (RACM), which includes
28 reasonably available control technologies (RACT). This date was December 10, 1993 (Section
29 189(a) CAA). Thus, 1994 marked the first year in which these control measures were reflected in
30 the emissions inventories for [Salt Lake County](#).

31
32 The nonattainment SIP for the [Salt Lake County](#) PM₁₀ nonattainment area included control
33 strategies for stationary sources and area sources (including controls for woodburning, mobile
34 sources, and road salting and sanding) of primary PM₁₀ emissions as well as sulfur oxide (SO_x)
35 and nitrogen oxide (NO_x) emissions, which are secondary sources of particulate emissions. This
36 is discussed in SIP Subsection IX.A.6, and was reflected in the attainment demonstration
37 presented in Subsection [IX.A.5](#).

38
39 The RACM control measures prescribed by the nonattainment SIP and their subsequent
40 implementation by the State were discussed in more detail in a milestone report submitted for the
41 area.

42
43 Section 189(c) of the CAA identifies, as a required plan element, quantitative milestones which
44 are to be achieved every 3 years, and which demonstrate reasonable further progress (RFP)
45 toward attainment of the standard by the applicable date. As defined in CAA Section 171(1), the
46 term *reasonable further progress* has the meaning of such annual incremental reductions in
47 emissions of the relevant air pollutant as are required by Part D of the Act for the purpose of
48 ensuring attainment of the NAAQS by the applicable date.

49
50 Hence, the milestone report must demonstrate that all measures in the approved nonattainment
51 SIP have been implemented and that the milestone has been met. In the case of initial moderate
52 areas for PM₁₀, this first milestone had the meaning of all control measures identified in the plan

1 being sufficient to bring the area into compliance with the NAAQS by the statutory attainment
2 date of December 31, 1994.

3
4 Section 188(d) of the Act allows States to petition the Administrator for up to two one-year
5 extensions of the attainment date, provided that all SIP elements have been implemented and that
6 the ambient data collected in the area during the year preceding the extension year indicates that
7 the area is on-target to attain the NAAQS. Presumably this is because the statutory attainment
8 date for initial moderate PM₁₀ nonattainment areas occurred only one year after the statutory
9 implementation date for RACM, the central control element of all implementation plans for such
10 areas, and because three consecutive years of clean ambient data are needed to determine that an
11 area has attained the standard. Because the milestone report and the request for extension of the
12 attainment date both required a demonstration that all SIP elements had been implemented, as
13 well as a showing of RFP, Utah combined these into a single analysis.

14
15 Utah's actions to meet these requirements and EPA's subsequent review thereof are discussed in
16 a Federal Register notice from Monday, June 18, 2001 (66 FR 32752). In this notice, EPA
17 granted a one-year extension of the attainment date for the Salt Lake County PM₁₀ nonattainment
18 area and determined that the area had attained the PM₁₀ NAAQS by December 31, 1995. The key
19 elements of that FR notice are reiterated below.

20
21 On May 11, 1995, Utah submitted a milestone report as required by sec.189(c)(2). On Sept.29,
22 1995, Utah submitted a revised version of the milestone report. It estimated current emissions
23 from all source categories covered by the SIP and compared those to actual emissions from 1988.
24 Based on information the State submitted in 1995, EPA believes that Utah was in substantial
25 compliance with the requirements and commitments in the SIP for the Salt Lake County PM₁₀
26 nonattainment area. The milestone report indicates that Utah had implemented most of its
27 adopted control measures and had, therefore, substantially implemented the RACM/RACT
28 requirements applicable to moderate PM₁₀ nonattainment areas. It showed that in Salt Lake
29 County, emissions of PM₁₀, SO₂ and NO_x had been reduced by approximately 60,752 tpy (from
30 150,292 down to 89,540). The effect of these emission reductions appears to be reflected in
31 ambient measurements at the monitoring site [and] is evidence that the State's implementation of
32 the PM₁₀ SIP control measures resulted in emission reductions amounting to RFP in the Salt Lake
33 County PM₁₀ nonattainment area.

34
35 This Federal Register notice (66 FR 32752) and the milestone report from September 29, 1995
36 have been included in the TSD.

37
38 Furthermore, since these control measures are incorporated into the Utah SIP, the emission
39 reductions that resulted are consistent with the notion of permanent and enforceable
40 improvements in air quality. Taken together, the trends in ambient air quality illustrated in the
41 preceding paragraph, along with the continued implementation of the nonattainment SIP for the
42 Salt Lake County nonattainment area, provide a reliable indication that these improvements in air
43 quality reflect the application of permanent steps to improve the air quality in the region, rather
44 than just temporary economic or meteorological changes.

45
46
47 **(4) State has Met Requirements of Section 110 and Part D**

48
49 *CAA 107(d)(3)(E)(v) - The State containing such area has met all requirements applicable to the*
50 *area under section 110 and part D.* Section 110(a)(2) of the Act deals with the broad scope of
51 state implementation plans and the capacity of the respective state agency to effectively
52 administer such a plan. Sections I through VIII of Utah's SIP contain information relevant to

1 these criteria. Part D deals specifically with plan requirements for nonattainment areas, and
2 includes the requirements for a maintenance plan in Section 175A.

3
4 Utah currently has an approved SIP that meets the requirements of section 110(a)(2) of the Act.
5 Many of these elements have been in place for several decades. In the March 9, 2001 approval of
6 Utah's Ogden City Maintenance Plan for Carbon Monoxide, EPA stated:

7
8 On August 15, 1984, we approved revisions to Utah's SIP as meeting the
9 requirements of section 110(a)(2) of the CAA (see 45 FR 32575). Although
10 section 110 of the CAA was amended in 1990, most of the changes were not
11 substantial. Thus, we have determined that the SIP revisions approved in 1984
12 continue to satisfy the requirements of section 110(a)(2). For further detail, see
13 45 FR 32575 dated August 15, 1984 (Volume 49, No. 159) or 66 FR 14079 dated
14 March 9, 2001 (Volume 66, No. 47.)

15
16 Part D of the Act addresses "Plan Requirements for Nonattainment Areas." Subpart 1 of Part D
17 includes the general requirements that apply to all areas designated nonattainment based on a
18 violation of the NAAQS. Section 172(c) of this subpart contains a list of generally required
19 elements for all nonattainment plans. Subpart 1 is followed by a series of subparts (2-5) specific
20 to various criteria pollutants. Subpart 4 contains the provisions specific to PM₁₀ nonattainment
21 areas. The general requirements for nonattainment plans in Section 172(c) may be subsumed
22 within or superseded by the more specific requirements of Subpart 4, but each element must be
23 addressed in the respective nonattainment plan.

24
25 One of the pre-conditions for a maintenance plan is a fully approved (non)attainment plan for the
26 area. This is also discussed in section IX.A.10.b(2).

27
28 Other Part D requirements that are applicable in nonattainment and maintenance areas include the
29 general and transportation conformity provisions of Section 176(c) of the Act. These provisions
30 ensure that federally funded or approved projects and actions conform to the PM₁₀ SIPs and
31 Maintenance Plans prior to the projects or actions being implemented. The State has already
32 submitted to EPA a SIP revision implementing the requirement of Section 176(c).

33
34 For [Salt Lake County](#), the Part D requirements for PM₁₀ were addressed in an attainment SIP
35 approved by EPA on [July 8, 1994 \(59 FR 35036\)](#).

36 37 38 **(5) Maintenance Plan for PM₁₀ Areas**

39
40 As stated in the Act, an area may not request redesignation to attainment without first submitting,
41 and then receiving EPA approval of, a maintenance plan. The plan is basically a quantitative
42 showing that the area will continue to attain the NAAQS for an additional 10 years (from EPA
43 approval), accompanied by sufficient assurance that the terms of the numeric demonstration will
44 be administered by the State and by the EPA in an oversight capacity. The maintenance plan is
45 the central criterion for redesignation. It is contained in the following subsection.

46 47 **IX.A.10.c Maintenance Plan**

48 *CAA 107(d)(3)(E)(iv) - The Administrator has fully approved a maintenance plan for the area as*
49 *meeting the requirements of section 175A. An approved maintenance plan is one of several*

1 criteria necessary for area redesignation as outlined in Section 107(d)(3)(E) of the Act. The
 2 maintenance plan itself, as described in Section 175A of the Act and further addressed in EPA
 3 guidance (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni
 4 to Regional Air Directors, September 4, 1992; or for the purpose of this document, simply
 5 “Calcagni”), has its own list of required elements. The following table is presented to summarize
 6 these requirements. Each will then be addressed in turn.

Table IX.A.10. 4 Requirements of a Maintenance Plan in the Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Maintenance demonstration	Provide for maintenance of the relevant NAAQS in the area for at least 10 years after redesignation.	CAA: Sec 175A(a)	IX.A.10.c(1)
Revise in 8 Years	The State must submit an additional revision to the plan, 8 years after redesignation, showing an additional 10 years of maintenance.	CAA: Sec 175A(b)	IX.A.10.c(8)
Continued Implementation of Nonattainment Area Control Strategy	The Clean Air Act requires continued implementation of the nonattainment area control strategy unless such measures are shown to be unnecessary for maintenance or are replaced with measures that achieve equivalent reductions.	CAA: Sec 175A(c), CAA Sec 110(l), Calcagni memo	IX.A.10.c(7)
Contingency Measures	Areas seeking redesignation from nonattainment to attainment are required to develop contingency measures that include State commitments to implement additional control measures in response to future violations of the NAAQS.	CAA: Sec 175A(d)	IX.A.10.c(10)
Verification of Continued Maintenance	The maintenance plan must indicate how the State will track the progress of the maintenance plan.	Calcagni memo	IX.A.10.c(9)

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(1) Demonstration of Maintenance - Modeling Analysis

CAA 175A(a) - Each State which submits a request under section 107(d) for redesignation of a nonattainment area as an area which has attained the NAAQS shall also submit a revision of the applicable implementation plan to provide for maintenance of the NAAQS for at least 10 years after the redesignation. The plan shall contain such additional measures, if any, as may be required to ensure such maintenance. The maintenance demonstration is discussed in EPA guidance (Calcagni) as one of the core provisions that should be considered by states for inclusion in a maintenance plan.

According to Calcagni, a State may generally demonstrate maintenance of the NAAQS by either showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory (discussed below) or by modeling to show that the future mix of sources and emission rates will not cause a violation of the NAAQS. Utah has elected to make its demonstration based on air quality modeling.

1
2 **(a) Introduction**

3
4 The following chapter presents an analysis using observational datasets to detail the chemical
5 regimes of Utah's Nonattainment areas.

6
7 Prior to the development of this PM₁₀ maintenance plan, UDAQ conducted a technical analysis to
8 support the development of Utah's 24-hr State Implementation Plan for PM_{2.5}. That analysis
9 included preparation of emissions inventories and meteorological data, and the evaluation and
10 application of a regional photochemical model.

11
12 Outside of the springtime high wind events and wildfires, the Wasatch Front experiences high 24-
13 hr PM₁₀ concentrations under stable conditions during the wintertime (e.g., temperature
14 inversion). These are the same episodes where the Wasatch Front sees its highest concentrations
15 of 24-hr PM_{2.5} that sometimes exceed the 24-hr PM_{2.5} NAAQS. Most (60% to 90%) of the PM₁₀
16 observed during high wintertime pollution days consists of PM_{2.5}. The dominant species of the
17 wintertime PM₁₀ is secondarily formed particulate nitrate, which is also the dominant species of
18 PM_{2.5}.

19
20 Given these similarities, the PM_{2.5} modeling analysis was utilized as the foundation for this PM₁₀
21 Maintenance Plan.

22
23 The CMAQ model performance for the PM₁₀ Maintenance Plan adds to the detailed model
24 performance that was part of the UDAQ's previous PM_{2.5} SIP process. Utah DAQ used the same
25 modeling episode that was used in the PM_{2.5} SIP, which is the 45-day modeling episode from the
26 winter of 2009-2010. The modeled meteorology datasets from the Weather Research and
27 Forecasting (WRF) model for the PM₁₀ Plan are the same datasets used for the PM_{2.5} SIP. Also,
28 the CMAQ version (4.7.1) and CMAQ model setup (i.e., vertical advection module turned off)
29 for the PM₁₀ modeling matches the PM_{2.5} SIP setup.

30
31 For this reason, much of the information presented below pertains specifically to the PM_{2.5}
32 evaluation. This is supplemented with information pertaining to PM₁₀, most notably with respect
33 to the PM₁₀ model performance evaluation.

34
35 The additional PM₁₀ analysis is also presented in the Technical Support Document.

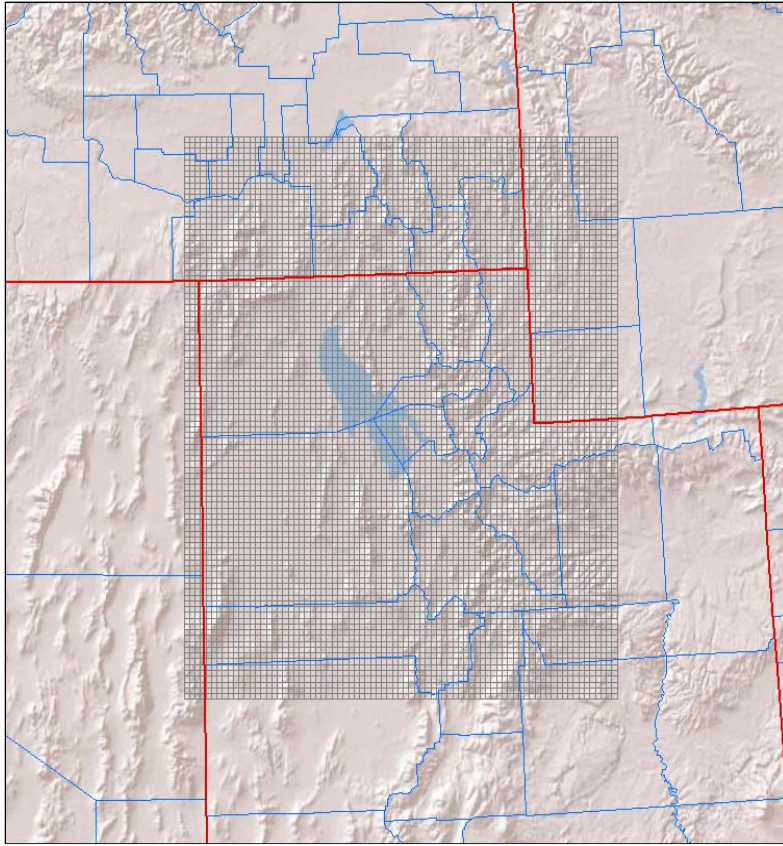
36
37 **(b) Photochemical Modeling**

38
39 Photochemical models are relied upon by federal and state regulatory agencies to support their
40 planning efforts. Used properly, models can assist policy makers in deciding which control
41 programs are most effective in improving air quality, and meeting specific goals and objectives.
42 The air quality analyses were conducted with the Community Multiscale Air Quality (CMAQ)
43 Model version 4.7.1, with emissions and meteorology inputs generated using SMOKE and WRF,
44 respectively. CMAQ was selected because it is the open source atmospheric chemistry model co-
45 sponsored by EPA and the National Oceanic Atmospheric Administration (NOAA), and thus
46 approved by EPA for this plan.

47
48 **(c) Domain/Grid Resolution**

49
50 UDAQ selected a high resolution 4-km modeling domain to cover all of northern Utah including
51 the portion of southern Idaho extending north of Franklin County and west to the Nevada border
52 (Figure IX.A.10. 12). This 97 x 79 horizontal grid cell domain was selected to ensure that all of

1 the major emissions sources that have the potential to impact the nonattainment areas were
2 included. The vertical resolution in the air quality model consists of 17 layers extending up to 15
3 km, with higher resolution in the boundary layer.
4



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Figure IX.A.10. 12 Northern Utah photochemical modeling domain.

10 **(d) Episode Selection**

11
12 According to EPA's April 2007 "Guidance on the Use of Models and Other Analyses for
13 Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze," the
14 selection of SIP episodes for modeling should consider the following 4 criteria:

- 15
- 16 1. Select episodes that represent a variety of meteorological conditions that lead to elevated
17 PM_{2.5}.
- 18
- 19 2. Select episodes during which observed concentrations are close to the baseline design
20 value.
- 21
- 22 3. Select episodes that have extensive air quality data bases.
- 23
- 24 4. Select enough episodes such that the model attainment test is based on multiple days at
25 each monitor violating NAAQS.
- 26

27 In general, UDAQ wanted to select episodes with hourly PM_{2.5} concentrations that are reflective
28 of conditions that lead to 24-hour NAAQS exceedances. From a synoptic meteorology point of

1 view, each selected episode features a similar pattern. The typical pattern includes a deep trough
 2 over the eastern United States with a building and eastward moving ridge over the western United
 3 States. The episodes typically begin as the ridge begins to build eastward, near surface winds
 4 weaken, and rapid stabilization due to warm advection and subsidence dominate. As the ridge
 5 centers over Utah and subsidence peaks, the atmosphere becomes extremely stable and a
 6 subsidence inversion descends towards the surface. During this time, weak insolation, light
 7 winds, and cold temperatures promote the development of a persistent cold air pool. Not until the
 8 ridge moves eastward or breaks down from north to south is there enough mixing in the
 9 atmosphere to completely erode the persistent cold air pool.

10
 11 From the most recent 5-year period of 2007-2011, UDAQ developed a long list of candidate
 12 PM_{2.5} wintertime episodes. Three episodes were selected. An episode was selected from January
 13 2007, an episode from February 2008, and an episode during the winter of 2009-2010 that
 14 features multi-event episodes of PM_{2.5} buildup and washout.

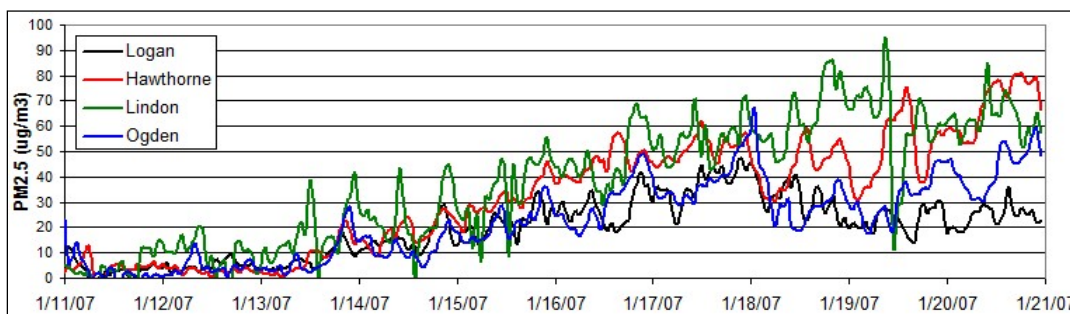
15
 16 As noted in the introduction, these episodes were also ideal from the standpoint of characterizing
 17 PM₁₀ buildup and formation.

18
 19 Further detail of the episodes is below:

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

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

30
 31 Figure IX.A.10. 13 shows hourly PM_{2.5} concentrations from Utah's 4 PM_{2.5} monitors for January
 32 11-20, 2007. The first 6 to 8 days of this episode are suited for modeling. The episode becomes
 33 less suited after January 18 because of the complexities in the meteorological conditions leading
 34 to temporary PM_{2.5} reductions.



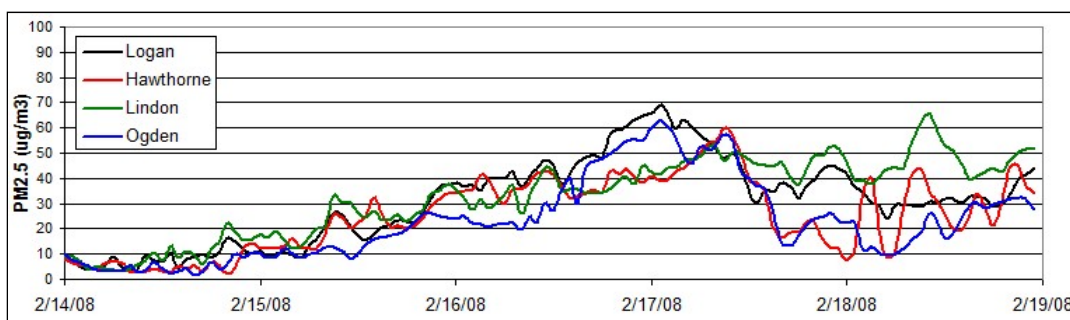
36
 37
 38 **Figure IX.A.10. 13 Hourly PM_{2.5} concentrations for January 11-20, 2007**

39
 40
 41 • **Episode 2: February 14-18, 2008**

42
 43 The February 2008 episode features a cold front passage at the start of the episode that brought
 44 significant new snow to the Wasatch Front. A ridge began building eastward from the Pacific

1 Coast and centered itself over Utah on Feb 20th. During this time a subsidence inversion lowered
 2 significantly from February 16 to February 19. Temperatures during this episode were mild with
 3 high temperatures at SLC in the upper 30's and lower 40's Fahrenheit.
 4

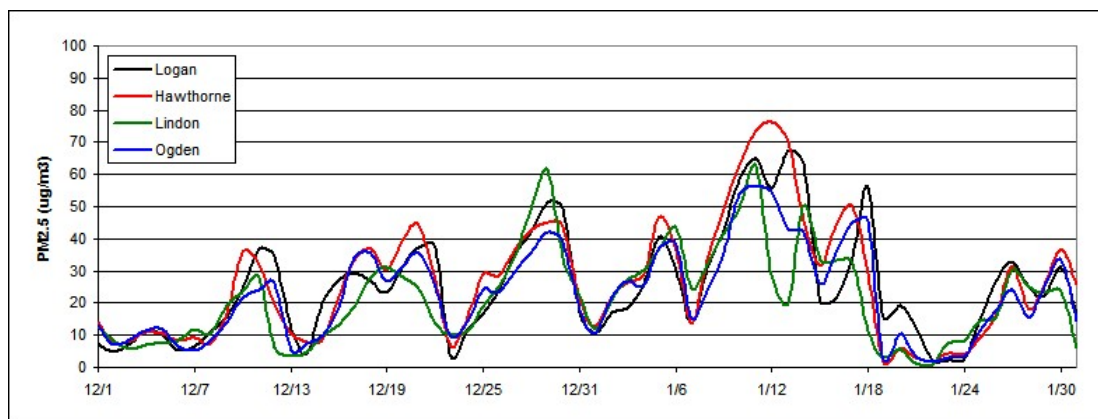
5 The 24-hour average PM_{2.5} exceedances observed during the proposed modeling period of
 6 February 14-19, 2008 were not exceptionally high. What makes this episode a good candidate for
 7 modeling are the high hourly values and smooth concentration build-up. The first 24-hour
 8 exceedances occurred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



16
 17
 18 **Figure IX.A.10. 14 Hourly PM_{2.5} concentrations for February 14-19, 2008**
 19
 20

21 **• Episode 3: December 13, 2009 – January 18, 2010**
 22

23 The third episode that was selected is more similar to a “season” than a single PM_{2.5} episode
 24 (Figure IX.A.10. 15). During the winter of 2009 and 2010, Utah was dominated by a semi-
 25 permanent ridge of high pressure that prevented strong storms from crossing Utah. This 35 day
 26 period was characterized by 4 to 5 individual PM_{2.5} episodes each followed by a partial PM_{2.5} mix
 27 out when a weak weather system passed through the ridge. The long length of the episode and
 28 repetitive PM_{2.5} build-up and mix-out cycles makes it ideal for evaluating model strengths and
 29 weaknesses and PM_{2.5} control strategies.
 30



31
 32

1 **Figure IX.A.10. 15 24-hour average PM_{2.5} concentrations for December-January, 2009-10**

2
3
4 **(e) Meteorological Data**

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

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

- 17
18 • The biggest issue with meteorological performance is the existence of a warm bias in
19 surface temperatures during high PM_{2.5} episodes. This warm bias is a common trait of
20 WRF modeling during Utah wintertime inversions.
- 21
22 • WRF does a good job of replicating the light wind speeds (< 5 mph) that occur during
23 high PM_{2.5} episodes.
- 24
25 • WRF is able to simulate the diurnal wind flows common during high PM_{2.5} episodes.
26 WRF captures the overnight downslope and daytime upslope wind flow that occurs in
27 Utah valley basins.
- 28
29 • WRF has reasonable ability to replicate the vertical temperature structure of the
30 boundary layer (i.e., the temperature inversion), although it is difficult for WRF to
31 reproduce the inversion when the inversion is shallow and strong (i.e., an 8 degree
32 temperature increase over 100 vertical meters).

33
34
35 **(f) Photochemical Model Performance Evaluation**

36
37 PM_{2.5} Results

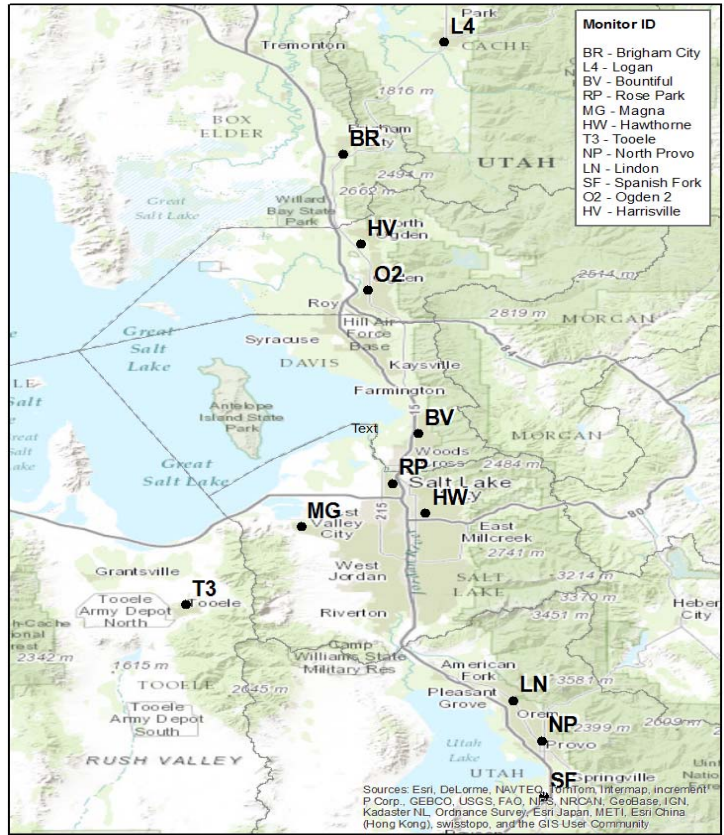
38
39 The model performance evaluation focused on the magnitude, spatial pattern, and temporal
40 variation of modeled and measured concentrations. This exercise was intended to assess whether,
41 and to what degree, confidence in the model is warranted (and to assess whether model
42 improvements are necessary).

43
44 CMAQ model performance was assessed with observed air quality datasets at UDAQ-maintained
45 air monitoring sites (Figure IX.A.10. 16). Measurements of observed PM_{2.5} concentrations along
46 with gaseous precursors of secondary particulate (e.g., NO_x, ozone) and carbon monoxide are
47 made throughout winter at most of the locations in the figure . PM_{2.5} speciation performance was
48 assessed using the three Speciation Monitoring Network Sites (STN) located at the Hawthorne
49 site in Salt Lake City, the Bountiful site in Davis County, and the Lindon site in Utah County.

50
51 PM₁₀ data is also collected at Logan, Bountiful, Ogden2, Magna, Hawthorne, North Provo, and
52 Lindon.

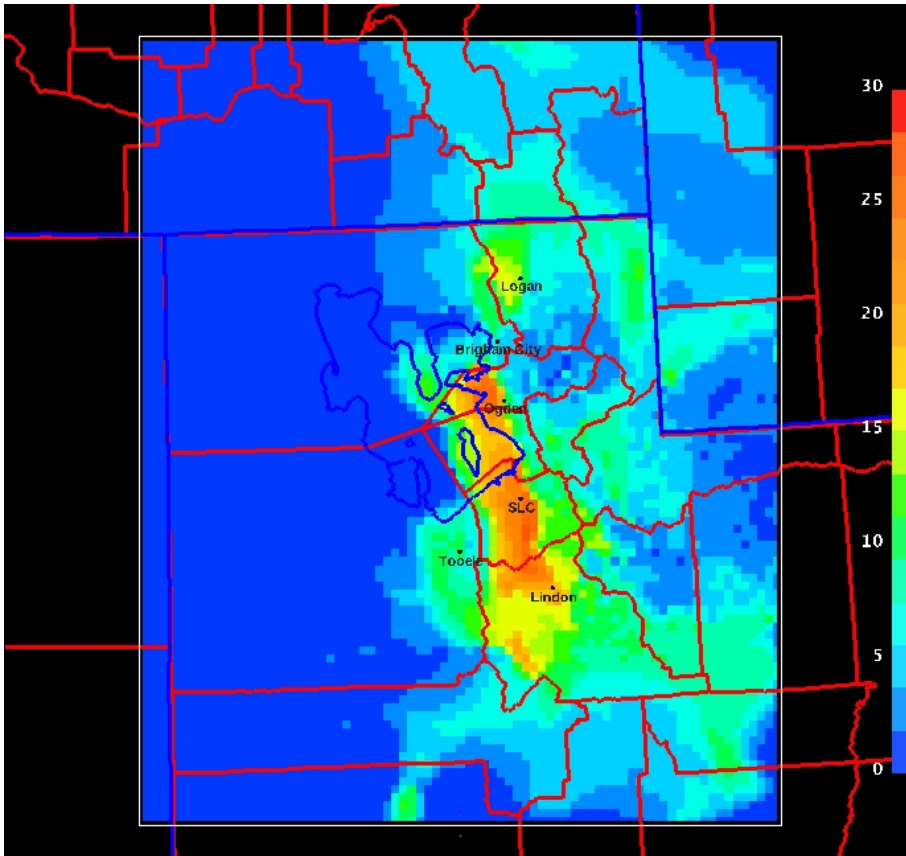
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PM₁₀ filters were collected at Bountiful, Hawthorne and Lindon, and analyzed with the goal comparing CMAQ modeled speciation to the collected PM₁₀ filters. While analyzing the PM₁₀ filters, most of the secondarily chemically formed particulate nitrate had been volatilized, and thus could not be accounted for. This is most likely due to the age of the filters, which were collected over five years ago. Thus, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter speciation could not be made for this modeling period.



9
10 **Figure IX.A.10.16 UDAQ monitoring network.**

1 A spatial plot is provided for modeled 24-hr $PM_{2.5}$ for 2010 January 03 in Figure IX.A.10. 17.
2 The spatial plot shows the model does a reasonable job reproducing the high $PM_{2.5}$ values, and
3 keeping those high values confined in the valley locations where emissions occur.



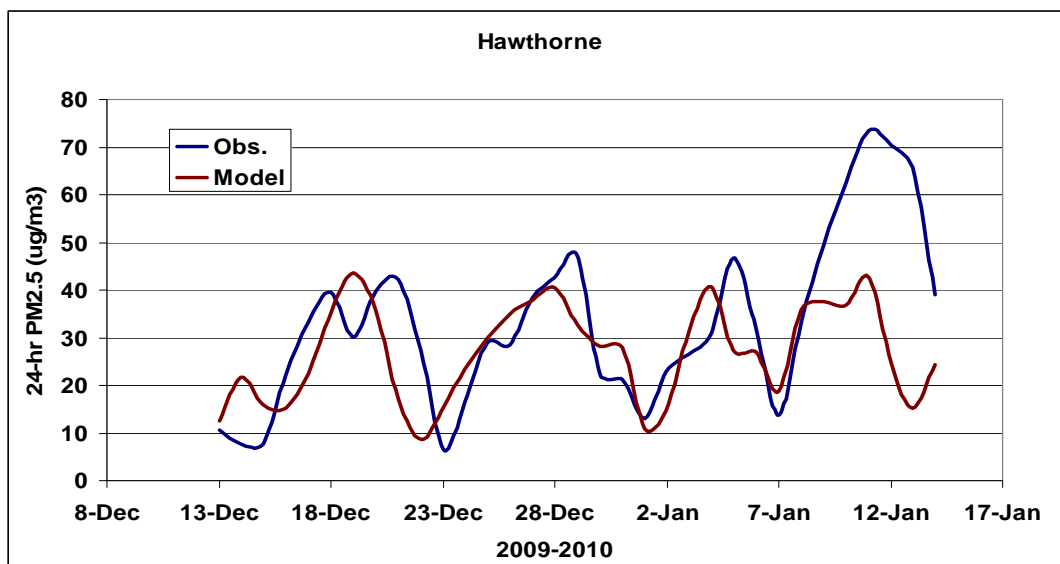
6
7 **Figure IX.A.10. 17 Spatial plot of CMAQ modeled 24-hr $PM_{2.5}$ ($\mu\text{g}/\text{m}^3$) for 2010 Jan. 03.**

8
9 Time series of 24-hr $PM_{2.5}$ concentrations for the 13 Dec. 2009 – 15 Jan. 2010 modeling period
10 are shown in Figs. IX.A.10. 18 - 21 at the Hawthorne site in Salt Lake City, the Ogden site in
11 Weber County, the Lindon site in Utah County, and the Logan site in Cache County. For the
12 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
14 produce the $> 60 \mu\text{g}/\text{m}^3$ concentrations observed at the monitoring locations.

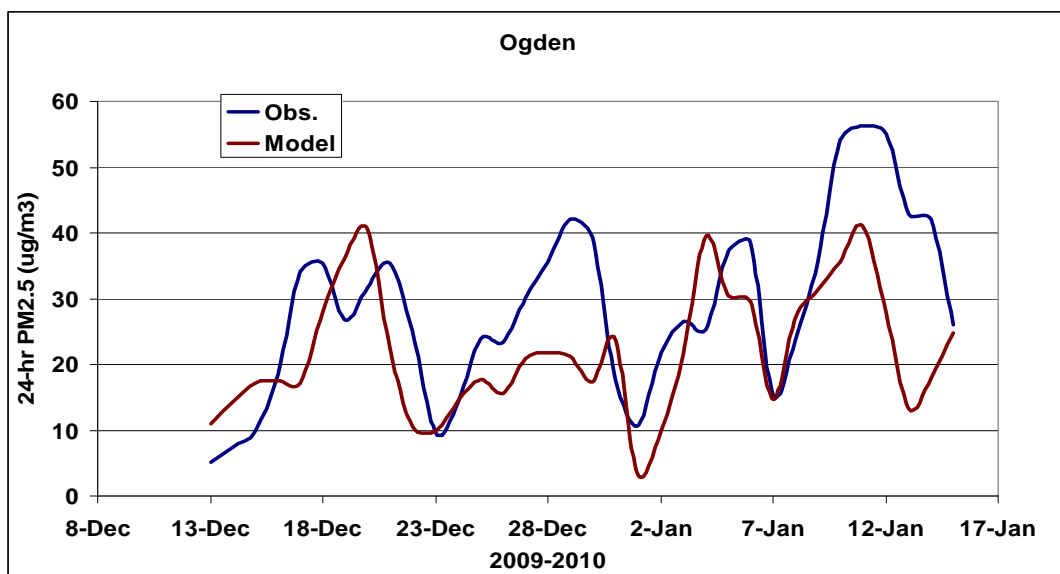
15
16 It is often seen that CMAQ “washes” out the $PM_{2.5}$ episode a day or two earlier than that seen in
17 the observations. For example, on the day 21 Dec. 2009, the concentration of $PM_{2.5}$ continues to
18 build while CMAQ has already cleaned the valley basins of high $PM_{2.5}$ concentrations. At these
19 times, the observed cold pool that holds the $PM_{2.5}$ is often very shallow and winds just above this
20 cold pool are southerly and strong before the approaching cold front. This situation is very
21 difficult for a meteorological and photochemical model to reproduce. An example of this
22 situation is shown in Fig. IX.A.10. 22, where the lowest part of the Salt Lake Valley is still under
23 a very shallow stable cold pool, yet higher elevations of the valley have already been cleared of
24 the high $PM_{2.5}$ concentrations.

25
26 During the 24 – 30 Dec. 2009 episode, a weak meteorological disturbance brushes through the
27 northernmost portion of Utah. It is noticeable in the observations at the Ogden monitor on 25
28 Dec. as $PM_{2.5}$ concentrations drop on this day before resuming an increase through Dec. 30. The

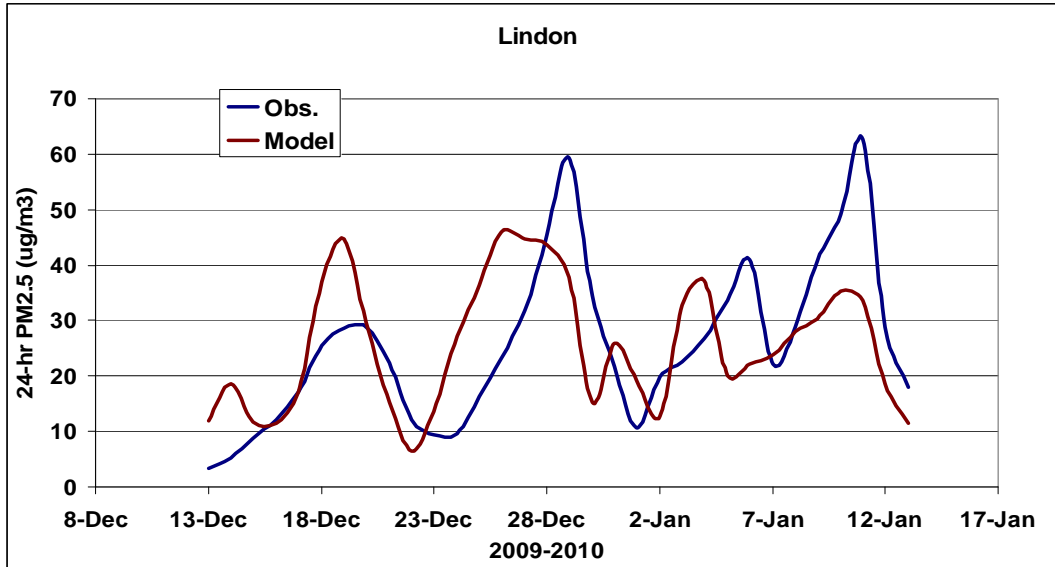
1 meteorological model and thus CMAQ correctly pick up this disturbance, but completely clears
 2 out the building $PM_{2.5}$; and thus performance suffers at the most northern Utah monitors (e.g.
 3 Ogden, Logan). The monitors to the south (Hawthorne, Lindon) are not influence by this
 4 disturbance and building of $PM_{2.5}$ is replicated by CMAQ. This highlights another challenge of
 5 modeling $PM_{2.5}$ episodes in Utah. Often during cold pool events, weak disturbances will pass
 6 through Utah that will de-stabilize the valley inversion and cause a partial clear out of $PM_{2.5}$.
 7 However, the $PM_{2.5}$ is not completely cleared out, and after the disturbance exits, the valley
 8 inversion strengthens and the $PM_{2.5}$ concentrations continue to build. Typically, CMAQ
 9 completely mixes out the valley inversion during these weak disturbances.
 10



11
 12 **Figure IX.A.10.18 24-hr $PM_{2.5}$ time series (Hawthorne). Observed 24-hr $PM_{2.5}$**
 13 **(blue trace) and CMAQ modeled 24-hr $PM_{2.5}$ (red trace).**
 14
 15

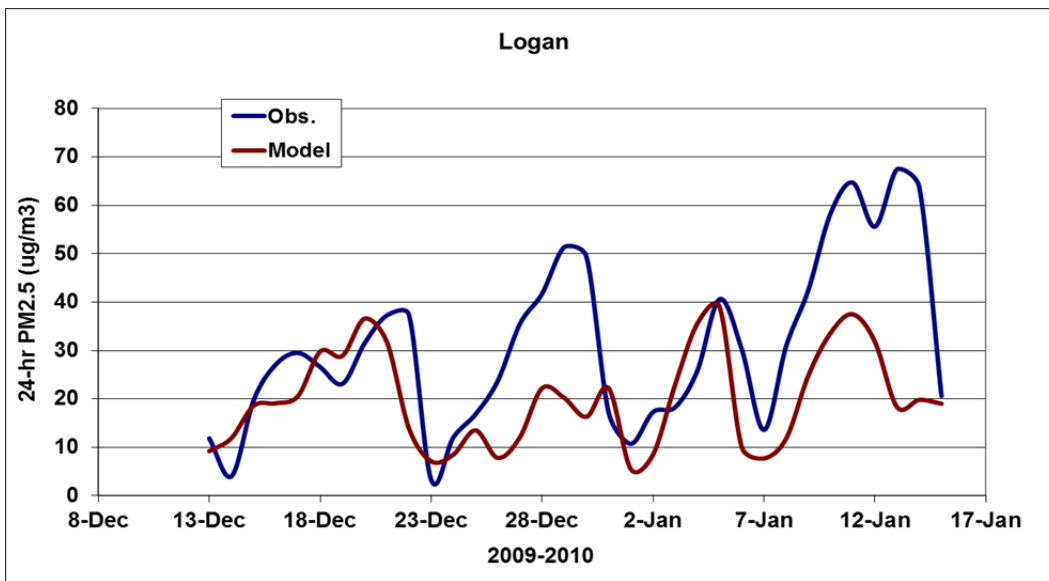


16
 17 **Figure IX.A.10.19 24-hr $PM_{2.5}$ time series (Ogden). Observed 24-hr $PM_{2.5}$**
 18 **(blue trace) and CMAQ modeled 24-hr $PM_{2.5}$ (red trace).**
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Figure IX.A.10. 20 24-hr PM_{2.5} time series (Lindon). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



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Figure IX.A.10. 21 24-hr PM_{2.5} time series (Logan). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



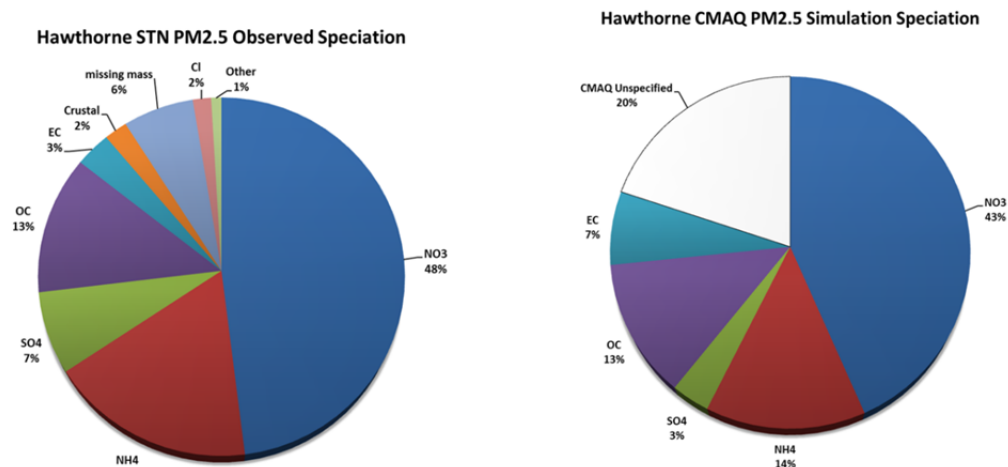
1
2 **Figure IX.A.10. 22 An example of the Salt Lake Valley at the end of a high PM_{2.5} episode.**
3 **The lowest elevations of the Salt Lake Valley are still experiencing an inversion and**
4 **elevated PM_{2.5} concentrations while the PM_{2.5} has been ‘cleared out’ throughout the rest of**
5 **the valley. These ‘end of episode’ clear out periods are difficult to replicate in the**
6 **photochemical model.**

7
8 Generally, the performance of CMAQ to replicate the buildup and clear out of PM_{2.5} is good.
9 However, it is important to verify that CMAQ is replicating the components of PM_{2.5}
10 concentrations. PM_{2.5} simulated and observed speciation is shown at the 3 STN sites in Figures
11 IX.A.10. 23 -25. The observed speciation is constructed using days in which the STN filter 24-hr
12 PM_{2.5} concentration was > 35 µg/m³. For the 2009-2010 modeling period, the observed
13 speciation pie charts were created using 8 filter days at Hawthorne, 6 days at Lindon, and 4 days
14 at Bountiful.

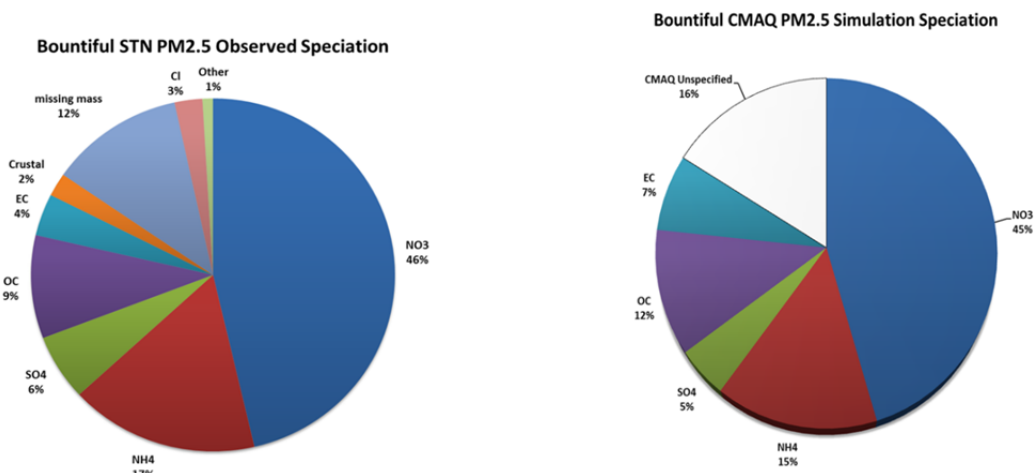
15
16 The simulated speciation is constructed using modeling days that produced 24-hr PM_{2.5}
17 concentrations > 35 µg/m³. Using this criterion, the simulated speciation pie chart is created from
18 18 modeling days for Hawthorne, 14 days at Lindon, and 14 days at Bountiful.
19 At all 3 STN sites, the percentage of simulated nitrate is greater than 40%, while the simulated
20 ammonium percentage is at ~15%. This indicates that the model is able to replicate the
21 secondarily formed particulates that typically make up the majority of the measured PM_{2.5} on the
22 STN filters during wintertime pollution events.

23
24 The percentage of model simulated organic carbon is ~13% at all STN sites, which is in
25 agreement with the observed speciation of organic carbon at Hawthorne and slightly
26 overestimated (by ~3%) at Lindon and Bountiful.

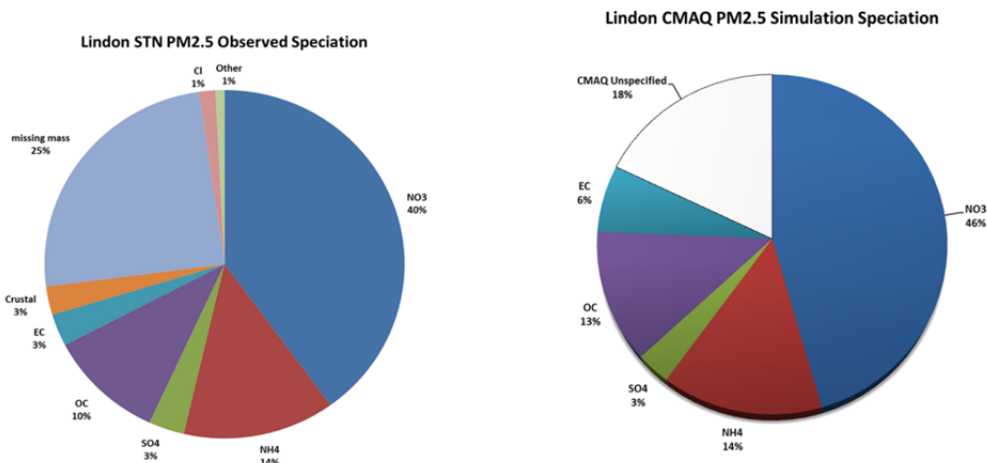
27
28 There is no STN site in the Logan nonattainment area, and very little speciation information
29 available in the Cache Valley. Figure IX.A.10. 26 shows the model simulated speciation at
30 Logan. Ammonium (17%) and nitrate (56%) make up a higher percentage of the simulated PM_{2.5}
31 at Logan when compared to sites along the Wasatch Front.



1
2 **Figure IX.A.10. 23** The composition of observed and model simulated average 24-hr PM_{2.5}
3 speciation averaged over days when an observed and modeled day had 24-hr concentrations
4 > 35 µg/m³ at the Hawthorne STN site.
5

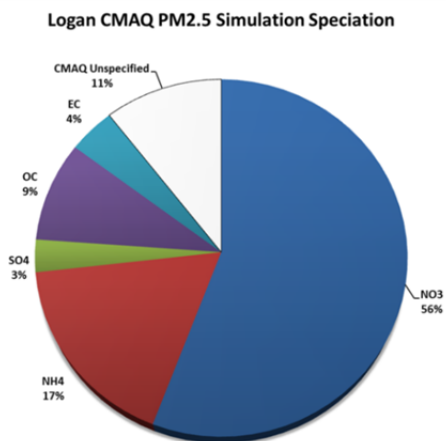


6
7 **Figure IX.A.10. 24** The composition of observed and model simulated average 24-hr PM_{2.5}
8 speciation averaged over days when an observed and modeled day had 24-hr concentrations
9 > 35 µg/m³ at the Bountiful STN site.
10
11



12

1 **Figure IX.A.10. 25 The composition of observed and model simulated average 24-hr PM_{2.5}**
2 **speciation averaged over days when an observed and modeled day had 24-hr concentrations**
3 **> 35 µg/m³ at the Lindon STN site.**
4

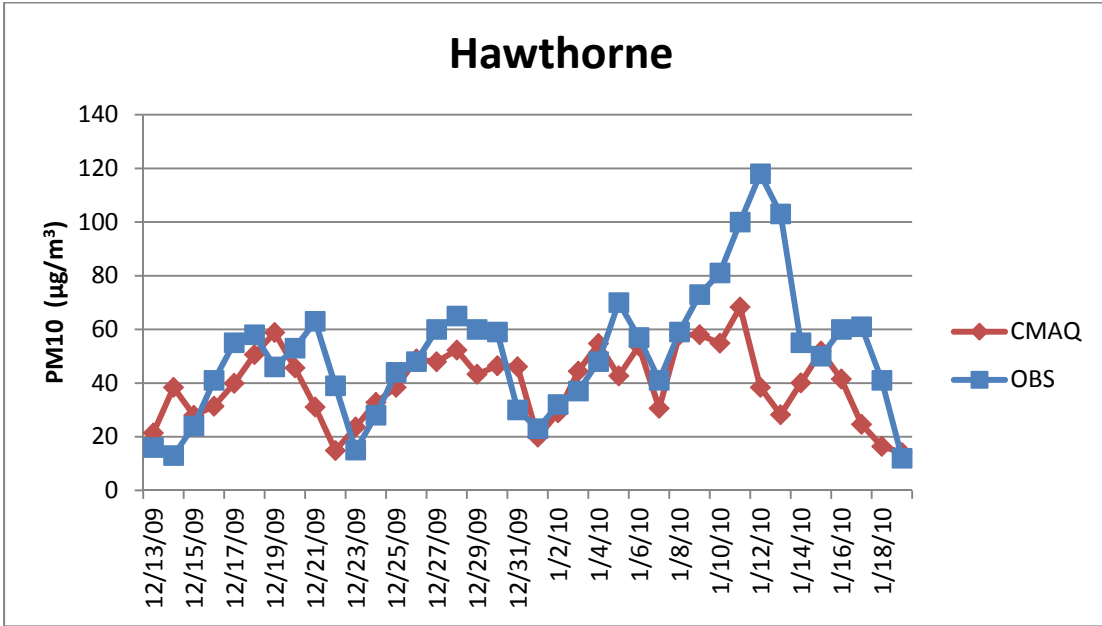


5
6 **Figure IX.A.10. 26 The composition of model simulated average 24-hr PM_{2.5} speciation**
7 **averaged over days when a modeled day had 24-hr concentrations > 35 µg/m³ at the Logan**
8 **monitoring site. No observed speciation data is available for Logan.**
9

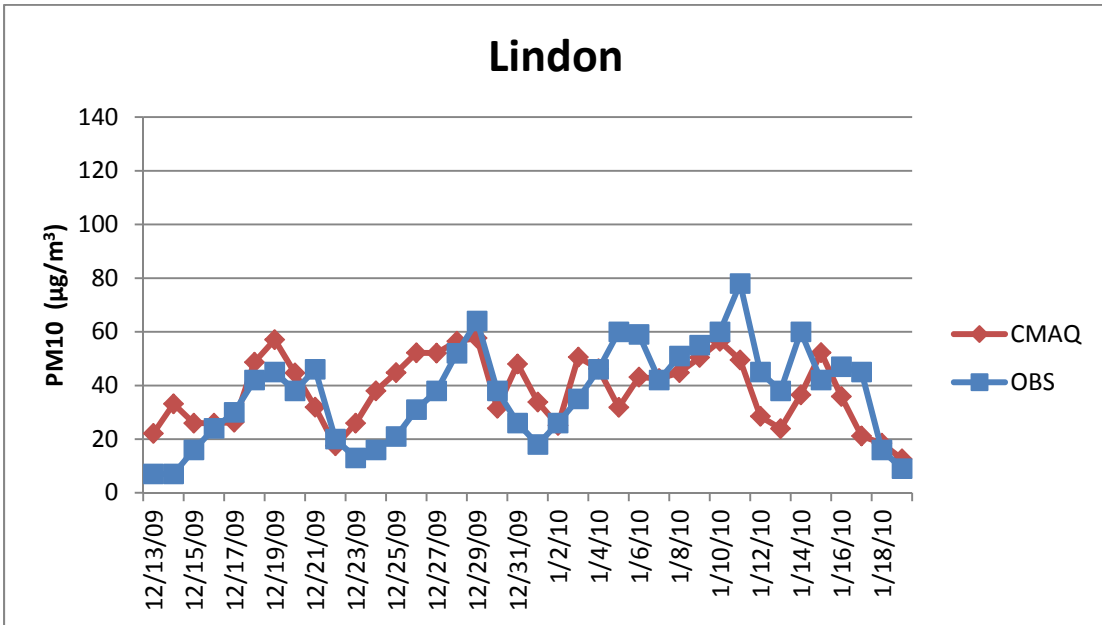
10 PM₁₀ Results

11
12 As mentioned previously, the bulk of the performance for CMAQ modeled Particulate Matter
13 (PM) for the 2009 – 2010 episode was done for the 24-hr PM_{2.5} SIP. The detailed model
14 performance was shown using time series, statistical metrics, and pie charts. For the CMAQ
15 performance of PM₁₀ in particular, UDAQ has updated the model versus observations time series
16 plots to show PM₁₀, in addition to the prior times series using PM_{2.5}. For the 2009 – 2010
17 episode, UDAQ collected PM₁₀ observational data at Hawthorne and Magna in Salt Lake County;
18 Lindon and North Provo in Utah County; and for Ogden City.
19

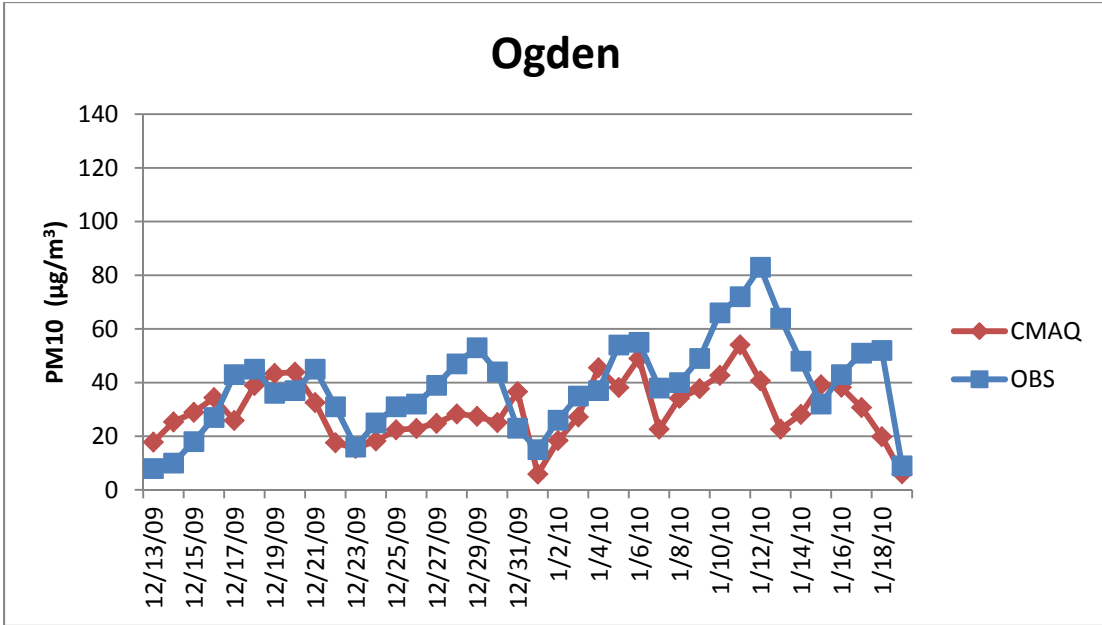
1 The PM₁₀ model versus observation time series is shown in Figures IX.A.10. 27 - 32.
2



3
4
5 **Figure IX.A.10. 27 Time Series of total PM10 (ug/m3) for Hawthorne for the 2009-2010**
6 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
7 **trace.**

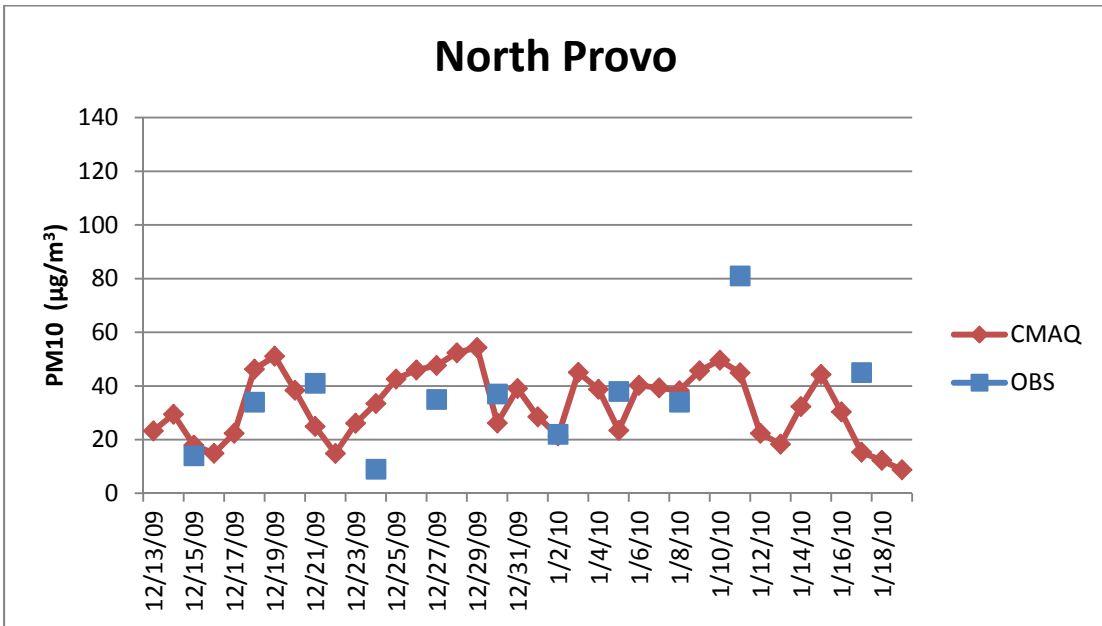


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12 **Figure IX.A.10. 28 Time Series of total PM10 (ug/m3) for Lindon for the 2009-2010**
13 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
14 **trace.**



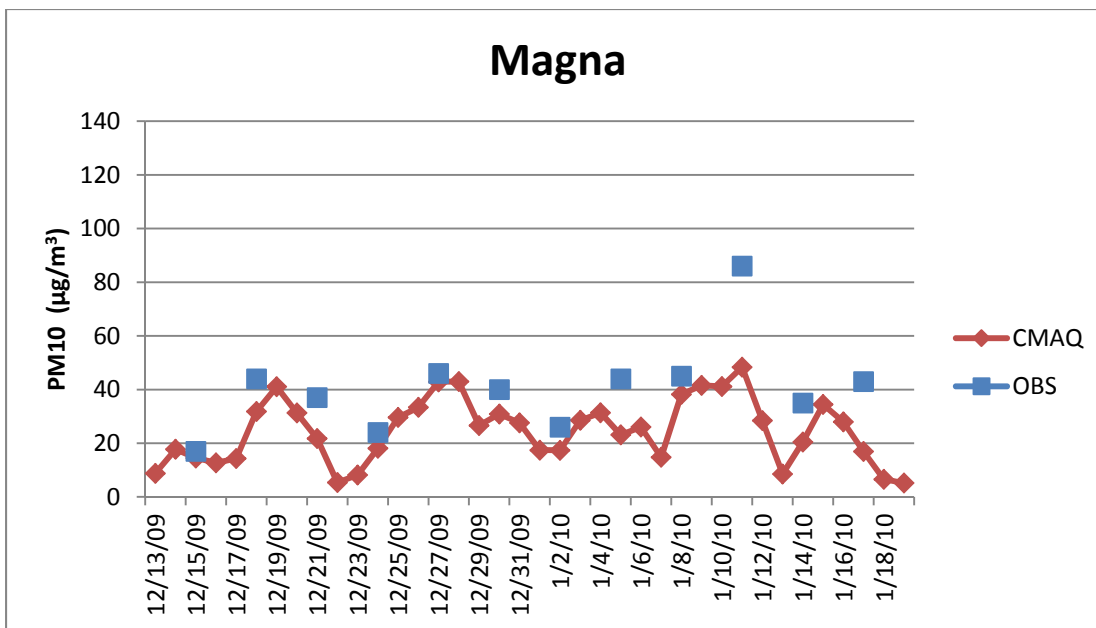
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Figure IX.A.10. 29 Time Series of total PM10 (ug/m3) for Ogden for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



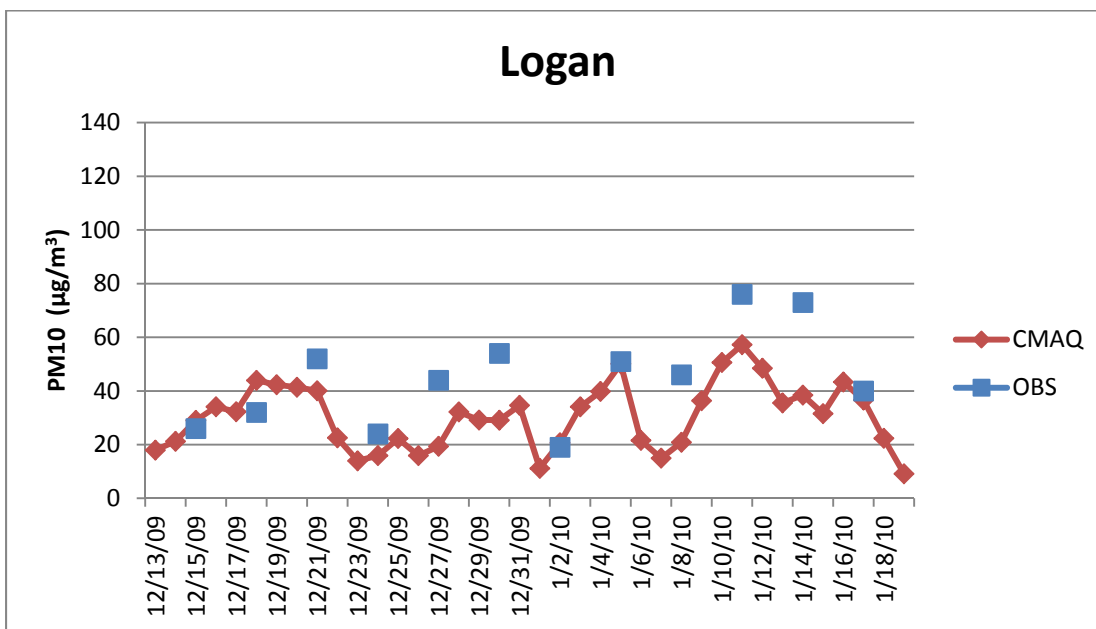
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Figure IX.A.10. 30 Time Series of total PM10 (ug/m3) for North Provo for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



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Figure IX.A.10.31 Time Series of total PM10 (ug/m3) for Magna for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



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Figure IX.A.10.32 Time Series of total PM10 (ug/m3) for Logan for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.

As noted before, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter speciation could not be made for this modeling period because most of the secondarily chemically formed particulate nitrate had been volatilized from the PM₁₀ filters and thus could not be accounted for. It should be noted that CMAQ was able to produce the secondarily formed nitrate

1 when compared to PM_{2.5} filters during the previous PM_{2.5} SIP work. Therefore, UDAQ feels
2 CMAQ shows good replication of the species that make up PM₁₀ during wintertime pollution
3 events.
4

5 6 **(g) Summary of Model Performance**

7
8 Model performance for 24-hr PM_{2.5} is good and generally acceptable and can be characterized as
9 follows:

- 10
11 • Good replication of the episodic buildup and clear out of PM_{2.5}. Often the model will
12 clear out the simulated PM_{2.5} a day too early at the end of an episode. This clear out time
13 period is difficult to model (i.e., Figure IX.A.10. 22).
14
- 15 • Good agreement in the magnitude of PM_{2.5}, as the model can consistently produce the
16 high concentrations of PM_{2.5} that coincide with observed high concentrations.
17
- 18 • Spatial patterns of modeled 24-hr PM_{2.5}, show for the most part, that the PM_{2.5} is being
19 confined in the valley basins, consistent to what is observed.
20
- 21 • Speciation and composition of the modeled PM_{2.5} matches the observed speciation quite
22 well. Modeled and observed nitrate are between 40% and 50% of the PM_{2.5}. Ammonium
23 is between 15% and 20% for both modeled and observed PM_{2.5}, while modeled and
24 observed organic carbon falls between 10% to 13% of the total PM_{2.5}.
25

26 For PM₁₀ the CMAQ model performance is quite good at all locations along Northern Utah.
27 CMAQ is able to re-produce the buildup and washout of the pollution episodes during the 2009 –
28 2010 winter. CMAQ is also able to re-produce the peak PM₁₀ concentrations during most
29 episodes. The exception being the 2010 Jan. 08 – 14 episode, where CMAQ fails to build to the
30 extremely high PM₁₀ concentration (>80 ug/m³) seen at the monitors. This episode in particular
31 featured an “early model washout,” and these results are similar to the results found in PM_{2.5}
32 modeling.
33

34 Several observations should be noted on the implications of these model performance findings on
35 the attainment modeling presented in the following section. First, it has been demonstrated that
36 model performance overall is acceptable and, thus, the model can be used for air quality planning
37 purposes. Second, consistent with EPA guidance, the model is used in a relative sense to project
38 future year values. EPA suggests that this approach “should reduce some of the uncertainty
39 attendant with using absolute model predictions alone.”
40

41 **(h) Modeled Attainment Test**

42 43 • **Introduction**

44
45 With acceptable performance, the model can be utilized to make future-year attainment
46 projections. For any given (future) year, an attainment projection is made by calculating a
47 concentration termed the Future Design Value (FDV). This calculation is made for each monitor
48 included in the analysis, and then compared to the NAAQS (150 µg/m³). If the FDV at every
49 monitor located within a nonattainment area is smaller than the NAAQS, this would demonstrate
50 attainment for that area in that future year.
51

1 A maintenance plan must demonstrate continued attainment of the NAAQS for a span of ten
 2 years. This span is measured from the time EPA approves the plan, a date which is somewhat
 3 uncertain during plan development. To be conservative, attainment projections were made for
 4 2019, 2028, and 2030. An assessment was also made for 2024 as a “spot-check” against emission
 5 trends within the ten year span.

6
 7 • **PM₁₀ Baseline Design Values**
 8

9 For any monitor, the FDV is greatly influenced by existing air quality at that location. This can
 10 be quantified and expressed as a Baseline Design Value (BDV). The BDV is consistent with the
 11 form of the 24-hour PM₁₀ NAAQS; that is, that the probability of exceeding the standard should
 12 be no greater than once per calendar year. Quantification of the BDV for each monitor is
 13 included in the TSD, and is consistent with EPA guidance.

14
 15 Hourly PM₁₀ observations are taken from FRM filters spanning five monitors in three
 16 maintenance areas: Salt Lake County, Utah County, and the city of Ogden.

17
 18 In Table IX.A.10. 5, baseline design values are given for Ogden, Hawthorne, Magna, Lindon, and
 19 North Provo. These values were calculated based on data collected during the 2011-2014 time
 20 period.

21
 22 **Table IX.A.10. 5 Baseline design values listed for each monitor.**
 23

Site	Maintenance Area	2011-2014 BDV
Ogden	Ogden City	88.2 µg/m ³
Hawthorne	Salt Lake County	100.9 µg/m ³
Magna	Salt Lake County	70.5 µg/m ³
Lindon	Utah County	111.4 µg/m ³
North Provo	Utah County	124.4 µg/m ³

24
 25
 26 • **Relative Response Factors**
 27

28 In making future-year predictions, the output from the CMAQ 4.7.1 model is not considered to be
 29 an absolute answer. Rather, the model is used in a relative sense. In doing so, a comparison is
 30 made using the predicted concentrations for both the year in question and a pre-selected base-
 31 year, which for this plan is 2011. This comparison results in a Relative Response Factor (RRF).
 32 RRFs are calculated as follows:

- 33
 34 1) Modeled PM₁₀ concentrations are calculated for each grid cell in the modeling domain
 35 over the 39-day wintertime 2009-2010 episode. Of particular interest are the nine grid
 36 cells (3x3 window) that are collocated with each monitor. The monitor, itself is located in
 37 the window’s center cell.
 38
 39 2) For every simulated day, the maximum daily PM₁₀ concentration for each of these nine-
 40 cell windows is identified.
 41
 42 3) For each monitor, the top 20% of these 39 values are averaged to formulate a modeled
 43 PM₁₀ peak concentration value (PCV).
 44
 45 4) At each monitor, the RRF is calculated as the ratio between future-year PCV and base-
 46 year PCV: **RRF = FPCV / BPCV**

• **Future Design Values and Results**

Finally, for each monitor, the FDV is calculated by multiplying the baseline design value by the relative response factor: **FDV = RRF * BDV**. These FDV's are compared to the NAAQS in order to determine whether attainment is predicted at that location or not. The results for each of the monitors are shown below in Table IX.A.10. 6.

Table IX.A.10. 6 Baseline design values, relative response factors, and future design values for all monitors and future years. Units of design values are $\mu\text{g}/\text{m}^3$, while RRF's are dimensionless.

Monitor	2011 BDV	2019 RRF	2019 FDV	2024 RRF	2024 FDV	2028 RRF	2028 FDV	2030 RRF	2030 FDV
Ogden	88.2	1.05	92.6	1.04	91.7	1.02	90.0	1.05	92.6
Hawthorne	100.9	1.09	110.0	1.09	110.0	1.09	110.0	1.12	113.0
Magna	70.5	1.14	80.4	1.13	79.7	1.11	78.3	1.15	81.1
Lindon	111.4	1.16	129.2	1.12	124.8	1.11	123.7	1.16	129.2
North Provo	124.4	1.15	143.1	1.12	139.3	1.10	136.8	1.15	143.1

For all future-years and monitors, no FDV exceeds the NAAQS. Therefore continued attainment is demonstrated for all three maintenance areas.

(2) Attainment Inventory

The attainment inventory is discussed in EPA guidance (Calcagni) as another one of the core provisions that should be considered by states for inclusion in a maintenance plan.

According to Calcagni, the stated purpose of the attainment inventory is to establish the level of emissions during the time periods associated with monitoring data showing attainment.

In cases such as this, where a maintenance demonstration is founded on a modeling analysis that is used in a relative sense, the baseline inventory modeled as the basis for comparison with every projection year model run is best suited to act as the attainment inventory. For this analysis, a baseline inventory was compiled for the year 2011. This year also falls within the span of data representing current attainment of the PM_{10} NAAQS.

Calcagni speaks about the projection inventory as well, and notes that it should consider future growth, including population and industry, should be consistent with the base-year attainment inventory, and should document data inputs and assumptions. Any assumptions concerning emission rates must reflect permanent, enforceable measures.

Utah compiled projection inventories for use in the quantitative modeling demonstration. The years selected for projection included 2019, 2024, 2028, and 2030. The emissions contained in the inventories include sources located within a regional area called a modeling domain. The

1 modeling domain encompasses all three areas within the state that were designated as
2 nonattainment areas for PM₁₀: Salt Lake County, Utah County, and Ogden City, as well as a
3 bordering region see Figure IX.A.10 1.

4
5 Since this bordering region is so large (owing to its creation to assess a much larger region of
6 PM_{2.5} nonattainment), a “core area” within this domain was identified wherein a higher degree of
7 accuracy would be important. Within this core area (which includes Weber, Davis, Salt Lake,
8 and Utah Counties), SIP-specific inventories were prepared to include seasonal adjustments and
9 forecasting to represent each of the projection years. In the bordering regions away from this
10 core, the 2011 National Emissions Inventory was downloaded from EPA and inserted to the
11 analysis. It remained unchanged throughout the analysis period.

12
13 There are four general categories of sources included in these inventories: large stationary
14 sources, smaller area sources, on-road mobile sources, and off-road mobile sources.

15
16 For each of these source categories, the pollutants that were inventoried included: particulate
17 matter with an aerodynamic diameter of ten microns or less (PM₁₀), sulfur dioxide (SO₂), oxides
18 of nitrogen (NO_x), volatile organic compounds (VOC), and ammonia. SO₂ and NO_x are
19 specifically defined as PM₁₀ precursors, that is, compounds that, after being emitted to the
20 atmosphere, undergo chemical or physical change to become PM₁₀. Any PM₁₀ that is created in
21 this way is referred to as secondary aerosol. The CMAQ model also considers ammonia and
22 VOC to be contributing factors in the formation of secondary aerosol.

23
24 The unit of measure for point and area sources is the traditional tons per year, but the CMAQ
25 model includes a pre-processor that converts these emission rates to hourly increments throughout
26 each day for each episode. Mobile source emissions are reported in terms of tons per day, and are
27 also pre-processed by the model.

28
29 The basis for the point source and area inventories, for the base-year attainment inventory as well
30 as all future-year projection inventories, was the 2011 tri-annual inventory of actual emissions
31 that had already been compiled by the Division of Air Quality.

32
33 Area sources, off-road mobile sources, and generally also the large point sources were projected
34 forward from 2011, using population and economic forecasts from the Governor’s Office of
35 Management and Budget.

36
37 Mobile source emissions were calculated for each year using MOVES2010 in conjunction with
38 the appropriate estimates for vehicle miles traveled (VMT). VMT estimates for the urban
39 counties were based on a travel demand model that is only run periodically for specific projection
40 years. VMT for intervening years were estimated by interpolation.

41
42 Since this SIP subsection takes the form of a maintenance plan, it must demonstrate that the area
43 will continue to attain the PM₁₀ NAAQS throughout a period of ten years from the date of EPA
44 approval. It is also necessary to “spot check” this ten-year interval. Hence, projection inventories
45 were prepared for the following years: 2019, 2024, 2028, (the ten-year mark from anticipated
46 EPA approval), and 2030. 2011 was established as the baseline period.

47
48 The following tables are provided to summarize these inventories. As described, they represent
49 point, area, on-road mobile, and off-road mobile sources in the modeling domain. They include
50 PM₁₀, SO₂, NO_x, VOC, and ammonia.

51

1 Table IX.A.10. 7 shows the baseline emissions for each of the areas within the modeling
 2 domain. Table IX.A.10. 8 is specific to this nonattainment area, and shows the emissions from
 3 the baseline through the projection years.
 4

5 **Table IX.A.10. 7 Baseline Emissions throughout the Modeling Domain**
 6

2011 Baseline	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline Sum of Emissions (tpd)	Ogden City NA-Area	Area Sources	0.85	0.08	2.12	5.67	0.86
		NonRoad	0.90	0.00	1.32	0.91	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.09	0.05	12.18	8.58	0.22
		Provo NA Total	3.84	0.13	15.62	15.16	1.08
	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	7.12	0.32	11.71	6.38	0.00
		Point Source	4.04	8.90	15.56	2.97	0.20
		Mobile Sources	10.95	0.28	57.96	35.35	1.14
		Salt Lake City NA Total	26.72	9.55	85.96	77.32	2.87
	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	3.53	0.02	4.24	2.31	0.00
		Point Source	0.28	0.29	1.03	0.18	0.18
		Mobile Sources	4.90	0.13	24.64	11.89	0.49
		Surrounding Areas Total	10.90	0.46	30.13	15.54	1.50
	Surrounding Areas	Area Sources	537.49	13.60	228.31	629.52	331.22
		NonRoad	34.53	0.10	60.77	72.57	0.01
		Point Source	17.64	283.15	538.86	63.96	6.08
		Mobile Sources	22.80	193.52	434.92	6.47	1.67
		Surrounding Areas Total	612.46	490.37	1262.86	772.52	338.98
	2011 Total	653.92	500.51	1394.57	880.54	344.43	

7
8
9
10
11 **Table IX.A.10. 8 Salt Lake County Nonattainment Area; Actual Emissions for 2011 and**
 12 **Emission Projections for 2019, 2024, 2028, and 2030.**
 13

Year	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	7.12	0.32	11.71	6.38	0.00
		Point Source	4.04	8.90	15.56	2.97	0.20
		Mobile Sources	10.95	0.28	57.96	35.35	1.14
		2011 Total	26.72	9.55	85.96	77.32	2.87
2019	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	8.28	0.36	9.11	5.94	0.01
		Point Source	11.29	7.72	22.17	3.77	0.26
		Mobile Sources	10.88	0.31	25.79	21.16	0.89
	2019 Total	35.06	8.44	57.80	63.49	2.69	
2024	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	8.83	0.40	8.48	6.22	0.01
		Point Source	11.52	8.16	22.36	3.86	0.29
		Mobile Sources	11.28	0.29	17.16	16.63	0.89
	2024 Total	36.24	8.90	48.73	59.33	2.72	
2028	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	9.27	0.44	8.43	6.54	0.01
		Point Source	11.72	8.57	0.00	3.95	0.31
		Mobile Sources	11.82	0.28	13.88	13.94	0.91
	2028 Total	37.42	9.34	23.04	57.05	2.76	
2030	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	9.52	0.46	8.50	6.72	0.01
		Point Source	11.83	8.82	22.68	4.00	0.32
		Mobile Sources	12.07	0.28	12.59	13.34	0.93
	2030 Total	38.03	9.61	44.50	56.68	2.79	

1
2 More detail concerning any element of the inventory can be found at the appropriate section of
3 the Technical Support Document (TSD). More detail about the general construction of the
4 inventory may be found in the Inventory Preparation Plan.
5

6 7 **(3) Emissions Limitations** 8

9 As discussed above, the larger sources within the nonattainment areas were individually
10 inventoried and modeled in the analysis.
11

12 A subset of these “large” sources was subsequently identified for the purpose of establishing
13 emission limitations as part of the Utah SIP. This subset includes any source located within any
14 of the three current nonattainment areas for PM₁₀: Salt Lake County, Utah County, or Ogden City
15 whose actual emissions of PM₁₀, SO₂, or NO_x exceeded 100 tons in 2011, or who had the
16 potential to emit 100 tpy of any of these pollutants. A source might also be included in the subset
17 if it was currently regulated for PM₁₀ under section IX, Part H of the Utah SIP. There were
18 several sources in Davis County that were close enough to the border so as to have originally
19 been included in the original PM₁₀ SIP.
20

21 As discussed before, the emission limits for these sources had already been reflected in the
22 projected emissions inventories used in the modeling analysis. Only those limits for which credit
23 is being taken in the SIP have been incorporated specifically into the SIP. Many of these limits
24 appear in state issued Approval Orders or Title V Operating Permits. Such regulatory documents
25 typically include many emission limits and operating restrictions. However, the limits found in
26 the SIP cannot be changed unless the State provides, and EPA approves, a SIP revision.
27

28 These limits are incorporated in the Utah SIP at Section IX, Part H (formerly Sections 1 and 2 of
29 Appendix A to Section IX, Part A), and as such are federally enforceable.
30

31 These conditions support a demonstration of maintenance through 2030.
32
33

34 **(4) Emission Reduction Credits** 35

36 Under Utah’s new source review rules in R307-403-8, banking of emission reduction credits
37 (ERCs) is permitted to the fullest extent allowed by applicable Federal Law as identified in 40
38 CFR 51, Appendix S, among other documents. Under Appendix S, Section IV.C.5, a permitting
39 authority may allow banked ERCs to be used under the preconstruction review program (R307-
40 403) as long as the banked ERCs are identified and accounted for in the SIP control strategy.
41

42 Existing Emission Reduction Credits, for PM₁₀, SO₂, and NO_x, were included in the modeled
43 demonstration of maintenance outlined in Subsection IX.A.10.c(1).
44

45 The subsequent crediting of any emission reduction of PM₁₀, or precursors thereto, whether pre-
46 existing or established subsequent to the approval of this SIP revision, remains permissible. In
47 general, credits must be in excess and must be established by actual, verifiable, and enforceable
48 reductions in emissions. Additionally, these ERCs cannot be used to offset major new sources or
49 major modifications at existing sources in PM_{2.5} nonattainment areas.
50

1 Once Salt Lake County is redesignated to attainment for PM₁₀, permitting new PM₁₀ sources or
2 major modifications to existing PM₁₀ sources will be conducted under the rules of the Prevention
3 of Significant Deterioration program.
4
5
6

7 **(5) Additional Controls for Future Years**
8

9 Since the emission limitations discussed in subsection IX.A.10.c.(3) are federally enforceable
10 and, as demonstrated in IX.A.10.c(1) above, are sufficient to ensure continued attainment of the
11 PM₁₀NAAQS, there is no need to require any additional control measures to maintain the PM₁₀
12 NAAQS.
13
14

15 **(6) Mobile Source Budget for Purposes of Conformity**
16

17 The transportation conformity provisions of section 176(c)(2)(A) of the Clean Air Act (CAA)
18 require regional transportation plans and programs to show that "...emissions expected from
19 implementation of plans and programs are consistent with estimates of emissions from motor
20 vehicles and necessary emissions reductions contained in the applicable implementation plan..."
21 EPA's transportation conformity regulation (40 CFR 93, Subpart A, last amended at 77 FR 14979,
22 March 14 2012) also requires that motor vehicle emission budgets must be established for the
23 last year of the maintenance plan, and may be established for any years deemed appropriate (see
24 40 CFR 93.118(b)(2)(i)). If the maintenance plan does not establish motor vehicle emissions
25 budgets for any years other than the last year of the maintenance plan, the conformity regulation
26 requires that a "demonstration of consistency with the motor vehicle emissions budget(s) must be
27 accompanied by a qualitative finding that there are not factors which would cause or contribute to
28 a new violation or exacerbate an existing violation in the years before the last year of the
29 maintenance plan." The normal interagency consultation process required by the regulation (40
30 CFR 93.105) shall determine what must be considered in order to make such a finding.
31

32 Thus, for a Metropolitan Planning Organization's (MPO's) Regional Transportation Plan (RTP),
33 analysis years that are after the last year of the maintenance plan (in this case 2030), a conformity
34 determination must show that emissions are less than or equal to the maintenance plan's motor
35 vehicle emissions budget(s) for the last year of the implementation plan.
36

37 EPA's MOVES2014 was used to calculate mobile source emissions, and road dust projections
38 were calculated using the January 2011 update to AP-42 Method for Estimating Re-Entrained
39 Road Dust from Paved Roads (Chapter 13, released 76 FR 6329 February 4, 2011).
40

41 Utah has determined that mobile sources are not significant contributors of SO₂ for this
42 maintenance plan. As such, this maintenance plan does not establish a motor vehicle emissions
43 budget for SO₂.
44

45 **(a) Salt Lake County Mobile Source PM10 Emissions Budgets**
46

47 In this maintenance plan, Utah is establishing transportation conformity motor vehicle emission
48 budgets (MVEB) for PM₁₀ (direct) and NO_x for 2030.
49

50 **(i) Direct PM10 Emissions Budget**
51

1 Direct (or “primary”) PM₁₀ refers to PM₁₀ that is not formed via atmospheric chemistry. Rather,
2 direct PM₁₀ is emitted straight from a mobile or stationary source. With regard to the emission
3 budget presented herein, direct PM₁₀ includes road dust, brake wear, and tire wear as well as
4 PM₁₀ from exhaust.

5
6 As presented in the Technical Support Document for on-road mobile sources, the estimated on-
7 road mobile source emissions for Salt Lake County, in 2030, of direct sources of PM₁₀ (road dust,
8 brake wear, tire wear, and exhaust particles) were 12.07 tons per winter-weekday. These mobile
9 source PM₁₀ emissions were included in the maintenance demonstration in Subsection
10 IX.A.10.c.(1) which estimates a maximum PM₁₀ concentration of 113.0 µg/m³ in 2030 within the
11 Salt Lake County portion of the modeling domain. The above PM₁₀ mobile source emission
12 figure of 12.07 tons per day (tpd) would traditionally be considered as the MVEB for the
13 maintenance plan. However, and as discussed below, the modeled concentration is 37.0 µg/m³
14 below the NAAQS of 150 µg/m³, and represents potential PM₁₀ emissions that may be considered
15 for allocation to the PM₁₀ MVEB.

16
17 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
18 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
19 compliance with the maintenance requirement. These additional emissions that can be allocated
20 to the applicable MVEB are considered the “safety margin.” As defined in 40 CFR 93.101,
21 safety margin represents the amount of emissions by which the total projected emissions from all
22 sources of a given pollutant are less than the total emissions that would satisfy the applicable
23 requirement for demonstrating maintenance. The implementation plan can then allocate some or
24 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

25
26 The safety margin for the Salt Lake County portion of the domain equates to 37.0 µg/m³.

27
28 To evaluate the portion of safety margin that could be allocated to the PM₁₀ MVEB, modeling
29 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.

30
31 Using the same emission projections for point and area and non-road mobile sources, the
32 SMOKE 3.6 emissions model was re-run using 24.00 tons of PM₁₀ per winter-weekday for
33 mobile sources (and 21.00 tons/winter-weekday of NO_x). The revised maintenance
34 demonstration for 2030 still shows maintenance of the PM₁₀ standard.

35
36 It estimates a maximum PM₁₀ concentration of 120.1 µg/m³ in 2030 within the Salt Lake County
37 portion of the modeling domain. This value is 29.9 µg/m³ below the NAAQ Standard of 150
38 µg/m³, but 7.1 µg/m³ higher than the previous value.

39
40 This shows that the safety margin is at least 11.93 tons/day of PM₁₀ (24.00 tons/day minus 12.07
41 tons/day) and 8.41 tons/day of NO_x (21.00 tons/day minus 12.59 tons/day). This maintenance
42 plan allocates this portion of the safety margin to the mobile source budgets for Salt Lake County,
43 and thereby sets the direct PM₁₀ MVEB for 2030 at 24.00 tons/winter-weekday.

44
45
46 **(ii) NO_x Emissions Budget**

47
48 Through atmospheric chemistry, NO_x emissions can substantially contribute to secondary PM₁₀
49 formation. For this reason, NO_x is considered a PM10 precursor.

50
51 As presented in the Technical Support Document for on-road mobile sources, the estimated on-
52 road mobile source NO_x emissions for Salt Lake County in 2030 were 12.59 tons per winter-

1 weekday. These mobile source PM₁₀ emissions were included in the maintenance demonstration
2 in Subsection IX.A.10.c.(1) which estimates a maximum PM₁₀ concentration of 113.0 µg/m³ in
3 2030 within the Salt Lake County portion of the modeling domain. The above NO_x mobile
4 source emission figure of 12.59 tons per day (tpd) would traditionally be considered as the
5 MVEB for the maintenance plan. However, and as discussed below, the modeled concentration
6 is 37.0 µg/m³ below the NAAQS of 150 µg/m³, and represents potential NO_x emissions that may
7 be considered for allocation to the NO_x MVEB.

8
9 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
10 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
11 compliance with the maintenance requirement. These additional emissions that can be allocated
12 to the applicable MVEB are considered the "safety margin." As defined in 40 CFR 93.101,
13 safety margin represents the amount of emissions by which the total projected emissions from all
14 sources of a given pollutant are less than the total emissions that would satisfy the applicable
15 requirement for demonstrating maintenance. The implementation plan can then allocate some or
16 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

17
18 The safety margin for the Salt Lake County portion of the domain equates to 37.0 µg/m³.

19
20 To evaluate the portion of safety margin that could be allocated to the PM₁₀ MVEB, modeling
21 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.

22
23 Using the same emission projections for point and area and non-road mobile sources, the
24 SMOKE 3.6 emissions model was re-run using 21.00 tons of NO_x per winter-weekday for on-
25 road mobile sources (and 24.00 tons/winter-weekday of PM₁₀). The revised maintenance
26 demonstration for 2030 still shows maintenance of the PM₁₀ standard.

27
28 It estimates a maximum PM₁₀ concentration of 120.1 µg/m³ in 2030 within the Salt Lake County
29 portion of the modeling domain. This value is 29.9 µg/m³ below the NAAQ Standard of 150
30 µg/m³, but 7.1 µg/m³ higher than the previous value.

31
32 This shows that the safety margin is at least 8.41 tons/day of NO_x (21.00 tons/day minus 12.59
33 tons/day) and 11.93 tons/day of PM₁₀ (24.00 tons/day minus 12.07 tons/day). This maintenance
34 plan allocates this portion of the safety margin to the mobile source budgets for Salt Lake County,
35 and thereby sets the NO_x MVEB for 2030 at 21.00 tons/winter-weekday

36
37
38 **(b) Net Effect to Maintenance Demonstration**

39
40 Using the procedure described above, some of the identified safety margin indicated earlier in
41 Subsection IX.A.10.c(6) has been allocated to the mobile vehicle emissions budgets. The results
42 of this modification are presented below.

43
44 **(i) Inventory: The emissions inventory was adjusted as shown below:**

45
46 in 2030: PM₁₀ was adjusted by adding 11.93 ton/day (tpd) of safety margin to
47 12.07 tpd inventory for a total of 24.00 tpd, and

48
49 NO_x was adjusted by adding 8.41 tpd of safety margin to 12.59 tpd
50 inventory for a total of 21.00 tpd,

1 **(ii) Modeling:**

2
3 The effect on the modeling results throughout the domain is summarized in the following
4 Table IX.A.10. 9 (which shows predicted concentrations in $\mu\text{g}/\text{m}^3$). It demonstrates that
5 with the allocation of the safety margin, the NAAQS is still maintained through 2030 in
6 all areas.

7
8
9 **Table IX.A.10. 9 Modeling of Attainment in 2030, Including the Portion of the Safety**
10 **Margin Allocated to Motor Vehicles**

11

Air Quality Monitor	Predicted Concentrations in 2030 $\mu\text{g}/\text{m}^3$	
	A	B
Hawthorne	113.0	120.1
Magna	81.1	82.5

12
13 **Notes:** Column A shows concentrations presented previously as part of the modeled attainment test.
14 Column B shows concentrations resulting from allocation of a portion of the safety margin.

15
16
17
18 **(7) Nonattainment Requirements Applicable Pending Plan Approval**

19
20 CAA 175A(c) - *Until such plan revision is approved and an area is redesignated as attainment,*
21 *the requirements of CAA Part D, Plan Requirements for Nonattainment Areas, shall remain in*
22 *force and effect.* The Act requires the continued implementation of the nonattainment area
23 control strategy unless such measures are shown to be unnecessary for maintenance or are
24 replaced with measures that achieve equivalent reductions. Utah will continue to implement the
25 emissions limitations and measures from the PM₁₀ SIP.

26
27
28 **(8) Revise in Eight Years**

29
30 CAA 175A(b) - *Eight years after redesignation, the State must submit an additional plan revision*
31 *which shows maintenance of the applicable NAAQS for an additional 10 years.* Utah commits to
32 submit a revised maintenance plan eight years after EPA takes final action redesignating the [Salt](#)
33 [Lake County](#) area to attainment, as required by the Act.

34
35
36 **(9) Verification of Continued Maintenance**

37
38 Implicit in the requirements outlined above is the need for the State to determine whether the area
39 is in fact maintaining the standard it has achieved. There are two complementary ways to
40 measure this: 1) by monitoring the ambient air for PM₁₀, and 2) by inventorying emissions of
41 PM₁₀ and its precursors from various sources.

42
43 The State will continue to maintain an ambient monitoring network for PM₁₀ in accordance with
44 40 CFR Part 58 and the Utah SIP. The State anticipates that the EPA will continue to review the

1 ambient monitoring network for PM₁₀ each year, and any necessary modifications to the network
2 will be implemented.

3
4 Additionally, the State will track and document measured mobile source parameters (e.g., vehicle
5 miles traveled, congestion, fleet mix, etc.) and new and modified stationary source permits. If
6 these and the resulting emissions change significantly over time, the State will perform
7 appropriate studies to determine: 1) whether additional and/or re-sited monitors are necessary,
8 and 2) whether mobile and stationary source emission projections are on target.

9
10 The State will also continue to collect actual emissions inventory data from all sources of PM₁₀,
11 SO₂, and NO_x in excess of 25 tons (in aggregate) per year, as required by R307-150.

12 13 14 15 **(10) Contingency Measures**

16
17 *CAA 175A(d) - Each maintenance plan shall contain contingency measures to assure that the*
18 *State will promptly correct any violation of the standard which occurs after the redesignation of*
19 *the area to attainment. Such provisions shall include a requirement that the State will implement*
20 *all control measures which were contained in the SIP prior to redesignation.*

21
22 Utah has implemented all measures contained in the nonattainment plan, however for the
23 purposes of this maintenance plan the list of stationary sources included in SIP Section IX. Part
24 H. was updated. Some of the sources identified in the nonattainment SIP are no longer
25 operational or no longer rise to the emission thresholds established for such inclusion. In such
26 instances, the emission limits belonging specifically to these sources were not carried forward.
27 Where such a source is still operational, the prior SIP limits from the nonattainment plan are
28 identified below as potential contingency measures. Some of the specific limits within may no
29 longer apply and would need to be reevaluated at that time.

30
31 This Contingency Plan for [Salt Lake County](#) supersedes Subsection IX.A.8, Contingency
32 Measures, which is part of the original PM₁₀ SIP.

33
34 The contingency plan must also ensure that the contingency measures are adopted expeditiously
35 once triggered. The primary elements of the contingency plan are: 1) the list of potential
36 contingency measures, 2) the tracking and triggering mechanisms to determine when
37 contingency measures are needed, and 3) a description of the process for recommending and
38 implementing the contingency measures.

39 40 **(a) Tracking**

41
42 The tracking plan for the Salt Lake County, Utah County, and Ogden City areas consists of
43 monitoring and analyzing PM₁₀ concentrations. In accordance with 40 CFR 58, the State will
44 continue to operate and maintain an adequate PM₁₀ monitoring network in Salt Lake County,
45 Utah County, and Ogden City.

46 47 48 **(b) Triggering**

49
50 Triggering of the contingency plan does not automatically require a revision to the SIP, nor does
51 it necessarily mean the area will be redesignated once again to nonattainment. Instead, the State
52 will normally have an appropriate timeframe to correct the potential violation with

1 implementation of one or more adopted contingency measures. In the event that violations
2 continue to occur, additional contingency measures will be adopted until the violations are
3 corrected.

4
5 Upon notification of a potential violation of the PM₁₀ NAAQS, the State will develop appropriate
6 contingency measures intended to prevent or correct a violation of the PM₁₀ standard.
7 Information about historical exceedances of the standard, the meteorological conditions related to
8 the recent exceedances, and the most recent estimates of growth and emissions will be reviewed.
9 The possibility that an exceptional event occurred will also be evaluated.

10
11 Upon monitoring a potential violation of the PM₁₀ NAAQS, including exceedances flagged as
12 exceptional events but not concurred with by EPA, the State will take the following actions.

- 13
14 • The State will identify the source(s) of PM₁₀ causing the potential violation, and report
15 the situation to EPA Region VIII within four months of the potential violation.
- 16
17 • The State will identify a means of corrective action within six months after a potential
18 violation. The maintenance plan contingency measures to be considered and selected
19 will be chosen from the following list or any other emission control measures deemed
20 appropriate based on a consideration of cost-effectiveness, emission reduction potential,
21 economic and social considerations, or other factors that the State deems appropriate:
 - 22
23 - Re-evaluate the thresholds at which a red or yellow burn day is triggered, as
24 established in R307-302;
 - 25
26 - Further controls on stationary sources; to include the prior SIP controls at the
27 following sources listed below:

28
29
30 **Prior SIP Source**
31 **Controls**

Reference to Prior SIP

32		
33	Crysen Refining (now Silver Eagle)	IX.H.2.b.L
34	Hercules (now ATK/Bacchus)	IX.H.2.b.S
35	Interstate Brick	IX.H.2.b.U
36	Kennecott / Barney's Canyon	IX.H.2.b.AA
37	LDS Welfare Square	IX.H.2.b.CC
38	LDS Hospital	IX.H.2.b.DD
39	Mountain Bell	IX.H.2.b.HH
40	Mountain Fuel, 100 S. 1078 W. (now Questar)	IX.H.2.b.II
41	Murray City Power	IX.H.2.b.KK
42	Utah Metal Works	IX.H.2.b.ZZ
43	V.A. Hospital	IX.H.2.b.CCC
44		

45
46
47 The State will then hold a public hearing to consider the contingency measures identified to
48 address the potential violation. The State will require implementation of such corrective action
49 no later than one year after a violation is confirmed. Any contingency measures adopted and
50 implemented will become part of the next revised maintenance plan submitted to the EPA for
51 approval.

1 It is also possible that contingency measures may be pre-implemented, where no violation of the
2 2006 PM₁₀ NAAQS has yet occurred.
3
4



State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQ-050-15

MEMORANDUM

TO: Air Quality Board

THROUGH: Bryce C. Bird, Executive Secretary

FROM: Bill Reiss, Environmental Engineer

DATE: August 21, 2015

SUBJECT: PROPOSE FOR PUBLIC COMMENT: **Repeal of Existing SIP Subsection IX.A.11 and Re-enact with SIP Subsection IX.A.11: PM₁₀ Maintenance Provisions for Utah County.**

Introduction:

This item concerns a proposed State Implementation Plan (SIP) revision to address Utah's three nonattainment areas for PM₁₀. These areas have been attaining the PM₁₀ standard for a long time, and this revision demonstrates that they will continue to do so through the year 2030.

The revision is structured as a maintenance plan, which will allow Utah to request that EPA change the area designations back to attainment for PM₁₀. These areas include Salt Lake County, Utah County, and Ogden City.

The existing SIP for PM₁₀ affecting Salt Lake and Utah Counties was adopted in 1991 and resulted in attainment of the 1987 National Ambient Air Quality Standards (NAAQS) in both areas by 1996. Since that time, PM_{2.5} has supplanted PM₁₀ as the indicator of fine particulate matter. Though PM₁₀ also includes the coarse fraction of PM, Utah's difficulties with PM₁₀ were characterized by the same winter time episodes that lead to elevated PM_{2.5} levels.

Essentially, this SIP revision would close the book on PM₁₀ and allow Utah to focus on meeting the PM_{2.5} standard. All three of the affected areas are currently designated nonattainment for PM_{2.5}.

Scope:

There are two parts to the SIP revision. (This) Section IX. Part A is the SIP document itself, and addresses the criteria necessary to request redesignation. It includes the actual Maintenance Plan, which includes the quantitative demonstration of continued attainment.

Some of the items addressed in Part A include:

- monitored attainment of the PM₁₀ NAAQS
- establishment of motor vehicle emission budgets for purposes of transportation conformity
- consideration of emission reduction credits, and
- contingency measures

The second piece is SIP Section IX, Part H. It includes the emission limits for certain specific stationary sources. Including these limits in the SIP makes them federally enforceable.

The list of stationary sources to be included in Part H was updated as part of this proposal. It includes sources located in any of the nonattainment areas with actual emissions (in 2011), or potentials to emit, that are at least 100 tons per year for PM₁₀, SO₂, or NO_x.

Using these criteria means that some sources will not be retained in the revised Part H, while other new sources, that did not exist when the original SIP was written, will be added.

SIP Organization:

As originally written in 1991, the PM₁₀ nonattainment SIP for Salt Lake and Utah Counties resides at Section IX.A. 1-8 of the Utah SIP. This plan had projected attainment of the NAAQS through the year 2003.

In 2005, Utah prepared a revision to the plan that showed continued attainment in **Utah County** through the year 2017. This revision, also structured as a maintenance plan, was placed into the SIP at Section **IX.A.11**. Subsections IX.A.10 and 12 were also added as the maintenance plan provisions for Salt Lake County and Ogden City respectively.

At this time, DAQ staff is proposing to replace each of these three subsections of the SIP in separate actions. Since there is a large amount of redundant material in the three documents, they have been prepared using color coding to denote which parts of each plan are specific to the respective nonattainment areas. In reviewing the proposals, the reader should note that **green text** is specific to the **Utah County** nonattainment area. Likewise, **blue text** and **purple text** are specific to Salt Lake County and Ogden City respectively.

Staff Recommendation: Staff recommends that the Board propose for public comment to repeal existing SIP Subsection **IX.A.11**, and re-enact with SIP Subsection **IX.A.11: PM₁₀ Maintenance Provisions for Utah County**, as proposed.

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UTAH

PM₁₀ Maintenance Provisions for Utah County

Section IX.A.11

Adopted by the Air Quality Board
December 2, 2015

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Section IX.A.11
PM₁₀ Maintenance Provisions for Utah County

5
6
IX.A.11.a Introduction

7 The State of Utah is requesting that the U.S. Environmental Protection Agency (EPA) redesignate
8 the Utah County nonattainment area to attainment status for the 24-hour PM₁₀ National Ambient
9 Air Quality Standard (NAAQS).

10
11 The foregoing Subsections 1-9 of Part IX.A of the Utah State Implementation Plans (SIP) were
12 written in 1991 to address violations of the NAAQS for PM₁₀ in both Utah County and Salt Lake
13 County. These areas were each classified as Initial Moderate PM₁₀ Nonattainment Areas, and as
14 such required “nonattainment SIPs” to bring them into compliance with the NAAQS by a
15 statutory attainment date. The control measures adopted as part of those plans have proven
16 successful in that regard, and at the time of this writing (2015) each of these areas continues to
17 show compliance with the federal health standards for PM₁₀.

18
19 This Subsection 11 of Part IX.A of the Utah SIP represents the second chapter of the PM₁₀ story
20 for Utah County, and demonstrates that the area has achieved compliance with the PM₁₀ NAAQS
21 and will continue to maintain that standard through the year 2030. As such, it is written in
22 accordance with Section 175A (42 U.S.C. 7505a) of the federal Clean Air Act (the Act), and
23 should serve to satisfy the requirement of Section 107(d)(3)(E)(iv) of the Act.

24
25 This section is hereafter referred to as the “Maintenance Plan” or “the Plan,” and contains the
26 maintenance provisions of the PM₁₀ SIP for Utah County.

27
28 While the Maintenance Plan could be written to replace all that had come before, it is presented
29 herein as an addendum to Subsections 1-9 in the interest of providing the reader with some sense
30 of historical perspective. Subsections 1-9 are retained for historical purposes, while existing
31 subsection 10 (transportation conformity for Utah County) is replaced with the maintenance
32 provisions for Salt Lake County. Transportation conformity for Utah County is herein replaced
33 with a more current evaluation of transportation conformity.

34
35 In a similar way, any references to the Technical Support Document (TSD) in this section means
36 actually Supplement IV-15 to the Technical Support Document for the PM₁₀ SIP.

37
38
39 **Background**

40
41 The Act requires areas failing to meet the federal ambient PM₁₀ standard to develop SIP revisions
42 with sufficient control requirements to expeditiously attain and maintain the standard. On July 1,
43 1987, EPA promulgated a new NAAQS for particulate matter with a diameter of 10 microns or
44 less (PM₁₀), and listed Utah County as a Group I area for PM₁₀. This designation was based on
45 historical data for the previous standard, total suspended particulate, and indicated there was a
46 95% probability the area would exceed the new PM₁₀ standard. Group I area SIPs were due in
47 April 1988, but Utah was unable to complete the SIP by that date. In 1989, several citizens
48 groups sued EPA (*Preservation Counsel v. Reilly*, civil Action (No. 89-C262-G (D, Utah)) for

1 failure to implement a Federal Implementation Plan (FIP) under provisions of §110(c)(1) of the
2 Clean Air Act (42 U.S.C. 7410(c)(1)).

3
4 A settlement agreement in January 1990 called for Utah to submit a SIP and for EPA to approve
5 it by December 31, 1991. In August 1991, the parties voluntarily agreed to dismiss the lawsuit
6 and the complaint and vacate the settlement agreement.

7
8 The Clean Air Act Amendments of November 1990 redesignated Group I areas as initial
9 moderate nonattainment areas and required that SIPs be submitted by November 15, 1991. These
10 moderate area SIPs were to require installation of Reasonably Available Control Measures
11 (RACM) on industrial sources by December 10, 1993 and a demonstration the NAAQS would be
12 attained no later than December 31, 1994.

13 14 **(1) The PM₁₀ SIP**

15
16 On November 14, 1991, Utah submitted a SIP for Salt Lake and Utah Counties that demonstrated
17 attainment of the PM₁₀ standards in Salt Lake and Utah Counties for 10 years, 1993 through
18 2003. EPA published approval of the SIP on July 8, 1994 (59 FR 35036).

19 20 **(2) Supplemental History of SIP Approval - PM₁₀**

21
22 Utah's SIP included two provisions that promised additional action by the state: 1) a road salting
23 and sanding program, and 2) a diesel vehicle emissions inspection and maintenance program.

24
25 On February 3, 1995, Utah submitted amendments to the SIP to specify the details of the road
26 salting and sanding program promised as a control measure. EPA published approval of the road
27 salting and sanding provisions on December 6, 1999 (64 FR 68031).

28
29 On February 6, 1996, Utah submitted to EPA a new SIP Section XXI, a diesel vehicle inspection
30 and maintenance program.

31
32 Also, in April 1992, EPA published the "General Preamble," describing EPA's views on
33 reviewing state SIP submittals. One of the requirements was that moderate nonattainment area
34 states must submit contingency plans by November 15, 1993.

35
36 On July 31, 1994, Utah submitted an amendment to the PM₁₀ SIP that required lowering the
37 threshold for calling no-burn days as a contingency measure for Salt Lake, Davis and Utah
38 Counties.

39
40 On July 18, 1997, EPA promulgated a new form of the PM₁₀ standard. As a way to simplify
41 EPA's process of revoking the old PM₁₀ standard, EPA requested on April 6, 1998, that Utah
42 withdraw its submittals of contingency measures. Utah submitted a letter requesting withdrawal
43 on November 9, 1998, and EPA returned the submittals on January 29, 1999.

44 45 **(3) Attainment of the PM₁₀ Standard and Reasonable Further Progress**

46
47 By statute, EPA was to determine whether Initial Moderate Areas were attaining the standard as
48 of December 31, 1994. This determination requires an examination of the three previous calendar
49 years of monitoring data (in this case 1992, 1993 and 1994). The 24-hour NAAQS allows no
50 more than three expected exceedances of the 24-hour standard at any monitor in this 3-year
51 period. Since the statutory deadline for the implementation of RACM was not until the end of
52 1993, it was reasonable to presume that the area might not be able to show attainment with a 3-

1 year data set until the end of 1996 even if the control measures were having the desired effect.
2 Presumably for this reason, Section 188(d) of the Act, (42 U.S.C. 7513(d)) allows a state to
3 request up to two 1-year extensions of the attainment date. In doing so, the state must show that
4 it has met all requirements of the SIP, that no more than one exceedance of the 24-hour PM₁₀
5 NAAQS has been observed in the year prior to the request, and that the annual mean
6 concentration for such year is less than or equal to the annual standard.

7
8 EPA's Office of Air Quality Planning and Standards issued a guidance memorandum concerning
9 extension requests (November 14, 1994), clarifying that the authority delegated to the
10 Administrator for extending moderate area attainment dates is discretionary. In exercising this
11 discretionary authority, it says, EPA will examine the air quality planning progress made in the
12 area, and in addition to the two criteria specified in Section 188(d), EPA will be disinclined to
13 grant an attainment date extension unless a state has, in substantial part, addressed its moderate
14 PM₁₀ planning obligations for the area. The EPA will expect the State to have adopted and
15 substantially implemented control measures submitted to address the requirement for
16 implementing RACM/RACT in the moderate nonattainment area, as this was the central control
17 requirement applicable to such areas. Furthermore it said, "EPA believes this request is
18 appropriate, as it provides a reliable indication that any improvement in air quality evidenced by a
19 low number of exceedances reflects the application of permanent steps to improve the air quality
20 in the region, rather than temporary economic or meteorological changes." As part of this
21 showing, EPA expected the State to demonstrate that the PM₁₀ nonattainment area has made
22 emission reductions amounting to reasonable further progress (RFP) toward attainment of the
23 NAAQS, as defined in Section 171(1) of the Act.

24
25 On May 11, 1995, Utah requested one-year extensions of the attainment date for both Salt Lake
26 and Utah Counties. On October 18, 1995, EPA sent a letter granting the requests for extensions,
27 and on January 25, 1996, sent a letter indicating that EPA would publish a rulemaking action on
28 the extension requests. **On March 27, 1996, Utah requested a second one-year extension for Utah**
29 **County.**

30
31 Along with the extension requests in 1995, Utah submitted a milestone report as required under
32 Section 172(1) of the Act, (42 U.S.C. 7501(1)) to assess progress toward attainment. This
33 milestone report addressed two issues: 1) that all control measures in the approved plan had been
34 implemented, and 2) that reasonable further progress (RFP) had been made toward attainment of
35 the standard in terms of reducing emissions. As defined in Section 171(1), RFP means such
36 annual incremental reductions in emissions of the relevant air pollutant as are required to ensure
37 attainment of the applicable NAAQS by the applicable date.

38
39 On June 18, 2001, EPA published notice in the Federal Register (66 FR 32752) that Utah's
40 extension requests were granted, that Salt Lake County attained the PM₁₀ standard by December
41 31, 1995, and that Utah County attained the standard by December 31, 1996. The notice stated
42 that these areas remain moderate nonattainment areas and are not subject to the additional
43 requirements of serious nonattainment areas.

44 45 46 **IX.A.11.b Pre-requisites to Area Redesignation**

47
48 Section 107(d)(3)(E) of the Act outlines five requirements that must be satisfied in order that a
49 state may petition the Administrator to redesignate a nonattainment area back to attainment.
50 These requirements are summarized as follows: 1) the Administrator determines that the area has

1 attained the applicable NAAQS, 2) the Administrator has fully approved the applicable
 2 implementation plan for the area under §110(k) of the Act, 3) the Administrator determines that
 3 the improvement in air quality is due to permanent and enforceable reductions in emissions
 4 resulting from implementation of the applicable implementation plan ... and other permanent and
 5 enforceable reductions, 4) the Administrator has fully approved a maintenance plan for the area
 6 as meeting the requirements of §175A of the Act, and 5) the State containing such area has met
 7 all requirements applicable to the area under §110 and Part D of the Act.

8
 9 Each of these requirements will be addressed below. Certainly, the central element from this list
 10 is the maintenance plan found at Subsection IX.A.11.c below. Section 175A of the Act contains
 11 the necessary requirements of a maintenance plan, and EPA policy based on the Act requires
 12 additional elements in order that such plan be federally approvable. Table IX.A.11. 1 identifies
 13 the prerequisites that must be fulfilled before a nonattainment area may be redesignated to
 14 attainment under Section 107(d)(3)(E) of the Act.

15
 16

Table IX.A.11. 1 Prerequisites to Redesignation in the Federal Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Attainment of Standard	Three consecutive years of PM ₁₀ monitoring data must show that violations of the standard are no longer occurring.	CAA §107(d)(3)(E)(i)	IX.A.11.b(1)
Approved State Implementation Plan	The SIP for the area must be fully approved.	CAA §107(d)(3)(E)(ii)	IX.A.11.b(2)
Permanent and Enforceable Emissions Reductions	The State must be able to reasonably attribute the improvement in air quality to emission reductions that are permanent and enforceable	CAA §107(d)(3)(E)(iii), Calcagni memo (Sect 3, para 2)	IX.A.11.b(3)
Section 110 and Part D requirements	The State must verify that the area has met all requirements applicable to the area under section 110 and Part D.	CAA: §107(d)(3)(E)(v), §110(a)(2), Sec 171	IX.A.11.b(4)
Maintenance Plan	The Administrator has fully approved the Maintenance Plan for the area as meeting the requirements of CAA §175A	CAA: §107(d)(3)(E)(iv)	IX.A.11.b(5) and IX.A.11.c

17
 18
 19 **(1) The Area Has Attained the PM₁₀ NAAQS**

20 CAA 107(d)(3)(E)(i) - *The Administrator determines that the area has attained the national*
 21 *ambient air quality standard.* To satisfy this requirement, the State must show that the area is
 22 attaining the applicable NAAQS. According to EPA's guidance concerning area redesignations
 23 (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni to
 24 Regional Air Directors, September 4, 1992 [or, Calcagni]), there are generally two components
 25 involved in making this demonstration. The first relies upon ambient air quality data which
 26 should be representative of the area of highest concentration and should be collected and quality
 27 assured in accordance with 40 CFR 58. The second component relies upon supplemental air
 28 quality modeling. Each will be discussed in turn.

29 **(a) Ambient Air Quality Data (Monitoring)**
 30

1 In 1987 EPA promulgated the National Ambient Air Quality Standard (NAAQS) for PM₁₀. The
2 NAAQS for PM₁₀ is listed in 40 CFR 50.6 along with the criteria for attaining the standard. The
3 24-hour NAAQS is 150 micrograms per cubic meter (ug/m³) for a 24-hour period, measured from
4 midnight to midnight. The 24-hour standard is attained when the expected number of days per
5 calendar year with a 24-hour average concentration above 150 ug/m³, as determined in
6 accordance with Appendix K to that part, is equal to or less than one. In other words, each
7 monitoring site is allowed up to three expected exceedances of the 24-hour standard within a
8 period of three calendar years. More than three expected exceedances in that three-year period is
9 a violation of the NAAQS.

10
11 There also had been an annual standard of 50 ug/m³. The annual standard was attained if the
12 three-year average of individual annual averages was less than 50 ug/m³. Utah never violated the
13 annual standard at any of its monitoring stations, and the annual average was not retained as a
14 PM₁₀ standard when the NAAQS was revised in 2006. Nevertheless, an annual average still
15 provides a useful metric to evaluate long-term trends in PM₁₀ concentrations here in Utah where
16 short-term meteorology has such an influence on high 24-hour concentrations during the winter
17 season.

18
19 40 CFR 58 Appendix K, Interpretation of the National Ambient Air Quality Standards for
20 Particulate Matter, acknowledges the uncertainty inherent in measuring ambient PM₁₀
21 concentrations by specifying that an *observed exceedance* of the (150 ug/m³) 24-hour health
22 standard means a daily value that is above the level of the 24-hour standard after rounding to the
23 nearest 10 ug/m³ (e.g., values ending in 5 or greater are to be rounded up).

24
25 The term *expected exceedance* accounts for the possibility of missing data. Missing data can
26 occur when a monitor is being repaired, calibrated, or is malfunctioning, leaving a time gap in the
27 monitored readings. EPA discounts these gaps if the highest recorded PM₁₀ reading at the
28 affected monitor on the day before or after the gap is not more than 75 percent of the standard,
29 and no measured exceedance has occurred during the year.

30
31 Expected exceedances are calculated from the Aerometric Information and Retrieval System
32 (AIRS) data base according to procedures contained in 40 CFR Part 50, Appendix K. The State
33 relied on the expected exceedance values contained in the AIRS Quick Look Report (AMP 450)
34 to determine if a violation of the standard had occurred.

35
36 Data may also be flagged when circumstances indicate that it would represent an outlier in the
37 data set and not be indicative of the entire airshed or the efforts to reasonably mitigate air
38 pollution within. Appendix N to Part 50 – “Interpretation of the National Ambient Air Quality
39 Standards for Particulate Matter” anticipates this and states: “Data resulting from uncontrollable
40 or natural events, for example structural fires or high winds, may require special consideration.
41 In some cases, it may be appropriate to exclude these data because they could result in
42 inappropriate values to compare with the levels of the PM standards.” The protocol for data
43 handling dictates that flagging is initiated by the state or local agency, and then the EPA either
44 concurs or indicates that it has not concurred. Some discussion will be provided to help the
45 reader understand the occasional occurrence of wind-blown dust events that affect these
46 nonattainment areas, and how the resulting data should be interpreted with respect to the control
47 measures enacted to address the 24-hour NAAQS.

48
49 Using the criteria from 40 CFR 58 Appendix K, data was compiled for all PM₁₀ monitors
50 within the **Utah County** nonattainment area that recorded a four-year data set comprising the
51 years 2011 – 2014. For each monitor, the number of expected exceedances is reported for each
52 year, and then the average number of expected exceedances is reported for the overlapping three-

1 year periods. If this average number of expected exceedances is less than or equal to 1.0, then
 2 that particular monitor is said to be in compliance with the 24-hour standard for PM₁₀. In order
 3 for an area to be in compliance with the NAAQS, every monitor within that area must be in
 4 compliance.

5
 6 As illustrated in the table below, the results of this exercise show that the Utah County PM₁₀
 7 nonattainment area is presently attaining the NAAQS.

8
 9 **Table IX.A.11. 2 PM₁₀ Compliance in Utah County, 2011-2014**

10

Lindon 49-049-4001	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	0.0 / 0.0*	0.0 / 0.0*

11

North Provo 49-049-0002	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	0.0 / 0.0*	0.0 / 0.0*

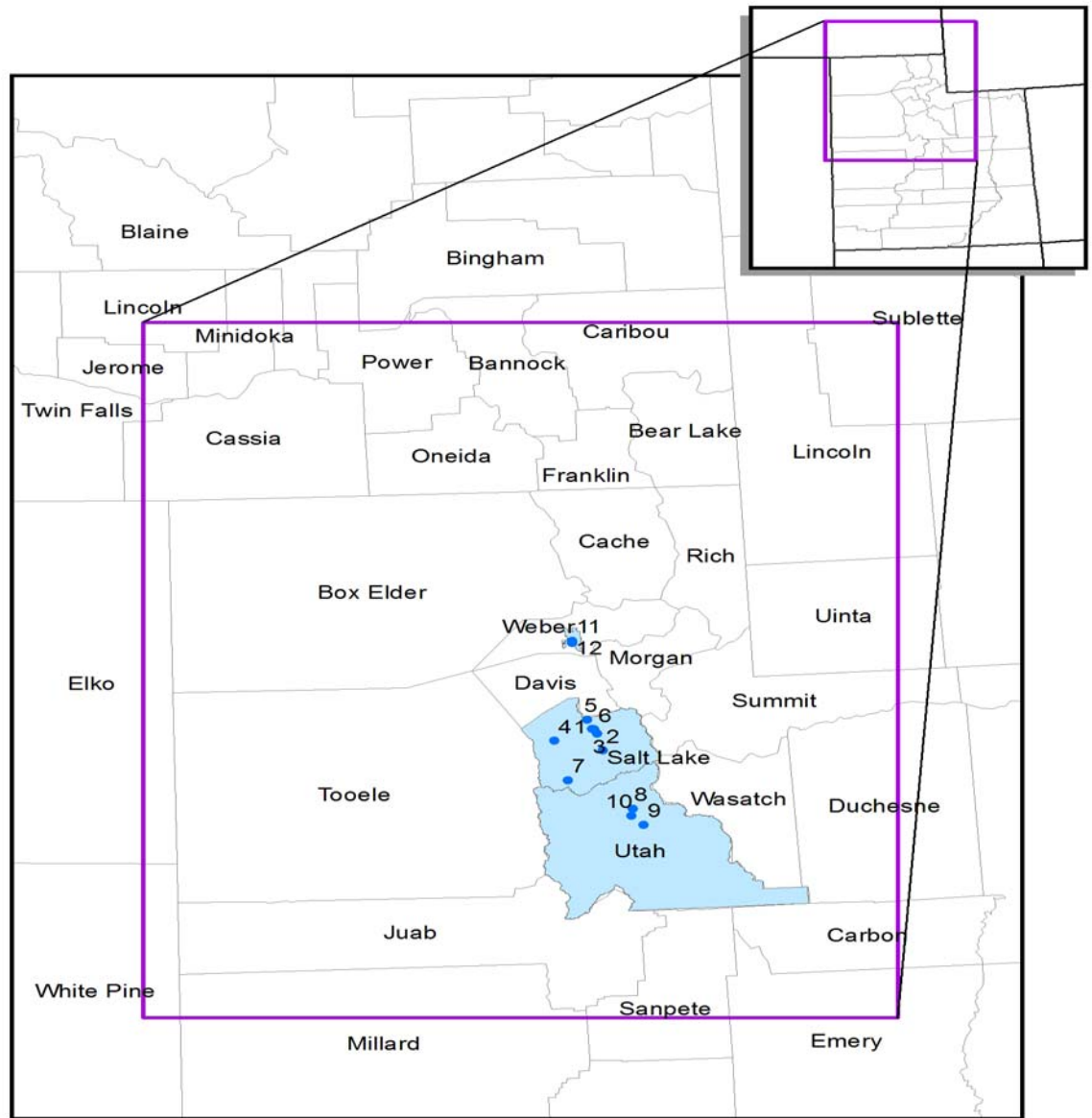
12
 13 * The second set of numbers shows what would be the effect of including all of the data that has
 14 been flagged by DAQ and not yet concurred with by EPA.

15
 16 **(b) PM₁₀ Monitoring Network**

17
 18 The overall assessments made in the preceding paragraph were based on data collected at
 19 monitoring stations located throughout the nonattainment area. The Utah DAQ maintains a
 20 network of PM₁₀ monitoring stations in accordance with 40 CFR 58. These stations are referred
 21 to as SLAMS sites, meaning that they are State and Local Air Monitoring Stations. In
 22 consultation with EPA, an Annual Monitoring Network Plan is developed to address the
 23 adequacy of the monitoring network for all criteria pollutants. Within the network, individual
 24 stations may be situated so as to monitor large sources of PM₁₀, capture the highest
 25 concentrations in the area, represent residential areas, or assess regional concentrations of PM₁₀.
 26 Collectively, these monitors make up Utah's PM₁₀ monitoring network. The following
 27 paragraphs describe the network in each of Utah's three nonattainment areas for PM₁₀.

28
 29 Provided in Figure IX.A.11. 1 is a map of the modeling domain that shows the existing PM₁₀
 30 nonattainment areas and the locations of the monitors therein. Some of the monitors at these
 31 locations are no longer operational, but they have been included for informational purposes.

1 **Figure IX.A.11.1 Modeling Domain**



2
3 The following PM₁₀ monitoring stations operated in the Salt Lake County PM₁₀ nonattainment
4 area from 1985 through 2015. They are numbered as they appear on the map:
5

- 6 1. Air Monitoring Center (AMC) (AIRS number 49-035-0010): This site was located in an
7 urban city center, near an area of high vehicle use. It was closed in 1999 when DAQ lost
8 its lease on the building.
9
- 10 2. Cottonwood (AIRS number 49-035-0003): This site was located in a suburban
11 residential area. It collected data from 1986 - 2011. It was closed in 2011 due to siting
12 criteria violations as well as safety concerns.
13
- 14 3. Hawthorne (AIRS number 49-035-3006): This site is located in a suburban residential
15 area. It began collecting data in 1997 and is the NCORE site for Utah.

- 1
- 2 4. Magna (AIRS number 49-035-1001): This site is located in a suburban residential area.
- 3 It was historically impacted periodically by blowing dust from a large tailings
- 4 impoundment, and as such is anomalous with respect to the typical wintertime scenario
- 5 that otherwise characterizes the nonattainment area. It has been collecting data since
- 6 1987.
- 7
- 8 5. North Salt Lake (AIRS number 49-035-0012): This site was located in an industrial area
- 9 that is impacted by sand and gravel operations, freeway traffic, and several refineries. It
- 10 was near a residential area as well. It collected data from 1985 - 2013. The monitor was
- 11 situated over a sewer main, and service of that main required its removal in September
- 12 2013, and following the service, the site owner did not allow the monitor to return.
- 13
- 14 6. Salt Lake City (AIRS number 49-035-3001): This site was situated in an urban city
- 15 center. It was discontinued in 1994 because of modifications that were made to the air
- 16 conditioning on the roof-top.
- 17
- 18 7. Herriman #3 (AIRS number 49-035-3012): This site is located in a suburban residential
- 19 area. It began collecting data in 2015.
- 20
- 21

22 The following PM₁₀ monitoring stations operated in the Utah County PM₁₀ nonattainment area
23 from 1985 through 2015. They are numbered as they appear on the map:

- 24
- 25 8. Lindon (AIRS number 49-049-4001): This site is designed to measure population
- 26 exposure to PM₁₀. It is located in a suburban residential area affected by both industrial
- 27 and vehicle emissions. PM₁₀ has been measured at this site since 1985, and the readings
- 28 taken here have consistently been the highest in Utah County. Area source emissions,
- 29 primarily wood smoke, also affect the site.
- 30
- 31 9. North Provo (AIRS number 49-049-0002): This is a neighborhood site in a mixed
- 32 residential-commercial area in Provo, Utah. It began collecting data in 1986.
- 33
- 34 10. West Orem (AIRS number 49-049-5001): This site was originally located in a residential
- 35 area adjacent to a large steel mill which has since closed. It is a neighborhood site. It
- 36 was situated based on computer modeling, and has historically reported high PM₁₀
- 37 values, but not consistently as high as those observed at the Lindon site. The site was
- 38 closed at the end of 1997 for this reason.
- 39

40 The following PM₁₀ monitoring stations operated in the Ogden City PM₁₀ nonattainment area
41 from 1986 through 2015. They are numbered as they appear on the map:

- 42
- 43 11. Ogden 1 (AIRS number 49-057-0001): This site was situated in an urban city center. It
- 44 was discontinued in 2000 because DAQ lost its lease on the building.
- 45
- 46 12. Ogden 2 (AIRS number 49-057-0002): This site began collecting data in 2001, as a
- 47 replacement for the Ogden 1 location. It, too, is situated in an urban city center.
- 48

49 **(c) Modeling Element**

50

1 EPA guidance concerning redesignation requests and maintenance plans (Calcagni) discusses the
2 requirement that the area has attained the standard, and notes that air quality modeling may be
3 necessary to determine the representativeness of the monitored data.

4
5 Information concerning PM₁₀ monitoring in Utah is included in the Annual Monitoring Network
6 Review and The 5 Year Network Plan. Since the early 1980's, the network review has been
7 updated annually and submitted to EPA for approval. EPA has concurred with the annual
8 network reviews and agreed that the PM₁₀ network is adequate. EPA personnel have also visited
9 the monitor sites on several occasions to verify compliance with federal siting requirements.
10 Therefore, additional modeling will not be necessary to determine the representativeness of the
11 monitored data.

12
13 The Calcagni memo goes on to say that areas that were designated nonattainment based on
14 modeling will generally not be redesignated to attainment unless an acceptable modeling analysis
15 indicates attainment.

16
17 Though none of Utah's three PM₁₀ nonattainment areas was designated based on modeling,
18 Calcagni also states that (when dealing with PM₁₀) dispersion modeling will generally be
19 necessary to evaluate comprehensively sources' impacts and to determine the areas of expected
20 high concentrations based upon current conditions. Air quality modeling was conducted for the
21 purpose of this maintenance demonstration. It shows that all three nonattainment areas are
22 presently in compliance, and will continue to comply with the PM₁₀ NAAQS through the year
23 2030.

24
25 **(d) EPA Acknowledgement**

26
27 The data presented in the preceding paragraphs shows quite clearly that the Utah County PM₁₀
28 nonattainment area is attaining the NAAQS. As discussed before, the EPA acknowledged in the
29 Federal Register that both Utah County and Salt Lake County had already attained.

30
31 On June 18, 2001, EPA published notice in the Federal Register (66 FR 32752) that Utah's
32 extension requests were granted, and that Utah County attained the standard by December 31,
33 1996. The notice stated that the area would remain a moderate nonattainment area and would
34 not be subject to the additional requirements of serious nonattainment areas.

35
36
37 **(2) Fully Approved Attainment Plan for PM₁₀**

38 CAA 107(d)(3)(E)(ii) - *The Administrator has fully approved the applicable implementation plan*
39 *for the area under section 110(k).*

40 On November 14, 1991, Utah submitted a SIP for Salt Lake and Utah Counties that demonstrated
41 attainment for Salt Lake and Utah Counties for 10 years, 1993 through 2003. EPA published
42 approval of the SIP on July 8, 1994 (59 FR 35036).

43 On July 3, 2002, Utah submitted a PM₁₀ SIP revision for Utah County. It revised the existing
44 attainment demonstration in the approved PM₁₀ SIP based on a short-term emissions inventory,
45 established 24-hour emission limits for the major stationary sources in the Utah County
46 nonattainment area, and established motor vehicle emission budgets based on EPA's most recent
47 mobile source emissions model, MOBILE6. It demonstrated attainment in the Utah County
48 nonattainment area through 2003. The revised attainment demonstration extended through the

1 year 2003. EPA published approval of this SIP revision on December 23, 2002 (67 FR 78181).
2 It became effective on January 22, 2003.

3 Also, on March 9, 2015, Utah submitted a revision to the SIP, adding a new rule regarding
4 trading of motor vehicle emission budgets (MVEB) for Utah County. The rule allows trading
5 from the motor vehicle emissions budget for primary PM₁₀ to the motor vehicle emissions budget
6 for nitrogen oxides (NO_x), which is a PM₁₀ precursor. The resulting motor vehicle emissions
7 budgets for NO_x and PM₁₀ may then be used to demonstrate transportation conformity with the
8 SIP. The rule was approved by EPA and became effective on July 17, 2015.

9
10 **(3) Improvements in Air Quality Due to Permanent and Enforceable Reductions in**
11 **Emissions**

12
13 CAA 107(d)(3)(E)(iii) - *The Administrator determines that the improvement in air quality is due*
14 *to permanent and enforceable reductions in emissions resulting from implementation of the*
15 *applicable implementation plan and applicable Federal air pollutant control regulations and*
16 *other permanent and enforceable reductions. Speaking further on the issue, EPA guidance*
17 *(Calcagni) reads that the State must be able to reasonably attribute the improvement in air quality*
18 *to emission reductions which are permanent and enforceable. In the following sections, both the*
19 *improvement in air quality and the emission reductions themselves will be discussed.*

20
21 **(a) Improvement in Air Quality**

22
23 The improvement in air quality with respect to PM₁₀ can be shown in a number of ways.
24 Improvement, in this case, is relative to the various control strategies that affected the airshed.

25
26 For the **Utah County nonattainment area**, these control measures were implemented as the result
27 of the nonattainment PM₁₀ SIP promulgated in 1991. As discussed below, the actual
28 implementation of the control strategies required therein first exhibits itself in the observable data
29 in 1994. The ambient air quality data presented below includes values prior to 1994 in order to
30 give a representation of the air quality prior to the application of any control measures. It then
31 includes data collected from then until the present time to illustrate the effect of these controls. In
32 considering the data presented below, it is important to keep this distinction in mind: data through
33 1993 represents pre-SIP conditions, and data collected from 1994 through the present represents
34 post-SIP conditions.

35
36 Additionally, a downturn in the economy is clearly not responsible for the improvement in
37 ambient particulate levels in Salt Lake County, Utah County, and Ogden City areas. From 2001
38 to present, the areas have experienced strong growth while at the same time achieving continuous
39 attainment of the 24-hour and annual PM₁₀ NAAQS. Data was analyzed for the Salt Lake City
40 Metropolitan Statistical Area from the US Department of Commerce, Bureau of Economic
41 Analysis. According to this data, job growth from 2011 through 2013 increased by 5.5 percent,
42 population increased by 3 percent, and personal income increased by approximately 10 percent.
43 The estimated VMT increase was 12 percent from 2011 to present.

44
45 Expected Exceedances – Referring back to the discussion of the PM₁₀ NAAQS in Subsection
46 IX.A.11.b(1), it is apparent that the number of expected exceedances of the 24-hour standard is an
47 important indicator. As such, this information has been tabulated for each of the monitors located
48 in each of the nonattainment areas. The data in Table IX.A.11. 3 below reveals a marked decline

1 in the number of these expected exceedances, and therefore that the **Utah County** PM₁₀
 2 nonattainment area has experienced significant improvements in air quality. The gray cells
 3 indicate that the monitor was not in operation. This improvement is especially revealing in light
 4 of the significant growth experienced during this same period in time.

5
6
7 **Table IX.A.11.3 Utah County: Expected Exceedances Per-Year, 1986-2014**
8

Utah County Nonattainment Area		
Monitor:	North Provo	Lindon
1986		
1987	0.0	0.0
1988	2.0	15.9
1989	8.0	22.2
1990	0.0	0.0
1991	7.3	11.7
1992	3.1	5.3
1993	4.1	5.2
1994	0.0	0.0
1995	0.0	0.0
1996	0.0	0.0
1997	0.0	0.0
1998	0.0	0.0
1999	0.0	0.0
2000	0.0	0.0
2001	0.0	0.0
2002	0.0	1.0
2003	0.0	0.0
2004	0.0	1.0
2005	0.0	0.0
2006	0.0	0.0
2007	0.0	0.0
2008	0.0	4.0
2009	0.0	2.1
2010	3.5	1.0
2011	0.0	0.0
2012	0.0	0.0
2013	0.0	0.0
2014	0.0	0.0

9
10
11
12
13 As discussed before in section IX.A.10.b(1), the number of expected exceedances may include
14 data which had been flagged by DAQ as being influenced by an exceptional event; most
15 typically, a wind-blown dust event. Data is flagged when circumstances indicate that it would

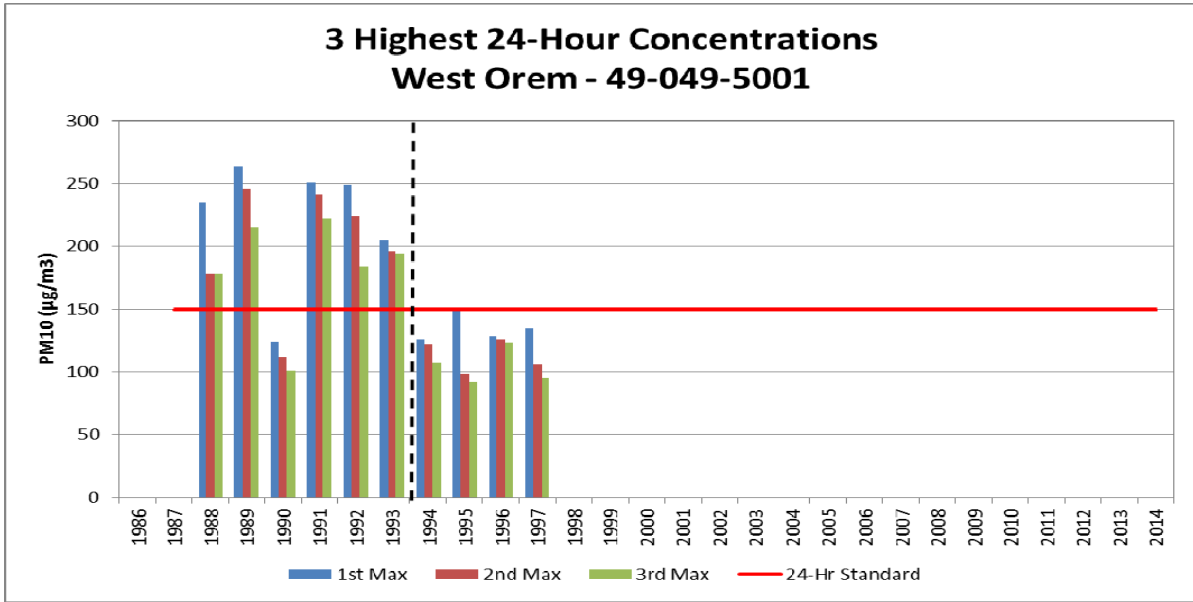
1 represent an outlier in the data set and not be indicative of the entire airshed or the efforts to
2 reasonably mitigate air pollution within.
3

4
5 As such two things should be noted: 1) The focus of the control strategy developed for the 1991
6 PM₁₀ SIP was directed at episodes characterized by wintertime temperature inversions, elevated
7 concentrations of secondary aerosol, and low wind speed. Under these conditions, blowing dust
8 is generally nonexistent. Therefore, in evaluating the effectiveness of these types of controls, the
9 inclusion of several high wind events may bias the conclusion. 2) Even with the inclusion of
10 these values, the conclusion remains essentially the same; that since 1994 when the 1991 SIP
11 controls were fully implemented, there has been a marked improvement in monitored air quality.
12

13
14 Highest Values – Also indicative of improvement in air quality with respect to the 24-hour
15 standard, is the magnitude of the excessive concentrations that are observed. This is illustrated in
16 Figures IX.A.11. 2-4, which show the three highest 24-hour concentrations observed at each
17 monitor in a particular year.
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19

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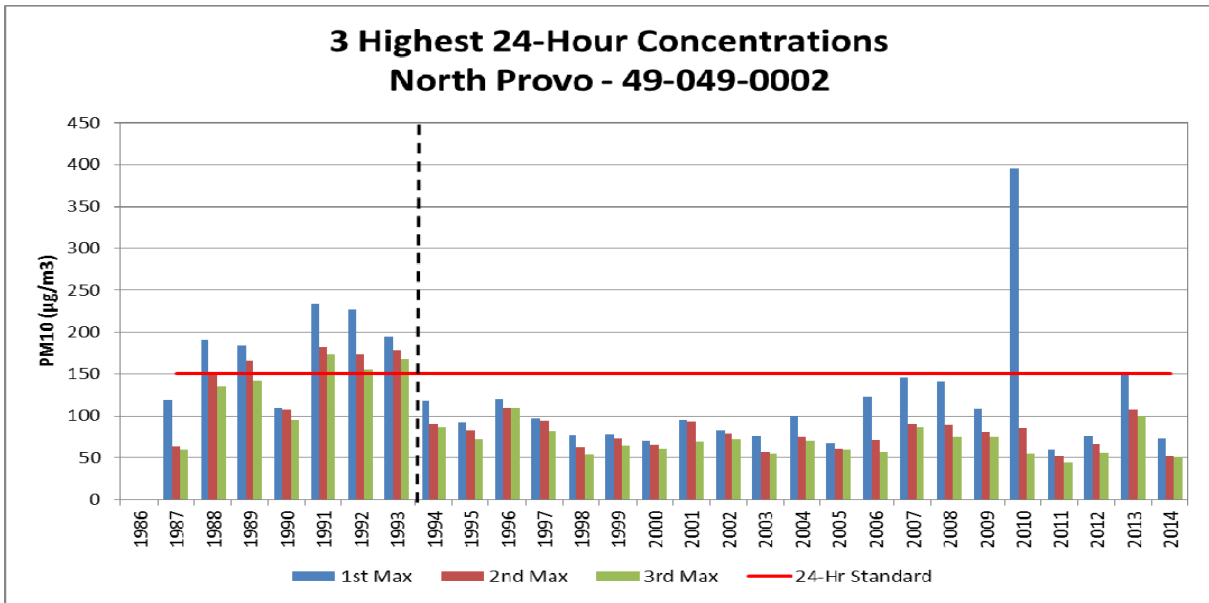
Figure IX.A.11. 2 3 Highest 24-hr PM₁₀ Concentrations; West Orem



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(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

Figure IX.A.11. 3 3 Highest 24-hr PM₁₀ Concentrations; North Provo

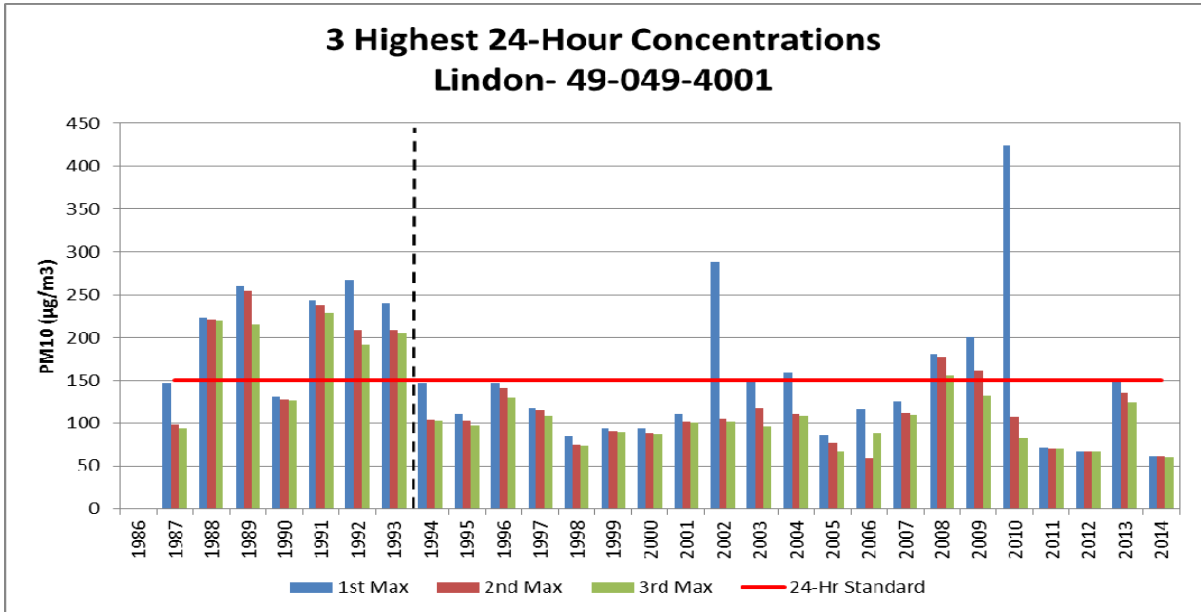


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(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

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Figure IX.A.11. 4 3 Highest 24-hr PM₁₀ Concentrations; Lindon



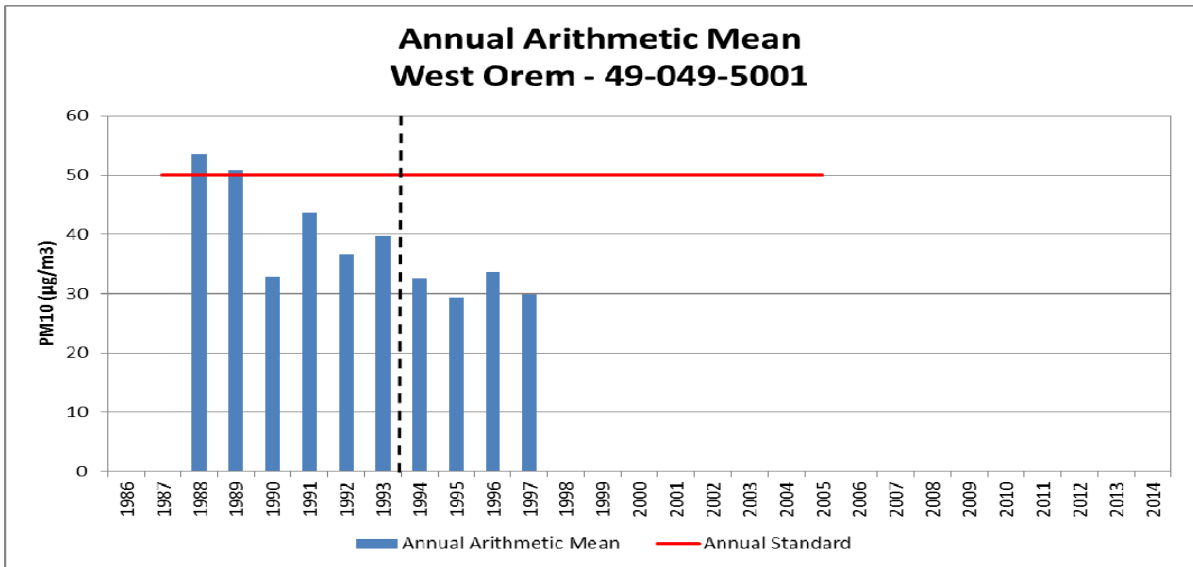
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(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

Again there is a noticeable improvement in the magnitude of these concentrations. It must be kept in mind, however, that some of these concentrations may have resulted from windblown dust events that occur outside of the typical scenario of wintertime air stagnation. As such, the effectiveness of any control measures directed at the precursors to PM₁₀ would not be evident.

1
2 Annual Mean – Although there is no longer an annual PM₁₀ standard, the annual arithmetic mean
3 is also a significant parameter to consider. This is especially so given one of the assumptions
4 made in the original nonattainment SIP for Utah County. The SIP was developed to address the
5 24-hour standard for PM₁₀, but it was assumed that by controlling for the wintertime 24-hour
6 standard, the annual arithmetic mean concentrations would also be reduced such that the annual
7 standard would be protected (even though it had never been violated). Annual arithmetic means
8 have been plotted in Figures IX.A.11. 5-7, and the data reveals a noticeable decline in the values
9 of these annual means. This supports the validity of the assumption made in the SIP, and
10 indicates that there have been significant improvements in air quality in the Utah County
11 nonattainment area.
12
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14

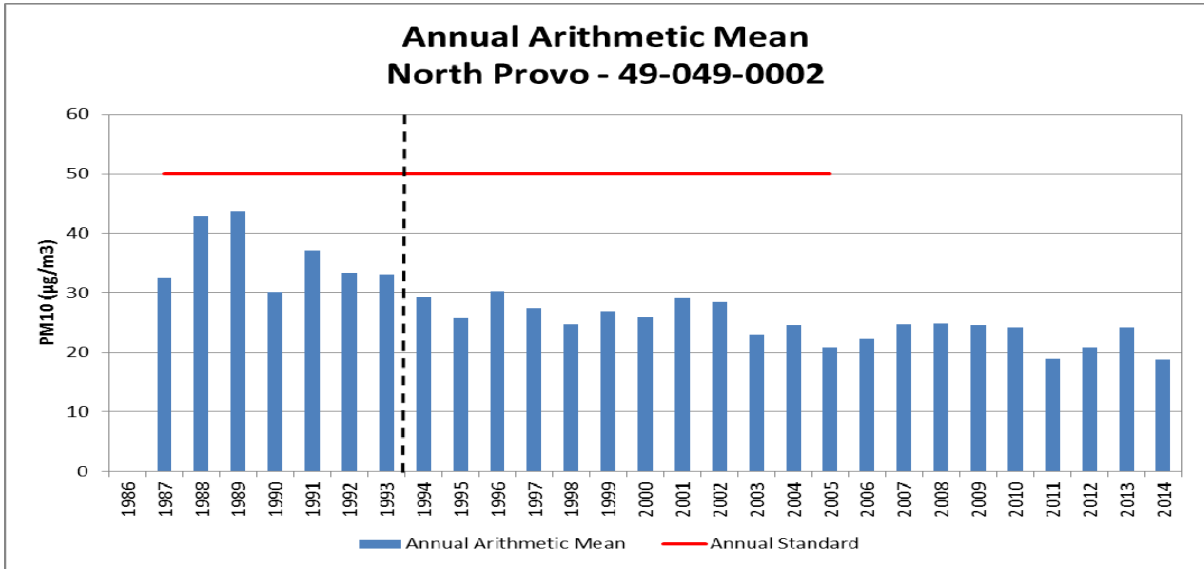
15 **Figure IX.A.11. 5 Annual Arithmetic Mean; West Orem**
16



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18
19 (Vertical dotted line indicates complete implementation of 1991 SIP control measures.)
20

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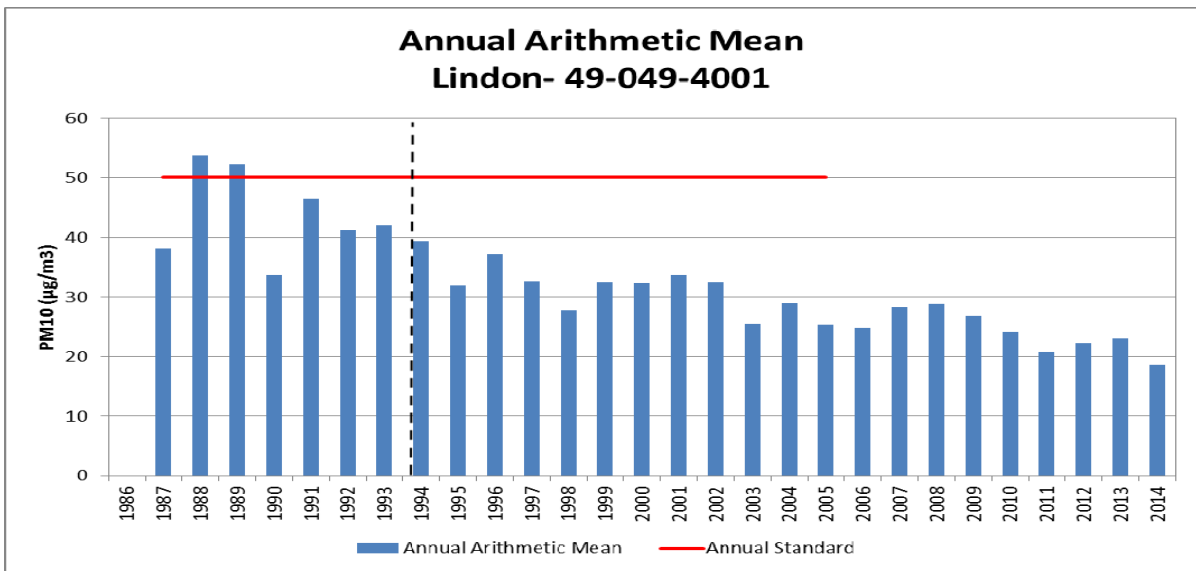
Figure IX.A.11. 6 Annual Arithmetic Mean; North Provo



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14

(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

Figure IX.A.11. 7 Annual Arithmetic Mean; Lindon



15
16
17
18
19
20

(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

1 As with the number of expected exceedances and the three highest values, the data in Figures
2 IX.A.11. 5-7 may include data which had been flagged by DAQ as being influenced by wind-
3 blown dust events. Nevertheless, the annual averaging period tends to make these data points less
4 significant. The downward trend of these annual mean values is truly indicative of improvements
5 in air quality, particularly during the winter inversion season.

6
7
8 **(b) Reduction in Emissions**
9

10 As stated above, EPA guidance (Calcagni) says that the State must be able to reasonably attribute
11 the improvement in air quality to emission reductions that are permanent and enforceable. In
12 making this showing, the State should estimate the percent reduction (from the year that was used
13 to determine the design value) achieved by Federal measures such as motor vehicle control, as
14 well as by control measures that have been adopted and implemented by the State.

15
16 In **Utah County**, the design values at each of the representative monitors were measured in 1988
17 or 1989 (see SIP Subsections IX.A.3-5).

18
19 As mentioned before, the ambient air quality data presented in Subsection IX.A.11.b(3)(a) above
20 includes values prior to these dates in order to give a representation of the air quality prior to the
21 application of any control measures. It then includes data collected from then until the present
22 time to illustrate the lasting effect of these controls. In discussing the effect of the controls, as
23 well as the control measures themselves, however, it is important to keep in mind the time
24 necessary for their implementation.

25
26 The nonattainment SIPs for all initial moderate PM₁₀ nonattainment areas included a statutory
27 date for the implementation of reasonably available control measures (RACM), which includes
28 reasonably available control technologies (RACT). This date was December 10, 1993 (Section
29 189(a) CAA). Thus, 1994 marked the first year in which these control measures were reflected in
30 the emissions inventories for **Utah County**.

31
32 The nonattainment SIP for the **Utah County** PM₁₀ nonattainment area included control strategies
33 for stationary sources and area sources (including controls for woodburning, mobile sources, and
34 road salting and sanding) of primary PM₁₀ emissions as well as sulfur oxide (SO_x) and nitrogen
35 oxide (NO_x) emissions, which are secondary sources of particulate emissions. This is discussed
36 in SIP Subsection IX.A.6, and was reflected in the attainment demonstration presented in
37 Subsection IX.A.3.

38
39 The RACM control measures prescribed by the nonattainment SIP and their subsequent
40 implementation by the State were discussed in more detail in a milestone report submitted for the
41 area.

42
43 Section 189(c) of the CAA identifies, as a required plan element, quantitative milestones which
44 are to be achieved every 3 years, and which demonstrate reasonable further progress (RFP)
45 toward attainment of the standard by the applicable date. As defined in CAA Section 171(1), the
46 term *reasonable further progress* has the meaning of such annual incremental reductions in
47 emissions of the relevant air pollutant as are required by Part D of the Act for the purpose of
48 ensuring attainment of the NAAQS by the applicable date.

49
50 Hence, the milestone report must demonstrate that all measures in the approved nonattainment
51 SIP have been implemented and that the milestone has been met. In the case of initial moderate
52 areas for PM₁₀, this first milestone had the meaning of all control measures identified in the plan

1 being sufficient to bring the area into compliance with the NAAQS by the statutory attainment
2 date of December 31, 1994.

3
4 Section 188(d) of the Act allows States to petition the Administrator for up to two one-year
5 extensions of the attainment date, provided that all SIP elements have been implemented and that
6 the ambient data collected in the area during the year preceding the extension year indicates that
7 the area is on-target to attain the NAAQS. Presumably this is because the statutory attainment
8 date for initial moderate PM₁₀ nonattainment areas occurred only one year after the statutory
9 implementation date for RACM, the central control element of all implementation plans for such
10 areas, and because three consecutive years of clean ambient data are needed to determine that an
11 area has attained the standard. Because the milestone report and the request for extension of the
12 attainment date both required a demonstration that all SIP elements had been implemented, as
13 well as a showing of RFP, Utah combined these into a single analysis.

14
15 Utah's actions to meet these requirements and EPA's subsequent review thereof are discussed in
16 a Federal Register notice from Monday, June 18, 2001 (66 FR 32752). In this notice, EPA
17 granted two one-year extensions of the attainment date for the Utah County PM₁₀ nonattainment
18 area and determined that the area had attained the PM₁₀ NAAQS by December 31, 1996. The key
19 elements of that FR notice are reiterated below.

20
21 On May 11, 1995, Utah submitted a milestone report as required by sec.189(c)(2). On Sept.29,
22 1995, Utah submitted a revised version of the milestone report. It estimated current emissions
23 from all source categories covered by the SIP, and compared those to actual emissions from 1988.
24 Based on information the State submitted in 1995, EPA believes that Utah was in substantial
25 compliance with the requirements and commitments in the SIP for the Utah County PM₁₀
26 nonattainment area when Utah submitted its first extension request. The milestone report
27 indicates that Utah had implemented most of its adopted control measures, and had therefore
28 substantially implemented the RACM/RACT requirements applicable to moderate PM₁₀
29 nonattainment areas. It showed that in Utah County, emissions of PM₁₀, SO₂ and NO_x had been
30 reduced by approximately 3,129 tpy (from 25,920 down to 22,791). With its March 27, 1996
31 request for an additional extension year, Utah submitted another milestone report (and revised it
32 again on May 17) which repeated this exercise using more current numbers. The results this time
33 showed that emissions had been reduced by approximately 8,391 tpy. The effect of these
34 emission reductions appears to be reflected in ambient measurements at the monitoring sites [and
35 this is evidence that the State's implementation of the PM₁₀ SIP control measures resulted in
36 emission reductions amounting to RFP in the Utah County PM₁₀ nonattainment area.

37
38 This Federal Register notice (66 FR 32752), the milestone report from September 29, 1995, and
39 the milestone report from May 17, 1996 have all been included in the TSD.

40
41 Furthermore, since these control measures are incorporated into the Utah SIP, the emission
42 reductions that resulted are consistent with the notion of permanent and enforceable
43 improvements in air quality. Taken together, the trends in ambient air quality illustrated in the
44 preceding paragraph, along with the continued implementation of the nonattainment SIP for the
45 Utah County nonattainment area, provide a reliable indication that these improvements in air
46 quality reflect the application of permanent steps to improve the air quality in the region, rather
47 than just temporary economic or meteorological changes.

48 49 **(4) State has Met Requirements of Section 110 and Part D**

50
51 CAA 107(d)(3)(E)(v) - The State containing such area has met all requirements applicable to the
52 area under section 110 and part D. Section 110(a)(2) of the Act deals with the broad scope of

1 state implementation plans and the capacity of the respective state agency to effectively
2 administer such a plan. Sections I through VIII of Utah's SIP contain information relevant to
3 these criteria. Part D deals specifically with plan requirements for nonattainment areas, and
4 includes the requirements for a maintenance plan in Section 175A.

5
6 Utah currently has an approved SIP that meets the requirements of section 110(a)(2) of the Act.
7 Many of these elements have been in place for several decades. In the March 9, 2001 approval of
8 Utah's Ogden City Maintenance Plan for Carbon Monoxide, EPA stated:

9
10 On August 15, 1984, we approved revisions to Utah's SIP as meeting the
11 requirements of section 110(a)(2) of the CAA (see 45 FR 32575). Although
12 section 110 of the CAA was amended in 1990, most of the changes were not
13 substantial. Thus, we have determined that the SIP revisions approved in 1984
14 continue to satisfy the requirements of section 110(a)(2). For further detail, see
15 45 FR 32575 dated August 15, 1984 (Volume 49, No. 159) or 66 FR 14079 dated
16 March 9, 2001 (Volume 66, No. 47.)

17
18 Part D of the Act addresses "Plan Requirements for Nonattainment Areas." Subpart 1 of Part D
19 includes the general requirements that apply to all areas designated nonattainment based on a
20 violation of the NAAQS. Section 172(c) of this subpart contains a list of generally required
21 elements for all nonattainment plans. Subpart 1 is followed by a series of subparts (2-5) specific
22 to various criteria pollutants. Subpart 4 contains the provisions specific to PM₁₀ nonattainment
23 areas. The general requirements for nonattainment plans in Section 172(c) may be subsumed
24 within or superseded by the more specific requirements of Subpart 4, but each element must be
25 addressed in the respective nonattainment plan.

26
27 One of the pre-conditions for a maintenance plan is a fully approved (non)attainment plan for the
28 area. This is also discussed in section IX.A.11.b(2).

29
30 Other Part D requirements that are applicable in nonattainment and maintenance areas include the
31 general and transportation conformity provisions of Section 176(c) of the Act. These provisions
32 ensure that federally funded or approved projects and actions conform to the PM₁₀ SIPs and
33 Maintenance Plans prior to the projects or actions being implemented. The State has already
34 submitted to EPA a SIP revision implementing the requirement of Section 176(c).

35
36 For Utah County, the Part D requirements for PM₁₀ were first addressed in an attainment SIP
37 approved by EPA on July 8, 1994 (59 FR 35036), and most recently addressed in a revision to the
38 attainment SIP approved by EPA on December 23, 2002 (67 FR 78181).

39 40 41 **(5) Maintenance Plan for PM₁₀ Areas**

42
43 As stated in the Act, an area may not request redesignation to attainment without first submitting,
44 and then receiving EPA approval of, a maintenance plan. The plan is basically a quantitative
45 showing that the area will continue to attain the NAAQS for an additional 10 years (from EPA
46 approval), accompanied by sufficient assurance that the terms of the numeric demonstration will
47 be administered by the State and by the EPA in an oversight capacity. The maintenance plan is
48 the central criterion for redesignation. It is contained in the following subsection.

1 **IX.A.11.c Maintenance Plan**

2 *CAA 107(d)(3)(E)(iv) - The Administrator has fully approved a maintenance plan for the area as*
 3 *meeting the requirements of section 175A. An approved maintenance plan is one of several*
 4 *criteria necessary for area redesignation as outlined in Section 107(d)(3)(E) of the Act. The*
 5 *maintenance plan itself, as described in Section 175A of the Act and further addressed in EPA*
 6 *guidance (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni*
 7 *to Regional Air Directors, September 4, 1992; or for the purpose of this document, simply*
 8 *“Calcagni”), has its own list of required elements. The following table is presented to summarize*
 9 *these requirements. Each will then be addressed in turn.*

Table IX.A.11. 4 Requirements of a Maintenance Plan in the Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Maintenance demonstration	Provide for maintenance of the relevant NAAQS in the area for at least 10 years after redesignation.	CAA: Sec 175A(a)	IX.A.11.c(1)
Revise in 8 Years	The State must submit an additional revision to the plan, 8 years after redesignation, showing an additional 10 years of maintenance.	CAA: Sec 175A(b)	IX.A.11.c(8)
Continued Implementation of Nonattainment Area Control Strategy	The Clean Air Act requires continued implementation of the nonattainment area control strategy unless such measures are shown to be unnecessary for maintenance or are replaced with measures that achieve equivalent reductions.	CAA: Sec 175A(c), CAA Sec 110(l), Calcagni memo	IX.A.11.c(7)
Contingency Measures	Areas seeking redesignation from nonattainment to attainment are required to develop contingency measures that include State commitments to implement additional control measures in response to future violations of the NAAQS.	CAA: Sec 175A(d)	IX.A.11.c(10)
Verification of Continued Maintenance	The maintenance plan must indicate how the State will track the progress of the maintenance plan.	Calcagni memo	IX.A.11c(9)

10
11
12 **(1) Demonstration of Maintenance - Modeling Analysis**

13
14 *CAA 175A(a) - Each State which submits a request under section 107(d) for redesignation of a*
 15 *nonattainment area as an area which has attained the NAAQS shall also submit a revision of the*
 16 *applicable implementation plan to provide for maintenance of the NAAQS for at least 10 years*
 17 *after the redesignation. The plan shall contain such additional measures, if any, as may be*
 18 *required to ensure such maintenance. The maintenance demonstration is discussed in EPA*
 19 *guidance (Calcagni) as one of the core provisions that should be considered by states for*
 20 *inclusion in a maintenance plan.*

21
22 According to Calcagni, a State may generally demonstrate maintenance of the NAAQS by either
 23 showing that future emissions of a pollutant or its precursors will not exceed the level of the
 24 attainment inventory (discussed below) or by modeling to show that the future mix of sources and

1 emission rates will not cause a violation of the NAAQS. Utah has elected to make its
2 demonstration based on air quality modeling.

3
4 **(a) Introduction**

5
6 The following chapter presents an analysis using observational datasets to detail the chemical
7 regimes of Utah's Nonattainment areas.

8
9 Prior to the development of this PM₁₀ maintenance plan, UDAQ conducted a technical analysis to
10 support the development of Utah's 24-hr State Implementation Plan for PM_{2.5}. That analysis
11 included preparation of emissions inventories and meteorological data, and the evaluation and
12 application of a regional photochemical model.

13
14 Outside of the springtime high wind events and wildfires, the Wasatch Front experiences high 24-
15 hr PM₁₀ concentrations under stable conditions during the wintertime (e.g., temperature
16 inversion). These are the same episodes where the Wasatch Front sees its highest concentrations
17 of 24-hr PM_{2.5} that sometimes exceed the 24-hr PM_{2.5} NAAQS. Most (60% to 90%) of the PM₁₀
18 observed during high wintertime pollution days consists of PM_{2.5}. The dominant species of the
19 wintertime PM₁₀ is secondarily formed particulate nitrate, which is also the dominant species of
20 PM_{2.5}.

21
22 Given these similarities, the PM_{2.5} modeling analysis was utilized as the foundation for this PM₁₀
23 Maintenance Plan.

24
25 The CMAQ model performance for the PM₁₀ Maintenance Plan adds to the detailed model
26 performance that was part of the UDAQ's previous PM_{2.5} SIP process. Utah DAQ used the same
27 modeling episode that was used in the PM_{2.5} SIP, which is the 45-day modeling episode from the
28 winter of 2009-2010. The modeled meteorology datasets from the Weather Research and
29 Forecasting (WRF) model for the PM₁₀ Plan are the same datasets used for the PM_{2.5} SIP. Also,
30 the CMAQ version (4.7.1) and CMAQ model setup (i.e., vertical advection module turned off)
31 for the PM₁₀ modeling matches the PM_{2.5} SIP setup.

32
33 For this reason, much of the information presented below pertains specifically to the PM_{2.5}
34 evaluation. This is supplemented with information pertaining to PM₁₀, most notably with respect
35 to the PM₁₀ model performance evaluation.

36
37 The additional PM₁₀ analysis is also presented in the Technical Support Document.

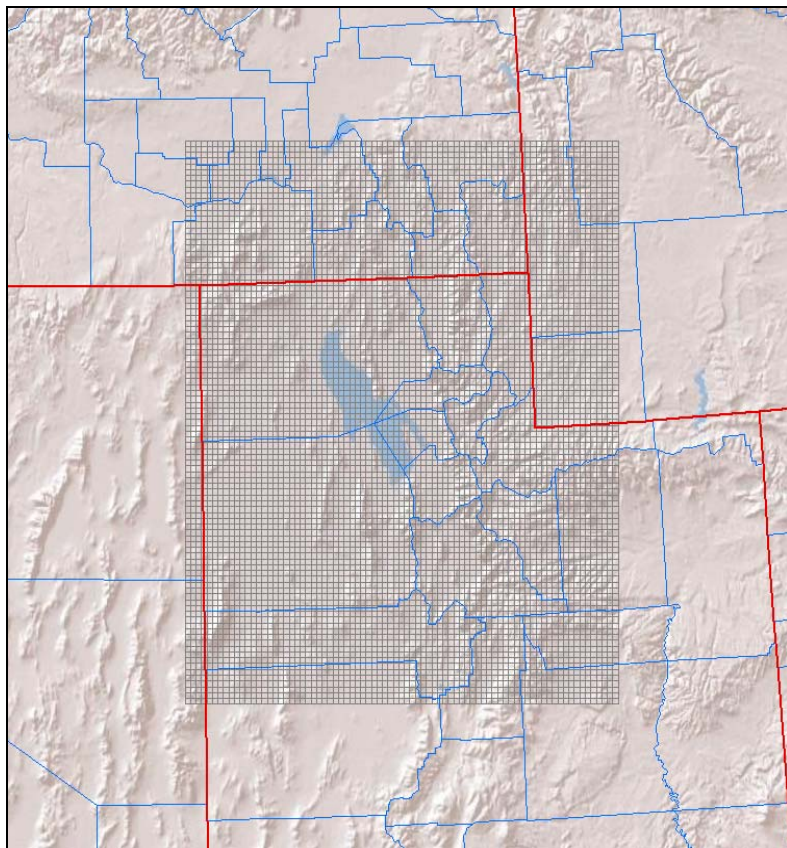
38
39 **(b) Photochemical Modeling**

40
41 Photochemical models are relied upon by federal and state regulatory agencies to support their
42 planning efforts. Used properly, models can assist policy makers in deciding which control
43 programs are most effective in improving air quality, and meeting specific goals and objectives.
44 The air quality analyses were conducted with the Community Multiscale Air Quality (CMAQ)
45 Model version 4.7.1, with emissions and meteorology inputs generated using SMOKE and WRF,
46 respectively. CMAQ was selected because it is the open source atmospheric chemistry model co-
47 sponsored by EPA and the National Oceanic Atmospheric Administration (NOAA), and thus
48 approved by EPA for this plan.

49
50 **(c) Domain/Grid Resolution**

51

1 UDAQ selected a high resolution 4-km modeling domain to cover all of northern Utah including
2 the portion of southern Idaho extending north of Franklin County and west to the Nevada border
3 (Figure IX.A.11. 8). This 97 x 79 horizontal grid cell domain was selected to ensure that all of
4 the major emissions sources that have the potential to impact the nonattainment areas were
5 included. The vertical resolution in the air quality model consists of 17 layers extending up to 15
6 km, with higher resolution in the boundary layer.
7



8
9
10 **Figure IX.A.11. 8 Northern Utah photochemical modeling domain.**

11
12 **(d) Episode Selection**

13
14 According to EPA's April 2007 "Guidance on the Use of Models and Other Analyses for
15 Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze," the
16 selection of SIP episodes for modeling should consider the following 4 criteria:

- 17
18 1. Select episodes that represent a variety of meteorological conditions that lead to elevated
19 PM_{2.5}.
20
21 2. Select episodes during which observed concentrations are close to the baseline design
22 value.
23
24 3. Select episodes that have extensive air quality data bases.
25
26 4. Select enough episodes such that the model attainment test is based on multiple days at
27 each monitor violating NAAQS.
28

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

12
 13 From the most recent 5-year period of 2007-2011, UDAQ developed a long list of candidate
 14 PM_{2.5} wintertime episodes. Three episodes were selected. An episode was selected from January
 15 2007, an episode from February 2008, and an episode during the winter of 2009-2010 that
 16 features multi-event episodes of PM_{2.5} buildup and washout.

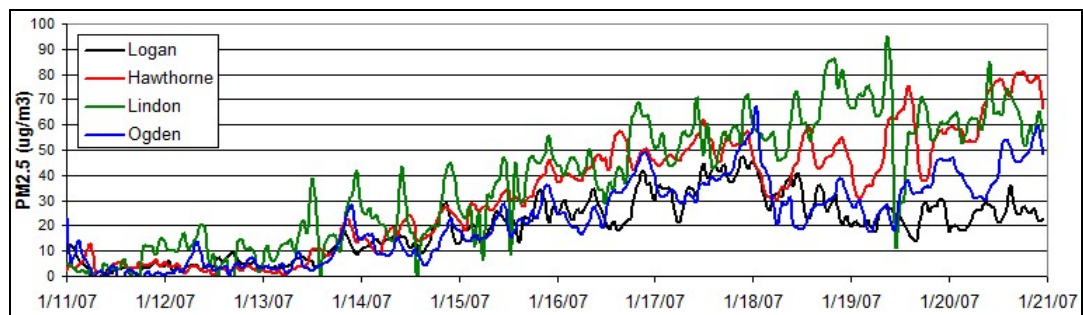
17
 18 As noted in the introduction, these episodes were also ideal from the standpoint of characterizing
 19 PM₁₀ buildup and formation.

20
 21 Further detail of the episodes is below:

22
 23 • **Episode 1: January 11-20, 2007**

24
 25 A cold front passed through Utah during the early portion of the episode and brought very cold
 26 temperatures and several inches of fresh snow to the Wasatch Front. The trough was quickly
 27 followed by a ridge that built north into British Columbia and began expanding east into Utah.
 28 This ridge did not fully center itself over Utah, but the associated light winds, cold temperatures,
 29 fresh snow, and subsidence inversion produced very stagnant conditions along the Wasatch Front.
 30 High temperatures in Salt Lake City throughout the episode were in the high teens to mid-20's
 31 Fahrenheit.

32
 33 Figure IX.A.11. 9 shows hourly PM_{2.5} concentrations from Utah's 4 PM_{2.5} monitors for January
 34 11-20, 2007. The first 6 to 8 days of this episode are suited for modeling. The episode becomes
 35 less suited after January 18 because of the complexities in the meteorological conditions leading
 36 to temporary PM_{2.5} reductions.

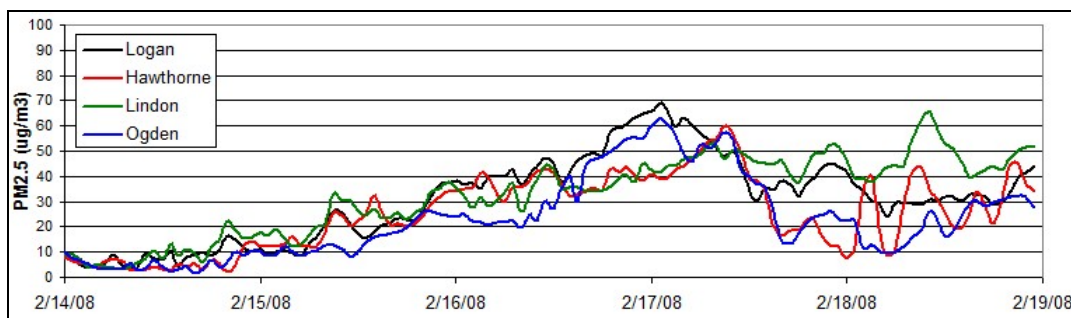


38
 39
 40 **Figure IX.A.11. 9 Hourly PM_{2.5} concentrations for January 11-20, 2007**

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

2
3 The February 2008 episode features a cold front passage at the start of the episode that brought
4 significant new snow to the Wasatch Front. A ridge began building eastward from the Pacific
5 Coast and centered itself over Utah on Feb 20th. During this time a subsidence inversion lowered
6 significantly from February 16 to February 19. Temperatures during this episode were mild with
7 high temperatures at SLC in the upper 30's and lower 40's Fahrenheit.
8

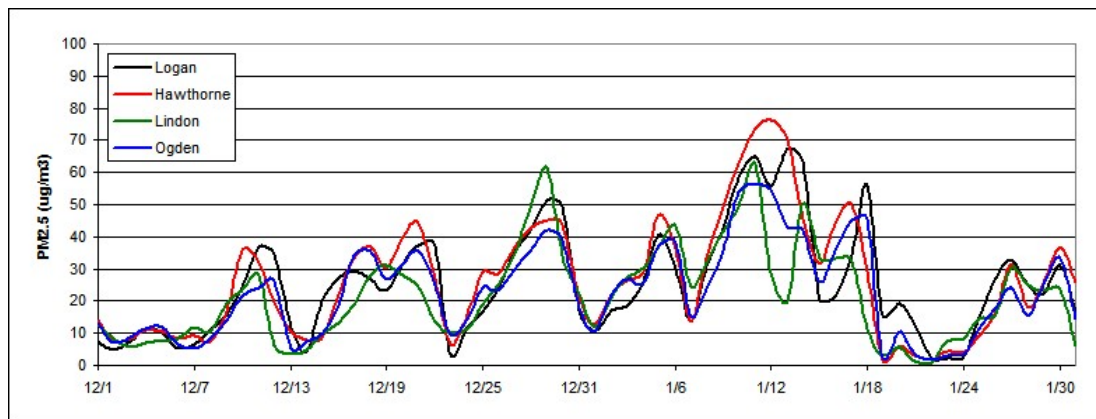
9 The 24-hour average PM_{2.5} exceedances observed during the proposed modeling period of
10 February 14-19, 2008 were not exceptionally high. What makes this episode a good candidate for
11 modeling are the high hourly values and smooth concentration build-up. The first 24-hour
12 exceedances occurred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



20
21
22 **Figure IX.A.11. 10 Hourly PM_{2.5} concentrations for February 14-19, 2008**

23
24
25 • **Episode 3: December 13, 2009 – January 18, 2010**

26
27 The third episode that was selected is more similar to a “season” than a single PM_{2.5} episode
28 (Figure IX.A.11. 11). During the winter of 2009 and 2010, Utah was dominated by a semi-
29 permanent ridge of high pressure that prevented strong storms from crossing Utah. This 35 day
30 period was characterized by 4 to 5 individual PM_{2.5} episodes each followed by a partial PM_{2.5} mix
31 out when a weak weather system passed through the ridge. The long length of the episode and
32 repetitive PM_{2.5} build-up and mix-out cycles makes it ideal for evaluating model strengths and
33 weaknesses and PM_{2.5} control strategies.
34



1
2
3 **Figure IX.A.11. 11 24-hour average PM_{2.5} concentrations for December-January, 2009-10**

4
5
6 **(e) Meteorological Data**

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

15
16 Model performance of WRF was assessed against observations at sites maintained by the Utah
17 Air Monitoring Center. A summary of the performance evaluation results for WRF are presented
18 below:

- 19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
- The biggest issue with meteorological performance is the existence of a warm bias in surface temperatures during high PM_{2.5} episodes. This warm bias is a common trait of WRF modeling during Utah wintertime inversions.
 - WRF does a good job of replicating the light wind speeds (< 5 mph) that occur during high PM_{2.5} episodes.
 - WRF is able to simulate the diurnal wind flows common during high PM_{2.5} episodes. WRF captures the overnight downslope and daytime upslope wind flow that occurs in Utah valley basins.
 - WRF has reasonable ability to replicate the vertical temperature structure of the boundary layer (i.e., the temperature inversion), although it is difficult for WRF to reproduce the inversion when the inversion is shallow and strong (i.e., an 8 degree temperature increase over 100 vertical meters).

36 **(f) Photochemical Model Performance Evaluation**

37
38 PM_{2.5} Results

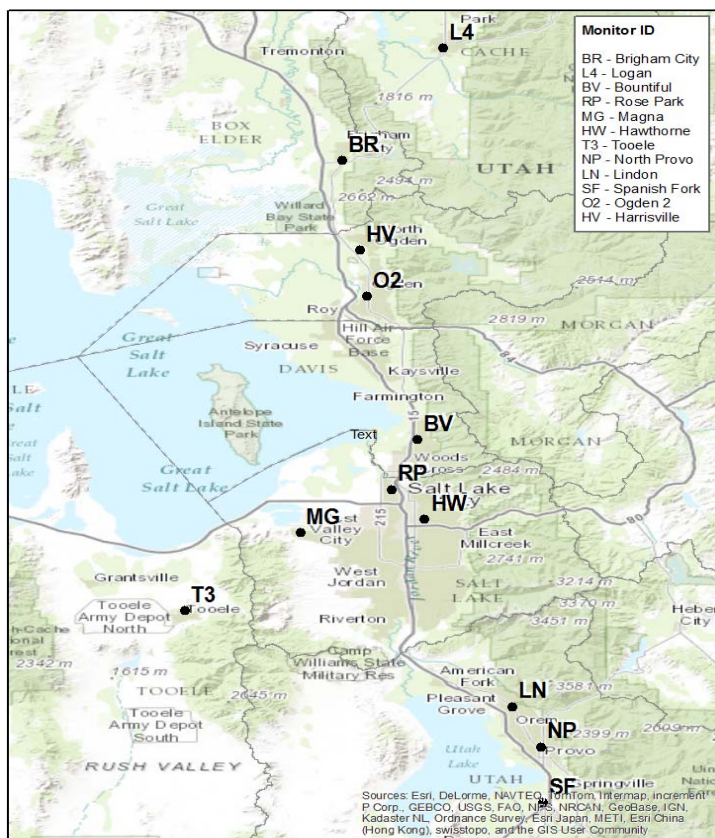
39
40 The model performance evaluation focused on the magnitude, spatial pattern, and temporal
41 variation of modeled and measured concentrations. This exercise was intended to assess whether,

1 and to what degree, confidence in the model is warranted (and to assess whether model
 2 improvements are necessary).

3
 4 CMAQ model performance was assessed with observed air quality datasets at UDAQ-maintained
 5 air monitoring sites (Figure IX.A.11. 12). Measurements of observed PM_{2.5} concentrations along
 6 with gaseous precursors of secondary particulate (e.g., NO_x, ozone) and carbon monoxide are
 7 made throughout winter at most of the locations in the figure. PM_{2.5} speciation performance was
 8 assessed using the three Speciation Monitoring Network Sites (STN) located at the Hawthorne
 9 site in Salt Lake City, the Bountiful site in Davis County, and the Lindon site in Utah County.

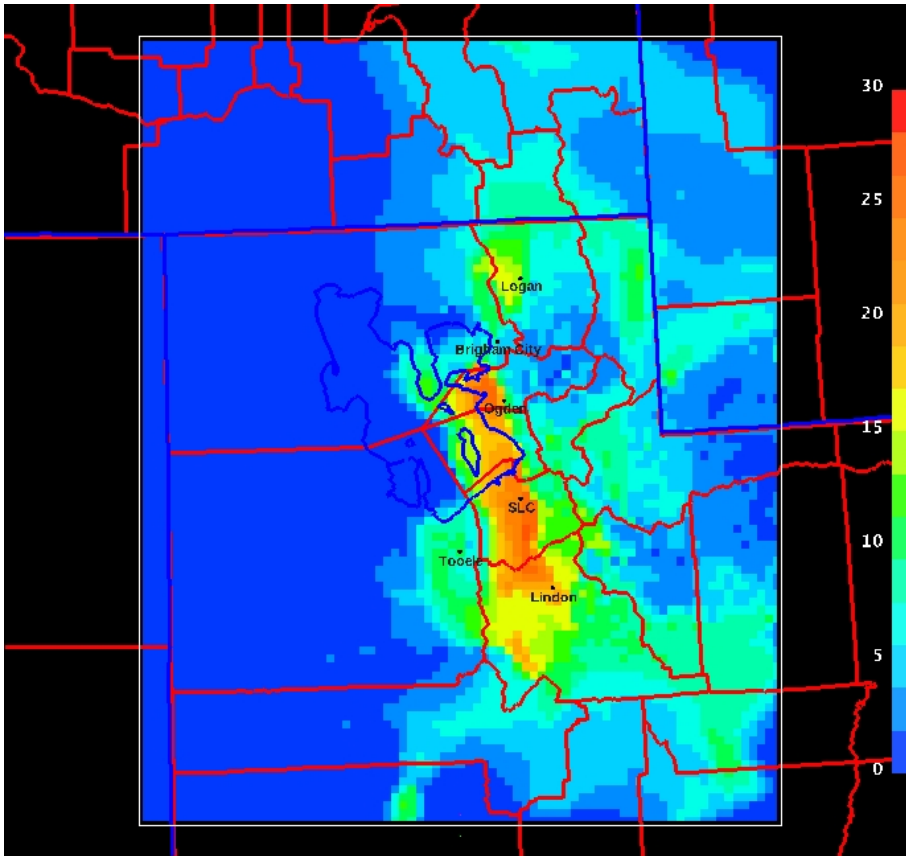
10
 11 PM₁₀ data is also collected at Logan, Bountiful, Ogden2, Magna, Hawthorne, North Provo, and
 12 Lindon.

13
 14 PM₁₀ filters were collected at Bountiful, Hawthorne and Lindon, and analyzed with the goal
 15 comparing CMAQ modeled speciation to the collected PM₁₀ filters. While analyzing the PM₁₀
 16 filters, most of the secondarily chemically formed particulate nitrate had been volatilized, and thus
 17 could not be accounted for. This is most likely due to the age of the filters, which were collected
 18 over five years ago. Thus, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter
 19 speciation could not be made for this modeling period.



21
 22 **Figure IX.A.11. 12 UDAQ monitoring network.**

1 A spatial plot is provided for modeled 24-hr PM_{2.5} for 2010 January 03 in Figure IX.A.11. 13.
2 The spatial plot shows the model does a reasonable job reproducing the high PM_{2.5} values, and
3 keeping those high values confined in the valley locations where emissions occur.
4
5



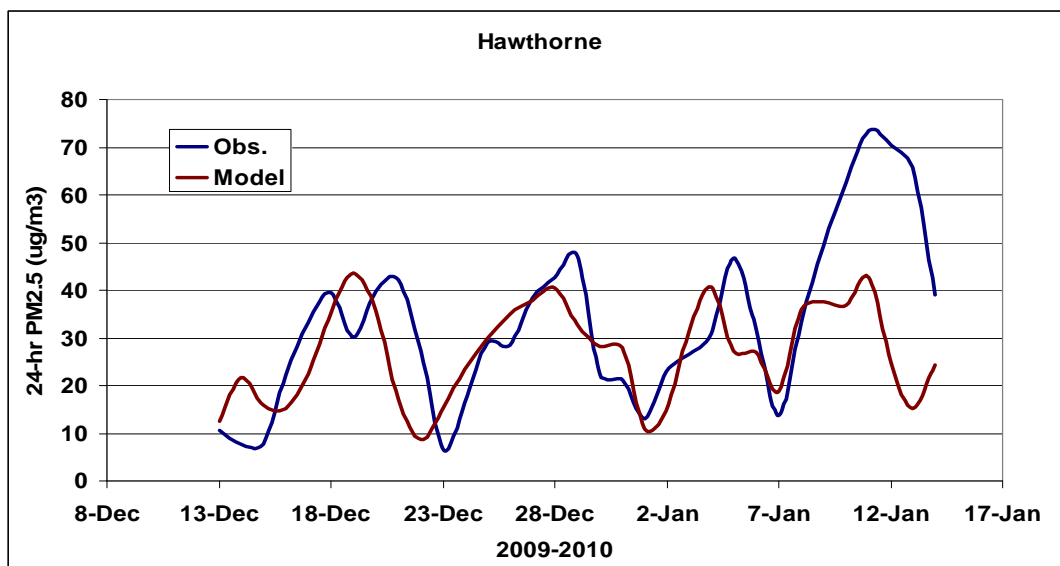
6
7 **Figure IX.A.11. 13 Spatial plot of CMAQ modeled 24-hr PM_{2.5} (µg/m³) for 2010 Jan. 03.**
8

9 Time series of 24-hr PM_{2.5} concentrations for the 13 Dec. 2009 – 15 Jan. 2010 modeling period
10 are shown in Figs. IX.A.11. 14-17 at the Hawthorne site in Salt Lake City, the Ogden site in
11 Weber County, the Lindon site in Utah County, and the Logan site in Cache County. For the
12 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
14 produce the > 60 µg/m³ concentrations observed at the monitoring locations.
15

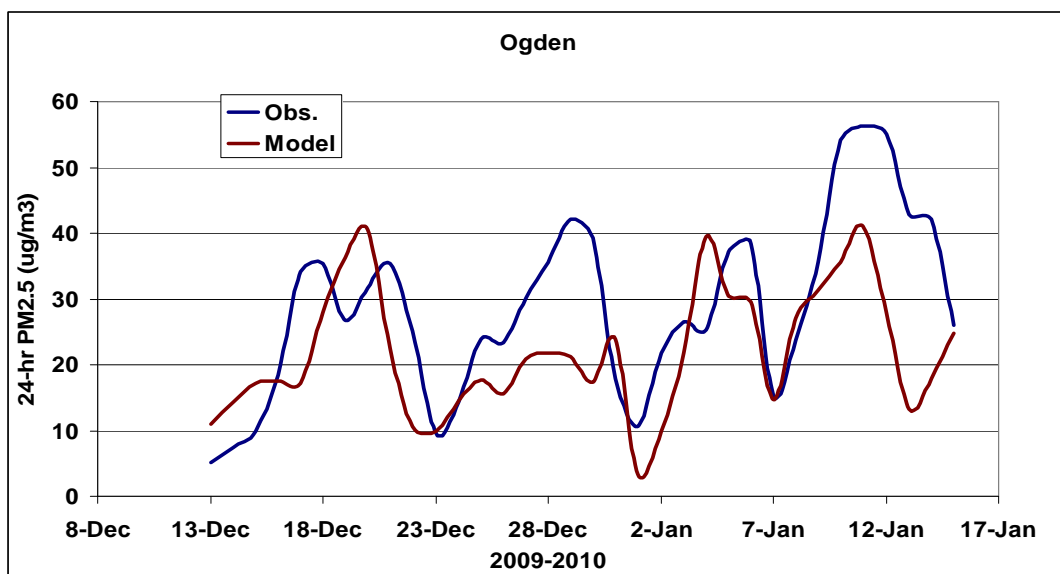
16 It is often seen that CMAQ “washes” out the PM_{2.5} episode a day or two earlier than that seen in
17 the observations. For example, on the day 21 Dec. 2009, the concentration of PM_{2.5} continues to
18 build while CMAQ has already cleaned the valley basins of high PM_{2.5} concentrations. At these
19 times, the observed cold pool that holds the PM_{2.5} is often very shallow and winds just above this
20 cold pool are southerly and strong before the approaching cold front. This situation is very
21 difficult for a meteorological and photochemical model to reproduce. An example of this
22 situation is shown in Fig. IX.A.11. 18, where the lowest part of the Salt Lake Valley is still under
23 a very shallow stable cold pool, yet higher elevations of the valley have already been cleared of
24 the high PM_{2.5} concentrations.
25

26 During the 24 – 30 Dec. 2009 episode, a weak meteorological disturbance brushes through the
27 northernmost portion of Utah. It is noticeable in the observations at the Ogden monitor on 25
28 Dec. as PM_{2.5} concentrations drop on this day before resuming an increase through Dec. 30. The

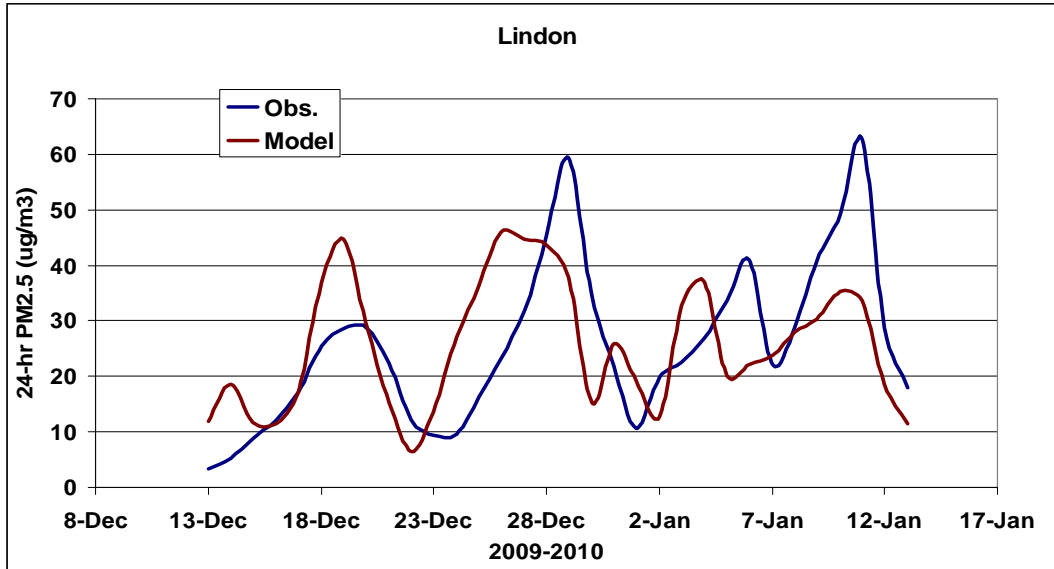
1 meteorological model and thus CMAQ correctly pick up this disturbance, but completely clears
 2 out the building $PM_{2.5}$; and thus performance suffers at the most northern Utah monitors (e.g.
 3 Ogden, Logan). The monitors to the south (Hawthorne, Lindon) are not influence by this
 4 disturbance and building of $PM_{2.5}$ is replicated by CMAQ. This highlights another challenge of
 5 modeling $PM_{2.5}$ episodes in Utah. Often during cold pool events, weak disturbances will pass
 6 through Utah that will de-stabilize the valley inversion and cause a partial clear out of $PM_{2.5}$.
 7 However, the $PM_{2.5}$ is not completely cleared out, and after the disturbance exits, the valley
 8 inversion strengthens and the $PM_{2.5}$ concentrations continue to build. Typically, CMAQ
 9 completely mixes out the valley inversion during these weak disturbances.
 10



11
 12 **Figure IX.A.11. 14 24-hr $PM_{2.5}$ time series (Hawthorne). Observed 24-hr $PM_{2.5}$**
 13 **(blue trace) and CMAQ modeled 24-hr $PM_{2.5}$ (red trace).**
 14
 15

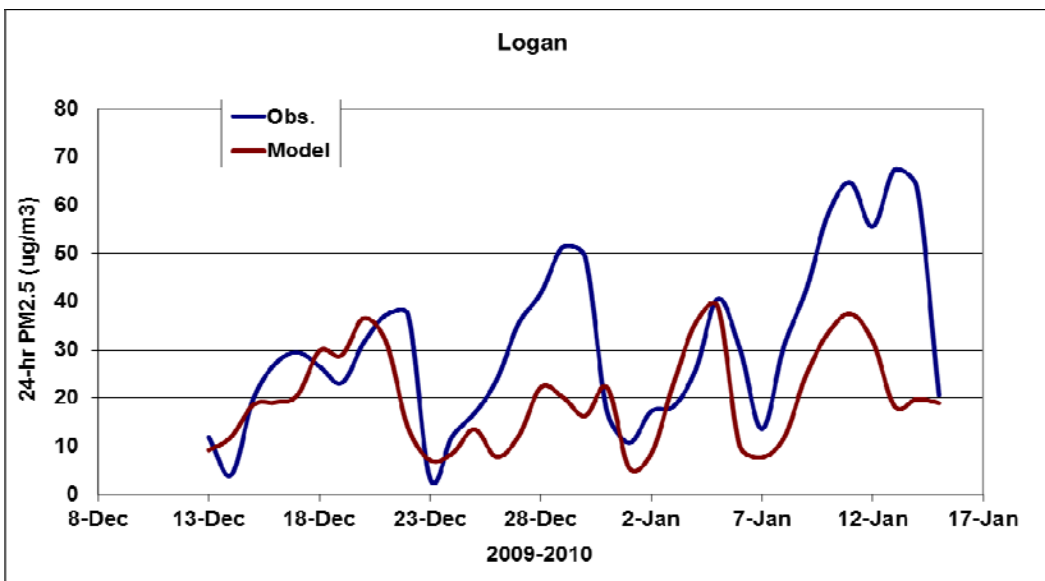


16
 17 **Figure IX.A.11. 15 24-hr $PM_{2.5}$ time series (Ogden). Observed 24-hr $PM_{2.5}$**
 18 **(blue trace) and CMAQ modeled 24-hr $PM_{2.5}$ (red trace).**
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Figure IX.A.11. 16 24-hr PM_{2.5} time series (Lindon). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



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Figure IX.A.11. 17 24-hr PM_{2.5} time series (Logan). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



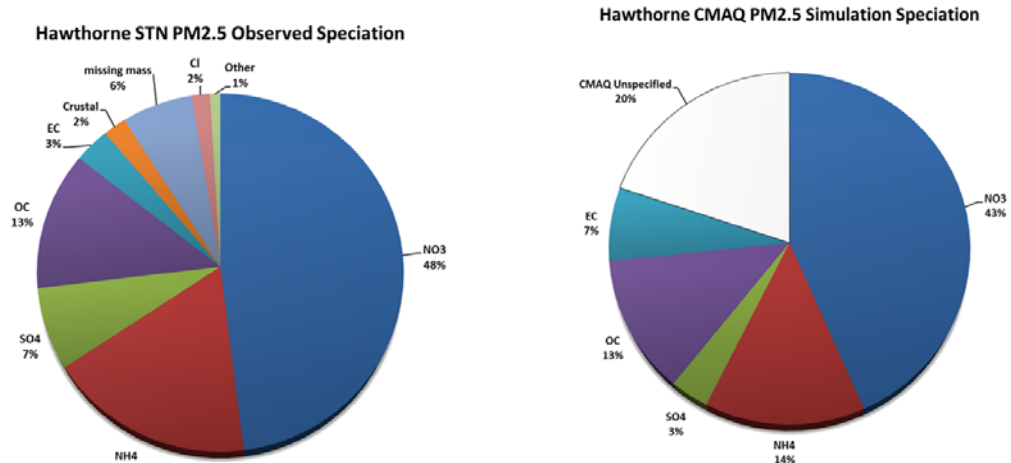
1
2 **Figure IX.A.11. 18 An example of the Salt Lake Valley at the end of a high PM_{2.5} episode.**
3 **The lowest elevations of the Salt Lake Valley are still experiencing an inversion and**
4 **elevated PM_{2.5} concentrations while the PM_{2.5} has been ‘cleared out’ throughout the rest of**
5 **the valley. These ‘end of episode’ clear out periods are difficult to replicate in the**
6 **photochemical model.**

7
8 Generally, the performance of CMAQ to replicate the buildup and clear out of PM_{2.5} is good.
9 However, it is important to verify that CMAQ is replicating the components of PM_{2.5}
10 concentrations. PM_{2.5} simulated and observed speciation is shown at the 3 STN sites in Figures
11 IX.A.11. 19-21. The observed speciation is constructed using days in which the STN filter 24-hr
12 PM_{2.5} concentration was > 35 µg/m³. For the 2009-2010 modeling period, the observed
13 speciation pie charts were created using 8 filter days at Hawthorne, 6 days at Lindon, and 4 days
14 at Bountiful.

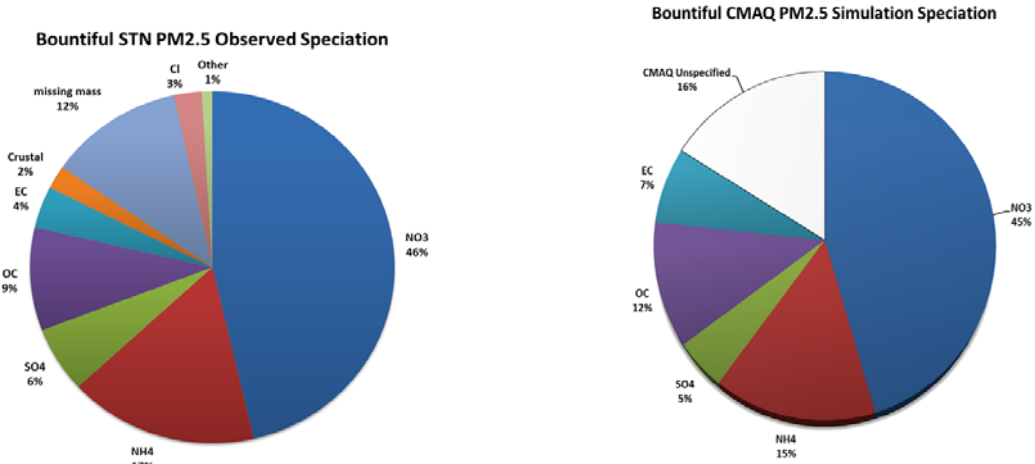
15
16 The simulated speciation is constructed using modeling days that produced 24-hr PM_{2.5}
17 concentrations > 35 µg/m³. Using this criterion, the simulated speciation pie chart is created from
18 18 modeling days for Hawthorne, 14 days at Lindon, and 14 days at Bountiful.
19 At all 3 STN sites, the percentage of simulated nitrate is greater than 40%, while the simulated
20 ammonium percentage is at ~15%. This indicates that the model is able to replicate the
21 secondarily formed particulates that typically make up the majority of the measured PM_{2.5} on the
22 STN filters during wintertime pollution events.

23
24 The percentage of model simulated organic carbon is ~13% at all STN sites, which is in
25 agreement with the observed speciation of organic carbon at Hawthorne and slightly
26 overestimated (by ~3%) at Lindon and Bountiful.

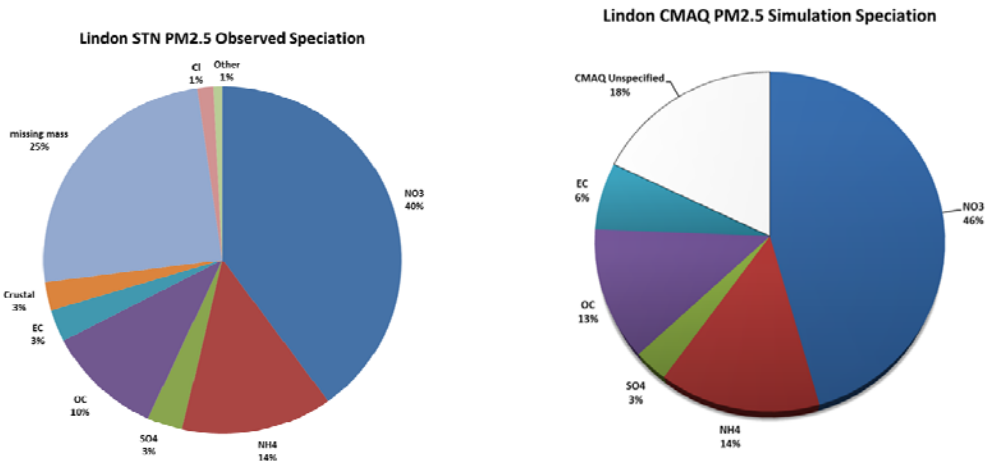
27
28 There is no STN site in the Logan nonattainment area, and very little speciation information
29 available in the Cache Valley. Figure IX.A.11. 22 shows the model simulated speciation at
30 Logan. Ammonium (17%) and nitrate (56%) make up a higher percentage of the simulated PM_{2.5}
31 at Logan when compared to sites along the Wasatch Front.



1
2 **Figure IX.A.11. 19** The composition of observed and model simulated average 24-hr PM_{2.5}
3 speciation averaged over days when an observed and modeled day had 24-hr concentrations
4 > 35 µg/m³ at the Hawthorne STN site.
5

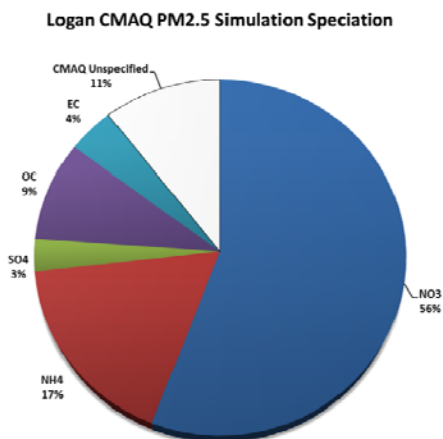


6
7 **Figure IX.A.11. 20** The composition of observed and model simulated average 24-hr PM_{2.5}
8 speciation averaged over days when an observed and modeled day had 24-hr concentrations
9 > 35 µg/m³ at the Bountiful STN site.
10
11



12

1 **Figure IX.A.11. 21 The composition of observed and model simulated average 24-hr PM_{2.5}**
2 **speciation averaged over days when an observed and modeled day had 24-hr concentrations**
3 **> 35 µg/m³ at the Lindon STN site.**
4



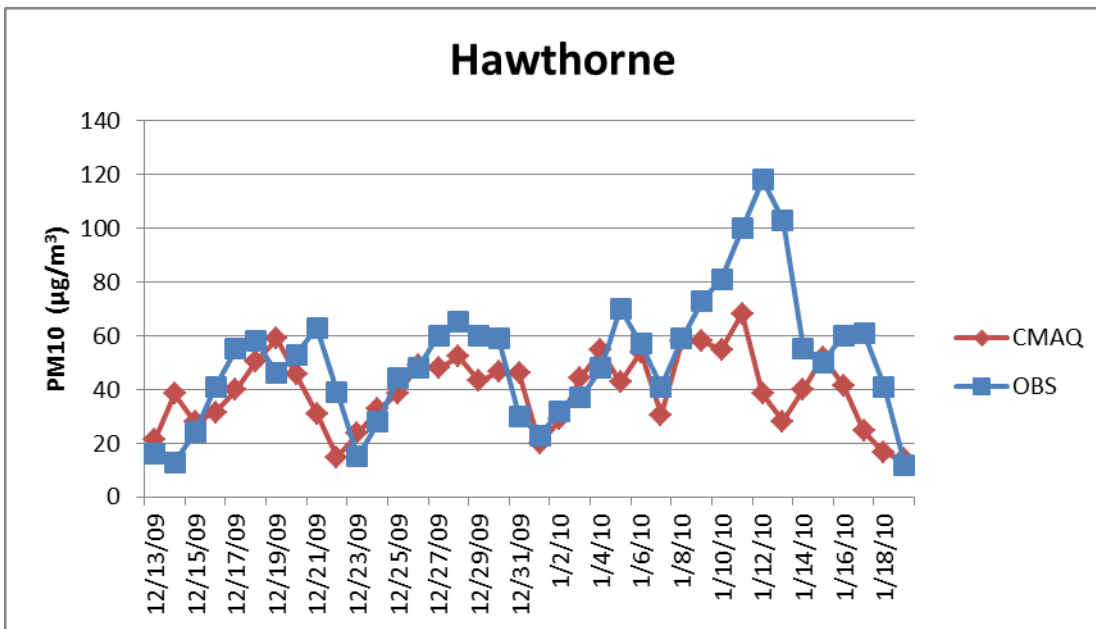
5
6 **Figure IX.A.11. 22 The composition of model simulated average 24-hr PM_{2.5} speciation**
7 **averaged over days when a modeled day had 24-hr concentrations > 35 µg/m³ at the Logan**
8 **monitoring site. No observed speciation data is available for Logan.**
9

10 PM₁₀ Results

11
12 As mentioned previously, the bulk of the performance for CMAQ modeled Particulate Matter
13 (PM) for the 2009 – 2010 episode was done for the 24-hr PM_{2.5} SIP. The detailed model
14 performance was shown using time series, statistical metrics, and pie charts. For the CMAQ
15 performance of PM₁₀ in particular, UDAQ has updated the model versus observations time series
16 plots to show PM₁₀, in addition to the prior times series using PM_{2.5}. For the 2009 – 2010
17 episode, UDAQ collected PM₁₀ observational data at Hawthorne and Magna in Salt Lake County;
18 Lindon and North Provo in Utah County; and for Ogden City.
19

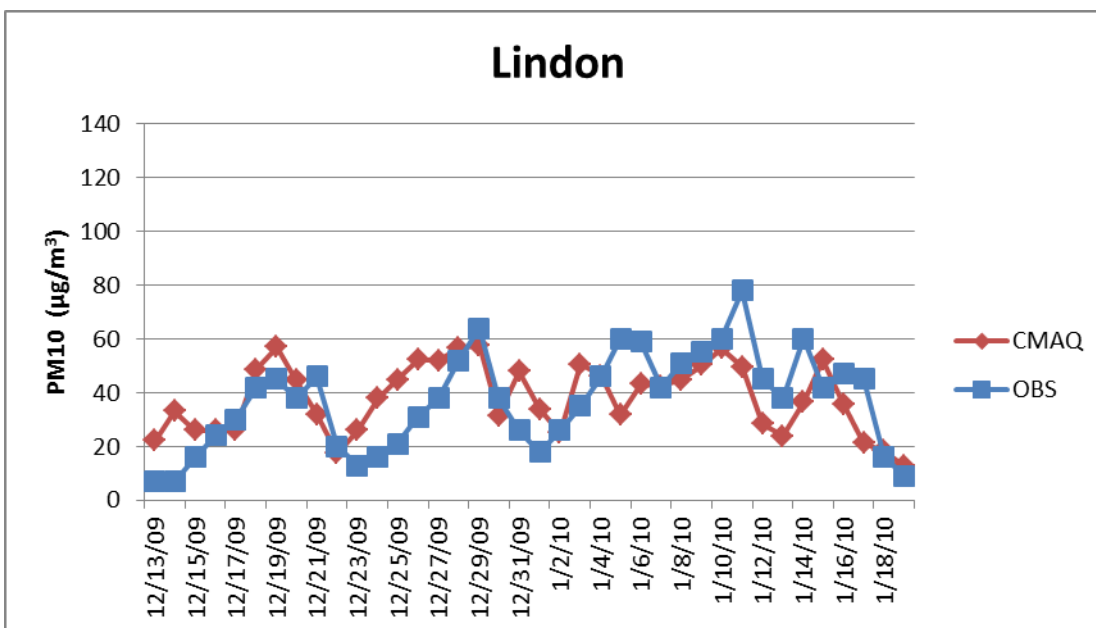
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The PM₁₀ model versus observation time series is shown in Figures IX.A.11. 23-28.



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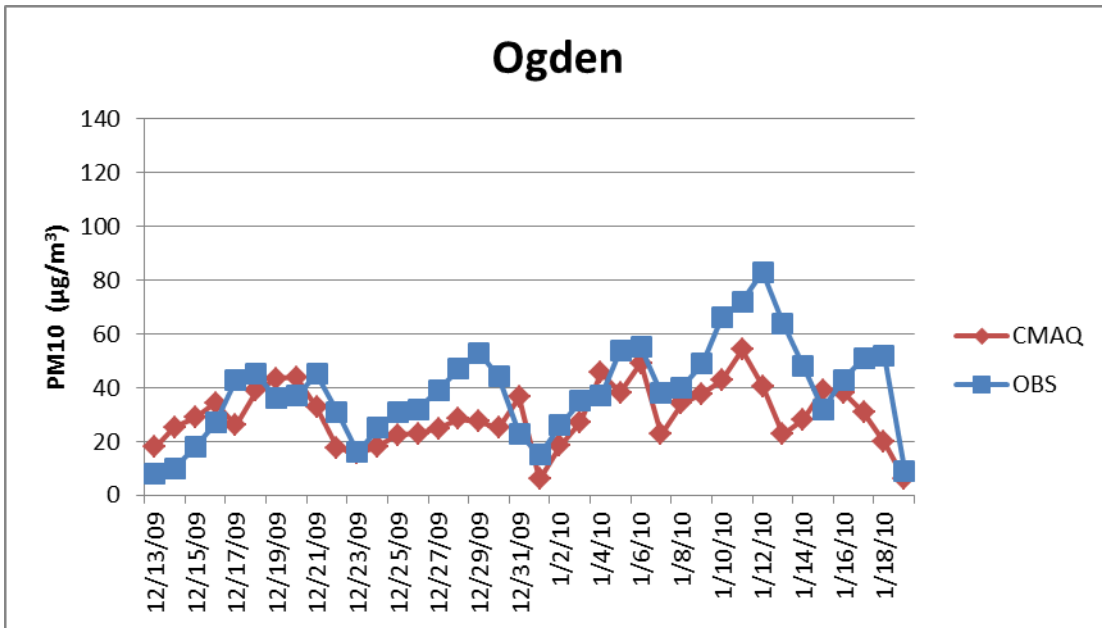
Figure IX.A.11. 23 Time Series of total PM10 (ug/m3) for Hawthorne for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



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Figure IX.A.11. 24 Time Series of total PM10 (ug/m3) for Lindon for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.

1



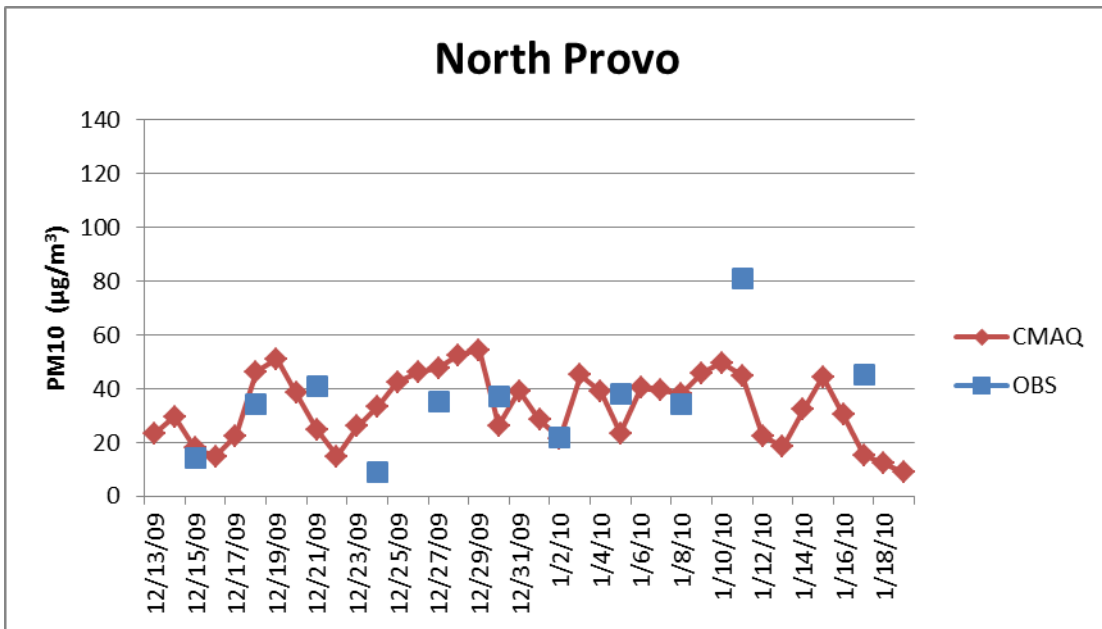
2

3

4 **Figure IX.A.11. 25 Time Series of total PM10 (ug/m3) for Ogden for the 2009-2010**
 5 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
 6 **trace.**

7

8



9

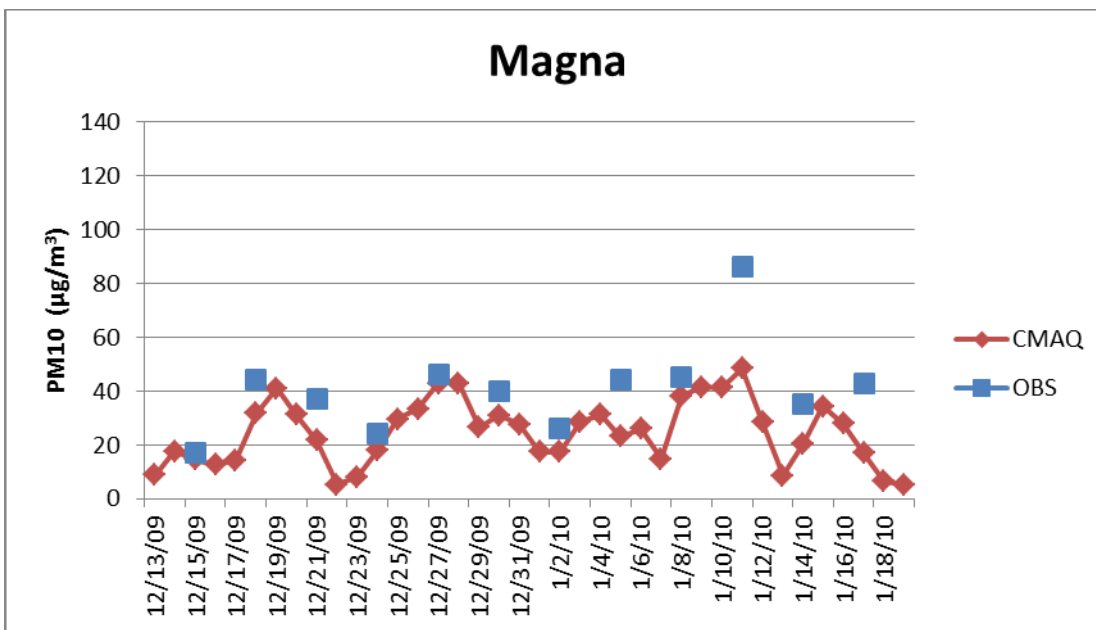
10

11 **Figure IX.A.11. 26 Time Series of total PM10 (ug/m3) for North Provo for the 2009-2010**
 12 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
 13 **trace.**

14

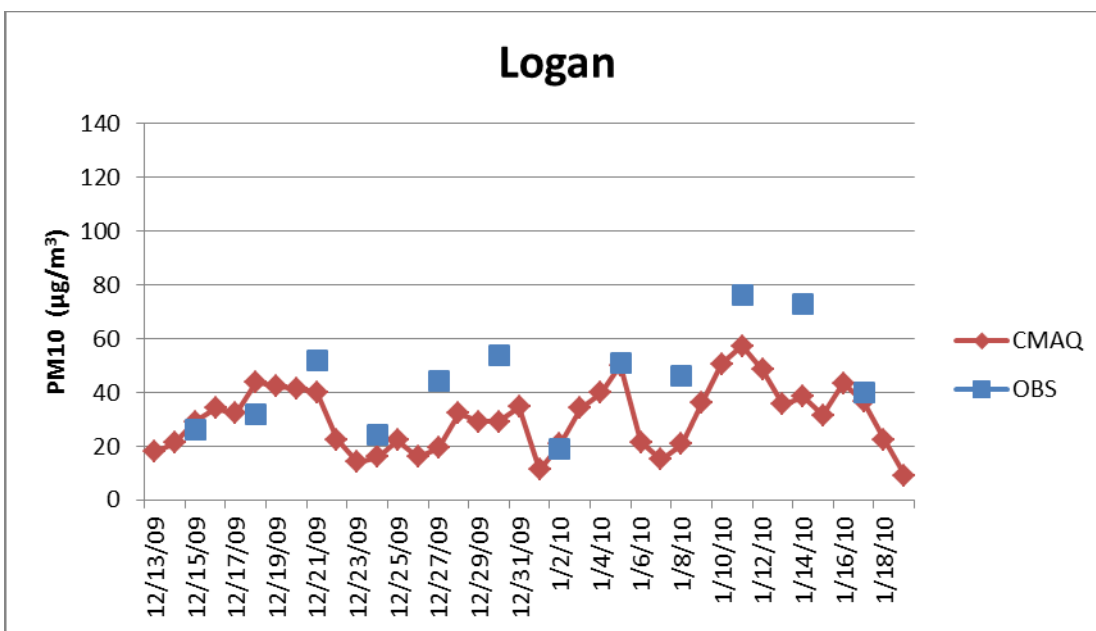
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Figure IX.A.11. 27 Time Series of total PM10 (ug/m3) for Magna for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



8
9

Figure IX.A.11. 28 Time Series of total PM10 (ug/m3) for Logan for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.

As noted before, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter speciation could not be made for this modeling period because most of the secondarily chemically formed particulate nitrate had been volatilized from the PM₁₀ filters and thus could not be accounted for. It should be noted that CMAQ was able to produce the secondarily formed nitrate

1 when compared to PM_{2.5} filters during the previous PM_{2.5} SIP work. Therefore, UDAQ feels
2 CMAQ shows good replication of the species that make up PM₁₀ during wintertime pollution
3 events.

4
5 **(g) Summary of Model Performance**

6
7 Model performance for 24-hr PM_{2.5} is good and generally acceptable and can be characterized as
8 follows:

- 9
- 10 • Good replication of the episodic buildup and clear out of PM_{2.5}. Often the model will
11 clear out the simulated PM_{2.5} a day too early at the end of an episode. This clear out time
12 period is difficult to model (i.e., Figure IX.A.11. 18).
 - 13
 - 14 • Good agreement in the magnitude of PM_{2.5}, as the model can consistently produce the
15 high concentrations of PM_{2.5} that coincide with observed high concentrations.
 - 16
 - 17 • Spatial patterns of modeled 24-hr PM_{2.5}, show for the most part, that the PM_{2.5} is being
18 confined in the valley basins, consistent to what is observed.
 - 19
 - 20 • Speciation and composition of the modeled PM_{2.5} matches the observed speciation quite
21 well. Modeled and observed nitrate are between 40% and 50% of the PM_{2.5}. Ammonium
22 is between 15% and 20% for both modeled and observed PM_{2.5}, while modeled and
23 observed organic carbon falls between 10% to 13% of the total PM_{2.5}.
 - 24

25 For PM₁₀ the CMAQ model performance is quite good at all locations along Northern Utah.
26 CMAQ is able to re-produce the buildup and washout of the pollution episodes during the 2009 –
27 2010 winter. CMAQ is also able to re-produce the peak PM₁₀ concentrations during most
28 episodes. The exception being the 2010 Jan. 08 – 14 episode, where CMAQ fails to build to the
29 extremely high PM₁₀ concentration (>80 ug/m³) seen at the monitors. This episode in particular
30 featured an “early model washout,” and these results are similar to the results found in PM_{2.5}
31 modeling.

32
33 Several observations should be noted on the implications of these model performance findings on
34 the attainment modeling presented in the following section. First, it has been demonstrated that
35 model performance overall is acceptable and, thus, the model can be used for air quality planning
36 purposes. Second, consistent with EPA guidance, the model is used in a relative sense to project
37 future year values. EPA suggests that this approach “should reduce some of the uncertainty
38 attendant with using absolute model predictions alone.”

39
40 **(h) Modeled Attainment Test**

41
42 • **Introduction**

43
44 With acceptable performance, the model can be utilized to make future-year attainment
45 projections. For any given (future) year, an attainment projection is made by calculating a
46 concentration termed the Future Design Value (FDV). This calculation is made for each monitor
47 included in the analysis, and then compared to the NAAQS (150 µg/m³). If the FDV at every
48 monitor located within a nonattainment area is smaller than the NAAQS, this would demonstrate
49 attainment for that area in that future year.

50
51 A maintenance plan must demonstrate continued attainment of the NAAQS for a span of ten
52 years. This span is measured from the time EPA approves the plan, a date which is somewhat

1 uncertain during plan development. To be conservative, attainment projections were made for
 2 2019, 2028, and 2030. An assessment was also made for 2024 as a “spot-check” against emission
 3 trends within the ten year span.

4
 5 • **PM₁₀ Baseline Design Values**

6
 7 For any monitor, the FDV is greatly influenced by existing air quality at that location. This can
 8 be quantified and expressed as a Baseline Design Value (BDV). The BDV is consistent with the
 9 form of the 24-hour PM₁₀ NAAQS; that is, that the probability of exceeding the standard should
 10 be no greater than once per calendar year. Quantification of the BDV for each monitor is
 11 included in the TSD, and is consistent with EPA guidance.

12
 13 Hourly PM₁₀ observations are taken from FRM filters spanning five monitors in three
 14 maintenance areas: Salt Lake County, Utah County, and the city of Ogden.

15
 16 In Table IX.A.11. 5, baseline design values are given for Ogden, Hawthorne, Magna, Lindon, and
 17 North Provo. These values were calculated based on data collected during the 2011-2014 time
 18 period.

19
 20 **Table IX.A.11. 5: Baseline design values listed for each monitor.**

21

Site	Maintenance Area	2011-2014 BDV
Ogden	Ogden City	88.2 µg/m ³
Hawthorne	Salt Lake County	100.9 µg/m ³
Magna	Salt Lake County	70.5 µg/m ³
Lindon	Utah County	111.4 µg/m ³
North Provo	Utah County	124.4 µg/m ³

22
 23
 24 • **Relative Response Factors**

25
 26 In making future-year predictions, the output from the CMAQ 4.7.1 model is not considered to be
 27 an absolute answer. Rather, the model is used in a relative sense. In doing so, a comparison is
 28 made using the predicted concentrations for both the year in question and a pre-selected base-
 29 year, which for this plan is 2011. This comparison results in a Relative Response Factor (RRF).
 30 RRFs are calculated as follows:

- 31
- 32 1) Modeled PM₁₀ concentrations are calculated for each grid cell in the modeling domain
 33 over the 39-day wintertime 2009-2010 episode. Of particular interest are the nine grid
 34 cells (3x3 window) that are collocated with each monitor. The monitor, itself is located in
 35 the window’s center cell.
 - 36 2) For every simulated day, the maximum daily PM₁₀ concentration for each of these nine-
 37 cell windows is identified.
 - 38 3) For each monitor, the top 20% of these 39 values are averaged to formulate a modeled
 39 PM₁₀ peak concentration value (PCV).
 - 40 4) At each monitor, the RRF is calculated as the ratio between future-year PCV and base-
 41 year PCV: **RRF = FPCV / BPCV**

42
 43
 44 • **Future Design Values and Results**

1
2 Finally, for each monitor, the FDV is calculated by multiplying the baseline design value by the
3 relative response factor: **FDV = RRF * BDV**. These FDV's are compared to the NAAQS in order
4 to determine whether attainment is predicted at that location or not. The results for each of the
5 monitors are shown below in Table IX.A.11. 6.

6
7 **Table IX.A.11. 6: Baseline design values, relative response factors, and future design values**
8 **for all monitors and future years. Units of design values are $\mu\text{g}/\text{m}^3$, while RRF's are**
9 **dimensionless.**

10

Monitor	2011 BDV	2019 RRF	2019 FDV	2024 RRF	2024 FDV	2028 RRF	2028 FDV	2030 RRF	2030 FDV
Ogden	88.2	1.05	92.6	1.04	91.7	1.02	90.0	1.05	92.6
Hawthorne	100.9	1.09	110.0	1.09	110.0	1.09	110.0	1.12	113.0
Magna	70.5	1.14	80.4	1.13	79.7	1.11	78.3	1.15	81.1
Lindon	111.4	1.16	129.2	1.12	124.8	1.11	123.7	1.16	129.2
North Provo	124.4	1.15	143.1	1.12	139.3	1.10	136.8	1.15	143.1

11
12
13 For all future-years and monitors, no FDV exceeds the NAAQS. Therefore continued attainment
14 is demonstrated for all three maintenance areas.

15
16 **(2) Attainment Inventory**

17
18 The attainment inventory is discussed in EPA guidance (Calcagni) as another one of the core
19 provisions that should be considered by states for inclusion in a maintenance plan.

20
21 According to Calcagni, the stated purpose of the attainment inventory is to establish the level of
22 emissions during the time periods associated with monitoring data showing attainment.

23
24 In cases such as this, where a maintenance demonstration is founded on a modeling analysis that
25 is used in a relative sense, the baseline inventory modeled as the basis for comparison with every
26 projection year model run is best suited to act as the attainment inventory. For this analysis, a
27 baseline inventory was compiled for the year 2011. This year also falls within the span of data
28 representing current attainment of the PM_{10} NAAQS.

29
30 Calcagni speaks about the projection inventory as well, and notes that it should consider future
31 growth, including population and industry, should be consistent with the base-year attainment
32 inventory, and should document data inputs and assumptions. Any assumptions concerning
33 emission rates must reflect permanent, enforceable measures.

34
35 Utah compiled projection inventories for use in the quantitative modeling demonstration. The
36 years selected for projection included 2019, 2024, 2028, and 2030. The emissions contained in
37 the inventories include sources located within a regional area called a modeling domain. The
38 modeling domain encompasses all three areas within the state that were designated as
39 nonattainment areas for PM_{10} : Salt Lake County, Utah County, and Ogden City, as well as a
40 bordering region see Figure IX.A.11. 1.

41
42 Since this bordering region is so large (owing to its creation to assess a much larger region of
43 $\text{PM}_{2.5}$ nonattainment), a "core area" within this domain was identified wherein a higher degree of

1 accuracy would be important. Within this core area (which includes Weber, Davis, Salt Lake,
2 and Utah Counties), SIP-specific inventories were prepared to include seasonal adjustments and
3 forecasting to represent each of the projection years. In the bordering regions away from this
4 core, the 2011 National Emissions Inventory was downloaded from EPA and inserted to the
5 analysis. It remained unchanged throughout the analysis period.

6
7 There are four general categories of sources included in these inventories: large stationary
8 sources, smaller area sources, on-road mobile sources, and off-road mobile sources.

9
10 For each of these source categories, the pollutants that were inventoried included: particulate
11 matter with an aerodynamic diameter of ten microns or less (PM₁₀), sulfur dioxide (SO₂), oxides
12 of nitrogen (NO_x), volatile organic compounds (VOC), and ammonia. SO₂ and NO_x are
13 specifically defined as PM₁₀ precursors, that is, compounds that, after being emitted to the
14 atmosphere, undergo chemical or physical change to become PM₁₀. Any PM₁₀ that is created in
15 this way is referred to as secondary aerosol. The CMAQ model also considers ammonia and
16 VOC to be contributing factors in the formation of secondary aerosol.

17
18 The unit of measure for point and area sources is the traditional tons per year, but the CMAQ
19 model includes a pre-processor that converts these emission rates to hourly increments throughout
20 each day for each episode. Mobile source emissions are reported in terms of tons per day, and are
21 also pre-processed by the model.

22
23 The basis for the point source and area inventories, for the base-year attainment inventory as well
24 as all future-year projection inventories, was the 2011 tri-annual inventory of actual emissions
25 that had already been compiled by the Division of Air Quality.

26
27 Area sources, off-road mobile sources, and generally also the large point sources were projected
28 forward from 2011, using population and economic forecasts from the Governor's Office of
29 Management and Budget.

30
31 Mobile source emissions were calculated for each year using MOVES2010 in conjunction with
32 the appropriate estimates for vehicle miles traveled (VMT). VMT estimates for the urban
33 counties were based on a travel demand model that is only run periodically for specific projection
34 years. VMT for intervening years were estimated by interpolation.

35
36 Since this SIP subsection takes the form of a maintenance plan, it must demonstrate that the area
37 will continue to attain the PM₁₀ NAAQS throughout a period of ten years from the date of EPA
38 approval. It is also necessary to "spot check" this ten-year interval. Hence, projection inventories
39 were prepared for the following years: 2019, 2024, 2028, (the ten-year mark from anticipated
40 EPA approval), and 2030. 2011 was established as the baseline period.

41
42 The following tables are provided to summarize these inventories. As described, they represent
43 point, area, on-road mobile, and off-road mobile sources in the modeling domain. They include
44 PM₁₀, SO₂, NO_x, VOC, and ammonia.

45
46 The first Table IX.A.11. 7 shows the baseline emissions for each of the areas within the
47 modeling domain. The second Table IX.A.11. 8 is specific to this nonattainment area, and
48 shows the emissions from the baseline through the projection years.

1
2

Table IX.A.11. 7 Baseline Emissions throughout the Modeling Domain

2011 Baseline	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline Sum of Emissions (tpd)	Ogden City NA-Area	Area Sources	0.85	0.08	2.12	5.67	0.86
		NonRoad	0.90	0.00	1.32	0.91	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.09	0.05	12.18	8.58	0.22
		Provo NA Total	3.84	0.13	15.62	15.16	1.08
	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	7.12	0.32	11.71	6.38	0.00
		Point Source	4.04	8.90	15.56	2.97	0.20
		Mobile Sources	10.95	0.28	57.96	35.35	1.14
		Salt Lake City NA Total	26.72	9.55	85.96	77.32	2.87
	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	3.53	0.02	4.24	2.31	0.00
		Point Source	0.28	0.29	1.03	0.18	0.18
		Mobile Sources	4.90	0.13	24.64	11.89	0.49
		Surrounding Areas Total	10.90	0.46	30.13	15.54	1.50
	Surrounding Areas	Area Sources	537.49	13.60	228.31	629.52	331.22
		NonRoad	34.53	0.10	60.77	72.57	0.01
		Point Source	17.64	283.15	538.86	63.96	6.08
		Mobile Sources	22.80	193.52	434.92	6.47	1.67
		Surrounding Areas Total	612.46	490.37	1262.86	772.52	338.98
	2011 Total	653.92	500.51	1394.57	880.54	344.43	

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Table IX.A.11. 8 Salt Lake County Nonattainment Area; Actual Emissions for 2011 and Emission Projections for 2019, 2024, 2028, and 2030.

Year	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	3.53	0.02	4.24	2.31	0.00
		Point Source	0.28	0.29	1.03	0.18	0.18
		Mobile Sources	4.90	0.13	24.64	11.89	0.49
		2011 Total	10.90	0.46	30.13	15.54	1.50
2019	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	4.80	0.02	3.04	1.95	0.01
		Point Source	0.87	0.44	3.24	0.86	0.43
		Mobile Sources	6.04	0.17	13.77	6.43	0.46
	2019 Total	13.90	0.65	20.27	10.40	1.73	
2024	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	5.19	0.02	2.45	1.90	0.01
		Point Source	0.92	0.47	3.42	0.91	0.43
		Mobile Sources	6.37	0.16	9.01	5.22	0.48
	2024 Total	14.67	0.67	15.10	9.19	1.75	
2028	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	5.68	0.02	2.17	1.92	0.01
		Point Source	0.96	0.49	0.00	0.96	0.43
		Mobile Sources	6.97	0.16	7.28	4.60	0.51
	2028 Total	15.80	0.69	9.67	8.64	1.78	
2030	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	6.25	0.02	2.07	1.94	0.01
		Point Source	0.99	0.49	3.67	0.98	0.43
		Mobile Sources	7.66	0.16	6.81	4.54	0.54
	2030 Total	17.09	0.69	12.77	8.62	1.81	

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More detail concerning any element of the inventory can be found at the appropriate section of the Technical Support Document (TSD). More detail about the general construction of the inventory may be found in the Inventory Preparation Plan.

1
2 **(3) Emissions Limitations**
3

4 As discussed above, the larger sources within the nonattainment areas were individually
5 inventoried and modeled in the analysis.
6

7 A subset of these “large” sources was subsequently identified for the purpose of establishing
8 emission limitations as part of the Utah SIP. This subset includes any source located within any
9 of the three current nonattainment areas for PM₁₀: Salt Lake County, Utah County, or Ogden City
10 whose actual emissions of PM₁₀, SO₂, or NO_x exceeded 100 tons in 2011, or who had the
11 potential to emit 100 tpy of any of these pollutants. A source might also be included in the subset
12 if it was currently regulated for PM₁₀ under section IX, Part H of the Utah SIP. There were
13 several sources in Davis County that were close enough to the border so as to have originally
14 been included in the original PM₁₀ SIP.
15

16 As discussed before, the emission limits for these sources had already been reflected in the
17 projected emissions inventories used in the modeling analysis. Only those limits for which credit
18 is being taken in the SIP have been incorporated specifically into the SIP. Many of these limits
19 appear in state issued Approval Orders or Title V Operating Permits. Such regulatory documents
20 typically include many emission limits and operating restrictions. However, the limits found in
21 the SIP cannot be changed unless the State provides, and EPA approves, a SIP revision.
22

23 These limits are incorporated in the Utah SIP at Section IX, Part H (formerly Sections 1 and 2 of
24 Appendix A to Section IX, Part A), and as such are federally enforceable.
25

26 These conditions support a demonstration of maintenance through 2030.
27
28

29 **(4) Emission Reduction Credits**
30

31 Under Utah’s new source review rules in R307-403-8, banking of emission reduction credits
32 (ERCs) is permitted to the fullest extent allowed by applicable Federal Law as identified in 40
33 CFR 51, Appendix S, among other documents. Under Appendix S, Section IV.C.5, a permitting
34 authority may allow banked ERCs to be used under the preconstruction review program (R307-
35 403) as long as the banked ERCs are identified and accounted for in the SIP control strategy.
36

37 Existing Emission Reduction Credits, for PM₁₀, SO₂, and NO_x, were included in the modeled
38 demonstration of maintenance outlined in Subsection IX.A.11.c(1).
39

40 The subsequent crediting of any emission reduction of PM₁₀, or precursors thereto, whether pre-
41 existing or established subsequent to the approval of this SIP revision, remains permissible. In
42 general, credits must be in excess and must be established by actual, verifiable, and enforceable
43 reductions in emissions. Additionally, these ERCs cannot be used to offset major new sources or
44 major modifications at existing sources in PM_{2.5} nonattainment areas.
45

46 Once **Utah County** is redesignated to attainment for PM₁₀, permitting new PM₁₀ sources or major
47 modifications to existing PM₁₀ sources will be conducted under the rules of the Prevention of
48 Significant Deterioration program.
49
50
51

1 **(5) Additional Controls for Future Years**

2
3 Since the emission limitations discussed in subsection IX.A.11.c.(3) are federally enforceable
4 and, as demonstrated in IX.A.10.c(1) above, are sufficient to ensure continued attainment of the
5 PM₁₀ NAAQS, there is no need to require any additional control measures to maintain the PM₁₀
6 NAAQS.
7
8

9 **(6) Mobile Source Budget for Purposes of Conformity**

10
11 The transportation conformity provisions of section 176(c)(2)(A) of the Clean Air Act (CAA)
12 require regional transportation plans and programs to show that "...emissions expected from
13 implementation of plans and programs are consistent with estimates of emissions from motor
14 vehicles and necessary emissions reductions contained in the applicable implementation plan..."
15 EPA's transportation conformity regulation (40 CFR 93, Subpart A, last amended at 77 FR 14979,
16 March 14 2012) also requires that motor vehicle emission budgets must be established for the
17 last year of the maintenance plan, and may be established for any years deemed appropriate (see
18 40 CFR 93.118((b)(2)(i)). If the maintenance plan does not establish motor vehicle emissions
19 budgets for any years other than the last year of the maintenance plan, the conformity regulation
20 requires that a "demonstration of consistency with the motor vehicle emissions budget(s) must be
21 accompanied by a qualitative finding that there are not factors which would cause or contribute to
22 a new violation or exacerbate an existing violation in the years before the last year of the
23 maintenance plan." The normal interagency consultation process required by the regulation (40
24 CFR 93.105) shall determine what must be considered in order to make such a finding.
25

26 Thus, for a Metropolitan Planning Organization's (MPO's) Regional Transportation Plan (RTP),
27 analysis years that are after the last year of the maintenance plan (in this case 2030), a conformity
28 determination must show that emissions are less than or equal to the maintenance plan's motor
29 vehicle emissions budget(s) for the last year of the implementation plan.
30

31 EPA's MOVES2014 was used to calculate mobile source emissions, and road dust projections
32 were calculated using the January 2011 update to AP-42 Method for Estimating Re-Entrained
33 Road Dust from Paved Roads (Chapter 13, released 76 FR 6329 February 4, 2011).
34

35 Utah has determined that mobile sources are not significant contributors of SO₂ for this
36 maintenance plan. As such, this maintenance plan does not establish a motor vehicle emissions
37 budget for SO₂.
38

39 **(a) Utah County: Mobile Source PM₁₀ Emissions Budgets**

40
41 In this maintenance plan, Utah is establishing transportation conformity motor vehicle emission
42 budgets (MVEB) for PM₁₀ (direct) and NO_x for 2030.
43

44 **(i) Direct PM₁₀ Emissions Budget**

45
46 Direct (or "primary") PM₁₀ refers to PM₁₀ that is not formed via atmospheric chemistry. Rather,
47 direct PM₁₀ is emitted straight from a mobile or stationary source. With regard to the emission
48 budget presented herein, direct PM₁₀ includes road dust, brake wear, and tire wear as well as
49 PM₁₀ from exhaust.
50

51 *As presented in the Technical Support Document for on-road mobile sources, the estimated on-*
52 *road mobile source emissions for Utah County, in 2030, of direct sources of PM₁₀ (road dust,*

1 brake wear, tire wear, and exhaust particles) were 7.66 tons per winter-weekday. These mobile
2 source PM₁₀ emissions were included in the maintenance demonstration in Subsection
3 IX.A.11.c.(1) which estimates a maximum PM₁₀ concentration of 143.1 µg/m³ in 2030 within the
4 Utah County portion of the modeling domain. The above PM₁₀ mobile source emission figure of
5 7.66 tons per day (tpd) would traditionally be considered as the MVEB for the maintenance plan.
6 However, and as discussed below, the modeled concentration is 6.9 µg/m³ below the NAAQS of
7 150 µg/m³, and represents potential PM₁₀ emissions that may be considered for allocation to the
8 PM₁₀ MVEB.

9
10 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
11 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
12 compliance with the maintenance requirement. These additional emissions that can be allocated
13 to the applicable MVEB are considered the "safety margin." As defined in 40 CFR 93.101,
14 safety margin represents the amount of emissions by which the total projected emissions from all
15 sources of a given pollutant are less than the total emissions that would satisfy the applicable
16 requirement for demonstrating maintenance. The implementation plan can then allocate some or
17 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

18
19 The safety margin for the Utah County portion of the domain equates to 6.9 µg/m³.

20
21 To evaluate the portion of safety margin that could be allocated to the PM₁₀ MVEB, modeling
22 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.

23
24 Using the same emission projections for point and area and non-road mobile sources, the
25 SMOKE 3.6 emissions model was re-run using 12.28 tons of PM₁₀ per winter-weekday for
26 mobile sources (and 8.34 tons/winter-weekday of NO_x). The revised maintenance demonstration
27 for 2030 still shows maintenance of the PM₁₀ standard.

28
29 It estimates a maximum PM₁₀ concentration of 148.0 µg/m³ in 2030 within the Utah County
30 portion of the modeling domain. This value is 2.0 µg/m³ below the NAAQ Standard of 150
31 µg/m³, but 4.9 µg/m³ higher than the previous value.

32
33 This shows that the safety margin is at least 4.62 tons/day of PM₁₀ (12.28 tons/day minus 7.66
34 tons/day) and 1.53 tons/day of NO_x (8.34 tons/day minus 6.81 tons/day). This maintenance plan
35 allocates this portion of the safety margin to the mobile source budgets for Utah County, and
36 thereby sets the direct PM₁₀ MVEB for 2030 at 12.28 tons/winter-weekday.

37 38 39 (ii) NO_x Emissions Budget

40
41 Through atmospheric chemistry, NO_x emissions can substantially contribute to secondary PM₁₀
42 formation. For this reason, NO_x is considered a PM₁₀ precursor.

43
44 As presented in the Technical Support Document for on-road mobile sources, the estimated on-
45 road mobile source NO_x emissions for Utah County in 2030 were 6.81 tons per winter-weekday.
46 These mobile source PM₁₀ emissions were included in the maintenance demonstration in
47 Subsection IX.A.11.c.(1) which estimates a maximum PM₁₀ concentration of 143.1 µg/m³ in
48 2030 within the Utah County portion of the modeling domain. The above NO_x mobile source
49 emission figure of 6.81 tons per day (tpd) would traditionally be considered as the MVEB for the
50 maintenance plan. However, and as discussed below, the modeled concentration is 6.9 µg/m³
51 below the NAAQS of 150 µg/m³, and represents potential NO_x emissions that may be considered
52 for allocation to the NO_x MVEB.

1
2 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
3 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
4 compliance with the maintenance requirement. These additional emissions that can be allocated
5 to the applicable MVEB are considered the "safety margin." As defined in 40 CFR 93.101,
6 safety margin represents the amount of emissions by which the total projected emissions from all
7 sources of a given pollutant are less than the total emissions that would satisfy the applicable
8 requirement for demonstrating maintenance. The implementation plan can then allocate some or
9 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

10
11 The safety margin for the Utah County portion of the domain equates to $6.9 \mu\text{g}/\text{m}^3$.

12
13 To evaluate the portion of safety margin that could be allocated to the PM_{10} MVEB, modeling
14 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.

15
16 Using the same emission projections for point and area and non-road mobile sources, the
17 SMOKE 3.6 emissions model was re-run using 8.34 tons of NO_x per winter-weekday for on-road
18 mobile sources (and 12.28 tons/winter-weekday of PM_{10}). The revised maintenance
19 demonstration for 2030 still shows maintenance of the PM_{10} standard.

20
21 It estimates a maximum PM_{10} concentration of $148.0 \mu\text{g}/\text{m}^3$ in 2030 within the Utah County
22 portion of the modeling domain. This value is $2.0 \mu\text{g}/\text{m}^3$ below the NAAQ Standard of 150
23 $\mu\text{g}/\text{m}^3$, but $4.9 \mu\text{g}/\text{m}^3$ higher than the previous value.

24
25 This shows that the safety margin is at least 1.53 tons/day of NO_x (8.34 tons/day minus 6.81
26 tons/day) and 4.62 tons/day of PM_{10} (12.28 tons/day minus 7.66 tons/day). This maintenance
27 plan allocates this portion of the safety margin to the mobile source budgets for Utah County, and
28 thereby sets the NO_x MVEB for 2030 at 8.34 tons/winter-weekday

29
30
31 **(b) Net Effect to Maintenance Demonstration**

32
33 Using the procedure described above, some of the identified safety margin indicated earlier in
34 Subsection IX.A.11.c(6) has been allocated to the mobile vehicle emissions budgets. The results
35 of this modification are presented below.

36
37 **(i) Inventory: The emissions inventory was adjusted as shown below:**

38
39 in 2030: PM_{10} was adjusted by adding 4.62 ton/day (tpd) of safety margin to 7.66
40 tpd inventory for a total of 12.28 tpd, and

41
42 NO_x was adjusted by adding 1.53 tpd of safety margin to 6.81 tpd
43 inventory for a total of 8.34 tpd,

44 **(ii) Modeling:**

45
46 The effect on the modeling results throughout the domain is summarized in the following
47 Table IX.A.11. 9 (which shows predicted concentrations in $\mu\text{g}/\text{m}^3$). It demonstrates that
48 with the allocation of the safety margin, the NAAQS is still maintained through 2030 in
49 all areas.

Table IX.A. IX.A.11. 9 Modeling of Attainment in 2030, Including the Portion of the Safety Margin Allocated to Motor Vehicles

Air Quality Monitor	Predicted Concentrations in 2030 $\mu\text{g}/\text{m}^3$	
	A	B
Lindon	129.2	133.7
North Provo	143.1	148.0

Notes: Column A shows concentrations presented previously as part of the modeled attainment test. Column B shows concentrations resulting from allocation of a portion of the safety margin.

(7) Nonattainment Requirements Applicable Pending Plan Approval

CAA 175A(c) - *Until such plan revision is approved and an area is redesignated as attainment, the requirements of CAA Part D, Plan Requirements for Nonattainment Areas, shall remain in force and effect.* The Act requires the continued implementation of the nonattainment area control strategy unless such measures are shown to be unnecessary for maintenance or are replaced with measures that achieve equivalent reductions. Utah will continue to implement the emissions limitations and measures from the PM₁₀ SIP.

(8) Revise in Eight Years

CAA 175A(b) - *Eight years after redesignation, the State must submit an additional plan revision which shows maintenance of the applicable NAAQS for an additional 10 years.* Utah commits to submit a revised maintenance plan eight years after EPA takes final action redesignating the Utah County area to attainment, as required by the Act.

(9) Verification of Continued Maintenance

Implicit in the requirements outlined above is the need for the State to determine whether the area is in fact maintaining the standard it has achieved. There are two complementary ways to measure this: 1) by monitoring the ambient air for PM₁₀, and 2) by inventorying emissions of PM₁₀ and its precursors from various sources.

The State will continue to maintain an ambient monitoring network for PM₁₀ in accordance with 40 CFR Part 58 and the Utah SIP. The State anticipates that the EPA will continue to review the ambient monitoring network for PM₁₀ each year, and any necessary modifications to the network will be implemented.

Additionally, the State will track and document measured mobile source parameters (e.g., vehicle miles traveled, congestion, fleet mix, etc.) and new and modified stationary source permits. If these and the resulting emissions change significantly over time, the State will perform appropriate studies to determine: 1) whether additional and/or re-sited monitors are necessary, and 2) whether mobile and stationary source emission projections are on target.

1 The State will also continue to collect actual emissions inventory data from all sources of PM₁₀,
2 SO₂, and NO_x in excess of 25 tons (in aggregate) per year, as required by R307-150.
3
4
5

6 **(10) Contingency Measures**

7

8 *CAA 175A(d) - Each maintenance plan shall contain contingency measures to assure that the*
9 *State will promptly correct any violation of the standard which occurs after the redesignation of*
10 *the area to attainment. Such provisions shall include a requirement that the State will implement*
11 *all control measures which were contained in the SIP prior to redesignation.*
12

13 Utah has implemented all measures contained in the nonattainment plan, however for the
14 purposes of this maintenance plan the list of stationary sources included in SIP Section IX. Part
15 H. was updated. Some of the sources identified in the nonattainment SIP are no longer
16 operational or no longer rise to the emission thresholds established for such inclusion. In such
17 instances, the emission limits belonging specifically to these sources were not carried forward.
18 Where such a source is still operational, the prior SIP limits from the nonattainment plan are
19 identified below as potential contingency measures. Some of the specific limits within may no
20 longer apply and would need to be reevaluated at that time.
21

22 This Contingency Plan for **Utah County** supersedes Subsection IX.A.8, Contingency Measures,
23 which is part of the original PM₁₀ SIP.
24

25 The contingency plan must also ensure that the contingency measures are adopted expeditiously
26 once triggered. The primary elements of the contingency plan are: 1) the list of potential
27 contingency measures, 2) the tracking and triggering mechanisms to determine when
28 contingency measures are needed, and 3) a description of the process for recommending and
29 implementing the contingency measures.
30

31 **(a) Tracking**

32

33 The tracking plan for the Salt Lake County, Utah County, and Ogden City areas consists of
34 monitoring and analyzing PM₁₀ concentrations. In accordance with 40 CFR 58, the State will
35 continue to operate and maintain an adequate PM₁₀ monitoring network in Salt Lake County,
36 Utah County, and Ogden City.
37
38
39

40 **(b) Triggering**

41

42 Triggering of the contingency plan does not automatically require a revision to the SIP, nor does
43 it necessarily mean the area will be redesignated once again to nonattainment. Instead, the State
44 will normally have an appropriate timeframe to correct the potential violation with
45 implementation of one or more adopted contingency measures. In the event that violations
46 continue to occur, additional contingency measures will be adopted until the violations are
47 corrected.
48

49 Upon notification of a potential violation of the PM₁₀ NAAQS, the State will develop appropriate
50 contingency measures intended to prevent or correct a violation of the PM₁₀ standard.
51 Information about historical exceedances of the standard, the meteorological conditions related to

1 the recent exceedances, and the most recent estimates of growth and emissions will be reviewed.
2 The possibility that an exceptional event occurred will also be evaluated.

3
4 Upon monitoring a potential violation of the PM₁₀ NAAQS, including exceedances flagged as
5 exceptional events but not concurred with by EPA, the State will take the following actions.

- 6
7 • The State will identify the source(s) of PM₁₀ causing the potential violation, and report
8 the situation to EPA Region VIII within four months of the potential violation.
9
10 • The State will identify a means of corrective action within six months after a potential
11 violation. The maintenance plan contingency measures to be considered and selected
12 will be chosen from the following list or any other emission control measures deemed
13 appropriate based on a consideration of cost-effectiveness, emission reduction potential,
14 economic and social considerations, or other factors that the State deems appropriate:
15
16 - Re-evaluate the thresholds at which a red or yellow burn day is triggered, as
17 established in R307-302;
18
19 - Further controls on stationary sources

20
21 The State will then hold a public hearing to consider the contingency measures identified to
22 address the violation. The State will require implementation of such corrective action no later
23 than one year after the violation is confirmed. Any contingency measures adopted and
24 implemented will become part of the next revised maintenance plan submitted to the EPA for
25 approval.

26
27 It is also possible that contingency measures may be pre-implemented, where no violation of the
28 2006 PM₁₀ NAAQS has yet occurred.



State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQ-049-15

MEMORANDUM

TO: Air Quality Board

THROUGH: Bryce C. Bird, Executive Secretary

FROM: Bill Reiss, Environmental Engineer

DATE: August 21, 2015

SUBJECT: PROPOSE FOR PUBLIC COMMENT: [Repeal of Existing SIP Subsection IX.A12 and Re-enact with SIP Subsection IX.A.12: PM₁₀ Maintenance Provisions for Ogden City.](#)

Introduction:

This item concerns a proposed State Implementation Plan (SIP) revision to address Utah's three nonattainment areas for PM₁₀. These areas have been attaining the PM₁₀ standard for a long time, and this revision demonstrates that they will continue to do so through the year 2030.

The revision is structured as a maintenance plan, which will allow Utah to request that EPA change the area designations back to attainment for PM₁₀. These areas include Salt Lake County, Utah County, and Ogden City.

[Ogden City was designated a nonattainment area for PM₁₀ in 1995 based on a total of six exceedances of the 24-hour standard recorded between January 1991 and January 1993.](#) Since that time, PM_{2.5} has supplanted PM₁₀ as the indicator of fine particulate matter. Though PM₁₀ also includes the coarse fraction of PM, Utah's difficulties with PM₁₀ were characterized by the same winter time episodes that lead to elevated PM_{2.5} levels.

Essentially, this SIP revision would close the book on PM₁₀ and allow Utah to focus on meeting the PM_{2.5} standard. All three of the affected areas are currently designated nonattainment for PM_{2.5}.

Scope:

There are two parts to the SIP revision. (This) Section IX. Part A is the SIP document itself, and addresses the criteria necessary to request redesignation. It includes the actual Maintenance Plan, which includes the quantitative demonstration of continued attainment.

Some of the items addressed in Part A include:

- monitored attainment of the PM₁₀ NAAQS
- establishment of motor vehicle emission budgets for purposes of transportation conformity
- consideration of emission reduction credits, and
- contingency measures

The second piece is SIP Section IX, Part H. It includes the emission limits for certain specific stationary sources. Including these limits in the SIP makes them federally enforceable.

Part H, whether currently approved or as now proposed, does not include any sources located in Ogden City.

SIP Organization:

As originally written in 1991, the PM₁₀ nonattainment SIP for Salt Lake and Utah Counties resides at Section IX.A. 1-8 of the Utah SIP. This plan had projected attainment of the NAAQS through the year 2003.

In 2005, Utah prepared a revision to the plan that showed continued attainment in Ogden City through the year 2017. This revision, also structured as a maintenance plan, was placed into the SIP at Section IX.A.12. Subsections IX.A.10 and 11 were also added as the maintenance plan provisions for Salt Lake County and Utah County respectively.

At this time, DAQ staff is proposing to replace each of these three subsections of the SIP in separate actions. Since there is a large amount of redundant material in the three documents, they have been prepared using color coding to denote which parts of each plan are specific to the respective nonattainment areas. In reviewing the proposals, the reader should note that purple text is specific to the Ogden City nonattainment area. Likewise, blue text and green text are specific to Salt Lake County and Utah County respectively.

Staff Recommendation: Staff recommends that the Board propose for public comment to repeal existing SIP Subsection IX.A.12, and re-enact with SIP Subsection IX.A.12: PM₁₀ Maintenance Provisions for Ogden City, as proposed.

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UTAH

PM₁₀ Maintenance Provisions for Ogden City

Section IX.A.12

Adopted by the Air Quality Board
December 2, 2015

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Section IX.A.12
PM₁₀ Maintenance Provisions for Ogden City

5
6
IX.A.12.a Introduction

7 The State of Utah is requesting that the U.S. Environmental Protection Agency (EPA) redesignate
8 the **Ogden City** nonattainment area to attainment status for the 24-hour PM₁₀ National Ambient
9 Air Quality Standard (NAAQS).

10
11 The foregoing Subsections 1-9 of Part IX.A of the Utah State Implementation Plans (SIP) were
12 written in 1991 to address violations of the NAAQS for PM₁₀ in both Utah County and Salt Lake
13 County. These areas were each classified as Initial Moderate PM₁₀ Nonattainment Areas, and as
14 such required “nonattainment SIPs” to bring them into compliance with the NAAQS by a
15 statutory attainment date. The control measures adopted as part of those plans have proven
16 successful in that regard, and at the time of this writing (2015) each of these areas continues to
17 show compliance with the federal health standards for PM₁₀.

18
19 Subsections 10 and 11 of Part IX.A of the Utah SIP represent the second chapter of the PM₁₀
20 story for these areas, and demonstrate that they have achieved compliance with the PM₁₀ NAAQS
21 and will continue to maintain that standard through the year 2017. As such, Subsections 10 and
22 11 are written in accordance with Section 175A (42 U.S.C. 7505a) of the federal Clean Air Act
23 (the Act), and should serve to satisfy the requirement of Section 107(d)(3)(E)(iv) of the Act.
24

25 This Subsection 12 makes the same demonstration with respect to Ogden City, and is structured
26 in the same way. It is hereafter referred to as the “Maintenance Plan” or “the Plan,” and contains
27 the PM₁₀ maintenance provisions for Ogden City. This area was effectively designated to
28 nonattainment for PM₁₀ on September 26, 1995.
29

30 In a similar way, any references to the Technical Support Document (TSD) in this section means
31 actually Supplement IV-15 to the Technical Support Document for the PM₁₀ SIP.
32
33

34
35
Background

36 The Act requires areas failing to meet the federal ambient PM₁₀ standard to develop SIP revisions
37 with sufficient control requirements to expeditiously attain and maintain the standard. On July 1,
38 1987, EPA promulgated a new NAAQS for particulate matter with a diameter of 10 microns or
39 less (PM₁₀).
40

41 Ogden City was designated from unclassifiable to nonattainment on September 26, 1995. This
42 was due to a total of six exceedances of the 24-hour standard recorded between January 1991 and
43 January 1993. Along with redesignation came the requirement for a nonattainment SIP, due in 18
44 months, and an attainment date of December 31, 2001.
45

46 However, in 1997 a new standard for PM₁₀ was promulgated by the EPA, and, based on the
47 revised form of this new standard, Ogden City would never have been found to be in
48 noncompliance.
49

1 In an effort to transition to the new form of the PM₁₀ standard, EPA issued its Interim
2 Implementation Guidance (IIG) on December 23, 1997. This, in conjunction with additional
3 guidance (5/8/98 memorandum from Sally L. Shaver to all Regional Air Directors) identified two
4 steps necessary to revoke the old standard for areas like Ogden City that were presently (as of
5 September 16, 1997) attaining the standard. The State would need to: 1) codify into its SIP any
6 existing controls that were implemented at the state level, and 2) demonstrate the state's
7 capacity to implement the revised PM₁₀ standards with respect to the Clean Air Act (CAA)
8 requirements found at Section 110.
9

10 By letter of March 27, 1998, Utah declared it could meet the second of these requirements for all
11 areas of the state. A second letter (June 25, 1998) addressed the first requirement, and requested
12 that the old PM₁₀ standard be revoked and that the outstanding Part D requirement be waived for
13 Ogden City.
14

15 EPA responded in a letter dated August 12, 1999 that the rationale for revoking the old standard
16 would no longer apply because the United States D.C. Circuit Court of Appeals had, on May 14,
17 1999, vacated the 1997 PM₁₀ NAAQS. This meant that Utah's obligation to satisfy the Part D
18 requirements with respect to the pre-1997 NAAQS was still outstanding.
19

20 In the wake of the ruling by the D.C. Circuit, EPA (on October 18, 1999) made available its PM₁₀
21 Clean Data Areas Approach, providing areas like Ogden City with another avenue by which to
22 satisfy any outstanding Part D requirements. Under EPA's Clean Data Policy and the regulations
23 that embody it, 40 CFR 51.918 (1997 8-hour ozone) and 51.1004(c) (PM_{2.5}), an EPA rulemaking
24 determination that an area is attaining the relevant standard suspends the area's obligations to
25 submit an attainment demonstration, reasonable available control measures (RACM), reasonable
26 further progress, contingency measures and other planning requirements related to attainment for
27 as long as the area continues to attain. EPA's statutory interpretation of the Clean Data Policy is
28 described in the "Final Rule to Implement the 8-hour Ozone National Ambient Air Quality
29 Standard – Phase 2" (Phase 2 Final Rule). 70 FR 71612, 71644-46 (November 29, 2005)
30 (ozone); See also 72 FR 20586, 20665 (April 25, 2007) (PM_{2.5}). EPA believes that the legal basis
31 set forth in detail in the Phase 2 final rule, May 10, 1995 memorandum from John S. Seitz,
32 entitled "Reasonable Further Progress, Attainment Demonstrations, and Related Requirements for
33 Ozone Nonattainment Areas Meeting the Ozone National Ambient Air Quality Standard," and the
34 December 14, 2004 memorandum from Stephen D. Page entitled "Clean Data Policy for the Fine
35 Particulate National Ambient Air Quality Standards" are equally pertinent to all NAAQS. EPA
36 has codified the Clean Data Policy for the 1997 8-hour ozone and PM_{2.5} NAAQS and has also
37 applied it in individual rulemakings for PM₁₀.
38

39 Under the Clean Data Policy, EPA may issue a determination of attainment (known formally as a
40 Clean Data Determination) after notice and comment rulemaking determining that a specific area
41 is attaining the relevant standard. For such areas the requirement to submit to EPA those SIP
42 elements related to attaining the NAAQS is suspended for so long as the area continues to attain
43 the standard. These planning elements include reasonable further progress (RFP) requirements,
44 attainment demonstrations, RACM, contingency measures, and other state planning requirements
45 related to attainment of the NAAQS. The determination of attainment is not equivalent to a
46 redesignation, and the state must still meet the statutory requirements for redesignation in order to
47 be redesignated to attainment. A determination of attainment for purposes of the Clean Data
48 Policy / regulations is also not linked to any particular attainment deadline, and is not necessarily
49 equivalent to a determination that the area has attained the standard by its applicable attainment
50 deadline. Also any sanction clocks that may have been running would be stopped.
51

1 Utah addressed these criteria for Ogden City in a letter dated March 30, 2000. In particular, it
2 identified a number of control measures that applied to nonattainment areas in general and were
3 at least partly responsible for bringing the area into compliance with the PM₁₀ NAAQS. Since
4 these measures (open burning rule, visible emissions rule, fugitive dust rule, and vehicle I/M)
5 were incorporated into the Utah SIP, and since the IIG had indicated that it would be
6 inappropriate to require any new control measures, it could be concluded that the Part D planning
7 requirements for Ogden City had been satisfied. The March 30, 2000, letter cited agreement
8 between the respective agencies on these three criteria, and accordingly petitioned EPA to note in
9 the Federal Register that the Part D planning requirements for Ogden City had in fact been
10 satisfied. It also acknowledged that such action would not constitute a redesignation under CAA
11 Section 107, and that if the State wished to request that Ogden City be redesignated to attainment,
12 then subsequent action must be taken under CAA Section 175[A].

13
14 Also acknowledged was the obligation to produce a basic emissions inventory for Ogden City to
15 the satisfaction of EPA Region VIII. After a period of public review and comment, the inventory
16 was transmitted to EPA on August 9, 2001. The State identified this inventory as the only
17 remaining element among the criteria outlined in the PM₁₀ Clean Data Areas Approach, and again
18 requested that EPA find in the Federal Register that Utah had fulfilled its planning requirements
19 for Ogden City, under Part D of the CAA.

20
21 Unfortunately, while the emissions inventory was being developed the PM₁₀ monitoring site in
22 Ogden was shut down. Utah had been collecting ambient PM₁₀ data at the Ogden site (AIRS #
23 49-057-0001) since April of 1987, but in February of 2000 the structure on which the monitor
24 was situated was demolished. It was not until July 1, 2001 that collection could resume at a new
25 location (AIRS # 49-057-0002). Unfortunately, this meant that EPA could take no action.
26 Although the data collected from 1994 through February of 2000 showed continued compliance
27 with the NAAQS, Utah did not have data for the three most recent years.

28
29 Ultimately EPA did propose to determine that the Ogden City nonattainment area was currently
30 attaining the 24-hour NAAQS for PM₁₀, based on certified, quality assured data for the years
31 2009 through 2011, and that Utah's obligation to submit certain CAA requirements would be
32 suspended for so long as the area continued to attain the PM₁₀ standard (see 77 FR, 44544). The
33 proposal was finalized in a notice dated January 7, 2013 (see FR Vol. 78, 885).

34 35 36 **IX.A.12.b Pre-requisites to Area Redesignation**

37
38 Section 107(d)(3)(E) of the Act outlines five requirements that must be satisfied in order that a
39 state may petition the Administrator to redesignate a nonattainment area back to attainment.
40 These requirements are summarized as follows: 1) the Administrator determines that the area has
41 attained the applicable NAAQS, 2) the Administrator has fully approved the applicable
42 implementation plan for the area under §110(k) of the Act, 3) the Administrator determines that
43 the improvement in air quality is due to permanent and enforceable reductions in emissions
44 resulting from implementation of the applicable implementation plan ... and other permanent and
45 enforceable reductions, 4) the Administrator has fully approved a maintenance plan for the area
46 as meeting the requirements of §175A of the Act, and 5) the State containing such area has met
47 all requirements applicable to the area under §110 and Part D of the Act.

48
49 Each of these requirements will be addressed below. Certainly, the central element from this list
50 is the maintenance plan found at Subsection IX.A.12.c below. Section 175A of the Act contains
51 the necessary requirements of a maintenance plan, and EPA policy based on the Act requires

1 additional elements in order that such plan be federally approvable. Table IX.A.12. 1 identifies
 2 the prerequisites that must be fulfilled before a nonattainment area may be redesignated to
 3 attainment under Section 107(d)(3)(E) of the Act.
 4
 5
 6

Table IX.A.12. 1 Prerequisites to Redesignation in the Federal Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Attainment of Standard	Three consecutive years of PM ₁₀ monitoring data must show that violations of the standard are no longer occurring.	CAA §107(d)(3)(E)(i)	IX.A.12.b(1)
Approved State Implementation Plan	The SIP for the area must be fully approved.	CAA §107(d)(3)(E)(ii)	IX.A.12.b(2)
Permanent and Enforceable Emissions Reductions	The State must be able to reasonably attribute the improvement in air quality to emission reductions that are permanent and enforceable	CAA §107(d)(3)(E)(iii), Calcagni memo (Sect 3, para 2)	IX.A.12.b(3)
Section 110 and Part D requirements	The State must verify that the area has met all requirements applicable to the area under section 110 and Part D.	CAA: §107(d)(3)(E)(v), §110(a)(2), Sec 171	IX.A.12.b(4)
Maintenance Plan	The Administrator has fully approved the Maintenance Plan for the area as meeting the requirements of CAA §175A	CAA: §107(d)(3)(E)(iv)	IX.A.12.b(5) and IX.A.12.c

7
 8
 9 **(1) The Area Has Attained the PM₁₀ NAAQS**

10 CAA 107(d)(3)(E)(i) - *The Administrator determines that the area has attained the national*
 11 *ambient air quality standard.* To satisfy this requirement, the State must show that the area is
 12 attaining the applicable NAAQS. According to EPA's guidance concerning area redesignations
 13 (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni to
 14 Regional Air Directors, September 4, 1992 [or, Calcagni]), there are generally two components
 15 involved in making this demonstration. The first relies upon ambient air quality data which
 16 should be representative of the area of highest concentration and should be collected and quality
 17 assured in accordance with 40 CFR 58. The second component relies upon supplemental air
 18 quality modeling. Each will be discussed in turn.

19 **(a) Ambient Air Quality Data (Monitoring)**
 20

21 In 1987 EPA promulgated the National Ambient Air Quality Standard (NAAQS) for PM₁₀. The
 22 NAAQS for PM₁₀ is listed in 40 CFR 50.6 along with the criteria for attaining the standard. The
 23 24-hour NAAQS is 150 micrograms per cubic meter (ug/m³) for a 24-hour period, measured from
 24 midnight to midnight. The 24-hour standard is attained when the expected number of days per
 25 calendar year with a 24-hour average concentration above 150 ug/m³, as determined in
 26 accordance with Appendix K to that part, is equal to or less than one. In other words, each
 27 monitoring site is allowed up to three expected exceedances of the 24-hour standard within a
 28 period of three calendar years. More than three expected exceedances in that three-year period is
 29 a violation of the NAAQS.
 30

1 There also had been an annual standard of 50 ug/m³. The annual standard was attained if the
2 three-year average of individual annual averages was less than 50 ug/m³. Utah never violated the
3 annual standard at any of its monitoring stations, and the annual average was not retained as a
4 PM₁₀ standard when the NAAQS was revised in 2006. Nevertheless, an annual average still
5 provides a useful metric to evaluate long-term trends in PM₁₀ concentrations here in Utah where
6 short-term meteorology has such an influence on high 24-hour concentrations during the winter
7 season.

8
9 40 CFR 58 Appendix K, Interpretation of the National Ambient Air Quality Standards for
10 Particulate Matter, acknowledges the uncertainty inherent in measuring ambient PM₁₀
11 concentrations by specifying that an *observed exceedance* of the (150 ug/m³) 24-hour health
12 standard means a daily value that is above the level of the 24-hour standard after rounding to the
13 nearest 10 ug/m³ (e.g., values ending in 5 or greater are to be rounded up).

14
15 The term *expected exceedance* accounts for the possibility of missing data. Missing data can
16 occur when a monitor is being repaired, calibrated, or is malfunctioning, leaving a time gap in the
17 monitored readings. EPA discounts these gaps if the highest recorded PM₁₀ reading at the
18 affected monitor on the day before or after the gap is not more than 75 percent of the standard,
19 and no measured exceedance has occurred during the year.

20
21 Expected exceedances are calculated from the Aerometric Information and Retrieval System
22 (AIRS) data base according to procedures contained in 40 CFR Part 50, Appendix K. The State
23 relied on the expected exceedance values contained in the AIRS Quick Look Report (AMP 450)
24 to determine if a violation of the standard had occurred.

25
26 Data may also be flagged when circumstances indicate that it would represent an outlier in the
27 data set and not be indicative of the entire airshed or the efforts to reasonably mitigate air
28 pollution within. Appendix N to Part 50 – “Interpretation of the National Ambient Air Quality
29 Standards for Particulate Matter” anticipates this and states: “Data resulting from uncontrollable
30 or natural events, for example structural fires or high winds, may require special consideration.
31 In some cases, it may be appropriate to exclude these data because they could result in
32 inappropriate values to compare with the levels of the PM standards.” The protocol for data
33 handling dictates that flagging is initiated by the state or local agency, and then the EPA either
34 concurs or indicates that it has not concurred. Some discussion will be provided to help the
35 reader understand the occasional occurrence of wind-blown dust events that affect these
36 nonattainment areas, and how the resulting data should be interpreted with respect to the control
37 measures enacted to address the 24-hour NAAQS.

38
39 Using the criteria from 40 CFR 58 Appendix K, data was compiled for all PM₁₀ monitors
40 within the [Ogden City](#) nonattainment area that recorded a four-year data set comprising the years
41 2011 – 2014. For each monitor, the number of expected exceedances is reported for each year,
42 and then the average number of expected exceedances is reported for the overlapping three-year
43 periods. If this average number of expected exceedances is less than or equal to 1.0, then that
44 particular monitor is said to be in compliance with the 24-hour standard for PM₁₀. In order for an
45 area to be in compliance with the NAAQS, every monitor within that area must be in compliance.

46
47 As illustrated in the table below, the results of this exercise show that the [Ogden City](#) PM₁₀
48 nonattainment area is presently attaining the NAAQS.
49

1
2
3

Table IX.A.12. 2 PM₁₀ Compliance in Ogden City, 1999-2001, and 2011-2014

Ogden 2 49-057-0002	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
1999	0.0 / 0.0*	
2000	0.0 / 0.0*	
2001	0.0 / 0.0*	0.0 / 0.0*
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	0.0 / 0.0*	0.0 / 0.0*

4
5
6
7
8
9

* The second set of numbers shows what would be the effect of including all of the data that has been flagged by DAQ and not yet concurred with by EPA.

** Data from 1999 and 2000 was collected at Ogden 1 49-057-0001

10
11

(b) PM₁₀ Monitoring Network

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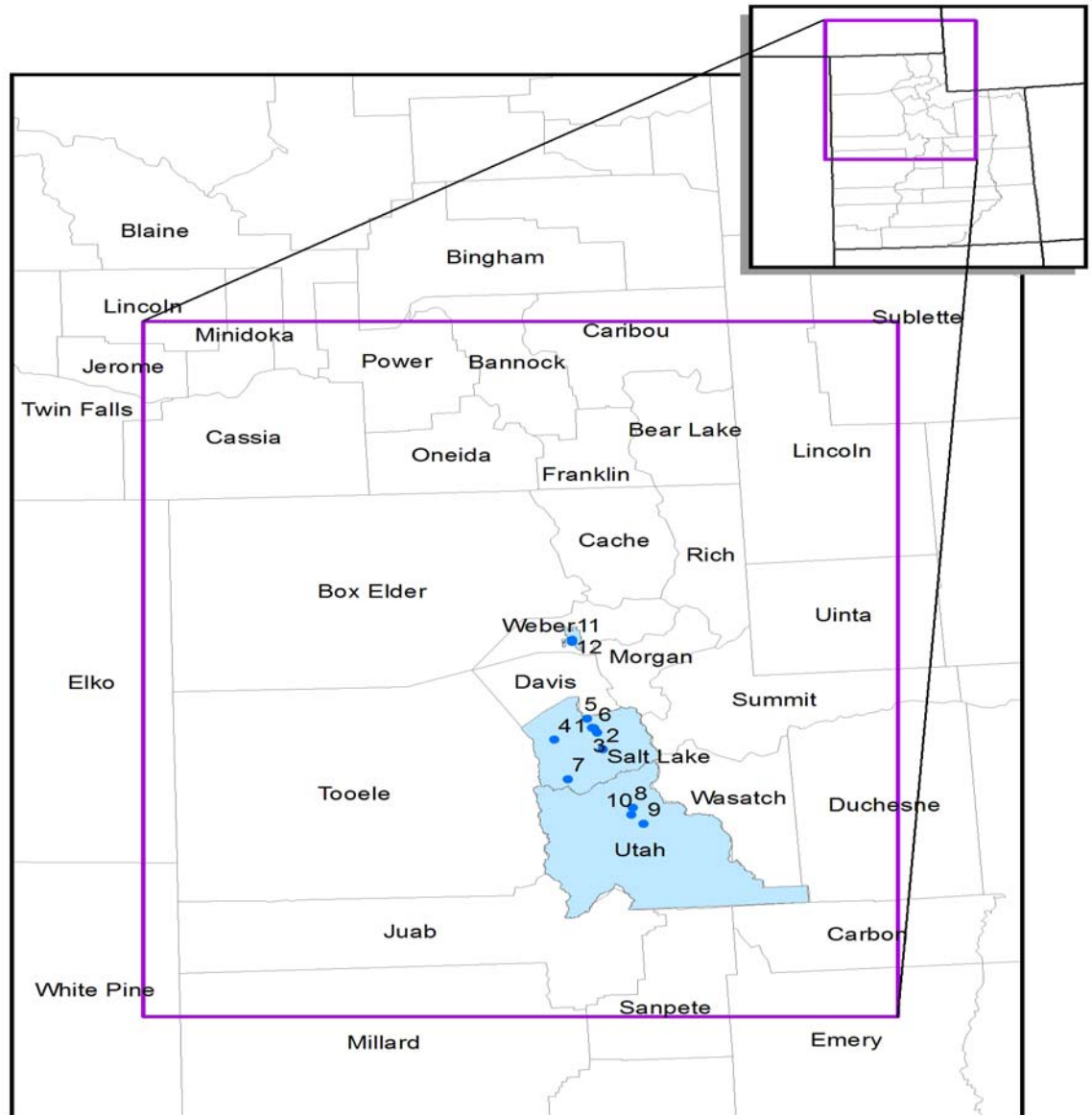
The overall assessments made in the preceding paragraph were based on data collected at monitoring stations located throughout the nonattainment area. The Utah DAQ maintains a network of PM₁₀ monitoring stations in accordance with 40 CFR 58. These stations are referred to as SLAMS sites, meaning that they are State and Local Air Monitoring Stations. In consultation with EPA, an Annual Monitoring Network Plan is developed to address the adequacy of the monitoring network for all criteria pollutants. Within the network, individual stations may be situated so as to monitor large sources of PM₁₀, capture the highest concentrations in the area, represent residential areas, or assess regional concentrations of PM₁₀. Collectively, these monitors make up Utah's PM₁₀ monitoring network. The following paragraphs describe the network in each of Utah's three nonattainment areas for PM₁₀.

25
26
27

Provided in Figure IX.A.12. 1 is a map of the modeling domain that shows the existing PM₁₀ nonattainment areas and the locations of the monitors therein. Some of the monitors at these locations are no longer operational, but they have been included for informational purposes.

28
29

Figure IX.A.12. 1 Modeling Domain



1
2 The following PM₁₀ monitoring stations operated in the Salt Lake County PM₁₀ nonattainment
3 area from 1985 through 2015. They are numbered as they appear on the map:
4

- 5 1. Air Monitoring Center (AMC) (AIRS number 49-035-0010): This site was located in an
6 urban city center, near an area of high vehicle use. It was closed in 1999 when DAQ lost
7 its lease on the building.
8
- 9 2. Cottonwood (AIRS number 49-035-0003): This site was located in a suburban
10 residential area. It collected data from 1986 - 2011. It was closed in 2011 due to siting
11 criteria violations as well as safety concerns.
12
- 13 3. Hawthorne (AIRS number 49-035-3006): This site is located in a suburban residential
14 area. It began collecting data in 1997, and is the NCORE site for Utah.
15

- 1 4. Magna (AIRS number 49-035-1001): This site is located in a suburban residential area.
2 It was historically impacted periodically by blowing dust from a large tailings
3 impoundment, and as such is anomalous with respect to the typical wintertime scenario
4 that otherwise characterizes the nonattainment area. It has been collecting data since
5 1987.
6
- 7 5. North Salt Lake (AIRS number 49-035-0012): This site was located in an industrial area
8 that is impacted by sand and gravel operations, freeway traffic, and several refineries. It
9 was near a residential area as well. It collected data from 1985 - 2013. The monitor was
10 situated over a sewer main, and service of that main required its removal in September
11 2013 and following the service, the site owner did not allow the monitor to return.
12
- 13 6. Salt Lake City (AIRS number 49-035-3001): This site was situated in an urban city
14 center. It was discontinued in 1994 because of modifications that were made to the air
15 conditioning on the roof-top.
16
- 17 7. Herriman #3 (AIRS number 49-035-3012): This site is located in a suburban residential
18 area. It began collecting data in 2015.
19
20

21 The following PM₁₀ monitoring stations operated in the Utah County PM₁₀ nonattainment area
22 from 1985 through 2015. They are numbered as they appear on the map:
23

- 24 8. Lindon (AIRS number 49-049-4001): This site is designed to measure population
25 exposure to PM₁₀. It is located in a suburban residential area affected by both industrial
26 and vehicle emissions. PM₁₀ has been measured at this site since 1985, and the readings
27 taken here have consistently been the highest in Utah County. Area source emissions,
28 primarily wood smoke, also affect the site.
29
- 30 9. North Provo (AIRS number 49-049-0002): This is a neighborhood site in a mixed
31 residential-commercial area in Provo, Utah. It began collecting data in 1986.
32
- 33 10. West Orem (AIRS number 49-049-5001): This site was originally located in a residential
34 area adjacent to a large steel mill which has since closed. It is a neighborhood site. It
35 was situated based on computer modeling, and has historically reported high PM₁₀
36 values, but not consistently as high as those observed at the Lindon site. The site was
37 closed at the end of 1997 for this reason.
38

39 The following PM₁₀ monitoring stations operated in the Ogden City PM₁₀ nonattainment area
40 from 1986 through 2015. They are numbered as they appear on the map:
41

- 42 11. Ogden 1 (AIRS number 49-057-0001): This site was situated in an urban city center. It
43 was discontinued in 2000 because DAQ lost its lease on the building.
44
- 45 12. Ogden 2 (AIRS number 49-057-0002): This site began collecting data in 2001, as a
46 replacement for the Ogden 1 location. It, too, is situated in an urban city center.
47

48 **(c) Modeling Element**
49

50 EPA guidance concerning redesignation requests and maintenance plans (Calcagni) discusses the
51 requirement that the area has attained the standard, and notes that air quality modeling may be
52 necessary to determine the representativeness of the monitored data.

1
2 Information concerning PM₁₀ monitoring in Utah is included in the Annual Monitoring Network
3 Review and The 5 Year Network Plan. Since the early 1980's, the network review has been
4 updated annually and submitted to EPA for approval. EPA has concurred with the annual
5 network reviews and agreed that the PM₁₀ network is adequate. EPA personnel have also visited
6 the monitor sites on several occasions to verify compliance with federal siting requirements.
7 Therefore, additional modeling will not be necessary to determine the representativeness of the
8 monitored data.

9
10 The Calcagni memo goes on to say that areas that were designated nonattainment based on
11 modeling will generally not be redesignated to attainment unless an acceptable modeling analysis
12 indicates attainment.

13
14 Though none of Utah's three PM₁₀ nonattainment areas was designated based on modeling,
15 Calcagni also states that (when dealing with PM₁₀) dispersion modeling will generally be
16 necessary to evaluate comprehensively sources' impacts and to determine the areas of expected
17 high concentrations based upon current conditions. Air quality modeling was conducted for the
18 purpose of this maintenance demonstration. It shows that all three nonattainment areas are
19 presently in compliance, and will continue to comply with the PM₁₀ NAAQS through the year
20 2030.

21
22 **(d) EPA Acknowledgement**

23
24 Ogden City was designated a moderate nonattainment area for the PM₁₀ standard on September
25 26, 1995. From CAA 188(c)(1), the moderate area attainment date for Ogden City "shall be as
26 expeditiously as practicable but no later than the end of the sixth calendar year after the area's
27 designation as nonattainment." Thus Ogden City's attainment date would be December 31, 2001.

28
29 Based on the data provided for 1999-2001, Ogden City attained the moderate area attainment
30 date. Additionally, the data presented in the preceding paragraphs shows quite clearly that the
31 Ogden City PM₁₀ nonattainment area continues to attain the PM₁₀ NAAQS. EPA earlier
32 acknowledged that Ogden City was attaining the PM₁₀ NAAQS based on certified, quality
33 assured data for the years 2009 through 2011 (see FR Vol. 78, No. 4, January 7, 2013; pp. 885.)

34
35
36 **(2) Fully Approved Attainment Plan for PM₁₀**

37 CAA 107(d)(3)(E)(ii) - *The Administrator has fully approved the applicable implementation plan*
38 *for the area under section 110(k).*

39 There is no applicable implementation plan for the Ogden City PM₁₀ nonattainment area. Rather,
40 EPA made a determination of Clean Data, stating that Ogden City was attaining the 24-hour PM₁₀
41 NAAQS based on certified ambient air monitoring data for the years 2009 – 2011 (see FR Vol.78,
42 pp. 885, Monday, January 7, 2013). Under such Clean Data Area Determination, Utah's
43 obligation to make submissions to meet certain Clean Air Act requirements related to attainment
44 of the NAAQS is not applicable for as long as the Ogden City nonattainment area continues to
45 attain the NAAQS.

46 There has been no violation of the PM₁₀ NAAQS in Ogden City since the determination was
47 made, so Utah's obligation to submit a nonattainment SIP still does not apply.

1 States are not precluded from seeking redesignation in cases where a Clean Data Area
2 Determination has suspended the need for an implementation plan. Further discussion
3 concerning some of the Section 110 and Part D requirements normally addressed in a
4 nonattainment SIP is provided in section (4).

5

6 **(3) Improvements in Air Quality Due to Permanent and Enforceable Reductions in**
7 **Emissions**

8

9 CAA 107(d)(3)(E)(iii) - *The Administrator determines that the improvement in air quality is due*
10 *to permanent and enforceable reductions in emissions resulting from implementation of the*
11 *applicable implementation plan and applicable Federal air pollutant control regulations and*
12 *other permanent and enforceable reductions. Speaking further on the issue, EPA guidance*
13 *(Calcagni) reads that the State must be able to reasonably attribute the improvement in air quality*
14 *to emission reductions which are permanent and enforceable. In the following sections, both the*
15 *improvement in air quality and the emission reductions themselves will be discussed.*

16

17 **(a) Improvement in Air Quality**

18

19 The improvement in air quality with respect to PM₁₀ can be shown in a number of ways.
20 Improvement, in this case, is relative to the various control strategies that affected the airshed.

21

22 Expected Exceedances – Referring back to the discussion of the PM₁₀ NAAQS in Subsection
23 IX.A.12.b(1), it is apparent that the number of expected exceedances of the 24-hour standard is an
24 important indicator. As such, this information has been tabulated for each of the monitors located
25 in each of the nonattainment areas. The data in Table IX.A.12. 3 below reveals a marked decline
26 in the number of these expected exceedances, and therefore that the **Ogden City** PM₁₀
27 nonattainment area has experienced significant improvements in air quality. The gray cells
28 indicate that the monitor was not in operation. This improvement is especially revealing in light
29 of the significant growth experienced during this same period in time.

30

31

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2
3

Table IX.A.12. 3 Ogden City: Expected Exceedances Per-Year, 1986-2014

Ogden City nonattainment area		
Monitor:	Ogden	Ogden 2
1986		
1987	0.0	
1988	0.0	
1989	0.0	
1990	0.0	
1991	2.1	
1992	3.1	
1993	2.1	
1994	0.0	
1995	0.0	
1996	0.0	
1997	0.0	
1998	0.0	
1999	0.0	
2000	0.0	
2001		0.0
2002		1.0
2003		2.1
2004		0.0
2005		0.0
2006		0.0
2007		0.0
2008		0.0
2009		1.0
2010		2.0
2011		0.0
2012		0.0
2013		0.0
2014		0.0

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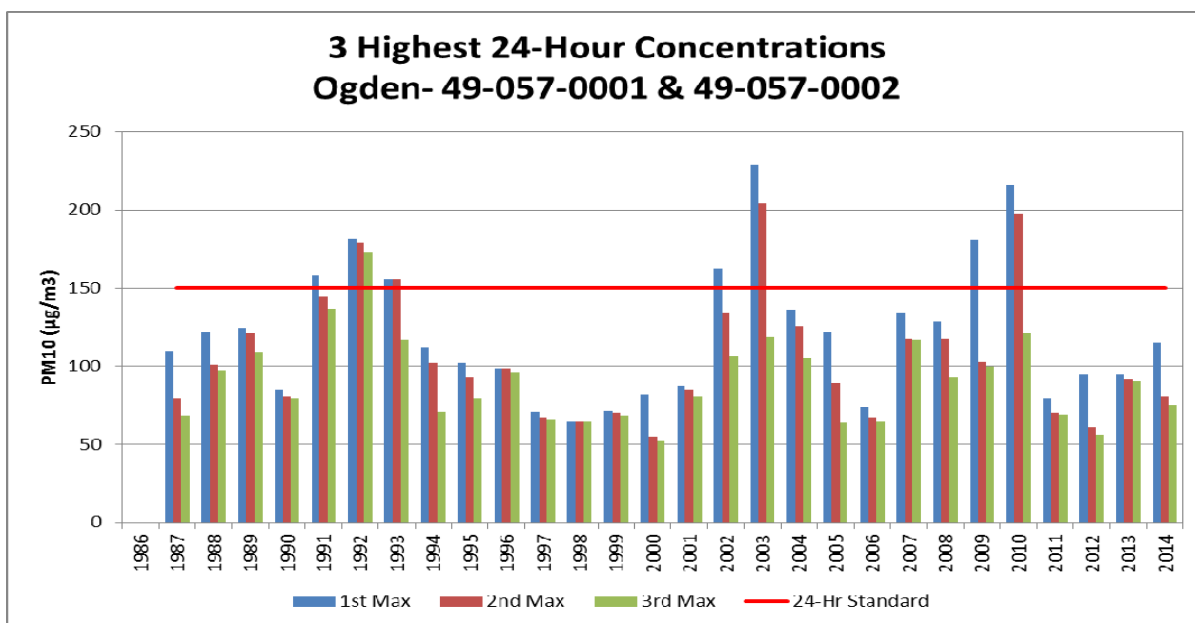
As discussed before in section IX.A.12.b(1), the number of expected exceedances may include data which had been flagged by DAQ as being influenced by an exceptional event; most typically, a wind-blown dust event. Data is flagged when circumstances indicate that it would represent an outlier in the data set and not be indicative of the entire airshed or the efforts to reasonably mitigate air pollution within.

As such two things should be noted with regard to the control measures cited under the Clean Data Policy as attributable to improving air quality in Ogden City: 1) The focus of the vehicle I/M control strategy, implemented in Weber County by 1992, was directed at precursors to fine particulate matter. These precursors react to become secondary PM during episodes

1 characterized by wintertime temperature inversions, elevated concentrations of secondary aerosol,
 2 and low wind speed. Under these conditions, blowing dust is generally nonexistent. Therefore,
 3 in evaluating the effectiveness of these types of controls, the inclusion of several high wind
 4 events may bias the conclusion. 2) Even with the inclusion of these values, the conclusion
 5 remains essentially the same; that with the implementation of the open burning rule, visible
 6 emissions rule, fugitive dust rule, and vehicle I/M, there has been a marked improvement in
 7 monitored air quality.

8
 9 Highest Values – Also indicative of improvement in air quality with respect to the 24-hour
 10 standard, is the magnitude of the excessive concentrations that are observed. This is illustrated in
 11 Figure IX.A.12. 2, which shows the three highest 24-hour concentrations observed in a particular
 12 year.

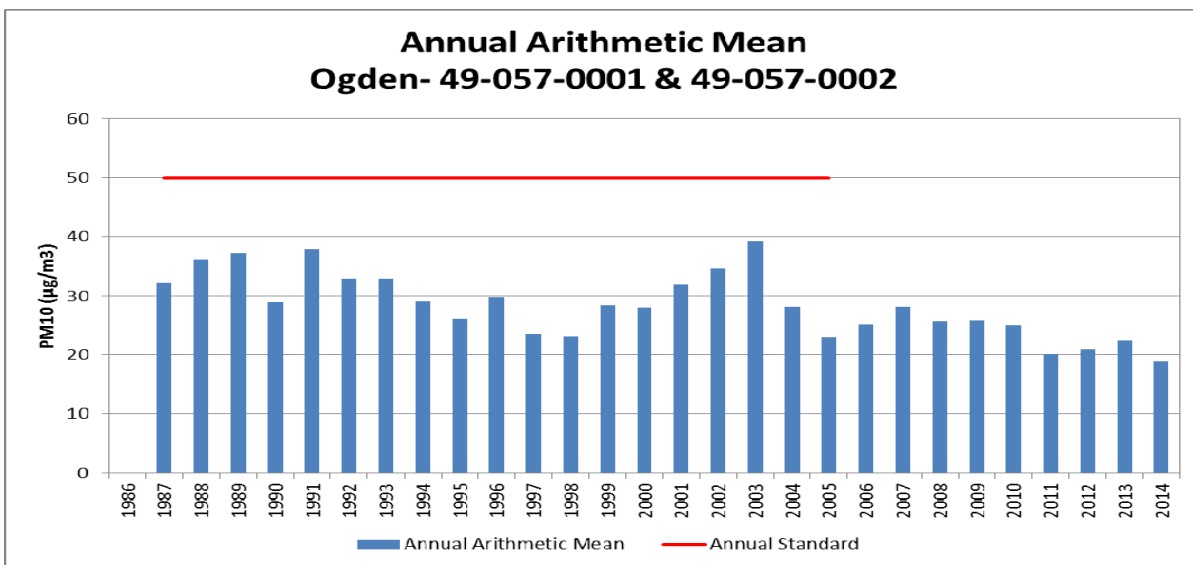
13
 14
 15 **Figure IX.A.12. 2 3 Highest 24-hr PM₁₀ Concentrations; Ogden**



17
 18
 19
 20 Again there is a noticeable improvement in the magnitude of these concentrations. It must be
 21 kept in mind, however, that some of these concentrations may have resulted from windblown dust
 22 events that occur outside of the typical scenario of wintertime air stagnation. As such, the
 23 effectiveness of any control measures directed at the precursors to PM₁₀ would not be evident.

1
2 Annual Mean – Although there is no longer an annual PM₁₀ standard, the annual arithmetic mean
3 is also a significant parameter to consider. Annual arithmetic means have been plotted in Figure
4 IX.A.12. 3, and the data reveals a noticeable decline in the values of these annual means.

5
6
7 **Figure IX.A.12. 3 Annual Arithmetic Mean; Ogden**
8



9
10
11
12
13 As with the number of expected exceedances and the three highest values, the data in Figure
14 IX.A.12. 3 may include data which had been flagged by DAQ as being influenced by wind-blown
15 dust events. Nevertheless, the annual averaging period tends to make these data points less
16 significant. The downward trend of these annual mean values is truly indicative of improvements
17 in air quality, particularly during the winter inversion season.

18
19
20 **(b) Reduction in Emissions**

21
22 As stated above, EPA guidance (Calcagni) says that the State must be able to reasonably attribute
23 the improvement in air quality to emission reductions that are permanent and enforceable. In
24 making this showing, the State should estimate the percent reduction (from the year that was used
25 to determine the design value) achieved by Federal measures such as motor vehicle control, as
26 well as by control measures that have been adopted and implemented by the State.

27
28 **Ogden City was designated nonattainment based on data collected in 1991 through 1993.**

29
30 As mentioned before, the ambient air quality data presented in Subsection IX.A.12.b(3)(a) above
31 includes values prior to these dates in order to give a representation of the air quality prior to the
32 application of any control measures. It then includes data collected from then until the present
33 time to illustrate the lasting effect of these controls. In discussing the effect of the controls, as
34 well as the control measures themselves, however, it is important to keep in mind the time
35 necessary for their implementation.
36

1 For Ogden City, the statutory date for RACM implementation was four years after designation, or
2 September 26, 1999. Its attainment date was December 31, 2001. As discussed earlier, there was
3 no nonattainment SIP for Ogden City, but there were a number of control measures that applied
4 to nonattainment areas in general and were at least partly responsible for bringing the area into
5 compliance with the PM₁₀ NAAQS.

6
7 Since these control measures (open burning rule, visible emissions rule, fugitive dust rule, and
8 vehicle I/M) were incorporated into the Utah SIP, the emission reductions that resulted are
9 consistent with the notion of permanent and enforceable improvements in air quality. Taken
10 together, the trends in ambient air quality illustrated in the preceding paragraph, along with the
11 continued implementation of these control measures, provide a reliable indication that these
12 improvements in air quality reflect the application of permanent steps to improve the air quality
13 in the region, rather than just temporary economic or meteorological changes.

14
15 Additionally, a downturn in the economy is clearly not responsible for the improvement in
16 ambient particulate levels in Salt Lake County, Utah County, and Ogden City areas. From 2001
17 to present, the areas have experienced strong growth while at the same time achieving continuous
18 attainment of the 24-hour and annual PM₁₀ NAAQS. Data was analyzed for the Salt Lake City
19 Metropolitan Statistical Area from the US Department of Commerce, Bureau of Economic
20 Analysis. According to this data, job growth from 2011 through 2013 increased by 5.5 percent,
21 population increased by 3 percent, and personal income increased by approximately 10 percent.
22 The estimated VMT increase was 12 percent from 2011 to present.

23 24 25 **(4) State has Met Requirements of Section 110 and Part D**

26
27 *CAA 107(d)(3)(E)(v) - The State containing such area has met all requirements applicable to the*
28 *area under section 110 and part D.* Section 110(a)(2) of the Act deals with the broad scope of
29 state implementation plans and the capacity of the respective state agency to effectively
30 administer such a plan. Sections I through VIII of Utah's SIP contain information relevant to
31 these criteria. Part D deals specifically with plan requirements for nonattainment areas, and
32 includes the requirements for a maintenance plan in Section 175A.

33
34 Utah currently has an approved SIP that meets the requirements of section 110(a)(2) of the Act.
35 Many of these elements have been in place for several decades. In the March 9, 2001 approval of
36 Utah's Ogden City Maintenance Plan for Carbon Monoxide, EPA stated:

37
38 On August 15, 1984, we approved revisions to Utah's SIP as meeting the
39 requirements of section 110(a)(2) of the CAA (see 45 FR 32575). Although
40 section 110 of the CAA was amended in 1990, most of the changes were not
41 substantial. Thus, we have determined that the SIP revisions approved in 1984
42 continue to satisfy the requirements of section 110(a)(2). For further detail, see
43 45 FR 32575 dated August 15, 1984 (Volume 49, No. 159) or 66 FR 14079 dated
44 March 9, 2001 (Volume 66, No. 47.)

45
46 Part D of the Act addresses "Plan Requirements for Nonattainment Areas". Subpart 1 of Part D
47 includes the general requirements that apply to all areas designated nonattainment based on a
48 violation of the NAAQS. Section 172(c) of this subpart contains a list of generally required
49 elements for all nonattainment plans. Subpart 1 is followed by a series of subparts (2-5) specific
50 to various criteria pollutants. Subpart 4 contains the provisions specific to PM₁₀ nonattainment
51 areas. The general requirements for nonattainment plans in Section 172(c) may be subsumed

1 within or superseded by the more specific requirements of Subpart 4, but each element must be
2 addressed in the respective nonattainment plan.

3
4 One of the pre-conditions for a maintenance plan is a fully approved (non)attainment plan for the
5 area. This is also discussed in section IX.A.12.b(2).

6
7 Other Part D requirements that are applicable in nonattainment and maintenance areas include the
8 general and transportation conformity provisions of Section 176(c) of the Act. These provisions
9 ensure that federally funded or approved projects and actions conform to the PM₁₀ SIPs and
10 Maintenance Plans prior to the projects or actions being implemented. The State has already
11 submitted to EPA a SIP revision implementing the requirement of Section 176(c).

12
13 For Ogden City, the requirement to prepare and submit a nonattainment plan was suspended by
14 EPA's Clean Data Area Determination (FR Vol.78, pp. 885). Thus, the specific Part D elements
15 from Subparts 1 and 4 were not addressed in a comprehensive plan that can be referenced herein.
16 Instead, what follows is a brief summary of the required plan elements (not otherwise covered by
17 Section 110(a)(2) and an assessment of how each of these elements is to be treated in a
18 maintenance plan for this area.

- 19
20 (a) Implementation of Reasonably Available Control Measures (RACM)
21
22 (b) Other Control Measures – including enforceable emission limits and schedules for
23 compliance to provide for attainment of the NAAQS by the applicable attainment date
24
25 (c) Attainment of the NAAQS – including air quality modeling
26
27 (d) Reasonable Further Progress (RFP) – toward attainment of the standard (section 172(c))
28
29 (e) Milestones – to be achieved every three years, and which demonstrate RFP (section
30 189(c))
31
32 (f) Contingency Measures – to be undertaken if the area fails to make RFP or to attain the
33 NAAQS
34
35 (g) Emissions Inventory – a current inventory from all sources
36
37 (h) Permits – (in accordance with Section 173) for the construction and operation of new and
38 modified major stationary sources within the nonattainment area
39

40 EPA guidance concerning redesignation requests and maintenance plans (Calcagni) differentiates
41 among these elements and notes that *“The requirements for reasonable further progress,
42 identification of certain emissions increases, and other measures needed for attainment will not
43 apply for redesignations because they only have meaning for areas not attaining the standard.*
44 The requirements for an emission inventory will be satisfied by the inventory requirements of the
45 maintenance plan. The requirements of the Part D new source review program will be replaced
46 by the prevention of significant deterioration (PSD) program once the area has been
47 redesignated”, provided the State “make any needed modifications to its rules to have the
48 approved PSD program apply to the affected area upon redesignation.”

49
50 Calcagni earlier stated that the “EPA anticipates that areas will already have met most or all of
51 these [Section 172(c)] requirements,” presumably because areas eligible to redesignate would in
52 all likelihood also have nonattainment SIPs. Following the logic expressed later regarding areas

1 that are attaining the standard, there are also elements on this list of Part D elements that only
 2 have meaning within the context of a nonattainment plan.

3
 4 Such plans are built around quantitative demonstrations of attainment which include air quality
 5 modeling and identify rates of progress and milestones to be achieved. Such plans also identify
 6 contingency measures to be triggered if the area fails to make RFP or attain the NAAQS.

7
 8 For areas like Ogden City to which the Clean Data Policy has been applied, these Part D elements
 9 are not required so long as the area continues to show attainment to the particular standard for
 10 which the area is designated nonattainment. EPA’s January 7, 2013 determination speaks directly
 11 to this point, stating: “EPA is taking final action to determine that Utah’s obligation to make SIP
 12 submissions to meet the following CAA requirements is not applicable for as long as the Ogden
 13 City nonattainment area continues to attain the PM10 NAAQS: the part D, subpart 4 obligation to
 14 provide an attainment demonstration pursuant to section 189(a)(1)(B); the RACM requirements
 15 of section 189(a)(1)(B); the RACM requirements of section 189(a)(1)(C); the RFP requirements
 16 of section 189(c); and the attainment demonstration, RACM, RFP, and
 17 contingency measure requirements of part D subpart 1 contained in section 172.”

18
 19
 20 **(5) Maintenance Plan for PM₁₀ Areas**

21
 22 As stated in the Act, an area may not request redesignation to attainment without first submitting,
 23 and then receiving EPA approval of, a maintenance plan. The plan is basically a quantitative
 24 showing that the area will continue to attain the NAAQS for an additional 10 years (from EPA
 25 approval), accompanied by sufficient assurance that the terms of the numeric demonstration will
 26 be administered by the State and by the EPA in an oversight capacity. The maintenance plan is
 27 the central criterion for redesignation. It is contained in the following subsection.
 28

29 **IX.A.12.c Maintenance Plan**

30 *CAA 107(d)(3)(E)(iv) - The Administrator has fully approved a maintenance plan for the area as*
 31 *meeting the requirements of section 175A. An approved maintenance plan is one of several*
 32 *criteria necessary for area redesignation as outlined in Section 107(d)(3)(E) of the Act. The*
 33 *maintenance plan itself, as described in Section 175A of the Act and further addressed in EPA*
 34 *guidance (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni*
 35 *to Regional Air Directors, September 4, 1992; or for the purpose of this document, simply*
 36 *“Calcagni”), has its own list of required elements. The following table is presented to summarize*
 37 *these requirements. Each will then be addressed in turn.*

Table IX.A.12. 4 Requirements of a Maintenance Plan in the Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Maintenance demonstration	Provide for maintenance of the relevant NAAQS in the area for at least 10 years after redesignation.	CAA: Sec 175A(a)	IX.A.12.c(1)
Revise in 8 Years	The State must submit an additional revision to the plan, 8 years after redesignation, showing an additional 10 years of maintenance.	CAA: Sec 175A(b)	IX.A.12.c(8)
Continued Implementation	The Clean Air Act requires continued implementation of the nonattainment area	CAA: Sec 175A(c),	IX.A.12.c(7)

of Nonattainment Area Control Strategy	control strategy unless such measures are shown to be unnecessary for maintenance or are replaced with measures that achieve equivalent reductions.	CAA Sec 110(l), Calcagni memo	
Contingency Measures	Areas seeking redesignation from nonattainment to attainment are required to develop contingency measures that include State commitments to implement additional control measures in response to future violations of the NAAQS.	CAA: Sec 175A(d)	IX.A.12.c(10)
Verification of Continued Maintenance	The maintenance plan must indicate how the State will track the progress of the maintenance plan.	Calcagni memo	IX.A.12.c(9)

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(1) Demonstration of Maintenance - Modeling Analysis

CAA 175A(a) - Each State which submits a request under section 107(d) for redesignation of a nonattainment area as an area which has attained the NAAQS shall also submit a revision of the applicable implementation plan to provide for maintenance of the NAAQS for at least 10 years after the redesignation. The plan shall contain such additional measures, if any, as may be required to ensure such maintenance. The maintenance demonstration is discussed in EPA guidance (Calcagni) as one of the core provisions that should be considered by states for inclusion in a maintenance plan.

According to Calcagni, a State may generally demonstrate maintenance of the NAAQS by either showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory (discussed below) or by modeling to show that the future mix of sources and emission rates will not cause a violation of the NAAQS. Utah has elected to make its demonstration based on air quality modeling.

(a) Introduction

The following chapter presents an analysis using observational datasets to detail the chemical regimes of Utah’s Nonattainment areas.

Prior to the development of this PM₁₀ maintenance plan, UDAQ conducted a technical analysis to support the development of Utah’s 24-hr State Implementation Plan for PM_{2.5}. That analysis included preparation of emissions inventories and meteorological data, and the evaluation and application of a regional photochemical model.

Outside of the springtime high wind events and wildfires, the Wasatch Front experiences high 24-hr PM₁₀ concentrations under stable conditions during the wintertime (e.g., temperature inversion). These are the same episodes where the Wasatch Front sees its highest concentrations of 24-hr PM_{2.5} that sometimes exceed the 24-hr PM_{2.5} NAAQS. Most (60% to 90%) of the PM₁₀ observed during high wintertime pollution days consists of PM_{2.5}. The dominant species of the wintertime PM₁₀ is secondarily formed particulate nitrate, which is also the dominant species of PM_{2.5}.

Given these similarities, the PM_{2.5} modeling analysis was utilized as the foundation for this PM₁₀ Maintenance Plan.

1
2 The CMAQ model performance for the PM₁₀ Maintenance Plan adds to the detailed model
3 performance that was part of the UDAQ's previous PM_{2.5} SIP process. Utah DAQ used the same
4 modeling episode that was used in the PM_{2.5} SIP, which is the 45-day modeling episode from the
5 winter of 2009-2010. The modeled meteorology datasets from the Weather Research and
6 Forecasting (WRF) model for the PM₁₀ Plan are the same datasets used for the PM_{2.5} SIP. Also,
7 the CMAQ version (4.7.1) and CMAQ model setup (i.e., vertical advection module turned off)
8 for the PM₁₀ modeling matches the PM_{2.5} SIP setup.
9

10 For this reason, much of the information presented below pertains specifically to the PM_{2.5}
11 evaluation. This is supplemented with information pertaining to PM₁₀, most notably with respect
12 to the PM₁₀ model performance evaluation.
13

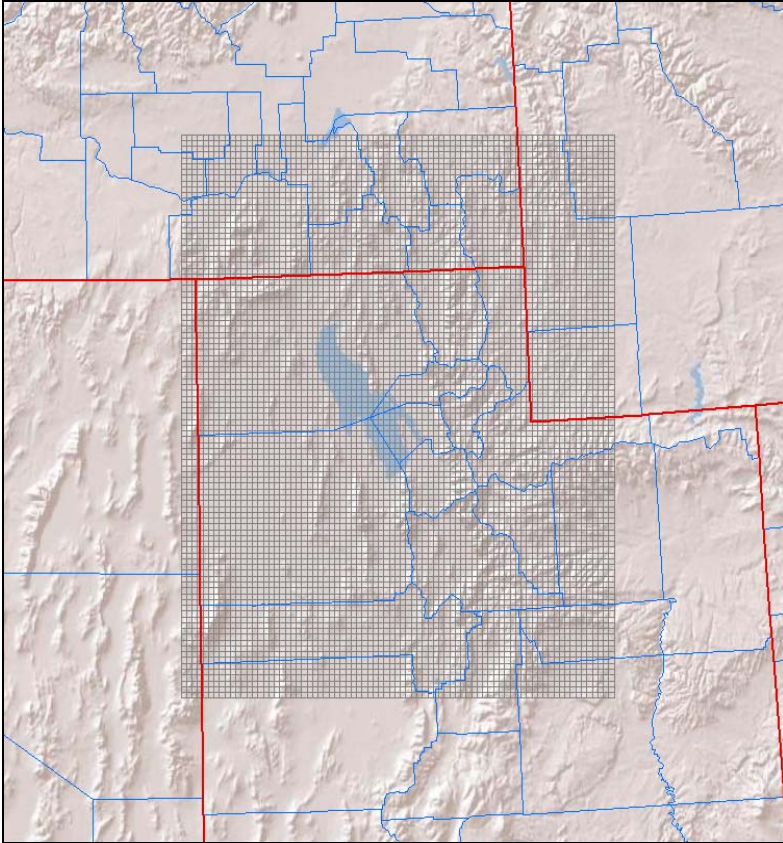
14 The additional PM₁₀ analysis is also presented in the Technical Support Document.
15

16 **(b) Photochemical Modeling**
17

18 Photochemical models are relied upon by federal and state regulatory agencies to support their
19 planning efforts. Used properly, models can assist policy makers in deciding which control
20 programs are most effective in improving air quality, and meeting specific goals and objectives.
21 The air quality analyses were conducted with the Community Multiscale Air Quality (CMAQ)
22 Model version 4.7.1, with emissions and meteorology inputs generated using SMOKE and WRF,
23 respectively. CMAQ was selected because it is the open source atmospheric chemistry model co-
24 sponsored by EPA and the National Oceanic Atmospheric Administration (NOAA), and thus
25 approved by EPA for this plan.
26

27 **(c) Domain/Grid Resolution**
28

29 UDAQ selected a high resolution 4-km modeling domain to cover all of northern Utah including
30 the portion of southern Idaho extending north of Franklin County and west to the Nevada border
31 (Figure IX.A.12. 4). This 97 x 79 horizontal grid cell domain was selected to ensure that all of
32 the major emissions sources that have the potential to impact the nonattainment areas were
33 included. The vertical resolution in the air quality model consists of 17 layers extending up to 15
34 km, with higher resolution in the boundary layer.
35



1
2
3 **Figure IX.A.12. 4 Northern Utah photochemical modeling domain.**
4
5

6 **(d) Episode Selection**
7

8 According to EPA's April 2007 "Guidance on the Use of Models and Other Analyses for
9 Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze," the
10 selection of SIP episodes for modeling should consider the following 4 criteria:
11

- 12 1. Select episodes that represent a variety of meteorological conditions that lead to elevated
13 PM_{2.5}.
14
- 15 2. Select episodes during which observed concentrations are close to the baseline design
16 value.
17
- 18 3. Select episodes that have extensive air quality data bases.
19
- 20 4. Select enough episodes such that the model attainment test is based on multiple days at
21 each monitor violating NAAQS.
22

23 In general, UDAQ wanted to select episodes with hourly PM_{2.5} concentrations that are reflective
24 of conditions that lead to 24-hour NAAQS exceedances. From a synoptic meteorology point of
25 view, each selected episode features a similar pattern. The typical pattern includes a deep trough
26 over the eastern United States with a building and eastward moving ridge over the western United
27 States. The episodes typically begin as the ridge begins to build eastward, near surface winds
28 weaken, and rapid stabilization due to warm advection and subsidence dominate. As the ridge

1 centers over Utah and subsidence peaks, the atmosphere becomes extremely stable and a
2 subsidence inversion descends towards the surface. During this time, weak insolation, light
3 winds, and cold temperatures promote the development of a persistent cold air pool. Not until the
4 ridge moves eastward or breaks down from north to south is there enough mixing in the
5 atmosphere to completely erode the persistent cold air pool.

6
7 From the most recent 5-year period of 2007-2011, UDAQ developed a long list of candidate
8 PM_{2.5} wintertime episodes. Three episodes were selected. An episode was selected from January
9 2007, an episode from February 2008, and an episode during the winter of 2009-2010 that
10 features multi-event episodes of PM_{2.5} buildup and washout.

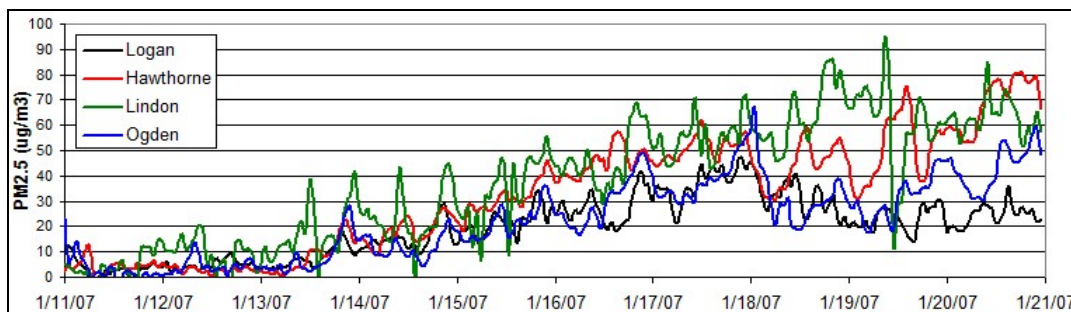
11
12 As noted in the introduction, these episodes were also ideal from the standpoint of characterizing
13 PM₁₀ buildup and formation.

14
15 Further detail of the episodes is below:

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

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

26
27 Figure IX.A.12. 5 shows hourly PM_{2.5} concentrations from Utah's 4 PM_{2.5} monitors for January
28 11-20, 2007. The first 6 to 8 days of this episode are suited for modeling. The episode becomes
29 less suited after January 18 because of the complexities in the meteorological conditions leading
30 to temporary PM_{2.5} reductions.

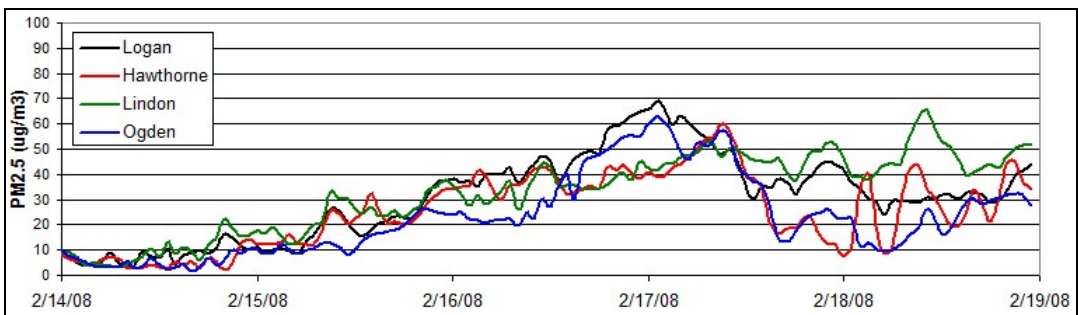


32
33
34 **Figure IX.A.12. 5 Hourly PM_{2.5} concentrations for January 11-20, 2007**

35
36
37 • **Episode 2: February 14-18, 2008**

38
39 The February 2008 episode features a cold front passage at the start of the episode that brought
40 significant new snow to the Wasatch Front. A ridge began building eastward from the Pacific
41 Coast and centered itself over Utah on Feb 20th. During this time a subsidence inversion lowered
42 significantly from February 16 to February 19. Temperatures during this episode were mild with
43 high temperatures at SLC in the upper 30's and lower 40's Fahrenheit.

1 The 24-hour average PM_{2.5} exceedances observed during the proposed modeling period of
 2 February 14-19, 2008 were not exceptionally high. What makes this episode a good candidate for
 3 modeling are the high hourly values and smooth concentration build-up. The first 24-hour
 4 exceedances occurred on February 16 and were followed by a rapid increase in PM_{2.5} through the
 5 first half of February 17 (Figure IX.A.12. 6). During the second half of February 17, a subtle
 6 meteorological feature produced a mid-morning partial mix-out of particulate matter and forced
 7 24-hour averages to fall. After February 18, the atmosphere began to stabilize again and resulted
 8 in even higher PM_{2.5} concentrations during February 20, 21, and 22. Modeling the 14th through
 9 the 19th of this episode should successfully capture these dynamics. The smooth gradual build-up
 10 of hourly PM_{2.5} is ideal for modeling.
 11



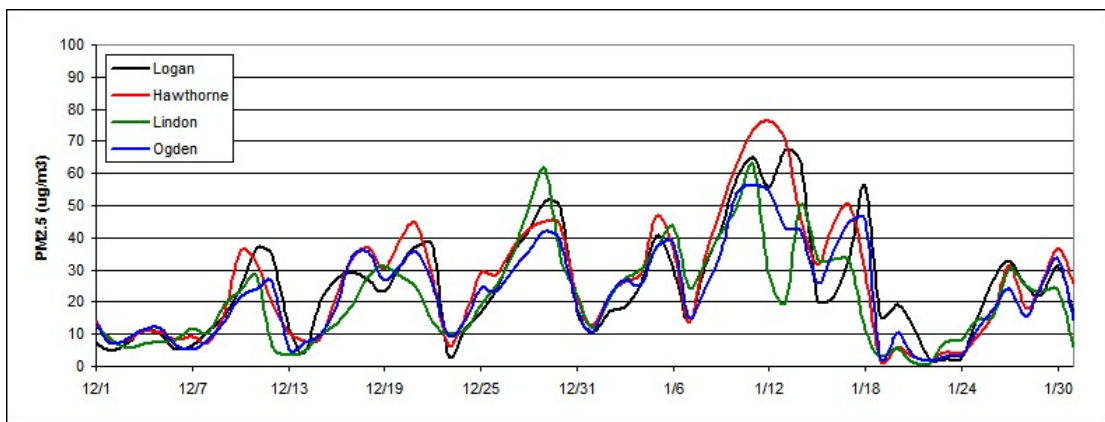
12
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14 **Figure IX.A.12. 6 Hourly PM_{2.5} concentrations for February 14-19, 2008**

15
16
17 **• Episode 3: December 13, 2009 – January 18, 2010**

18

19 The third episode that was selected is more similar to a “season” than a single PM_{2.5} episode
 20 (Figure IX.A.12. 7). During the winter of 2009 and 2010, Utah was dominated by a semi-
 21 permanent ridge of high pressure that prevented strong storms from crossing Utah. This 35 day
 22 period was characterized by 4 to 5 individual PM_{2.5} episodes each followed by a partial PM_{2.5} mix
 23 out when a weak weather system passed through the ridge. The long length of the episode and
 24 repetitive PM_{2.5} build-up and mix-out cycles makes it ideal for evaluating model strengths and
 25 weaknesses and PM_{2.5} control strategies.
 26



27
28

29 **Figure IX.A.12. 7 24-hour average PM_{2.5} concentrations for December-January, 2009-10**

30

31
32 **(e) Meteorological Data**

33

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

8
9 Model performance of WRF was assessed against observations at sites maintained by the Utah
10 Air Monitoring Center. A summary of the performance evaluation results for WRF are presented
11 below:

- 12
13 • The biggest issue with meteorological performance is the existence of a warm bias in
14 surface temperatures during high PM_{2.5} episodes. This warm bias is a common trait of
15 WRF modeling during Utah wintertime inversions.
- 16
17 • WRF does a good job of replicating the light wind speeds (< 5 mph) that occur during
18 high PM_{2.5} episodes.
- 19
20 • WRF is able to simulate the diurnal wind flows common during high PM_{2.5} episodes.
21 WRF captures the overnight downslope and daytime upslope wind flow that occurs in
22 Utah valley basins.
- 23
24 • WRF has reasonable ability to replicate the vertical temperature structure of the
25 boundary layer (i.e., the temperature inversion), although it is difficult for WRF to
26 reproduce the inversion when the inversion is shallow and strong (i.e., an 8 degree
27 temperature increase over 100 vertical meters).

28 29 30 (f) Photochemical Model Performance Evaluation

31 32 PM_{2.5} Results

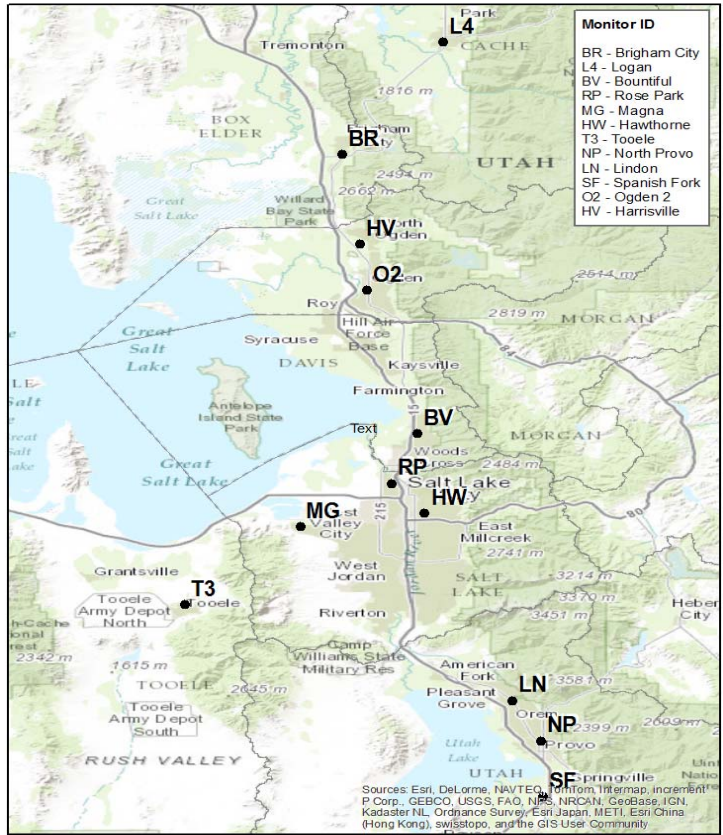
33
34 The model performance evaluation focused on the magnitude, spatial pattern, and temporal
35 variation of modeled and measured concentrations. This exercise was intended to assess whether,
36 and to what degree, confidence in the model is warranted (and to assess whether model
37 improvements are necessary).

38
39 CMAQ model performance was assessed with observed air quality datasets at UDAQ-maintained
40 air monitoring sites (Figure IX.A.12. 8). Measurements of observed PM_{2.5} concentrations along
41 with gaseous precursors of secondary particulate (e.g., NO_x, ozone) and carbon monoxide are
42 made throughout winter at most of the locations in the figure. PM_{2.5} speciation performance was
43 assessed using the three Speciation Monitoring Network Sites (STN) located at the Hawthorne
44 site in Salt Lake City, the Bountiful site in Davis County, and the Lindon site in Utah County.

45
46 PM₁₀ data is also collected at Logan, Bountiful, Ogden2, Magna, Hawthorne, North Provo, and
47 Lindon.

48
49 PM₁₀ filters were collected at Bountiful, Hawthorne and Lindon, and analyzed with the goal
50 comparing CMAQ modeled speciation to the collected PM₁₀ filters. While analyzing the PM₁₀
51 filters, most of the secondarily chemically formed particulate nitrate had been volatilized, and thus
52 could not be accounted for. This is most likely due to the age of the filters, which were collected

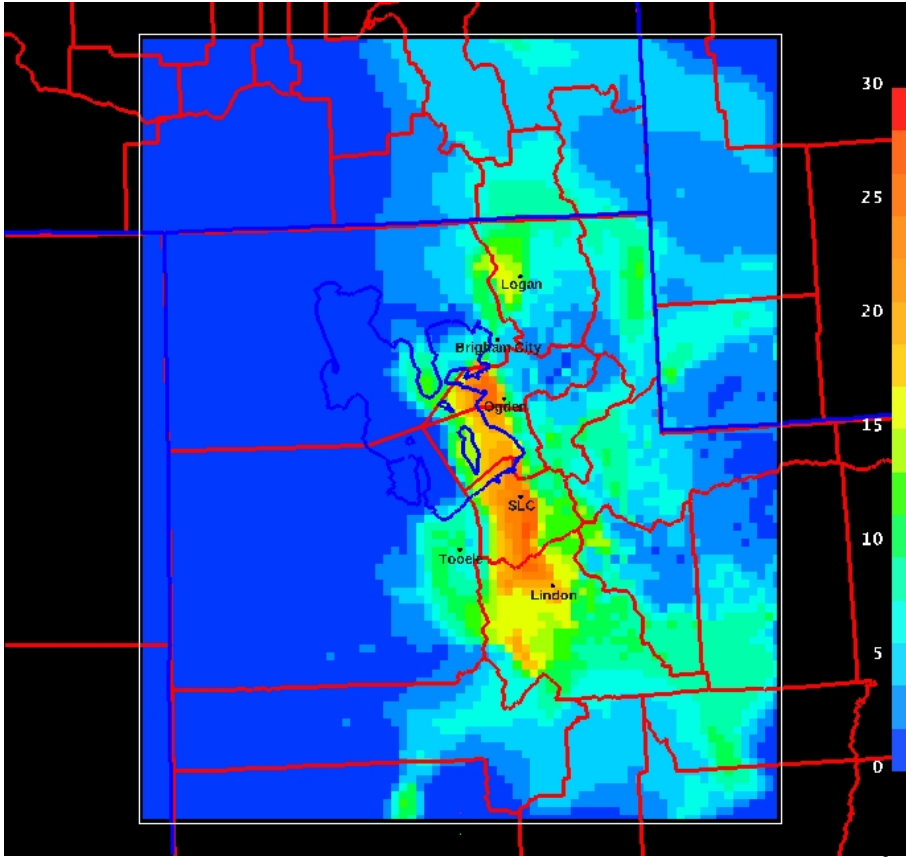
1 over five years ago. Thus, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter
2 speciation could not be made for this modeling period.
3



4
5 **Figure IX.A.12.8 UDAQ monitoring network.**

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A spatial plot is provided for modeled 24-hr $PM_{2.5}$ for 2010 January 03 in Figure IX.A.12. 9. The spatial plot shows the model does a reasonable job reproducing the high $PM_{2.5}$ values, and keeping those high values confined in the valley locations where emissions occur.



7
8
9

Figure IX.A.12. 9 Spatial plot of CMAQ modeled 24-hr $PM_{2.5}$ ($\mu\text{g}/\text{m}^3$) for 2010 Jan. 03.

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

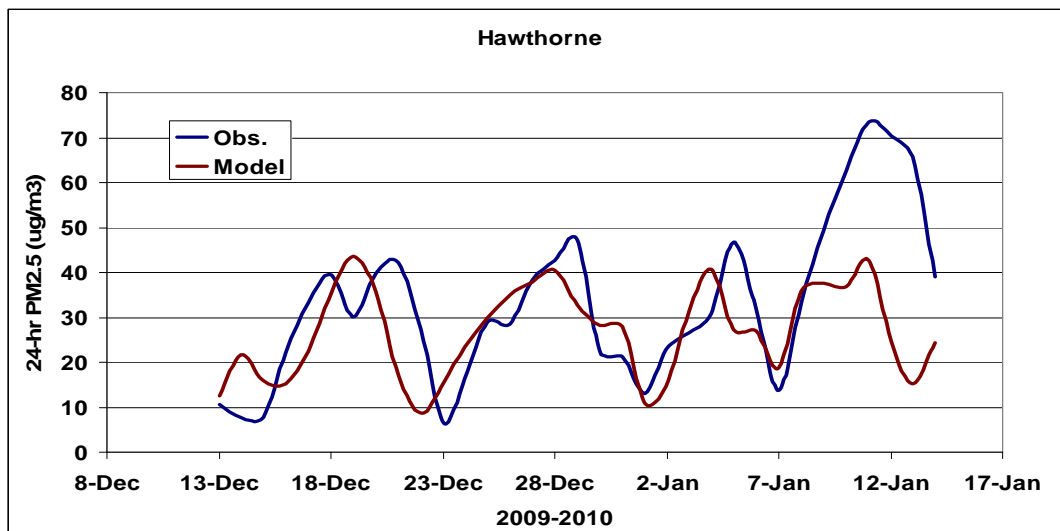
16

17 It is often seen that CMAQ “washes” out the $PM_{2.5}$ episode a day or two earlier than that seen in
18 the observations. For example, on the day 21 Dec. 2009, the concentration of $PM_{2.5}$ continues to
19 build while CMAQ has already cleaned the valley basins of high $PM_{2.5}$ concentrations. At these
20 times, the observed cold pool that holds the $PM_{2.5}$ is often very shallow and winds just above this
21 cold pool are southerly and strong before the approaching cold front. This situation is very
22 difficult for a meteorological and photochemical model to reproduce. An example of this
23 situation is shown in Fig. IX.A.12. 14, where the lowest part of the Salt Lake Valley is still under
24 a very shallow stable cold pool, yet higher elevations of the valley have already been cleared of
25 the high $PM_{2.5}$ concentrations.

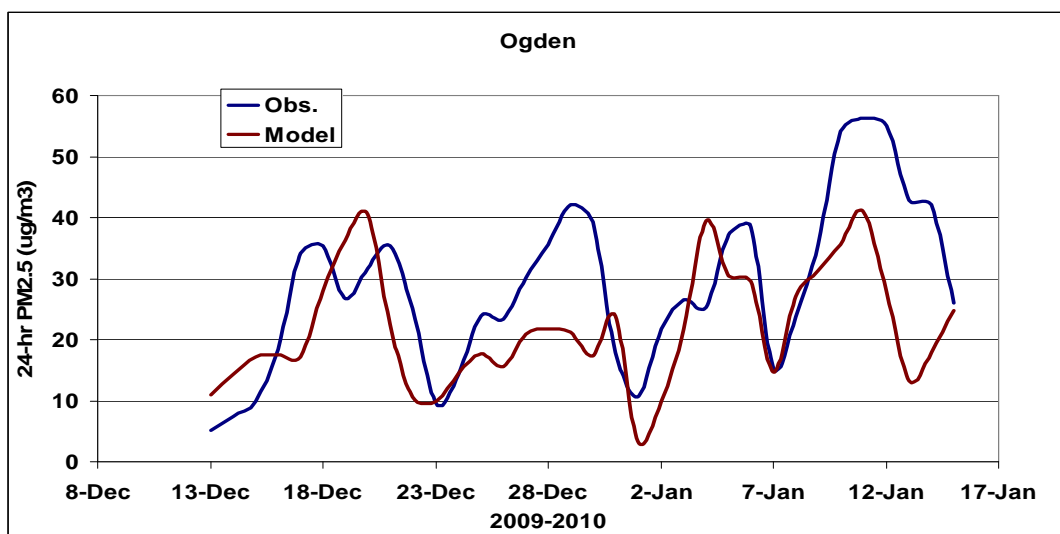
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27 During the 24 – 30 Dec. 2009 episode, a weak meteorological disturbance brushes through the
28 northernmost portion of Utah. It is noticeable in the observations at the Ogden monitor on 25

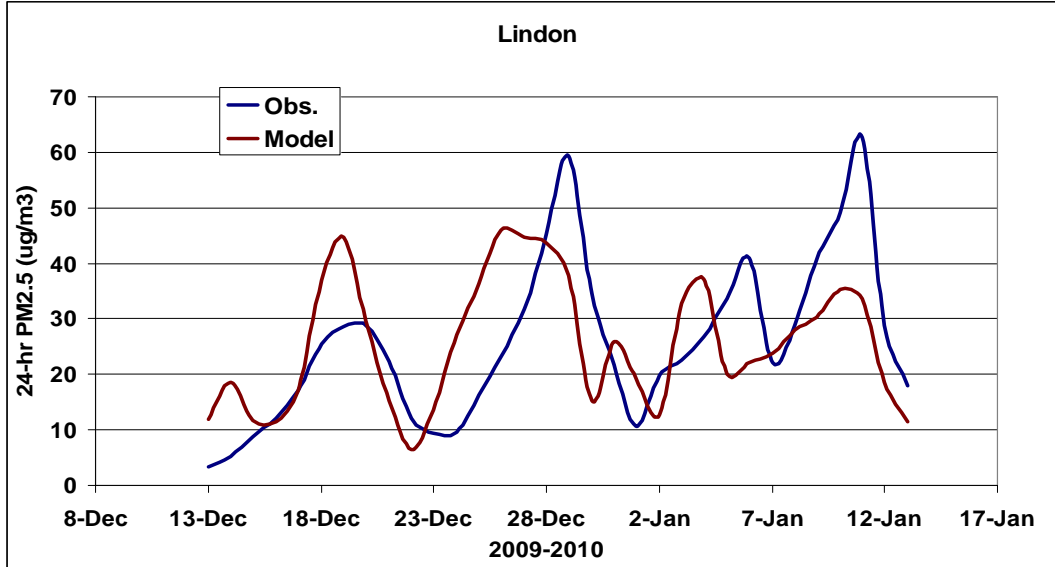
1 Dec. as $PM_{2.5}$ concentrations drop on this day before resuming an increase through Dec. 30. The
 2 meteorological model and thus CMAQ correctly pick up this disturbance, but completely clears
 3 out the building $PM_{2.5}$; and thus performance suffers at the most northern Utah monitors (e.g.
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



12
 13 **Figure IX.A.12. 10 24-hr $PM_{2.5}$ time series (Hawthorne). Observed 24-hr $PM_{2.5}$**
 14 **(blue trace) and CMAQ modeled 24-hr $PM_{2.5}$ (red trace).**
 15
 16

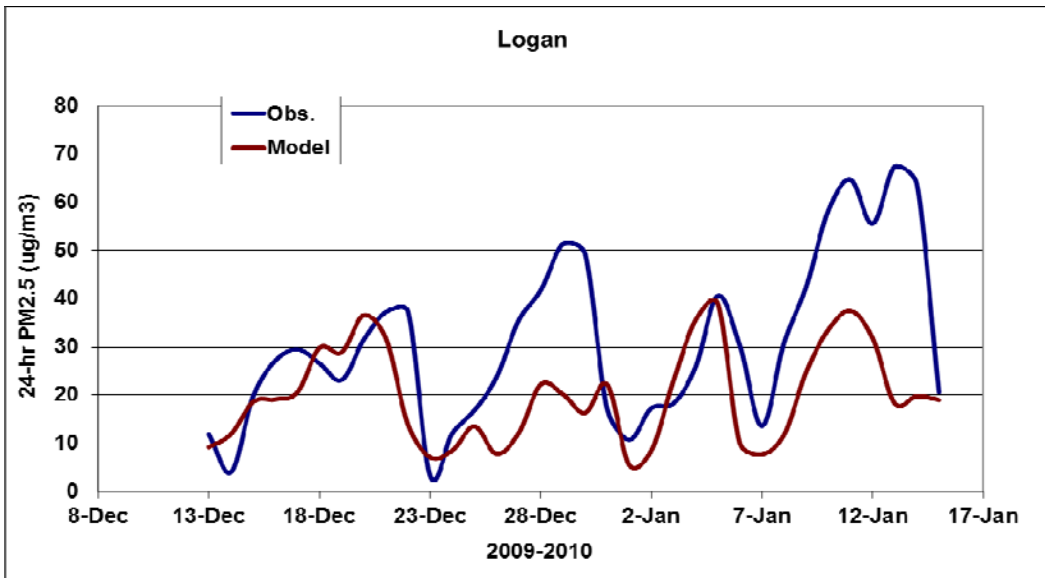


17
 18 **Figure IX.A.12. 11 24-hr $PM_{2.5}$ time series (Ogden). Observed 24-hr $PM_{2.5}$**
 19 **(blue trace) and CMAQ modeled 24-hr $PM_{2.5}$ (red trace).**
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Figure IX.A.12. 12 24-hr PM_{2.5} time series (Lindon). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



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Figure IX.A.12. 13 24-hr PM_{2.5} time series (Logan). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



1
2 **Figure IX.A.12. 14 An example of the Salt Lake Valley at the end of a high PM_{2.5} episode.**
3 **The lowest elevations of the Salt Lake Valley are still experiencing an inversion and**
4 **elevated PM_{2.5} concentrations while the PM_{2.5} has been ‘cleared out’ throughout the rest of**
5 **the valley. These ‘end of episode’ clear out periods are difficult to replicate in the**
6 **photochemical model.**

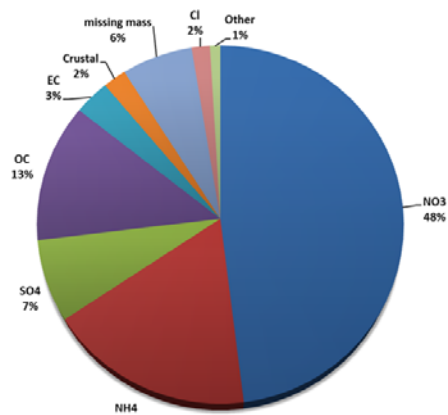
7
8 Generally, the performance of CMAQ to replicate the buildup and clear out of PM_{2.5} is good.
9 However, it is important to verify that CMAQ is replicating the components of PM_{2.5}
10 concentrations. PM_{2.5} simulated and observed speciation is shown at the 3 STN sites in Figures
11 IX.A.12. 15-17. The observed speciation is constructed using days in which the STN filter 24-hr
12 PM_{2.5} concentration was > 35 µg/m³. For the 2009-2010 modeling period, the observed
13 speciation pie charts were created using 8 filter days at Hawthorne, 6 days at Lindon, and 4 days
14 at Bountiful.

15
16 The simulated speciation is constructed using modeling days that produced 24-hr PM_{2.5}
17 concentrations > 35 µg/m³. Using this criterion, the simulated speciation pie chart is created from
18 18 modeling days for Hawthorne, 14 days at Lindon, and 14 days at Bountiful.
19 At all 3 STN sites, the percentage of simulated nitrate is greater than 40%, while the simulated
20 ammonium percentage is at ~15%. This indicates that the model is able to replicate the
21 secondarily formed particulates that typically make up the majority of the measured PM_{2.5} on the
22 STN filters during wintertime pollution events.

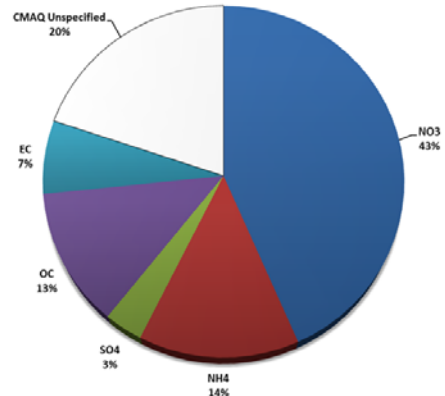
23
24 The percentage of model simulated organic carbon is ~13% at all STN sites, which is in
25 agreement with the observed speciation of organic carbon at Hawthorne and slightly
26 overestimated (by ~3%) at Lindon and Bountiful.

27
28 There is no STN site in the Logan nonattainment area, and very little speciation information
29 available in the Cache Valley. Figure IX.A.12. 18 shows the model simulated speciation at
30 Logan. Ammonium (17%) and nitrate (56%) make up a higher percentage of the simulated PM_{2.5}
31 at Logan when compared to sites along the Wasatch Front.

Hawthorne STN PM2.5 Observed Speciation

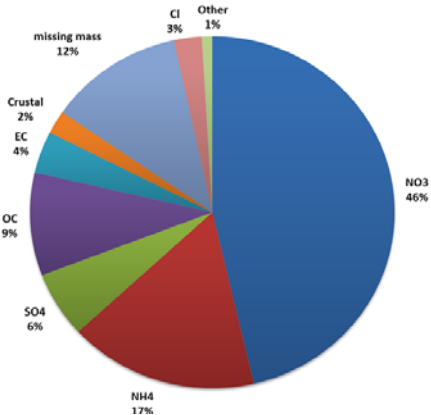


Hawthorne CMAQ PM2.5 Simulation Speciation

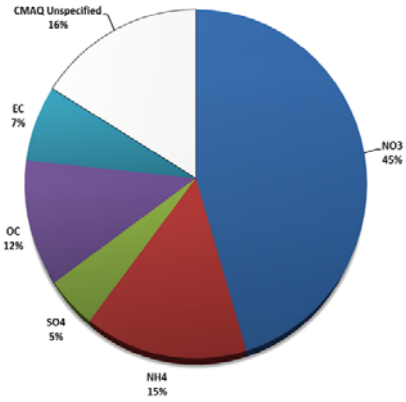


1
2 **Figure IX.A.12.15** The composition of observed and model simulated average 24-hr
3 **PM_{2.5}** speciation averaged over days when an observed and modeled day had 24-hr
4 concentrations > 35 µg/m³ at the Hawthorne STN site.
5

Bountiful STN PM2.5 Observed Speciation

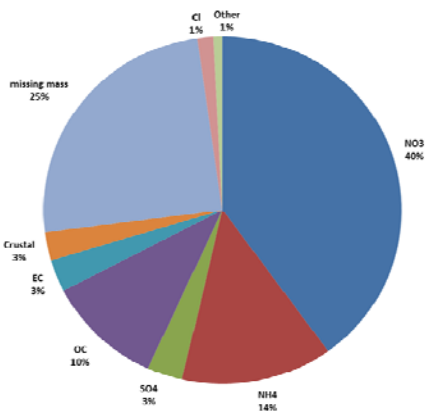


Bountiful CMAQ PM2.5 Simulation Speciation

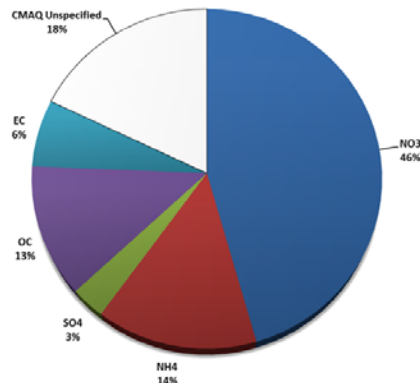


6
7 **Figure IX.A.12.16** The composition of observed and model simulated average 24-hr
8 **PM_{2.5}** speciation averaged over days when an observed and modeled day had 24-hr
9 concentrations > 35 µg/m³ at the Bountiful STN site.
10
11

Lindon STN PM2.5 Observed Speciation

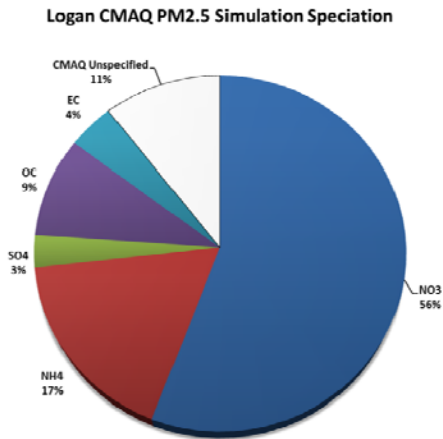


Lindon CMAQ PM2.5 Simulation Speciation



12

1 **Figure IX.A.12. 17 The composition of observed and model simulated average 24-hr**
2 **PM_{2.5} speciation averaged over days when an observed and modeled day had 24-hr**
3 **concentrations > 35 µg/m³ at the Lindon STN site.**
4



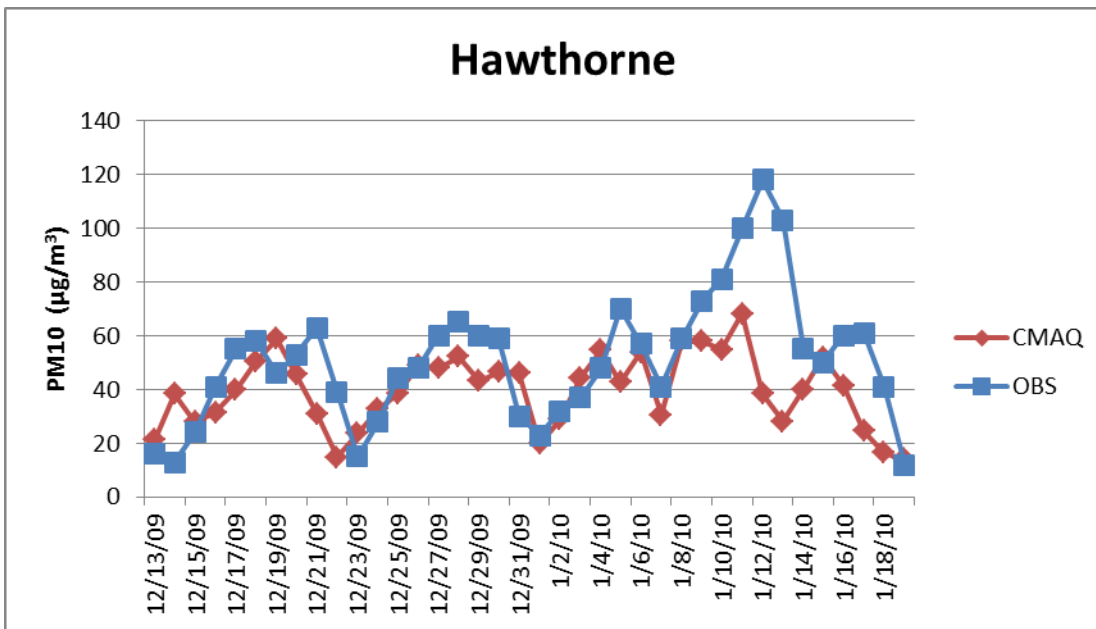
5
6 **Figure IX.A.12. 18 The composition of model simulated average 24-hr PM_{2.5} speciation**
7 **averaged over days when a modeled day had 24-hr concentrations > 35 µg/m³ at the Logan**
8 **monitoring site. No observed speciation data is available for Logan.**
9

10 PM₁₀ Results

11
12 As mentioned previously, the bulk of the performance for CMAQ modeled Particulate Matter
13 (PM) for the 2009 – 2010 episode was done for the 24-hr PM_{2.5} SIP. The detailed model
14 performance was shown using time series, statistical metrics, and pie charts. For the CMAQ
15 performance of PM₁₀ in particular, UDAQ has updated the model versus observations time series
16 plots to show PM₁₀, in addition to the prior times series using PM_{2.5}. For the 2009 – 2010
17 episode, UDAQ collected PM₁₀ observational data at Hawthorne and Magna in Salt Lake County;
18 Lindon and North Provo in Utah County; and for Ogden City.
19

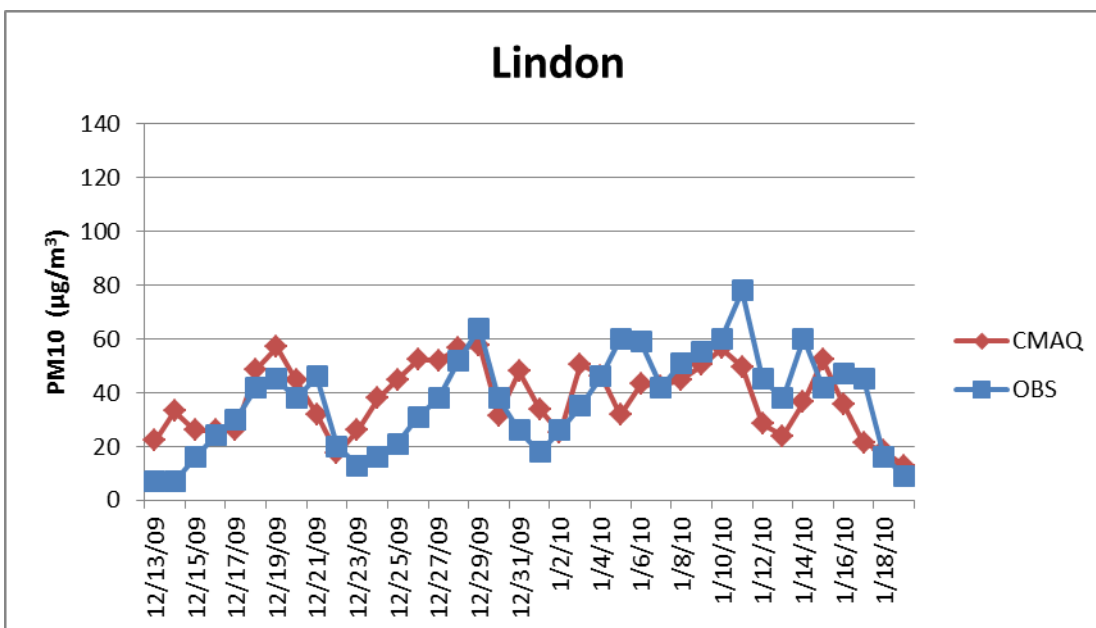
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The PM₁₀ model versus observation time series is shown in Figures IX.A.12. 19-24 .



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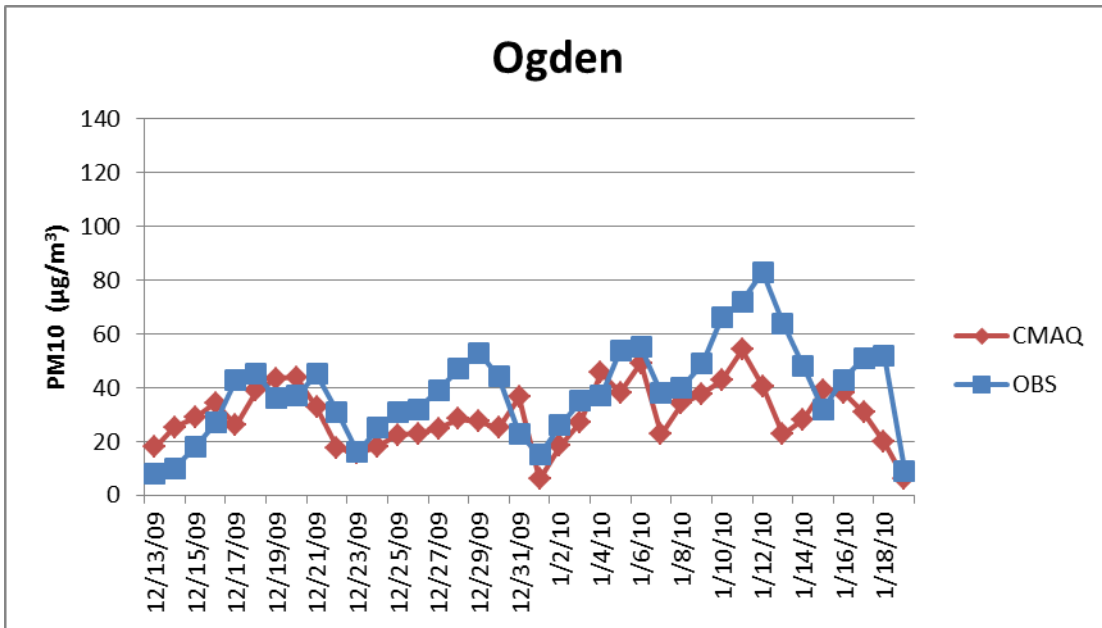
Figure IX.A.12. 19 Time Series of total PM₁₀ (ug/m3) for Hawthorne for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



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Figure IX.A.12. 20 Time Series of total PM₁₀ (ug/m3) for Lindon for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.

1



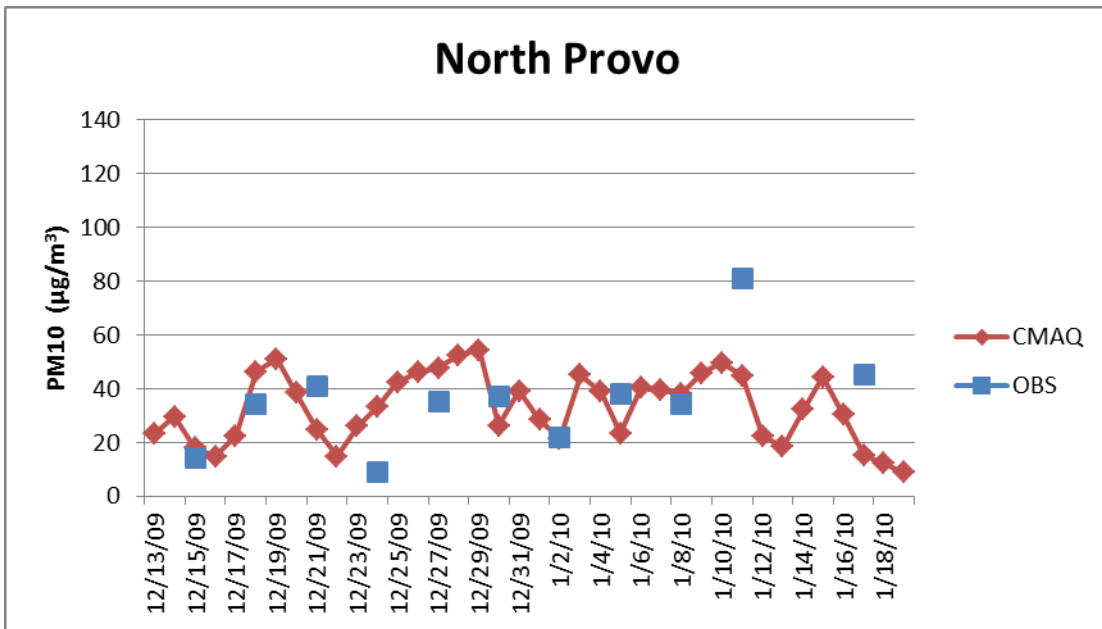
2

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4 **Figure IX.A.12.21 Time Series of total PM₁₀ (ug/m3) for Ogden for the 2009-2010**
 5 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
 6 **trace.**

7

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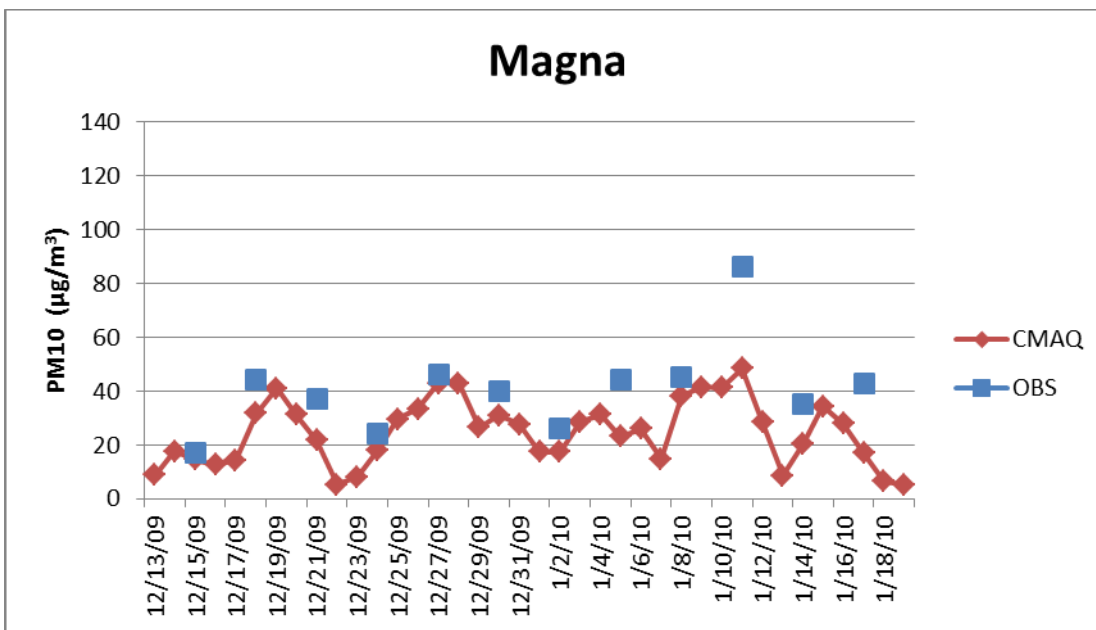
10

11 **Figure IX.A.12.22 Time Series of total PM₁₀ (ug/m3) for North Provo for the 2009-2010**
 12 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
 13 **trace.**

14

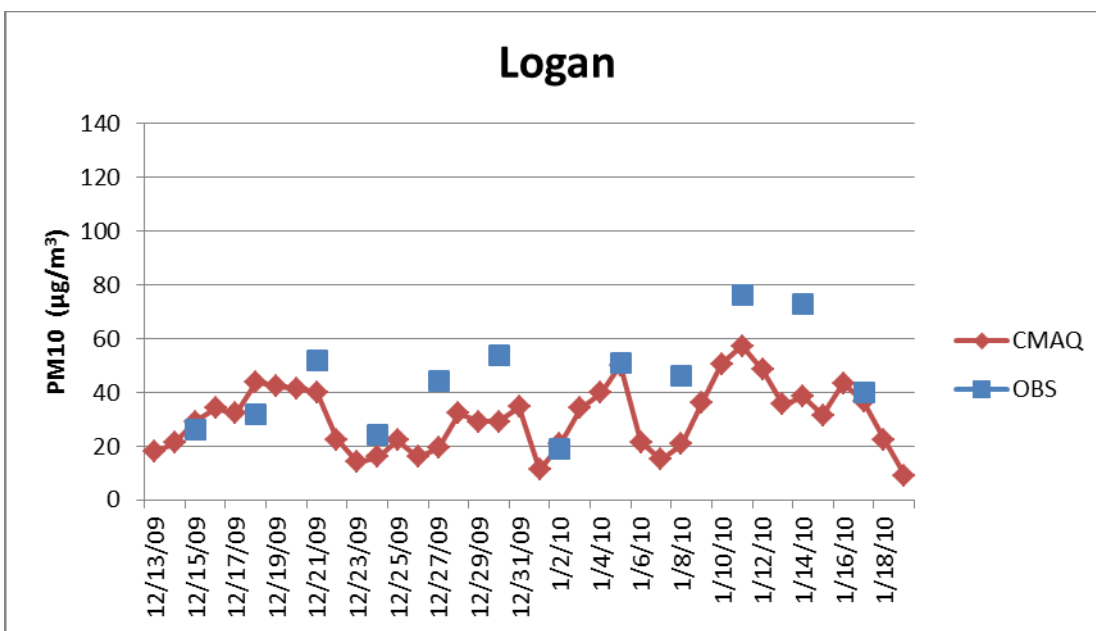
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Figure IX.A.12.23 Time Series of total PM₁₀ (ug/m3) for Magna for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



8
9

Figure IX.A.12.24 Time Series of total PM₁₀ (ug/m3) for Logan for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.

As noted before, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter speciation could not be made for this modeling period because most of the secondarily chemically formed particulate nitrate had been volatilized from the PM₁₀ filters and thus could not be accounted for. It should be noted that CMAQ was able to produce the secondarily formed nitrate

1 when compared to PM_{2.5} filters during the previous PM_{2.5} SIP work. Therefore, UDAQ feels
2 CMAQ shows good replication of the species that make up PM₁₀ during wintertime pollution
3 events.
4

5
6 **(g) Summary of Model Performance**
7

8 Model performance for 24-hr PM_{2.5} is good and generally acceptable and can be characterized as
9 follows:
10

- 11 • Good replication of the episodic buildup and clear out of PM_{2.5}. Often the model will
12 clear out the simulated PM_{2.5} a day too early at the end of an episode. This clear out time
13 period is difficult to model (i.e., Figure IX.A.12. 14).
- 14
15 • Good agreement in the magnitude of PM_{2.5}, as the model can consistently produce the
16 high concentrations of PM_{2.5} that coincide with observed high concentrations.
17
- 18 • Spatial patterns of modeled 24-hr PM_{2.5}, show for the most part, that the PM_{2.5} is being
19 confined in the valley basins, consistent to what is observed.
20
- 21 • Speciation and composition of the modeled PM_{2.5} matches the observed speciation quite
22 well. Modeled and observed nitrate are between 40% and 50% of the PM_{2.5}. Ammonium
23 is between 15% and 20% for both modeled and observed PM_{2.5}, while modeled and
24 observed organic carbon falls between 10% to 13% of the total PM_{2.5}.
25

26 For PM₁₀ the CMAQ model performance is quite good at all locations along Northern Utah.
27 CMAQ is able to re-produce the buildup and washout of the pollution episodes during the 2009 –
28 2010 winter. CMAQ is also able to re-produce the peak PM₁₀ concentrations during most
29 episodes. The exception being the 2010 Jan. 08 – 14 episode, where CMAQ fails to build to the
30 extremely high PM₁₀ concentration (>80 ug/m³) seen at the monitors. This episode in particular
31 featured an “early model washout,” and these results are similar to the results found in PM_{2.5}
32 modeling.
33

34 Several observations should be noted on the implications of these model performance findings on
35 the attainment modeling presented in the following section. First, it has been demonstrated that
36 model performance overall is acceptable and, thus, the model can be used for air quality planning
37 purposes. Second, consistent with EPA guidance, the model is used in a relative sense to project
38 future year values. EPA suggests that this approach “should reduce some of the uncertainty
39 attendant with using absolute model predictions alone.”
40

41 **(h) Modeled Attainment Test**
42

43 • **Introduction**
44

45 With acceptable performance, the model can be utilized to make future-year attainment
46 projections. For any given (future) year, an attainment projection is made by calculating a
47 concentration termed the Future Design Value (FDV). This calculation is made for each monitor
48 included in the analysis, and then compared to the NAAQS (150 µg/m³). If the FDV at every
49 monitor located within a nonattainment area is smaller than the NAAQS, this would demonstrate
50 attainment for that area in that future year.
51

1 A maintenance plan must demonstrate continued attainment of the NAAQS for a span of ten
 2 years. This span is measured from the time EPA approves the plan, a date which is somewhat
 3 uncertain during plan development. To be conservative, attainment projections were made for
 4 2019, 2028, and 2030. An assessment was also made for 2024 as a “spot-check” against emission
 5 trends within the ten year span.

6
 7 • **PM₁₀ Baseline Design Values**
 8

9 For any monitor, the FDV is greatly influenced by existing air quality at that location. This can
 10 be quantified and expressed as a Baseline Design Value (BDV). The BDV is consistent with the
 11 form of the 24-hour PM₁₀ NAAQS; that is, that the probability of exceeding the standard should
 12 be no greater than once per calendar year. Quantification of the BDV for each monitor is
 13 included in the TSD, and is consistent with EPA guidance.

14
 15 Hourly PM₁₀ observations are taken from FRM filters spanning five monitors in three
 16 maintenance areas: Salt Lake County, Utah County, and the city of Ogden.

17
 18 In Table IX.A.12. 5, baseline design values are given for Ogden, Hawthorne, Magna, Lindon, and
 19 North Provo. These values were calculated based on data collected during the 2011-2014 time
 20 period.

21
 22 **Table IX.A.12. 5 Baseline design values listed for each monitor.**
 23

Site	Maintenance Area	2011-2014 BDV
Ogden	Ogden City	88.2 µg/m ³
Hawthorne	Salt Lake County	100.9 µg/m ³
Magna	Salt Lake County	70.5 µg/m ³
Lindon	Utah County	111.4 µg/m ³
North Provo	Utah County	124.4 µg/m ³

24
 25
 26 • **Relative Response Factors**
 27

28 In making future-year predictions, the output from the CMAQ 4.7.1 model is not considered to be
 29 an absolute answer. Rather, the model is used in a relative sense. In doing so, a comparison is
 30 made using the predicted concentrations for both the year in question and a pre-selected base-
 31 year, which for this plan is 2011. This comparison results in a Relative Response Factor (RRF).
 32 RRFs are calculated as follows:

- 33
 34 1) Modeled PM₁₀ concentrations are calculated for each grid cell in the modeling domain
 35 over the 39-day wintertime 2009-2010 episode. Of particular interest are the nine grid
 36 cells (3x3 window) that are collocated with each monitor. The monitor, itself is located in
 37 the window’s center cell.
 38
 39 2) For every simulated day, the maximum daily PM₁₀ concentration for each of these nine-
 40 cell windows is identified.
 41
 42 3) For each monitor, the top 20% of these 39 values are averaged to formulate a modeled
 43 PM₁₀ peak concentration value (PCV).
 44
 45 4) At each monitor, the RRF is calculated as the ratio between future-year PCV and base-
 46 year PCV: **RRF = FPCV / BPCV**

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2
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4 • **Future Design Values and Results**
5

6 Finally, for each monitor, the FDV is calculated by multiplying the baseline design value by the
7 relative response factor: **FDV = RRF * BDV**. These FDV's are compared to the NAAQS in order
8 to determine whether attainment is predicted at that location or not. The results for each of the
9 monitors are shown below in Table IX.A.12. 6.

10
11 **Table IX.A.12. 6 Baseline design values, relative response factors, and future design**
12 **values for all monitors and future years. Units of design values are $\mu\text{g}/\text{m}^3$, while RRF's are**
13 **dimensionless.**
14

Monitor	2011 BDV	2019 RRF	2019 FDV	2024 RRF	2024 FDV	2028 RRF	2028 FDV	2030 RRF	2030 FDV
Ogden	88.2	1.05	92.6	1.04	91.7	1.02	90.0	1.05	92.6
Hawthorne	100.9	1.09	110.0	1.09	110.0	1.09	110.0	1.12	113.0
Magna	70.5	1.14	80.4	1.13	79.7	1.11	78.3	1.15	81.1
Lindon	111.4	1.16	129.2	1.12	124.8	1.11	123.7	1.16	129.2
North Provo	124.4	1.15	143.1	1.12	139.3	1.10	136.8	1.15	143.1

15
16
17 For all future-years and monitors, no FDV exceeds the NAAQS. Therefore continued attainment
18 is demonstrated for all three maintenance areas.
19
20
21

22 **(2) Attainment Inventory**
23

24 The attainment inventory is discussed in EPA guidance (Calcagni) as another one of the core
25 provisions that should be considered by states for inclusion in a maintenance plan.
26

27 According to Calcagni, the stated purpose of the attainment inventory is to establish the level of
28 emissions during the time periods associated with monitoring data showing attainment.
29

30 In cases such as this, where a maintenance demonstration is founded on a modeling analysis that
31 is used in a relative sense, the baseline inventory modeled as the basis for comparison with every
32 projection year model run is best suited to act as the attainment inventory. For this analysis, a
33 baseline inventory was compiled for the year 2011. This year also falls within the span of data
34 representing current attainment of the PM_{10} NAAQS.
35

36 Calcagni speaks about the projection inventory as well, and notes that it should consider future
37 growth, including population and industry, should be consistent with the base-year attainment
38 inventory, and should document data inputs and assumptions. Any assumptions concerning
39 emission rates must reflect permanent, enforceable measures.
40

41 Utah compiled projection inventories for use in the quantitative modeling demonstration. The
42 years selected for projection included 2019, 2024, 2028, and 2030. The emissions contained in
43 the inventories include sources located within a regional area called a modeling domain. The

1 modeling domain encompasses all three areas within the state that were designated as
2 nonattainment areas for PM₁₀: Salt Lake County, Utah County, and Ogden City, as well as a
3 bordering region see Figure IX.A.12. 1.

4
5 Since this bordering region is so large (owing to its creation to assess a much larger region of
6 PM_{2.5} nonattainment), a “core area” within this domain was identified wherein a higher degree of
7 accuracy would be important. Within this core area (which includes Weber, Davis, Salt Lake,
8 and Utah Counties), SIP-specific inventories were prepared to include seasonal adjustments and
9 forecasting to represent each of the projection years. In the bordering regions away from this
10 core, the 2011 National Emissions Inventory was downloaded from EPA and inserted to the
11 analysis. It remained unchanged throughout the analysis period.

12
13 There are four general categories of sources included in these inventories: large stationary
14 sources, smaller area sources, on-road mobile sources, and off-road mobile sources.

15
16 For each of these source categories, the pollutants that were inventoried included: particulate
17 matter with an aerodynamic diameter of ten microns or less (PM₁₀), sulfur dioxide (SO₂), oxides
18 of nitrogen (NO_x), volatile organic compounds (VOC), and ammonia. SO₂ and NO_x are
19 specifically defined as PM₁₀ precursors, that is, compounds that, after being emitted to the
20 atmosphere, undergo chemical or physical change to become PM₁₀. Any PM₁₀ that is created in
21 this way is referred to as secondary aerosol. The CMAQ model also considers ammonia and
22 VOC to be contributing factors in the formation of secondary aerosol.

23
24 The unit of measure for point and area sources is the traditional tons per year, but the CMAQ
25 model includes a pre-processor that converts these emission rates to hourly increments throughout
26 each day for each episode. Mobile source emissions are reported in terms of tons per day, and are
27 also pre-processed by the model.

28
29 The basis for the point source and area inventories, for the base-year attainment inventory as well
30 as all future-year projection inventories, was the 2011 tri-annual inventory of actual emissions
31 that had already been compiled by the Division of Air Quality.

32
33 Area sources, off-road mobile sources, and generally also the large point sources were projected
34 forward from 2011, using population and economic forecasts from the Governor’s Office of
35 Management and Budget.

36
37 Mobile source emissions were calculated for each year using MOVES2010 in conjunction with
38 the appropriate estimates for vehicle miles traveled (VMT). VMT estimates for the urban
39 counties were based on a travel demand model that is only run periodically for specific projection
40 years. VMT for intervening years were estimated by interpolation.

41
42 Since this SIP subsection takes the form of a maintenance plan, it must demonstrate that the area
43 will continue to attain the PM₁₀ NAAQS throughout a period of ten years from the date of EPA
44 approval. It is also necessary to “spot check” this ten-year interval. Hence, projection inventories
45 were prepared for the following years: 2019, 2024, 2028, (the ten-year mark from anticipated
46 EPA approval), and 2030. 2011 was established as the baseline period.

47
48 The following tables are provided to summarize these inventories. As described, they represent
49 point, area, on-road mobile, and off-road mobile sources in the modeling domain. They include
50 PM₁₀, SO₂, NO_x, VOC, and ammonia.

51

1 The first Table IX.A.12. 7 shows the baseline emissions for each of the areas within the
 2 modeling domain. The second Table IX.A.12. 8 is specific to this nonattainment area, and
 3 shows the emissions from the baseline through the projection years.
 4
 5
 6

7 **Table IX.A.12. 7 Baseline Emissions throughout the Modeling Domain**
 8

2011 Baseline	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline Sum of Emissions (tpd)	Ogden City NA-Area	Area Sources	0.85	0.08	2.12	5.67	0.86
		NonRoad	0.90	0.00	1.32	0.91	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.09	0.05	12.18	8.58	0.22
	Provo NA Total		3.84	0.13	15.62	15.16	1.08
	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	7.12	0.32	11.71	6.38	0.00
		Point Source	4.04	8.90	15.56	2.97	0.20
		Mobile Sources	10.95	0.28	57.96	35.35	1.14
	Salt Lake City NA Total		26.72	9.55	85.96	77.32	2.87
	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	3.53	0.02	4.24	2.31	0.00
		Point Source	0.28	0.29	1.03	0.18	0.18
		Mobile Sources	4.90	0.13	24.64	11.89	0.49
	Surrounding Areas Total		10.90	0.46	30.13	15.54	1.50
	Surrounding Areas	Area Sources	537.49	13.60	228.31	629.52	331.22
		NonRoad	34.53	0.10	60.77	72.57	0.01
		Point Source	17.64	283.15	538.86	63.96	6.08
		Mobile Sources	22.80	193.52	434.92	6.47	1.67
	Surrounding Areas Total		612.46	490.37	1262.86	772.52	338.98
2011 Total		653.92	500.51	1394.57	880.54	344.43	

9
 10
 11
 12
 13 **Table IX.A.12. 8 Salt Lake County Nonattainment Area; Actual Emissions for 2011 and**
 14 **Emission Projections for 2019, 2024, 2028, and 2030.**
 15

Year	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline	Ogden City NA-Area	Area Sources	0.85	0.08	2.12	5.67	0.86
		NonRoad	0.90	0.00	1.32	0.91	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.09	0.05	12.18	8.58	0.22
	2011 Total		3.84	0.13	15.62	15.16	1.08
2019	Ogden City NA-Area	Area Sources	0.61	0.08	1.21	3.87	0.88
		NonRoad	1.00	0.00	0.84	0.77	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.07	0.06	6.68	5.26	0.17
2019 Total		3.68	0.14	8.73	9.90	1.05	
2024	Ogden City NA-Area	Area Sources	0.65	0.12	1.16	4.18	0.95
		NonRoad	1.05	0.00	0.70	0.77	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.11	0.06	4.50	4.19	0.17
2024 Total		3.81	0.18	6.36	9.14	1.12	
2028	Ogden City NA-Area	Area Sources	0.71	0.10	1.21	4.38	0.99
		NonRoad	1.13	0.00	0.66	0.78	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.17	0.05	3.12	3.42	0.17
2028 Total		4.01	0.15	4.99	8.58	1.16	
2030	Ogden City NA-Area	Area Sources	0.71	0.08	1.21	4.50	0.99
		NonRoad	1.17	0.00	0.64	0.80	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.22	0.05	2.83	3.26	0.17
2030 Total		4.10	0.13	4.68	8.56	1.16	

1
2
3
4 More detail concerning any element of the inventory can be found at the appropriate section of
5 the Technical Support Document (TSD). More detail about the general construction of the
6 inventory may be found in the Inventory Preparation Plan.
7
8

9 **(3) Emissions Limitations**

10
11 As discussed above, the larger sources within the nonattainment areas were individually
12 inventoried and modeled in the analysis.
13

14 A subset of these “large” sources was subsequently identified for the purpose of establishing
15 emission limitations as part of the Utah SIP. This subset includes any source located within any
16 of the three current nonattainment areas for PM₁₀: Salt Lake County, Utah County, or Ogden City
17 whose actual emissions of PM₁₀, SO₂, or NO_x exceeded 100 tons in 2011, or who had the
18 potential to emit 100 tpy of any of these pollutants. A source might also be included in the subset
19 if it was currently regulated for PM₁₀ under section IX, Part H of the Utah SIP. There were
20 several sources in Davis County that were close enough to the border so as to have originally
21 been included in the original PM₁₀ SIP.
22

23 As discussed before, the emission limits for these sources had already been reflected in the
24 projected emissions inventories used in the modeling analysis. Only those limits for which credit
25 is being taken in the SIP have been incorporated specifically into the SIP. Many of these limits
26 appear in state issued Approval Orders or Title V Operating Permits. Such regulatory documents
27 typically include many emission limits and operating restrictions. However, the limits found in
28 the SIP cannot be changed unless the State provides, and EPA approves, a SIP revision.
29

30 These limits are incorporated in the Utah SIP at Section IX, Part H (formerly Sections 1 and 2 of
31 Appendix A to Section IX, Part A), and as such are federally enforceable.
32

33 These conditions support a demonstration of maintenance through 2030.
34
35

36 **(4) Emission Reduction Credits**

37
38 Under Utah’s new source review rules in R307-403-8, banking of emission reduction credits
39 (ERCs) is permitted to the fullest extent allowed by applicable Federal Law as identified in 40
40 CFR 51, Appendix S, among other documents. Under Appendix S, Section IV.C.5, a permitting
41 authority may allow banked ERCs to be used under the preconstruction review program (R307-
42 403) as long as the banked ERCs are identified and accounted for in the SIP control strategy.
43

44 Existing Emission Reduction Credits, for PM₁₀, SO₂, and NO_x, were included in the modeled
45 demonstration of maintenance outlined in Subsection IX.A.12.c(1).
46

47 The subsequent crediting of any emission reduction of PM₁₀, or precursors thereto, whether pre-
48 existing or established subsequent to the approval of this SIP revision, remains permissible. In
49 general, credits must be in excess and must be established by actual, verifiable, and enforceable
50 reductions in emissions. Additionally, these ERCs cannot be used to offset major new sources or
51 major modifications at existing sources in PM_{2.5} nonattainment areas.
52

1 Once **Ogden City** is redesignated to attainment for PM₁₀, permitting new PM₁₀ sources or major
2 modifications to existing PM₁₀ sources will be conducted under the rules of the Prevention of
3 Significant Deterioration program.
4
5
6

7 **(5) Additional Controls for Future Years**

8
9 Since the emission limitations discussed in subsection IX.A.12.c.(3) are federally enforceable
10 and, as demonstrated in IX.A.10.c(1) above, are sufficient to ensure continued attainment of the
11 PM₁₀NAAQS, there is no need to require any additional control measures to maintain the PM₁₀
12 NAAQS.
13
14

15 **(6) Mobile Source Budget for Purposes of Conformity**

16
17 The transportation conformity provisions of section 176(c)(2)(A) of the Clean Air Act (CAA)
18 require regional transportation plans and programs to show that "...emissions expected from
19 implementation of plans and programs are consistent with estimates of emissions from motor
20 vehicles and necessary emissions reductions contained in the applicable implementation plan..."
21 EPA's transportation conformity regulation (40 CFR 93, Subpart A, last amended at 77 FR 14979,
22 March 14 2012) also requires that motor vehicle emission budgets must be established for the
23 last year of the maintenance plan, and may be established for any years deemed appropriate (see
24 40 CFR 93.118(b)(2)(i)). If the maintenance plan does not establish motor vehicle emissions
25 budgets for any years other than the last year of the maintenance plan, the conformity regulation
26 requires that a "demonstration of consistency with the motor vehicle emissions budget(s) must be
27 accompanied by a qualitative finding that there are not factors which would cause or contribute to
28 a new violation or exacerbate an existing violation in the years before the last year of the
29 maintenance plan." The normal interagency consultation process required by the regulation (40
30 CFR 93.105) shall determine what must be considered in order to make such a finding.
31

32 Thus, for a Metropolitan Planning Organization's (MPO's) Regional Transportation Plan (RTP),
33 analysis years that are after the last year of the maintenance plan (in this case 2030), a conformity
34 determination must show that emissions are less than or equal to the maintenance plan's motor
35 vehicle emissions budget(s) for the last year of the implementation plan.
36

37 EPA's MOVES2014 was used to calculate mobile source emissions, and road dust projections
38 were calculated using the January 2011 update to AP-42 Method for Estimating Re-Entrained
39 Road Dust from Paved Roads (Chapter 13, released 76 FR 6329 February 4, 2011).
40

41 Utah has determined that mobile sources are not significant contributors of SO₂ for this
42 maintenance plan. As such, this maintenance plan does not establish a motor vehicle emissions
43 budget for SO₂.
44

45 **(a) Ogden City Mobile Source PM₁₀ Emissions Budgets**

46
47 In this maintenance plan, Utah is establishing transportation conformity motor vehicle emission
48 budgets (MVEB) for PM₁₀ (direct) and NO_x for 2030.
49

50 **(i) Direct PM₁₀ Emissions Budget**

51

1 Direct (or “primary”) PM₁₀ refers to PM₁₀ that is not formed via atmospheric chemistry. Rather,
2 direct PM₁₀ is emitted straight from a mobile or stationary source. With regard to the emission
3 budget presented herein, direct PM₁₀ includes road dust, brake wear, and tire wear as well as
4 PM₁₀ from exhaust.

5
6 As presented in the Technical Support Document for on-road mobile sources, the estimated on-
7 road mobile source emissions for Salt Lake County, in 2030, of direct sources of PM₁₀ (road dust,
8 brake wear, tire wear, and exhaust particles) were 0.71 tons per winter-weekday. These mobile
9 source PM₁₀ emissions were included in the maintenance demonstration in Subsection
10 IX.A.10.c.(1) which estimates a maximum PM₁₀ concentration of 92.6 µg/m³ in 2030 within the
11 Salt Lake County portion of the modeling domain. The above PM₁₀ mobile source emission
12 figure of 0.71 tons per day (tpd) would traditionally be considered as the MVEB for the
13 maintenance plan. However, and as discussed below, the modeled concentration is 57.4 µg/m³
14 below the NAAQS of 150 µg/m³, and represents potential PM₁₀ emissions that may be considered
15 for allocation to the PM₁₀ MVEB.

16
17 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
18 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
19 compliance with the maintenance requirement. These additional emissions that can be allocated
20 to the applicable MVEB are considered the “safety margin.” As defined in 40 CFR 93.101,
21 safety margin represents the amount of emissions by which the total projected emissions from all
22 sources of a given pollutant are less than the total emissions that would satisfy the applicable
23 requirement for demonstrating maintenance. The implementation plan can then allocate some or
24 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

25
26 The safety margin for the Ogden City portion of the domain equates to 57.4 µg/m³.

27
28 To evaluate the portion of safety margin that could be allocated to the PM₁₀ MVEB, modeling
29 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.

30
31 Using the same emission projections for point and area and non-road mobile sources, the
32 SMOKE 3.6 emissions model was re-run using 1.50 tons of PM₁₀ per winter-weekday for mobile
33 sources (and 1.00 tons/winter-weekday of NO_x). The revised maintenance demonstration for
34 2030 still shows maintenance of the PM₁₀ standard.

35
36 It estimates a maximum PM₁₀ concentration of 97.0 µg/m³ in 2030 within the Ogden City portion
37 of the modeling domain. This value is 53.0 µg/m³ below the NAAQ Standard of 150 µg/m³, but
38 4.4 µg/m³ higher than the previous value.

39
40 This shows that the safety margin is at least 0.79 tons/day of PM₁₀ (1.50 tons/day minus 0.71
41 tons/day) and 0.30 tons/day of NO_x (1.00 tons/day minus 0.70 tons/day). This maintenance plan
42 allocates this portion of the safety margin to the mobile source budgets for Ogden City, and
43 thereby sets the direct PM₁₀ MVEB for 2030 at 1.50 tons/winter-weekday.

44 45 **(ii) NO_x Emissions Budget**

46
47 Through atmospheric chemistry, NO_x emissions can substantially contribute to secondary PM₁₀
48 formation. For this reason, NO_x is considered a PM₁₀ precursor.

49
50 As presented in the Technical Support Document for on-road mobile sources, the estimated on-
51 road mobile source NO_x emissions for Ogden City in 2030 were 0.70 tons per winter-weekday.
52 These mobile source PM₁₀ emissions were included in the maintenance demonstration in

1 Subsection IX.A.10.c.(1) which estimates a maximum PM₁₀ concentration of 92.6 µg/m³ in 2030
2 within the Ogden City portion of the modeling domain. The above NO_x mobile source emission
3 figure of 0.70 tons per day (tpd) would traditionally be considered as the MVEB for the
4 maintenance plan. However, and as discussed below, the modeled concentration is 57.4 µg/m³
5 below the NAAQS of 150 µg/m³, and represents potential NO_x emissions that may be considered
6 for allocation to the NO_x MVEB.
7

8 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
9 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
10 compliance with the maintenance requirement. These additional emissions that can be allocated
11 to the applicable MVEB are considered the "safety margin." As defined in 40 CFR 93.101,
12 safety margin represents the amount of emissions by which the total projected emissions from all
13 sources of a given pollutant are less than the total emissions that would satisfy the applicable
14 requirement for demonstrating maintenance. The implementation plan can then allocate some or
15 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.
16

17 The safety margin for the Ogden City portion of the domain equates to 57.4 µg/m³.
18

19 To evaluate the portion of safety margin that could be allocated to the PM₁₀ MVEB, modeling
20 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.
21

22 Using the same emission projections for point and area and non-road mobile sources, the
23 SMOKE 3.6 emissions model was re-run using 1.00 tons of NO_x per winter-weekday for on-road
24 mobile sources (and 1.50 tons/winter-weekday of PM₁₀). The revised maintenance demonstration
25 for 2030 still shows maintenance of the PM₁₀ standard.
26

27 It estimates a maximum PM₁₀ concentration of 97.0 µg/m³ in 2030 within the Ogden City portion
28 of the modeling domain. This value is 53.0 µg/m³ below the NAAQ Standard of 150 µg/m³, but
29 4.4 µg/m³ higher than the previous value.
30

31 This shows that the safety margin is at least 0.30 tons/day of NO_x (1.00 tons/day minus 0.70
32 tons/day) and 0.79 tons/day of PM₁₀ (1.50 tons/day minus 0.71 tons/day). This maintenance plan
33 allocates this portion of the safety margin to the mobile source budgets for Ogden City, and
34 thereby sets the NO_x MVEB for 2030 at 1.00 tons/winter-weekday
35
36

37 (b) Net Effect to Maintenance Demonstration

38

39 Using the procedure described above, some of the identified safety margin indicated earlier in
40 Subsection IX.A.12.c(6) has been allocated to the mobile vehicle emissions budgets. The results
41 of this modification are presented below.
42

43 (i) Inventory: The emissions inventory was adjusted as shown below:

44

45
46 in 2030: PM₁₀ was adjusted by adding 0.79 ton/day (tpd) of safety margin to 0.71
47 tpd inventory for a total of 1.50 tpd, and

48
49 NO_x was adjusted by adding 0.30 tpd of safety margin to 0.70 tpd
50 inventory for a total of 1.00 tpd,
51
52

1
2 **(ii) Modeling:**

3
4 The effect on the modeling results throughout the domain is summarized in the following
5 Table IX.A.12. 9 (which shows predicted concentrations in $\mu\text{g}/\text{m}^3$). It demonstrates that
6 with the allocation of the safety margin, the NAAQS is still maintained through 2030 in
7 all areas.
8
9

10
11 **Table IX.A.12. 9 Modeling of Attainment in 2030, Including the Portion of the Safety**
12 **Margin Allocated to Motor Vehicles**
13

Air Quality Monitor	Predicted Concentrations in 2030 $\mu\text{g}/\text{m}^3$	
	A	B
Ogden	92.6	97.0

14
15 **Notes:** Column A shows concentrations presented previously as part of the modeled attainment test.
16 Column B shows concentrations resulting from allocation of a portion of the safety margin.
17
18
19

20 **(7) Nonattainment Requirements Applicable Pending Plan Approval**

21
22 CAA 175A(c) - *Until such plan revision is approved and an area is redesignated as attainment,*
23 *the requirements of CAA Part D, Plan Requirements for Nonattainment Areas, shall remain in*
24 *force and effect.* The Act requires the continued implementation of the nonattainment area
25 control strategy unless such measures are shown to be unnecessary for maintenance or are
26 replaced with measures that achieve equivalent reductions. *Utah will continue to implement the*
27 *control measures identified under the Clean Data Policy.*
28
29

30 **(8) Revise in Eight Years**

31
32 CAA 175A(b) - *Eight years after redesignation, the State must submit an additional plan revision*
33 *which shows maintenance of the applicable NAAQS for an additional 10 years.* Utah commits to
34 submit a revised maintenance plan eight years after EPA takes final action redesignating the
35 *Ogden City* area to attainment, as required by the Act.
36
37

38 **(9) Verification of Continued Maintenance**

39
40 Implicit in the requirements outlined above is the need for the State to determine whether the area
41 is in fact maintaining the standard it has achieved. There are two complementary ways to
42 measure this: 1) by monitoring the ambient air for PM_{10} , and 2) by inventorying emissions of
43 PM_{10} and its precursors from various sources.
44

45 The State will continue to maintain an ambient monitoring network for PM_{10} in accordance with
46 40 CFR Part 58 and the Utah SIP. The State anticipates that the EPA will continue to review the

1 ambient monitoring network for PM₁₀ each year, and any necessary modifications to the network
2 will be implemented.

3
4 Additionally, the State will track and document measured mobile source parameters (e.g., vehicle
5 miles traveled, congestion, fleet mix, etc.) and new and modified stationary source permits. If
6 these and the resulting emissions change significantly over time, the State will perform
7 appropriate studies to determine: 1) whether additional and/or re-sited monitors are necessary,
8 and 2) whether mobile and stationary source emission projections are on target.

9
10 The State will also continue to collect actual emissions inventory data from all sources of PM₁₀,
11 SO₂, and NO_x in excess of 25 tons (in aggregate) per year, as required by R307-150.

12 13 14 15 **(10) Contingency Measures**

16
17 *CAA 175A(d) - Each maintenance plan shall contain contingency measures to assure that the*
18 *State will promptly correct any violation of the standard which occurs after the redesignation of*
19 *the area to attainment. Such provisions shall include a requirement that the State will implement*
20 *all control measures which were contained in the SIP prior to redesignation.*

21
22 For Ogden City there was no nonattainment SIP. Therefore this revision need only address such
23 contingency measures as may be necessary to mitigate any future violation of the standard.

24
25 The contingency plan must also ensure that the contingency measures are adopted expeditiously
26 once triggered. The primary elements of the contingency plan are: 1) the list of potential
27 contingency measures, 2) the tracking and triggering mechanisms to determine when
28 contingency measures are needed, and 3) a description of the process for recommending and
29 implementing the contingency measures.

30 31 **(a) Tracking**

32
33 The tracking plan for the Salt Lake County, Utah County, and Ogden City areas consists of
34 monitoring and analyzing PM₁₀ concentrations. In accordance with 40 CFR 58, the State will
35 continue to operate and maintain an adequate PM₁₀ monitoring network in Salt Lake County,
36 Utah County, and Ogden City.

37 38 39 **(b) Triggering**

40
41 Triggering of the contingency plan does not automatically require a revision to the SIP, nor does
42 it necessarily mean the area will be redesignated once again to nonattainment. Instead, the State
43 will normally have an appropriate timeframe to correct the potential violation with
44 implementation of one or more adopted contingency measures. In the event that violations
45 continue to occur, additional contingency measures will be adopted until the violations are
46 corrected.

47
48 Upon notification of a potential violation of the PM₁₀ NAAQS, the State will develop appropriate
49 contingency measures intended to prevent or correct a violation of the PM₁₀ standard.
50 Information about historical exceedances of the standard, the meteorological conditions related to
51 the recent exceedances, and the most recent estimates of growth and emissions will be reviewed.
52 The possibility that an exceptional event occurred will also be evaluated.

1
2 Upon monitoring a potential violation of the PM₁₀ NAAQS, including exceedances flagged as
3 exceptional events but not concurred with by EPA, the State will take the following actions.
4

- 5 • The State will identify the source(s) of PM₁₀ causing the potential violation, and report
6 the situation to EPA Region VIII within four months of the potential violation.
7
- 8 • The State will identify a means of corrective action within six months after a potential
9 violation. The maintenance plan contingency measures to be considered and selected
10 will be chosen from the following list or any other emission control measures deemed
11 appropriate based on a consideration of cost-effectiveness, emission reduction potential,
12 economic and social considerations, or other factors that the State deems appropriate:
13
 - 14 - Re-evaluate the thresholds at which a red or yellow burn day is triggered, as
15 established in R307-302;
 - 16
 - 17 - Expand the road salting and sanding program in R307-307 to include Weber
18 County.
19

20 The State will then hold a public hearing to consider the contingency measures identified to
21 address the potential violation. The State will require implementation of such corrective action
22 no later than one year after a violation is confirmed. Any contingency measures adopted and
23 implemented will become part of the next revised maintenance plan submitted to the EPA for
24 approval.
25

26 It is also possible that contingency measures may be pre-implemented, where no violation of the
27 2006 PM₁₀ NAAQS has yet occurred.
28
29



State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQ-047-15

MEMORANDUM

TO: Air Quality Board

THROUGH: Bryce C. Bird, Executive Secretary

FROM: Bill Reiss, Environmental Engineer

DATE: August 21, 2015

SUBJECT: PROPOSE FOR PUBLIC COMMENT: [Repeal of Existing SIP Subsection IX.A10 and Re-enact with SIP Subsection IX.A.10: PM₁₀ Maintenance Provisions for Salt Lake County.](#)

Introduction:

This item concerns a proposed State Implementation Plan (SIP) revision to address Utah's three nonattainment areas for PM₁₀. These areas have been attaining the PM₁₀ standard for a long time, and this revision demonstrates that they will continue to do so through the year 2030.

The revision is structured as a maintenance plan, which will allow Utah to request that EPA change the area designations back to attainment for PM₁₀. These areas include Salt Lake County, Utah County, and Ogden City.

The existing SIP for PM₁₀ affecting Salt Lake and Utah Counties was adopted in 1991 and resulted in attainment of the 1987 National Ambient Air Quality Standards (NAAQS) in both areas by 1996. Since that time, PM_{2.5} has supplanted PM₁₀ as the indicator of fine particulate matter. Though PM₁₀ also includes the coarse fraction of PM, Utah's difficulties with PM₁₀ were characterized by the same winter time episodes that lead to elevated PM_{2.5} levels.

Essentially, this SIP revision would close the book on PM₁₀ and allow Utah to focus on meeting the PM_{2.5} standard. All three of the affected areas are currently designated nonattainment for PM_{2.5}.

Scope:

There are two parts to the SIP revision. (This) Section IX. Part A is the SIP document itself, and addresses

the criteria necessary to request redesignation. It includes the actual Maintenance Plan, which includes the quantitative demonstration of continued attainment.

Some of the items addressed in Part A include:

- monitored attainment of the PM₁₀ NAAQS
- establishment of motor vehicle emission budgets for purposes of transportation conformity
- consideration of emission reduction credits, and
- contingency measures

The second piece is SIP Section IX, Part H. It includes the emission limits for certain specific stationary sources. Including these limits in the SIP makes them federally enforceable.

The list of stationary sources to be included in Part H was updated as part of this proposal. It includes sources located in any of the nonattainment areas with actual emissions (in 2011), or potentials to emit, that are at least 100 tons per year for PM₁₀, SO₂, or NO_x.

Using these criteria means that some sources will not be retained in the revised Part H, while other new sources, that did not exist when the original SIP was written, will be added.

SIP Organization:

As originally written in 1991, the PM₁₀ nonattainment SIP for Salt Lake and Utah Counties resides at Section IX.A. 1-8 of the Utah SIP. This plan had projected attainment of the NAAQS through the year 2003.

In 2005, Utah prepared a revision to the plan that showed continued attainment in [Salt Lake County](#) through the year 2017. This revision, also structured as a maintenance plan, was placed into the SIP at Section [IX.A.10](#). Subsections IX.A.11 and 12 were also added as the maintenance plan provisions for Utah County and Ogden City respectively.

At this time, DAQ staff is proposing to replace each of these three subsections of the SIP in separate actions. Since there is a large amount of redundant material in the three documents, they have been prepared using color coding to denote which parts of each plan are specific to the respective nonattainment areas. In reviewing the proposals, the reader should note that [blue text](#) is specific to the [Salt Lake County](#) nonattainment area. Likewise, [green text](#) and [purple text](#) are specific to Utah County and Ogden City respectively.

Staff Recommendation: Staff recommends that the Board propose for public comment to repeal existing SIP Subsection [IX.A.10](#), and re-enact with SIP Subsection [IX.A.10](#): PM₁₀ Maintenance Provisions for [Salt Lake County](#), as proposed.

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UTAH

PM₁₀ Maintenance Provisions for Salt Lake County

Section IX.A.10

Adopted by the Air Quality Board
December 2, 2015

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Section IX.A. 10 PM₁₀ Maintenance Provisions for Salt Lake County

5
6

IX.A.10.a Introduction

7 The State of Utah is requesting that the U.S. Environmental Protection Agency (EPA) redesignate
8 the [Salt Lake County](#) nonattainment area to attainment status for the 24-hour PM₁₀ National
9 Ambient Air Quality Standard (NAAQS).

10
11 The foregoing Subsections 1-9 of Part IX.A of the Utah State Implementation Plans (SIP) were
12 written in 1991 to address violations of the NAAQS for PM₁₀ in both Utah County and Salt Lake
13 County. These areas were each classified as Initial Moderate PM₁₀ Nonattainment Areas, and as
14 such required “nonattainment SIPs” to bring them into compliance with the NAAQS by a
15 statutory attainment date. The control measures adopted as part of those plans have proven
16 successful in that regard, and at the time of this writing (2015) each of these areas continues to
17 show compliance with the federal health standards for PM₁₀.

18
19 This [Subsection 10](#) of Part IX.A of the Utah SIP represents the second chapter of the PM₁₀ story
20 for [Salt Lake County](#), and demonstrates that the area has achieved compliance with the PM₁₀
21 NAAQS and will continue to maintain that standard through the year 2030. As such, it is written
22 in accordance with Section 175A (42 U.S.C. 7505a) of the federal Clean Air Act (the Act), and
23 should serve to satisfy the requirement of Section 107(d)(3)(E)(iv) of the Act.

24
25 This section is hereafter referred to as the “Maintenance Plan” or “the Plan,” and contains the
26 maintenance provisions of the PM₁₀ SIP for [Salt Lake County](#).

27
28 While the Maintenance Plan could be written to replace all that had come before, it is presented
29 herein as an addendum to Subsections 1-9 in the interest of providing the reader with some sense
30 of historical perspective. Subsections 1-9 are retained for historical purposes, while existing
31 subsection 10 (transportation conformity for Utah County) [is herein replaced](#). [A more current](#)
32 [evaluation of transportation conformity for Utah County is presented in Section IX.A.11](#).

33
34 In a similar way, any references to the Technical Support Document (TSD) in this section means
35 actually Supplement IV-15 to the Technical Support Document for the PM₁₀ SIP.

36
37
38 **Background**

39
40 The Act requires areas failing to meet the federal ambient PM₁₀ standard to develop SIP revisions
41 with sufficient control requirements to expeditiously attain and maintain the standard. On July 1,
42 1987, EPA promulgated a new NAAQS for particulate matter with a diameter of 10 microns or
43 less (PM₁₀), and listed [Salt Lake County](#) as a Group I area for PM₁₀. This designation was based
44 on historical data for the previous standard, total suspended particulate, and indicated there was a
45 95% probability the area would exceed the new PM₁₀ standard. Group I area SIPs were due in
46 April 1988, but Utah was unable to complete the SIP by that date. In 1989, several citizens
47 groups sued EPA (*Preservation Counsel v. Reilly*, civil Action (No. 89-C262-G (D, Utah)) for
48 failure to implement a Federal Implementation Plan (FIP) under provisions of §110(c)(1) of the
49 Clean Air Act (42 U.S.C. 7410(c)(1)).

1
2 A settlement agreement in January 1990 called for Utah to submit a SIP and for EPA to approve
3 it by December 31, 1991. In August 1991, the parties voluntarily agreed to dismiss the lawsuit
4 and the complaint and vacate the settlement agreement.
5

6 The Clean Air Act Amendments of November 1990 redesignated Group I areas as initial
7 moderate nonattainment areas and required that SIPs be submitted by November 15, 1991. These
8 moderate area SIPs were to require installation of Reasonably Available Control Measures
9 (RACM) on industrial sources by December 10, 1993 and a demonstration the NAAQS would be
10 attained no later than December 31, 1994.
11

12 **(1) The PM₁₀ SIP**

13
14 On November 14, 1991, Utah submitted a SIP for Salt Lake and Utah Counties that demonstrated
15 attainment of the PM₁₀ standards in Salt Lake and Utah Counties for 10 years, 1993 through
16 2003. EPA published approval of the SIP on July 8, 1994 (59 FR 35036).
17

18 **(2) Supplemental History of SIP Approval - PM₁₀**

19
20 Utah's SIP included two provisions that promised additional action by the state: 1) a road salting
21 and sanding program, and 2) a diesel vehicle emissions inspection and maintenance program.
22

23 On February 3, 1995, Utah submitted amendments to the SIP to specify the details of the road
24 salting and sanding program promised as a control measure. EPA published approval of the road
25 salting and sanding provisions on December 6, 1999 (64 FR 68031).
26

27 On February 6, 1996, Utah submitted to EPA a new SIP Section XXI, a diesel vehicle inspection
28 and maintenance program.
29

30 Also, in April 1992, EPA published the "General Preamble," describing EPA's views on
31 reviewing state SIP submittals. One of the requirements was that moderate nonattainment area
32 states must submit contingency plans by November 15, 1993.
33

34 On July 31, 1994, Utah submitted an amendment to the PM₁₀ SIP that required lowering the
35 threshold for calling no-burn days as a contingency measure for Salt Lake, Davis and Utah
36 Counties.
37

38 On July 18, 1997, EPA promulgated a new form of the PM₁₀ standard. As a way to simplify
39 EPA's process of revoking the old PM₁₀ standard, EPA requested on April 6, 1998, that Utah
40 withdraw its submittals of contingency measures. Utah submitted a letter requesting withdrawal
41 on November 9, 1998, and EPA returned the submittals on January 29, 1999.
42

43 **(3) Attainment of the PM₁₀ Standard and Reasonable Further Progress**

44
45 By statute, EPA was to determine whether Initial Moderate Areas were attaining the standard as
46 of December 31, 1994. This determination requires an examination of the three previous calendar
47 years of monitoring data (in this case 1992, 1993 and 1994). The 24-hour NAAQS allows no
48 more than three expected exceedances of the 24-hour standard at any monitor in this 3-year
49 period. Since the statutory deadline for the implementation of RACM was not until the end of
50 1993, it was reasonable to presume that the area might not be able to show attainment with a 3-
51 year data set until the end of 1996 even if the control measures were having the desired effect.
52 Presumably for this reason, Section 188(d) of the Act, (42 U.S.C. 7513(d)) allows a state to

1 request up to two 1-year extensions of the attainment date. In doing so, the state must show that
2 it has met all requirements of the SIP, that no more than one exceedance of the 24-hour PM₁₀
3 NAAQS has been observed in the year prior to the request, and that the annual mean
4 concentration for such year is less than or equal to the annual standard.

5
6 EPA's Office of Air Quality Planning and Standards issued a guidance memorandum concerning
7 extension requests (November 14, 1994), clarifying that the authority delegated to the
8 Administrator for extending moderate area attainment dates is discretionary. In exercising this
9 discretionary authority, it says, EPA will examine the air quality planning progress made in the
10 area, and in addition to the two criteria specified in Section 188(d), EPA will be disinclined to
11 grant an attainment date extension unless a state has, in substantial part, addressed its moderate
12 PM₁₀ planning obligations for the area. The EPA will expect the State to have adopted and
13 substantially implemented control measures submitted to address the requirement for
14 implementing RACM/RACT in the moderate nonattainment area, as this was the central control
15 requirement applicable to such areas. Furthermore it said, "EPA believes this request is
16 appropriate, as it provides a reliable indication that any improvement in air quality evidenced by a
17 low number of exceedances reflects the application of permanent steps to improve the air quality
18 in the region, rather than temporary economic or meteorological changes." As part of this
19 showing, EPA expected the State to demonstrate that the PM₁₀ nonattainment area has made
20 emission reductions amounting to reasonable further progress (RFP) toward attainment of the
21 NAAQS, as defined in Section 171(1) of the Act.

22
23 On May 11, 1995, Utah requested one-year extensions of the attainment date for both Salt Lake
24 and Utah Counties. On October 18, 1995, EPA sent a letter granting the requests for extensions,
25 and on January 25, 1996, sent a letter indicating that EPA would publish a rulemaking action on
26 the extension requests.

27
28 Along with the extension requests in 1995, Utah submitted a milestone report as required under
29 Section 172(1) of the Act, (42 U.S.C. 7501(1)) to assess progress toward attainment. This
30 milestone report addressed two issues: 1) that all control measures in the approved plan had been
31 implemented, and 2) that reasonable further progress (RFP) had been made toward attainment of
32 the standard in terms of reducing emissions. As defined in Section 171(1), RFP means such
33 annual incremental reductions in emissions of the relevant air pollutant as are required to ensure
34 attainment of the applicable NAAQS by the applicable date.

35
36 On June 18, 2001, EPA published notice in the Federal Register (66 FR 32752) that Utah's
37 extension requests were granted, that Salt Lake County attained the PM₁₀ standard by December
38 31, 1995, and that Utah County attained the standard by December 31, 1996. The notice stated
39 that these areas remain moderate nonattainment areas and are not subject to the additional
40 requirements of serious nonattainment areas.

41 42 43 44 **IX.A.10.b Pre-requisites to Area Redesignation**

45
46 Section 107(d)(3)(E) of the Act outlines five requirements that must be satisfied in order that a
47 state may petition the Administrator to redesignate a nonattainment area back to attainment.
48 These requirements are summarized as follows: 1) the Administrator determines that the area has
49 attained the applicable NAAQS, 2) the Administrator has fully approved the applicable
50 implementation plan for the area under §110(k) of the Act, 3) the Administrator determines that
51 the improvement in air quality is due to permanent and enforceable reductions in emissions

1 resulting from implementation of the applicable implementation plan ... and other permanent and
 2 enforceable reductions, 4) the Administrator has fully approved a maintenance plan for the area
 3 as meeting the requirements of §175A of the Act, and 5) the State containing such area has met
 4 all requirements applicable to the area under §110 and Part D of the Act.

5
 6 Each of these requirements will be addressed below. Certainly, the central element from this list
 7 is the maintenance plan found at Subsection IX.A.10.c below. Section 175A of the Act contains
 8 the necessary requirements of a maintenance plan, and EPA policy based on the Act requires
 9 additional elements in order that such plan be federally approvable. Table IX.A.10. 1 identifies
 10 the prerequisites that must be fulfilled before a nonattainment area may be redesignated to
 11 attainment under Section 107(d)(3)(E) of the Act.

12
 13
 14

Table IX.A.10. 1 Prerequisites to Redesignation in the federal Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Attainment of Standard	Three consecutive years of PM ₁₀ monitoring data must show that violations of the standard are no longer occurring.	CAA §107(d)(3)(E)(i)	IX.A.10.b(1)
Approved State Implementation Plan	The SIP for the area must be fully approved.	CAA §107(d)(3)(E)(ii)	IX.A.10.b(2)
Permanent and Enforceable Emissions Reductions	The State must be able to reasonably attribute the improvement in air quality to emission reductions that are permanent and enforceable	CAA §107(d)(3)(E)(iii), Calcagni memo (Sect 3, para 2)	IX.A.10.b(3)
Section 110 and Part D requirements	The State must verify that the area has met all requirements applicable to the area under section 110 and Part D.	CAA: §107(d)(3)(E)(v), §110(a)(2), Sec 171	IX.A.10.b(4)
Maintenance Plan	The Administrator has fully approved the Maintenance Plan for the area as meeting the requirements of CAA §175A	CAA: §107(d)(3)(E)(iv)	IX.A.10.b(5) and IX.A.10.c

15
 16
 17 **(1) The Area Has Attained the PM₁₀ NAAQS**

18 CAA 107(d)(3)(E)(i) - *The Administrator determines that the area has attained the national*
 19 *ambient air quality standard.* To satisfy this requirement, the State must show that the area is
 20 attaining the applicable NAAQS. According to EPA's guidance concerning area redesignations
 21 (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni to
 22 Regional Air Directors, September 4, 1992 [or, Calcagni]), there are generally two components
 23 involved in making this demonstration. The first relies upon ambient air quality data which
 24 should be representative of the area of highest concentration and should be collected and quality
 25 assured in accordance with 40 CFR 58. The second component relies upon supplemental air
 26 quality modeling. Each will be discussed in turn.

27 **(a) Ambient Air Quality Data (Monitoring)**
 28

29 In 1987 EPA promulgated the National Ambient Air Quality Standard (NAAQS) for PM₁₀. The
 30 NAAQS for PM₁₀ is listed in 40 CFR 50.6 along with the criteria for attaining the standard. The

1 24-hour NAAQS is 150 micrograms per cubic meter (ug/m^3) for a 24-hour period, measured from
2 midnight to midnight. The 24-hour standard is attained when the expected number of days per
3 calendar year with a 24-hour average concentration above $150 \text{ ug}/\text{m}^3$, as determined in
4 accordance with Appendix K to that part, is equal to or less than one. In other words, each
5 monitoring site is allowed up to three expected exceedances of the 24-hour standard within a
6 period of three calendar years. More than three expected exceedances in that three-year period is
7 a violation of the NAAQS.

8
9 There also had been an annual standard of $50 \text{ ug}/\text{m}^3$. The annual standard was attained if the
10 three-year average of individual annual averages was less than $50 \text{ ug}/\text{m}^3$. Utah never violated the
11 annual standard at any of its monitoring stations, and the annual average was not retained as a
12 PM_{10} standard when the NAAQS was revised in 2006. Nevertheless, an annual average still
13 provides a useful metric to evaluate long-term trends in PM_{10} concentrations here in Utah where
14 short-term meteorology has such an influence on high 24-hour concentrations during the winter
15 season.

16
17 40 CFR 58 Appendix K, Interpretation of the National Ambient Air Quality Standards for
18 Particulate Matter, acknowledges the uncertainty inherent in measuring ambient PM_{10}
19 concentrations by specifying that an *observed exceedance* of the ($150 \text{ ug}/\text{m}^3$) 24-hour health
20 standard means a daily value that is above the level of the 24-hour standard after rounding to the
21 nearest $10 \text{ ug}/\text{m}^3$ (e.g., values ending in 5 or greater are to be rounded up).

22
23 The term *expected exceedance* accounts for the possibility of missing data. Missing data can
24 occur when a monitor is being repaired, calibrated, or is malfunctioning, leaving a time gap in the
25 monitored readings. EPA discounts these gaps if the highest recorded PM_{10} reading at the
26 affected monitor on the day before or after the gap is not more than 75 percent of the standard,
27 and no measured exceedance has occurred during the year.

28
29 Expected exceedances are calculated from the Aerometric Information and Retrieval System
30 (AIRS) data base according to procedures contained in 40 CFR Part 50, Appendix K. The State
31 relied on the expected exceedance values contained in the AIRS Quick Look Report (AMP 450)
32 to determine if a violation of the standard had occurred.

33
34 Data may also be flagged when circumstances indicate that it would represent an outlier in the
35 data set and not be indicative of the entire airshed or the efforts to reasonably mitigate air
36 pollution within. Appendix N to Part 50 – “Interpretation of the National Ambient Air Quality
37 Standards for Particulate Matter” anticipates this and states: “Data resulting from uncontrollable
38 or natural events, for example structural fires or high winds, may require special consideration.
39 In some cases, it may be appropriate to exclude these data because they could result in
40 inappropriate values to compare with the levels of the PM standards.” The protocol for data
41 handling dictates that flagging is initiated by the state or local agency, and then the EPA either
42 concurs or indicates that it has not concurred. Some discussion will be provided to help the
43 reader understand the occasional occurrence of wind-blown dust events that affect these
44 nonattainment areas, and how the resulting data should be interpreted with respect to the control
45 measures enacted to address the 24-hour NAAQS.

46
47 Using the criteria from 40 CFR 58 Appendix K, data was compiled for all PM_{10} monitors
48 within the [Salt Lake County](#) nonattainment area that recorded a four-year data set comprising
49 the years 2011 – 2014. For each monitor, the number of expected exceedances is reported for
50 each year, and then the average number of expected exceedances is reported for the overlapping
51 three-year periods. If this average number of expected exceedances is less than or equal to 1.0,
52 then that particular monitor is said to be in compliance with the 24-hour standard for PM_{10} . In

1 order for an area to be in compliance with the NAAQS, every monitor within that area must be in
 2 compliance.

3
 4 As illustrated in the table below, the results of this exercise show that the Salt Lake County
 5 PM₁₀ nonattainment area is presently attaining the NAAQS.

6
 7 **Table IX.A.10. 2 PM₁₀ Compliance in Salt Lake County, 2011-2014**
 8

Hawthorne 49-035-3006	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	0.0 / 0.0*	0.0 / 0.0*

9

North Salt Lake 49-035-0012	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	NA**	NA**

10

Magna 49-035-1001	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	0.0 / 0.0*	0.0 / 0.0*

11
 12 * The second set of numbers shows what would be the effect of including all of the data that has
 13 been flagged by DAQ and not yet concurred with by EPA.

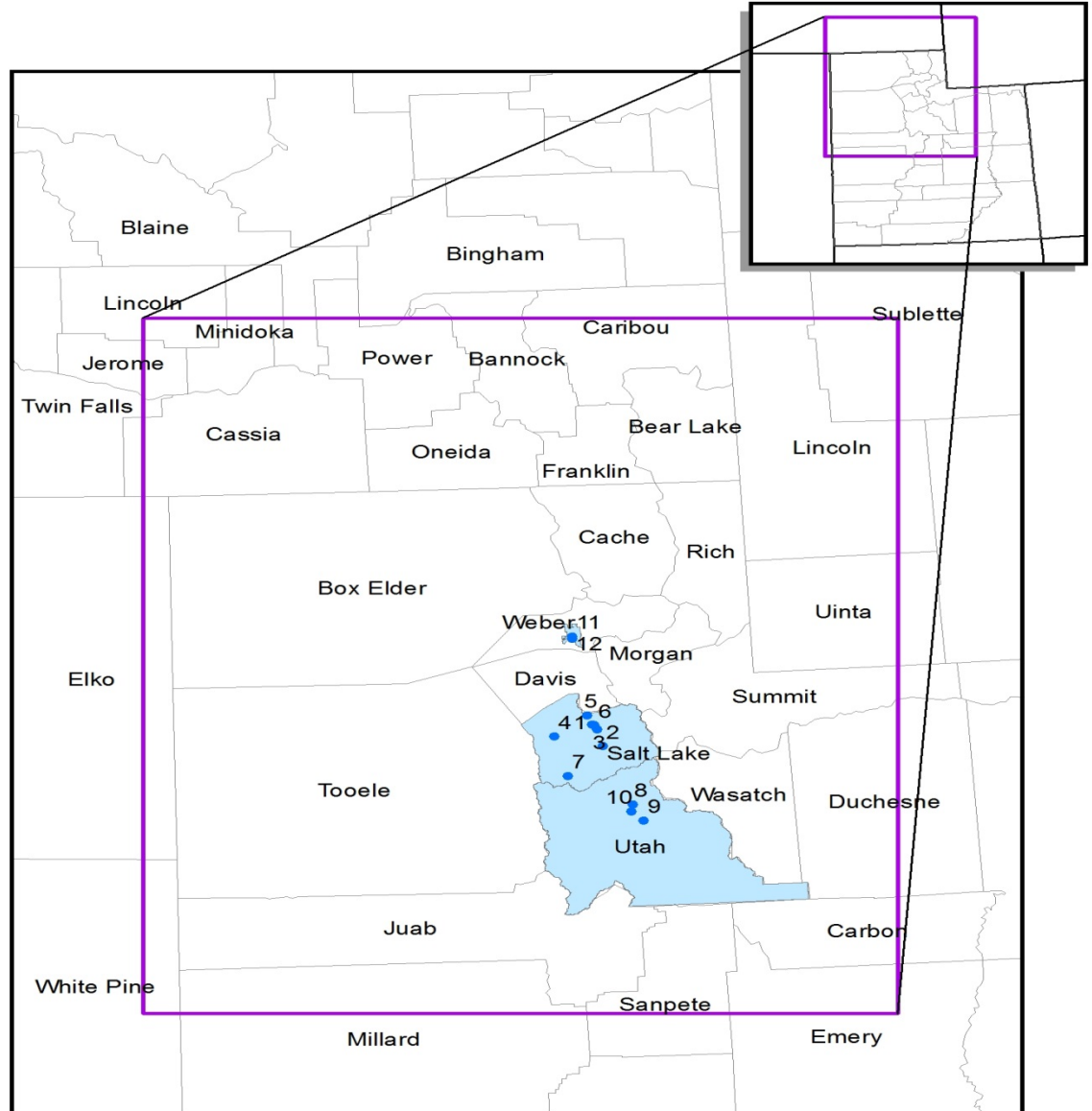
14
 15 ** The North Salt Lake monitor was closed in September of 2013.

16
 17
 18 **(b) PM₁₀ Monitoring Network**
 19

20 The overall assessments made in the preceding paragraph were based on data collected at
 21 monitoring stations located throughout the nonattainment area. The Utah DAQ maintains a
 22 network of PM₁₀ monitoring stations in accordance with 40 CFR 58. These stations are referred
 23 to as SLAMS sites, meaning that they are State and Local Air Monitoring Stations. In
 24 consultation with EPA, an Annual Monitoring Network Plan is developed to address the
 25 adequacy of the monitoring network for all criteria pollutants. Within the network, individual
 26 stations may be situated so as to monitor large sources of PM₁₀, capture the highest
 27 concentrations in the area, represent residential areas, or assess regional concentrations of PM₁₀.
 28 Collectively, these monitors make up Utah's PM₁₀ monitoring network. The following
 29 paragraphs describe the network in each of Utah's three nonattainment areas for PM₁₀.
 30

1 Provided in Figure IX.A.10. 1 is a map of the modeling domain that shows the existing PM₁₀
2 nonattainment areas and the locations of the monitors therein. Some of the monitors at these
3 locations are no longer operational, but they have been included for informational purposes.
4

5 **Figure IX.A.10. 1 Modeling Domain**



6
7 The following PM₁₀ monitoring stations operated in the Salt Lake County PM₁₀ nonattainment
8 area from 1985 through 2015. They are numbered as they appear on the map:
9

- 10 1. Air Monitoring Center (AMC) (AIRS number 49-035-0010): This site was located in an
11 urban city center, near an area of high vehicle use. It was closed in 1999 when DAQ lost
12 its lease on the building.
13

- 1 2. Cottonwood (AIRS number 49-035-0003): This site was located in a suburban
2 residential area. It collected data from 1986 - 2011. It was closed in 2011 due to siting
3 criteria violations as well as safety concerns.
4
- 5 3. Hawthorne (AIRS number 49-035-3006): This site is located in a suburban residential
6 area. It began collecting data in 1997, and is the NCORE site for Utah.
7
- 8 4. Magna (AIRS number 49-035-1001): This site is located in a suburban residential area.
9 It was historically impacted periodically by blowing dust from a large tailings
10 impoundment, and as such is anomalous with respect to the typical wintertime scenario
11 that otherwise characterizes the nonattainment area. It has been collecting data since
12 1987.
13
- 14 5. North Salt Lake (AIRS number 49-035-0012): This site was located in an industrial area
15 that is impacted by sand and gravel operations, freeway traffic, and several refineries. It
16 was near a residential area as well. It collected data from 1985 - 2013. The monitor was
17 situated over a sewer main, and service of that main required its removal in September
18 2013 and following the service, the site owner did not allow the monitor to return.
19
- 20 6. Salt Lake City (AIRS number 49-035-3001): This site was situated in an urban city
21 center. It was discontinued in 1994 because of modifications that were made to the air
22 conditioning on the roof-top.
23
- 24 7. Herriman #3 (AIRS number 49-035-3012): This site is located in a suburban residential
25 area. It began collecting data in 2015.
26
27

28 The following PM₁₀ monitoring stations operated in the Utah County PM₁₀ nonattainment area
29 from 1985 through 2015. They are numbered as they appear on the map:
30

- 31 8. Lindon (AIRS number 49-049-4001): This site is designed to measure population
32 exposure to PM₁₀. It is located in a suburban residential area affected by both industrial
33 and vehicle emissions. PM₁₀ has been measured at this site since 1985, and the readings
34 taken here have consistently been the highest in Utah County. Area source emissions,
35 primarily wood smoke, also affect the site.
36
- 37 9. North Provo (AIRS number 49-049-0002): This is a neighborhood site in a mixed
38 residential-commercial area in Provo, Utah. It began collecting data in 1986.
39
- 40 10. West Orem (AIRS number 49-049-5001): This site was originally located in a residential
41 area adjacent to a large steel mill which has since closed. It is a neighborhood site. It
42 was situated based on computer modeling, and has historically reported high PM₁₀
43 values, but not consistently as high as those observed at the Lindon site. The site was
44 closed at the end of 1997 for this reason.
45

46 The following PM₁₀ monitoring stations operated in the Ogden City PM₁₀ nonattainment area
47 from 1986 through 2015. They are numbered as they appear on the map:
48

- 49 11. Ogden 1 (AIRS number 49-057-0001): This site was situated in an urban city center. It
50 was discontinued in 2000 because DAQ lost its lease on the building.
51

1 12. Ogden 2 (AIRS number 49-057-0002): This site began collecting data in 2001, as a
2 replacement for the Ogden 1 location. It, too, is situated in an urban city center.
3

4 **(c) Modeling Element**
5

6 EPA guidance concerning redesignation requests and maintenance plans (Calcagni) discusses the
7 requirement that the area has attained the standard, and notes that air quality modeling may be
8 necessary to determine the representativeness of the monitored data.
9

10 Information concerning PM₁₀ monitoring in Utah is included in the Annual Monitoring Network
11 Review and The 5 Year Network Plan. Since the early 1980's, the network review has been
12 updated annually and submitted to EPA for approval. EPA has concurred with the annual
13 network reviews and agreed that the PM₁₀ network is adequate. EPA personnel have also visited
14 the monitor sites on several occasions to verify compliance with federal siting requirements.
15 Therefore, additional modeling will not be necessary to determine the representativeness of the
16 monitored data.
17

18 The Calcagni memo goes on to say that areas that were designated nonattainment based on
19 modeling will generally not be redesignated to attainment unless an acceptable modeling analysis
20 indicates attainment.
21

22 Though none of Utah's three PM₁₀ nonattainment areas was designated based on modeling,
23 Calcagni also states that (when dealing with PM₁₀) dispersion modeling will generally be
24 necessary to evaluate comprehensively sources' impacts and to determine the areas of expected
25 high concentrations based upon current conditions. Air quality modeling was conducted for the
26 purpose of this maintenance demonstration. It shows that all three nonattainment areas are
27 presently in compliance, and will continue to comply with the PM₁₀ NAAQS through the year
28 2030.
29

30 **(d) EPA Acknowledgement**
31

32 The data presented in the preceding paragraphs shows quite clearly that the [Salt Lake County](#)
33 PM₁₀ nonattainment area is attaining the NAAQS. As discussed before, the EPA acknowledged
34 in the Federal Register that both Utah County and Salt Lake County had already attained.
35

36 On June 18, 2001, EPA published notice in the Federal Register (66 FR 32752) that Utah's
37 extension requests were granted, [\[and\] that Salt Lake County attained the PM₁₀ standard by](#)
38 [December 31, 1995](#). The notice stated that the area would remain a moderate nonattainment
39 area and would not be subject to the additional requirements of serious nonattainment areas.
40
41

42 **(2) Fully Approved Attainment Plan for PM₁₀**

43 CAA 107(d)(3)(E)(ii) - *The Administrator has fully approved the applicable implementation plan*
44 *for the area under section 110(k).*

45 On November 14, 1991, Utah submitted a SIP for Salt Lake and Utah Counties that demonstrated
46 attainment for Salt Lake and Utah Counties for 10 years, 1993 through 2003. EPA published
47 approval of the SIP on July 8, 1994 (59 FR 35036).
48

1 **(3) Improvements in Air Quality Due to Permanent and Enforceable Reductions in**
2 **Emissions**

3
4 CAA 107(d)(3)(E)(iii) - *The Administrator determines that the improvement in air quality is due*
5 *to permanent and enforceable reductions in emissions resulting from implementation of the*
6 *applicable implementation plan and applicable Federal air pollutant control regulations and*
7 *other permanent and enforceable reductions.* Speaking further on the issue, EPA guidance
8 (Calcagni) reads that the State must be able to reasonably attribute the improvement in air quality
9 to emission reductions which are permanent and enforceable. In the following sections, both the
10 improvement in air quality and the emission reductions themselves will be discussed.

11
12 **(a) Improvement in Air Quality**

13
14 The improvement in air quality with respect to PM₁₀ can be shown in a number of ways.
15 Improvement, in this case, is relative to the various control strategies that affected the airshed.

16
17 For the [Salt Lake County nonattainment area](#), these control measures were implemented as the
18 result of the nonattainment PM₁₀ SIP promulgated in 1991. As discussed below, the actual
19 implementation of the control strategies required therein first exhibits itself in the observable data
20 in 1994. The ambient air quality data presented below includes values prior to 1994 in order to
21 give a representation of the air quality prior to the application of any control measures. It then
22 includes data collected from then until the present time to illustrate the effect of these controls. In
23 considering the data presented below, it is important to keep this distinction in mind: data through
24 1993 represents pre-SIP conditions, and data collected from 1994 through the present represents
25 post-SIP conditions.

26
27 Additionally, a downturn in the economy is clearly not responsible for the improvement in
28 ambient particulate levels in Salt Lake County, Utah County, and Ogden City areas. From 2001
29 to present, the areas have experienced strong growth while at the same time achieving continuous
30 attainment of the 24-hour and annual PM₁₀ NAAQS. Data was analyzed for the Salt Lake City
31 Metropolitan Statistical Area from the US Department of Commerce, Bureau of Economic
32 Analysis. According to this data, job growth from 2011 through 2013 increased by 5.5 percent,
33 population increased by 3 percent, and personal income increased by approximately 10 percent.
34 The estimated VMT increase was 12 percent from 2011 to present.

35
36 Expected Exceedances – Referring back to the discussion of the PM₁₀ NAAQS in Subsection
37 IX.A.10.b(1), it is apparent that the number of expected exceedances of the 24-hour standard is an
38 important indicator. As such, this information has been tabulated for each of the monitors located
39 in each of the nonattainment areas. The data in Table IX.A.10. 3 below reveals a marked decline
40 in the number of these expected exceedances, and therefore that the [Salt Lake County](#) PM₁₀
41 nonattainment area has experienced significant improvements in air quality. The gray cells
42 indicate that the monitor was not in operation. This improvement is especially revealing in light
43 of the significant growth experienced during this same period in time.

1 **Table IX.A.10.3 Salt Lake County: Expected Exceedances Per-Year, 1985-2014**
 2

Salt Lake County Nonattainment Area					
Monitor:	Cottonwood	AMC	North Salt Lake	Magna	Hawthorne
1986	0.0				
1987	0.0		0.0	2.4	
1988	0.0		5.8	2.2	
1989	0.0	8.7	3.3	0.0	
1990	0.0	0.0	0.0	0.0	
1991	6.0	15.9	13.5	0.0	
1992	0.0	8.6	3.2	0.0	
1993	0.0	0.0	0.0	0.0	
1994	0.0	1.0	8.6	0.0	
1995	0.0	0.0	0.0	0.0	
1996	0.0	0.0	2.3	0.0	
1997	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0
2000	0.0		0.0	0.0	0.0
2001	0.0		0.0	6.4	0.0
2002	0.0		0.0	0.0	0.0
2003	0.0		3.1	1.6	2.1
2004	0.0		1.0	0.0	0.0
2005	0.0		0.0	3.4	0.0
2006	0.0		2.2	0.0	0.0
2007	0.0		4.3	0.0	0.0
2008	3.6		2.1	0.0	2.0
2009	0.0		1.0	0.0	0.0
2010			2.0	3.0	2.1
2011			0.0	0.0	0.0
2012			0.0	0.0	0.0
2013			0.0	0.0	0.0
2014				0.0	0.0

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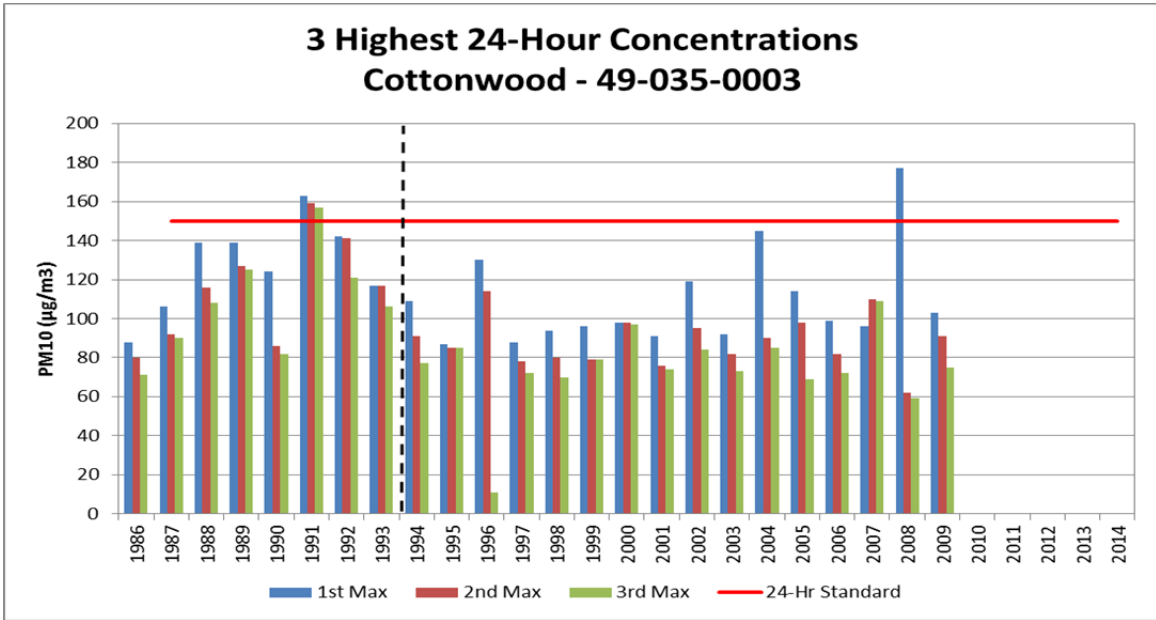
As discussed before in section IX.A.10.b(1), the number of expected exceedances may include data which had been flagged by DAQ as being influenced by an exceptional event; most typically, a wind-blown dust event. Data is flagged when circumstances indicate that it would represent an outlier in the data set and not be indicative of the entire airshed or the efforts to reasonably mitigate air pollution within.

As such, two things should be noted: 1) The focus of the control strategy developed for the 1991 PM₁₀ SIP was directed at episodes characterized by wintertime temperature inversions, elevated concentrations of secondary aerosol, and low wind speed. Under these conditions, blowing dust is generally nonexistent. Therefore, in evaluating the effectiveness of these types of controls, the inclusion of several high wind events may bias the conclusion. 2) Even with the inclusion of these values, the conclusion remains essentially the same; that since 1994 when the 1991 SIP controls were fully implemented, there has been a marked improvement in monitored air quality.

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Highest Values – Also indicative of improvement in air quality with respect to the 24-hour standard, is the magnitude of the excessive concentrations that are observed. This is illustrated in Figures IX.A.10. 2 - 6, which show the three highest 24-hour concentrations observed at each monitor in a particular year.

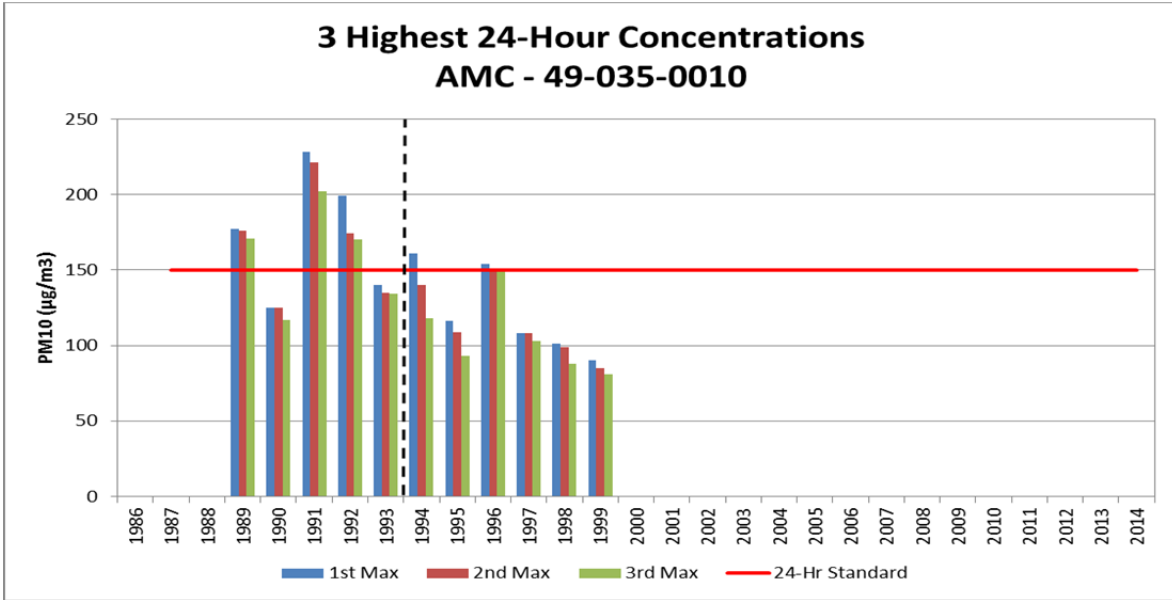
Figure IX.A.10. 2 3 Highest 24-hr PM₁₀ Concentrations; Cottonwood



(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

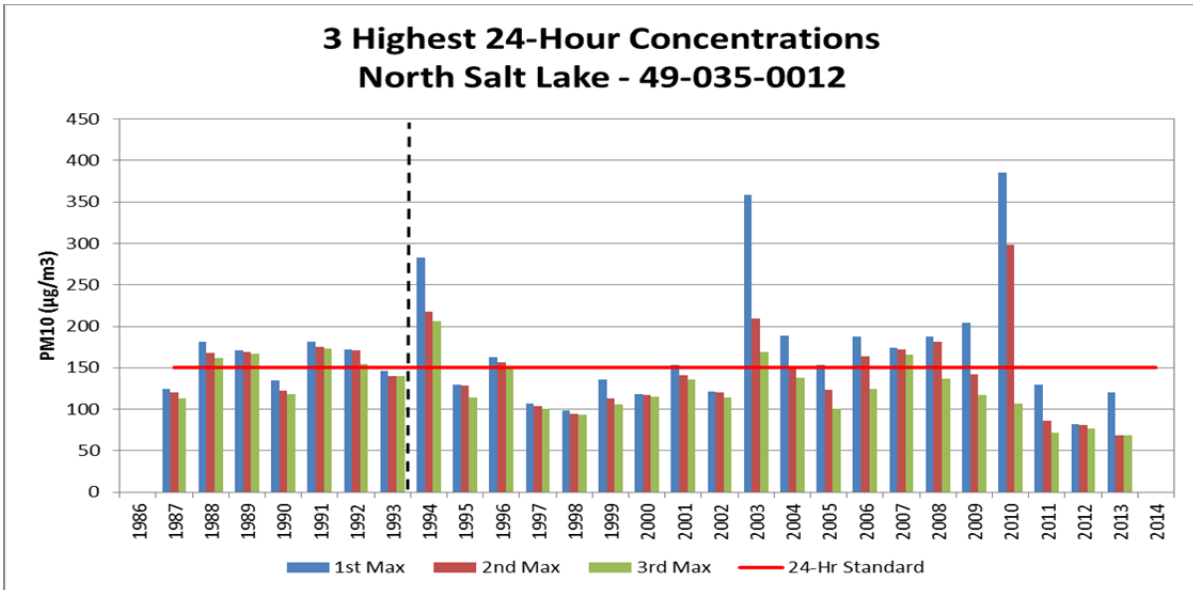
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1 **Figure IX.A.10.3 3 Highest 24-hr PM₁₀ Concentrations; AMC**
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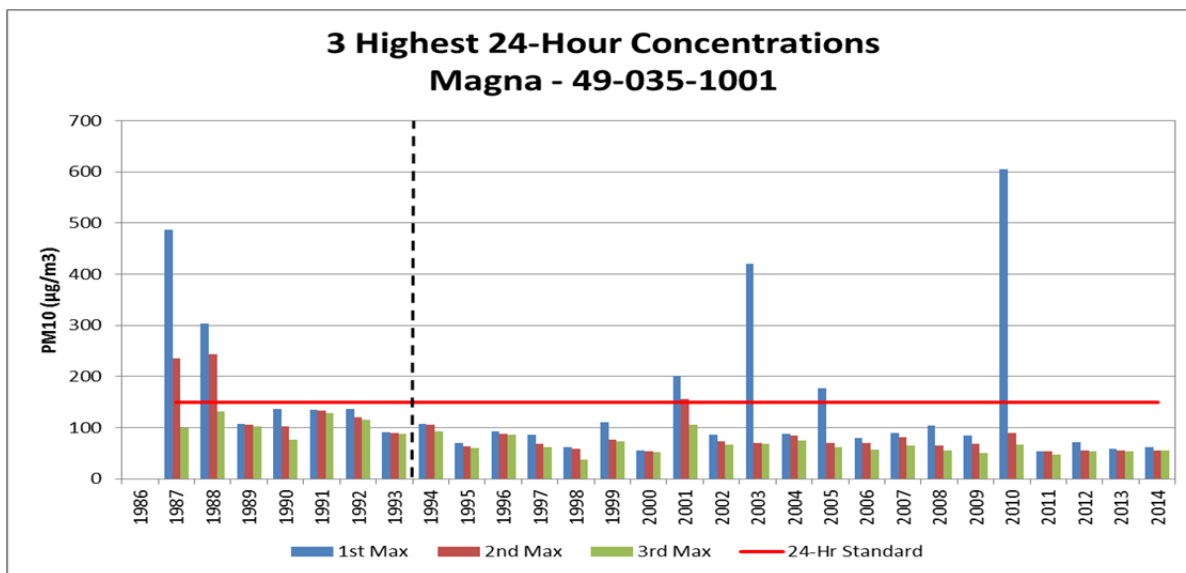
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5 (Vertical dotted line indicates complete implementation of 1991 SIP control measures.)
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10 **Figure IX.A.10.4 3 Highest 24-hr PM₁₀ Concentrations; North Salt Lake**
11



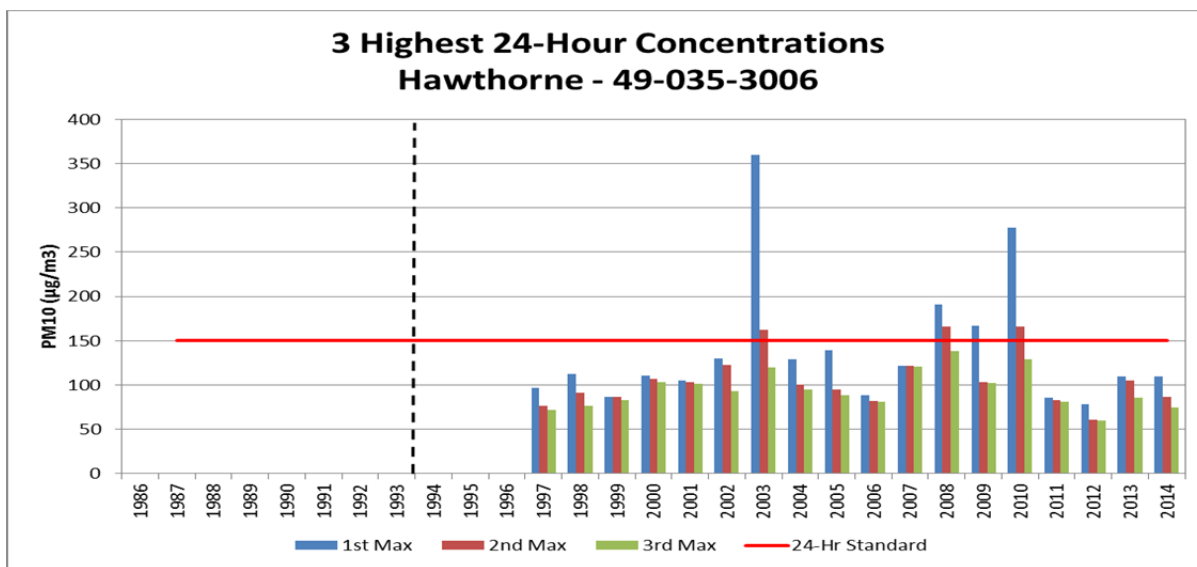
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14 (Vertical dotted line indicates complete implementation of 1991 SIP control measures.)
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Figure IX.A.10. 5 3 Highest 24-hr PM₁₀ Concentrations; Magna



(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

Figure IX.A.10. 6 3 Highest 24-hr PM₁₀ Concentrations; Hawthorne

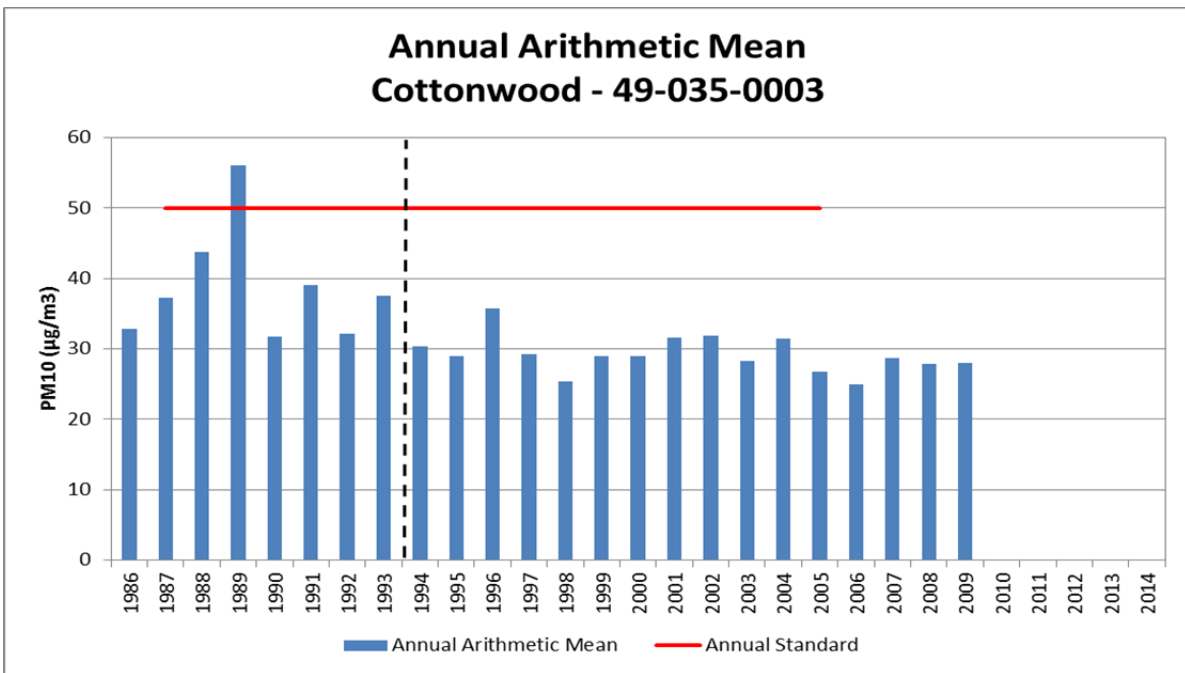


(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

Again there is a noticeable improvement in the magnitude of these concentrations. It must be kept in mind, however, that some of these concentrations may have resulted from windblown dust events that occur outside of the typical scenario of wintertime air stagnation. As such, the effectiveness of any control measures directed at the precursors to PM₁₀ would not be evident.

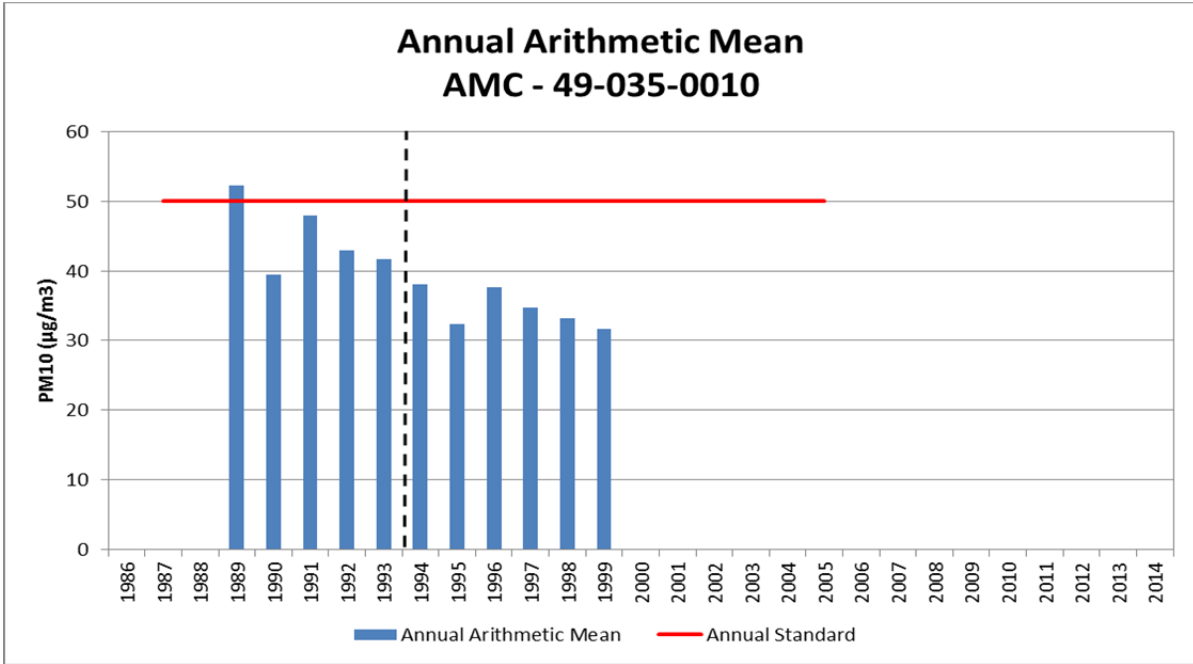
1 Annual Mean – Although there is no longer an annual PM₁₀ standard, the annual arithmetic mean
2 is also a significant parameter to consider. This is especially so given one of the assumptions
3 made in the original nonattainment SIP for **Salt Lake County**. The SIP was developed to address
4 the 24-hour standard for PM₁₀, but it was assumed that by controlling for the wintertime 24-hour
5 standard, the annual arithmetic mean concentrations would also be reduced such that the annual
6 standard would be protected (even though it had never been violated). Annual arithmetic means
7 have been plotted in **Figures IX.A.10 7 - 11**, and the data reveals a noticeable decline in the
8 values of these annual means. This supports the validity of the assumption made in the SIP, and
9 indicates that there have been significant improvements in air quality in the **Salt Lake County**
10 nonattainment area.

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13 **Figure IX.A.10.7 Annual Arithmetic Mean; Cottonwood**



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18 (Vertical dotted line indicates complete implementation of 1991 SIP control measures.)
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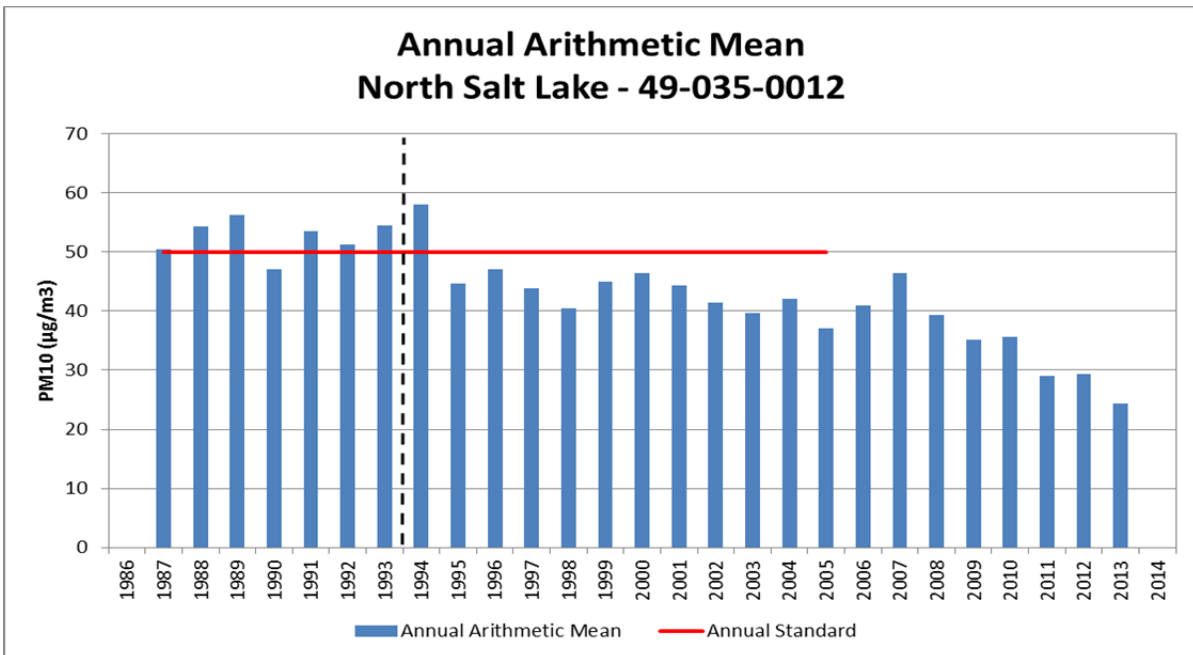
1 **Figure IX.A.10.8 Annual Arithmetic Mean; Cottonwood**
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(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

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Figure IX.A.10.9 Annual Arithmetic Mean; North Salt Lake

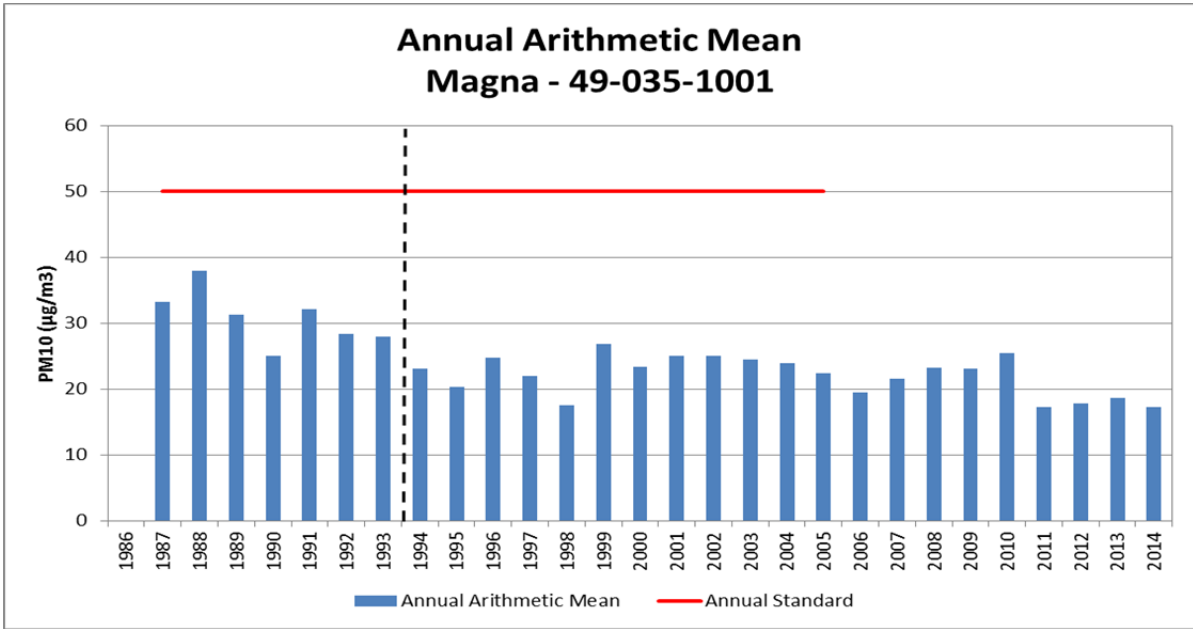


(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

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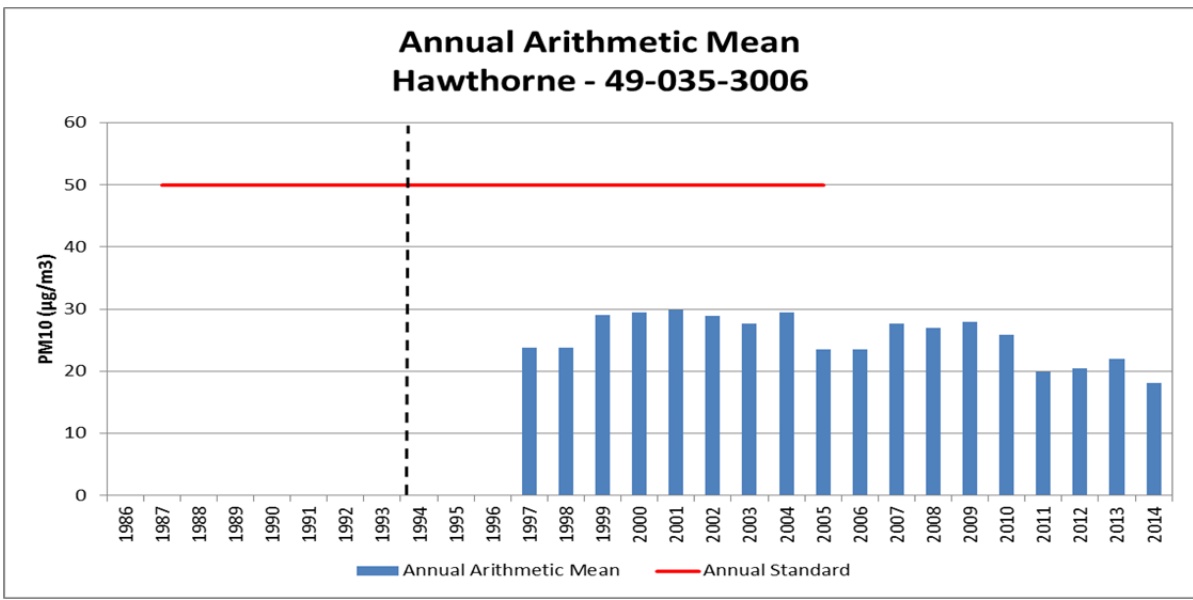
Figure IX.A.10. 10 Annual Arithmetic Mean; Magna



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(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

Figure IX.A.10. 11 Annual Arithmetic Mean; Hawthorne



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(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

1 As with the number of expected exceedances and the three highest values, the data in Figures
2 [IX.A.10. 7 - 11](#) may include data which had been flagged by DAQ as being influenced by wind-
3 blown dust events. Nevertheless, the annual averaging period tends to make these data points less
4 significant. The downward trend of these annual mean values is truly indicative of improvements
5 in air quality, particularly during the winter inversion season.

6
7
8 **(b) Reduction in Emissions**
9

10 As stated above, EPA guidance (Calcagni) says that the State must be able to reasonably attribute
11 the improvement in air quality to emission reductions that are permanent and enforceable. In
12 making this showing, the State should estimate the percent reduction (from the year that was used
13 to determine the design value) achieved by Federal measures such as motor vehicle control, as
14 well as by control measures that have been adopted and implemented by the State.

15
16 In [Salt Lake County](#), the design values at each of the representative monitors were measured in
17 1988 or 1989 (see SIP Subsections IX.A.3-5).

18
19 As mentioned before, the ambient air quality data presented in Subsection IX.A.10.b(3)(a) above
20 includes values prior to these dates in order to give a representation of the air quality prior to the
21 application of any control measures. It then includes data collected from then until the present
22 time to illustrate the lasting effect of these controls. In discussing the effect of the controls, as
23 well as the control measures themselves, however, it is important to keep in mind the time
24 necessary for their implementation.

25
26 The nonattainment SIPs for all initial moderate PM₁₀ nonattainment areas included a statutory
27 date for the implementation of reasonably available control measures (RACM), which includes
28 reasonably available control technologies (RACT). This date was December 10, 1993 (Section
29 189(a) CAA). Thus, 1994 marked the first year in which these control measures were reflected in
30 the emissions inventories for [Salt Lake County](#).

31
32 The nonattainment SIP for the [Salt Lake County](#) PM₁₀ nonattainment area included control
33 strategies for stationary sources and area sources (including controls for woodburning, mobile
34 sources, and road salting and sanding) of primary PM₁₀ emissions as well as sulfur oxide (SO_x)
35 and nitrogen oxide (NO_x) emissions, which are secondary sources of particulate emissions. This
36 is discussed in SIP Subsection IX.A.6, and was reflected in the attainment demonstration
37 presented in Subsection [IX.A.5](#).

38
39 The RACM control measures prescribed by the nonattainment SIP and their subsequent
40 implementation by the State were discussed in more detail in a milestone report submitted for the
41 area.

42
43 Section 189(c) of the CAA identifies, as a required plan element, quantitative milestones which
44 are to be achieved every 3 years, and which demonstrate reasonable further progress (RFP)
45 toward attainment of the standard by the applicable date. As defined in CAA Section 171(1), the
46 term *reasonable further progress* has the meaning of such annual incremental reductions in
47 emissions of the relevant air pollutant as are required by Part D of the Act for the purpose of
48 ensuring attainment of the NAAQS by the applicable date.

49
50 Hence, the milestone report must demonstrate that all measures in the approved nonattainment
51 SIP have been implemented and that the milestone has been met. In the case of initial moderate
52 areas for PM₁₀, this first milestone had the meaning of all control measures identified in the plan

1 being sufficient to bring the area into compliance with the NAAQS by the statutory attainment
2 date of December 31, 1994.

3
4 Section 188(d) of the Act allows States to petition the Administrator for up to two one-year
5 extensions of the attainment date, provided that all SIP elements have been implemented and that
6 the ambient data collected in the area during the year preceding the extension year indicates that
7 the area is on-target to attain the NAAQS. Presumably this is because the statutory attainment
8 date for initial moderate PM₁₀ nonattainment areas occurred only one year after the statutory
9 implementation date for RACM, the central control element of all implementation plans for such
10 areas, and because three consecutive years of clean ambient data are needed to determine that an
11 area has attained the standard. Because the milestone report and the request for extension of the
12 attainment date both required a demonstration that all SIP elements had been implemented, as
13 well as a showing of RFP, Utah combined these into a single analysis.

14
15 Utah's actions to meet these requirements and EPA's subsequent review thereof are discussed in
16 a Federal Register notice from Monday, June 18, 2001 (66 FR 32752). In this notice, EPA
17 granted a one-year extension of the attainment date for the Salt Lake County PM₁₀ nonattainment
18 area and determined that the area had attained the PM₁₀ NAAQS by December 31, 1995. The key
19 elements of that FR notice are reiterated below.

20
21 On May 11, 1995, Utah submitted a milestone report as required by sec.189(c)(2). On Sept.29,
22 1995, Utah submitted a revised version of the milestone report. It estimated current emissions
23 from all source categories covered by the SIP and compared those to actual emissions from 1988.
24 Based on information the State submitted in 1995, EPA believes that Utah was in substantial
25 compliance with the requirements and commitments in the SIP for the Salt Lake County PM₁₀
26 nonattainment area. The milestone report indicates that Utah had implemented most of its
27 adopted control measures and had, therefore, substantially implemented the RACM/RACT
28 requirements applicable to moderate PM₁₀ nonattainment areas. It showed that in Salt Lake
29 County, emissions of PM₁₀, SO₂ and NO_x had been reduced by approximately 60,752 tpy (from
30 150,292 down to 89,540). The effect of these emission reductions appears to be reflected in
31 ambient measurements at the monitoring site [and] is evidence that the State's implementation of
32 the PM₁₀ SIP control measures resulted in emission reductions amounting to RFP in the Salt Lake
33 County PM₁₀ nonattainment area.

34
35 This Federal Register notice (66 FR 32752) and the milestone report from September 29, 1995
36 have been included in the TSD.

37
38 Furthermore, since these control measures are incorporated into the Utah SIP, the emission
39 reductions that resulted are consistent with the notion of permanent and enforceable
40 improvements in air quality. Taken together, the trends in ambient air quality illustrated in the
41 preceding paragraph, along with the continued implementation of the nonattainment SIP for the
42 Salt Lake County nonattainment area, provide a reliable indication that these improvements in air
43 quality reflect the application of permanent steps to improve the air quality in the region, rather
44 than just temporary economic or meteorological changes.

45 46 47 **(4) State has Met Requirements of Section 110 and Part D**

48
49 CAA 107(d)(3)(E)(v) - The State containing such area has met all requirements applicable to the
50 area under section 110 and part D. Section 110(a)(2) of the Act deals with the broad scope of
51 state implementation plans and the capacity of the respective state agency to effectively
52 administer such a plan. Sections I through VIII of Utah's SIP contain information relevant to

1 these criteria. Part D deals specifically with plan requirements for nonattainment areas, and
2 includes the requirements for a maintenance plan in Section 175A.

3
4 Utah currently has an approved SIP that meets the requirements of section 110(a)(2) of the Act.
5 Many of these elements have been in place for several decades. In the March 9, 2001 approval of
6 Utah's Ogden City Maintenance Plan for Carbon Monoxide, EPA stated:

7
8 On August 15, 1984, we approved revisions to Utah's SIP as meeting the
9 requirements of section 110(a)(2) of the CAA (see 45 FR 32575). Although
10 section 110 of the CAA was amended in 1990, most of the changes were not
11 substantial. Thus, we have determined that the SIP revisions approved in 1984
12 continue to satisfy the requirements of section 110(a)(2). For further detail, see
13 45 FR 32575 dated August 15, 1984 (Volume 49, No. 159) or 66 FR 14079 dated
14 March 9, 2001 (Volume 66, No. 47.)

15
16 Part D of the Act addresses "Plan Requirements for Nonattainment Areas." Subpart 1 of Part D
17 includes the general requirements that apply to all areas designated nonattainment based on a
18 violation of the NAAQS. Section 172(c) of this subpart contains a list of generally required
19 elements for all nonattainment plans. Subpart 1 is followed by a series of subparts (2-5) specific
20 to various criteria pollutants. Subpart 4 contains the provisions specific to PM₁₀ nonattainment
21 areas. The general requirements for nonattainment plans in Section 172(c) may be subsumed
22 within or superseded by the more specific requirements of Subpart 4, but each element must be
23 addressed in the respective nonattainment plan.

24
25 One of the pre-conditions for a maintenance plan is a fully approved (non)attainment plan for the
26 area. This is also discussed in section IX.A.10.b(2).

27
28 Other Part D requirements that are applicable in nonattainment and maintenance areas include the
29 general and transportation conformity provisions of Section 176(c) of the Act. These provisions
30 ensure that federally funded or approved projects and actions conform to the PM₁₀ SIPs and
31 Maintenance Plans prior to the projects or actions being implemented. The State has already
32 submitted to EPA a SIP revision implementing the requirement of Section 176(c).

33
34 For [Salt Lake County](#), the Part D requirements for PM₁₀ were addressed in an attainment SIP
35 approved by EPA on [July 8, 1994 \(59 FR 35036\)](#).

36 37 38 **(5) Maintenance Plan for PM₁₀ Areas**

39
40 As stated in the Act, an area may not request redesignation to attainment without first submitting,
41 and then receiving EPA approval of, a maintenance plan. The plan is basically a quantitative
42 showing that the area will continue to attain the NAAQS for an additional 10 years (from EPA
43 approval), accompanied by sufficient assurance that the terms of the numeric demonstration will
44 be administered by the State and by the EPA in an oversight capacity. The maintenance plan is
45 the central criterion for redesignation. It is contained in the following subsection.

46 47 **IX.A.10.c Maintenance Plan**

48 *CAA 107(d)(3)(E)(iv) - The Administrator has fully approved a maintenance plan for the area as*
49 *meeting the requirements of section 175A. An approved maintenance plan is one of several*

1 criteria necessary for area redesignation as outlined in Section 107(d)(3)(E) of the Act. The
 2 maintenance plan itself, as described in Section 175A of the Act and further addressed in EPA
 3 guidance (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni
 4 to Regional Air Directors, September 4, 1992; or for the purpose of this document, simply
 5 “Calcagni”), has its own list of required elements. The following table is presented to summarize
 6 these requirements. Each will then be addressed in turn.

Table IX.A.10. 4 Requirements of a Maintenance Plan in the Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Maintenance demonstration	Provide for maintenance of the relevant NAAQS in the area for at least 10 years after redesignation.	CAA: Sec 175A(a)	IX.A.10.c(1)
Revise in 8 Years	The State must submit an additional revision to the plan, 8 years after redesignation, showing an additional 10 years of maintenance.	CAA: Sec 175A(b)	IX.A.10.c(8)
Continued Implementation of Nonattainment Area Control Strategy	The Clean Air Act requires continued implementation of the nonattainment area control strategy unless such measures are shown to be unnecessary for maintenance or are replaced with measures that achieve equivalent reductions.	CAA: Sec 175A(c), CAA Sec 110(l), Calcagni memo	IX.A.10.c(7)
Contingency Measures	Areas seeking redesignation from nonattainment to attainment are required to develop contingency measures that include State commitments to implement additional control measures in response to future violations of the NAAQS.	CAA: Sec 175A(d)	IX.A.10.c(10)
Verification of Continued Maintenance	The maintenance plan must indicate how the State will track the progress of the maintenance plan.	Calcagni memo	IX.A.10.c(9)

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(1) Demonstration of Maintenance - Modeling Analysis

CAA 175A(a) - Each State which submits a request under section 107(d) for redesignation of a nonattainment area as an area which has attained the NAAQS shall also submit a revision of the applicable implementation plan to provide for maintenance of the NAAQS for at least 10 years after the redesignation. The plan shall contain such additional measures, if any, as may be required to ensure such maintenance. The maintenance demonstration is discussed in EPA guidance (Calcagni) as one of the core provisions that should be considered by states for inclusion in a maintenance plan.

According to Calcagni, a State may generally demonstrate maintenance of the NAAQS by either showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory (discussed below) or by modeling to show that the future mix of sources and emission rates will not cause a violation of the NAAQS. Utah has elected to make its demonstration based on air quality modeling.

1
2 **(a) Introduction**

3
4 The following chapter presents an analysis using observational datasets to detail the chemical
5 regimes of Utah's Nonattainment areas.

6
7 Prior to the development of this PM₁₀ maintenance plan, UDAQ conducted a technical analysis to
8 support the development of Utah's 24-hr State Implementation Plan for PM_{2.5}. That analysis
9 included preparation of emissions inventories and meteorological data, and the evaluation and
10 application of a regional photochemical model.

11
12 Outside of the springtime high wind events and wildfires, the Wasatch Front experiences high 24-
13 hr PM₁₀ concentrations under stable conditions during the wintertime (e.g., temperature
14 inversion). These are the same episodes where the Wasatch Front sees its highest concentrations
15 of 24-hr PM_{2.5} that sometimes exceed the 24-hr PM_{2.5} NAAQS. Most (60% to 90%) of the PM₁₀
16 observed during high wintertime pollution days consists of PM_{2.5}. The dominant species of the
17 wintertime PM₁₀ is secondarily formed particulate nitrate, which is also the dominant species of
18 PM_{2.5}.

19
20 Given these similarities, the PM_{2.5} modeling analysis was utilized as the foundation for this PM₁₀
21 Maintenance Plan.

22
23 The CMAQ model performance for the PM₁₀ Maintenance Plan adds to the detailed model
24 performance that was part of the UDAQ's previous PM_{2.5} SIP process. Utah DAQ used the same
25 modeling episode that was used in the PM_{2.5} SIP, which is the 45-day modeling episode from the
26 winter of 2009-2010. The modeled meteorology datasets from the Weather Research and
27 Forecasting (WRF) model for the PM₁₀ Plan are the same datasets used for the PM_{2.5} SIP. Also,
28 the CMAQ version (4.7.1) and CMAQ model setup (i.e., vertical advection module turned off)
29 for the PM₁₀ modeling matches the PM_{2.5} SIP setup.

30
31 For this reason, much of the information presented below pertains specifically to the PM_{2.5}
32 evaluation. This is supplemented with information pertaining to PM₁₀, most notably with respect
33 to the PM₁₀ model performance evaluation.

34
35 The additional PM₁₀ analysis is also presented in the Technical Support Document.

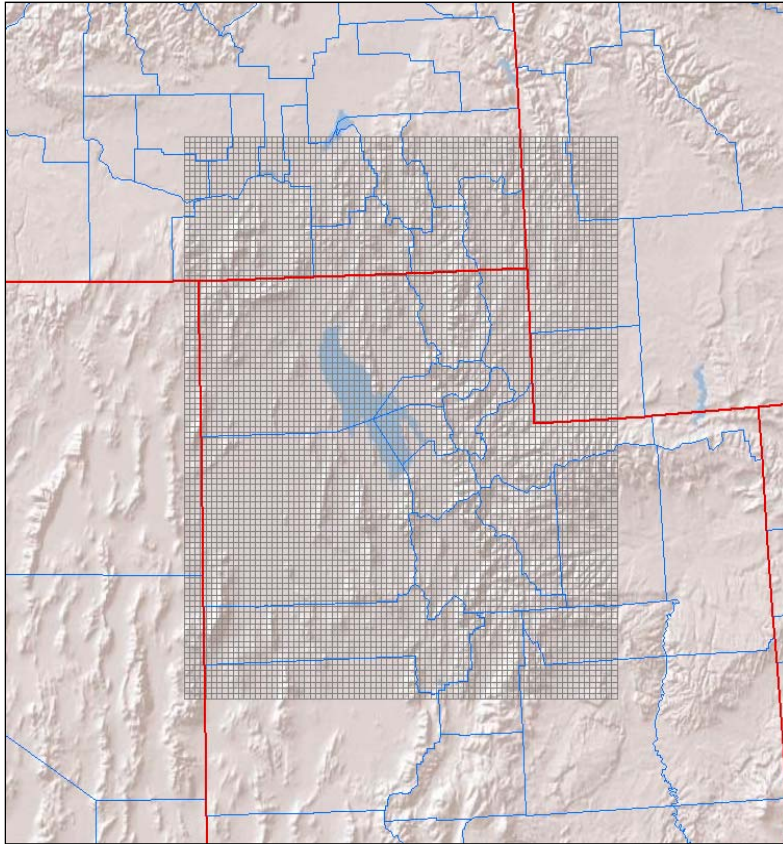
36
37 **(b) Photochemical Modeling**

38
39 Photochemical models are relied upon by federal and state regulatory agencies to support their
40 planning efforts. Used properly, models can assist policy makers in deciding which control
41 programs are most effective in improving air quality, and meeting specific goals and objectives.
42 The air quality analyses were conducted with the Community Multiscale Air Quality (CMAQ)
43 Model version 4.7.1, with emissions and meteorology inputs generated using SMOKE and WRF,
44 respectively. CMAQ was selected because it is the open source atmospheric chemistry model co-
45 sponsored by EPA and the National Oceanic Atmospheric Administration (NOAA), and thus
46 approved by EPA for this plan.

47
48 **(c) Domain/Grid Resolution**

49
50 UDAQ selected a high resolution 4-km modeling domain to cover all of northern Utah including
51 the portion of southern Idaho extending north of Franklin County and west to the Nevada border
52 (Figure IX.A.10. 12). This 97 x 79 horizontal grid cell domain was selected to ensure that all of

1 the major emissions sources that have the potential to impact the nonattainment areas were
2 included. The vertical resolution in the air quality model consists of 17 layers extending up to 15
3 km, with higher resolution in the boundary layer.
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Figure IX.A.10. 12 Northern Utah photochemical modeling domain.

10 **(d) Episode Selection**

11
12 According to EPA's April 2007 "Guidance on the Use of Models and Other Analyses for
13 Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze," the
14 selection of SIP episodes for modeling should consider the following 4 criteria:

- 15
- 16 1. Select episodes that represent a variety of meteorological conditions that lead to elevated
17 PM_{2.5}.
- 18
- 19 2. Select episodes during which observed concentrations are close to the baseline design
20 value.
- 21
- 22 3. Select episodes that have extensive air quality data bases.
- 23
- 24 4. Select enough episodes such that the model attainment test is based on multiple days at
25 each monitor violating NAAQS.
- 26

27 In general, UDAQ wanted to select episodes with hourly PM_{2.5} concentrations that are reflective
28 of conditions that lead to 24-hour NAAQS exceedances. From a synoptic meteorology point of

1 view, each selected episode features a similar pattern. The typical pattern includes a deep trough
 2 over the eastern United States with a building and eastward moving ridge over the western United
 3 States. The episodes typically begin as the ridge begins to build eastward, near surface winds
 4 weaken, and rapid stabilization due to warm advection and subsidence dominate. As the ridge
 5 centers over Utah and subsidence peaks, the atmosphere becomes extremely stable and a
 6 subsidence inversion descends towards the surface. During this time, weak insolation, light
 7 winds, and cold temperatures promote the development of a persistent cold air pool. Not until the
 8 ridge moves eastward or breaks down from north to south is there enough mixing in the
 9 atmosphere to completely erode the persistent cold air pool.

10
 11 From the most recent 5-year period of 2007-2011, UDAQ developed a long list of candidate
 12 PM_{2.5} wintertime episodes. Three episodes were selected. An episode was selected from January
 13 2007, an episode from February 2008, and an episode during the winter of 2009-2010 that
 14 features multi-event episodes of PM_{2.5} buildup and washout.

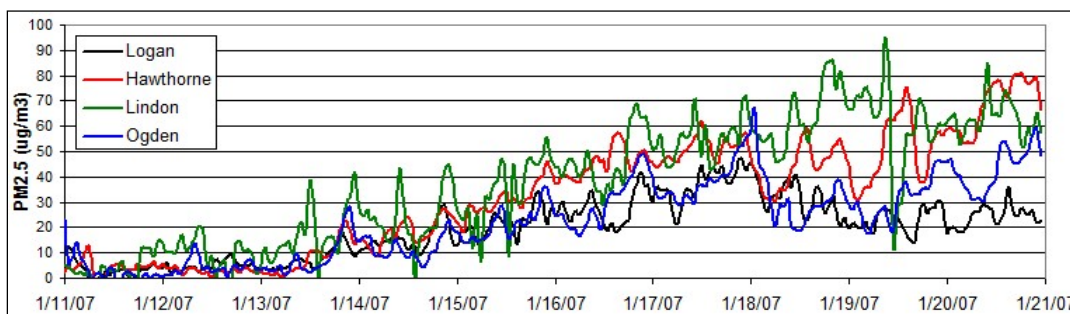
15
 16 As noted in the introduction, these episodes were also ideal from the standpoint of characterizing
 17 PM₁₀ buildup and formation.

18
 19 Further detail of the episodes is below:

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

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

30
 31 Figure IX.A.10. 13 shows hourly PM_{2.5} concentrations from Utah's 4 PM_{2.5} monitors for January
 32 11-20, 2007. The first 6 to 8 days of this episode are suited for modeling. The episode becomes
 33 less suited after January 18 because of the complexities in the meteorological conditions leading
 34 to temporary PM_{2.5} reductions.



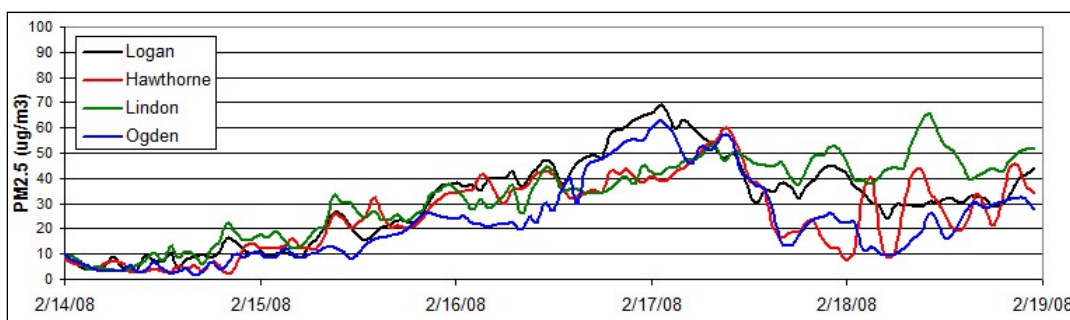
36
 37
 38 **Figure IX.A.10. 13 Hourly PM_{2.5} concentrations for January 11-20, 2007**

39
 40
 41 • **Episode 2: February 14-18, 2008**

42
 43 The February 2008 episode features a cold front passage at the start of the episode that brought
 44 significant new snow to the Wasatch Front. A ridge began building eastward from the Pacific

1 Coast and centered itself over Utah on Feb 20th. During this time a subsidence inversion lowered
 2 significantly from February 16 to February 19. Temperatures during this episode were mild with
 3 high temperatures at SLC in the upper 30's and lower 40's Fahrenheit.
 4

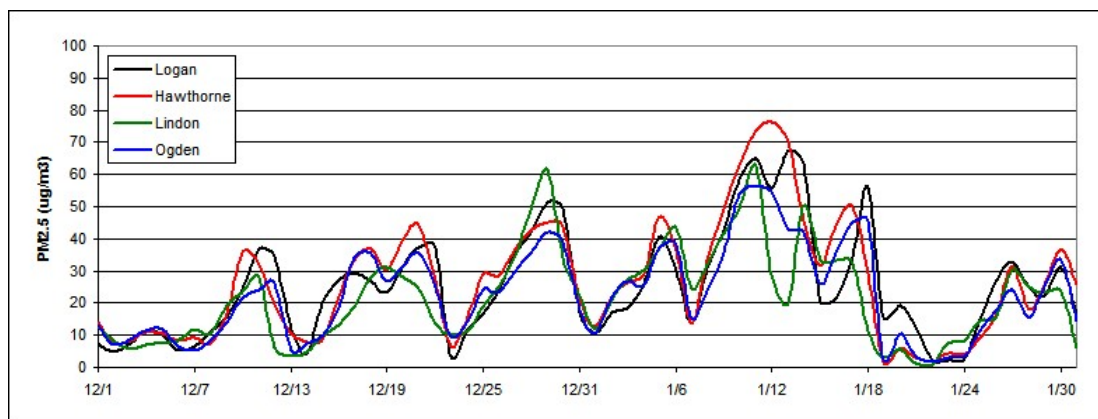
5 The 24-hour average PM_{2.5} exceedances observed during the proposed modeling period of
 6 February 14-19, 2008 were not exceptionally high. What makes this episode a good candidate for
 7 modeling are the high hourly values and smooth concentration build-up. The first 24-hour
 8 exceedances occurred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



16
 17
 18 **Figure IX.A.10. 14 Hourly PM_{2.5} concentrations for February 14-19, 2008**
 19
 20

21 **• Episode 3: December 13, 2009 – January 18, 2010**
 22

23 The third episode that was selected is more similar to a “season” than a single PM_{2.5} episode
 24 (Figure IX.A.10. 15). During the winter of 2009 and 2010, Utah was dominated by a semi-
 25 permanent ridge of high pressure that prevented strong storms from crossing Utah. This 35 day
 26 period was characterized by 4 to 5 individual PM_{2.5} episodes each followed by a partial PM_{2.5} mix
 27 out when a weak weather system passed through the ridge. The long length of the episode and
 28 repetitive PM_{2.5} build-up and mix-out cycles makes it ideal for evaluating model strengths and
 29 weaknesses and PM_{2.5} control strategies.
 30



31
 32

1 **Figure IX.A.10. 15 24-hour average PM_{2.5} concentrations for December-January, 2009-10**

2
3
4 **(e) Meteorological Data**

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

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

- 17
18 • The biggest issue with meteorological performance is the existence of a warm bias in
19 surface temperatures during high PM_{2.5} episodes. This warm bias is a common trait of
20 WRF modeling during Utah wintertime inversions.
- 21
22 • WRF does a good job of replicating the light wind speeds (< 5 mph) that occur during
23 high PM_{2.5} episodes.
- 24
25 • WRF is able to simulate the diurnal wind flows common during high PM_{2.5} episodes.
26 WRF captures the overnight downslope and daytime upslope wind flow that occurs in
27 Utah valley basins.
- 28
29 • WRF has reasonable ability to replicate the vertical temperature structure of the
30 boundary layer (i.e., the temperature inversion), although it is difficult for WRF to
31 reproduce the inversion when the inversion is shallow and strong (i.e., an 8 degree
32 temperature increase over 100 vertical meters).

33
34
35 **(f) Photochemical Model Performance Evaluation**

36
37 PM_{2.5} Results

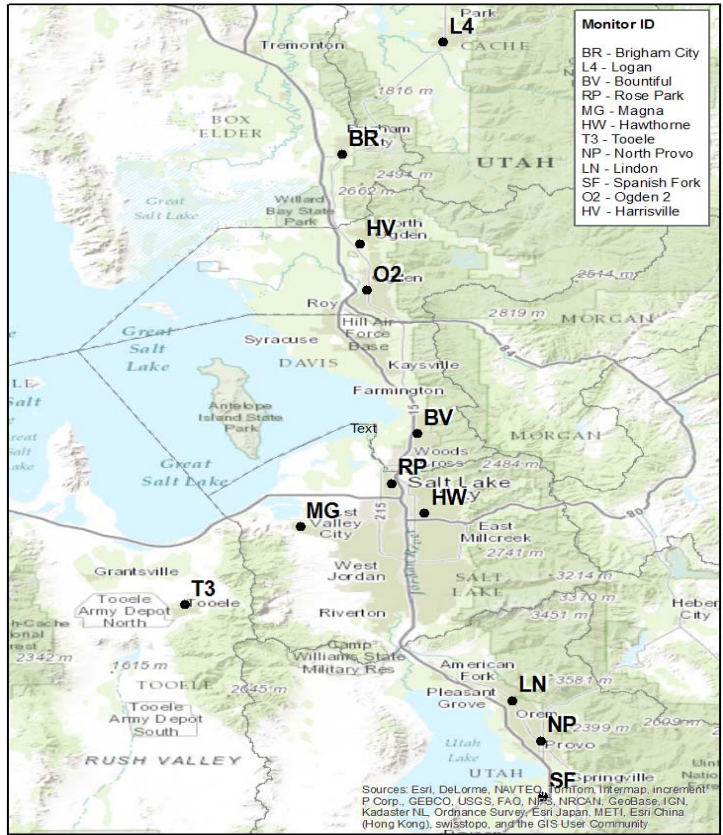
38
39 The model performance evaluation focused on the magnitude, spatial pattern, and temporal
40 variation of modeled and measured concentrations. This exercise was intended to assess whether,
41 and to what degree, confidence in the model is warranted (and to assess whether model
42 improvements are necessary).

43
44 CMAQ model performance was assessed with observed air quality datasets at UDAQ-maintained
45 air monitoring sites (Figure IX.A.10. 16). Measurements of observed PM_{2.5} concentrations along
46 with gaseous precursors of secondary particulate (e.g., NO_x, ozone) and carbon monoxide are
47 made throughout winter at most of the locations in the figure . PM_{2.5} speciation performance was
48 assessed using the three Speciation Monitoring Network Sites (STN) located at the Hawthorne
49 site in Salt Lake City, the Bountiful site in Davis County, and the Lindon site in Utah County.

50
51 PM₁₀ data is also collected at Logan, Bountiful, Ogden2, Magna, Hawthorne, North Provo, and
52 Lindon.

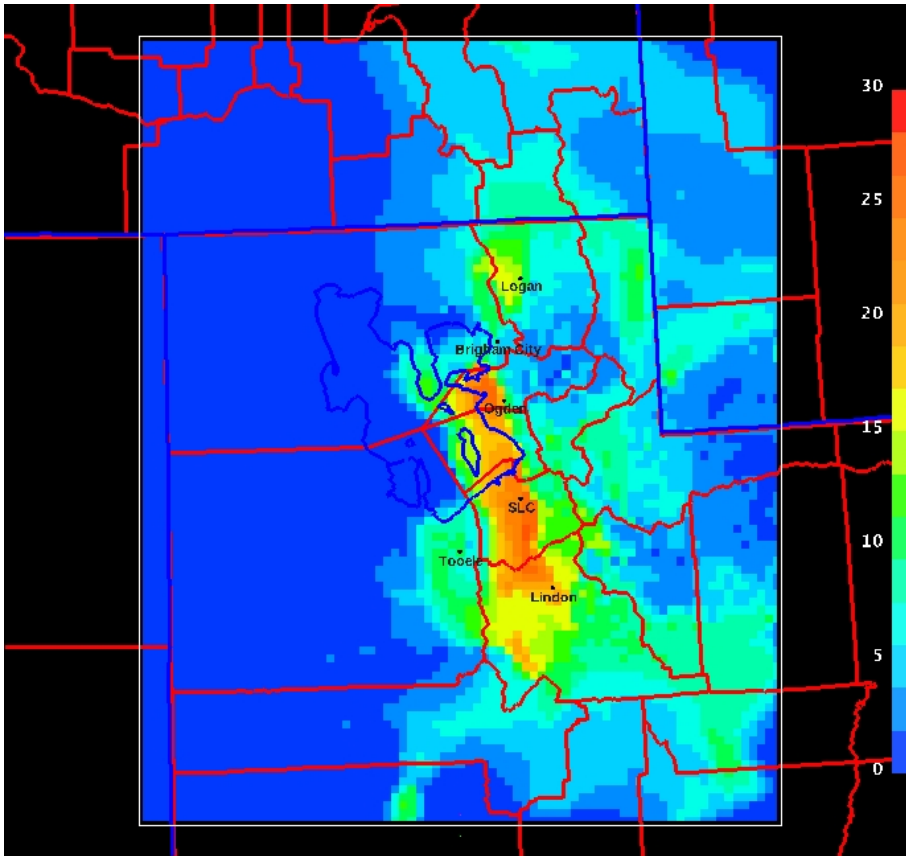
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PM₁₀ filters were collected at Bountiful, Hawthorne and Lindon, and analyzed with the goal comparing CMAQ modeled speciation to the collected PM₁₀ filters. While analyzing the PM₁₀ filters, most of the secondarily chemically formed particulate nitrate had been volatilized, and thus could not be accounted for. This is most likely due to the age of the filters, which were collected over five years ago. Thus, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter speciation could not be made for this modeling period.



9
10 **Figure IX.A.10.16 UDAQ monitoring network.**

1 A spatial plot is provided for modeled 24-hr $PM_{2.5}$ for 2010 January 03 in Figure IX.A.10. 17.
2 The spatial plot shows the model does a reasonable job reproducing the high $PM_{2.5}$ values, and
3 keeping those high values confined in the valley locations where emissions occur.



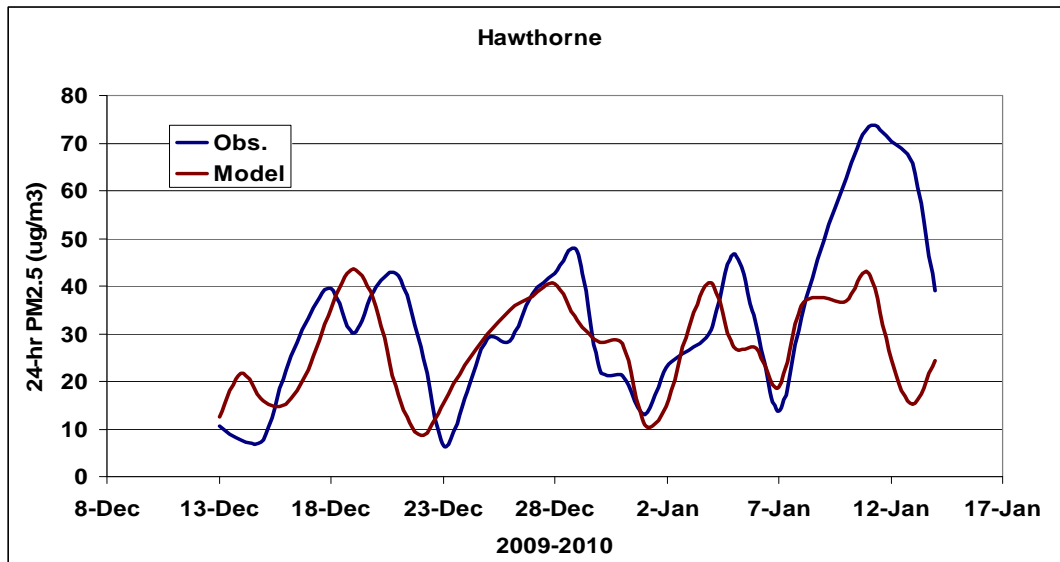
6
7 **Figure IX.A.10. 17 Spatial plot of CMAQ modeled 24-hr $PM_{2.5}$ ($\mu\text{g}/\text{m}^3$) for 2010 Jan. 03.**

8
9 Time series of 24-hr $PM_{2.5}$ concentrations for the 13 Dec. 2009 – 15 Jan. 2010 modeling period
10 are shown in Figs. IX.A.10. 18 - 21 at the Hawthorne site in Salt Lake City, the Ogden site in
11 Weber County, the Lindon site in Utah County, and the Logan site in Cache County. For the
12 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
14 produce the $> 60 \mu\text{g}/\text{m}^3$ concentrations observed at the monitoring locations.

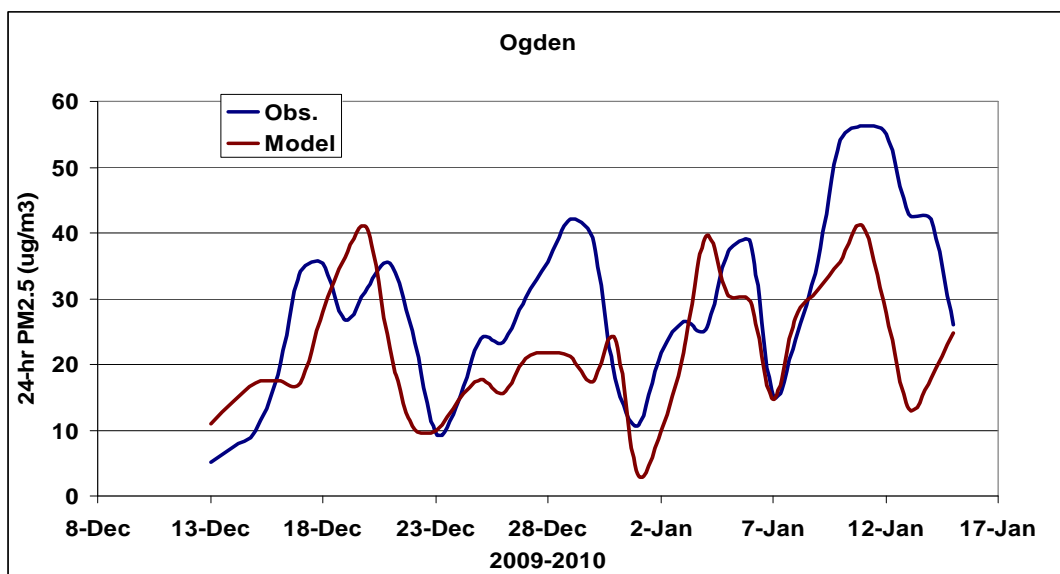
15
16 It is often seen that CMAQ “washes” out the $PM_{2.5}$ episode a day or two earlier than that seen in
17 the observations. For example, on the day 21 Dec. 2009, the concentration of $PM_{2.5}$ continues to
18 build while CMAQ has already cleaned the valley basins of high $PM_{2.5}$ concentrations. At these
19 times, the observed cold pool that holds the $PM_{2.5}$ is often very shallow and winds just above this
20 cold pool are southerly and strong before the approaching cold front. This situation is very
21 difficult for a meteorological and photochemical model to reproduce. An example of this
22 situation is shown in Fig. IX.A.10. 22, where the lowest part of the Salt Lake Valley is still under
23 a very shallow stable cold pool, yet higher elevations of the valley have already been cleared of
24 the high $PM_{2.5}$ concentrations.

25
26 During the 24 – 30 Dec. 2009 episode, a weak meteorological disturbance brushes through the
27 northernmost portion of Utah. It is noticeable in the observations at the Ogden monitor on 25
28 Dec. as $PM_{2.5}$ concentrations drop on this day before resuming an increase through Dec. 30. The

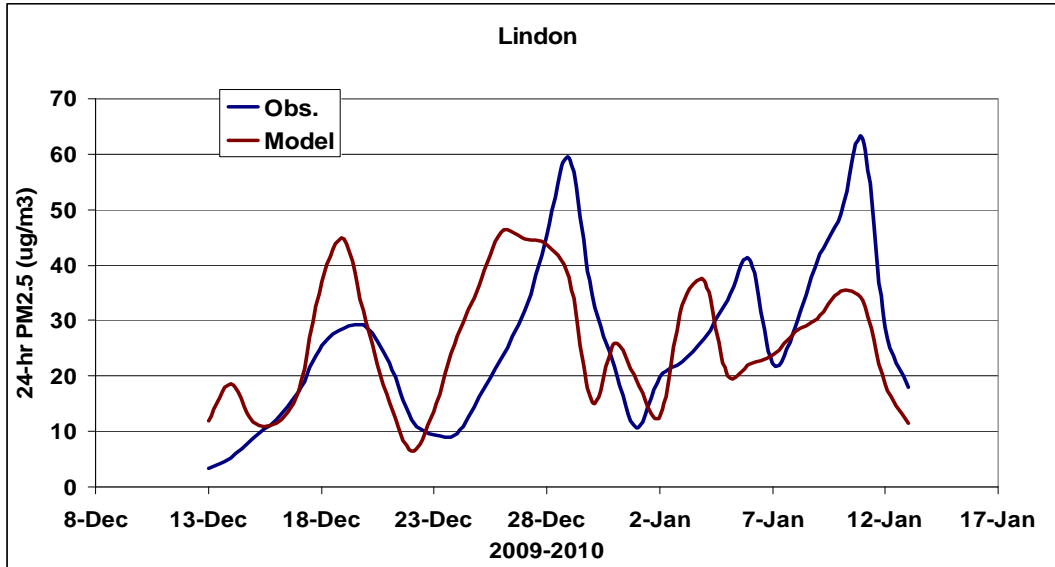
1 meteorological model and thus CMAQ correctly pick up this disturbance, but completely clears
 2 out the building $PM_{2.5}$; and thus performance suffers at the most northern Utah monitors (e.g.
 3 Ogden, Logan). The monitors to the south (Hawthorne, Lindon) are not influence by this
 4 disturbance and building of $PM_{2.5}$ is replicated by CMAQ. This highlights another challenge of
 5 modeling $PM_{2.5}$ episodes in Utah. Often during cold pool events, weak disturbances will pass
 6 through Utah that will de-stabilize the valley inversion and cause a partial clear out of $PM_{2.5}$.
 7 However, the $PM_{2.5}$ is not completely cleared out, and after the disturbance exits, the valley
 8 inversion strengthens and the $PM_{2.5}$ concentrations continue to build. Typically, CMAQ
 9 completely mixes out the valley inversion during these weak disturbances.
 10



11
 12 **Figure IX.A.10.18 24-hr $PM_{2.5}$ time series (Hawthorne). Observed 24-hr $PM_{2.5}$**
 13 **(blue trace) and CMAQ modeled 24-hr $PM_{2.5}$ (red trace).**
 14
 15

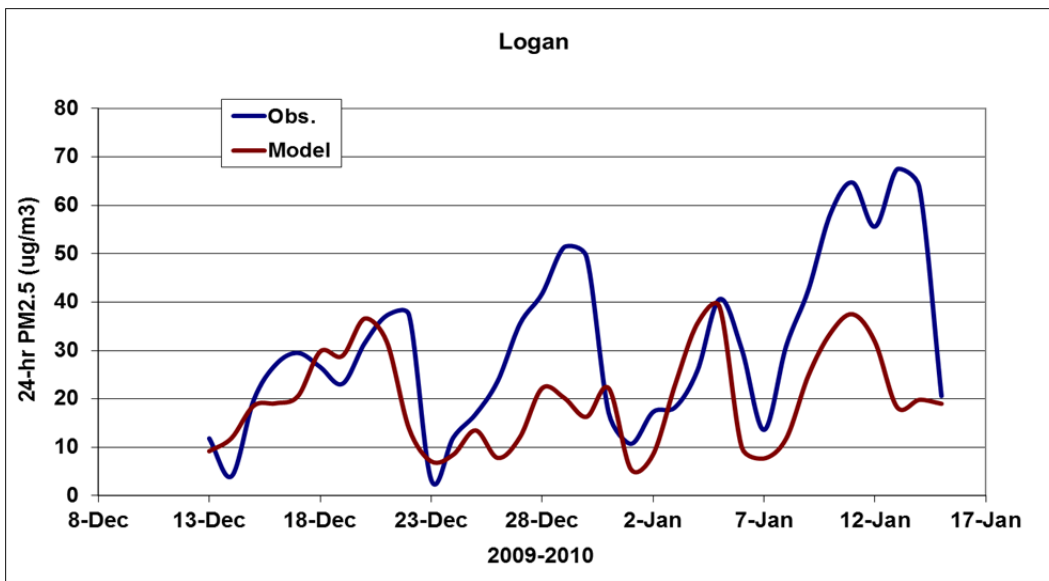


16
 17 **Figure IX.A.10.19 24-hr $PM_{2.5}$ time series (Ogden). Observed 24-hr $PM_{2.5}$**
 18 **(blue trace) and CMAQ modeled 24-hr $PM_{2.5}$ (red trace).**
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Figure IX.A.10. 20 24-hr PM_{2.5} time series (Lindon). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



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Figure IX.A.10. 21 24-hr PM_{2.5} time series (Logan). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



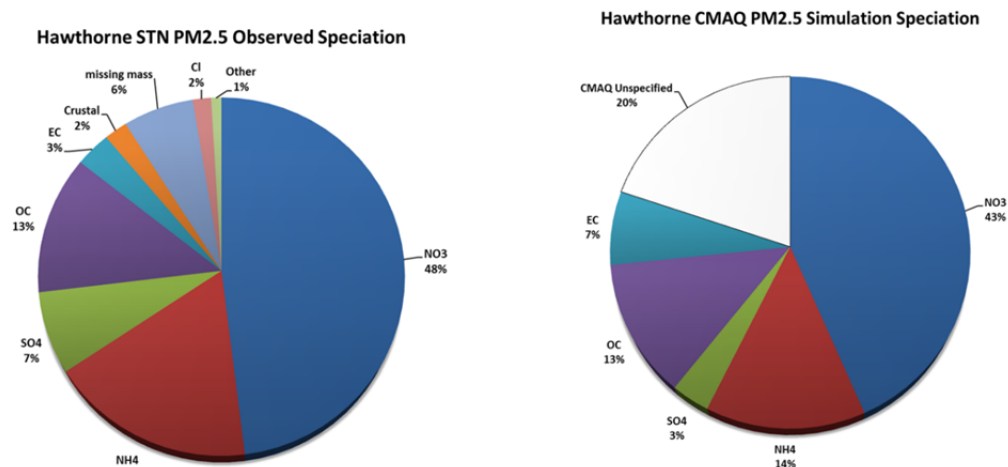
1
2 **Figure IX.A.10. 22 An example of the Salt Lake Valley at the end of a high PM_{2.5} episode.**
3 **The lowest elevations of the Salt Lake Valley are still experiencing an inversion and**
4 **elevated PM_{2.5} concentrations while the PM_{2.5} has been ‘cleared out’ throughout the rest of**
5 **the valley. These ‘end of episode’ clear out periods are difficult to replicate in the**
6 **photochemical model.**

7
8 Generally, the performance of CMAQ to replicate the buildup and clear out of PM_{2.5} is good.
9 However, it is important to verify that CMAQ is replicating the components of PM_{2.5}
10 concentrations. PM_{2.5} simulated and observed speciation is shown at the 3 STN sites in Figures
11 IX.A.10. 23 -25. The observed speciation is constructed using days in which the STN filter 24-hr
12 PM_{2.5} concentration was > 35 µg/m³. For the 2009-2010 modeling period, the observed
13 speciation pie charts were created using 8 filter days at Hawthorne, 6 days at Lindon, and 4 days
14 at Bountiful.

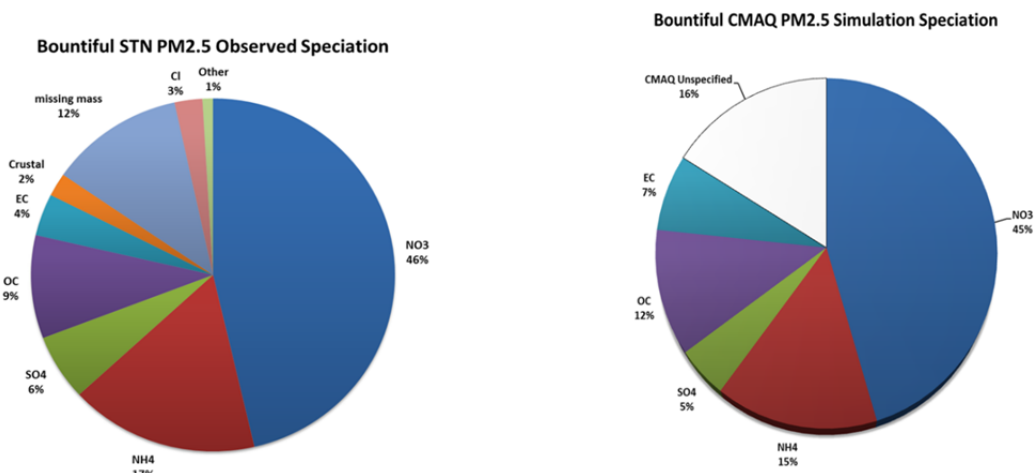
15
16 The simulated speciation is constructed using modeling days that produced 24-hr PM_{2.5}
17 concentrations > 35 µg/m³. Using this criterion, the simulated speciation pie chart is created from
18 18 modeling days for Hawthorne, 14 days at Lindon, and 14 days at Bountiful.
19 At all 3 STN sites, the percentage of simulated nitrate is greater than 40%, while the simulated
20 ammonium percentage is at ~15%. This indicates that the model is able to replicate the
21 secondarily formed particulates that typically make up the majority of the measured PM_{2.5} on the
22 STN filters during wintertime pollution events.

23
24 The percentage of model simulated organic carbon is ~13% at all STN sites, which is in
25 agreement with the observed speciation of organic carbon at Hawthorne and slightly
26 overestimated (by ~3%) at Lindon and Bountiful.

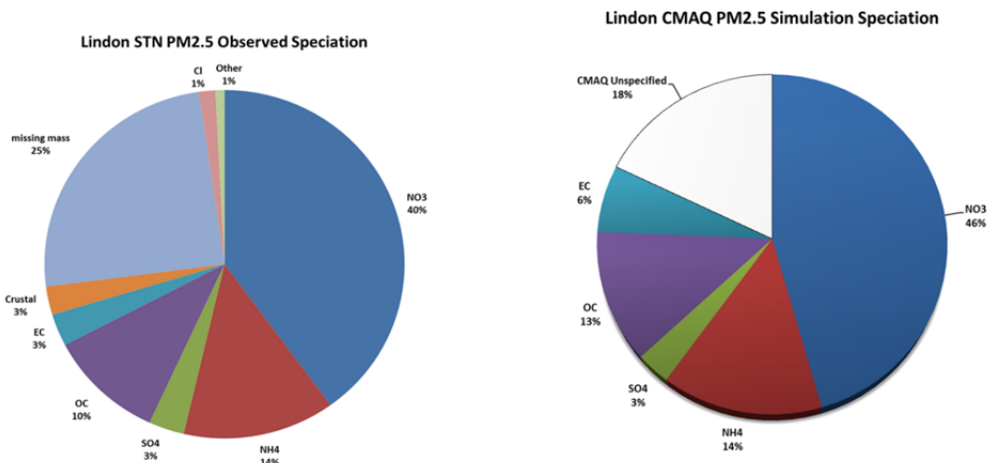
27
28 There is no STN site in the Logan nonattainment area, and very little speciation information
29 available in the Cache Valley. Figure IX.A.10. 26 shows the model simulated speciation at
30 Logan. Ammonium (17%) and nitrate (56%) make up a higher percentage of the simulated PM_{2.5}
31 at Logan when compared to sites along the Wasatch Front.



1
2 **Figure IX.A.10. 23** The composition of observed and model simulated average 24-hr PM_{2.5}
3 speciation averaged over days when an observed and modeled day had 24-hr concentrations
4 > 35 µg/m³ at the Hawthorne STN site.
5

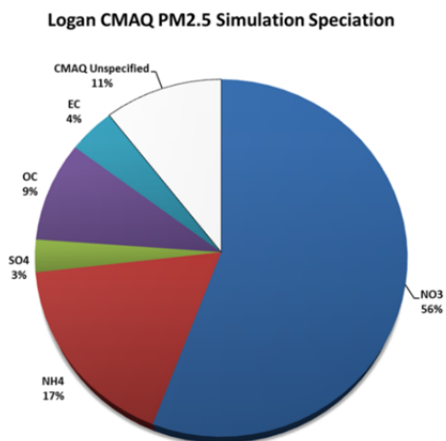


6
7 **Figure IX.A.10. 24** The composition of observed and model simulated average 24-hr PM_{2.5}
8 speciation averaged over days when an observed and modeled day had 24-hr concentrations
9 > 35 µg/m³ at the Bountiful STN site.
10
11



12

1 **Figure IX.A.10. 25 The composition of observed and model simulated average 24-hr PM_{2.5}**
2 **speciation averaged over days when an observed and modeled day had 24-hr concentrations**
3 **> 35 µg/m³ at the Lindon STN site.**
4

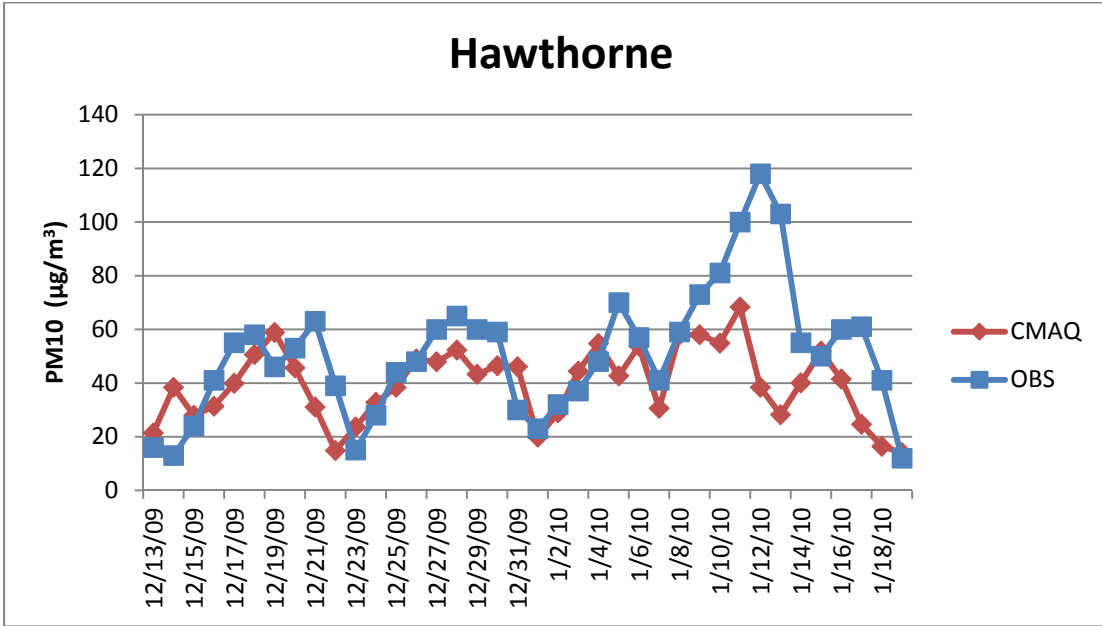


5
6 **Figure IX.A.10. 26 The composition of model simulated average 24-hr PM_{2.5} speciation**
7 **averaged over days when a modeled day had 24-hr concentrations > 35 µg/m³ at the Logan**
8 **monitoring site. No observed speciation data is available for Logan.**
9

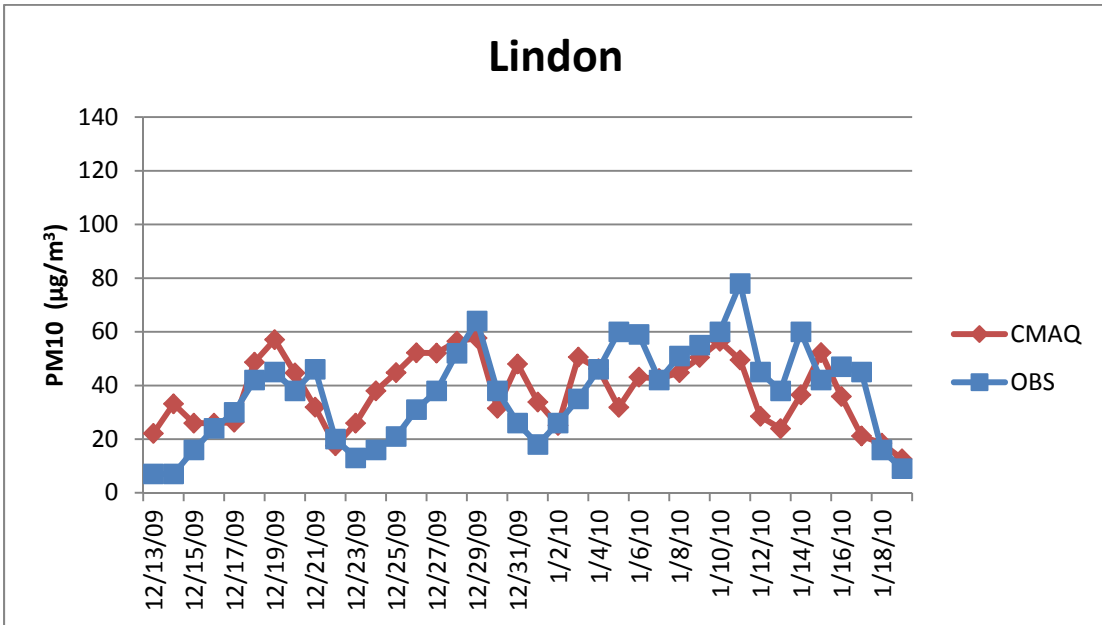
10 PM₁₀ Results

11
12 As mentioned previously, the bulk of the performance for CMAQ modeled Particulate Matter
13 (PM) for the 2009 – 2010 episode was done for the 24-hr PM_{2.5} SIP. The detailed model
14 performance was shown using time series, statistical metrics, and pie charts. For the CMAQ
15 performance of PM₁₀ in particular, UDAQ has updated the model versus observations time series
16 plots to show PM₁₀, in addition to the prior times series using PM_{2.5}. For the 2009 – 2010
17 episode, UDAQ collected PM₁₀ observational data at Hawthorne and Magna in Salt Lake County;
18 Lindon and North Provo in Utah County; and for Ogden City.
19

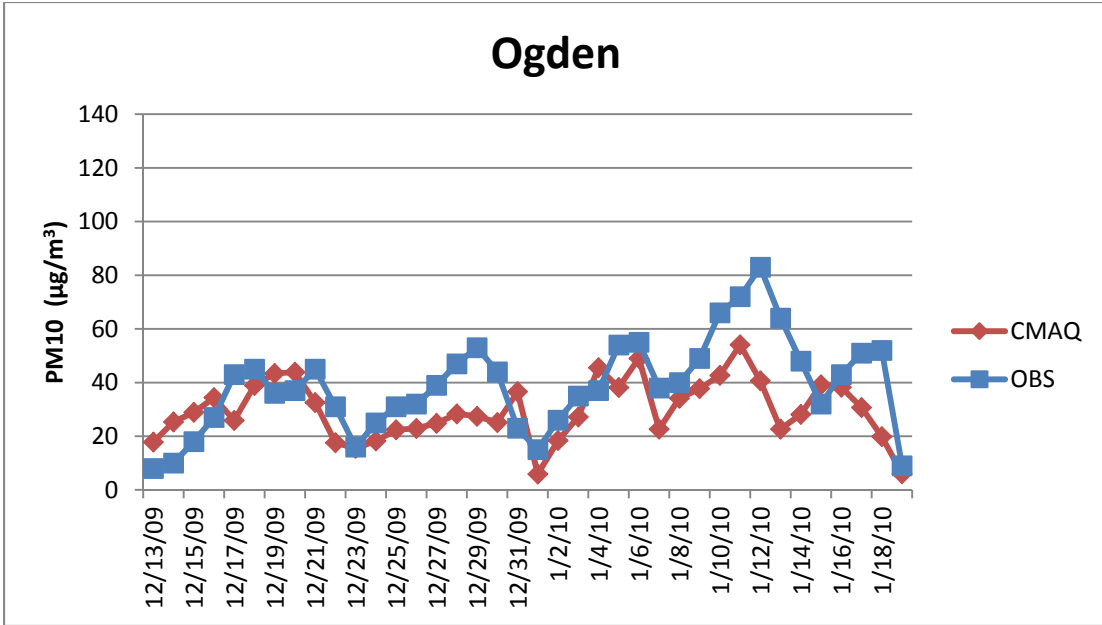
1 The PM₁₀ model versus observation time series is shown in Figures IX.A.10. 27 - 32.
2



3
4
5 **Figure IX.A.10. 27 Time Series of total PM10 (ug/m3) for Hawthorne for the 2009-2010**
6 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
7 **trace.**

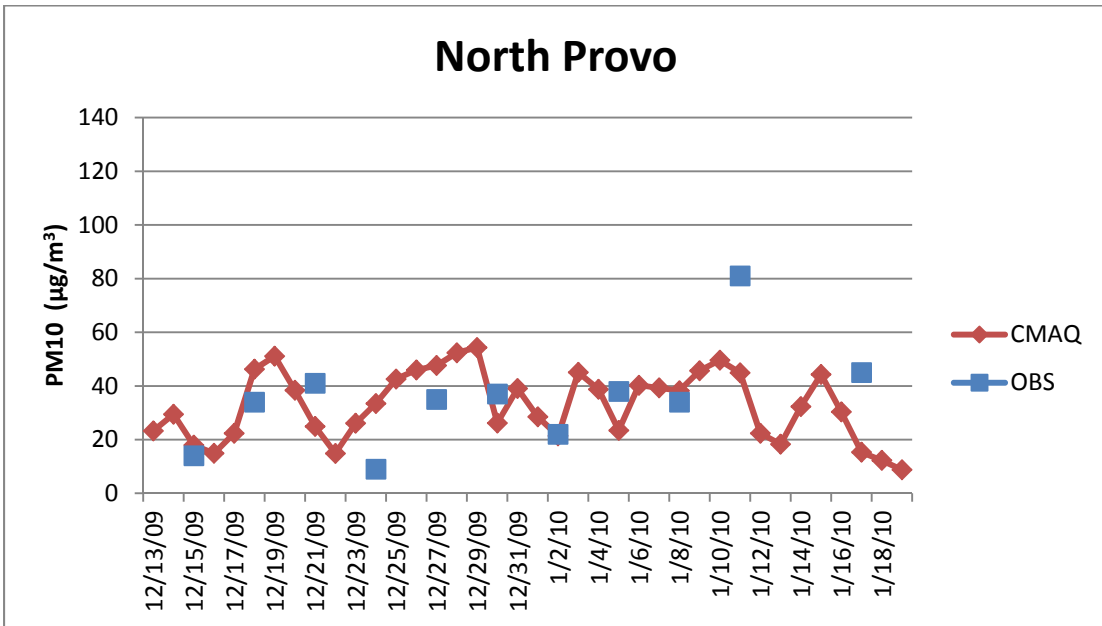


10
11
12 **Figure IX.A.10. 28 Time Series of total PM10 (ug/m3) for Lindon for the 2009-2010**
13 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
14 **trace.**



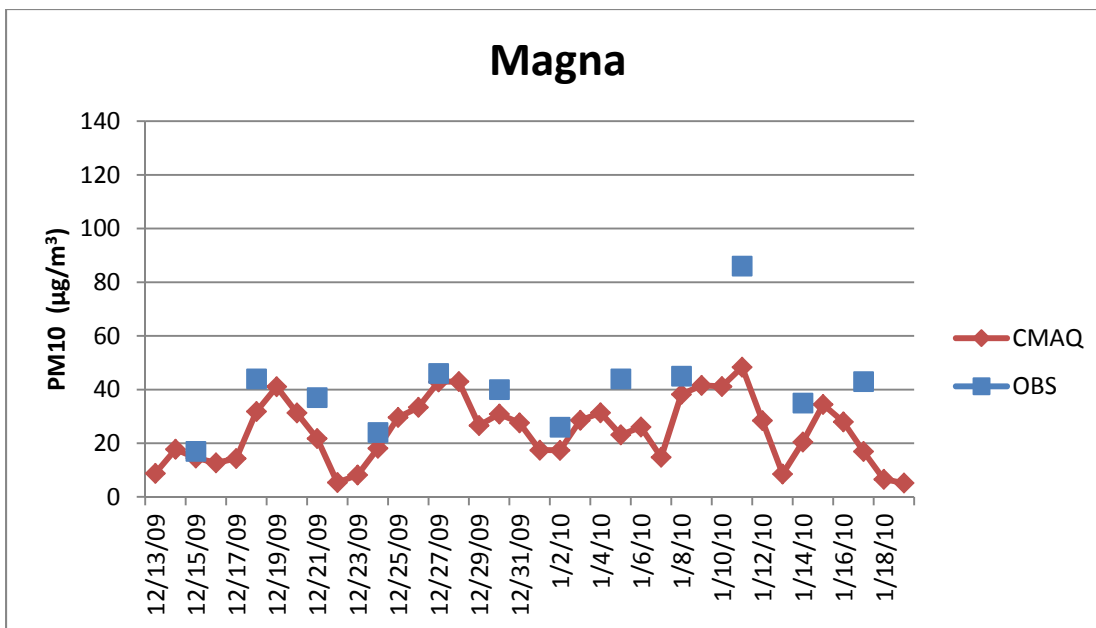
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Figure IX.A.10. 29 Time Series of total PM10 (ug/m3) for Ogden for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



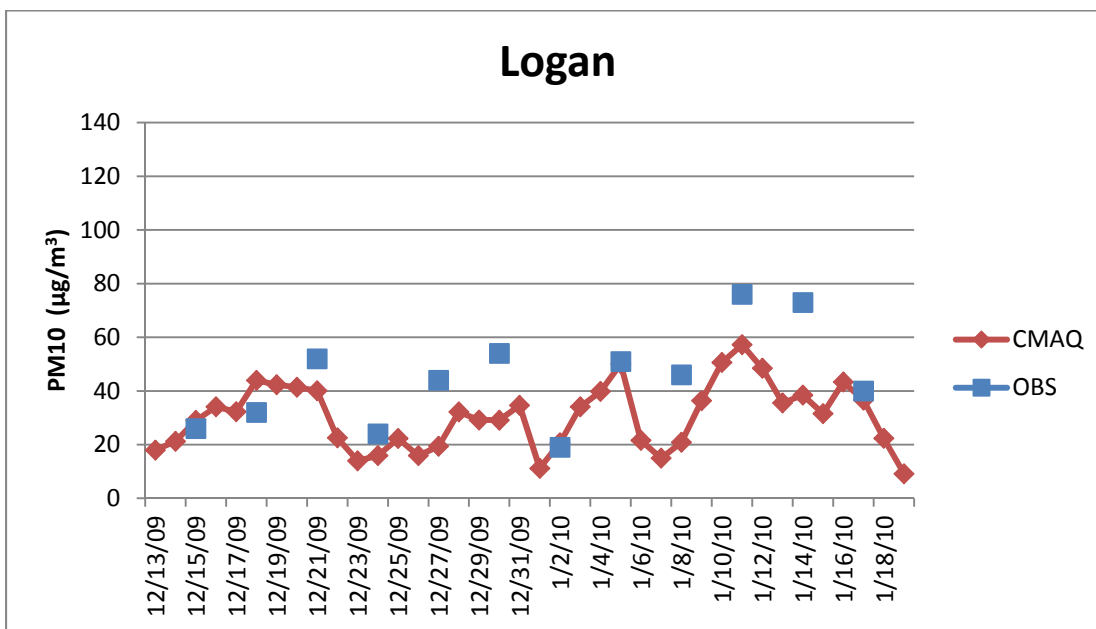
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Figure IX.A.10. 30 Time Series of total PM10 (ug/m3) for North Provo for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



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Figure IX.A.10.31 Time Series of total PM10 (ug/m3) for Magna for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



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Figure IX.A.10.32 Time Series of total PM10 (ug/m3) for Logan for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.

As noted before, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter speciation could not be made for this modeling period because most of the secondarily chemically formed particulate nitrate had been volatilized from the PM₁₀ filters and thus could not be accounted for. It should be noted that CMAQ was able to produce the secondarily formed nitrate

1 when compared to PM_{2.5} filters during the previous PM_{2.5} SIP work. Therefore, UDAQ feels
2 CMAQ shows good replication of the species that make up PM₁₀ during wintertime pollution
3 events.
4

5 6 **(g) Summary of Model Performance**

7
8 Model performance for 24-hr PM_{2.5} is good and generally acceptable and can be characterized as
9 follows:

- 10
11 • Good replication of the episodic buildup and clear out of PM_{2.5}. Often the model will
12 clear out the simulated PM_{2.5} a day too early at the end of an episode. This clear out time
13 period is difficult to model (i.e., Figure IX.A.10. 22).
14
- 15 • Good agreement in the magnitude of PM_{2.5}, as the model can consistently produce the
16 high concentrations of PM_{2.5} that coincide with observed high concentrations.
17
- 18 • Spatial patterns of modeled 24-hr PM_{2.5}, show for the most part, that the PM_{2.5} is being
19 confined in the valley basins, consistent to what is observed.
20
- 21 • Speciation and composition of the modeled PM_{2.5} matches the observed speciation quite
22 well. Modeled and observed nitrate are between 40% and 50% of the PM_{2.5}. Ammonium
23 is between 15% and 20% for both modeled and observed PM_{2.5}, while modeled and
24 observed organic carbon falls between 10% to 13% of the total PM_{2.5}.
25

26 For PM₁₀ the CMAQ model performance is quite good at all locations along Northern Utah.
27 CMAQ is able to re-produce the buildup and washout of the pollution episodes during the 2009 –
28 2010 winter. CMAQ is also able to re-produce the peak PM₁₀ concentrations during most
29 episodes. The exception being the 2010 Jan. 08 – 14 episode, where CMAQ fails to build to the
30 extremely high PM₁₀ concentration (>80 ug/m³) seen at the monitors. This episode in particular
31 featured an “early model washout,” and these results are similar to the results found in PM_{2.5}
32 modeling.
33

34 Several observations should be noted on the implications of these model performance findings on
35 the attainment modeling presented in the following section. First, it has been demonstrated that
36 model performance overall is acceptable and, thus, the model can be used for air quality planning
37 purposes. Second, consistent with EPA guidance, the model is used in a relative sense to project
38 future year values. EPA suggests that this approach “should reduce some of the uncertainty
39 attendant with using absolute model predictions alone.”
40

41 **(h) Modeled Attainment Test**

42 43 • **Introduction**

44
45 With acceptable performance, the model can be utilized to make future-year attainment
46 projections. For any given (future) year, an attainment projection is made by calculating a
47 concentration termed the Future Design Value (FDV). This calculation is made for each monitor
48 included in the analysis, and then compared to the NAAQS (150 µg/m³). If the FDV at every
49 monitor located within a nonattainment area is smaller than the NAAQS, this would demonstrate
50 attainment for that area in that future year.
51

1 A maintenance plan must demonstrate continued attainment of the NAAQS for a span of ten
 2 years. This span is measured from the time EPA approves the plan, a date which is somewhat
 3 uncertain during plan development. To be conservative, attainment projections were made for
 4 2019, 2028, and 2030. An assessment was also made for 2024 as a “spot-check” against emission
 5 trends within the ten year span.

6
 7 • **PM₁₀ Baseline Design Values**
 8

9 For any monitor, the FDV is greatly influenced by existing air quality at that location. This can
 10 be quantified and expressed as a Baseline Design Value (BDV). The BDV is consistent with the
 11 form of the 24-hour PM₁₀ NAAQS; that is, that the probability of exceeding the standard should
 12 be no greater than once per calendar year. Quantification of the BDV for each monitor is
 13 included in the TSD, and is consistent with EPA guidance.

14
 15 Hourly PM₁₀ observations are taken from FRM filters spanning five monitors in three
 16 maintenance areas: Salt Lake County, Utah County, and the city of Ogden.

17
 18 In Table IX.A.10. 5, baseline design values are given for Ogden, Hawthorne, Magna, Lindon, and
 19 North Provo. These values were calculated based on data collected during the 2011-2014 time
 20 period.

21
 22 **Table IX.A.10. 5 Baseline design values listed for each monitor.**
 23

Site	Maintenance Area	2011-2014 BDV
Ogden	Ogden City	88.2 µg/m ³
Hawthorne	Salt Lake County	100.9 µg/m ³
Magna	Salt Lake County	70.5 µg/m ³
Lindon	Utah County	111.4 µg/m ³
North Provo	Utah County	124.4 µg/m ³

24
 25
 26 • **Relative Response Factors**
 27

28 In making future-year predictions, the output from the CMAQ 4.7.1 model is not considered to be
 29 an absolute answer. Rather, the model is used in a relative sense. In doing so, a comparison is
 30 made using the predicted concentrations for both the year in question and a pre-selected base-
 31 year, which for this plan is 2011. This comparison results in a Relative Response Factor (RRF).
 32 RRFs are calculated as follows:
 33

- 34 1) Modeled PM₁₀ concentrations are calculated for each grid cell in the modeling domain
 35 over the 39-day wintertime 2009-2010 episode. Of particular interest are the nine grid
 36 cells (3x3 window) that are collocated with each monitor. The monitor, itself is located in
 37 the window’s center cell.
- 38 2) For every simulated day, the maximum daily PM₁₀ concentration for each of these nine-
 39 cell windows is identified.
- 40 3) For each monitor, the top 20% of these 39 values are averaged to formulate a modeled
 41 PM₁₀ peak concentration value (PCV).
- 42 4) At each monitor, the RRF is calculated as the ratio between future-year PCV and base-
 43 year PCV: **RRF = FPCV / BPCV**
 44
 45
 46

• **Future Design Values and Results**

Finally, for each monitor, the FDV is calculated by multiplying the baseline design value by the relative response factor: **FDV = RRF * BDV**. These FDV's are compared to the NAAQS in order to determine whether attainment is predicted at that location or not. The results for each of the monitors are shown below in Table IX.A.10. 6.

Table IX.A.10. 6 Baseline design values, relative response factors, and future design values for all monitors and future years. Units of design values are $\mu\text{g}/\text{m}^3$, while RRF's are dimensionless.

Monitor	2011 BDV	2019 RRF	2019 FDV	2024 RRF	2024 FDV	2028 RRF	2028 FDV	2030 RRF	2030 FDV
Ogden	88.2	1.05	92.6	1.04	91.7	1.02	90.0	1.05	92.6
Hawthorne	100.9	1.09	110.0	1.09	110.0	1.09	110.0	1.12	113.0
Magna	70.5	1.14	80.4	1.13	79.7	1.11	78.3	1.15	81.1
Lindon	111.4	1.16	129.2	1.12	124.8	1.11	123.7	1.16	129.2
North Provo	124.4	1.15	143.1	1.12	139.3	1.10	136.8	1.15	143.1

For all future-years and monitors, no FDV exceeds the NAAQS. Therefore continued attainment is demonstrated for all three maintenance areas.

(2) Attainment Inventory

The attainment inventory is discussed in EPA guidance (Calcagni) as another one of the core provisions that should be considered by states for inclusion in a maintenance plan.

According to Calcagni, the stated purpose of the attainment inventory is to establish the level of emissions during the time periods associated with monitoring data showing attainment.

In cases such as this, where a maintenance demonstration is founded on a modeling analysis that is used in a relative sense, the baseline inventory modeled as the basis for comparison with every projection year model run is best suited to act as the attainment inventory. For this analysis, a baseline inventory was compiled for the year 2011. This year also falls within the span of data representing current attainment of the PM_{10} NAAQS.

Calcagni speaks about the projection inventory as well, and notes that it should consider future growth, including population and industry, should be consistent with the base-year attainment inventory, and should document data inputs and assumptions. Any assumptions concerning emission rates must reflect permanent, enforceable measures.

Utah compiled projection inventories for use in the quantitative modeling demonstration. The years selected for projection included 2019, 2024, 2028, and 2030. The emissions contained in the inventories include sources located within a regional area called a modeling domain. The

1 modeling domain encompasses all three areas within the state that were designated as
2 nonattainment areas for PM₁₀: Salt Lake County, Utah County, and Ogden City, as well as a
3 bordering region see Figure IX.A.10 1.
4

5 Since this bordering region is so large (owing to its creation to assess a much larger region of
6 PM_{2.5} nonattainment), a “core area” within this domain was identified wherein a higher degree of
7 accuracy would be important. Within this core area (which includes Weber, Davis, Salt Lake,
8 and Utah Counties), SIP-specific inventories were prepared to include seasonal adjustments and
9 forecasting to represent each of the projection years. In the bordering regions away from this
10 core, the 2011 National Emissions Inventory was downloaded from EPA and inserted to the
11 analysis. It remained unchanged throughout the analysis period.
12

13 There are four general categories of sources included in these inventories: large stationary
14 sources, smaller area sources, on-road mobile sources, and off-road mobile sources.
15

16 For each of these source categories, the pollutants that were inventoried included: particulate
17 matter with an aerodynamic diameter of ten microns or less (PM₁₀), sulfur dioxide (SO₂), oxides
18 of nitrogen (NO_x), volatile organic compounds (VOC), and ammonia. SO₂ and NO_x are
19 specifically defined as PM₁₀ precursors, that is, compounds that, after being emitted to the
20 atmosphere, undergo chemical or physical change to become PM₁₀. Any PM₁₀ that is created in
21 this way is referred to as secondary aerosol. The CMAQ model also considers ammonia and
22 VOC to be contributing factors in the formation of secondary aerosol.
23

24 The unit of measure for point and area sources is the traditional tons per year, but the CMAQ
25 model includes a pre-processor that converts these emission rates to hourly increments throughout
26 each day for each episode. Mobile source emissions are reported in terms of tons per day, and are
27 also pre-processed by the model.
28

29 The basis for the point source and area inventories, for the base-year attainment inventory as well
30 as all future-year projection inventories, was the 2011 tri-annual inventory of actual emissions
31 that had already been compiled by the Division of Air Quality.
32

33 Area sources, off-road mobile sources, and generally also the large point sources were projected
34 forward from 2011, using population and economic forecasts from the Governor’s Office of
35 Management and Budget.
36

37 Mobile source emissions were calculated for each year using MOVES2010 in conjunction with
38 the appropriate estimates for vehicle miles traveled (VMT). VMT estimates for the urban
39 counties were based on a travel demand model that is only run periodically for specific projection
40 years. VMT for intervening years were estimated by interpolation.
41

42 Since this SIP subsection takes the form of a maintenance plan, it must demonstrate that the area
43 will continue to attain the PM₁₀ NAAQS throughout a period of ten years from the date of EPA
44 approval. It is also necessary to “spot check” this ten-year interval. Hence, projection inventories
45 were prepared for the following years: 2019, 2024, 2028, (the ten-year mark from anticipated
46 EPA approval), and 2030. 2011 was established as the baseline period.
47

48 The following tables are provided to summarize these inventories. As described, they represent
49 point, area, on-road mobile, and off-road mobile sources in the modeling domain. They include
50 PM₁₀, SO₂, NO_x, VOC, and ammonia.
51

1 Table IX.A.10. 7 shows the baseline emissions for each of the areas within the modeling
 2 domain. Table IX.A.10. 8 is specific to this nonattainment area, and shows the emissions from
 3 the baseline through the projection years.
 4

5 **Table IX.A.10. 7 Baseline Emissions throughout the Modeling Domain**
 6

2011 Baseline	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline Sum of Emissions (tpd)	Ogden City NA-Area	Area Sources	0.85	0.08	2.12	5.67	0.86
		NonRoad	0.90	0.00	1.32	0.91	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.09	0.05	12.18	8.58	0.22
		Provo NA Total	3.84	0.13	15.62	15.16	1.08
	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	7.12	0.32	11.71	6.38	0.00
		Point Source	4.04	8.90	15.56	2.97	0.20
		Mobile Sources	10.95	0.28	57.96	35.35	1.14
		Salt Lake City NA Total	26.72	9.55	85.96	77.32	2.87
	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	3.53	0.02	4.24	2.31	0.00
		Point Source	0.28	0.29	1.03	0.18	0.18
		Mobile Sources	4.90	0.13	24.64	11.89	0.49
		Surrounding Areas Total	10.90	0.46	30.13	15.54	1.50
	Surrounding Areas	Area Sources	537.49	13.60	228.31	629.52	331.22
		NonRoad	34.53	0.10	60.77	72.57	0.01
		Point Source	17.64	283.15	538.86	63.96	6.08
		Mobile Sources	22.80	193.52	434.92	6.47	1.67
		Surrounding Areas Total	612.46	490.37	1262.86	772.52	338.98
	2011 Total	653.92	500.51	1394.57	880.54	344.43	

7
8
9
10
11
12
13

14 **Table IX.A.10. 8 Salt Lake County Nonattainment Area; Actual Emissions for 2011 and
 15 Emission Projections for 2019, 2024, 2028, and 2030.**
 16

Year	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	7.12	0.32	11.71	6.38	0.00
		Point Source	4.04	8.90	15.56	2.97	0.20
		Mobile Sources	10.95	0.28	57.96	35.35	1.14
		2011 Total	26.72	9.55	85.96	77.32	2.87
2019	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	8.28	0.36	9.11	5.94	0.01
		Point Source	11.29	7.72	22.17	3.77	0.26
		Mobile Sources	10.88	0.31	25.79	21.16	0.89
	2019 Total	35.06	8.44	57.80	63.49	2.69	
2024	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	8.83	0.40	8.48	6.22	0.01
		Point Source	11.52	8.16	22.36	3.86	0.29
		Mobile Sources	11.28	0.29	17.16	16.63	0.89
	2024 Total	36.24	8.90	48.73	59.33	2.72	
2028	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	9.27	0.44	8.43	6.54	0.01
		Point Source	11.72	8.57	0.00	3.95	0.31
		Mobile Sources	11.82	0.28	13.88	13.94	0.91
	2028 Total	37.42	9.34	23.04	57.05	2.76	
2030	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	9.52	0.46	8.50	6.72	0.01
		Point Source	11.83	8.82	22.68	4.00	0.32
		Mobile Sources	12.07	0.28	12.59	13.34	0.93
	2030 Total	38.03	9.61	44.50	56.68	2.79	

14
15
16

1
2 More detail concerning any element of the inventory can be found at the appropriate section of
3 the Technical Support Document (TSD). More detail about the general construction of the
4 inventory may be found in the Inventory Preparation Plan.
5

6 7 **(3) Emissions Limitations**

8
9 As discussed above, the larger sources within the nonattainment areas were individually
10 inventoried and modeled in the analysis.
11

12 A subset of these “large” sources was subsequently identified for the purpose of establishing
13 emission limitations as part of the Utah SIP. This subset includes any source located within any
14 of the three current nonattainment areas for PM₁₀: Salt Lake County, Utah County, or Ogden City
15 whose actual emissions of PM₁₀, SO₂, or NO_x exceeded 100 tons in 2011, or who had the
16 potential to emit 100 tpy of any of these pollutants. A source might also be included in the subset
17 if it was currently regulated for PM₁₀ under section IX, Part H of the Utah SIP. There were
18 several sources in Davis County that were close enough to the border so as to have originally
19 been included in the original PM₁₀ SIP.
20

21 As discussed before, the emission limits for these sources had already been reflected in the
22 projected emissions inventories used in the modeling analysis. Only those limits for which credit
23 is being taken in the SIP have been incorporated specifically into the SIP. Many of these limits
24 appear in state issued Approval Orders or Title V Operating Permits. Such regulatory documents
25 typically include many emission limits and operating restrictions. However, the limits found in
26 the SIP cannot be changed unless the State provides, and EPA approves, a SIP revision.
27

28 These limits are incorporated in the Utah SIP at Section IX, Part H (formerly Sections 1 and 2 of
29 Appendix A to Section IX, Part A), and as such are federally enforceable.
30

31 These conditions support a demonstration of maintenance through 2030.
32
33

34 **(4) Emission Reduction Credits**

35
36 Under Utah’s new source review rules in R307-403-8, banking of emission reduction credits
37 (ERCs) is permitted to the fullest extent allowed by applicable Federal Law as identified in 40
38 CFR 51, Appendix S, among other documents. Under Appendix S, Section IV.C.5, a permitting
39 authority may allow banked ERCs to be used under the preconstruction review program (R307-
40 403) as long as the banked ERCs are identified and accounted for in the SIP control strategy.
41

42 Existing Emission Reduction Credits, for PM₁₀, SO₂, and NO_x, were included in the modeled
43 demonstration of maintenance outlined in Subsection IX.A.10.c(1).
44

45 The subsequent crediting of any emission reduction of PM₁₀, or precursors thereto, whether pre-
46 existing or established subsequent to the approval of this SIP revision, remains permissible. In
47 general, credits must be in excess and must be established by actual, verifiable, and enforceable
48 reductions in emissions. Additionally, these ERCs cannot be used to offset major new sources or
49 major modifications at existing sources in PM_{2.5} nonattainment areas.
50

1 Once Salt Lake County is redesignated to attainment for PM₁₀, permitting new PM₁₀ sources or
2 major modifications to existing PM₁₀ sources will be conducted under the rules of the Prevention
3 of Significant Deterioration program.
4
5
6

7 **(5) Additional Controls for Future Years**
8

9 Since the emission limitations discussed in subsection IX.A.10.c.(3) are federally enforceable
10 and, as demonstrated in IX.A.10.c(1) above, are sufficient to ensure continued attainment of the
11 PM₁₀NAAQS, there is no need to require any additional control measures to maintain the PM₁₀
12 NAAQS.
13
14

15 **(6) Mobile Source Budget for Purposes of Conformity**
16

17 The transportation conformity provisions of section 176(c)(2)(A) of the Clean Air Act (CAA)
18 require regional transportation plans and programs to show that "...emissions expected from
19 implementation of plans and programs are consistent with estimates of emissions from motor
20 vehicles and necessary emissions reductions contained in the applicable implementation plan..."
21 EPA's transportation conformity regulation (40 CFR 93, Subpart A, last amended at 77 FR 14979,
22 March 14 2012) also requires that motor vehicle emission budgets must be established for the
23 last year of the maintenance plan, and may be established for any years deemed appropriate (see
24 40 CFR 93.118(b)(2)(i)). If the maintenance plan does not establish motor vehicle emissions
25 budgets for any years other than the last year of the maintenance plan, the conformity regulation
26 requires that a "demonstration of consistency with the motor vehicle emissions budget(s) must be
27 accompanied by a qualitative finding that there are not factors which would cause or contribute to
28 a new violation or exacerbate an existing violation in the years before the last year of the
29 maintenance plan." The normal interagency consultation process required by the regulation (40
30 CFR 93.105) shall determine what must be considered in order to make such a finding.
31

32 Thus, for a Metropolitan Planning Organization's (MPO's) Regional Transportation Plan (RTP),
33 analysis years that are after the last year of the maintenance plan (in this case 2030), a conformity
34 determination must show that emissions are less than or equal to the maintenance plan's motor
35 vehicle emissions budget(s) for the last year of the implementation plan.
36

37 EPA's MOVES2014 was used to calculate mobile source emissions, and road dust projections
38 were calculated using the January 2011 update to AP-42 Method for Estimating Re-Entrained
39 Road Dust from Paved Roads (Chapter 13, released 76 FR 6329 February 4, 2011).
40

41 Utah has determined that mobile sources are not significant contributors of SO₂ for this
42 maintenance plan. As such, this maintenance plan does not establish a motor vehicle emissions
43 budget for SO₂.
44

45 **(a) Salt Lake County Mobile Source PM10 Emissions Budgets**
46

47 In this maintenance plan, Utah is establishing transportation conformity motor vehicle emission
48 budgets (MVEB) for PM₁₀ (direct) and NO_x for 2030.
49

50 **(i) Direct PM10 Emissions Budget**
51

1 Direct (or “primary”) PM₁₀ refers to PM₁₀ that is not formed via atmospheric chemistry. Rather,
2 direct PM₁₀ is emitted straight from a mobile or stationary source. With regard to the emission
3 budget presented herein, direct PM₁₀ includes road dust, brake wear, and tire wear as well as
4 PM₁₀ from exhaust.

5
6 As presented in the Technical Support Document for on-road mobile sources, the estimated on-
7 road mobile source emissions for Salt Lake County, in 2030, of direct sources of PM₁₀ (road dust,
8 brake wear, tire wear, and exhaust particles) were 12.07 tons per winter-weekday. These mobile
9 source PM₁₀ emissions were included in the maintenance demonstration in Subsection
10 IX.A.10.c.(1) which estimates a maximum PM₁₀ concentration of 113.0 µg/m³ in 2030 within the
11 Salt Lake County portion of the modeling domain. The above PM₁₀ mobile source emission
12 figure of 12.07 tons per day (tpd) would traditionally be considered as the MVEB for the
13 maintenance plan. However, and as discussed below, the modeled concentration is 37.0 µg/m³
14 below the NAAQS of 150 µg/m³, and represents potential PM₁₀ emissions that may be considered
15 for allocation to the PM₁₀ MVEB.

16
17 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
18 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
19 compliance with the maintenance requirement. These additional emissions that can be allocated
20 to the applicable MVEB are considered the “safety margin.” As defined in 40 CFR 93.101,
21 safety margin represents the amount of emissions by which the total projected emissions from all
22 sources of a given pollutant are less than the total emissions that would satisfy the applicable
23 requirement for demonstrating maintenance. The implementation plan can then allocate some or
24 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

25
26 The safety margin for the Salt Lake County portion of the domain equates to 37.0 µg/m³.

27
28 To evaluate the portion of safety margin that could be allocated to the PM₁₀ MVEB, modeling
29 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.

30
31 Using the same emission projections for point and area and non-road mobile sources, the
32 SMOKE 3.6 emissions model was re-run using 24.00 tons of PM₁₀ per winter-weekday for
33 mobile sources (and 21.00 tons/winter-weekday of NO_x). The revised maintenance
34 demonstration for 2030 still shows maintenance of the PM₁₀ standard.

35
36 It estimates a maximum PM₁₀ concentration of 120.1 µg/m³ in 2030 within the Salt Lake County
37 portion of the modeling domain. This value is 29.9 µg/m³ below the NAAQ Standard of 150
38 µg/m³, but 7.1 µg/m³ higher than the previous value.

39
40 This shows that the safety margin is at least 11.93 tons/day of PM₁₀ (24.00 tons/day minus 12.07
41 tons/day) and 8.41 tons/day of NO_x (21.00 tons/day minus 12.59 tons/day). This maintenance
42 plan allocates this portion of the safety margin to the mobile source budgets for Salt Lake County,
43 and thereby sets the direct PM₁₀ MVEB for 2030 at 24.00 tons/winter-weekday.

44 45 46 **(ii) NO_x Emissions Budget**

47
48 Through atmospheric chemistry, NO_x emissions can substantially contribute to secondary PM₁₀
49 formation. For this reason, NO_x is considered a PM₁₀ precursor.

50
51 As presented in the Technical Support Document for on-road mobile sources, the estimated on-
52 road mobile source NO_x emissions for Salt Lake County in 2030 were 12.59 tons per winter-

1 weekday. These mobile source PM₁₀ emissions were included in the maintenance demonstration
2 in Subsection IX.A.10.c.(1) which estimates a maximum PM₁₀ concentration of 113.0 µg/m³ in
3 2030 within the Salt Lake County portion of the modeling domain. The above NO_x mobile
4 source emission figure of 12.59 tons per day (tpd) would traditionally be considered as the
5 MVEB for the maintenance plan. However, and as discussed below, the modeled concentration
6 is 37.0 µg/m³ below the NAAQS of 150 µg/m³, and represents potential NO_x emissions that may
7 be considered for allocation to the NO_x MVEB.

8
9 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
10 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
11 compliance with the maintenance requirement. These additional emissions that can be allocated
12 to the applicable MVEB are considered the "safety margin." As defined in 40 CFR 93.101,
13 safety margin represents the amount of emissions by which the total projected emissions from all
14 sources of a given pollutant are less than the total emissions that would satisfy the applicable
15 requirement for demonstrating maintenance. The implementation plan can then allocate some or
16 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

17
18 The safety margin for the Salt Lake County portion of the domain equates to 37.0 µg/m³.

19
20 To evaluate the portion of safety margin that could be allocated to the PM₁₀ MVEB, modeling
21 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.

22
23 Using the same emission projections for point and area and non-road mobile sources, the
24 SMOKE 3.6 emissions model was re-run using 21.00 tons of NO_x per winter-weekday for on-
25 road mobile sources (and 24.00 tons/winter-weekday of PM₁₀). The revised maintenance
26 demonstration for 2030 still shows maintenance of the PM₁₀ standard.

27
28 It estimates a maximum PM₁₀ concentration of 120.1 µg/m³ in 2030 within the Salt Lake County
29 portion of the modeling domain. This value is 29.9 µg/m³ below the NAAQ Standard of 150
30 µg/m³, but 7.1 µg/m³ higher than the previous value.

31
32 This shows that the safety margin is at least 8.41 tons/day of NO_x (21.00 tons/day minus 12.59
33 tons/day) and 11.93 tons/day of PM₁₀ (24.00 tons/day minus 12.07 tons/day). This maintenance
34 plan allocates this portion of the safety margin to the mobile source budgets for Salt Lake County,
35 and thereby sets the NO_x MVEB for 2030 at 21.00 tons/winter-weekday

36
37
38 **(b) Net Effect to Maintenance Demonstration**

39
40 Using the procedure described above, some of the identified safety margin indicated earlier in
41 Subsection IX.A.10.c(6) has been allocated to the mobile vehicle emissions budgets. The results
42 of this modification are presented below.

43
44 **(i) Inventory: The emissions inventory was adjusted as shown below:**

45
46 in 2030: PM₁₀ was adjusted by adding 11.93 ton/day (tpd) of safety margin to
47 12.07 tpd inventory for a total of 24.00 tpd, and

48
49 NO_x was adjusted by adding 8.41 tpd of safety margin to 12.59 tpd
50 inventory for a total of 21.00 tpd,

1 **(ii) Modeling:**

2
3 The effect on the modeling results throughout the domain is summarized in the following
4 Table IX.A.10. 9 (which shows predicted concentrations in $\mu\text{g}/\text{m}^3$). It demonstrates that
5 with the allocation of the safety margin, the NAAQS is still maintained through 2030 in
6 all areas.
7

8
9 **Table IX.A.10. 9 Modeling of Attainment in 2030, Including the Portion of the Safety**
10 **Margin Allocated to Motor Vehicles**

11

Air Quality Monitor	Predicted Concentrations in 2030 $\mu\text{g}/\text{m}^3$	
	A	B
Hawthorne	113.0	120.1
Magna	81.1	82.5

12
13 **Notes:** Column A shows concentrations presented previously as part of the modeled attainment test.
14 Column B shows concentrations resulting from allocation of a portion of the safety margin.
15

16
17
18 **(7) Nonattainment Requirements Applicable Pending Plan Approval**

19
20 CAA 175A(c) - *Until such plan revision is approved and an area is redesignated as attainment,*
21 *the requirements of CAA Part D, Plan Requirements for Nonattainment Areas, shall remain in*
22 *force and effect.* The Act requires the continued implementation of the nonattainment area
23 control strategy unless such measures are shown to be unnecessary for maintenance or are
24 replaced with measures that achieve equivalent reductions. Utah will continue to implement the
25 emissions limitations and measures from the PM₁₀ SIP.
26

27
28 **(8) Revise in Eight Years**

29
30 CAA 175A(b) - *Eight years after redesignation, the State must submit an additional plan revision*
31 *which shows maintenance of the applicable NAAQS for an additional 10 years.* Utah commits to
32 submit a revised maintenance plan eight years after EPA takes final action redesignating the [Salt](#)
33 [Lake County](#) area to attainment, as required by the Act.
34

35
36 **(9) Verification of Continued Maintenance**

37
38 Implicit in the requirements outlined above is the need for the State to determine whether the area
39 is in fact maintaining the standard it has achieved. There are two complementary ways to
40 measure this: 1) by monitoring the ambient air for PM₁₀, and 2) by inventorying emissions of
41 PM₁₀ and its precursors from various sources.
42

43 The State will continue to maintain an ambient monitoring network for PM₁₀ in accordance with
44 40 CFR Part 58 and the Utah SIP. The State anticipates that the EPA will continue to review the

1 ambient monitoring network for PM₁₀ each year, and any necessary modifications to the network
2 will be implemented.

3
4 Additionally, the State will track and document measured mobile source parameters (e.g., vehicle
5 miles traveled, congestion, fleet mix, etc.) and new and modified stationary source permits. If
6 these and the resulting emissions change significantly over time, the State will perform
7 appropriate studies to determine: 1) whether additional and/or re-sited monitors are necessary,
8 and 2) whether mobile and stationary source emission projections are on target.

9
10 The State will also continue to collect actual emissions inventory data from all sources of PM₁₀,
11 SO₂, and NO_x in excess of 25 tons (in aggregate) per year, as required by R307-150.

12 13 14 15 **(10) Contingency Measures**

16
17 *CAA 175A(d) - Each maintenance plan shall contain contingency measures to assure that the*
18 *State will promptly correct any violation of the standard which occurs after the redesignation of*
19 *the area to attainment. Such provisions shall include a requirement that the State will implement*
20 *all control measures which were contained in the SIP prior to redesignation.*

21
22 Utah has implemented all measures contained in the nonattainment plan, however for the
23 purposes of this maintenance plan the list of stationary sources included in SIP Section IX. Part
24 H. was updated. Some of the sources identified in the nonattainment SIP are no longer
25 operational or no longer rise to the emission thresholds established for such inclusion. In such
26 instances, the emission limits belonging specifically to these sources were not carried forward.
27 Where such a source is still operational, the prior SIP limits from the nonattainment plan are
28 identified below as potential contingency measures. Some of the specific limits within may no
29 longer apply and would need to be reevaluated at that time.

30
31 This Contingency Plan for [Salt Lake County](#) supersedes Subsection IX.A.8, Contingency
32 Measures, which is part of the original PM₁₀ SIP.

33
34 The contingency plan must also ensure that the contingency measures are adopted expeditiously
35 once triggered. The primary elements of the contingency plan are: 1) the list of potential
36 contingency measures, 2) the tracking and triggering mechanisms to determine when
37 contingency measures are needed, and 3) a description of the process for recommending and
38 implementing the contingency measures.

39 40 **(a) Tracking**

41
42 The tracking plan for the Salt Lake County, Utah County, and Ogden City areas consists of
43 monitoring and analyzing PM₁₀ concentrations. In accordance with 40 CFR 58, the State will
44 continue to operate and maintain an adequate PM₁₀ monitoring network in Salt Lake County,
45 Utah County, and Ogden City.

46 47 48 **(b) Triggering**

49
50 Triggering of the contingency plan does not automatically require a revision to the SIP, nor does
51 it necessarily mean the area will be redesignated once again to nonattainment. Instead, the State
52 will normally have an appropriate timeframe to correct the potential violation with

1 implementation of one or more adopted contingency measures. In the event that violations
2 continue to occur, additional contingency measures will be adopted until the violations are
3 corrected.

4
5 Upon notification of a potential violation of the PM₁₀ NAAQS, the State will develop appropriate
6 contingency measures intended to prevent or correct a violation of the PM₁₀ standard.
7 Information about historical exceedances of the standard, the meteorological conditions related to
8 the recent exceedances, and the most recent estimates of growth and emissions will be reviewed.
9 The possibility that an exceptional event occurred will also be evaluated.

10
11 Upon monitoring a potential violation of the PM₁₀ NAAQS, including exceedances flagged as
12 exceptional events but not concurred with by EPA, the State will take the following actions.

- 13
14 • The State will identify the source(s) of PM₁₀ causing the potential violation, and report
15 the situation to EPA Region VIII within four months of the potential violation.
- 16
17 • The State will identify a means of corrective action within six months after a potential
18 violation. The maintenance plan contingency measures to be considered and selected
19 will be chosen from the following list or any other emission control measures deemed
20 appropriate based on a consideration of cost-effectiveness, emission reduction potential,
21 economic and social considerations, or other factors that the State deems appropriate:
 - 22
 - 23 - Re-evaluate the thresholds at which a red or yellow burn day is triggered, as
24 established in R307-302;
 - 25
 - 26 - Further controls on stationary sources; to include the prior SIP controls at the
27 following sources listed below:
 - 28
 - 29

30 **Prior SIP Source**
31 **Controls**

Reference to Prior SIP

32		
33	Crysen Refining (now Silver Eagle)	IX.H.2.b.L
34	Hercules (now ATK/Bacchus)	IX.H.2.b.S
35	Interstate Brick	IX.H.2.b.U
36	Kennecott / Barney's Canyon	IX.H.2.b.AA
37	LDS Welfare Square	IX.H.2.b.CC
38	LDS Hospital	IX.H.2.b.DD
39	Mountain Bell	IX.H.2.b.HH
40	Mountain Fuel, 100 S. 1078 W. (now Questar)	IX.H.2.b.II
41	Murray City Power	IX.H.2.b.KK
42	Utah Metal Works	IX.H.2.b.ZZ
43	V.A. Hospital	IX.H.2.b.CCC
44		
45		
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47 The State will then hold a public hearing to consider the contingency measures identified to
48 address the potential violation. The State will require implementation of such corrective action
49 no later than one year after a violation is confirmed. Any contingency measures adopted and
50 implemented will become part of the next revised maintenance plan submitted to the EPA for
51 approval.

1 It is also possible that contingency measures may be pre-implemented, where no violation of the
2 2006 PM₁₀ NAAQS has yet occurred.
3
4



State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQ-050-15

MEMORANDUM

TO: Air Quality Board

THROUGH: Bryce C. Bird, Executive Secretary

FROM: Bill Reiss, Environmental Engineer

DATE: August 21, 2015

SUBJECT: PROPOSE FOR PUBLIC COMMENT: **Repeal of Existing SIP Subsection IX.A.11 and Re-enact with SIP Subsection IX.A.11: PM₁₀ Maintenance Provisions for Utah County.**

Introduction:

This item concerns a proposed State Implementation Plan (SIP) revision to address Utah's three nonattainment areas for PM₁₀. These areas have been attaining the PM₁₀ standard for a long time, and this revision demonstrates that they will continue to do so through the year 2030.

The revision is structured as a maintenance plan, which will allow Utah to request that EPA change the area designations back to attainment for PM₁₀. These areas include Salt Lake County, Utah County, and Ogden City.

The existing SIP for PM₁₀ affecting Salt Lake and Utah Counties was adopted in 1991 and resulted in attainment of the 1987 National Ambient Air Quality Standards (NAAQS) in both areas by 1996. Since that time, PM_{2.5} has supplanted PM₁₀ as the indicator of fine particulate matter. Though PM₁₀ also includes the coarse fraction of PM, Utah's difficulties with PM₁₀ were characterized by the same winter time episodes that lead to elevated PM_{2.5} levels.

Essentially, this SIP revision would close the book on PM₁₀ and allow Utah to focus on meeting the PM_{2.5} standard. All three of the affected areas are currently designated nonattainment for PM_{2.5}.

Scope:

There are two parts to the SIP revision. (This) Section IX. Part A is the SIP document itself, and addresses the criteria necessary to request redesignation. It includes the actual Maintenance Plan, which includes the quantitative demonstration of continued attainment.

Some of the items addressed in Part A include:

- monitored attainment of the PM₁₀ NAAQS
- establishment of motor vehicle emission budgets for purposes of transportation conformity
- consideration of emission reduction credits, and
- contingency measures

The second piece is SIP Section IX, Part H. It includes the emission limits for certain specific stationary sources. Including these limits in the SIP makes them federally enforceable.

The list of stationary sources to be included in Part H was updated as part of this proposal. It includes sources located in any of the nonattainment areas with actual emissions (in 2011), or potentials to emit, that are at least 100 tons per year for PM₁₀, SO₂, or NO_x.

Using these criteria means that some sources will not be retained in the revised Part H, while other new sources, that did not exist when the original SIP was written, will be added.

SIP Organization:

As originally written in 1991, the PM₁₀ nonattainment SIP for Salt Lake and Utah Counties resides at Section IX.A. 1-8 of the Utah SIP. This plan had projected attainment of the NAAQS through the year 2003.

In 2005, Utah prepared a revision to the plan that showed continued attainment in **Utah County** through the year 2017. This revision, also structured as a maintenance plan, was placed into the SIP at Section **IX.A.11**. Subsections IX.A.10 and 12 were also added as the maintenance plan provisions for Salt Lake County and Ogden City respectively.

At this time, DAQ staff is proposing to replace each of these three subsections of the SIP in separate actions. Since there is a large amount of redundant material in the three documents, they have been prepared using color coding to denote which parts of each plan are specific to the respective nonattainment areas. In reviewing the proposals, the reader should note that **green text** is specific to the **Utah County** nonattainment area. Likewise, **blue text** and **purple text** are specific to Salt Lake County and Ogden City respectively.

Staff Recommendation: Staff recommends that the Board propose for public comment to repeal existing SIP Subsection **IX.A.11**, and re-enact with SIP Subsection **IX.A.11: PM₁₀ Maintenance Provisions for Utah County**, as proposed.

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UTAH

PM₁₀ Maintenance Provisions for Utah County

Section IX.A.11

Adopted by the Air Quality Board
December 2, 2015

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1
2 **Section IX.A.11**
3 **PM₁₀ Maintenance Provisions for Utah County**
4

5 **IX.A.11.a Introduction**

6
7 The State of Utah is requesting that the U.S. Environmental Protection Agency (EPA) redesignate
8 the Utah County nonattainment area to attainment status for the 24-hour PM₁₀ National Ambient
9 Air Quality Standard (NAAQS).

10
11 The foregoing Subsections 1-9 of Part IX.A of the Utah State Implementation Plans (SIP) were
12 written in 1991 to address violations of the NAAQS for PM₁₀ in both Utah County and Salt Lake
13 County. These areas were each classified as Initial Moderate PM₁₀ Nonattainment Areas, and as
14 such required “nonattainment SIPs” to bring them into compliance with the NAAQS by a
15 statutory attainment date. The control measures adopted as part of those plans have proven
16 successful in that regard, and at the time of this writing (2015) each of these areas continues to
17 show compliance with the federal health standards for PM₁₀.

18
19 This Subsection 11 of Part IX.A of the Utah SIP represents the second chapter of the PM₁₀ story
20 for Utah County, and demonstrates that the area has achieved compliance with the PM₁₀ NAAQS
21 and will continue to maintain that standard through the year 2030. As such, it is written in
22 accordance with Section 175A (42 U.S.C. 7505a) of the federal Clean Air Act (the Act), and
23 should serve to satisfy the requirement of Section 107(d)(3)(E)(iv) of the Act.

24
25 This section is hereafter referred to as the “Maintenance Plan” or “the Plan,” and contains the
26 maintenance provisions of the PM₁₀ SIP for Utah County.

27
28 While the Maintenance Plan could be written to replace all that had come before, it is presented
29 herein as an addendum to Subsections 1-9 in the interest of providing the reader with some sense
30 of historical perspective. Subsections 1-9 are retained for historical purposes, while existing
31 subsection 10 (transportation conformity for Utah County) is replaced with the maintenance
32 provisions for Salt Lake County. Transportation conformity for Utah County is herein replaced
33 with a more current evaluation of transportation conformity.

34
35 In a similar way, any references to the Technical Support Document (TSD) in this section means
36 actually Supplement IV-15 to the Technical Support Document for the PM₁₀ SIP.

37
38
39 **Background**

40
41 The Act requires areas failing to meet the federal ambient PM₁₀ standard to develop SIP revisions
42 with sufficient control requirements to expeditiously attain and maintain the standard. On July 1,
43 1987, EPA promulgated a new NAAQS for particulate matter with a diameter of 10 microns or
44 less (PM₁₀), and listed Utah County as a Group I area for PM₁₀. This designation was based on
45 historical data for the previous standard, total suspended particulate, and indicated there was a
46 95% probability the area would exceed the new PM₁₀ standard. Group I area SIPs were due in
47 April 1988, but Utah was unable to complete the SIP by that date. In 1989, several citizens
48 groups sued EPA (*Preservation Counsel v. Reilly*, civil Action (No. 89-C262-G (D, Utah)) for

1 failure to implement a Federal Implementation Plan (FIP) under provisions of §110(c)(1) of the
2 Clean Air Act (42 U.S.C. 7410(c)(1)).

3
4 A settlement agreement in January 1990 called for Utah to submit a SIP and for EPA to approve
5 it by December 31, 1991. In August 1991, the parties voluntarily agreed to dismiss the lawsuit
6 and the complaint and vacate the settlement agreement.

7
8 The Clean Air Act Amendments of November 1990 redesignated Group I areas as initial
9 moderate nonattainment areas and required that SIPs be submitted by November 15, 1991. These
10 moderate area SIPs were to require installation of Reasonably Available Control Measures
11 (RACM) on industrial sources by December 10, 1993 and a demonstration the NAAQS would be
12 attained no later than December 31, 1994.

13 14 **(1) The PM₁₀ SIP**

15
16 On November 14, 1991, Utah submitted a SIP for Salt Lake and Utah Counties that demonstrated
17 attainment of the PM₁₀ standards in Salt Lake and Utah Counties for 10 years, 1993 through
18 2003. EPA published approval of the SIP on July 8, 1994 (59 FR 35036).

19 20 **(2) Supplemental History of SIP Approval - PM₁₀**

21
22 Utah's SIP included two provisions that promised additional action by the state: 1) a road salting
23 and sanding program, and 2) a diesel vehicle emissions inspection and maintenance program.

24
25 On February 3, 1995, Utah submitted amendments to the SIP to specify the details of the road
26 salting and sanding program promised as a control measure. EPA published approval of the road
27 salting and sanding provisions on December 6, 1999 (64 FR 68031).

28
29 On February 6, 1996, Utah submitted to EPA a new SIP Section XXI, a diesel vehicle inspection
30 and maintenance program.

31
32 Also, in April 1992, EPA published the "General Preamble," describing EPA's views on
33 reviewing state SIP submittals. One of the requirements was that moderate nonattainment area
34 states must submit contingency plans by November 15, 1993.

35
36 On July 31, 1994, Utah submitted an amendment to the PM₁₀ SIP that required lowering the
37 threshold for calling no-burn days as a contingency measure for Salt Lake, Davis and Utah
38 Counties.

39
40 On July 18, 1997, EPA promulgated a new form of the PM₁₀ standard. As a way to simplify
41 EPA's process of revoking the old PM₁₀ standard, EPA requested on April 6, 1998, that Utah
42 withdraw its submittals of contingency measures. Utah submitted a letter requesting withdrawal
43 on November 9, 1998, and EPA returned the submittals on January 29, 1999.

44 45 **(3) Attainment of the PM₁₀ Standard and Reasonable Further Progress**

46
47 By statute, EPA was to determine whether Initial Moderate Areas were attaining the standard as
48 of December 31, 1994. This determination requires an examination of the three previous calendar
49 years of monitoring data (in this case 1992, 1993 and 1994). The 24-hour NAAQS allows no
50 more than three expected exceedances of the 24-hour standard at any monitor in this 3-year
51 period. Since the statutory deadline for the implementation of RACM was not until the end of
52 1993, it was reasonable to presume that the area might not be able to show attainment with a 3-

1 year data set until the end of 1996 even if the control measures were having the desired effect.
2 Presumably for this reason, Section 188(d) of the Act, (42 U.S.C. 7513(d)) allows a state to
3 request up to two 1-year extensions of the attainment date. In doing so, the state must show that
4 it has met all requirements of the SIP, that no more than one exceedance of the 24-hour PM₁₀
5 NAAQS has been observed in the year prior to the request, and that the annual mean
6 concentration for such year is less than or equal to the annual standard.

7
8 EPA's Office of Air Quality Planning and Standards issued a guidance memorandum concerning
9 extension requests (November 14, 1994), clarifying that the authority delegated to the
10 Administrator for extending moderate area attainment dates is discretionary. In exercising this
11 discretionary authority, it says, EPA will examine the air quality planning progress made in the
12 area, and in addition to the two criteria specified in Section 188(d), EPA will be disinclined to
13 grant an attainment date extension unless a state has, in substantial part, addressed its moderate
14 PM₁₀ planning obligations for the area. The EPA will expect the State to have adopted and
15 substantially implemented control measures submitted to address the requirement for
16 implementing RACM/RACT in the moderate nonattainment area, as this was the central control
17 requirement applicable to such areas. Furthermore it said, "EPA believes this request is
18 appropriate, as it provides a reliable indication that any improvement in air quality evidenced by a
19 low number of exceedances reflects the application of permanent steps to improve the air quality
20 in the region, rather than temporary economic or meteorological changes." As part of this
21 showing, EPA expected the State to demonstrate that the PM₁₀ nonattainment area has made
22 emission reductions amounting to reasonable further progress (RFP) toward attainment of the
23 NAAQS, as defined in Section 171(1) of the Act.

24
25 On May 11, 1995, Utah requested one-year extensions of the attainment date for both Salt Lake
26 and Utah Counties. On October 18, 1995, EPA sent a letter granting the requests for extensions,
27 and on January 25, 1996, sent a letter indicating that EPA would publish a rulemaking action on
28 the extension requests. **On March 27, 1996, Utah requested a second one-year extension for Utah**
29 **County.**

30
31 Along with the extension requests in 1995, Utah submitted a milestone report as required under
32 Section 172(1) of the Act, (42 U.S.C. 7501(1)) to assess progress toward attainment. This
33 milestone report addressed two issues: 1) that all control measures in the approved plan had been
34 implemented, and 2) that reasonable further progress (RFP) had been made toward attainment of
35 the standard in terms of reducing emissions. As defined in Section 171(1), RFP means such
36 annual incremental reductions in emissions of the relevant air pollutant as are required to ensure
37 attainment of the applicable NAAQS by the applicable date.

38
39 On June 18, 2001, EPA published notice in the Federal Register (66 FR 32752) that Utah's
40 extension requests were granted, that Salt Lake County attained the PM₁₀ standard by December
41 31, 1995, and that Utah County attained the standard by December 31, 1996. The notice stated
42 that these areas remain moderate nonattainment areas and are not subject to the additional
43 requirements of serious nonattainment areas.

44 45 46 **IX.A.11.b Pre-requisites to Area Redesignation**

47
48 Section 107(d)(3)(E) of the Act outlines five requirements that must be satisfied in order that a
49 state may petition the Administrator to redesignate a nonattainment area back to attainment.
50 These requirements are summarized as follows: 1) the Administrator determines that the area has

1 attained the applicable NAAQS, 2) the Administrator has fully approved the applicable
 2 implementation plan for the area under §110(k) of the Act, 3) the Administrator determines that
 3 the improvement in air quality is due to permanent and enforceable reductions in emissions
 4 resulting from implementation of the applicable implementation plan ... and other permanent and
 5 enforceable reductions, 4) the Administrator has fully approved a maintenance plan for the area
 6 as meeting the requirements of §175A of the Act, and 5) the State containing such area has met
 7 all requirements applicable to the area under §110 and Part D of the Act.

8
 9 Each of these requirements will be addressed below. Certainly, the central element from this list
 10 is the maintenance plan found at Subsection IX.A.11.c below. Section 175A of the Act contains
 11 the necessary requirements of a maintenance plan, and EPA policy based on the Act requires
 12 additional elements in order that such plan be federally approvable. Table IX.A.11. 1 identifies
 13 the prerequisites that must be fulfilled before a nonattainment area may be redesignated to
 14 attainment under Section 107(d)(3)(E) of the Act.

15
 16

Table IX.A.11. 1 Prerequisites to Redesignation in the Federal Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Attainment of Standard	Three consecutive years of PM ₁₀ monitoring data must show that violations of the standard are no longer occurring.	CAA §107(d)(3)(E)(i)	IX.A.11.b(1)
Approved State Implementation Plan	The SIP for the area must be fully approved.	CAA §107(d)(3)(E)(ii)	IX.A.11.b(2)
Permanent and Enforceable Emissions Reductions	The State must be able to reasonably attribute the improvement in air quality to emission reductions that are permanent and enforceable	CAA §107(d)(3)(E)(iii), Calcagni memo (Sect 3, para 2)	IX.A.11.b(3)
Section 110 and Part D requirements	The State must verify that the area has met all requirements applicable to the area under section 110 and Part D.	CAA: §107(d)(3)(E)(v), §110(a)(2), Sec 171	IX.A.11.b(4)
Maintenance Plan	The Administrator has fully approved the Maintenance Plan for the area as meeting the requirements of CAA §175A	CAA: §107(d)(3)(E)(iv)	IX.A.11.b(5) and IX.A.11.c

17
 18
 19 **(1) The Area Has Attained the PM₁₀ NAAQS**

20 CAA 107(d)(3)(E)(i) - *The Administrator determines that the area has attained the national*
 21 *ambient air quality standard.* To satisfy this requirement, the State must show that the area is
 22 attaining the applicable NAAQS. According to EPA's guidance concerning area redesignations
 23 (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni to
 24 Regional Air Directors, September 4, 1992 [or, Calcagni]), there are generally two components
 25 involved in making this demonstration. The first relies upon ambient air quality data which
 26 should be representative of the area of highest concentration and should be collected and quality
 27 assured in accordance with 40 CFR 58. The second component relies upon supplemental air
 28 quality modeling. Each will be discussed in turn.

29 **(a) Ambient Air Quality Data (Monitoring)**
 30

1 In 1987 EPA promulgated the National Ambient Air Quality Standard (NAAQS) for PM₁₀. The
2 NAAQS for PM₁₀ is listed in 40 CFR 50.6 along with the criteria for attaining the standard. The
3 24-hour NAAQS is 150 micrograms per cubic meter (ug/m³) for a 24-hour period, measured from
4 midnight to midnight. The 24-hour standard is attained when the expected number of days per
5 calendar year with a 24-hour average concentration above 150 ug/m³, as determined in
6 accordance with Appendix K to that part, is equal to or less than one. In other words, each
7 monitoring site is allowed up to three expected exceedances of the 24-hour standard within a
8 period of three calendar years. More than three expected exceedances in that three-year period is
9 a violation of the NAAQS.

10
11 There also had been an annual standard of 50 ug/m³. The annual standard was attained if the
12 three-year average of individual annual averages was less than 50 ug/m³. Utah never violated the
13 annual standard at any of its monitoring stations, and the annual average was not retained as a
14 PM₁₀ standard when the NAAQS was revised in 2006. Nevertheless, an annual average still
15 provides a useful metric to evaluate long-term trends in PM₁₀ concentrations here in Utah where
16 short-term meteorology has such an influence on high 24-hour concentrations during the winter
17 season.

18
19 40 CFR 58 Appendix K, Interpretation of the National Ambient Air Quality Standards for
20 Particulate Matter, acknowledges the uncertainty inherent in measuring ambient PM₁₀
21 concentrations by specifying that an *observed exceedance* of the (150 ug/m³) 24-hour health
22 standard means a daily value that is above the level of the 24-hour standard after rounding to the
23 nearest 10 ug/m³ (e.g., values ending in 5 or greater are to be rounded up).

24
25 The term *expected exceedance* accounts for the possibility of missing data. Missing data can
26 occur when a monitor is being repaired, calibrated, or is malfunctioning, leaving a time gap in the
27 monitored readings. EPA discounts these gaps if the highest recorded PM₁₀ reading at the
28 affected monitor on the day before or after the gap is not more than 75 percent of the standard,
29 and no measured exceedance has occurred during the year.

30
31 Expected exceedances are calculated from the Aerometric Information and Retrieval System
32 (AIRS) data base according to procedures contained in 40 CFR Part 50, Appendix K. The State
33 relied on the expected exceedance values contained in the AIRS Quick Look Report (AMP 450)
34 to determine if a violation of the standard had occurred.

35
36 Data may also be flagged when circumstances indicate that it would represent an outlier in the
37 data set and not be indicative of the entire airshed or the efforts to reasonably mitigate air
38 pollution within. Appendix N to Part 50 – “Interpretation of the National Ambient Air Quality
39 Standards for Particulate Matter” anticipates this and states: “Data resulting from uncontrollable
40 or natural events, for example structural fires or high winds, may require special consideration.
41 In some cases, it may be appropriate to exclude these data because they could result in
42 inappropriate values to compare with the levels of the PM standards.” The protocol for data
43 handling dictates that flagging is initiated by the state or local agency, and then the EPA either
44 concurs or indicates that it has not concurred. Some discussion will be provided to help the
45 reader understand the occasional occurrence of wind-blown dust events that affect these
46 nonattainment areas, and how the resulting data should be interpreted with respect to the control
47 measures enacted to address the 24-hour NAAQS.

48
49 Using the criteria from 40 CFR 58 Appendix K, data was compiled for all PM₁₀ monitors
50 within the **Utah County** nonattainment area that recorded a four-year data set comprising the
51 years 2011 – 2014. For each monitor, the number of expected exceedances is reported for each
52 year, and then the average number of expected exceedances is reported for the overlapping three-

1 year periods. If this average number of expected exceedances is less than or equal to 1.0, then
 2 that particular monitor is said to be in compliance with the 24-hour standard for PM₁₀. In order
 3 for an area to be in compliance with the NAAQS, every monitor within that area must be in
 4 compliance.

5
 6 As illustrated in the table below, the results of this exercise show that the **Utah County** PM₁₀
 7 nonattainment area is presently attaining the NAAQS.

8
 9 **Table IX.A.11. 2 PM₁₀ Compliance in Utah County, 2011-2014**

10

Lindon 49-049-4001	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	0.0 / 0.0*	0.0 / 0.0*

11

North Provo 49-049-0002	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	0.0 / 0.0*	0.0 / 0.0*

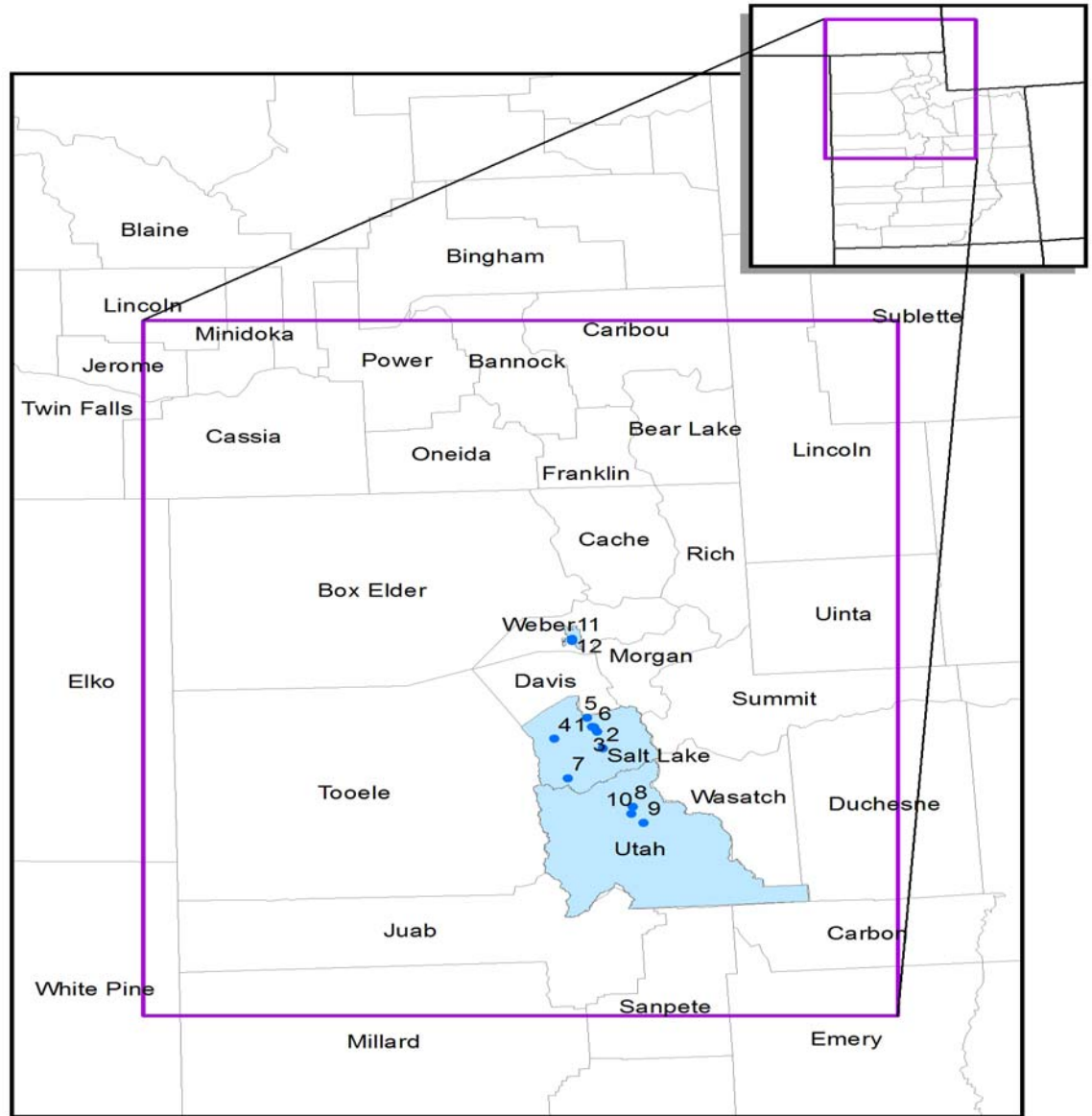
12
 13 * The second set of numbers shows what would be the effect of including all of the data that has
 14 been flagged by DAQ and not yet concurred with by EPA.

15
 16 **(b) PM₁₀ Monitoring Network**

17
 18 The overall assessments made in the preceding paragraph were based on data collected at
 19 monitoring stations located throughout the nonattainment area. The Utah DAQ maintains a
 20 network of PM₁₀ monitoring stations in accordance with 40 CFR 58. These stations are referred
 21 to as SLAMS sites, meaning that they are State and Local Air Monitoring Stations. In
 22 consultation with EPA, an Annual Monitoring Network Plan is developed to address the
 23 adequacy of the monitoring network for all criteria pollutants. Within the network, individual
 24 stations may be situated so as to monitor large sources of PM₁₀, capture the highest
 25 concentrations in the area, represent residential areas, or assess regional concentrations of PM₁₀.
 26 Collectively, these monitors make up Utah's PM₁₀ monitoring network. The following
 27 paragraphs describe the network in each of Utah's three nonattainment areas for PM₁₀.

28
 29 Provided in Figure IX.A.11. 1 is a map of the modeling domain that shows the existing PM₁₀
 30 nonattainment areas and the locations of the monitors therein. Some of the monitors at these
 31 locations are no longer operational, but they have been included for informational purposes.

1 **Figure IX.A.11.1 Modeling Domain**



2
3 The following PM₁₀ monitoring stations operated in the Salt Lake County PM₁₀ nonattainment
4 area from 1985 through 2015. They are numbered as they appear on the map:
5

- 6 1. Air Monitoring Center (AMC) (AIRS number 49-035-0010): This site was located in an
7 urban city center, near an area of high vehicle use. It was closed in 1999 when DAQ lost
8 its lease on the building.
9
- 10 2. Cottonwood (AIRS number 49-035-0003): This site was located in a suburban
11 residential area. It collected data from 1986 - 2011. It was closed in 2011 due to siting
12 criteria violations as well as safety concerns.
13
- 14 3. Hawthorne (AIRS number 49-035-3006): This site is located in a suburban residential
15 area. It began collecting data in 1997 and is the NCORE site for Utah.

- 1
- 2 4. Magna (AIRS number 49-035-1001): This site is located in a suburban residential area.
- 3 It was historically impacted periodically by blowing dust from a large tailings
- 4 impoundment, and as such is anomalous with respect to the typical wintertime scenario
- 5 that otherwise characterizes the nonattainment area. It has been collecting data since
- 6 1987.
- 7
- 8 5. North Salt Lake (AIRS number 49-035-0012): This site was located in an industrial area
- 9 that is impacted by sand and gravel operations, freeway traffic, and several refineries. It
- 10 was near a residential area as well. It collected data from 1985 - 2013. The monitor was
- 11 situated over a sewer main, and service of that main required its removal in September
- 12 2013, and following the service, the site owner did not allow the monitor to return.
- 13
- 14 6. Salt Lake City (AIRS number 49-035-3001): This site was situated in an urban city
- 15 center. It was discontinued in 1994 because of modifications that were made to the air
- 16 conditioning on the roof-top.
- 17
- 18 7. Herriman #3 (AIRS number 49-035-3012): This site is located in a suburban residential
- 19 area. It began collecting data in 2015.
- 20
- 21

22 The following PM₁₀ monitoring stations operated in the Utah County PM₁₀ nonattainment area
23 from 1985 through 2015. They are numbered as they appear on the map:

- 24
- 25 8. Lindon (AIRS number 49-049-4001): This site is designed to measure population
- 26 exposure to PM₁₀. It is located in a suburban residential area affected by both industrial
- 27 and vehicle emissions. PM₁₀ has been measured at this site since 1985, and the readings
- 28 taken here have consistently been the highest in Utah County. Area source emissions,
- 29 primarily wood smoke, also affect the site.
- 30
- 31 9. North Provo (AIRS number 49-049-0002): This is a neighborhood site in a mixed
- 32 residential-commercial area in Provo, Utah. It began collecting data in 1986.
- 33
- 34 10. West Orem (AIRS number 49-049-5001): This site was originally located in a residential
- 35 area adjacent to a large steel mill which has since closed. It is a neighborhood site. It
- 36 was situated based on computer modeling, and has historically reported high PM₁₀
- 37 values, but not consistently as high as those observed at the Lindon site. The site was
- 38 closed at the end of 1997 for this reason.
- 39

40 The following PM₁₀ monitoring stations operated in the Ogden City PM₁₀ nonattainment area
41 from 1986 through 2015. They are numbered as they appear on the map:

- 42
- 43 11. Ogden 1 (AIRS number 49-057-0001): This site was situated in an urban city center. It
- 44 was discontinued in 2000 because DAQ lost its lease on the building.
- 45
- 46 12. Ogden 2 (AIRS number 49-057-0002): This site began collecting data in 2001, as a
- 47 replacement for the Ogden 1 location. It, too, is situated in an urban city center.
- 48

49 (c) **Modeling Element**

50

1 EPA guidance concerning redesignation requests and maintenance plans (Calcagni) discusses the
2 requirement that the area has attained the standard, and notes that air quality modeling may be
3 necessary to determine the representativeness of the monitored data.

4
5 Information concerning PM₁₀ monitoring in Utah is included in the Annual Monitoring Network
6 Review and The 5 Year Network Plan. Since the early 1980's, the network review has been
7 updated annually and submitted to EPA for approval. EPA has concurred with the annual
8 network reviews and agreed that the PM₁₀ network is adequate. EPA personnel have also visited
9 the monitor sites on several occasions to verify compliance with federal siting requirements.
10 Therefore, additional modeling will not be necessary to determine the representativeness of the
11 monitored data.

12
13 The Calcagni memo goes on to say that areas that were designated nonattainment based on
14 modeling will generally not be redesignated to attainment unless an acceptable modeling analysis
15 indicates attainment.

16
17 Though none of Utah's three PM₁₀ nonattainment areas was designated based on modeling,
18 Calcagni also states that (when dealing with PM₁₀) dispersion modeling will generally be
19 necessary to evaluate comprehensively sources' impacts and to determine the areas of expected
20 high concentrations based upon current conditions. Air quality modeling was conducted for the
21 purpose of this maintenance demonstration. It shows that all three nonattainment areas are
22 presently in compliance, and will continue to comply with the PM₁₀ NAAQS through the year
23 2030.

24
25 **(d) EPA Acknowledgement**

26
27 The data presented in the preceding paragraphs shows quite clearly that the Utah County PM₁₀
28 nonattainment area is attaining the NAAQS. As discussed before, the EPA acknowledged in the
29 Federal Register that both Utah County and Salt Lake County had already attained.

30
31 On June 18, 2001, EPA published notice in the Federal Register (66 FR 32752) that Utah's
32 extension requests were granted, and that Utah County attained the standard by December 31,
33 1996. The notice stated that the area would remain a moderate nonattainment area and would
34 not be subject to the additional requirements of serious nonattainment areas.

35
36
37 **(2) Fully Approved Attainment Plan for PM₁₀**

38 CAA 107(d)(3)(E)(ii) - *The Administrator has fully approved the applicable implementation plan*
39 *for the area under section 110(k).*

40 On November 14, 1991, Utah submitted a SIP for Salt Lake and Utah Counties that demonstrated
41 attainment for Salt Lake and Utah Counties for 10 years, 1993 through 2003. EPA published
42 approval of the SIP on July 8, 1994 (59 FR 35036).

43 On July 3, 2002, Utah submitted a PM₁₀ SIP revision for Utah County. It revised the existing
44 attainment demonstration in the approved PM₁₀ SIP based on a short-term emissions inventory,
45 established 24-hour emission limits for the major stationary sources in the Utah County
46 nonattainment area, and established motor vehicle emission budgets based on EPA's most recent
47 mobile source emissions model, MOBILE6. It demonstrated attainment in the Utah County
48 nonattainment area through 2003. The revised attainment demonstration extended through the

1 year 2003. EPA published approval of this SIP revision on December 23, 2002 (67 FR 78181).
2 It became effective on January 22, 2003.

3 Also, on March 9, 2015, Utah submitted a revision to the SIP, adding a new rule regarding
4 trading of motor vehicle emission budgets (MVEB) for Utah County. The rule allows trading
5 from the motor vehicle emissions budget for primary PM₁₀ to the motor vehicle emissions budget
6 for nitrogen oxides (NO_x), which is a PM₁₀ precursor. The resulting motor vehicle emissions
7 budgets for NO_x and PM₁₀ may then be used to demonstrate transportation conformity with the
8 SIP. The rule was approved by EPA and became effective on July 17, 2015.

9
10 **(3) Improvements in Air Quality Due to Permanent and Enforceable Reductions in**
11 **Emissions**

12
13 CAA 107(d)(3)(E)(iii) - *The Administrator determines that the improvement in air quality is due*
14 *to permanent and enforceable reductions in emissions resulting from implementation of the*
15 *applicable implementation plan and applicable Federal air pollutant control regulations and*
16 *other permanent and enforceable reductions. Speaking further on the issue, EPA guidance*
17 *(Calcagni) reads that the State must be able to reasonably attribute the improvement in air quality*
18 *to emission reductions which are permanent and enforceable. In the following sections, both the*
19 *improvement in air quality and the emission reductions themselves will be discussed.*

20
21 **(a) Improvement in Air Quality**

22
23 The improvement in air quality with respect to PM₁₀ can be shown in a number of ways.
24 Improvement, in this case, is relative to the various control strategies that affected the airshed.

25
26 For the **Utah County nonattainment area**, these control measures were implemented as the result
27 of the nonattainment PM₁₀ SIP promulgated in 1991. As discussed below, the actual
28 implementation of the control strategies required therein first exhibits itself in the observable data
29 in 1994. The ambient air quality data presented below includes values prior to 1994 in order to
30 give a representation of the air quality prior to the application of any control measures. It then
31 includes data collected from then until the present time to illustrate the effect of these controls. In
32 considering the data presented below, it is important to keep this distinction in mind: data through
33 1993 represents pre-SIP conditions, and data collected from 1994 through the present represents
34 post-SIP conditions.

35
36 Additionally, a downturn in the economy is clearly not responsible for the improvement in
37 ambient particulate levels in Salt Lake County, Utah County, and Ogden City areas. From 2001
38 to present, the areas have experienced strong growth while at the same time achieving continuous
39 attainment of the 24-hour and annual PM₁₀ NAAQS. Data was analyzed for the Salt Lake City
40 Metropolitan Statistical Area from the US Department of Commerce, Bureau of Economic
41 Analysis. According to this data, job growth from 2011 through 2013 increased by 5.5 percent,
42 population increased by 3 percent, and personal income increased by approximately 10 percent.
43 The estimated VMT increase was 12 percent from 2011 to present.

44
45 Expected Exceedances – Referring back to the discussion of the PM₁₀ NAAQS in Subsection
46 IX.A.11.b(1), it is apparent that the number of expected exceedances of the 24-hour standard is an
47 important indicator. As such, this information has been tabulated for each of the monitors located
48 in each of the nonattainment areas. The data in Table IX.A.11. 3 below reveals a marked decline

1 in the number of these expected exceedances, and therefore that the **Utah County** PM₁₀
 2 nonattainment area has experienced significant improvements in air quality. The gray cells
 3 indicate that the monitor was not in operation. This improvement is especially revealing in light
 4 of the significant growth experienced during this same period in time.

5
6
7 **Table IX.A.11.3 Utah County: Expected Exceedances Per-Year, 1986-2014**
8

Utah County Nonattainment Area		
Monitor:	North Provo	Lindon
1986		
1987	0.0	0.0
1988	2.0	15.9
1989	8.0	22.2
1990	0.0	0.0
1991	7.3	11.7
1992	3.1	5.3
1993	4.1	5.2
1994	0.0	0.0
1995	0.0	0.0
1996	0.0	0.0
1997	0.0	0.0
1998	0.0	0.0
1999	0.0	0.0
2000	0.0	0.0
2001	0.0	0.0
2002	0.0	1.0
2003	0.0	0.0
2004	0.0	1.0
2005	0.0	0.0
2006	0.0	0.0
2007	0.0	0.0
2008	0.0	4.0
2009	0.0	2.1
2010	3.5	1.0
2011	0.0	0.0
2012	0.0	0.0
2013	0.0	0.0
2014	0.0	0.0

9
10
11
12
13 As discussed before in section IX.A.10.b(1), the number of expected exceedances may include
14 data which had been flagged by DAQ as being influenced by an exceptional event; most
15 typically, a wind-blown dust event. Data is flagged when circumstances indicate that it would

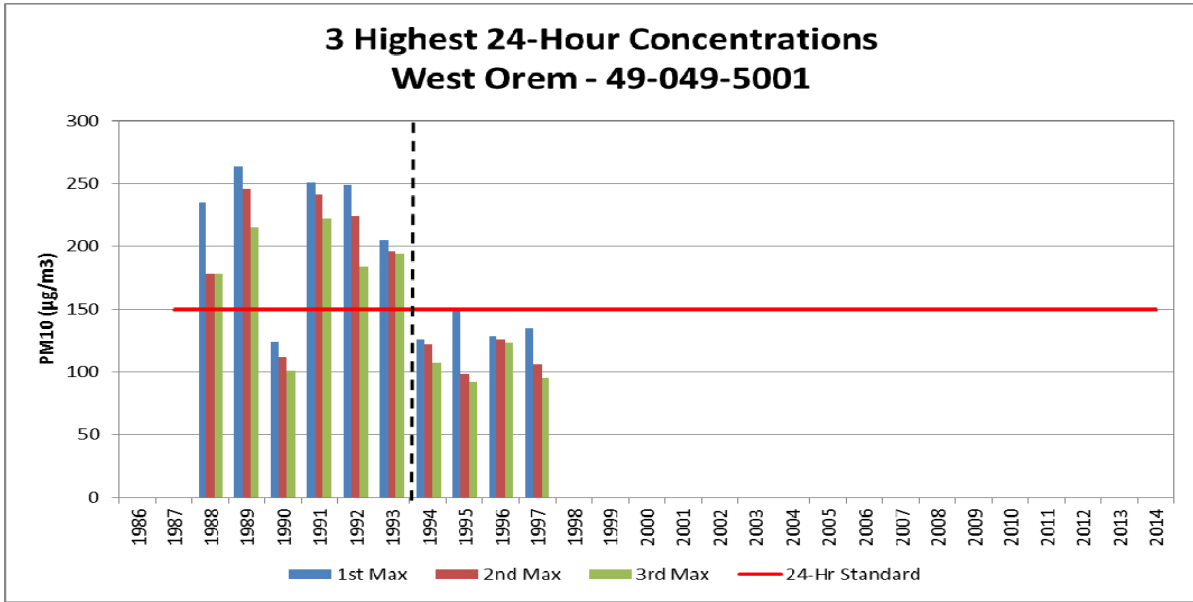
1 represent an outlier in the data set and not be indicative of the entire airshed or the efforts to
2 reasonably mitigate air pollution within.
3
4

5 As such two things should be noted: 1) The focus of the control strategy developed for the 1991
6 PM₁₀ SIP was directed at episodes characterized by wintertime temperature inversions, elevated
7 concentrations of secondary aerosol, and low wind speed. Under these conditions, blowing dust
8 is generally nonexistent. Therefore, in evaluating the effectiveness of these types of controls, the
9 inclusion of several high wind events may bias the conclusion. 2) Even with the inclusion of
10 these values, the conclusion remains essentially the same; that since 1994 when the 1991 SIP
11 controls were fully implemented, there has been a marked improvement in monitored air quality.
12
13

14 Highest Values – Also indicative of improvement in air quality with respect to the 24-hour
15 standard, is the magnitude of the excessive concentrations that are observed. This is illustrated in
16 Figures IX.A.11. 2-4, which show the three highest 24-hour concentrations observed at each
17 monitor in a particular year.
18
19

1
2
3

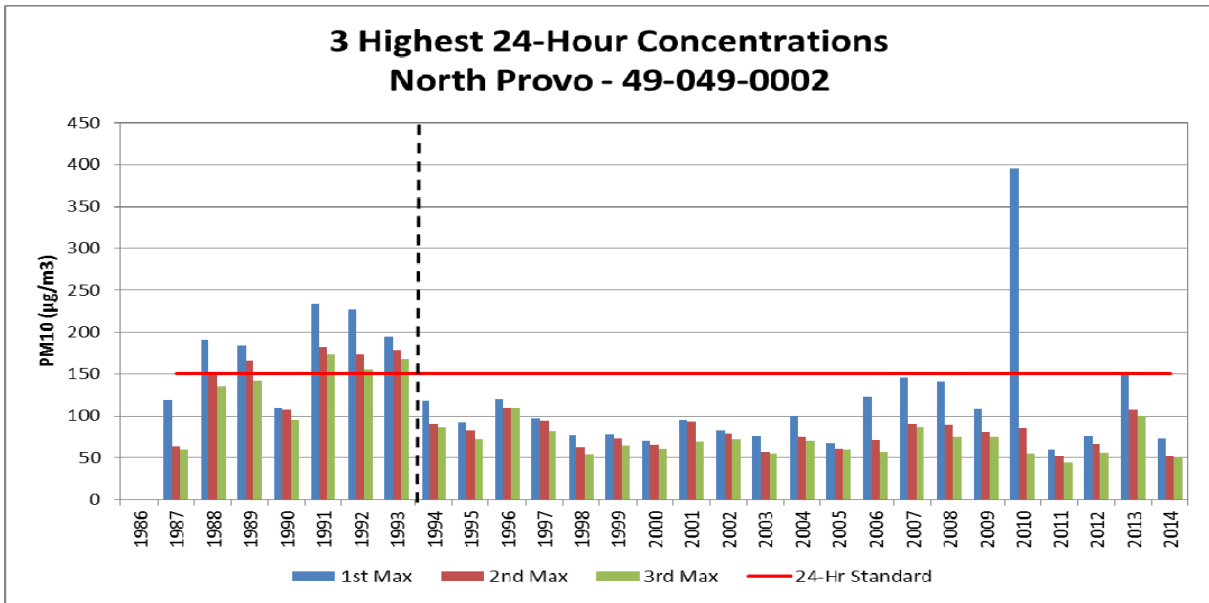
Figure IX.A.11.2 3 Highest 24-hr PM₁₀ Concentrations; West Orem



4
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9
10

(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

Figure IX.A.11.3 3 Highest 24-hr PM₁₀ Concentrations; North Provo

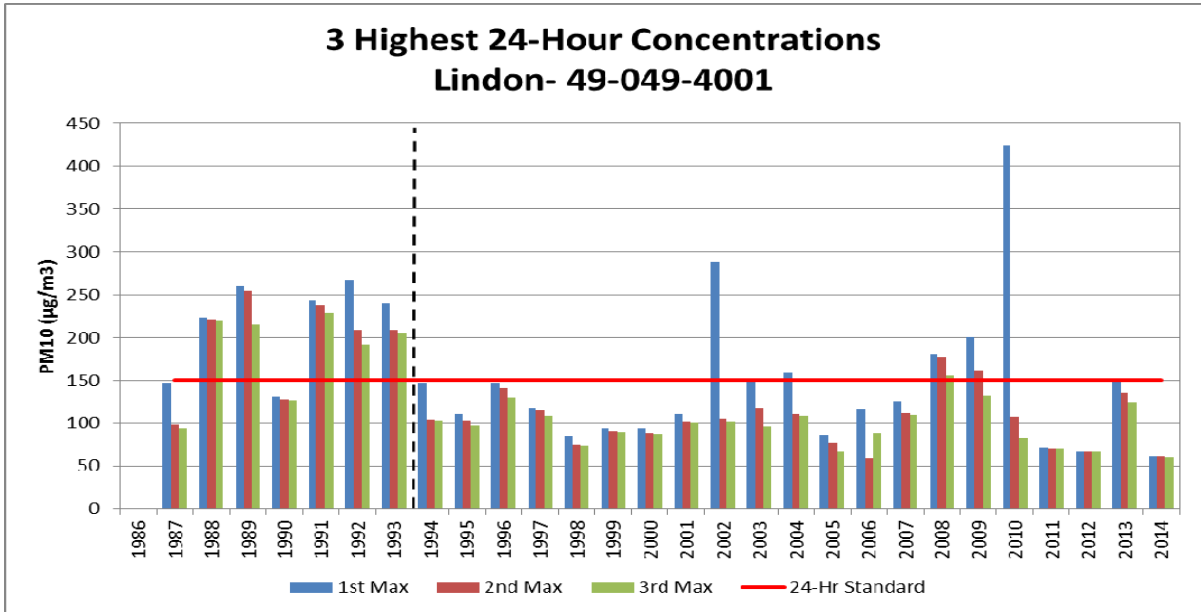


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(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

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Figure IX.A.11. 4 3 Highest 24-hr PM₁₀ Concentrations; Lindon



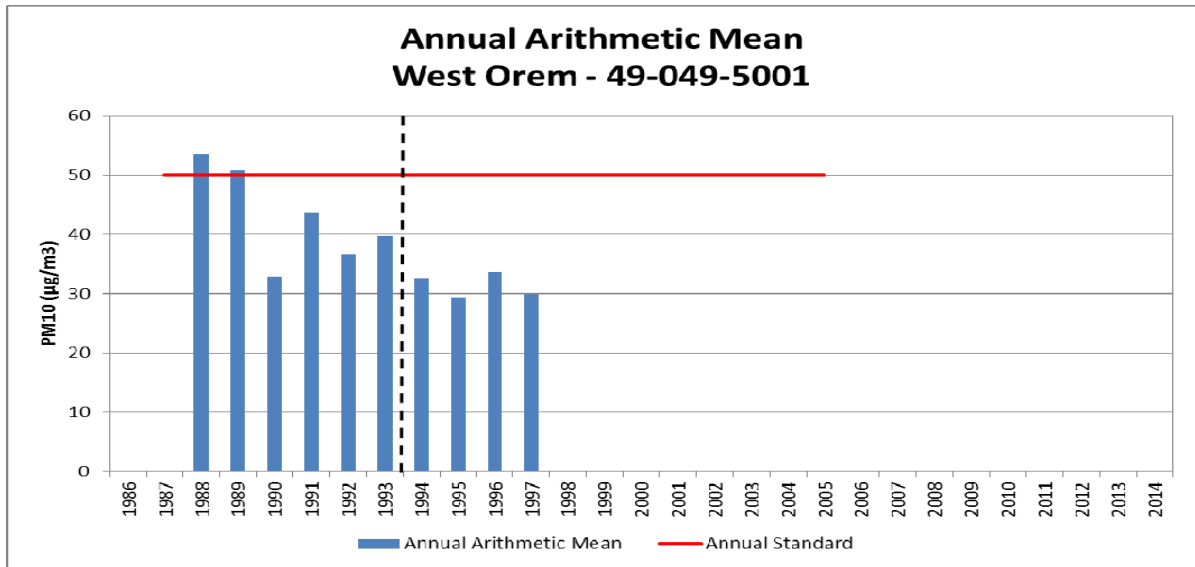
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14

(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

Again there is a noticeable improvement in the magnitude of these concentrations. It must be kept in mind, however, that some of these concentrations may have resulted from windblown dust events that occur outside of the typical scenario of wintertime air stagnation. As such, the effectiveness of any control measures directed at the precursors to PM₁₀ would not be evident.

1
2 Annual Mean – Although there is no longer an annual PM₁₀ standard, the annual arithmetic mean
3 is also a significant parameter to consider. This is especially so given one of the assumptions
4 made in the original nonattainment SIP for Utah County. The SIP was developed to address the
5 24-hour standard for PM₁₀, but it was assumed that by controlling for the wintertime 24-hour
6 standard, the annual arithmetic mean concentrations would also be reduced such that the annual
7 standard would be protected (even though it had never been violated). Annual arithmetic means
8 have been plotted in Figures IX.A.11. 5-7, and the data reveals a noticeable decline in the values
9 of these annual means. This supports the validity of the assumption made in the SIP, and
10 indicates that there have been significant improvements in air quality in the Utah County
11 nonattainment area.
12
13
14

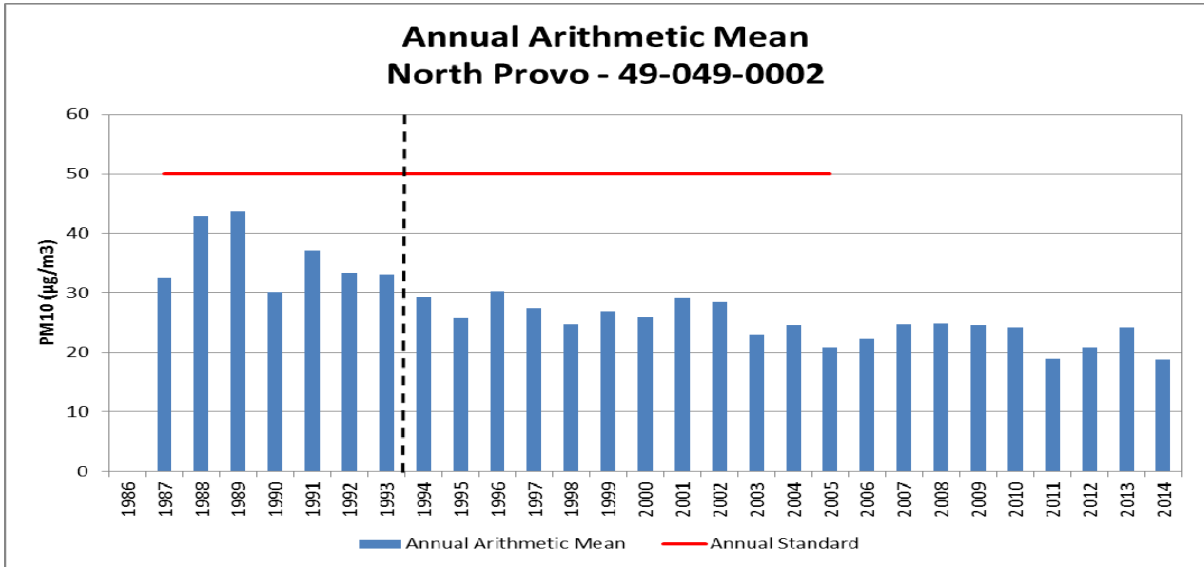
15 **Figure IX.A.11. 5 Annual Arithmetic Mean; West Orem**
16



17
18
19 (Vertical dotted line indicates complete implementation of 1991 SIP control measures.)
20

1
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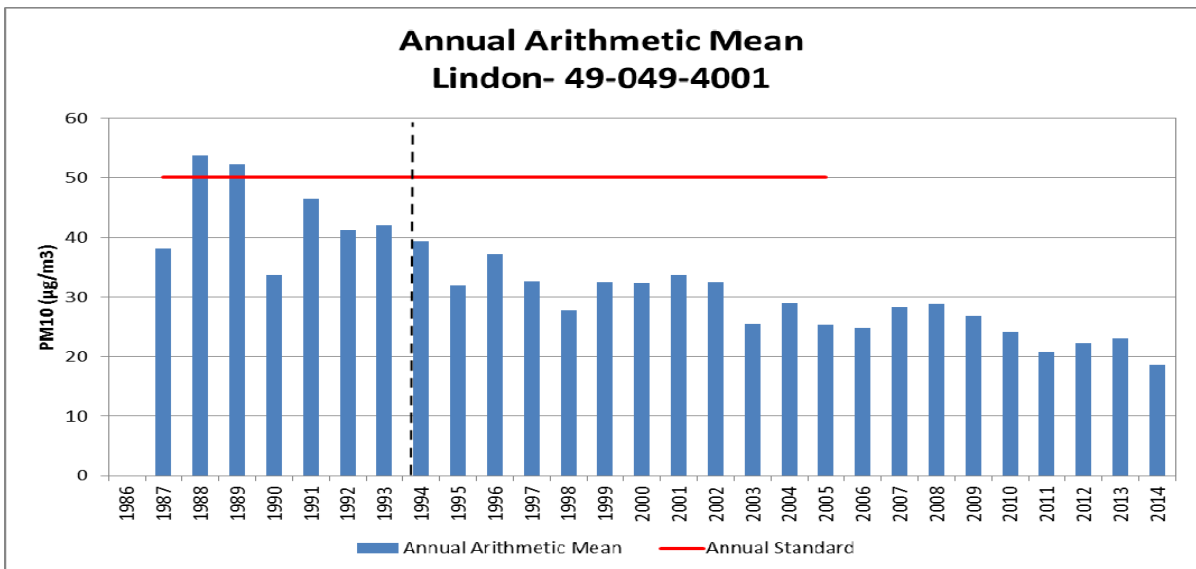
Figure IX.A.11. 6 Annual Arithmetic Mean; North Provo



4
5
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12
13
14

(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

Figure IX.A.11. 7 Annual Arithmetic Mean; Lindon



15
16
17
18
19
20

(Vertical dotted line indicates complete implementation of 1991 SIP control measures.)

1 As with the number of expected exceedances and the three highest values, the data in Figures
2 IX.A.11. 5-7 may include data which had been flagged by DAQ as being influenced by wind-
3 blown dust events. Nevertheless, the annual averaging period tends to make these data points less
4 significant. The downward trend of these annual mean values is truly indicative of improvements
5 in air quality, particularly during the winter inversion season.

6
7
8 **(b) Reduction in Emissions**
9

10 As stated above, EPA guidance (Calcagni) says that the State must be able to reasonably attribute
11 the improvement in air quality to emission reductions that are permanent and enforceable. In
12 making this showing, the State should estimate the percent reduction (from the year that was used
13 to determine the design value) achieved by Federal measures such as motor vehicle control, as
14 well as by control measures that have been adopted and implemented by the State.

15
16 In **Utah County**, the design values at each of the representative monitors were measured in 1988
17 or 1989 (see SIP Subsections IX.A.3-5).

18
19 As mentioned before, the ambient air quality data presented in Subsection IX.A.11.b(3)(a) above
20 includes values prior to these dates in order to give a representation of the air quality prior to the
21 application of any control measures. It then includes data collected from then until the present
22 time to illustrate the lasting effect of these controls. In discussing the effect of the controls, as
23 well as the control measures themselves, however, it is important to keep in mind the time
24 necessary for their implementation.

25
26 The nonattainment SIPs for all initial moderate PM₁₀ nonattainment areas included a statutory
27 date for the implementation of reasonably available control measures (RACM), which includes
28 reasonably available control technologies (RACT). This date was December 10, 1993 (Section
29 189(a) CAA). Thus, 1994 marked the first year in which these control measures were reflected in
30 the emissions inventories for **Utah County**.

31
32 The nonattainment SIP for the **Utah County** PM₁₀ nonattainment area included control strategies
33 for stationary sources and area sources (including controls for woodburning, mobile sources, and
34 road salting and sanding) of primary PM₁₀ emissions as well as sulfur oxide (SO_x) and nitrogen
35 oxide (NO_x) emissions, which are secondary sources of particulate emissions. This is discussed
36 in SIP Subsection IX.A.6, and was reflected in the attainment demonstration presented in
37 Subsection IX.A.3.

38
39 The RACM control measures prescribed by the nonattainment SIP and their subsequent
40 implementation by the State were discussed in more detail in a milestone report submitted for the
41 area.

42
43 Section 189(c) of the CAA identifies, as a required plan element, quantitative milestones which
44 are to be achieved every 3 years, and which demonstrate reasonable further progress (RFP)
45 toward attainment of the standard by the applicable date. As defined in CAA Section 171(1), the
46 term *reasonable further progress* has the meaning of such annual incremental reductions in
47 emissions of the relevant air pollutant as are required by Part D of the Act for the purpose of
48 ensuring attainment of the NAAQS by the applicable date.

49
50 Hence, the milestone report must demonstrate that all measures in the approved nonattainment
51 SIP have been implemented and that the milestone has been met. In the case of initial moderate
52 areas for PM₁₀, this first milestone had the meaning of all control measures identified in the plan

1 being sufficient to bring the area into compliance with the NAAQS by the statutory attainment
2 date of December 31, 1994.

3
4 Section 188(d) of the Act allows States to petition the Administrator for up to two one-year
5 extensions of the attainment date, provided that all SIP elements have been implemented and that
6 the ambient data collected in the area during the year preceding the extension year indicates that
7 the area is on-target to attain the NAAQS. Presumably this is because the statutory attainment
8 date for initial moderate PM₁₀ nonattainment areas occurred only one year after the statutory
9 implementation date for RACM, the central control element of all implementation plans for such
10 areas, and because three consecutive years of clean ambient data are needed to determine that an
11 area has attained the standard. Because the milestone report and the request for extension of the
12 attainment date both required a demonstration that all SIP elements had been implemented, as
13 well as a showing of RFP, Utah combined these into a single analysis.

14
15 Utah's actions to meet these requirements and EPA's subsequent review thereof are discussed in
16 a Federal Register notice from Monday, June 18, 2001 (66 FR 32752). In this notice, EPA
17 granted two one-year extensions of the attainment date for the Utah County PM₁₀ nonattainment
18 area and determined that the area had attained the PM₁₀ NAAQS by December 31, 1996. The key
19 elements of that FR notice are reiterated below.

20
21 On May 11, 1995, Utah submitted a milestone report as required by sec.189(c)(2). On Sept.29,
22 1995, Utah submitted a revised version of the milestone report. It estimated current emissions
23 from all source categories covered by the SIP, and compared those to actual emissions from 1988.
24 Based on information the State submitted in 1995, EPA believes that Utah was in substantial
25 compliance with the requirements and commitments in the SIP for the Utah County PM₁₀
26 nonattainment area when Utah submitted its first extension request. The milestone report
27 indicates that Utah had implemented most of its adopted control measures, and had therefore
28 substantially implemented the RACM/RACT requirements applicable to moderate PM₁₀
29 nonattainment areas. It showed that in Utah County, emissions of PM₁₀, SO₂ and NO_x had been
30 reduced by approximately 3,129 tpy (from 25,920 down to 22,791). With its March 27, 1996
31 request for an additional extension year, Utah submitted another milestone report (and revised it
32 again on May 17) which repeated this exercise using more current numbers. The results this time
33 showed that emissions had been reduced by approximately 8,391 tpy. The effect of these
34 emission reductions appears to be reflected in ambient measurements at the monitoring sites [and
35 this is evidence that the State's implementation of the PM₁₀ SIP control measures resulted in
36 emission reductions amounting to RFP in the Utah County PM₁₀ nonattainment area.

37
38 This Federal Register notice (66 FR 32752), the milestone report from September 29, 1995, and
39 the milestone report from May 17, 1996 have all been included in the TSD.

40
41 Furthermore, since these control measures are incorporated into the Utah SIP, the emission
42 reductions that resulted are consistent with the notion of permanent and enforceable
43 improvements in air quality. Taken together, the trends in ambient air quality illustrated in the
44 preceding paragraph, along with the continued implementation of the nonattainment SIP for the
45 Utah County nonattainment area, provide a reliable indication that these improvements in air
46 quality reflect the application of permanent steps to improve the air quality in the region, rather
47 than just temporary economic or meteorological changes.

48 49 **(4) State has Met Requirements of Section 110 and Part D**

50
51 CAA 107(d)(3)(E)(v) - The State containing such area has met all requirements applicable to the
52 area under section 110 and part D. Section 110(a)(2) of the Act deals with the broad scope of

1 state implementation plans and the capacity of the respective state agency to effectively
2 administer such a plan. Sections I through VIII of Utah's SIP contain information relevant to
3 these criteria. Part D deals specifically with plan requirements for nonattainment areas, and
4 includes the requirements for a maintenance plan in Section 175A.

5
6 Utah currently has an approved SIP that meets the requirements of section 110(a)(2) of the Act.
7 Many of these elements have been in place for several decades. In the March 9, 2001 approval of
8 Utah's Ogden City Maintenance Plan for Carbon Monoxide, EPA stated:

9
10 On August 15, 1984, we approved revisions to Utah's SIP as meeting the
11 requirements of section 110(a)(2) of the CAA (see 45 FR 32575). Although
12 section 110 of the CAA was amended in 1990, most of the changes were not
13 substantial. Thus, we have determined that the SIP revisions approved in 1984
14 continue to satisfy the requirements of section 110(a)(2). For further detail, see
15 45 FR 32575 dated August 15, 1984 (Volume 49, No. 159) or 66 FR 14079 dated
16 March 9, 2001 (Volume 66, No. 47.)

17
18 Part D of the Act addresses "Plan Requirements for Nonattainment Areas." Subpart 1 of Part D
19 includes the general requirements that apply to all areas designated nonattainment based on a
20 violation of the NAAQS. Section 172(c) of this subpart contains a list of generally required
21 elements for all nonattainment plans. Subpart 1 is followed by a series of subparts (2-5) specific
22 to various criteria pollutants. Subpart 4 contains the provisions specific to PM₁₀ nonattainment
23 areas. The general requirements for nonattainment plans in Section 172(c) may be subsumed
24 within or superseded by the more specific requirements of Subpart 4, but each element must be
25 addressed in the respective nonattainment plan.

26
27 One of the pre-conditions for a maintenance plan is a fully approved (non)attainment plan for the
28 area. This is also discussed in section IX.A.11.b(2).

29
30 Other Part D requirements that are applicable in nonattainment and maintenance areas include the
31 general and transportation conformity provisions of Section 176(c) of the Act. These provisions
32 ensure that federally funded or approved projects and actions conform to the PM₁₀ SIPs and
33 Maintenance Plans prior to the projects or actions being implemented. The State has already
34 submitted to EPA a SIP revision implementing the requirement of Section 176(c).

35
36 For Utah County, the Part D requirements for PM₁₀ were first addressed in an attainment SIP
37 approved by EPA on July 8, 1994 (59 FR 35036), and most recently addressed in a revision to the
38 attainment SIP approved by EPA on December 23, 2002 (67 FR 78181).

39 40 41 **(5) Maintenance Plan for PM₁₀ Areas**

42
43 As stated in the Act, an area may not request redesignation to attainment without first submitting,
44 and then receiving EPA approval of, a maintenance plan. The plan is basically a quantitative
45 showing that the area will continue to attain the NAAQS for an additional 10 years (from EPA
46 approval), accompanied by sufficient assurance that the terms of the numeric demonstration will
47 be administered by the State and by the EPA in an oversight capacity. The maintenance plan is
48 the central criterion for redesignation. It is contained in the following subsection.

1 **IX.A.11.c Maintenance Plan**

2 *CAA 107(d)(3)(E)(iv) - The Administrator has fully approved a maintenance plan for the area as*
 3 *meeting the requirements of section 175A. An approved maintenance plan is one of several*
 4 *criteria necessary for area redesignation as outlined in Section 107(d)(3)(E) of the Act. The*
 5 *maintenance plan itself, as described in Section 175A of the Act and further addressed in EPA*
 6 *guidance (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni*
 7 *to Regional Air Directors, September 4, 1992; or for the purpose of this document, simply*
 8 *“Calcagni”), has its own list of required elements. The following table is presented to summarize*
 9 *these requirements. Each will then be addressed in turn.*

Table IX.A.11. 4 Requirements of a Maintenance Plan in the Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Maintenance demonstration	Provide for maintenance of the relevant NAAQS in the area for at least 10 years after redesignation.	CAA: Sec 175A(a)	IX.A.11.c(1)
Revise in 8 Years	The State must submit an additional revision to the plan, 8 years after redesignation, showing an additional 10 years of maintenance.	CAA: Sec 175A(b)	IX.A.11.c(8)
Continued Implementation of Nonattainment Area Control Strategy	The Clean Air Act requires continued implementation of the nonattainment area control strategy unless such measures are shown to be unnecessary for maintenance or are replaced with measures that achieve equivalent reductions.	CAA: Sec 175A(c), CAA Sec 110(l), Calcagni memo	IX.A.11.c(7)
Contingency Measures	Areas seeking redesignation from nonattainment to attainment are required to develop contingency measures that include State commitments to implement additional control measures in response to future violations of the NAAQS.	CAA: Sec 175A(d)	IX.A.11.c(10)
Verification of Continued Maintenance	The maintenance plan must indicate how the State will track the progress of the maintenance plan.	Calcagni memo	IX.A.11c(9)

10
11
12 **(1) Demonstration of Maintenance - Modeling Analysis**

13
14 *CAA 175A(a) - Each State which submits a request under section 107(d) for redesignation of a*
 15 *nonattainment area as an area which has attained the NAAQS shall also submit a revision of the*
 16 *applicable implementation plan to provide for maintenance of the NAAQS for at least 10 years*
 17 *after the redesignation. The plan shall contain such additional measures, if any, as may be*
 18 *required to ensure such maintenance. The maintenance demonstration is discussed in EPA*
 19 *guidance (Calcagni) as one of the core provisions that should be considered by states for*
 20 *inclusion in a maintenance plan.*

21
22 According to Calcagni, a State may generally demonstrate maintenance of the NAAQS by either
 23 showing that future emissions of a pollutant or its precursors will not exceed the level of the
 24 attainment inventory (discussed below) or by modeling to show that the future mix of sources and

1 emission rates will not cause a violation of the NAAQS. Utah has elected to make its
2 demonstration based on air quality modeling.

3
4 **(a) Introduction**

5
6 The following chapter presents an analysis using observational datasets to detail the chemical
7 regimes of Utah's Nonattainment areas.

8
9 Prior to the development of this PM₁₀ maintenance plan, UDAQ conducted a technical analysis to
10 support the development of Utah's 24-hr State Implementation Plan for PM_{2.5}. That analysis
11 included preparation of emissions inventories and meteorological data, and the evaluation and
12 application of a regional photochemical model.

13
14 Outside of the springtime high wind events and wildfires, the Wasatch Front experiences high 24-
15 hr PM₁₀ concentrations under stable conditions during the wintertime (e.g., temperature
16 inversion). These are the same episodes where the Wasatch Front sees its highest concentrations
17 of 24-hr PM_{2.5} that sometimes exceed the 24-hr PM_{2.5} NAAQS. Most (60% to 90%) of the PM₁₀
18 observed during high wintertime pollution days consists of PM_{2.5}. The dominant species of the
19 wintertime PM₁₀ is secondarily formed particulate nitrate, which is also the dominant species of
20 PM_{2.5}.

21
22 Given these similarities, the PM_{2.5} modeling analysis was utilized as the foundation for this PM₁₀
23 Maintenance Plan.

24
25 The CMAQ model performance for the PM₁₀ Maintenance Plan adds to the detailed model
26 performance that was part of the UDAQ's previous PM_{2.5} SIP process. Utah DAQ used the same
27 modeling episode that was used in the PM_{2.5} SIP, which is the 45-day modeling episode from the
28 winter of 2009-2010. The modeled meteorology datasets from the Weather Research and
29 Forecasting (WRF) model for the PM₁₀ Plan are the same datasets used for the PM_{2.5} SIP. Also,
30 the CMAQ version (4.7.1) and CMAQ model setup (i.e., vertical advection module turned off)
31 for the PM₁₀ modeling matches the PM_{2.5} SIP setup.

32
33 For this reason, much of the information presented below pertains specifically to the PM_{2.5}
34 evaluation. This is supplemented with information pertaining to PM₁₀, most notably with respect
35 to the PM₁₀ model performance evaluation.

36
37 The additional PM₁₀ analysis is also presented in the Technical Support Document.

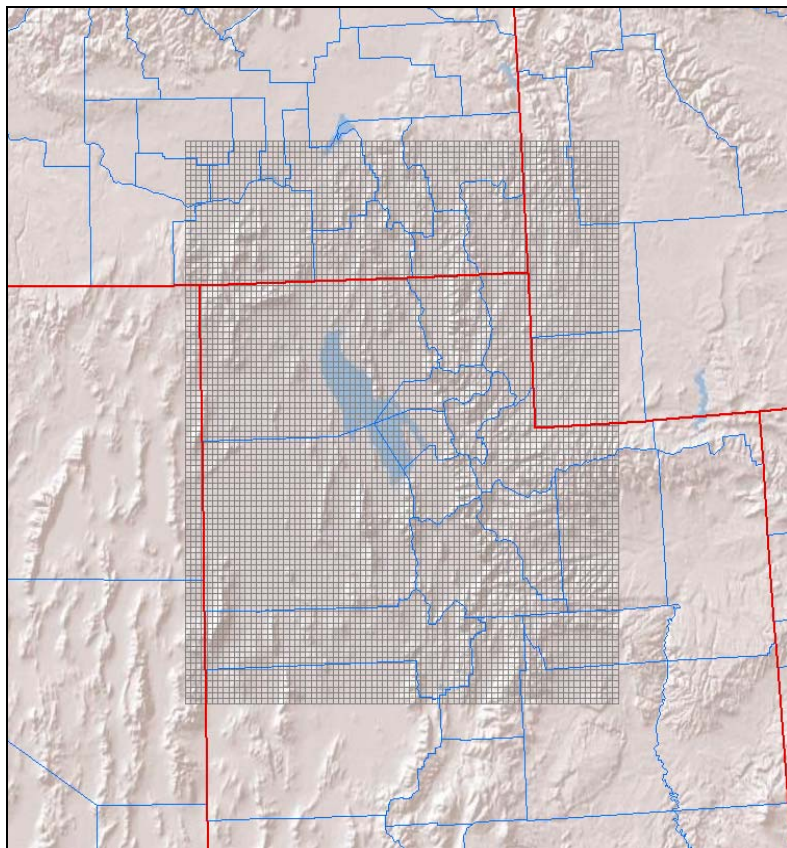
38
39 **(b) Photochemical Modeling**

40
41 Photochemical models are relied upon by federal and state regulatory agencies to support their
42 planning efforts. Used properly, models can assist policy makers in deciding which control
43 programs are most effective in improving air quality, and meeting specific goals and objectives.
44 The air quality analyses were conducted with the Community Multiscale Air Quality (CMAQ)
45 Model version 4.7.1, with emissions and meteorology inputs generated using SMOKE and WRF,
46 respectively. CMAQ was selected because it is the open source atmospheric chemistry model co-
47 sponsored by EPA and the National Oceanic Atmospheric Administration (NOAA), and thus
48 approved by EPA for this plan.

49
50 **(c) Domain/Grid Resolution**

51

1 UDAQ selected a high resolution 4-km modeling domain to cover all of northern Utah including
2 the portion of southern Idaho extending north of Franklin County and west to the Nevada border
3 (Figure IX.A.11. 8). This 97 x 79 horizontal grid cell domain was selected to ensure that all of
4 the major emissions sources that have the potential to impact the nonattainment areas were
5 included. The vertical resolution in the air quality model consists of 17 layers extending up to 15
6 km, with higher resolution in the boundary layer.
7



8
9
10 **Figure IX.A.11. 8 Northern Utah photochemical modeling domain.**

11
12 **(d) Episode Selection**

13
14 According to EPA's April 2007 "Guidance on the Use of Models and Other Analyses for
15 Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze," the
16 selection of SIP episodes for modeling should consider the following 4 criteria:

- 17
18 1. Select episodes that represent a variety of meteorological conditions that lead to elevated
19 PM_{2.5}.
20
21 2. Select episodes during which observed concentrations are close to the baseline design
22 value.
23
24 3. Select episodes that have extensive air quality data bases.
25
26 4. Select enough episodes such that the model attainment test is based on multiple days at
27 each monitor violating NAAQS.
28

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

12
 13 From the most recent 5-year period of 2007-2011, UDAQ developed a long list of candidate
 14 PM_{2.5} wintertime episodes. Three episodes were selected. An episode was selected from January
 15 2007, an episode from February 2008, and an episode during the winter of 2009-2010 that
 16 features multi-event episodes of PM_{2.5} buildup and washout.

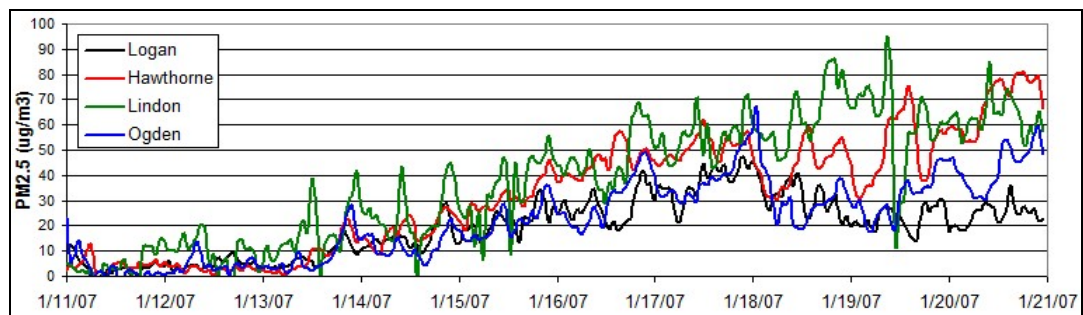
17
 18 As noted in the introduction, these episodes were also ideal from the standpoint of characterizing
 19 PM₁₀ buildup and formation.

20
 21 Further detail of the episodes is below:

22
 23 • **Episode 1: January 11-20, 2007**

24
 25 A cold front passed through Utah during the early portion of the episode and brought very cold
 26 temperatures and several inches of fresh snow to the Wasatch Front. The trough was quickly
 27 followed by a ridge that built north into British Columbia and began expanding east into Utah.
 28 This ridge did not fully center itself over Utah, but the associated light winds, cold temperatures,
 29 fresh snow, and subsidence inversion produced very stagnant conditions along the Wasatch Front.
 30 High temperatures in Salt Lake City throughout the episode were in the high teens to mid-20's
 31 Fahrenheit.

32
 33 Figure IX.A.11. 9 shows hourly PM_{2.5} concentrations from Utah's 4 PM_{2.5} monitors for January
 34 11-20, 2007. The first 6 to 8 days of this episode are suited for modeling. The episode becomes
 35 less suited after January 18 because of the complexities in the meteorological conditions leading
 36 to temporary PM_{2.5} reductions.

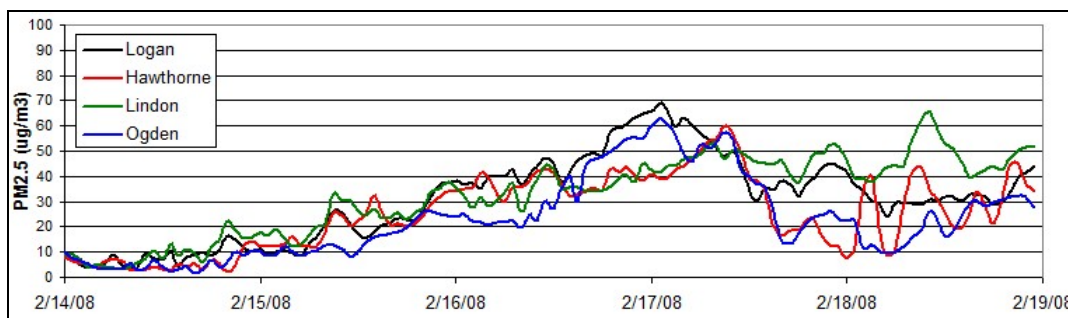


38
 39
 40 **Figure IX.A.11. 9 Hourly PM_{2.5} concentrations for January 11-20, 2007**

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

2
3 The February 2008 episode features a cold front passage at the start of the episode that brought
4 significant new snow to the Wasatch Front. A ridge began building eastward from the Pacific
5 Coast and centered itself over Utah on Feb 20th. During this time a subsidence inversion lowered
6 significantly from February 16 to February 19. Temperatures during this episode were mild with
7 high temperatures at SLC in the upper 30's and lower 40's Fahrenheit.
8

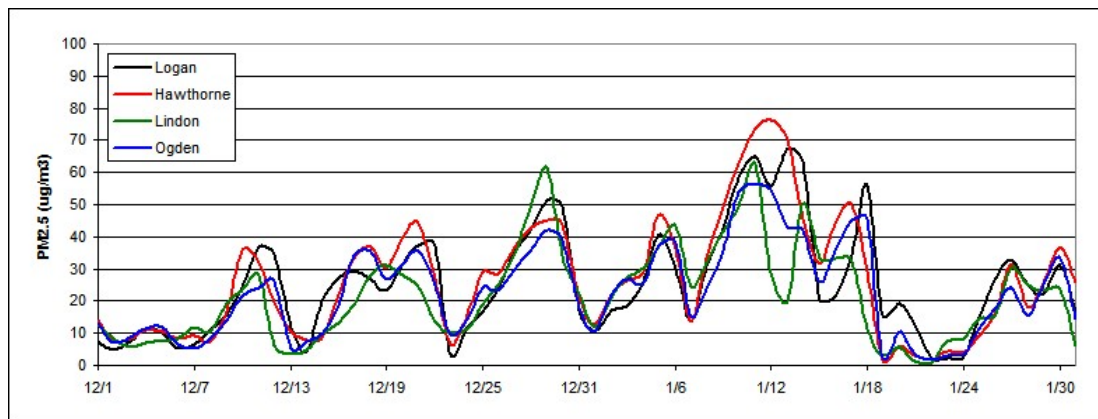
9 The 24-hour average PM_{2.5} exceedances observed during the proposed modeling period of
10 February 14-19, 2008 were not exceptionally high. What makes this episode a good candidate for
11 modeling are the high hourly values and smooth concentration build-up. The first 24-hour
12 exceedances occurred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



20
21
22 **Figure IX.A.11. 10 Hourly PM_{2.5} concentrations for February 14-19, 2008**

23
24
25 • **Episode 3: December 13, 2009 – January 18, 2010**

26
27 The third episode that was selected is more similar to a “season” than a single PM_{2.5} episode
28 (Figure IX.A.11. 11). During the winter of 2009 and 2010, Utah was dominated by a semi-
29 permanent ridge of high pressure that prevented strong storms from crossing Utah. This 35 day
30 period was characterized by 4 to 5 individual PM_{2.5} episodes each followed by a partial PM_{2.5} mix
31 out when a weak weather system passed through the ridge. The long length of the episode and
32 repetitive PM_{2.5} build-up and mix-out cycles makes it ideal for evaluating model strengths and
33 weaknesses and PM_{2.5} control strategies.
34



1
2
3 **Figure IX.A.11. 11 24-hour average PM_{2.5} concentrations for December-January, 2009-10**

4
5
6 **(e) Meteorological Data**

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

15
16 Model performance of WRF was assessed against observations at sites maintained by the Utah
17 Air Monitoring Center. A summary of the performance evaluation results for WRF are presented
18 below:

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35
- The biggest issue with meteorological performance is the existence of a warm bias in surface temperatures during high PM_{2.5} episodes. This warm bias is a common trait of WRF modeling during Utah wintertime inversions.
 - WRF does a good job of replicating the light wind speeds (< 5 mph) that occur during high PM_{2.5} episodes.
 - WRF is able to simulate the diurnal wind flows common during high PM_{2.5} episodes. WRF captures the overnight downslope and daytime upslope wind flow that occurs in Utah valley basins.
 - WRF has reasonable ability to replicate the vertical temperature structure of the boundary layer (i.e., the temperature inversion), although it is difficult for WRF to reproduce the inversion when the inversion is shallow and strong (i.e., an 8 degree temperature increase over 100 vertical meters).

36 **(f) Photochemical Model Performance Evaluation**

37
38 PM_{2.5} Results

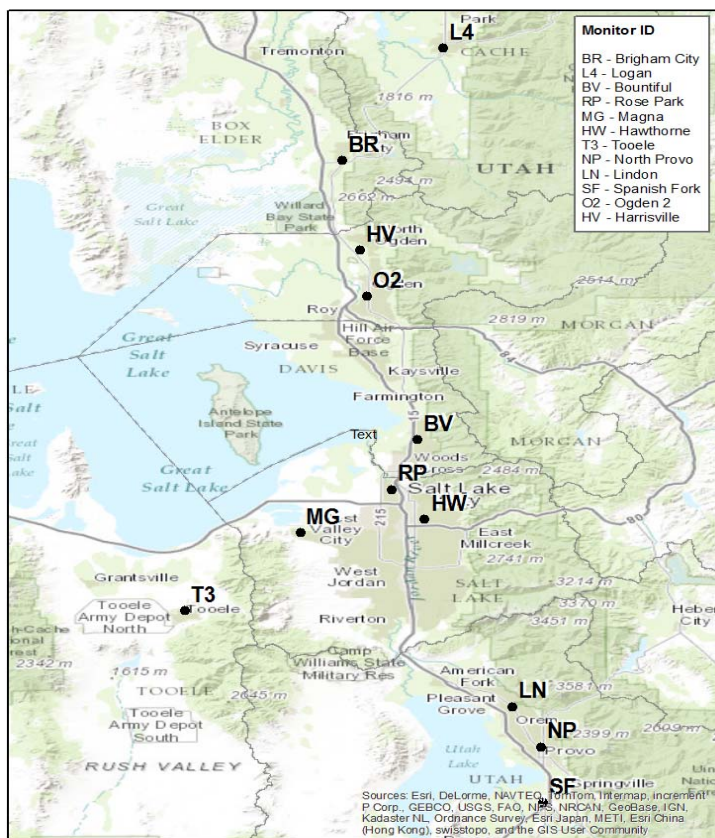
39
40 The model performance evaluation focused on the magnitude, spatial pattern, and temporal
41 variation of modeled and measured concentrations. This exercise was intended to assess whether,

1 and to what degree, confidence in the model is warranted (and to assess whether model
 2 improvements are necessary).

3
 4 CMAQ model performance was assessed with observed air quality datasets at UDAQ-maintained
 5 air monitoring sites (Figure IX.A.11. 12). Measurements of observed PM_{2.5} concentrations along
 6 with gaseous precursors of secondary particulate (e.g., NO_x, ozone) and carbon monoxide are
 7 made throughout winter at most of the locations in the figure. PM_{2.5} speciation performance was
 8 assessed using the three Speciation Monitoring Network Sites (STN) located at the Hawthorne
 9 site in Salt Lake City, the Bountiful site in Davis County, and the Lindon site in Utah County.

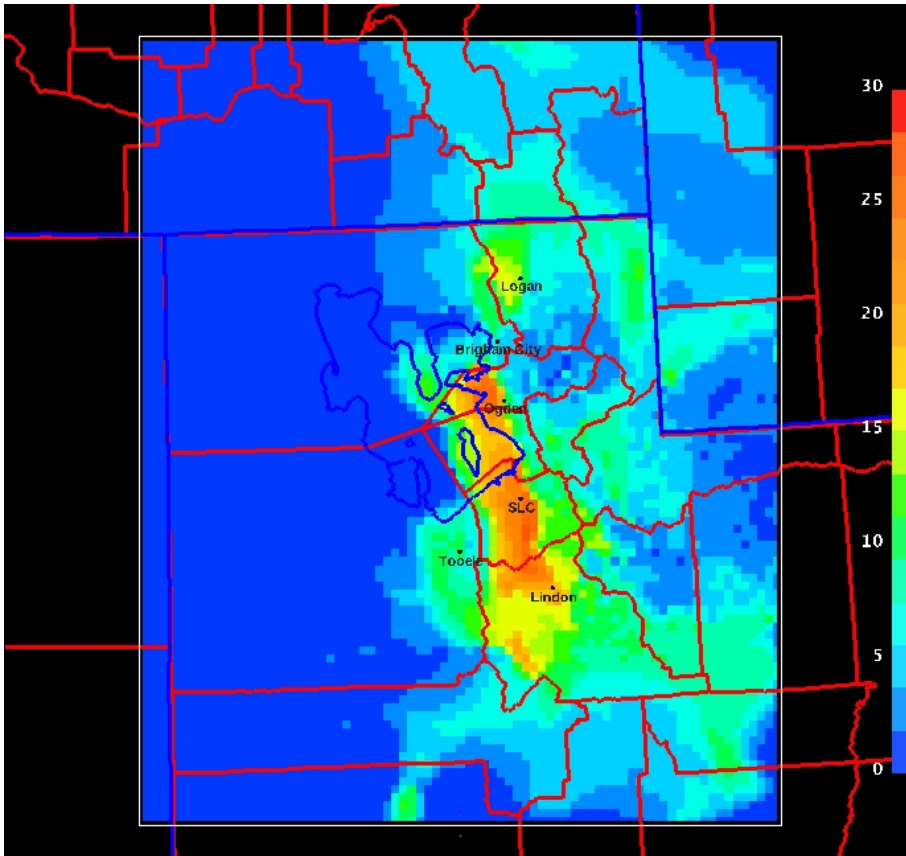
10
 11 PM₁₀ data is also collected at Logan, Bountiful, Ogden2, Magna, Hawthorne, North Provo, and
 12 Lindon.

13
 14 PM₁₀ filters were collected at Bountiful, Hawthorne and Lindon, and analyzed with the goal
 15 comparing CMAQ modeled speciation to the collected PM₁₀ filters. While analyzing the PM₁₀
 16 filters, most of the secondarily chemically formed particulate nitrate had been volatilized, and thus
 17 could not be accounted for. This is most likely due to the age of the filters, which were collected
 18 over five years ago. Thus, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter
 19 speciation could not be made for this modeling period.



21
 22 **Figure IX.A.11. 12 UDAQ monitoring network.**

1 A spatial plot is provided for modeled 24-hr PM_{2.5} for 2010 January 03 in Figure IX.A.11. 13.
2 The spatial plot shows the model does a reasonable job reproducing the high PM_{2.5} values, and
3 keeping those high values confined in the valley locations where emissions occur.
4
5



6
7 **Figure IX.A.11. 13 Spatial plot of CMAQ modeled 24-hr PM_{2.5} (µg/m³) for 2010 Jan. 03.**
8

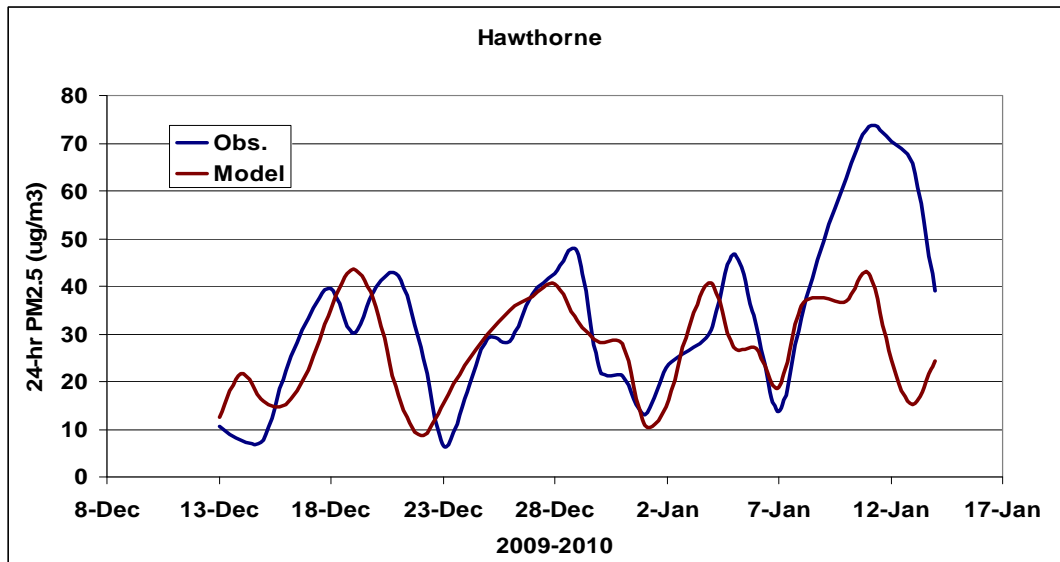
9 Time series of 24-hr PM_{2.5} concentrations for the 13 Dec. 2009 – 15 Jan. 2010 modeling period
10 are shown in Figs. IX.A.11. 14-17 at the Hawthorne site in Salt Lake City, the Ogden site in
11 Weber County, the Lindon site in Utah County, and the Logan site in Cache County. For the
12 most part, 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
14 produce the > 60 µg/m³ concentrations observed at the monitoring locations.
15

16 It is often seen that CMAQ “washes” out the PM_{2.5} episode a day or two earlier than that seen in
17 the observations. For example, on the day 21 Dec. 2009, the concentration of PM_{2.5} continues to
18 build while CMAQ has already cleaned the valley basins of high PM_{2.5} concentrations. At these
19 times, the observed cold pool that holds the PM_{2.5} is often very shallow and winds just above this
20 cold pool are southerly and strong before the approaching cold front. This situation is very
21 difficult for a meteorological and photochemical model to reproduce. An example of this
22 situation is shown in Fig. IX.A.11. 18, where the lowest part of the Salt Lake Valley is still under
23 a very shallow stable cold pool, yet higher elevations of the valley have already been cleared of
24 the high PM_{2.5} concentrations.
25

26 During the 24 – 30 Dec. 2009 episode, a weak meteorological disturbance brushes through the
27 northernmost portion of Utah. It is noticeable in the observations at the Ogden monitor on 25
28 Dec. as PM_{2.5} concentrations drop on this day before resuming an increase through Dec. 30. The

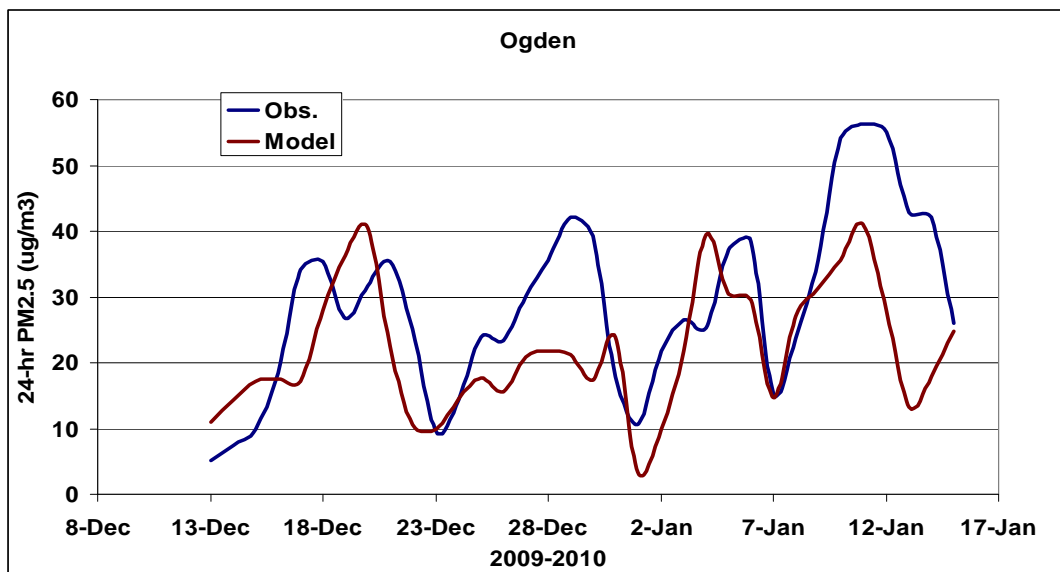
1 meteorological model and thus CMAQ correctly pick up this disturbance, but completely clears
 2 out the building $PM_{2.5}$; and thus performance suffers at the most northern Utah monitors (e.g.
 3 Ogden, Logan). The monitors to the south (Hawthorne, Lindon) are not influence by this
 4 disturbance and building of $PM_{2.5}$ is replicated by CMAQ. This highlights another challenge of
 5 modeling $PM_{2.5}$ episodes in Utah. Often during cold pool events, weak disturbances will pass
 6 through Utah that will de-stabilize the valley inversion and cause a partial clear out of $PM_{2.5}$.
 7 However, the $PM_{2.5}$ is not completely cleared out, and after the disturbance exits, the valley
 8 inversion strengthens and the $PM_{2.5}$ concentrations continue to build. Typically, CMAQ
 9 completely mixes out the valley inversion during these weak disturbances.

10



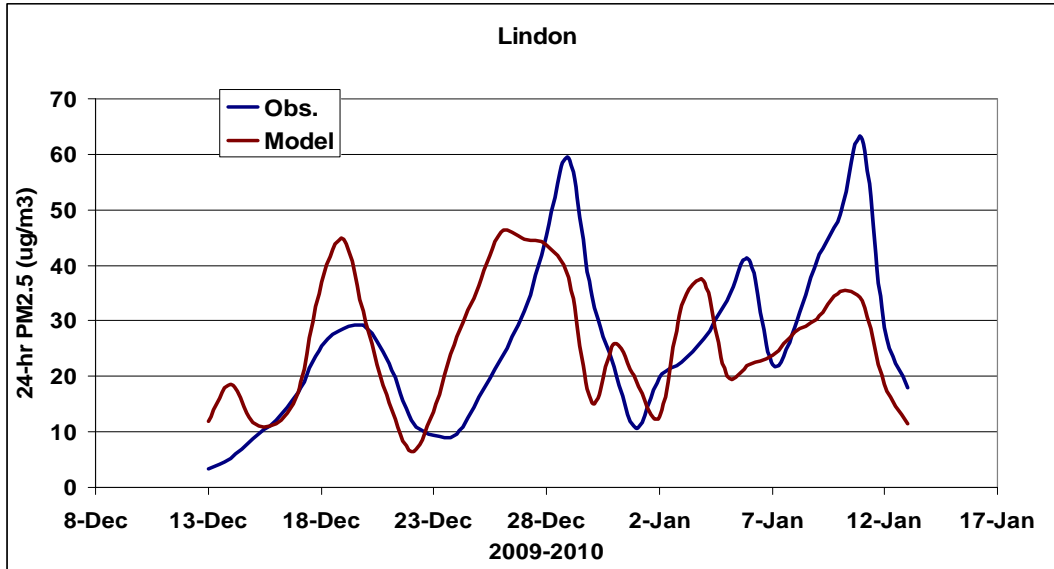
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Figure IX.A.11. 14 24-hr $PM_{2.5}$ time series (Hawthorne). Observed 24-hr $PM_{2.5}$ (blue trace) and CMAQ modeled 24-hr $PM_{2.5}$ (red trace).



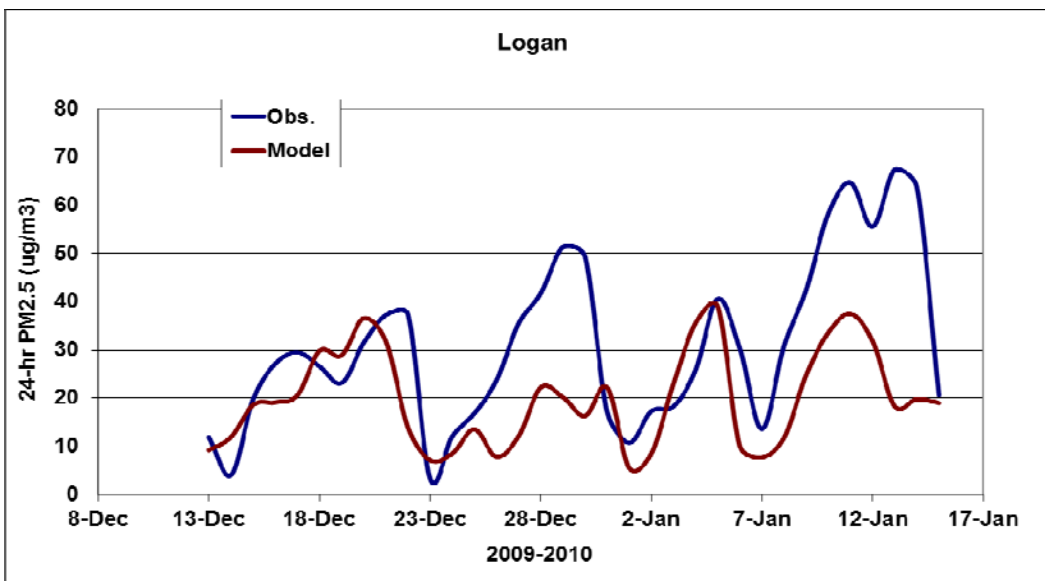
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Figure IX.A.11. 15 24-hr $PM_{2.5}$ time series (Ogden). Observed 24-hr $PM_{2.5}$ (blue trace) and CMAQ modeled 24-hr $PM_{2.5}$ (red trace).



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Figure IX.A.11. 16 24-hr PM_{2.5} time series (Lindon). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



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Figure IX.A.11. 17 24-hr PM_{2.5} time series (Logan). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



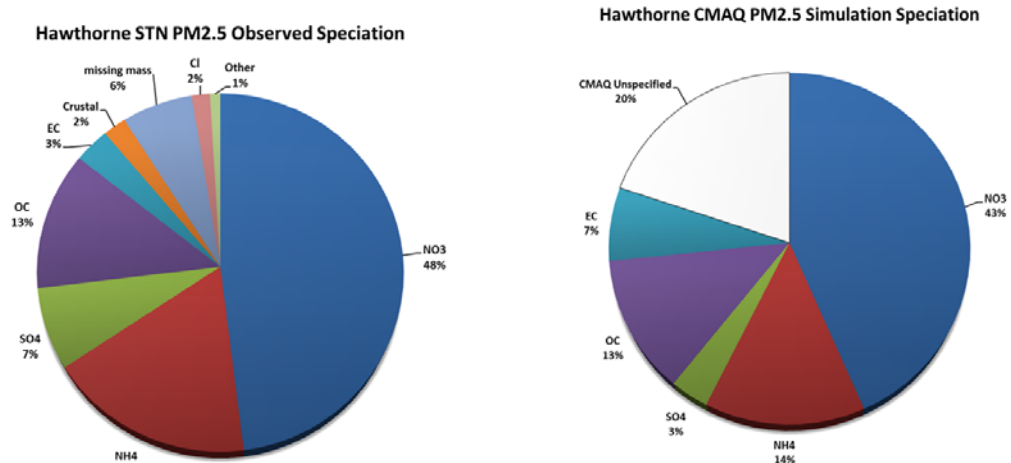
1
2 **Figure IX.A.11. 18 An example of the Salt Lake Valley at the end of a high PM_{2.5} episode.**
3 **The lowest elevations of the Salt Lake Valley are still experiencing an inversion and**
4 **elevated PM_{2.5} concentrations while the PM_{2.5} has been ‘cleared out’ throughout the rest of**
5 **the valley. These ‘end of episode’ clear out periods are difficult to replicate in the**
6 **photochemical model.**

7
8 Generally, the performance of CMAQ to replicate the buildup and clear out of PM_{2.5} is good.
9 However, it is important to verify that CMAQ is replicating the components of PM_{2.5}
10 concentrations. PM_{2.5} simulated and observed speciation is shown at the 3 STN sites in Figures
11 IX.A.11. 19-21. The observed speciation is constructed using days in which the STN filter 24-hr
12 PM_{2.5} concentration was > 35 µg/m³. For the 2009-2010 modeling period, the observed
13 speciation pie charts were created using 8 filter days at Hawthorne, 6 days at Lindon, and 4 days
14 at Bountiful.

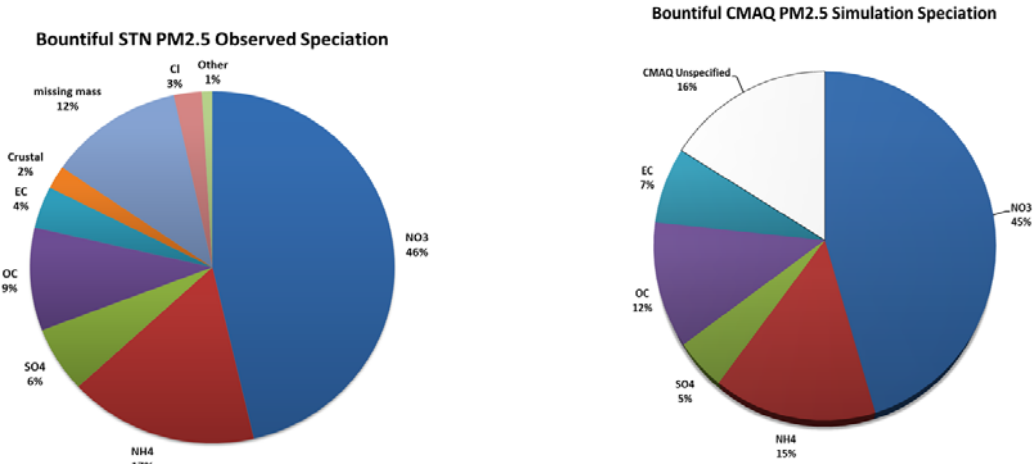
15
16 The simulated speciation is constructed using modeling days that produced 24-hr PM_{2.5}
17 concentrations > 35 µg/m³. Using this criterion, the simulated speciation pie chart is created from
18 18 modeling days for Hawthorne, 14 days at Lindon, and 14 days at Bountiful.
19 At all 3 STN sites, the percentage of simulated nitrate is greater than 40%, while the simulated
20 ammonium percentage is at ~15%. This indicates that the model is able to replicate the
21 secondarily formed particulates that typically make up the majority of the measured PM_{2.5} on the
22 STN filters during wintertime pollution events.

23
24 The percentage of model simulated organic carbon is ~13% at all STN sites, which is in
25 agreement with the observed speciation of organic carbon at Hawthorne and slightly
26 overestimated (by ~3%) at Lindon and Bountiful.

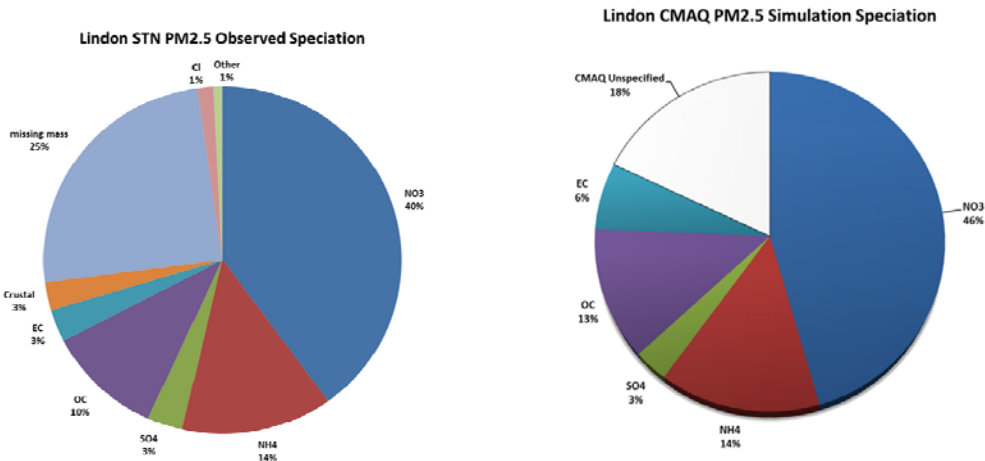
27
28 There is no STN site in the Logan nonattainment area, and very little speciation information
29 available in the Cache Valley. Figure IX.A.11. 22 shows the model simulated speciation at
30 Logan. Ammonium (17%) and nitrate (56%) make up a higher percentage of the simulated PM_{2.5}
31 at Logan when compared to sites along the Wasatch Front.



1
2 **Figure IX.A.11. 19** The composition of observed and model simulated average 24-hr PM_{2.5}
3 speciation averaged over days when an observed and modeled day had 24-hr concentrations
4 > 35 µg/m³ at the Hawthorne STN site.
5

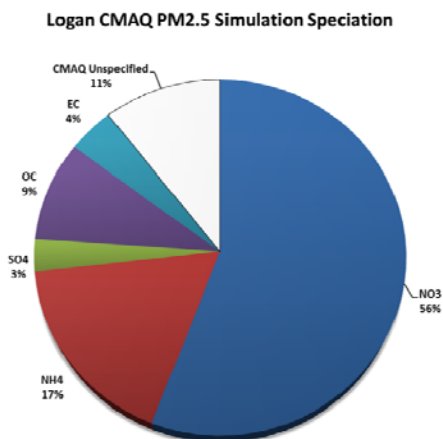


6
7 **Figure IX.A.11. 20** The composition of observed and model simulated average 24-hr PM_{2.5}
8 speciation averaged over days when an observed and modeled day had 24-hr concentrations
9 > 35 µg/m³ at the Bountiful STN site.
10
11



12

1 **Figure IX.A.11. 21 The composition of observed and model simulated average 24-hr PM_{2.5}**
2 **speciation averaged over days when an observed and modeled day had 24-hr concentrations**
3 **> 35 µg/m³ at the Lindon STN site.**
4



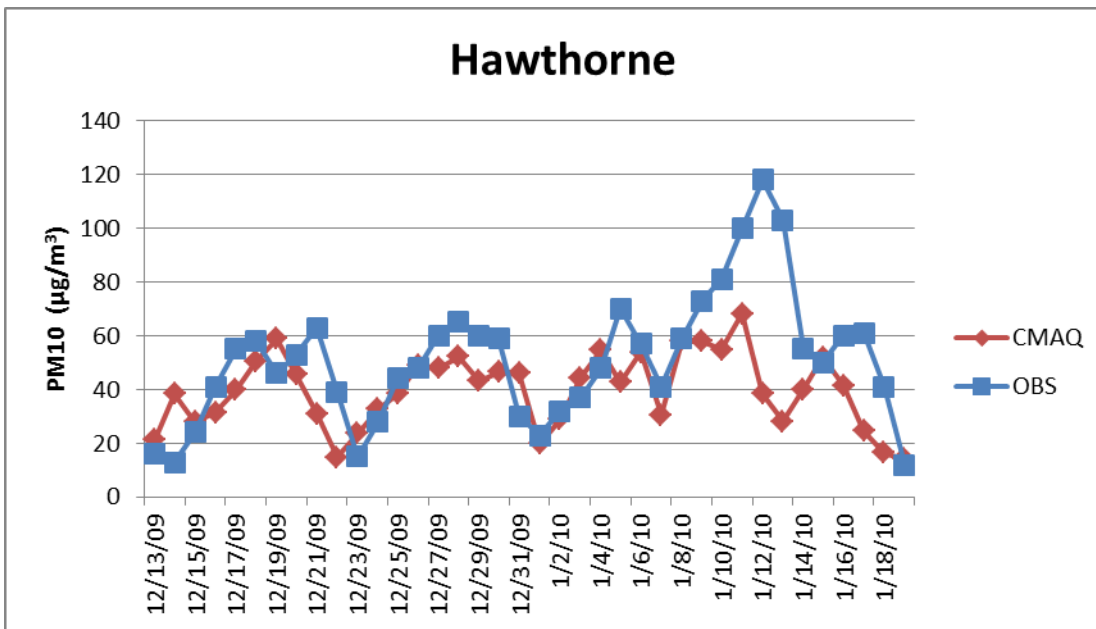
5
6 **Figure IX.A.11. 22 The composition of model simulated average 24-hr PM_{2.5} speciation**
7 **averaged over days when a modeled day had 24-hr concentrations > 35 µg/m³ at the Logan**
8 **monitoring site. No observed speciation data is available for Logan.**
9

10 PM₁₀ Results

11
12 As mentioned previously, the bulk of the performance for CMAQ modeled Particulate Matter
13 (PM) for the 2009 – 2010 episode was done for the 24-hr PM_{2.5} SIP. The detailed model
14 performance was shown using time series, statistical metrics, and pie charts. For the CMAQ
15 performance of PM₁₀ in particular, UDAQ has updated the model versus observations time series
16 plots to show PM₁₀, in addition to the prior times series using PM_{2.5}. For the 2009 – 2010
17 episode, UDAQ collected PM₁₀ observational data at Hawthorne and Magna in Salt Lake County;
18 Lindon and North Provo in Utah County; and for Ogden City.
19

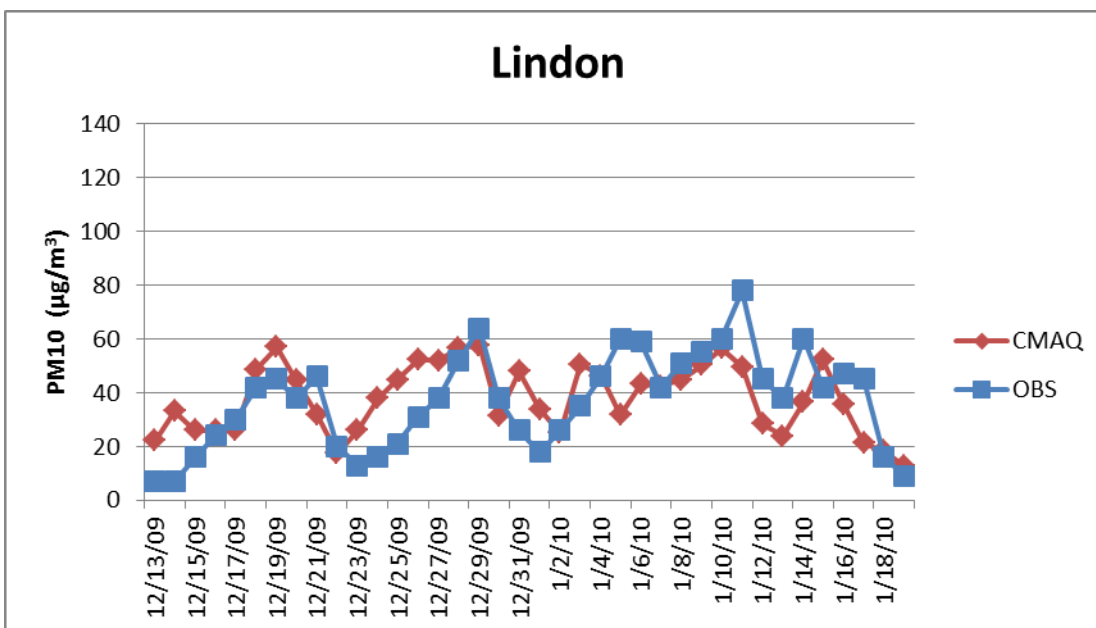
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The PM₁₀ model versus observation time series is shown in Figures IX.A.11. 23-28.



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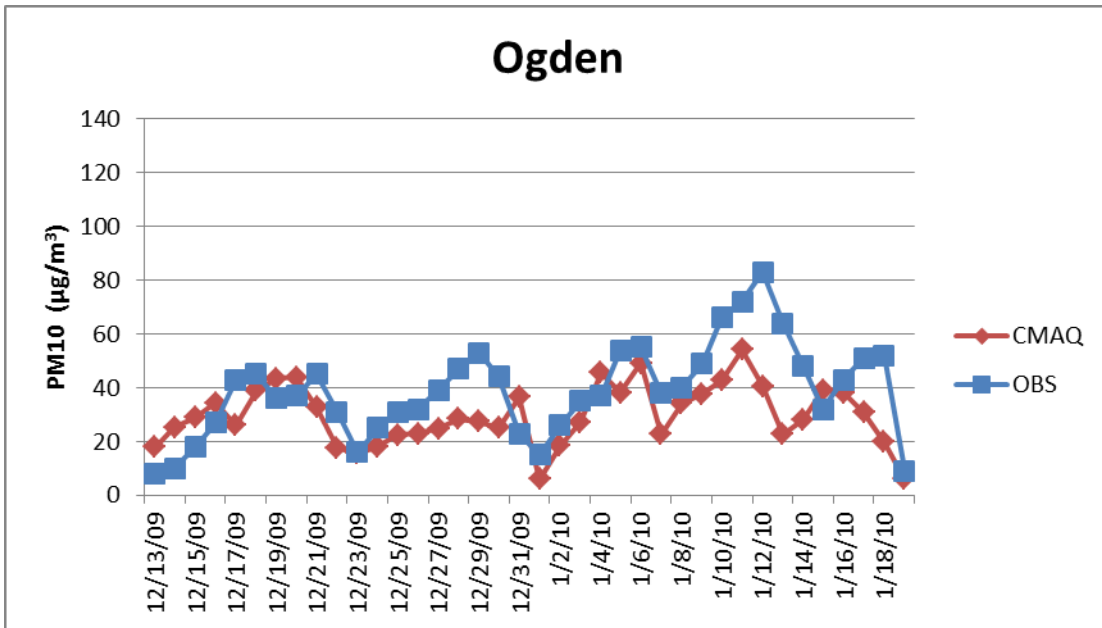
Figure IX.A.11. 23 Time Series of total PM10 (ug/m3) for Hawthorne for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



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Figure IX.A.11. 24 Time Series of total PM10 (ug/m3) for Lindon for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.

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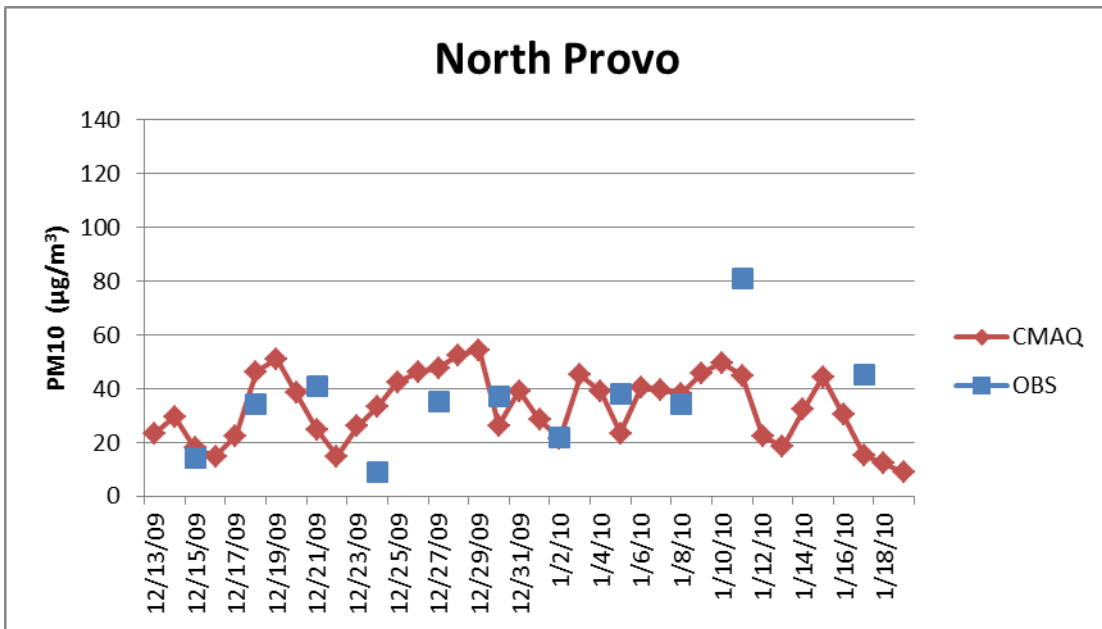
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4 **Figure IX.A.11. 25 Time Series of total PM10 (ug/m3) for Ogden for the 2009-2010**
 5 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
 6 **trace.**

7

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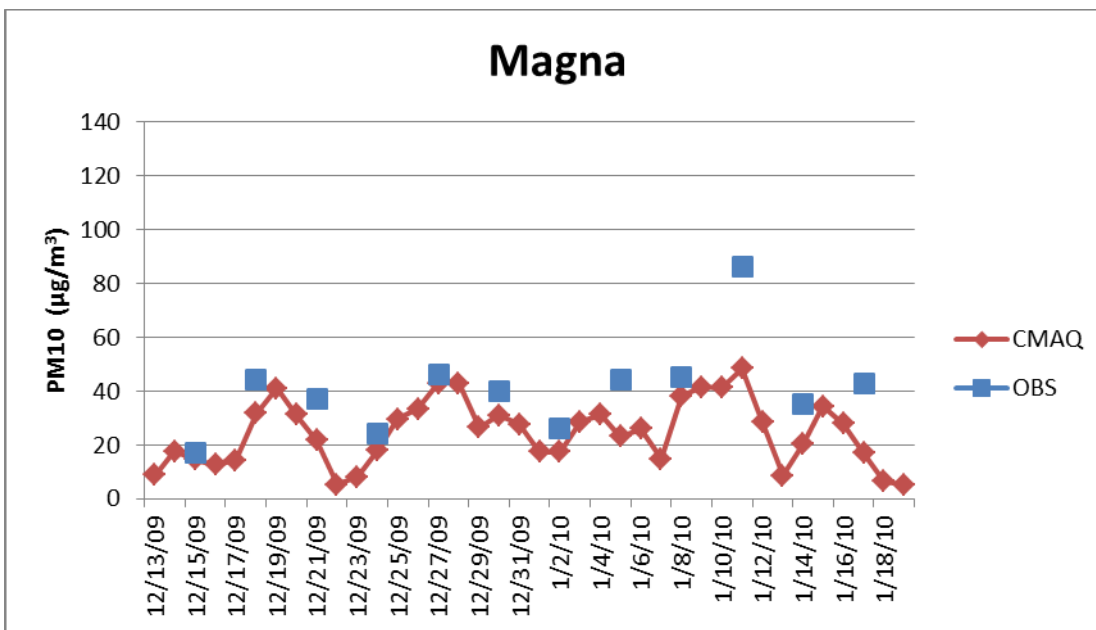
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11 **Figure IX.A.11. 26 Time Series of total PM10 (ug/m3) for North Provo for the 2009-2010**
 12 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
 13 **trace.**

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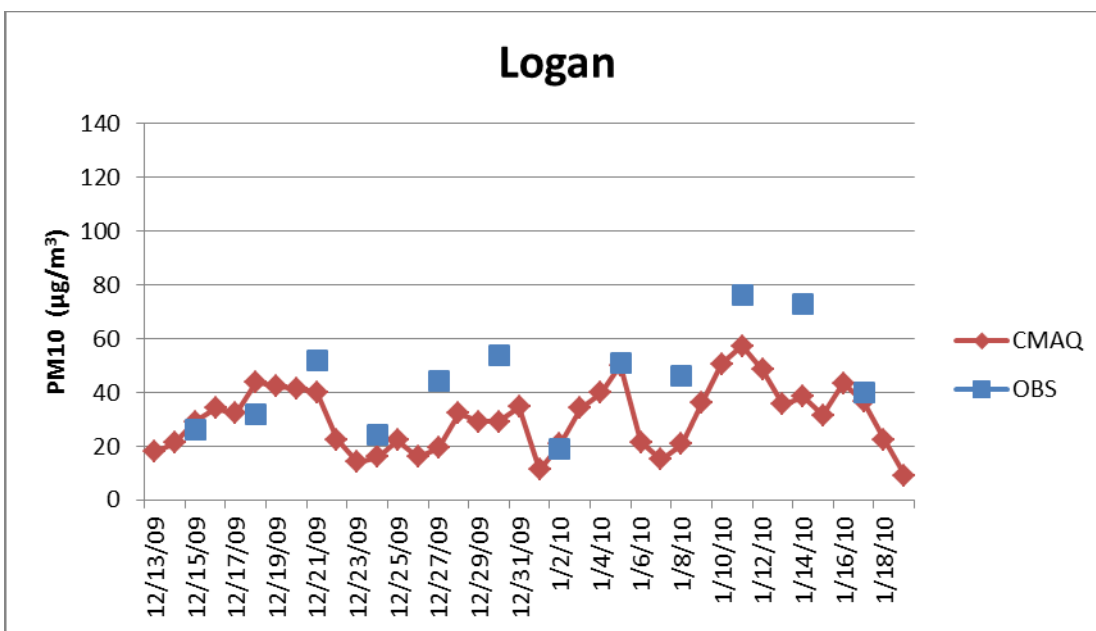
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Figure IX.A.11. 27 Time Series of total PM10 (ug/m3) for Magna for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



8
9

Figure IX.A.11. 28 Time Series of total PM10 (ug/m3) for Logan for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.

As noted before, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter speciation could not be made for this modeling period because most of the secondarily chemically formed particulate nitrate had been volatilized from the PM₁₀ filters and thus could not be accounted for. It should be noted that CMAQ was able to produce the secondarily formed nitrate

1 when compared to PM_{2.5} filters during the previous PM_{2.5} SIP work. Therefore, UDAQ feels
2 CMAQ shows good replication of the species that make up PM₁₀ during wintertime pollution
3 events.

4
5 **(g) Summary of Model Performance**

6
7 Model performance for 24-hr PM_{2.5} is good and generally acceptable and can be characterized as
8 follows:

- 9
- 10 • Good replication of the episodic buildup and clear out of PM_{2.5}. Often the model will
11 clear out the simulated PM_{2.5} a day too early at the end of an episode. This clear out time
12 period is difficult to model (i.e., Figure IX.A.11. 18).
 - 13
 - 14 • Good agreement in the magnitude of PM_{2.5}, as the model can consistently produce the
15 high concentrations of PM_{2.5} that coincide with observed high concentrations.
 - 16
 - 17 • Spatial patterns of modeled 24-hr PM_{2.5}, show for the most part, that the PM_{2.5} is being
18 confined in the valley basins, consistent to what is observed.
 - 19
 - 20 • Speciation and composition of the modeled PM_{2.5} matches the observed speciation quite
21 well. Modeled and observed nitrate are between 40% and 50% of the PM_{2.5}. Ammonium
22 is between 15% and 20% for both modeled and observed PM_{2.5}, while modeled and
23 observed organic carbon falls between 10% to 13% of the total PM_{2.5}.
 - 24

25 For PM₁₀ the CMAQ model performance is quite good at all locations along Northern Utah.
26 CMAQ is able to re-produce the buildup and washout of the pollution episodes during the 2009 –
27 2010 winter. CMAQ is also able to re-produce the peak PM₁₀ concentrations during most
28 episodes. The exception being the 2010 Jan. 08 – 14 episode, where CMAQ fails to build to the
29 extremely high PM₁₀ concentration (>80 ug/m³) seen at the monitors. This episode in particular
30 featured an “early model washout,” and these results are similar to the results found in PM_{2.5}
31 modeling.

32
33 Several observations should be noted on the implications of these model performance findings on
34 the attainment modeling presented in the following section. First, it has been demonstrated that
35 model performance overall is acceptable and, thus, the model can be used for air quality planning
36 purposes. Second, consistent with EPA guidance, the model is used in a relative sense to project
37 future year values. EPA suggests that this approach “should reduce some of the uncertainty
38 attendant with using absolute model predictions alone.”

39
40 **(h) Modeled Attainment Test**

41
42 • **Introduction**

43
44 With acceptable performance, the model can be utilized to make future-year attainment
45 projections. For any given (future) year, an attainment projection is made by calculating a
46 concentration termed the Future Design Value (FDV). This calculation is made for each monitor
47 included in the analysis, and then compared to the NAAQS (150 µg/m³). If the FDV at every
48 monitor located within a nonattainment area is smaller than the NAAQS, this would demonstrate
49 attainment for that area in that future year.

50
51 A maintenance plan must demonstrate continued attainment of the NAAQS for a span of ten
52 years. This span is measured from the time EPA approves the plan, a date which is somewhat

1 uncertain during plan development. To be conservative, attainment projections were made for
 2 2019, 2028, and 2030. An assessment was also made for 2024 as a “spot-check” against emission
 3 trends within the ten year span.

4
 5 • **PM₁₀ Baseline Design Values**

6
 7 For any monitor, the FDV is greatly influenced by existing air quality at that location. This can
 8 be quantified and expressed as a Baseline Design Value (BDV). The BDV is consistent with the
 9 form of the 24-hour PM₁₀ NAAQS; that is, that the probability of exceeding the standard should
 10 be no greater than once per calendar year. Quantification of the BDV for each monitor is
 11 included in the TSD, and is consistent with EPA guidance.

12
 13 Hourly PM₁₀ observations are taken from FRM filters spanning five monitors in three
 14 maintenance areas: Salt Lake County, Utah County, and the city of Ogden.

15
 16 In Table IX.A.11. 5, baseline design values are given for Ogden, Hawthorne, Magna, Lindon, and
 17 North Provo. These values were calculated based on data collected during the 2011-2014 time
 18 period.

19
 20 **Table IX.A.11. 5: Baseline design values listed for each monitor.**

21

Site	Maintenance Area	2011-2014 BDV
Ogden	Ogden City	88.2 µg/m ³
Hawthorne	Salt Lake County	100.9 µg/m ³
Magna	Salt Lake County	70.5 µg/m ³
Lindon	Utah County	111.4 µg/m ³
North Provo	Utah County	124.4 µg/m ³

22
 23
 24 • **Relative Response Factors**

25
 26 In making future-year predictions, the output from the CMAQ 4.7.1 model is not considered to be
 27 an absolute answer. Rather, the model is used in a relative sense. In doing so, a comparison is
 28 made using the predicted concentrations for both the year in question and a pre-selected base-
 29 year, which for this plan is 2011. This comparison results in a Relative Response Factor (RRF).
 30 RRFs are calculated as follows:

- 31
- 32 1) Modeled PM₁₀ concentrations are calculated for each grid cell in the modeling domain
 33 over the 39-day wintertime 2009-2010 episode. Of particular interest are the nine grid
 34 cells (3x3 window) that are collocated with each monitor. The monitor, itself is located in
 35 the window’s center cell.
 - 36 2) For every simulated day, the maximum daily PM₁₀ concentration for each of these nine-
 37 cell windows is identified.
 - 38 3) For each monitor, the top 20% of these 39 values are averaged to formulate a modeled
 39 PM₁₀ peak concentration value (PCV).
 - 40 4) At each monitor, the RRF is calculated as the ratio between future-year PCV and base-
 41 year PCV: **RRF = FPCV / BPCV**

42
 43
 44 • **Future Design Values and Results**

1
2 Finally, for each monitor, the FDV is calculated by multiplying the baseline design value by the
3 relative response factor: **FDV = RRF * BDV**. These FDV's are compared to the NAAQS in order
4 to determine whether attainment is predicted at that location or not. The results for each of the
5 monitors are shown below in Table IX.A.11. 6.

6
7 **Table IX.A.11. 6: Baseline design values, relative response factors, and future design values**
8 **for all monitors and future years. Units of design values are $\mu\text{g}/\text{m}^3$, while RRF's are**
9 **dimensionless.**

10

Monitor	2011 BDV	2019 RRF	2019 FDV	2024 RRF	2024 FDV	2028 RRF	2028 FDV	2030 RRF	2030 FDV
Ogden	88.2	1.05	92.6	1.04	91.7	1.02	90.0	1.05	92.6
Hawthorne	100.9	1.09	110.0	1.09	110.0	1.09	110.0	1.12	113.0
Magna	70.5	1.14	80.4	1.13	79.7	1.11	78.3	1.15	81.1
Lindon	111.4	1.16	129.2	1.12	124.8	1.11	123.7	1.16	129.2
North Provo	124.4	1.15	143.1	1.12	139.3	1.10	136.8	1.15	143.1

11
12
13 For all future-years and monitors, no FDV exceeds the NAAQS. Therefore continued attainment
14 is demonstrated for all three maintenance areas.

15
16 **(2) Attainment Inventory**

17
18 The attainment inventory is discussed in EPA guidance (Calcagni) as another one of the core
19 provisions that should be considered by states for inclusion in a maintenance plan.

20
21 According to Calcagni, the stated purpose of the attainment inventory is to establish the level of
22 emissions during the time periods associated with monitoring data showing attainment.

23
24 In cases such as this, where a maintenance demonstration is founded on a modeling analysis that
25 is used in a relative sense, the baseline inventory modeled as the basis for comparison with every
26 projection year model run is best suited to act as the attainment inventory. For this analysis, a
27 baseline inventory was compiled for the year 2011. This year also falls within the span of data
28 representing current attainment of the PM_{10} NAAQS.

29
30 Calcagni speaks about the projection inventory as well, and notes that it should consider future
31 growth, including population and industry, should be consistent with the base-year attainment
32 inventory, and should document data inputs and assumptions. Any assumptions concerning
33 emission rates must reflect permanent, enforceable measures.

34
35 Utah compiled projection inventories for use in the quantitative modeling demonstration. The
36 years selected for projection included 2019, 2024, 2028, and 2030. The emissions contained in
37 the inventories include sources located within a regional area called a modeling domain. The
38 modeling domain encompasses all three areas within the state that were designated as
39 nonattainment areas for PM_{10} : Salt Lake County, Utah County, and Ogden City, as well as a
40 bordering region see Figure IX.A.11. 1.

41
42 Since this bordering region is so large (owing to its creation to assess a much larger region of
43 $\text{PM}_{2.5}$ nonattainment), a "core area" within this domain was identified wherein a higher degree of

1 accuracy would be important. Within this core area (which includes Weber, Davis, Salt Lake,
2 and Utah Counties), SIP-specific inventories were prepared to include seasonal adjustments and
3 forecasting to represent each of the projection years. In the bordering regions away from this
4 core, the 2011 National Emissions Inventory was downloaded from EPA and inserted to the
5 analysis. It remained unchanged throughout the analysis period.

6
7 There are four general categories of sources included in these inventories: large stationary
8 sources, smaller area sources, on-road mobile sources, and off-road mobile sources.

9
10 For each of these source categories, the pollutants that were inventoried included: particulate
11 matter with an aerodynamic diameter of ten microns or less (PM₁₀), sulfur dioxide (SO₂), oxides
12 of nitrogen (NO_x), volatile organic compounds (VOC), and ammonia. SO₂ and NO_x are
13 specifically defined as PM₁₀ precursors, that is, compounds that, after being emitted to the
14 atmosphere, undergo chemical or physical change to become PM₁₀. Any PM₁₀ that is created in
15 this way is referred to as secondary aerosol. The CMAQ model also considers ammonia and
16 VOC to be contributing factors in the formation of secondary aerosol.

17
18 The unit of measure for point and area sources is the traditional tons per year, but the CMAQ
19 model includes a pre-processor that converts these emission rates to hourly increments throughout
20 each day for each episode. Mobile source emissions are reported in terms of tons per day, and are
21 also pre-processed by the model.

22
23 The basis for the point source and area inventories, for the base-year attainment inventory as well
24 as all future-year projection inventories, was the 2011 tri-annual inventory of actual emissions
25 that had already been compiled by the Division of Air Quality.

26
27 Area sources, off-road mobile sources, and generally also the large point sources were projected
28 forward from 2011, using population and economic forecasts from the Governor's Office of
29 Management and Budget.

30
31 Mobile source emissions were calculated for each year using MOVES2010 in conjunction with
32 the appropriate estimates for vehicle miles traveled (VMT). VMT estimates for the urban
33 counties were based on a travel demand model that is only run periodically for specific projection
34 years. VMT for intervening years were estimated by interpolation.

35
36 Since this SIP subsection takes the form of a maintenance plan, it must demonstrate that the area
37 will continue to attain the PM₁₀ NAAQS throughout a period of ten years from the date of EPA
38 approval. It is also necessary to "spot check" this ten-year interval. Hence, projection inventories
39 were prepared for the following years: 2019, 2024, 2028, (the ten-year mark from anticipated
40 EPA approval), and 2030. 2011 was established as the baseline period.

41
42 The following tables are provided to summarize these inventories. As described, they represent
43 point, area, on-road mobile, and off-road mobile sources in the modeling domain. They include
44 PM₁₀, SO₂, NO_x, VOC, and ammonia.

45
46 The first Table IX.A.11. 7 shows the baseline emissions for each of the areas within the
47 modeling domain. The second Table IX.A.11. 8 is specific to this nonattainment area, and
48 shows the emissions from the baseline through the projection years.

1
2

Table IX.A.11. 7 Baseline Emissions throughout the Modeling Domain

2011 Baseline	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline Sum of Emissions (tpd)	Ogden City NA-Area	Area Sources	0.85	0.08	2.12	5.67	0.86
		NonRoad	0.90	0.00	1.32	0.91	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.09	0.05	12.18	8.58	0.22
		Provo NA Total	3.84	0.13	15.62	15.16	1.08
	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	7.12	0.32	11.71	6.38	0.00
		Point Source	4.04	8.90	15.56	2.97	0.20
		Mobile Sources	10.95	0.28	57.96	35.35	1.14
		Salt Lake City NA Total	26.72	9.55	85.96	77.32	2.87
	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	3.53	0.02	4.24	2.31	0.00
		Point Source	0.28	0.29	1.03	0.18	0.18
		Mobile Sources	4.90	0.13	24.64	11.89	0.49
		Surrounding Areas Total	10.90	0.46	30.13	15.54	1.50
	Surrounding Areas	Area Sources	537.49	13.60	228.31	629.52	331.22
		NonRoad	34.53	0.10	60.77	72.57	0.01
		Point Source	17.64	283.15	538.86	63.96	6.08
		Mobile Sources	22.80	193.52	434.92	6.47	1.67
		Surrounding Areas Total	612.46	490.37	1262.86	772.52	338.98
	2011 Total	653.92	500.51	1394.57	880.54	344.43	

3
4
5
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8
9

Table IX.A.11. 8 Salt Lake County Nonattainment Area; Actual Emissions for 2011 and Emission Projections for 2019, 2024, 2028, and 2030.

Year	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	3.53	0.02	4.24	2.31	0.00
		Point Source	0.28	0.29	1.03	0.18	0.18
		Mobile Sources	4.90	0.13	24.64	11.89	0.49
		2011 Total	10.90	0.46	30.13	15.54	1.50
2019	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	4.80	0.02	3.04	1.95	0.01
		Point Source	0.87	0.44	3.24	0.86	0.43
		Mobile Sources	6.04	0.17	13.77	6.43	0.46
	2019 Total	13.90	0.65	20.27	10.40	1.73	
2024	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	5.19	0.02	2.45	1.90	0.01
		Point Source	0.92	0.47	3.42	0.91	0.43
		Mobile Sources	6.37	0.16	9.01	5.22	0.48
	2024 Total	14.67	0.67	15.10	9.19	1.75	
2028	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	5.68	0.02	2.17	1.92	0.01
		Point Source	0.96	0.49	0.00	0.96	0.43
		Mobile Sources	6.97	0.16	7.28	4.60	0.51
	2028 Total	15.80	0.69	9.67	8.64	1.78	
2030	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	6.25	0.02	2.07	1.94	0.01
		Point Source	0.99	0.49	3.67	0.98	0.43
		Mobile Sources	7.66	0.16	6.81	4.54	0.54
	2030 Total	17.09	0.69	12.77	8.62	1.81	

10
11
12
13
14
15
16

More detail concerning any element of the inventory can be found at the appropriate section of the Technical Support Document (TSD). More detail about the general construction of the inventory may be found in the Inventory Preparation Plan.

1
2 **(3) Emissions Limitations**
3

4 As discussed above, the larger sources within the nonattainment areas were individually
5 inventoried and modeled in the analysis.
6

7 A subset of these “large” sources was subsequently identified for the purpose of establishing
8 emission limitations as part of the Utah SIP. This subset includes any source located within any
9 of the three current nonattainment areas for PM₁₀: Salt Lake County, Utah County, or Ogden City
10 whose actual emissions of PM₁₀, SO₂, or NO_x exceeded 100 tons in 2011, or who had the
11 potential to emit 100 tpy of any of these pollutants. A source might also be included in the subset
12 if it was currently regulated for PM₁₀ under section IX, Part H of the Utah SIP. There were
13 several sources in Davis County that were close enough to the border so as to have originally
14 been included in the original PM₁₀ SIP.
15

16 As discussed before, the emission limits for these sources had already been reflected in the
17 projected emissions inventories used in the modeling analysis. Only those limits for which credit
18 is being taken in the SIP have been incorporated specifically into the SIP. Many of these limits
19 appear in state issued Approval Orders or Title V Operating Permits. Such regulatory documents
20 typically include many emission limits and operating restrictions. However, the limits found in
21 the SIP cannot be changed unless the State provides, and EPA approves, a SIP revision.
22

23 These limits are incorporated in the Utah SIP at Section IX, Part H (formerly Sections 1 and 2 of
24 Appendix A to Section IX, Part A), and as such are federally enforceable.
25

26 These conditions support a demonstration of maintenance through 2030.
27
28

29 **(4) Emission Reduction Credits**
30

31 Under Utah’s new source review rules in R307-403-8, banking of emission reduction credits
32 (ERCs) is permitted to the fullest extent allowed by applicable Federal Law as identified in 40
33 CFR 51, Appendix S, among other documents. Under Appendix S, Section IV.C.5, a permitting
34 authority may allow banked ERCs to be used under the preconstruction review program (R307-
35 403) as long as the banked ERCs are identified and accounted for in the SIP control strategy.
36

37 Existing Emission Reduction Credits, for PM₁₀, SO₂, and NO_x, were included in the modeled
38 demonstration of maintenance outlined in Subsection IX.A.11.c(1).
39

40 The subsequent crediting of any emission reduction of PM₁₀, or precursors thereto, whether pre-
41 existing or established subsequent to the approval of this SIP revision, remains permissible. In
42 general, credits must be in excess and must be established by actual, verifiable, and enforceable
43 reductions in emissions. Additionally, these ERCs cannot be used to offset major new sources or
44 major modifications at existing sources in PM_{2.5} nonattainment areas.
45

46 Once **Utah County** is redesignated to attainment for PM₁₀, permitting new PM₁₀ sources or major
47 modifications to existing PM₁₀ sources will be conducted under the rules of the Prevention of
48 Significant Deterioration program.
49
50
51

1 **(5) Additional Controls for Future Years**

2
3 Since the emission limitations discussed in subsection IX.A.11.c.(3) are federally enforceable
4 and, as demonstrated in IX.A.10.c(1) above, are sufficient to ensure continued attainment of the
5 PM₁₀NAAQS, there is no need to require any additional control measures to maintain the PM₁₀
6 NAAQS.
7
8

9 **(6) Mobile Source Budget for Purposes of Conformity**

10
11 The transportation conformity provisions of section 176(c)(2)(A) of the Clean Air Act (CAA)
12 require regional transportation plans and programs to show that "...emissions expected from
13 implementation of plans and programs are consistent with estimates of emissions from motor
14 vehicles and necessary emissions reductions contained in the applicable implementation plan..."
15 EPA's transportation conformity regulation (40 CFR 93, Subpart A, last amended at 77 FR 14979,
16 March 14 2012) also requires that motor vehicle emission budgets must be established for the
17 last year of the maintenance plan, and may be established for any years deemed appropriate (see
18 40 CFR 93.118((b)(2)(i)). If the maintenance plan does not establish motor vehicle emissions
19 budgets for any years other than the last year of the maintenance plan, the conformity regulation
20 requires that a "demonstration of consistency with the motor vehicle emissions budget(s) must be
21 accompanied by a qualitative finding that there are not factors which would cause or contribute to
22 a new violation or exacerbate an existing violation in the years before the last year of the
23 maintenance plan." The normal interagency consultation process required by the regulation (40
24 CFR 93.105) shall determine what must be considered in order to make such a finding.
25

26 Thus, for a Metropolitan Planning Organization's (MPO's) Regional Transportation Plan (RTP),
27 analysis years that are after the last year of the maintenance plan (in this case 2030), a conformity
28 determination must show that emissions are less than or equal to the maintenance plan's motor
29 vehicle emissions budget(s) for the last year of the implementation plan.
30

31 EPA's MOVES2014 was used to calculate mobile source emissions, and road dust projections
32 were calculated using the January 2011 update to AP-42 Method for Estimating Re-Entrained
33 Road Dust from Paved Roads (Chapter 13, released 76 FR 6329 February 4, 2011).
34

35 Utah has determined that mobile sources are not significant contributors of SO₂ for this
36 maintenance plan. As such, this maintenance plan does not establish a motor vehicle emissions
37 budget for SO₂.
38

39 **(a) Utah County: Mobile Source PM₁₀ Emissions Budgets**

40
41 In this maintenance plan, Utah is establishing transportation conformity motor vehicle emission
42 budgets (MVEB) for PM₁₀ (direct) and NO_x for 2030.
43

44 **(i) Direct PM₁₀ Emissions Budget**

45
46 Direct (or "primary") PM₁₀ refers to PM₁₀ that is not formed via atmospheric chemistry. Rather,
47 direct PM₁₀ is emitted straight from a mobile or stationary source. With regard to the emission
48 budget presented herein, direct PM₁₀ includes road dust, brake wear, and tire wear as well as
49 PM₁₀ from exhaust.
50

51 *As presented in the Technical Support Document for on-road mobile sources, the estimated on-*
52 *road mobile source emissions for Utah County, in 2030, of direct sources of PM₁₀ (road dust,*

1 brake wear, tire wear, and exhaust particles) were 7.66 tons per winter-weekday. These mobile
2 source PM₁₀ emissions were included in the maintenance demonstration in Subsection
3 IX.A.11.c.(1) which estimates a maximum PM₁₀ concentration of 143.1 µg/m³ in 2030 within the
4 Utah County portion of the modeling domain. The above PM₁₀ mobile source emission figure of
5 7.66 tons per day (tpd) would traditionally be considered as the MVEB for the maintenance plan.
6 However, and as discussed below, the modeled concentration is 6.9 µg/m³ below the NAAQS of
7 150 µg/m³, and represents potential PM₁₀ emissions that may be considered for allocation to the
8 PM₁₀ MVEB.

9
10 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
11 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
12 compliance with the maintenance requirement. These additional emissions that can be allocated
13 to the applicable MVEB are considered the "safety margin." As defined in 40 CFR 93.101,
14 safety margin represents the amount of emissions by which the total projected emissions from all
15 sources of a given pollutant are less than the total emissions that would satisfy the applicable
16 requirement for demonstrating maintenance. The implementation plan can then allocate some or
17 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

18
19 The safety margin for the Utah County portion of the domain equates to 6.9 µg/m³.

20
21 To evaluate the portion of safety margin that could be allocated to the PM₁₀ MVEB, modeling
22 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.

23
24 Using the same emission projections for point and area and non-road mobile sources, the
25 SMOKE 3.6 emissions model was re-run using 12.28 tons of PM₁₀ per winter-weekday for
26 mobile sources (and 8.34 tons/winter-weekday of NO_x). The revised maintenance demonstration
27 for 2030 still shows maintenance of the PM₁₀ standard.

28
29 It estimates a maximum PM₁₀ concentration of 148.0 µg/m³ in 2030 within the Utah County
30 portion of the modeling domain. This value is 2.0 µg/m³ below the NAAQ Standard of 150
31 µg/m³, but 4.9 µg/m³ higher than the previous value.

32
33 This shows that the safety margin is at least 4.62 tons/day of PM₁₀ (12.28 tons/day minus 7.66
34 tons/day) and 1.53 tons/day of NO_x (8.34 tons/day minus 6.81 tons/day). This maintenance plan
35 allocates this portion of the safety margin to the mobile source budgets for Utah County, and
36 thereby sets the direct PM₁₀ MVEB for 2030 at 12.28 tons/winter-weekday.

37 38 39 (ii) NO_x Emissions Budget

40
41 Through atmospheric chemistry, NO_x emissions can substantially contribute to secondary PM₁₀
42 formation. For this reason, NO_x is considered a PM10 precursor.

43
44 As presented in the Technical Support Document for on-road mobile sources, the estimated on-
45 road mobile source NO_x emissions for Utah County in 2030 were 6.81 tons per winter-weekday.
46 These mobile source PM₁₀ emissions were included in the maintenance demonstration in
47 Subsection IX.A.11.c.(1) which estimates a maximum PM₁₀ concentration of 143.1 µg/m³ in
48 2030 within the Utah County portion of the modeling domain. The above NO_x mobile source
49 emission figure of 6.81 tons per day (tpd) would traditionally be considered as the MVEB for the
50 maintenance plan. However, and as discussed below, the modeled concentration is 6.9 µg/m³
51 below the NAAQS of 150 µg/m³, and represents potential NO_x emissions that may be considered
52 for allocation to the NO_x MVEB.

1
2 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
3 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
4 compliance with the maintenance requirement. These additional emissions that can be allocated
5 to the applicable MVEB are considered the "safety margin." As defined in 40 CFR 93.101,
6 safety margin represents the amount of emissions by which the total projected emissions from all
7 sources of a given pollutant are less than the total emissions that would satisfy the applicable
8 requirement for demonstrating maintenance. The implementation plan can then allocate some or
9 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

10
11 The safety margin for the Utah County portion of the domain equates to $6.9 \mu\text{g}/\text{m}^3$.

12
13 To evaluate the portion of safety margin that could be allocated to the PM_{10} MVEB, modeling
14 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.

15
16 Using the same emission projections for point and area and non-road mobile sources, the
17 SMOKE 3.6 emissions model was re-run using 8.34 tons of NO_x per winter-weekday for on-road
18 mobile sources (and 12.28 tons/winter-weekday of PM_{10}). The revised maintenance
19 demonstration for 2030 still shows maintenance of the PM_{10} standard.

20
21 It estimates a maximum PM_{10} concentration of $148.0 \mu\text{g}/\text{m}^3$ in 2030 within the Utah County
22 portion of the modeling domain. This value is $2.0 \mu\text{g}/\text{m}^3$ below the NAAQ Standard of 150
23 $\mu\text{g}/\text{m}^3$, but $4.9 \mu\text{g}/\text{m}^3$ higher than the previous value.

24
25 This shows that the safety margin is at least 1.53 tons/day of NO_x (8.34 tons/day minus 6.81
26 tons/day) and 4.62 tons/day of PM_{10} (12.28 tons/day minus 7.66 tons/day). This maintenance
27 plan allocates this portion of the safety margin to the mobile source budgets for Utah County, and
28 thereby sets the NO_x MVEB for 2030 at 8.34 tons/winter-weekday

29
30
31 **(b) Net Effect to Maintenance Demonstration**

32
33 Using the procedure described above, some of the identified safety margin indicated earlier in
34 Subsection IX.A.11.c(6) has been allocated to the mobile vehicle emissions budgets. The results
35 of this modification are presented below.

36
37 **(i) Inventory: The emissions inventory was adjusted as shown below:**

38
39 in 2030: PM_{10} was adjusted by adding 4.62 ton/day (tpd) of safety margin to 7.66
40 tpd inventory for a total of 12.28 tpd, and

41
42 NO_x was adjusted by adding 1.53 tpd of safety margin to 6.81 tpd
43 inventory for a total of 8.34 tpd,

44 **(ii) Modeling:**

45
46 The effect on the modeling results throughout the domain is summarized in the following
47 Table IX.A.11. 9 (which shows predicted concentrations in $\mu\text{g}/\text{m}^3$). It demonstrates that
48 with the allocation of the safety margin, the NAAQS is still maintained through 2030 in
49 all areas.

Table IX.A. IX.A.11. 9 Modeling of Attainment in 2030, Including the Portion of the Safety Margin Allocated to Motor Vehicles

Air Quality Monitor	Predicted Concentrations in 2030 $\mu\text{g}/\text{m}^3$	
	A	B
Lindon	129.2	133.7
North Provo	143.1	148.0

Notes: Column A shows concentrations presented previously as part of the modeled attainment test. Column B shows concentrations resulting from allocation of a portion of the safety margin.

(7) Nonattainment Requirements Applicable Pending Plan Approval

CAA 175A(c) - *Until such plan revision is approved and an area is redesignated as attainment, the requirements of CAA Part D, Plan Requirements for Nonattainment Areas, shall remain in force and effect.* The Act requires the continued implementation of the nonattainment area control strategy unless such measures are shown to be unnecessary for maintenance or are replaced with measures that achieve equivalent reductions. Utah will continue to implement the emissions limitations and measures from the PM₁₀ SIP.

(8) Revise in Eight Years

CAA 175A(b) - *Eight years after redesignation, the State must submit an additional plan revision which shows maintenance of the applicable NAAQS for an additional 10 years.* Utah commits to submit a revised maintenance plan eight years after EPA takes final action redesignating the Utah County area to attainment, as required by the Act.

(9) Verification of Continued Maintenance

Implicit in the requirements outlined above is the need for the State to determine whether the area is in fact maintaining the standard it has achieved. There are two complementary ways to measure this: 1) by monitoring the ambient air for PM₁₀, and 2) by inventorying emissions of PM₁₀ and its precursors from various sources.

The State will continue to maintain an ambient monitoring network for PM₁₀ in accordance with 40 CFR Part 58 and the Utah SIP. The State anticipates that the EPA will continue to review the ambient monitoring network for PM₁₀ each year, and any necessary modifications to the network will be implemented.

Additionally, the State will track and document measured mobile source parameters (e.g., vehicle miles traveled, congestion, fleet mix, etc.) and new and modified stationary source permits. If these and the resulting emissions change significantly over time, the State will perform appropriate studies to determine: 1) whether additional and/or re-sited monitors are necessary, and 2) whether mobile and stationary source emission projections are on target.

1 The State will also continue to collect actual emissions inventory data from all sources of PM₁₀,
2 SO₂, and NO_x in excess of 25 tons (in aggregate) per year, as required by R307-150.
3
4
5

6 **(10) Contingency Measures**

7

8 *CAA 175A(d) - Each maintenance plan shall contain contingency measures to assure that the*
9 *State will promptly correct any violation of the standard which occurs after the redesignation of*
10 *the area to attainment. Such provisions shall include a requirement that the State will implement*
11 *all control measures which were contained in the SIP prior to redesignation.*
12

13 Utah has implemented all measures contained in the nonattainment plan, however for the
14 purposes of this maintenance plan the list of stationary sources included in SIP Section IX. Part
15 H. was updated. Some of the sources identified in the nonattainment SIP are no longer
16 operational or no longer rise to the emission thresholds established for such inclusion. In such
17 instances, the emission limits belonging specifically to these sources were not carried forward.
18 Where such a source is still operational, the prior SIP limits from the nonattainment plan are
19 identified below as potential contingency measures. Some of the specific limits within may no
20 longer apply and would need to be reevaluated at that time.
21

22 This Contingency Plan for **Utah County** supersedes Subsection IX.A.8, Contingency Measures,
23 which is part of the original PM₁₀ SIP.
24

25 The contingency plan must also ensure that the contingency measures are adopted expeditiously
26 once triggered. The primary elements of the contingency plan are: 1) the list of potential
27 contingency measures, 2) the tracking and triggering mechanisms to determine when
28 contingency measures are needed, and 3) a description of the process for recommending and
29 implementing the contingency measures.
30

31 **(a) Tracking**

32

33 The tracking plan for the Salt Lake County, Utah County, and Ogden City areas consists of
34 monitoring and analyzing PM₁₀ concentrations. In accordance with 40 CFR 58, the State will
35 continue to operate and maintain an adequate PM₁₀ monitoring network in Salt Lake County,
36 Utah County, and Ogden City.
37
38
39

40 **(b) Triggering**

41

42 Triggering of the contingency plan does not automatically require a revision to the SIP, nor does
43 it necessarily mean the area will be redesignated once again to nonattainment. Instead, the State
44 will normally have an appropriate timeframe to correct the potential violation with
45 implementation of one or more adopted contingency measures. In the event that violations
46 continue to occur, additional contingency measures will be adopted until the violations are
47 corrected.
48

49 Upon notification of a potential violation of the PM₁₀ NAAQS, the State will develop appropriate
50 contingency measures intended to prevent or correct a violation of the PM₁₀ standard.
51 Information about historical exceedances of the standard, the meteorological conditions related to

1 the recent exceedances, and the most recent estimates of growth and emissions will be reviewed.
2 The possibility that an exceptional event occurred will also be evaluated.

3
4 Upon monitoring a potential violation of the PM₁₀ NAAQS, including exceedances flagged as
5 exceptional events but not concurred with by EPA, the State will take the following actions.

- 6
7 • The State will identify the source(s) of PM₁₀ causing the potential violation, and report
8 the situation to EPA Region VIII within four months of the potential violation.
9
10 • The State will identify a means of corrective action within six months after a potential
11 violation. The maintenance plan contingency measures to be considered and selected
12 will be chosen from the following list or any other emission control measures deemed
13 appropriate based on a consideration of cost-effectiveness, emission reduction potential,
14 economic and social considerations, or other factors that the State deems appropriate:
15
16 - Re-evaluate the thresholds at which a red or yellow burn day is triggered, as
17 established in R307-302;
18
19 - Further controls on stationary sources

20
21 The State will then hold a public hearing to consider the contingency measures identified to
22 address the violation. The State will require implementation of such corrective action no later
23 than one year after the violation is confirmed. Any contingency measures adopted and
24 implemented will become part of the next revised maintenance plan submitted to the EPA for
25 approval.

26
27 It is also possible that contingency measures may be pre-implemented, where no violation of the
28 2006 PM₁₀ NAAQS has yet occurred.



State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQ-049-15

MEMORANDUM

TO: Air Quality Board

THROUGH: Bryce C. Bird, Executive Secretary

FROM: Bill Reiss, Environmental Engineer

DATE: August 21, 2015

SUBJECT: PROPOSE FOR PUBLIC COMMENT: [Repeal of Existing SIP Subsection IX.A12 and Re-enact with SIP Subsection IX.A.12: PM₁₀ Maintenance Provisions for Ogden City.](#)

Introduction:

This item concerns a proposed State Implementation Plan (SIP) revision to address Utah's three nonattainment areas for PM₁₀. These areas have been attaining the PM₁₀ standard for a long time, and this revision demonstrates that they will continue to do so through the year 2030.

The revision is structured as a maintenance plan, which will allow Utah to request that EPA change the area designations back to attainment for PM₁₀. These areas include Salt Lake County, Utah County, and Ogden City.

[Ogden City was designated a nonattainment area for PM₁₀ in 1995 based on a total of six exceedances of the 24-hour standard recorded between January 1991 and January 1993. Since that time, PM_{2.5} has supplanted PM₁₀ as the indicator of fine particulate matter. Though PM₁₀ also includes the coarse fraction of PM, Utah's difficulties with PM₁₀ were characterized by the same winter time episodes that lead to elevated PM_{2.5} levels.](#)

Essentially, this SIP revision would close the book on PM₁₀ and allow Utah to focus on meeting the PM_{2.5} standard. All three of the affected areas are currently designated nonattainment for PM_{2.5}.

Scope:

There are two parts to the SIP revision. (This) Section IX. Part A is the SIP document itself, and addresses the criteria necessary to request redesignation. It includes the actual Maintenance Plan, which includes the quantitative demonstration of continued attainment.

Some of the items addressed in Part A include:

- monitored attainment of the PM₁₀ NAAQS
- establishment of motor vehicle emission budgets for purposes of transportation conformity
- consideration of emission reduction credits, and
- contingency measures

The second piece is SIP Section IX, Part H. It includes the emission limits for certain specific stationary sources. Including these limits in the SIP makes them federally enforceable.

Part H, whether currently approved or as now proposed, does not include any sources located in Ogden City.

SIP Organization:

As originally written in 1991, the PM₁₀ nonattainment SIP for Salt Lake and Utah Counties resides at Section IX.A. 1-8 of the Utah SIP. This plan had projected attainment of the NAAQS through the year 2003.

In 2005, Utah prepared a revision to the plan that showed continued attainment in Ogden City through the year 2017. This revision, also structured as a maintenance plan, was placed into the SIP at Section IX.A.12. Subsections IX.A.10 and 11 were also added as the maintenance plan provisions for Salt Lake County and Utah County respectively.

At this time, DAQ staff is proposing to replace each of these three subsections of the SIP in separate actions. Since there is a large amount of redundant material in the three documents, they have been prepared using color coding to denote which parts of each plan are specific to the respective nonattainment areas. In reviewing the proposals, the reader should note that purple text is specific to the Ogden City nonattainment area. Likewise, blue text and green text are specific to Salt Lake County and Utah County respectively.

Staff Recommendation: Staff recommends that the Board propose for public comment to repeal existing SIP Subsection IX.A.12, and re-enact with SIP Subsection IX.A.12: PM₁₀ Maintenance Provisions for Ogden City, as proposed.

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UTAH

PM₁₀ Maintenance Provisions for Ogden City

Section IX.A.12

Adopted by the Air Quality Board
December 2, 2015

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Section IX.A.12
PM₁₀ Maintenance Provisions for Ogden City

5
6
IX.A.12.a Introduction

7 The State of Utah is requesting that the U.S. Environmental Protection Agency (EPA) redesignate
8 the **Ogden City** nonattainment area to attainment status for the 24-hour PM₁₀ National Ambient
9 Air Quality Standard (NAAQS).

10
11 The foregoing Subsections 1-9 of Part IX.A of the Utah State Implementation Plans (SIP) were
12 written in 1991 to address violations of the NAAQS for PM₁₀ in both Utah County and Salt Lake
13 County. These areas were each classified as Initial Moderate PM₁₀ Nonattainment Areas, and as
14 such required “nonattainment SIPs” to bring them into compliance with the NAAQS by a
15 statutory attainment date. The control measures adopted as part of those plans have proven
16 successful in that regard, and at the time of this writing (2015) each of these areas continues to
17 show compliance with the federal health standards for PM₁₀.

18
19 Subsections 10 and 11 of Part IX.A of the Utah SIP represent the second chapter of the PM₁₀
20 story for these areas, and demonstrate that they have achieved compliance with the PM₁₀ NAAQS
21 and will continue to maintain that standard through the year 2017. As such, Subsections 10 and
22 11 are written in accordance with Section 175A (42 U.S.C. 7505a) of the federal Clean Air Act
23 (the Act), and should serve to satisfy the requirement of Section 107(d)(3)(E)(iv) of the Act.

24
25 This Subsection 12 makes the same demonstration with respect to Ogden City, and is structured
26 in the same way. It is hereafter referred to as the “Maintenance Plan” or “the Plan,” and contains
27 the PM₁₀ maintenance provisions for Ogden City. This area was effectively designated to
28 nonattainment for PM₁₀ on September 26, 1995.

29
30 In a similar way, any references to the Technical Support Document (TSD) in this section means
31 actually Supplement IV-15 to the Technical Support Document for the PM₁₀ SIP.

32
33
34 **Background**

35
36 The Act requires areas failing to meet the federal ambient PM₁₀ standard to develop SIP revisions
37 with sufficient control requirements to expeditiously attain and maintain the standard. On July 1,
38 1987, EPA promulgated a new NAAQS for particulate matter with a diameter of 10 microns or
39 less (PM₁₀).

40
41 Ogden City was designated from unclassifiable to nonattainment on September 26, 1995. This
42 was due to a total of six exceedances of the 24-hour standard recorded between January 1991 and
43 January 1993. Along with redesignation came the requirement for a nonattainment SIP, due in 18
44 months, and an attainment date of December 31, 2001.

45
46 However, in 1997 a new standard for PM₁₀ was promulgated by the EPA, and, based on the
47 revised form of this new standard, Ogden City would never have been found to be in
48 noncompliance.

1 In an effort to transition to the new form of the PM₁₀ standard, EPA issued its Interim
2 Implementation Guidance (IIG) on December 23, 1997. This, in conjunction with additional
3 guidance (5/8/98 memorandum from Sally L. Shaver to all Regional Air Directors) identified two
4 steps necessary to revoke the old standard for areas like Ogden City that were presently (as of
5 September 16, 1997) attaining the standard. The State would need to: 1) codify into its SIP any
6 existing controls that were implemented at the state level, and 2) demonstrate the state's
7 capacity to implement the revised PM₁₀ standards with respect to the Clean Air Act (CAA)
8 requirements found at Section 110.
9

10 By letter of March 27, 1998, Utah declared it could meet the second of these requirements for all
11 areas of the state. A second letter (June 25, 1998) addressed the first requirement, and requested
12 that the old PM₁₀ standard be revoked and that the outstanding Part D requirement be waived for
13 Ogden City.
14

15 EPA responded in a letter dated August 12, 1999 that the rationale for revoking the old standard
16 would no longer apply because the United States D.C. Circuit Court of Appeals had, on May 14,
17 1999, vacated the 1997 PM₁₀ NAAQS. This meant that Utah's obligation to satisfy the Part D
18 requirements with respect to the pre-1997 NAAQS was still outstanding.
19

20 In the wake of the ruling by the D.C. Circuit, EPA (on October 18, 1999) made available its PM₁₀
21 Clean Data Areas Approach, providing areas like Ogden City with another avenue by which to
22 satisfy any outstanding Part D requirements. Under EPA's Clean Data Policy and the regulations
23 that embody it, 40 CFR 51.918 (1997 8-hour ozone) and 51.1004(c) (PM_{2.5}), an EPA rulemaking
24 determination that an area is attaining the relevant standard suspends the area's obligations to
25 submit an attainment demonstration, reasonable available control measures (RACM), reasonable
26 further progress, contingency measures and other planning requirements related to attainment for
27 as long as the area continues to attain. EPA's statutory interpretation of the Clean Data Policy is
28 described in the "Final Rule to Implement the 8-hour Ozone National Ambient Air Quality
29 Standard – Phase 2" (Phase 2 Final Rule). 70 FR 71612, 71644-46 (November 29, 2005)
30 (ozone); See also 72 FR 20586, 20665 (April 25, 2007) (PM_{2.5}). EPA believes that the legal basis
31 set forth in detail in the Phase 2 final rule, May 10, 1995 memorandum from John S. Seitz,
32 entitled "Reasonable Further Progress, Attainment Demonstrations, and Related Requirements for
33 Ozone Nonattainment Areas Meeting the Ozone National Ambient Air Quality Standard," and the
34 December 14, 2004 memorandum from Stephen D. Page entitled "Clean Data Policy for the Fine
35 Particulate National Ambient Air Quality Standards" are equally pertinent to all NAAQS. EPA
36 has codified the Clean Data Policy for the 1997 8-hour ozone and PM_{2.5} NAAQS and has also
37 applied it in individual rulemakings for PM₁₀.
38

39 Under the Clean Data Policy, EPA may issue a determination of attainment (known formally as a
40 Clean Data Determination) after notice and comment rulemaking determining that a specific area
41 is attaining the relevant standard. For such areas the requirement to submit to EPA those SIP
42 elements related to attaining the NAAQS is suspended for so long as the area continues to attain
43 the standard. These planning elements include reasonable further progress (RFP) requirements,
44 attainment demonstrations, RACM, contingency measures, and other state planning requirements
45 related to attainment of the NAAQS. The determination of attainment is not equivalent to a
46 redesignation, and the state must still meet the statutory requirements for redesignation in order to
47 be redesignated to attainment. A determination of attainment for purposes of the Clean Data
48 Policy / regulations is also not linked to any particular attainment deadline, and is not necessarily
49 equivalent to a determination that the area has attained the standard by its applicable attainment
50 deadline. Also any sanction clocks that may have been running would be stopped.
51

1 Utah addressed these criteria for Ogden City in a letter dated March 30, 2000. In particular, it
2 identified a number of control measures that applied to nonattainment areas in general and were
3 at least partly responsible for bringing the area into compliance with the PM₁₀ NAAQS. Since
4 these measures (open burning rule, visible emissions rule, fugitive dust rule, and vehicle I/M)
5 were incorporated into the Utah SIP, and since the IIG had indicated that it would be
6 inappropriate to require any new control measures, it could be concluded that the Part D planning
7 requirements for Ogden City had been satisfied. The March 30, 2000, letter cited agreement
8 between the respective agencies on these three criteria, and accordingly petitioned EPA to note in
9 the Federal Register that the Part D planning requirements for Ogden City had in fact been
10 satisfied. It also acknowledged that such action would not constitute a redesignation under CAA
11 Section 107, and that if the State wished to request that Ogden City be redesignated to attainment,
12 then subsequent action must be taken under CAA Section 175[A].

13
14 Also acknowledged was the obligation to produce a basic emissions inventory for Ogden City to
15 the satisfaction of EPA Region VIII. After a period of public review and comment, the inventory
16 was transmitted to EPA on August 9, 2001. The State identified this inventory as the only
17 remaining element among the criteria outlined in the PM₁₀ Clean Data Areas Approach, and again
18 requested that EPA find in the Federal Register that Utah had fulfilled its planning requirements
19 for Ogden City, under Part D of the CAA.

20
21 Unfortunately, while the emissions inventory was being developed the PM₁₀ monitoring site in
22 Ogden was shut down. Utah had been collecting ambient PM₁₀ data at the Ogden site (AIRS #
23 49-057-0001) since April of 1987, but in February of 2000 the structure on which the monitor
24 was situated was demolished. It was not until July 1, 2001 that collection could resume at a new
25 location (AIRS # 49-057-0002). Unfortunately, this meant that EPA could take no action.
26 Although the data collected from 1994 through February of 2000 showed continued compliance
27 with the NAAQS, Utah did not have data for the three most recent years.

28
29 Ultimately EPA did propose to determine that the Ogden City nonattainment area was currently
30 attaining the 24-hour NAAQS for PM₁₀, based on certified, quality assured data for the years
31 2009 through 2011, and that Utah's obligation to submit certain CAA requirements would be
32 suspended for so long as the area continued to attain the PM₁₀ standard (see 77 FR, 44544). The
33 proposal was finalized in a notice dated January 7, 2013 (see FR Vol. 78, 885).

34 35 36 **IX.A.12.b Pre-requisites to Area Redesignation**

37
38 Section 107(d)(3)(E) of the Act outlines five requirements that must be satisfied in order that a
39 state may petition the Administrator to redesignate a nonattainment area back to attainment.
40 These requirements are summarized as follows: 1) the Administrator determines that the area has
41 attained the applicable NAAQS, 2) the Administrator has fully approved the applicable
42 implementation plan for the area under §110(k) of the Act, 3) the Administrator determines that
43 the improvement in air quality is due to permanent and enforceable reductions in emissions
44 resulting from implementation of the applicable implementation plan ... and other permanent and
45 enforceable reductions, 4) the Administrator has fully approved a maintenance plan for the area
46 as meeting the requirements of §175A of the Act, and 5) the State containing such area has met
47 all requirements applicable to the area under §110 and Part D of the Act.

48
49 Each of these requirements will be addressed below. Certainly, the central element from this list
50 is the maintenance plan found at Subsection IX.A.12.c below. Section 175A of the Act contains
51 the necessary requirements of a maintenance plan, and EPA policy based on the Act requires

1 additional elements in order that such plan be federally approvable. Table IX.A.12. 1 identifies
 2 the prerequisites that must be fulfilled before a nonattainment area may be redesignated to
 3 attainment under Section 107(d)(3)(E) of the Act.

4
 5
 6

Table IX.A.12. 1 Prerequisites to Redesignation in the Federal Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Attainment of Standard	Three consecutive years of PM ₁₀ monitoring data must show that violations of the standard are no longer occurring.	CAA §107(d)(3)(E)(i)	IX.A.12.b(1)
Approved State Implementation Plan	The SIP for the area must be fully approved.	CAA §107(d)(3)(E)(ii)	IX.A.12.b(2)
Permanent and Enforceable Emissions Reductions	The State must be able to reasonably attribute the improvement in air quality to emission reductions that are permanent and enforceable	CAA §107(d)(3)(E)(iii), Calcagni memo (Sect 3, para 2)	IX.A.12.b(3)
Section 110 and Part D requirements	The State must verify that the area has met all requirements applicable to the area under section 110 and Part D.	CAA: §107(d)(3)(E)(v), §110(a)(2), Sec 171	IX.A.12.b(4)
Maintenance Plan	The Administrator has fully approved the Maintenance Plan for the area as meeting the requirements of CAA §175A	CAA: §107(d)(3)(E)(iv)	IX.A.12.b(5) and IX.A.12.c

7
 8
 9

(1) The Area Has Attained the PM₁₀ NAAQS

10 CAA 107(d)(3)(E)(i) - *The Administrator determines that the area has attained the national*
 11 *ambient air quality standard.* To satisfy this requirement, the State must show that the area is
 12 attaining the applicable NAAQS. According to EPA's guidance concerning area redesignations
 13 (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni to
 14 Regional Air Directors, September 4, 1992 [or, Calcagni]), there are generally two components
 15 involved in making this demonstration. The first relies upon ambient air quality data which
 16 should be representative of the area of highest concentration and should be collected and quality
 17 assured in accordance with 40 CFR 58. The second component relies upon supplemental air
 18 quality modeling. Each will be discussed in turn.

19 **(a) Ambient Air Quality Data (Monitoring)**

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In 1987 EPA promulgated the National Ambient Air Quality Standard (NAAQS) for PM₁₀. The NAAQS for PM₁₀ is listed in 40 CFR 50.6 along with the criteria for attaining the standard. The 24-hour NAAQS is 150 micrograms per cubic meter (ug/m³) for a 24-hour period, measured from midnight to midnight. The 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 ug/m³, as determined in accordance with Appendix K to that part, is equal to or less than one. In other words, each monitoring site is allowed up to three expected exceedances of the 24-hour standard within a period of three calendar years. More than three expected exceedances in that three-year period is a violation of the NAAQS.

1 There also had been an annual standard of 50 ug/m³. The annual standard was attained if the
2 three-year average of individual annual averages was less than 50 ug/m³. Utah never violated the
3 annual standard at any of its monitoring stations, and the annual average was not retained as a
4 PM₁₀ standard when the NAAQS was revised in 2006. Nevertheless, an annual average still
5 provides a useful metric to evaluate long-term trends in PM₁₀ concentrations here in Utah where
6 short-term meteorology has such an influence on high 24-hour concentrations during the winter
7 season.

8
9 40 CFR 58 Appendix K, Interpretation of the National Ambient Air Quality Standards for
10 Particulate Matter, acknowledges the uncertainty inherent in measuring ambient PM₁₀
11 concentrations by specifying that an *observed exceedance* of the (150 ug/m³) 24-hour health
12 standard means a daily value that is above the level of the 24-hour standard after rounding to the
13 nearest 10 ug/m³ (e.g., values ending in 5 or greater are to be rounded up).

14
15 The term *expected exceedance* accounts for the possibility of missing data. Missing data can
16 occur when a monitor is being repaired, calibrated, or is malfunctioning, leaving a time gap in the
17 monitored readings. EPA discounts these gaps if the highest recorded PM₁₀ reading at the
18 affected monitor on the day before or after the gap is not more than 75 percent of the standard,
19 and no measured exceedance has occurred during the year.

20
21 Expected exceedances are calculated from the Aerometric Information and Retrieval System
22 (AIRS) data base according to procedures contained in 40 CFR Part 50, Appendix K. The State
23 relied on the expected exceedance values contained in the AIRS Quick Look Report (AMP 450)
24 to determine if a violation of the standard had occurred.

25
26 Data may also be flagged when circumstances indicate that it would represent an outlier in the
27 data set and not be indicative of the entire airshed or the efforts to reasonably mitigate air
28 pollution within. Appendix N to Part 50 – “Interpretation of the National Ambient Air Quality
29 Standards for Particulate Matter” anticipates this and states: “Data resulting from uncontrollable
30 or natural events, for example structural fires or high winds, may require special consideration.
31 In some cases, it may be appropriate to exclude these data because they could result in
32 inappropriate values to compare with the levels of the PM standards.” The protocol for data
33 handling dictates that flagging is initiated by the state or local agency, and then the EPA either
34 concurs or indicates that it has not concurred. Some discussion will be provided to help the
35 reader understand the occasional occurrence of wind-blown dust events that affect these
36 nonattainment areas, and how the resulting data should be interpreted with respect to the control
37 measures enacted to address the 24-hour NAAQS.

38
39 Using the criteria from 40 CFR 58 Appendix K, data was compiled for all PM₁₀ monitors
40 within the [Ogden City](#) nonattainment area that recorded a four-year data set comprising the years
41 2011 – 2014. For each monitor, the number of expected exceedances is reported for each year,
42 and then the average number of expected exceedances is reported for the overlapping three-year
43 periods. If this average number of expected exceedances is less than or equal to 1.0, then that
44 particular monitor is said to be in compliance with the 24-hour standard for PM₁₀. In order for an
45 area to be in compliance with the NAAQS, every monitor within that area must be in compliance.

46
47 As illustrated in the table below, the results of this exercise show that the [Ogden City](#) PM₁₀
48 nonattainment area is presently attaining the NAAQS.
49

1
2
3

Table IX.A.12. 2 PM₁₀ Compliance in Ogden City, 1999-2001, and 2011-2014

Ogden 2 49-057-0002	24-hr Standard	3-Year Average
	No. Expected Exceedances	No. Expected Exceedances
1999	0.0 / 0.0*	
2000	0.0 / 0.0*	
2001	0.0 / 0.0*	0.0 / 0.0*
2011	0.0 / 0.0*	
2012	0.0 / 0.0*	
2013	0.0 / 0.0*	0.0 / 0.0*
2014	0.0 / 0.0*	0.0 / 0.0*

4
5
6
7
8
9

* The second set of numbers shows what would be the effect of including all of the data that has been flagged by DAQ and not yet concurred with by EPA.

** Data from 1999 and 2000 was collected at Ogden 1 49-057-0001

10
11

(b) PM₁₀ Monitoring Network

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24

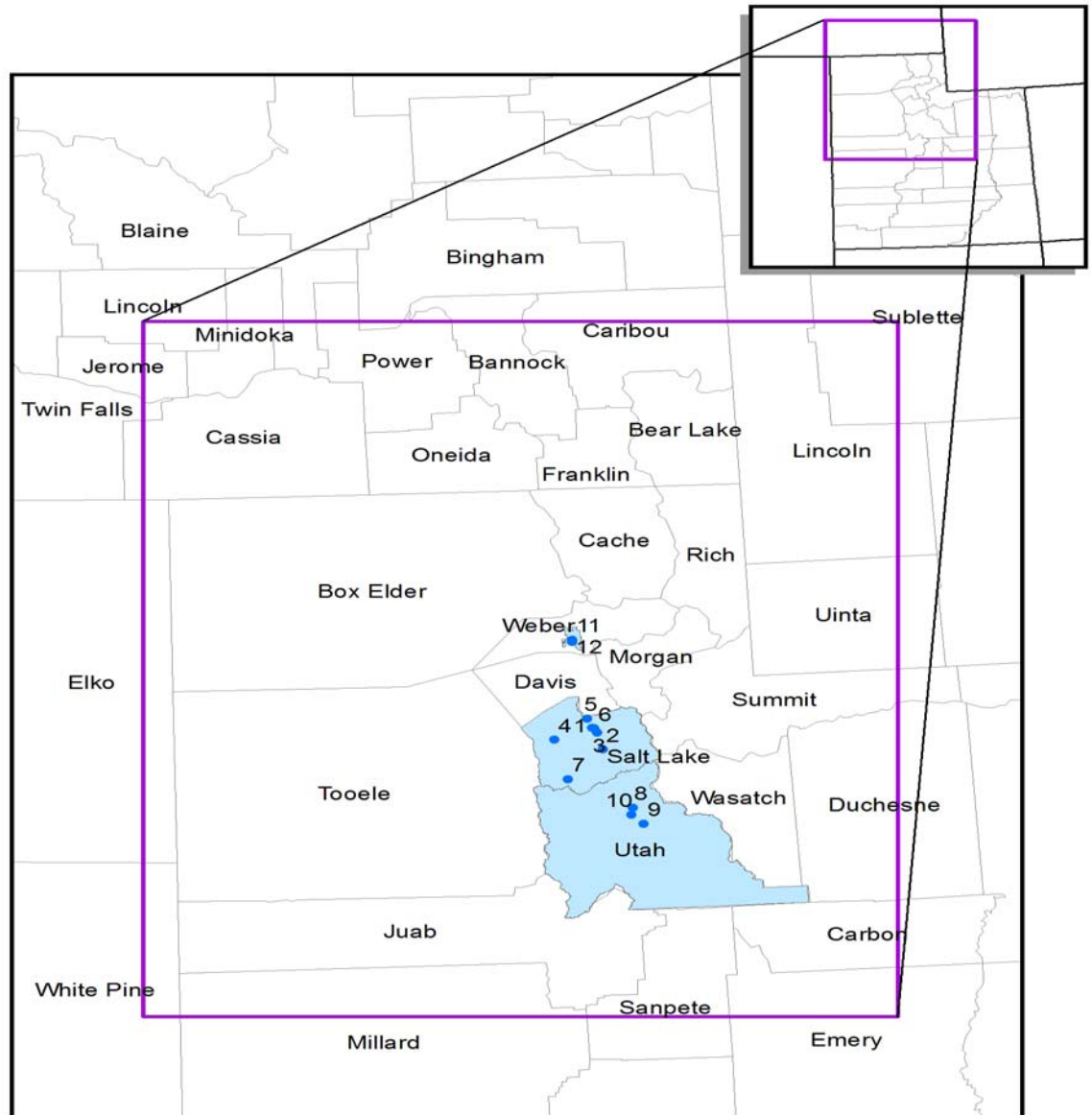
The overall assessments made in the preceding paragraph were based on data collected at monitoring stations located throughout the nonattainment area. The Utah DAQ maintains a network of PM₁₀ monitoring stations in accordance with 40 CFR 58. These stations are referred to as SLAMS sites, meaning that they are State and Local Air Monitoring Stations. In consultation with EPA, an Annual Monitoring Network Plan is developed to address the adequacy of the monitoring network for all criteria pollutants. Within the network, individual stations may be situated so as to monitor large sources of PM₁₀, capture the highest concentrations in the area, represent residential areas, or assess regional concentrations of PM₁₀. Collectively, these monitors make up Utah's PM₁₀ monitoring network. The following paragraphs describe the network in each of Utah's three nonattainment areas for PM₁₀.

25
26
27

Provided in Figure IX.A.12. 1 is a map of the modeling domain that shows the existing PM₁₀ nonattainment areas and the locations of the monitors therein. Some of the monitors at these locations are no longer operational, but they have been included for informational purposes.

28
29

Figure IX.A.12. 1 Modeling Domain



1
2 The following PM₁₀ monitoring stations operated in the Salt Lake County PM₁₀ nonattainment
3 area from 1985 through 2015. They are numbered as they appear on the map:
4

- 5 1. Air Monitoring Center (AMC) (AIRS number 49-035-0010): This site was located in an
6 urban city center, near an area of high vehicle use. It was closed in 1999 when DAQ lost
7 its lease on the building.
8
- 9 2. Cottonwood (AIRS number 49-035-0003): This site was located in a suburban
10 residential area. It collected data from 1986 - 2011. It was closed in 2011 due to siting
11 criteria violations as well as safety concerns.
12
- 13 3. Hawthorne (AIRS number 49-035-3006): This site is located in a suburban residential
14 area. It began collecting data in 1997, and is the NCORE site for Utah.
15

- 1 4. Magna (AIRS number 49-035-1001): This site is located in a suburban residential area.
2 It was historically impacted periodically by blowing dust from a large tailings
3 impoundment, and as such is anomalous with respect to the typical wintertime scenario
4 that otherwise characterizes the nonattainment area. It has been collecting data since
5 1987.
6
- 7 5. North Salt Lake (AIRS number 49-035-0012): This site was located in an industrial area
8 that is impacted by sand and gravel operations, freeway traffic, and several refineries. It
9 was near a residential area as well. It collected data from 1985 - 2013. The monitor was
10 situated over a sewer main, and service of that main required its removal in September
11 2013 and following the service, the site owner did not allow the monitor to return.
12
- 13 6. Salt Lake City (AIRS number 49-035-3001): This site was situated in an urban city
14 center. It was discontinued in 1994 because of modifications that were made to the air
15 conditioning on the roof-top.
16
- 17 7. Herriman #3 (AIRS number 49-035-3012): This site is located in a suburban residential
18 area. It began collecting data in 2015.
19
20

21 The following PM₁₀ monitoring stations operated in the Utah County PM₁₀ nonattainment area
22 from 1985 through 2015. They are numbered as they appear on the map:
23

- 24 8. Lindon (AIRS number 49-049-4001): This site is designed to measure population
25 exposure to PM₁₀. It is located in a suburban residential area affected by both industrial
26 and vehicle emissions. PM₁₀ has been measured at this site since 1985, and the readings
27 taken here have consistently been the highest in Utah County. Area source emissions,
28 primarily wood smoke, also affect the site.
29
- 30 9. North Provo (AIRS number 49-049-0002): This is a neighborhood site in a mixed
31 residential-commercial area in Provo, Utah. It began collecting data in 1986.
32
- 33 10. West Orem (AIRS number 49-049-5001): This site was originally located in a residential
34 area adjacent to a large steel mill which has since closed. It is a neighborhood site. It
35 was situated based on computer modeling, and has historically reported high PM₁₀
36 values, but not consistently as high as those observed at the Lindon site. The site was
37 closed at the end of 1997 for this reason.
38

39 The following PM₁₀ monitoring stations operated in the Ogden City PM₁₀ nonattainment area
40 from 1986 through 2015. They are numbered as they appear on the map:
41

- 42 11. Ogden 1 (AIRS number 49-057-0001): This site was situated in an urban city center. It
43 was discontinued in 2000 because DAQ lost its lease on the building.
44
- 45 12. Ogden 2 (AIRS number 49-057-0002): This site began collecting data in 2001, as a
46 replacement for the Ogden 1 location. It, too, is situated in an urban city center.
47

48 **(c) Modeling Element**
49

50 EPA guidance concerning redesignation requests and maintenance plans (Calcagni) discusses the
51 requirement that the area has attained the standard, and notes that air quality modeling may be
52 necessary to determine the representativeness of the monitored data.

1
2 Information concerning PM₁₀ monitoring in Utah is included in the Annual Monitoring Network
3 Review and The 5 Year Network Plan. Since the early 1980's, the network review has been
4 updated annually and submitted to EPA for approval. EPA has concurred with the annual
5 network reviews and agreed that the PM₁₀ network is adequate. EPA personnel have also visited
6 the monitor sites on several occasions to verify compliance with federal siting requirements.
7 Therefore, additional modeling will not be necessary to determine the representativeness of the
8 monitored data.

9
10 The Calcagni memo goes on to say that areas that were designated nonattainment based on
11 modeling will generally not be redesignated to attainment unless an acceptable modeling analysis
12 indicates attainment.

13
14 Though none of Utah's three PM₁₀ nonattainment areas was designated based on modeling,
15 Calcagni also states that (when dealing with PM₁₀) dispersion modeling will generally be
16 necessary to evaluate comprehensively sources' impacts and to determine the areas of expected
17 high concentrations based upon current conditions. Air quality modeling was conducted for the
18 purpose of this maintenance demonstration. It shows that all three nonattainment areas are
19 presently in compliance, and will continue to comply with the PM₁₀ NAAQS through the year
20 2030.

21
22 **(d) EPA Acknowledgement**

23
24 Ogden City was designated a moderate nonattainment area for the PM₁₀ standard on September
25 26, 1995. From CAA 188(c)(1), the moderate area attainment date for Ogden City "shall be as
26 expeditiously as practicable but no later than the end of the sixth calendar year after the area's
27 designation as nonattainment." Thus Ogden City's attainment date would be December 31, 2001.

28
29 Based on the data provided for 1999-2001, Ogden City attained the moderate area attainment
30 date. Additionally, the data presented in the preceding paragraphs shows quite clearly that the
31 Ogden City PM₁₀ nonattainment area continues to attain the PM₁₀ NAAQS. EPA earlier
32 acknowledged that Ogden City was attaining the PM₁₀ NAAQS based on certified, quality
33 assured data for the years 2009 through 2011 (see FR Vol. 78, No. 4, January 7, 2013; pp. 885.)

34
35
36 **(2) Fully Approved Attainment Plan for PM₁₀**

37 CAA 107(d)(3)(E)(ii) - *The Administrator has fully approved the applicable implementation plan*
38 *for the area under section 110(k).*

39 There is no applicable implementation plan for the Ogden City PM₁₀ nonattainment area. Rather,
40 EPA made a determination of Clean Data, stating that Ogden City was attaining the 24-hour PM₁₀
41 NAAQS based on certified ambient air monitoring data for the years 2009 – 2011 (see FR Vol.78,
42 pp. 885, Monday, January 7, 2013). Under such Clean Data Area Determination, Utah's
43 obligation to make submissions to meet certain Clean Air Act requirements related to attainment
44 of the NAAQS is not applicable for as long as the Ogden City nonattainment area continues to
45 attain the NAAQS.

46 There has been no violation of the PM₁₀ NAAQS in Ogden City since the determination was
47 made, so Utah's obligation to submit a nonattainment SIP still does not apply.

1 States are not precluded from seeking redesignation in cases where a Clean Data Area
2 Determination has suspended the need for an implementation plan. Further discussion
3 concerning some of the Section 110 and Part D requirements normally addressed in a
4 nonattainment SIP is provided in section (4).

5

6 **(3) Improvements in Air Quality Due to Permanent and Enforceable Reductions in**
7 **Emissions**

8

9 CAA 107(d)(3)(E)(iii) - *The Administrator determines that the improvement in air quality is due*
10 *to permanent and enforceable reductions in emissions resulting from implementation of the*
11 *applicable implementation plan and applicable Federal air pollutant control regulations and*
12 *other permanent and enforceable reductions. Speaking further on the issue, EPA guidance*
13 *(Calcagni) reads that the State must be able to reasonably attribute the improvement in air quality*
14 *to emission reductions which are permanent and enforceable. In the following sections, both the*
15 *improvement in air quality and the emission reductions themselves will be discussed.*

16

17 **(a) Improvement in Air Quality**

18

19 The improvement in air quality with respect to PM₁₀ can be shown in a number of ways.
20 Improvement, in this case, is relative to the various control strategies that affected the airshed.

21

22 Expected Exceedances – Referring back to the discussion of the PM₁₀ NAAQS in Subsection
23 IX.A.12.b(1), it is apparent that the number of expected exceedances of the 24-hour standard is an
24 important indicator. As such, this information has been tabulated for each of the monitors located
25 in each of the nonattainment areas. The data in Table IX.A.12. 3 below reveals a marked decline
26 in the number of these expected exceedances, and therefore that the **Ogden City** PM₁₀
27 nonattainment area has experienced significant improvements in air quality. The gray cells
28 indicate that the monitor was not in operation. This improvement is especially revealing in light
29 of the significant growth experienced during this same period in time.

30

31

1
2
3

Table IX.A.12. 3 Ogden City: Expected Exceedances Per-Year, 1986-2014

Ogden City nonattainment area		
Monitor:	Ogden	Ogden 2
1986		
1987	0.0	
1988	0.0	
1989	0.0	
1990	0.0	
1991	2.1	
1992	3.1	
1993	2.1	
1994	0.0	
1995	0.0	
1996	0.0	
1997	0.0	
1998	0.0	
1999	0.0	
2000	0.0	
2001		0.0
2002		1.0
2003		2.1
2004		0.0
2005		0.0
2006		0.0
2007		0.0
2008		0.0
2009		1.0
2010		2.0
2011		0.0
2012		0.0
2013		0.0
2014		0.0

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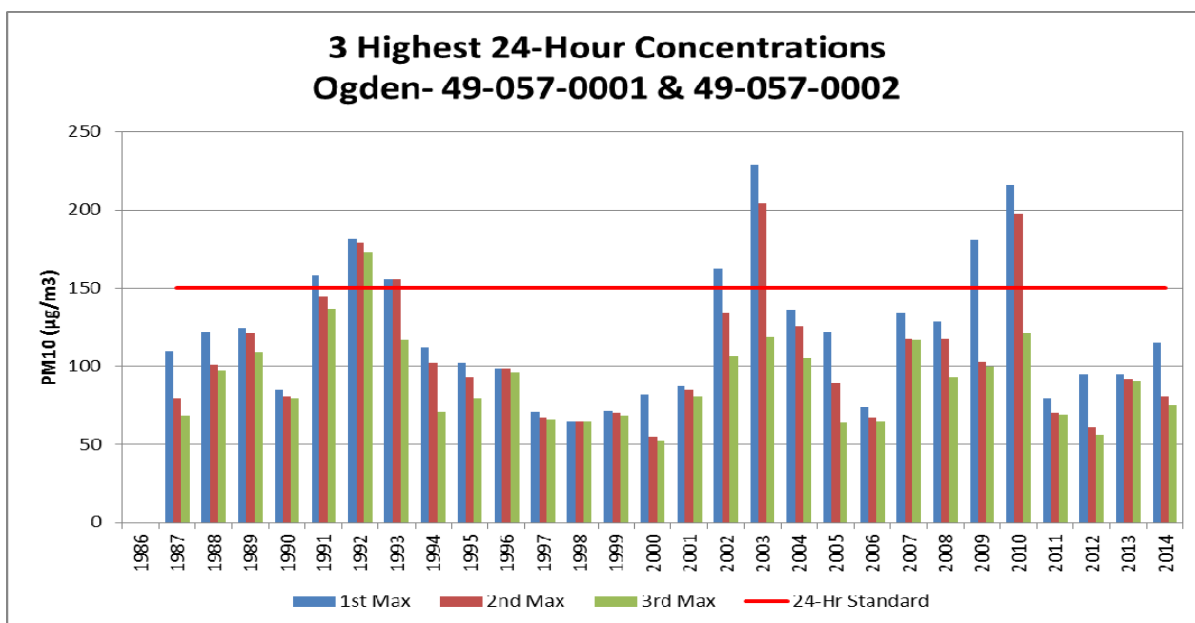
As discussed before in section IX.A.12.b(1), the number of expected exceedances may include data which had been flagged by DAQ as being influenced by an exceptional event; most typically, a wind-blown dust event. Data is flagged when circumstances indicate that it would represent an outlier in the data set and not be indicative of the entire airshed or the efforts to reasonably mitigate air pollution within.

As such two things should be noted with regard to the control measures cited under the Clean Data Policy as attributable to improving air quality in Ogden City: 1) The focus of the vehicle I/M control strategy, implemented in Weber County by 1992, was directed at precursors to fine particulate matter. These precursors react to become secondary PM during episodes

1 characterized by wintertime temperature inversions, elevated concentrations of secondary aerosol,
 2 and low wind speed. Under these conditions, blowing dust is generally nonexistent. Therefore,
 3 in evaluating the effectiveness of these types of controls, the inclusion of several high wind
 4 events may bias the conclusion. 2) Even with the inclusion of these values, the conclusion
 5 remains essentially the same; that with the implementation of the open burning rule, visible
 6 emissions rule, fugitive dust rule, and vehicle I/M, there has been a marked improvement in
 7 monitored air quality.

8
 9 Highest Values – Also indicative of improvement in air quality with respect to the 24-hour
 10 standard, is the magnitude of the excessive concentrations that are observed. This is illustrated in
 11 Figure IX.A.12. 2, which shows the three highest 24-hour concentrations observed in a particular
 12 year.

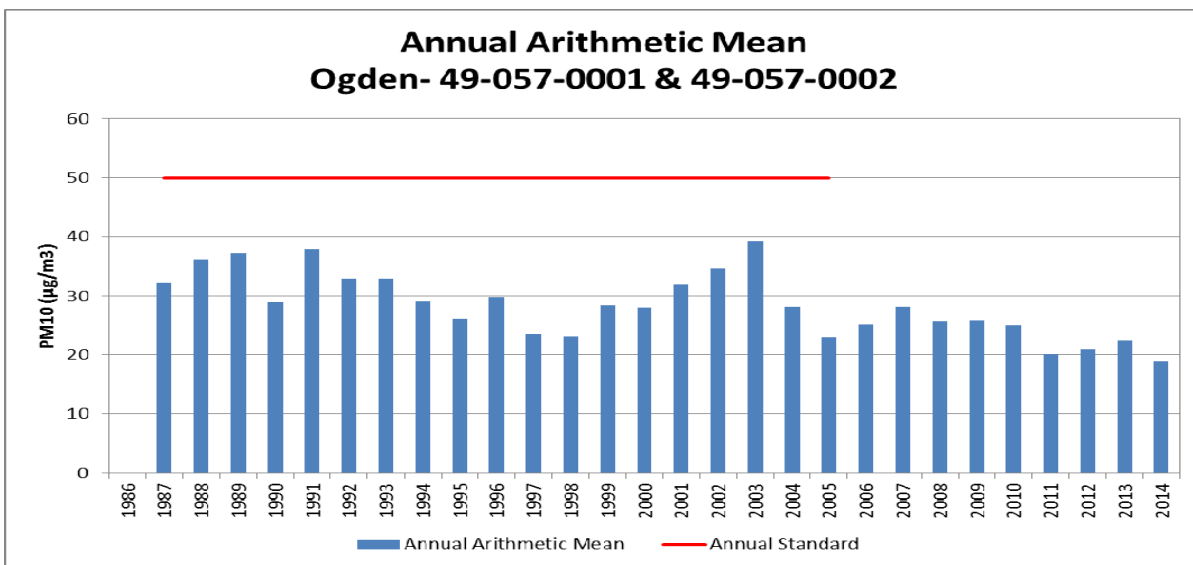
13
 14
 15 **Figure IX.A.12. 2 3 Highest 24-hr PM₁₀ Concentrations; Ogden**



17
 18
 19
 20 Again there is a noticeable improvement in the magnitude of these concentrations. It must be
 21 kept in mind, however, that some of these concentrations may have resulted from windblown dust
 22 events that occur outside of the typical scenario of wintertime air stagnation. As such, the
 23 effectiveness of any control measures directed at the precursors to PM₁₀ would not be evident.

1
2 Annual Mean – Although there is no longer an annual PM₁₀ standard, the annual arithmetic mean
3 is also a significant parameter to consider. Annual arithmetic means have been plotted in Figure
4 IX.A.12. 3, and the data reveals a noticeable decline in the values of these annual means.

5
6
7 **Figure IX.A.12. 3 Annual Arithmetic Mean; Ogden**
8



9
10
11
12
13 As with the number of expected exceedances and the three highest values, the data in Figure
14 IX.A.12. 3 may include data which had been flagged by DAQ as being influenced by wind-blown
15 dust events. Nevertheless, the annual averaging period tends to make these data points less
16 significant. The downward trend of these annual mean values is truly indicative of improvements
17 in air quality, particularly during the winter inversion season.

18
19
20 **(b) Reduction in Emissions**

21
22 As stated above, EPA guidance (Calcagni) says that the State must be able to reasonably attribute
23 the improvement in air quality to emission reductions that are permanent and enforceable. In
24 making this showing, the State should estimate the percent reduction (from the year that was used
25 to determine the design value) achieved by Federal measures such as motor vehicle control, as
26 well as by control measures that have been adopted and implemented by the State.

27
28 **Ogden City was designated nonattainment based on data collected in 1991 through 1993.**

29
30 As mentioned before, the ambient air quality data presented in Subsection IX.A.12.b(3)(a) above
31 includes values prior to these dates in order to give a representation of the air quality prior to the
32 application of any control measures. It then includes data collected from then until the present
33 time to illustrate the lasting effect of these controls. In discussing the effect of the controls, as
34 well as the control measures themselves, however, it is important to keep in mind the time
35 necessary for their implementation.
36

1 For Ogden City, the statutory date for RACM implementation was four years after designation, or
2 September 26, 1999. Its attainment date was December 31, 2001. As discussed earlier, there was
3 no nonattainment SIP for Ogden City, but there were a number of control measures that applied
4 to nonattainment areas in general and were at least partly responsible for bringing the area into
5 compliance with the PM₁₀ NAAQS.

6
7 Since these control measures (open burning rule, visible emissions rule, fugitive dust rule, and
8 vehicle I/M) were incorporated into the Utah SIP, the emission reductions that resulted are
9 consistent with the notion of permanent and enforceable improvements in air quality. Taken
10 together, the trends in ambient air quality illustrated in the preceding paragraph, along with the
11 continued implementation of these control measures, provide a reliable indication that these
12 improvements in air quality reflect the application of permanent steps to improve the air quality
13 in the region, rather than just temporary economic or meteorological changes.

14
15 Additionally, a downturn in the economy is clearly not responsible for the improvement in
16 ambient particulate levels in Salt Lake County, Utah County, and Ogden City areas. From 2001
17 to present, the areas have experienced strong growth while at the same time achieving continuous
18 attainment of the 24-hour and annual PM₁₀ NAAQS. Data was analyzed for the Salt Lake City
19 Metropolitan Statistical Area from the US Department of Commerce, Bureau of Economic
20 Analysis. According to this data, job growth from 2011 through 2013 increased by 5.5 percent,
21 population increased by 3 percent, and personal income increased by approximately 10 percent.
22 The estimated VMT increase was 12 percent from 2011 to present.

23 24 25 **(4) State has Met Requirements of Section 110 and Part D**

26
27 *CAA 107(d)(3)(E)(v) - The State containing such area has met all requirements applicable to the*
28 *area under section 110 and part D.* Section 110(a)(2) of the Act deals with the broad scope of
29 state implementation plans and the capacity of the respective state agency to effectively
30 administer such a plan. Sections I through VIII of Utah's SIP contain information relevant to
31 these criteria. Part D deals specifically with plan requirements for nonattainment areas, and
32 includes the requirements for a maintenance plan in Section 175A.

33
34 Utah currently has an approved SIP that meets the requirements of section 110(a)(2) of the Act.
35 Many of these elements have been in place for several decades. In the March 9, 2001 approval of
36 Utah's Ogden City Maintenance Plan for Carbon Monoxide, EPA stated:

37
38 On August 15, 1984, we approved revisions to Utah's SIP as meeting the
39 requirements of section 110(a)(2) of the CAA (see 45 FR 32575). Although
40 section 110 of the CAA was amended in 1990, most of the changes were not
41 substantial. Thus, we have determined that the SIP revisions approved in 1984
42 continue to satisfy the requirements of section 110(a)(2). For further detail, see
43 45 FR 32575 dated August 15, 1984 (Volume 49, No. 159) or 66 FR 14079 dated
44 March 9, 2001 (Volume 66, No. 47.)

45
46 Part D of the Act addresses "Plan Requirements for Nonattainment Areas". Subpart 1 of Part D
47 includes the general requirements that apply to all areas designated nonattainment based on a
48 violation of the NAAQS. Section 172(c) of this subpart contains a list of generally required
49 elements for all nonattainment plans. Subpart 1 is followed by a series of subparts (2-5) specific
50 to various criteria pollutants. Subpart 4 contains the provisions specific to PM₁₀ nonattainment
51 areas. The general requirements for nonattainment plans in Section 172(c) may be subsumed

1 within or superseded by the more specific requirements of Subpart 4, but each element must be
2 addressed in the respective nonattainment plan.

3
4 One of the pre-conditions for a maintenance plan is a fully approved (non)attainment plan for the
5 area. This is also discussed in section IX.A.12.b(2).

6
7 Other Part D requirements that are applicable in nonattainment and maintenance areas include the
8 general and transportation conformity provisions of Section 176(c) of the Act. These provisions
9 ensure that federally funded or approved projects and actions conform to the PM₁₀ SIPs and
10 Maintenance Plans prior to the projects or actions being implemented. The State has already
11 submitted to EPA a SIP revision implementing the requirement of Section 176(c).

12
13 For Ogden City, the requirement to prepare and submit a nonattainment plan was suspended by
14 EPA's Clean Data Area Determination (FR Vol.78, pp. 885). Thus, the specific Part D elements
15 from Subparts 1 and 4 were not addressed in a comprehensive plan that can be referenced herein.
16 Instead, what follows is a brief summary of the required plan elements (not otherwise covered by
17 Section 110(a)(2) and an assessment of how each of these elements is to be treated in a
18 maintenance plan for this area.

- 19
20 (a) Implementation of Reasonably Available Control Measures (RACM)
21
22 (b) Other Control Measures – including enforceable emission limits and schedules for
23 compliance to provide for attainment of the NAAQS by the applicable attainment date
24
25 (c) Attainment of the NAAQS – including air quality modeling
26
27 (d) Reasonable Further Progress (RFP) – toward attainment of the standard (section 172(c))
28
29 (e) Milestones – to be achieved every three years, and which demonstrate RFP (section
30 189(c))
31
32 (f) Contingency Measures – to be undertaken if the area fails to make RFP or to attain the
33 NAAQS
34
35 (g) Emissions Inventory – a current inventory from all sources
36
37 (h) Permits – (in accordance with Section 173) for the construction and operation of new and
38 modified major stationary sources within the nonattainment area
39

40 EPA guidance concerning redesignation requests and maintenance plans (Calcagni) differentiates
41 among these elements and notes that *“The requirements for reasonable further progress,
42 identification of certain emissions increases, and other measures needed for attainment will not
43 apply for redesignations because they only have meaning for areas not attaining the standard.*
44 The requirements for an emission inventory will be satisfied by the inventory requirements of the
45 maintenance plan. The requirements of the Part D new source review program will be replaced
46 by the prevention of significant deterioration (PSD) program once the area has been
47 redesignated”, provided the State “make any needed modifications to its rules to have the
48 approved PSD program apply to the affected area upon redesignation.”

49
50 Calcagni earlier stated that the “EPA anticipates that areas will already have met most or all of
51 these [Section 172(c)] requirements,” presumably because areas eligible to redesignate would in
52 all likelihood also have nonattainment SIPs. Following the logic expressed later regarding areas

1 that are attaining the standard, there are also elements on this list of Part D elements that only
 2 have meaning within the context of a nonattainment plan.

3
 4 Such plans are built around quantitative demonstrations of attainment which include air quality
 5 modeling and identify rates of progress and milestones to be achieved. Such plans also identify
 6 contingency measures to be triggered if the area fails to make RFP or attain the NAAQS.

7
 8 For areas like Ogden City to which the Clean Data Policy has been applied, these Part D elements
 9 are not required so long as the area continues to show attainment to the particular standard for
 10 which the area is designated nonattainment. EPA’s January 7, 2013 determination speaks directly
 11 to this point, stating: “EPA is taking final action to determine that Utah’s obligation to make SIP
 12 submissions to meet the following CAA requirements is not applicable for as long as the Ogden
 13 City nonattainment area continues to attain the PM10 NAAQS: the part D, subpart 4 obligation to
 14 provide an attainment demonstration pursuant to section 189(a)(1)(B); the RACM requirements
 15 of section 189(a)(1)(B); the RACM requirements of section 189(a)(1)(C); the RFP requirements
 16 of section 189(c); and the attainment demonstration, RACM, RFP, and
 17 contingency measure requirements of part D subpart 1 contained in section 172.”

18
 19
 20 **(5) Maintenance Plan for PM₁₀ Areas**

21
 22 As stated in the Act, an area may not request redesignation to attainment without first submitting,
 23 and then receiving EPA approval of, a maintenance plan. The plan is basically a quantitative
 24 showing that the area will continue to attain the NAAQS for an additional 10 years (from EPA
 25 approval), accompanied by sufficient assurance that the terms of the numeric demonstration will
 26 be administered by the State and by the EPA in an oversight capacity. The maintenance plan is
 27 the central criterion for redesignation. It is contained in the following subsection.
 28

29 **IX.A.12.c Maintenance Plan**

30 *CAA 107(d)(3)(E)(iv) - The Administrator has fully approved a maintenance plan for the area as*
 31 *meeting the requirements of section 175A. An approved maintenance plan is one of several*
 32 *criteria necessary for area redesignation as outlined in Section 107(d)(3)(E) of the Act. The*
 33 *maintenance plan itself, as described in Section 175A of the Act and further addressed in EPA*
 34 *guidance (Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni*
 35 *to Regional Air Directors, September 4, 1992; or for the purpose of this document, simply*
 36 *“Calcagni”), has its own list of required elements. The following table is presented to summarize*
 37 *these requirements. Each will then be addressed in turn.*

Table IX.A.12. 4 Requirements of a Maintenance Plan in the Clean Air Act (CAA)			
Category	Requirement	Reference	Addressed in Section
Maintenance demonstration	Provide for maintenance of the relevant NAAQS in the area for at least 10 years after redesignation.	CAA: Sec 175A(a)	IX.A.12.c(1)
Revise in 8 Years	The State must submit an additional revision to the plan, 8 years after redesignation, showing an additional 10 years of maintenance.	CAA: Sec 175A(b)	IX.A.12.c(8)
Continued Implementation	The Clean Air Act requires continued implementation of the nonattainment area	CAA: Sec 175A(c),	IX.A.12.c(7)

of Nonattainment Area Control Strategy	control strategy unless such measures are shown to be unnecessary for maintenance or are replaced with measures that achieve equivalent reductions.	CAA Sec 110(l), Calcagni memo	
Contingency Measures	Areas seeking redesignation from nonattainment to attainment are required to develop contingency measures that include State commitments to implement additional control measures in response to future violations of the NAAQS.	CAA: Sec 175A(d)	IX.A.12.c(10)
Verification of Continued Maintenance	The maintenance plan must indicate how the State will track the progress of the maintenance plan.	Calcagni memo	IX.A.12.c(9)

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(1) Demonstration of Maintenance - Modeling Analysis

CAA 175A(a) - Each State which submits a request under section 107(d) for redesignation of a nonattainment area as an area which has attained the NAAQS shall also submit a revision of the applicable implementation plan to provide for maintenance of the NAAQS for at least 10 years after the redesignation. The plan shall contain such additional measures, if any, as may be required to ensure such maintenance. The maintenance demonstration is discussed in EPA guidance (Calcagni) as one of the core provisions that should be considered by states for inclusion in a maintenance plan.

According to Calcagni, a State may generally demonstrate maintenance of the NAAQS by either showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory (discussed below) or by modeling to show that the future mix of sources and emission rates will not cause a violation of the NAAQS. Utah has elected to make its demonstration based on air quality modeling.

(a) Introduction

The following chapter presents an analysis using observational datasets to detail the chemical regimes of Utah’s Nonattainment areas.

Prior to the development of this PM₁₀ maintenance plan, UDAQ conducted a technical analysis to support the development of Utah’s 24-hr State Implementation Plan for PM_{2.5}. That analysis included preparation of emissions inventories and meteorological data, and the evaluation and application of a regional photochemical model.

Outside of the springtime high wind events and wildfires, the Wasatch Front experiences high 24-hr PM₁₀ concentrations under stable conditions during the wintertime (e.g., temperature inversion). These are the same episodes where the Wasatch Front sees its highest concentrations of 24-hr PM_{2.5} that sometimes exceed the 24-hr PM_{2.5} NAAQS. Most (60% to 90%) of the PM₁₀ observed during high wintertime pollution days consists of PM_{2.5}. The dominant species of the wintertime PM₁₀ is secondarily formed particulate nitrate, which is also the dominant species of PM_{2.5}.

Given these similarities, the PM_{2.5} modeling analysis was utilized as the foundation for this PM₁₀ Maintenance Plan.

1
2 The CMAQ model performance for the PM₁₀ Maintenance Plan adds to the detailed model
3 performance that was part of the UDAQ's previous PM_{2.5} SIP process. Utah DAQ used the same
4 modeling episode that was used in the PM_{2.5} SIP, which is the 45-day modeling episode from the
5 winter of 2009-2010. The modeled meteorology datasets from the Weather Research and
6 Forecasting (WRF) model for the PM₁₀ Plan are the same datasets used for the PM_{2.5} SIP. Also,
7 the CMAQ version (4.7.1) and CMAQ model setup (i.e., vertical advection module turned off)
8 for the PM₁₀ modeling matches the PM_{2.5} SIP setup.
9

10 For this reason, much of the information presented below pertains specifically to the PM_{2.5}
11 evaluation. This is supplemented with information pertaining to PM₁₀, most notably with respect
12 to the PM₁₀ model performance evaluation.
13

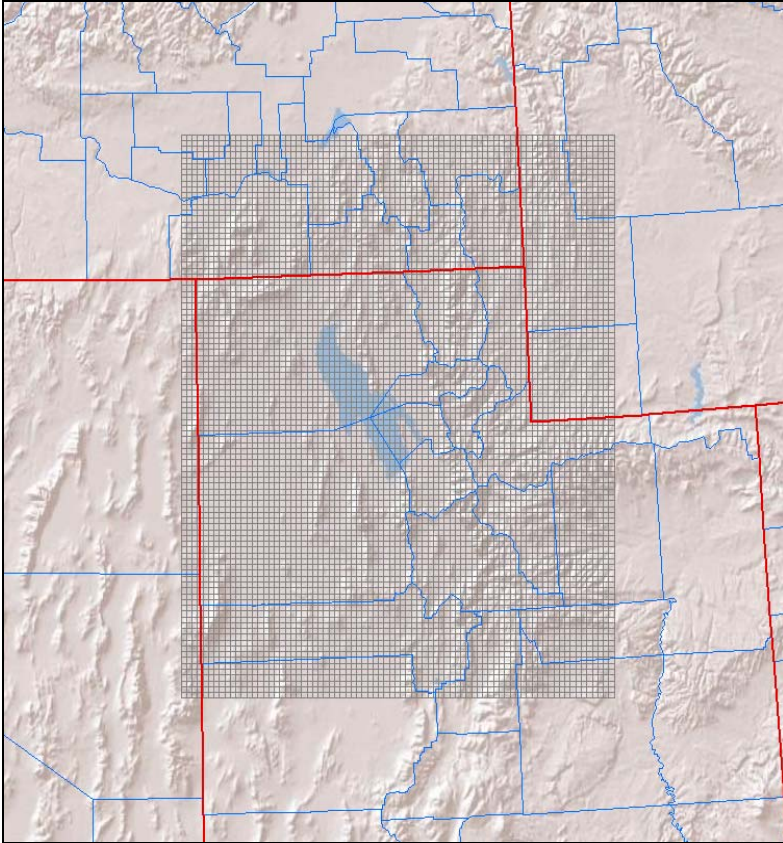
14 The additional PM₁₀ analysis is also presented in the Technical Support Document.
15

16 **(b) Photochemical Modeling**
17

18 Photochemical models are relied upon by federal and state regulatory agencies to support their
19 planning efforts. Used properly, models can assist policy makers in deciding which control
20 programs are most effective in improving air quality, and meeting specific goals and objectives.
21 The air quality analyses were conducted with the Community Multiscale Air Quality (CMAQ)
22 Model version 4.7.1, with emissions and meteorology inputs generated using SMOKE and WRF,
23 respectively. CMAQ was selected because it is the open source atmospheric chemistry model co-
24 sponsored by EPA and the National Oceanic Atmospheric Administration (NOAA), and thus
25 approved by EPA for this plan.
26

27 **(c) Domain/Grid Resolution**
28

29 UDAQ selected a high resolution 4-km modeling domain to cover all of northern Utah including
30 the portion of southern Idaho extending north of Franklin County and west to the Nevada border
31 (Figure IX.A.12. 4). This 97 x 79 horizontal grid cell domain was selected to ensure that all of
32 the major emissions sources that have the potential to impact the nonattainment areas were
33 included. The vertical resolution in the air quality model consists of 17 layers extending up to 15
34 km, with higher resolution in the boundary layer.
35



1
2
3 **Figure IX.A.12. 4 Northern Utah photochemical modeling domain.**
4
5

6 **(d) Episode Selection**
7

8 According to EPA's April 2007 "Guidance on the Use of Models and Other Analyses for
9 Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze," the
10 selection of SIP episodes for modeling should consider the following 4 criteria:
11

- 12 1. Select episodes that represent a variety of meteorological conditions that lead to elevated
13 PM_{2.5}.
14
- 15 2. Select episodes during which observed concentrations are close to the baseline design
16 value.
17
- 18 3. Select episodes that have extensive air quality data bases.
19
- 20 4. Select enough episodes such that the model attainment test is based on multiple days at
21 each monitor violating NAAQS.
22

23 In general, UDAQ wanted to select episodes with hourly PM_{2.5} concentrations that are reflective
24 of conditions that lead to 24-hour NAAQS exceedances. From a synoptic meteorology point of
25 view, each selected episode features a similar pattern. The typical pattern includes a deep trough
26 over the eastern United States with a building and eastward moving ridge over the western United
27 States. The episodes typically begin as the ridge begins to build eastward, near surface winds
28 weaken, and rapid stabilization due to warm advection and subsidence dominate. As the ridge

1 centers over Utah and subsidence peaks, the atmosphere becomes extremely stable and a
2 subsidence inversion descends towards the surface. During this time, weak insolation, light
3 winds, and cold temperatures promote the development of a persistent cold air pool. Not until the
4 ridge moves eastward or breaks down from north to south is there enough mixing in the
5 atmosphere to completely erode the persistent cold air pool.

6
7 From the most recent 5-year period of 2007-2011, UDAQ developed a long list of candidate
8 PM_{2.5} wintertime episodes. Three episodes were selected. An episode was selected from January
9 2007, an episode from February 2008, and an episode during the winter of 2009-2010 that
10 features multi-event episodes of PM_{2.5} buildup and washout.

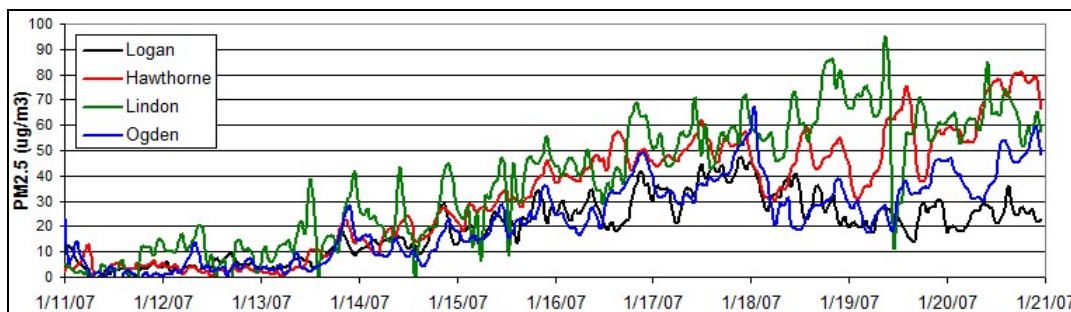
11
12 As noted in the introduction, these episodes were also ideal from the standpoint of characterizing
13 PM₁₀ buildup and formation.

14
15 Further detail of the episodes is below:

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

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

26
27 Figure IX.A.12. 5 shows hourly PM_{2.5} concentrations from Utah's 4 PM_{2.5} monitors for January
28 11-20, 2007. The first 6 to 8 days of this episode are suited for modeling. The episode becomes
29 less suited after January 18 because of the complexities in the meteorological conditions leading
30 to temporary PM_{2.5} reductions.

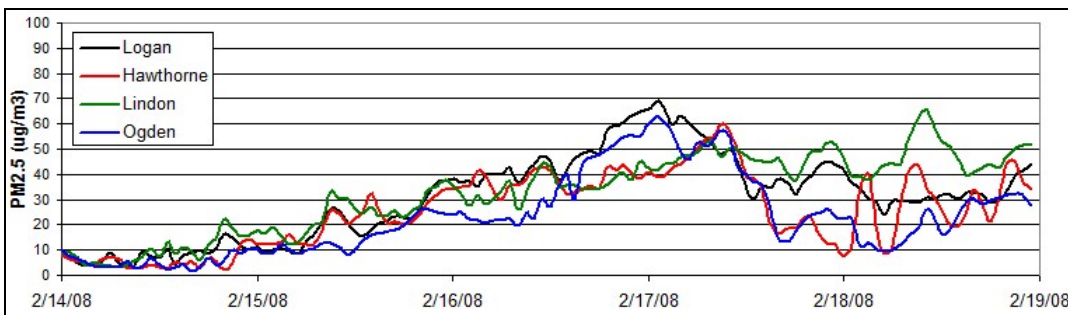


32
33
34 **Figure IX.A.12. 5 Hourly PM_{2.5} concentrations for January 11-20, 2007**

35
36
37 • **Episode 2: February 14-18, 2008**

38
39 The February 2008 episode features a cold front passage at the start of the episode that brought
40 significant new snow to the Wasatch Front. A ridge began building eastward from the Pacific
41 Coast and centered itself over Utah on Feb 20th. During this time a subsidence inversion lowered
42 significantly from February 16 to February 19. Temperatures during this episode were mild with
43 high temperatures at SLC in the upper 30's and lower 40's Fahrenheit.

1 The 24-hour average PM_{2.5} exceedances observed during the proposed modeling period of
 2 February 14-19, 2008 were not exceptionally high. What makes this episode a good candidate for
 3 modeling are the high hourly values and smooth concentration build-up. The first 24-hour
 4 exceedances occurred on February 16 and were followed by a rapid increase in PM_{2.5} through the
 5 first half of February 17 (Figure IX.A.12. 6). During the second half of February 17, a subtle
 6 meteorological feature produced a mid-morning partial mix-out of particulate matter and forced
 7 24-hour averages to fall. After February 18, the atmosphere began to stabilize again and resulted
 8 in even higher PM_{2.5} concentrations during February 20, 21, and 22. Modeling the 14th through
 9 the 19th of this episode should successfully capture these dynamics. The smooth gradual build-up
 10 of hourly PM_{2.5} is ideal for modeling.
 11



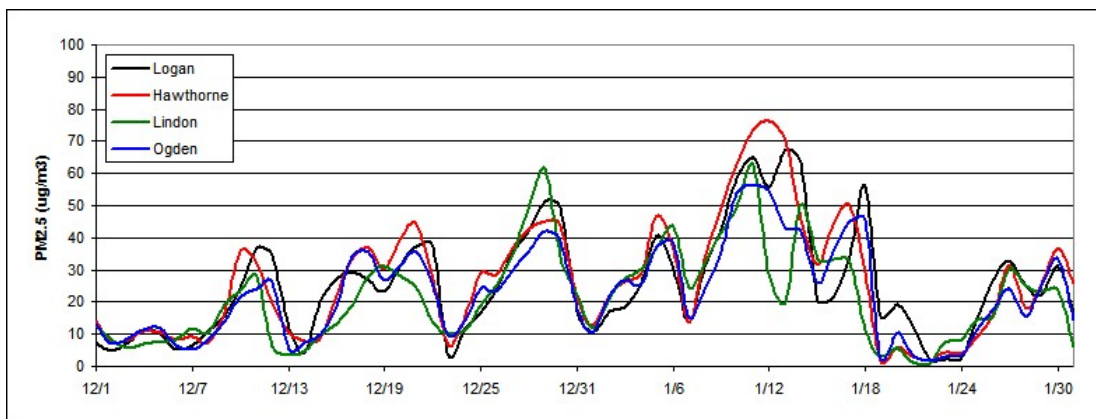
12
13

14 **Figure IX.A.12. 6 Hourly PM_{2.5} concentrations for February 14-19, 2008**

15
16
17 **• Episode 3: December 13, 2009 – January 18, 2010**

18

19 The third episode that was selected is more similar to a “season” than a single PM_{2.5} episode
 20 (Figure IX.A.12. 7). During the winter of 2009 and 2010, Utah was dominated by a semi-
 21 permanent ridge of high pressure that prevented strong storms from crossing Utah. This 35 day
 22 period was characterized by 4 to 5 individual PM_{2.5} episodes each followed by a partial PM_{2.5} mix
 23 out when a weak weather system passed through the ridge. The long length of the episode and
 24 repetitive PM_{2.5} build-up and mix-out cycles makes it ideal for evaluating model strengths and
 25 weaknesses and PM_{2.5} control strategies.
 26



27
28

29 **Figure IX.A.12. 7 24-hour average PM_{2.5} concentrations for December-January, 2009-10**

30

31

32 **(e) Meteorological Data**

33

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

8
9 Model performance of WRF was assessed against observations at sites maintained by the Utah
10 Air Monitoring Center. A summary of the performance evaluation results for WRF are presented
11 below:

- 12
13 • The biggest issue with meteorological performance is the existence of a warm bias in
14 surface temperatures during high PM_{2.5} episodes. This warm bias is a common trait of
15 WRF modeling during Utah wintertime inversions.
- 16
17 • WRF does a good job of replicating the light wind speeds (< 5 mph) that occur during
18 high PM_{2.5} episodes.
- 19
20 • WRF is able to simulate the diurnal wind flows common during high PM_{2.5} episodes.
21 WRF captures the overnight downslope and daytime upslope wind flow that occurs in
22 Utah valley basins.
- 23
24 • WRF has reasonable ability to replicate the vertical temperature structure of the
25 boundary layer (i.e., the temperature inversion), although it is difficult for WRF to
26 reproduce the inversion when the inversion is shallow and strong (i.e., an 8 degree
27 temperature increase over 100 vertical meters).

28 29 30 (f) Photochemical Model Performance Evaluation

31 32 PM_{2.5} Results

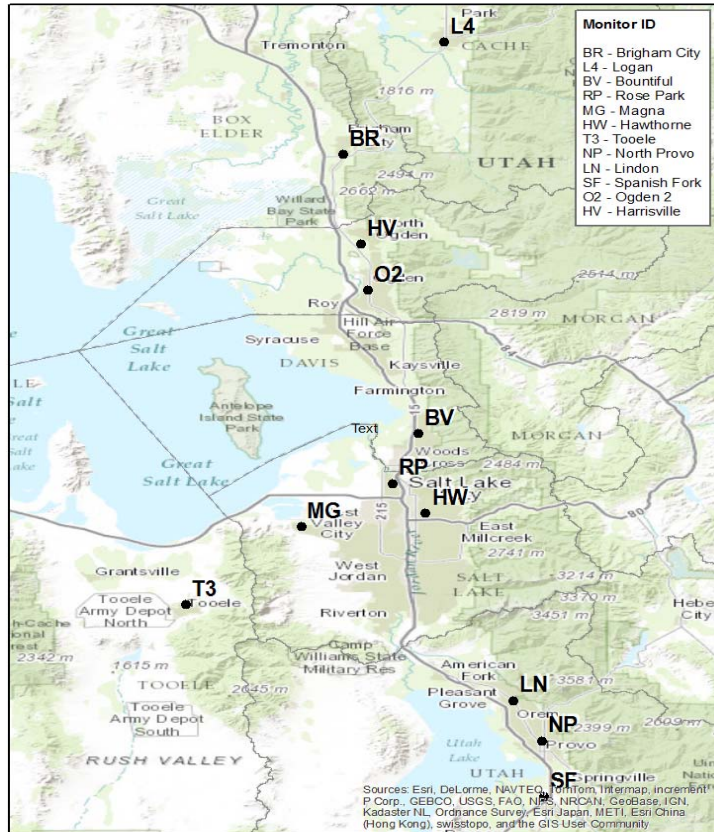
33
34 The model performance evaluation focused on the magnitude, spatial pattern, and temporal
35 variation of modeled and measured concentrations. This exercise was intended to assess whether,
36 and to what degree, confidence in the model is warranted (and to assess whether model
37 improvements are necessary).

38
39 CMAQ model performance was assessed with observed air quality datasets at UDAQ-maintained
40 air monitoring sites (Figure IX.A.12. 8). Measurements of observed PM_{2.5} concentrations along
41 with gaseous precursors of secondary particulate (e.g., NO_x, ozone) and carbon monoxide are
42 made throughout winter at most of the locations in the figure. PM_{2.5} speciation performance was
43 assessed using the three Speciation Monitoring Network Sites (STN) located at the Hawthorne
44 site in Salt Lake City, the Bountiful site in Davis County, and the Lindon site in Utah County.

45
46 PM₁₀ data is also collected at Logan, Bountiful, Ogden2, Magna, Hawthorne, North Provo, and
47 Lindon.

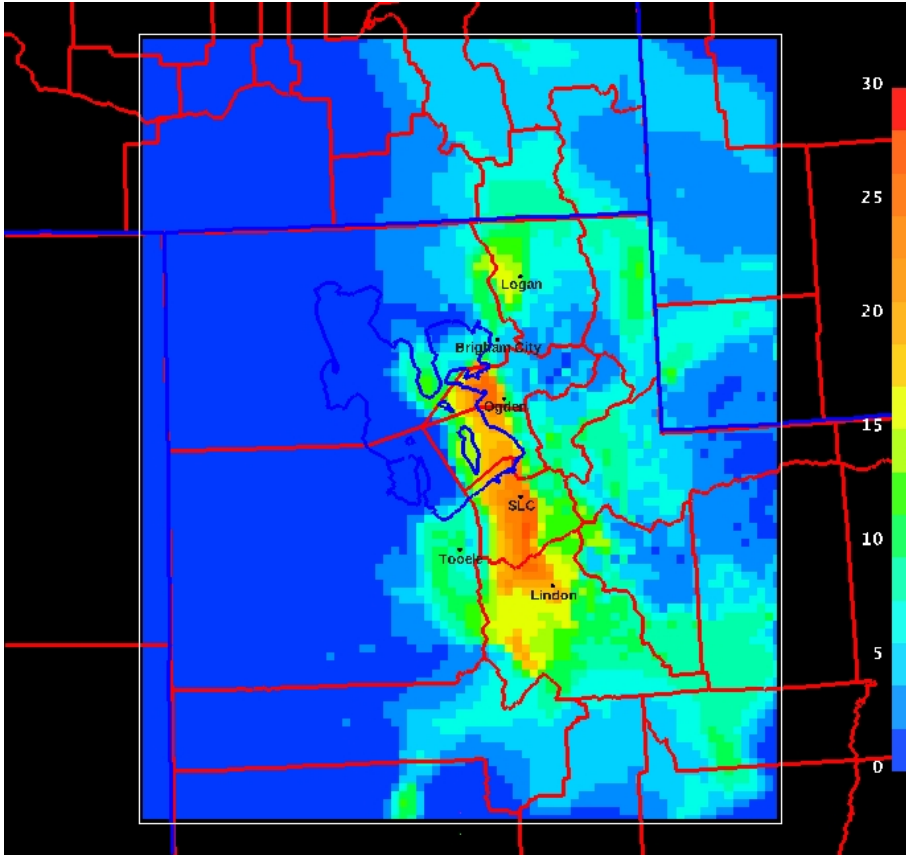
48
49 PM₁₀ filters were collected at Bountiful, Hawthorne and Lindon, and analyzed with the goal
50 comparing CMAQ modeled speciation to the collected PM₁₀ filters. While analyzing the PM₁₀
51 filters, most of the secondarily chemically formed particulate nitrate had been volatilized, and thus
52 could not be accounted for. This is most likely due to the age of the filters, which were collected

1 over five years ago. Thus, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter
2 speciation could not be made for this modeling period.
3



4
5 **Figure IX.A.12.8 UDAQ monitoring network.**

1
2 A spatial plot is provided for modeled 24-hr $PM_{2.5}$ for 2010 January 03 in Figure IX.A.12. 9. The
3 spatial plot shows the model does a reasonable job reproducing the high $PM_{2.5}$ values, and
4 keeping those high values confined in the valley locations where emissions occur.
5
6



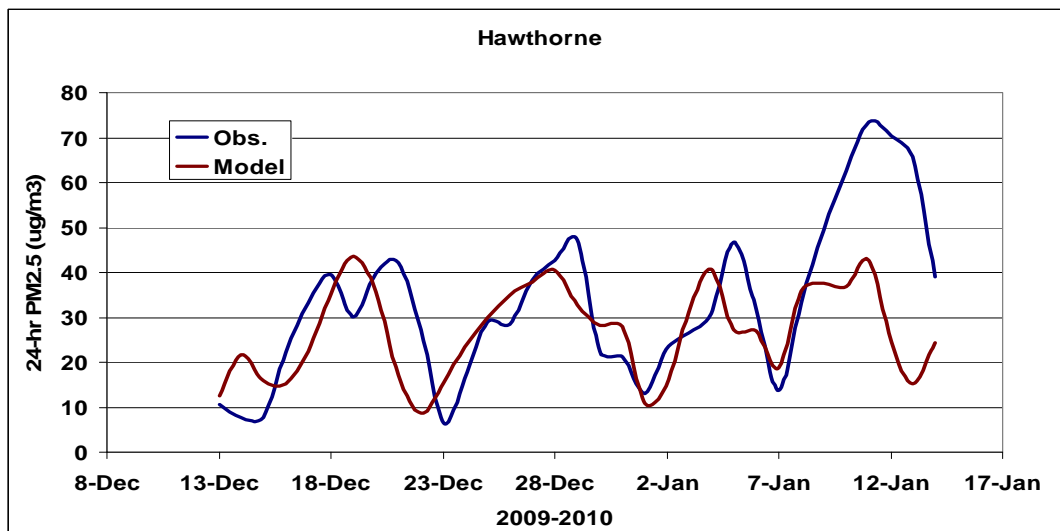
7
8 **Figure IX.A.12. 9 Spatial plot of CMAQ modeled 24-hr $PM_{2.5}$ ($\mu\text{g}/\text{m}^3$) for 2010 Jan. 03.**
9

10 Time series of 24-hr $PM_{2.5}$ concentrations for the 13 Dec. 2009 – 15 Jan. 2010 modeling period
11 are shown in Figs. IX.A.12. 10 - 13 at the Hawthorne site in Salt Lake City, the Ogden site in
12 Weber County, the Lindon site in Utah County, and the Logan site in Cache County. For the
13 most part, CMAQ replicates the buildup and washout of each individual episode. While CMAQ
14 builds 24-hr $PM_{2.5}$ concentrations during the 08 Jan. – 14 Jan. 2010 episode, it was not able to
15 produce the $> 60 \mu\text{g}/\text{m}^3$ concentrations observed at the monitoring locations.
16

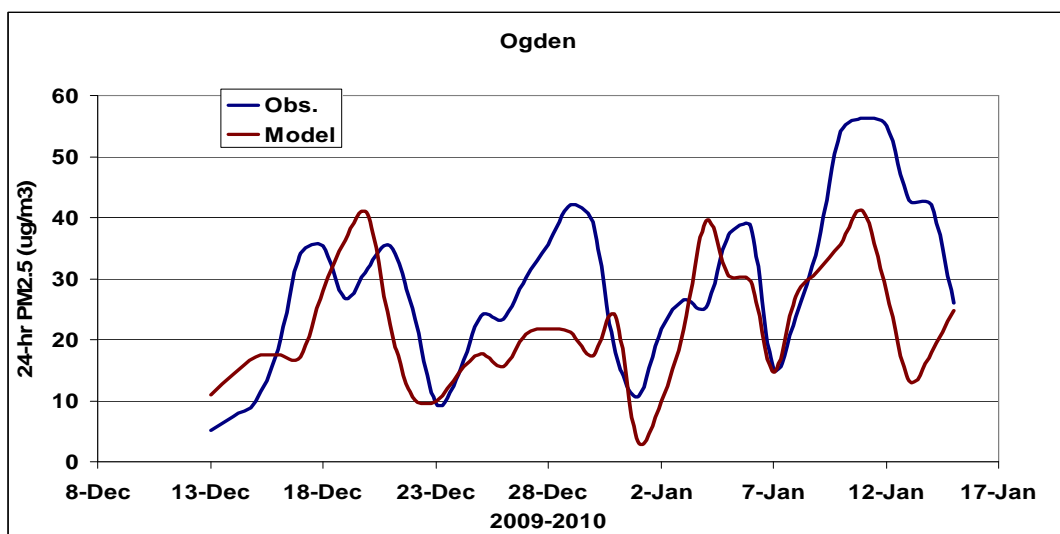
17 It is often seen that CMAQ “washes” out the $PM_{2.5}$ episode a day or two earlier than that seen in
18 the observations. For example, on the day 21 Dec. 2009, the concentration of $PM_{2.5}$ continues to
19 build while CMAQ has already cleaned the valley basins of high $PM_{2.5}$ concentrations. At these
20 times, the observed cold pool that holds the $PM_{2.5}$ is often very shallow and winds just above this
21 cold pool are southerly and strong before the approaching cold front. This situation is very
22 difficult for a meteorological and photochemical model to reproduce. An example of this
23 situation is shown in Fig. IX.A.12. 14, where the lowest part of the Salt Lake Valley is still under
24 a very shallow stable cold pool, yet higher elevations of the valley have already been cleared of
25 the high $PM_{2.5}$ concentrations.
26

27 During the 24 – 30 Dec. 2009 episode, a weak meteorological disturbance brushes through the
28 northernmost portion of Utah. It is noticeable in the observations at the Ogden monitor on 25

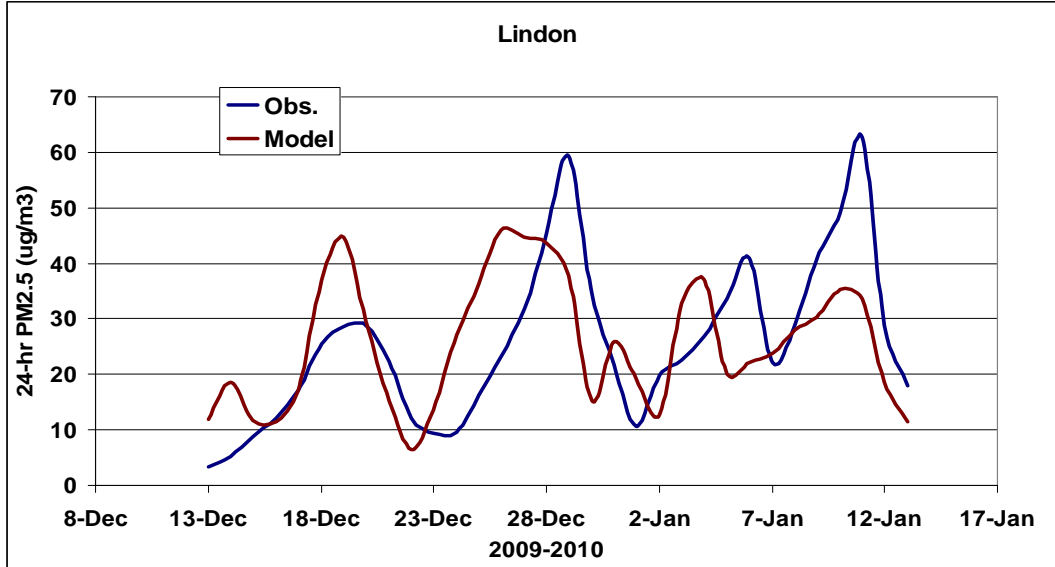
1 Dec. as PM_{2.5} concentrations drop on this day before resuming an increase through Dec. 30. The
 2 meteorological model and thus CMAQ correctly pick up this disturbance, but completely clears
 3 out the building PM_{2.5}; and thus performance suffers at the most northern Utah monitors (e.g.
 4 Ogden,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



12
 13 **Figure IX.A.12. 10 24-hr PM_{2.5} time series (Hawthorne). Observed 24-hr PM_{2.5}**
 14 **(blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).**
 15
 16

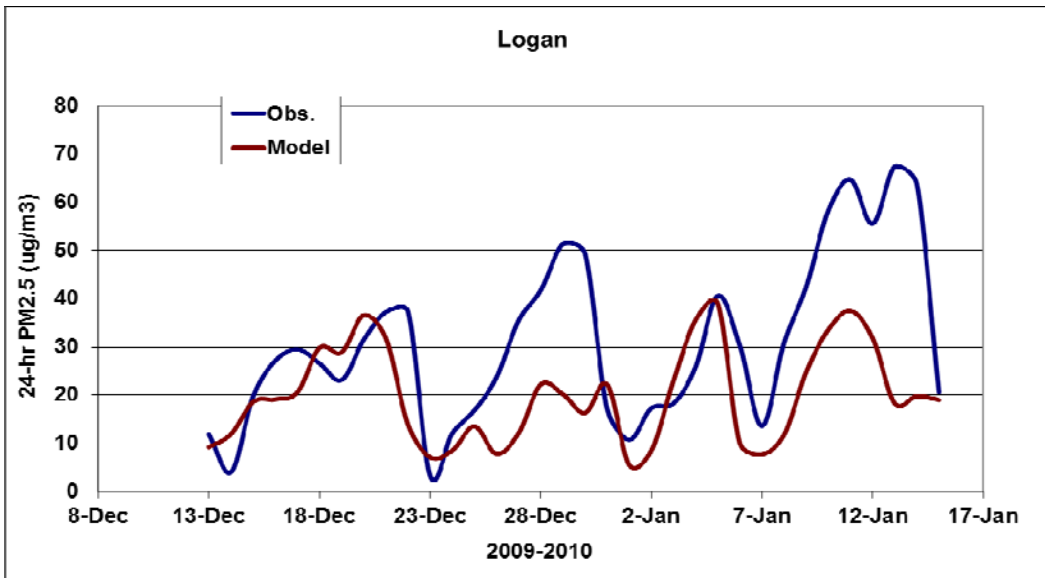


17
 18 **Figure IX.A.12. 11 24-hr PM_{2.5} time series (Ogden). Observed 24-hr PM_{2.5}**
 19 **(blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).**
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Figure IX.A.12. 12 24-hr PM_{2.5} time series (Lindon). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



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Figure IX.A.12. 13 24-hr PM_{2.5} time series (Logan). Observed 24-hr PM_{2.5} (blue trace) and CMAQ modeled 24-hr PM_{2.5} (red trace).



1
2 **Figure IX.A.12. 14 An example of the Salt Lake Valley at the end of a high PM_{2.5} episode.**
3 **The lowest elevations of the Salt Lake Valley are still experiencing an inversion and**
4 **elevated PM_{2.5} concentrations while the PM_{2.5} has been ‘cleared out’ throughout the rest of**
5 **the valley. These ‘end of episode’ clear out periods are difficult to replicate in the**
6 **photochemical model.**

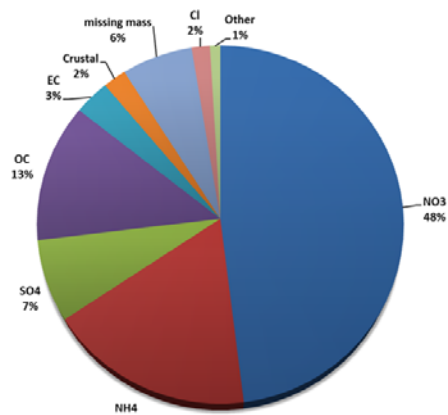
7
8 Generally, the performance of CMAQ to replicate the buildup and clear out of PM_{2.5} is good.
9 However, it is important to verify that CMAQ is replicating the components of PM_{2.5}
10 concentrations. PM_{2.5} simulated and observed speciation is shown at the 3 STN sites in Figures
11 IX.A.12. 15-17. The observed speciation is constructed using days in which the STN filter 24-hr
12 PM_{2.5} concentration was > 35 µg/m³. For the 2009-2010 modeling period, the observed
13 speciation pie charts were created using 8 filter days at Hawthorne, 6 days at Lindon, and 4 days
14 at Bountiful.

15
16 The simulated speciation is constructed using modeling days that produced 24-hr PM_{2.5}
17 concentrations > 35 µg/m³. Using this criterion, the simulated speciation pie chart is created from
18 18 modeling days for Hawthorne, 14 days at Lindon, and 14 days at Bountiful.
19 At all 3 STN sites, the percentage of simulated nitrate is greater than 40%, while the simulated
20 ammonium percentage is at ~15%. This indicates that the model is able to replicate the
21 secondarily formed particulates that typically make up the majority of the measured PM_{2.5} on the
22 STN filters during wintertime pollution events.

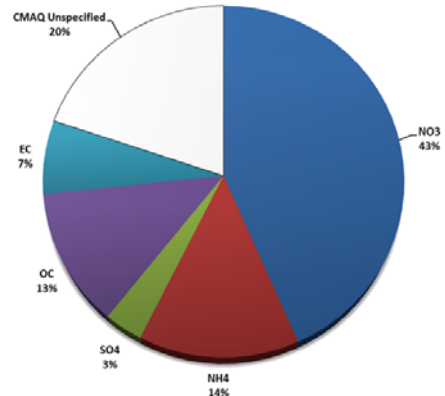
23
24 The percentage of model simulated organic carbon is ~13% at all STN sites, which is in
25 agreement with the observed speciation of organic carbon at Hawthorne and slightly
26 overestimated (by ~3%) at Lindon and Bountiful.

27
28 There is no STN site in the Logan nonattainment area, and very little speciation information
29 available in the Cache Valley. Figure IX.A.12. 18 shows the model simulated speciation at
30 Logan. Ammonium (17%) and nitrate (56%) make up a higher percentage of the simulated PM_{2.5}
31 at Logan when compared to sites along the Wasatch Front.

Hawthorne STN PM2.5 Observed Speciation

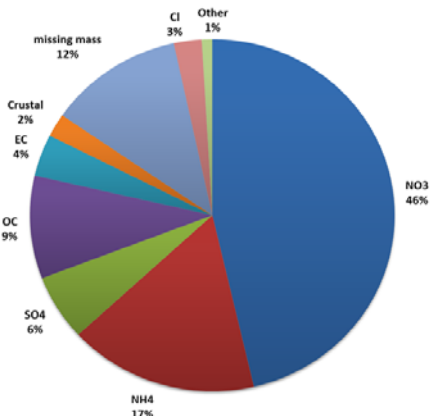


Hawthorne CMAQ PM2.5 Simulation Speciation

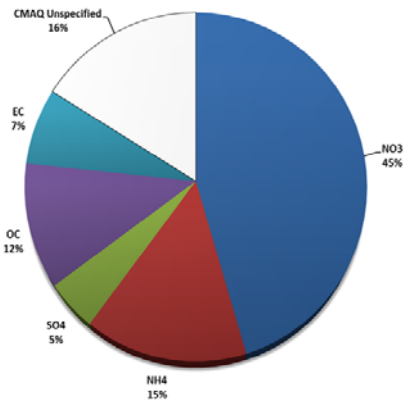


1
2 **Figure IX.A.12.15** The composition of observed and model simulated average 24-hr
3 **PM_{2.5}** speciation averaged over days when an observed and modeled day had 24-hr
4 concentrations > 35 µg/m³ at the Hawthorne STN site.
5

Bountiful STN PM2.5 Observed Speciation

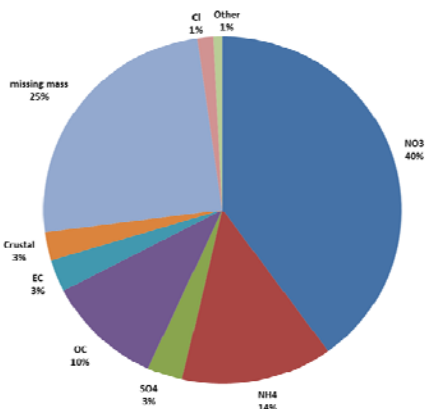


Bountiful CMAQ PM2.5 Simulation Speciation

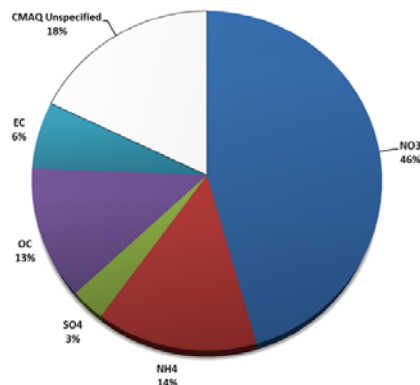


6
7 **Figure IX.A.12.16** The composition of observed and model simulated average 24-hr
8 **PM_{2.5}** speciation averaged over days when an observed and modeled day had 24-hr
9 concentrations > 35 µg/m³ at the Bountiful STN site.
10
11

Lindon STN PM2.5 Observed Speciation

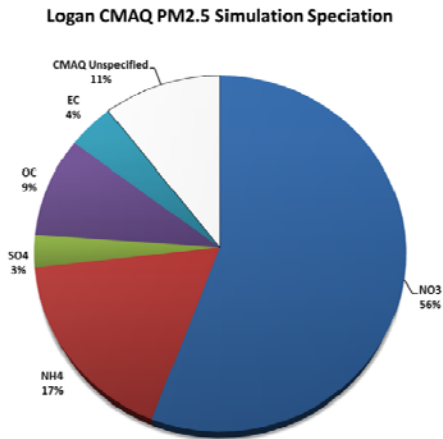


Lindon CMAQ PM2.5 Simulation Speciation



12

1 **Figure IX.A.12. 17 The composition of observed and model simulated average 24-hr**
2 **PM_{2.5} speciation averaged over days when an observed and modeled day had 24-hr**
3 **concentrations > 35 µg/m³ at the Lindon STN site.**
4



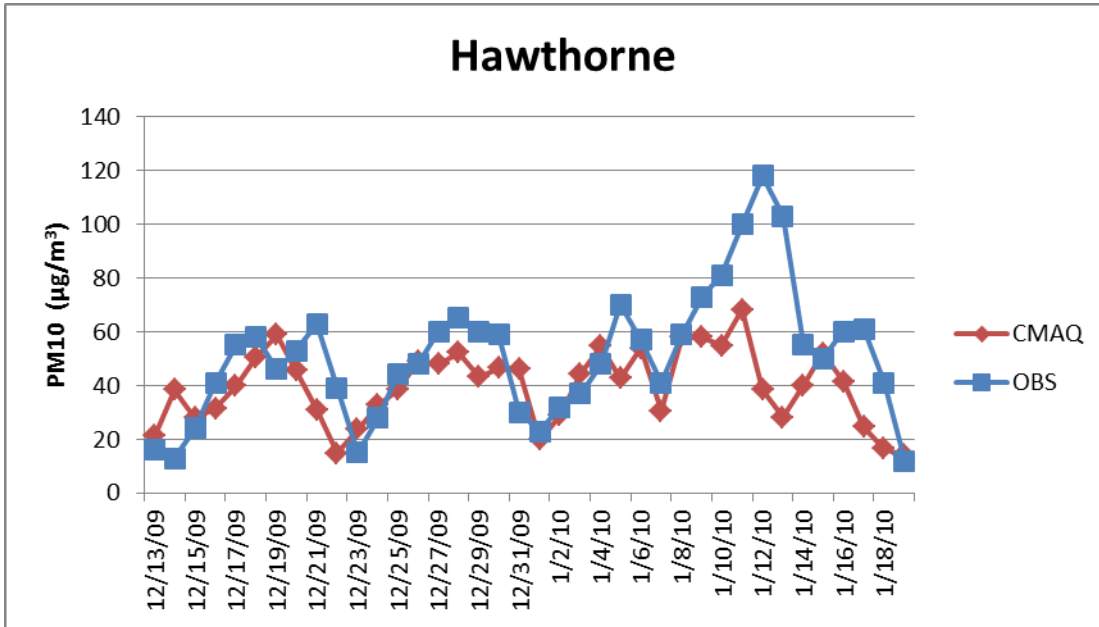
5
6 **Figure IX.A.12. 18 The composition of model simulated average 24-hr PM_{2.5} speciation**
7 **averaged over days when a modeled day had 24-hr concentrations > 35 µg/m³ at the Logan**
8 **monitoring site. No observed speciation data is available for Logan.**
9

10 PM₁₀ Results

11
12 As mentioned previously, the bulk of the performance for CMAQ modeled Particulate Matter
13 (PM) for the 2009 – 2010 episode was done for the 24-hr PM_{2.5} SIP. The detailed model
14 performance was shown using time series, statistical metrics, and pie charts. For the CMAQ
15 performance of PM₁₀ in particular, UDAQ has updated the model versus observations time series
16 plots to show PM₁₀, in addition to the prior times series using PM_{2.5}. For the 2009 – 2010
17 episode, UDAQ collected PM₁₀ observational data at Hawthorne and Magna in Salt Lake County;
18 Lindon and North Provo in Utah County; and for Ogden City.
19

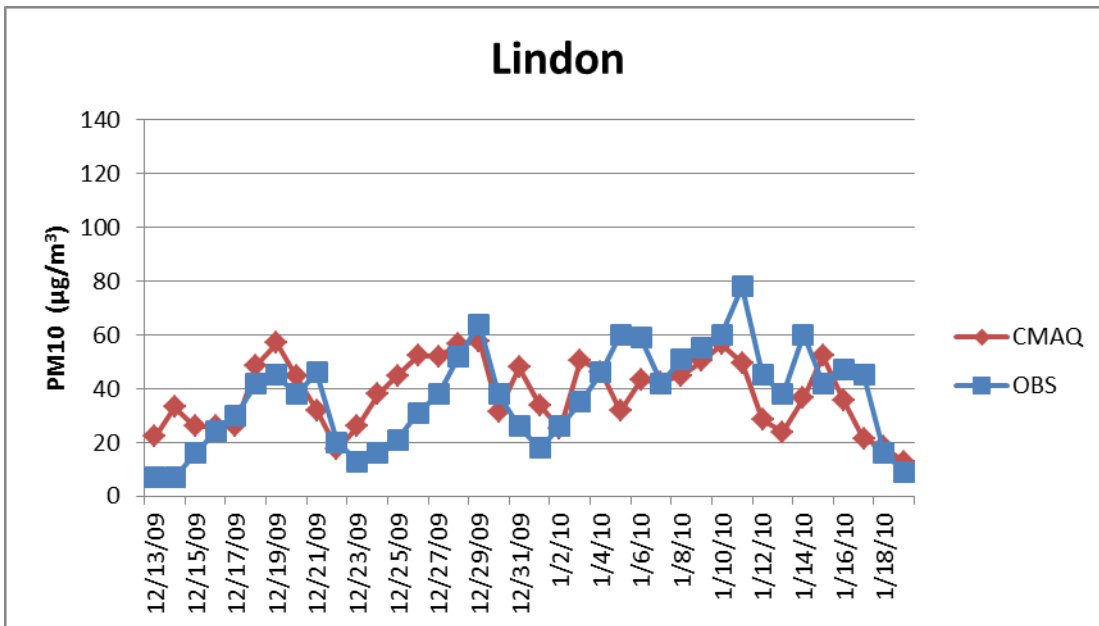
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The PM₁₀ model versus observation time series is shown in Figures IX.A.12. 19-24 .



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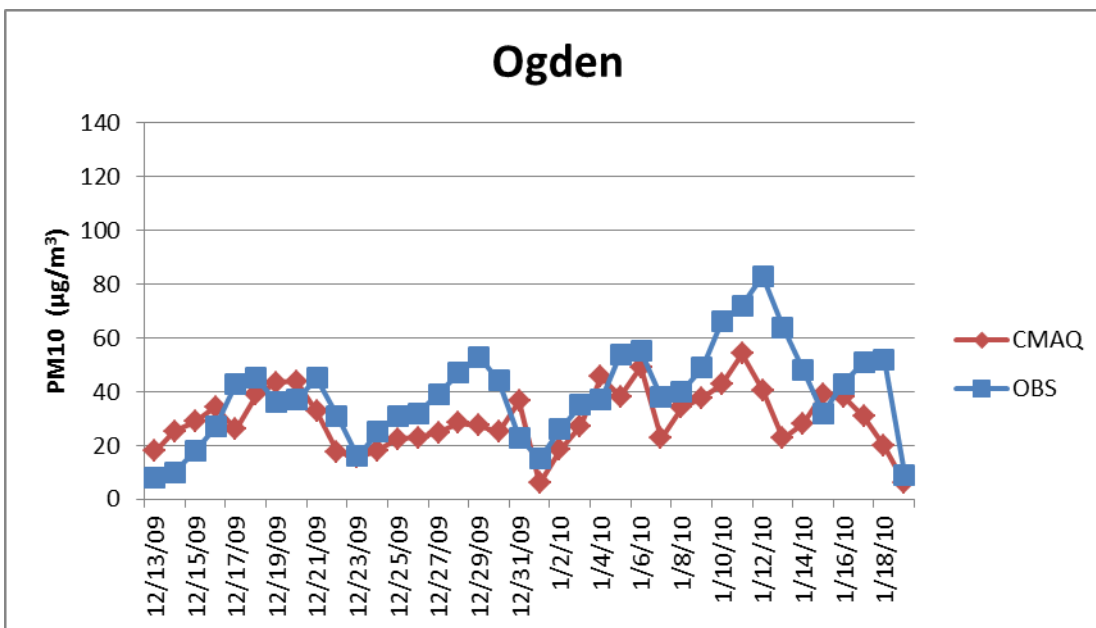
Figure IX.A.12. 19 Time Series of total PM₁₀ (ug/m3) for Hawthorne for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



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Figure IX.A.12. 20 Time Series of total PM₁₀ (ug/m3) for Lindon for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.

1



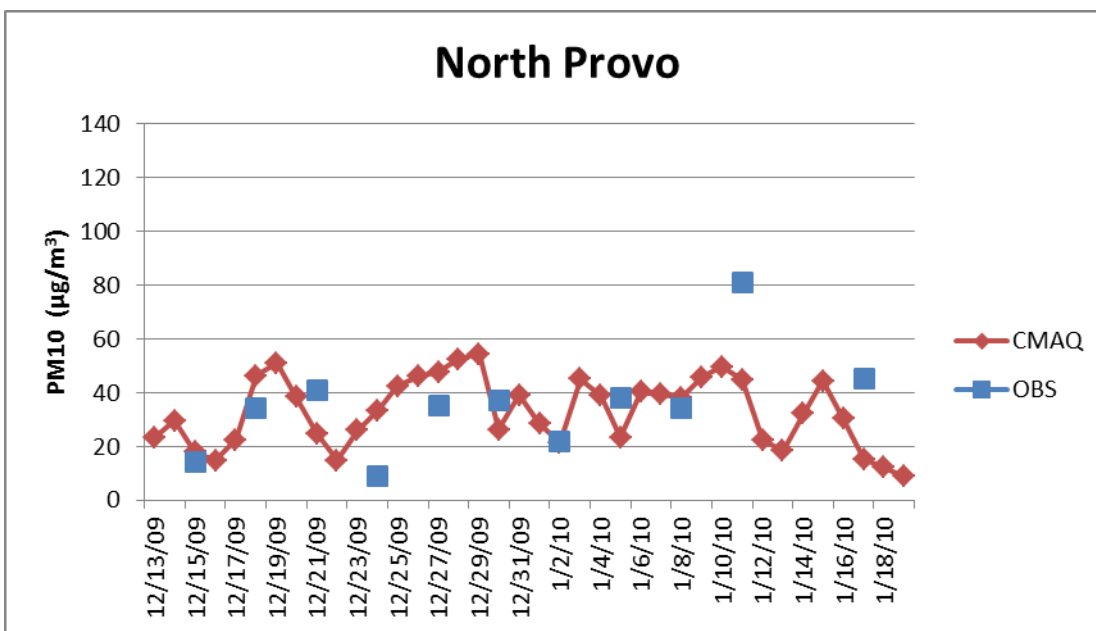
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4 **Figure IX.A.12.21 Time Series of total PM₁₀ (ug/m3) for Ogden for the 2009-2010**
 5 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
 6 **trace.**

7

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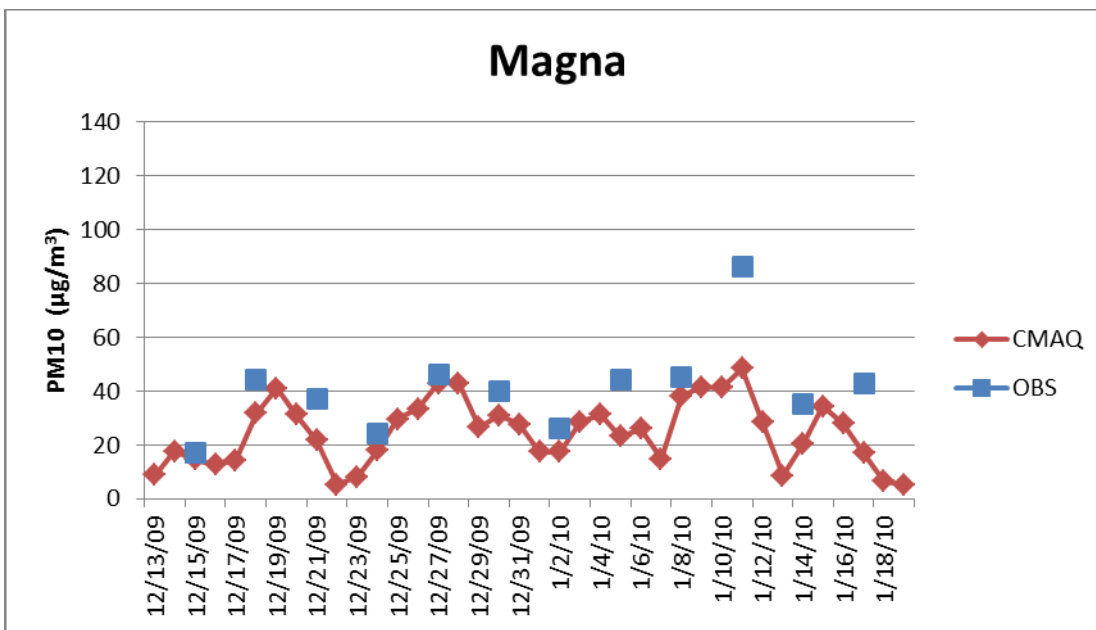
10

11 **Figure IX.A.12.22 Time Series of total PM₁₀ (ug/m3) for North Provo for the 2009-2010**
 12 **modeling. CMAQ results are shown in the red trace and the observations are the blue**
 13 **trace.**

14

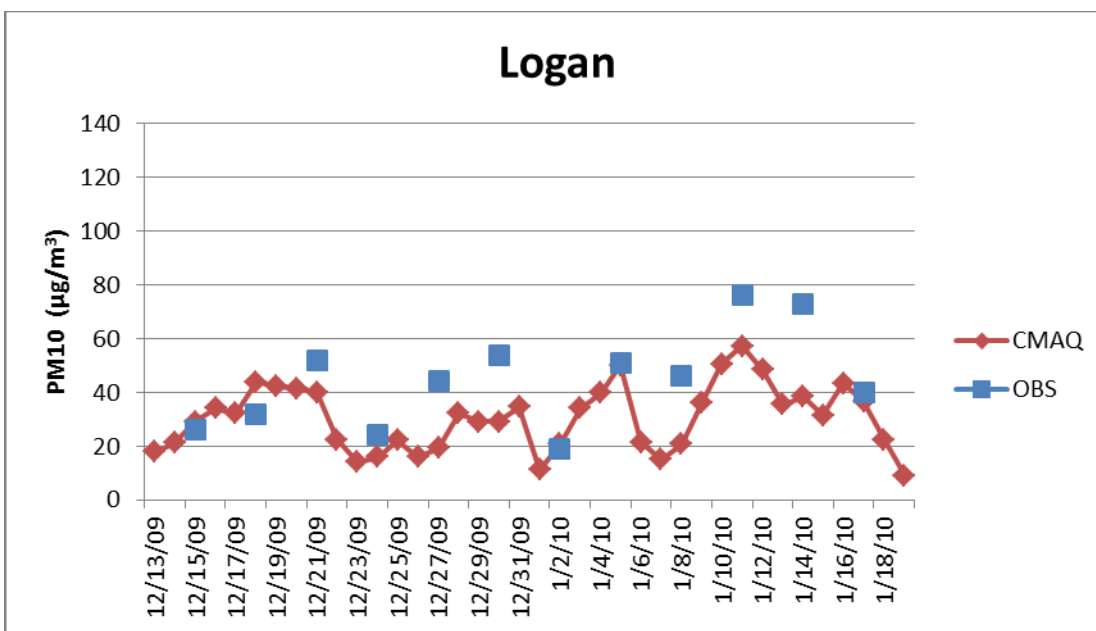
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Figure IX.A.12.23 Time Series of total PM₁₀ (ug/m3) for Magna for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.



8
9

Figure IX.A.12.24 Time Series of total PM₁₀ (ug/m3) for Logan for the 2009-2010 modeling. CMAQ results are shown in the red trace and the observations are the blue trace.

As noted before, a robust comparison of CMAQ modeled PM₁₀ speciation to PM₁₀ filter speciation could not be made for this modeling period because most of the secondarily chemically formed particulate nitrate had been volatilized from the PM₁₀ filters and thus could not be accounted for. It should be noted that CMAQ was able to produce the secondarily formed nitrate

17

1 when compared to PM_{2.5} filters during the previous PM_{2.5} SIP work. Therefore, UDAQ feels
2 CMAQ shows good replication of the species that make up PM₁₀ during wintertime pollution
3 events.
4

5
6 **(g) Summary of Model Performance**
7

8 Model performance for 24-hr PM_{2.5} is good and generally acceptable and can be characterized as
9 follows:
10

- 11 • Good replication of the episodic buildup and clear out of PM_{2.5}. Often the model will
12 clear out the simulated PM_{2.5} a day too early at the end of an episode. This clear out time
13 period is difficult to model (i.e., Figure IX.A.12. 14).
- 14
15 • Good agreement in the magnitude of PM_{2.5}, as the model can consistently produce the
16 high concentrations of PM_{2.5} that coincide with observed high concentrations.
17
- 18 • Spatial patterns of modeled 24-hr PM_{2.5}, show for the most part, that the PM_{2.5} is being
19 confined in the valley basins, consistent to what is observed.
20
- 21 • Speciation and composition of the modeled PM_{2.5} matches the observed speciation quite
22 well. Modeled and observed nitrate are between 40% and 50% of the PM_{2.5}. Ammonium
23 is between 15% and 20% for both modeled and observed PM_{2.5}, while modeled and
24 observed organic carbon falls between 10% to 13% of the total PM_{2.5}.
25

26 For PM₁₀ the CMAQ model performance is quite good at all locations along Northern Utah.
27 CMAQ is able to re-produce the buildup and washout of the pollution episodes during the 2009 –
28 2010 winter. CMAQ is also able to re-produce the peak PM₁₀ concentrations during most
29 episodes. The exception being the 2010 Jan. 08 – 14 episode, where CMAQ fails to build to the
30 extremely high PM₁₀ concentration (>80 ug/m³) seen at the monitors. This episode in particular
31 featured an “early model washout,” and these results are similar to the results found in PM_{2.5}
32 modeling.
33

34 Several observations should be noted on the implications of these model performance findings on
35 the attainment modeling presented in the following section. First, it has been demonstrated that
36 model performance overall is acceptable and, thus, the model can be used for air quality planning
37 purposes. Second, consistent with EPA guidance, the model is used in a relative sense to project
38 future year values. EPA suggests that this approach “should reduce some of the uncertainty
39 attendant with using absolute model predictions alone.”
40

41 **(h) Modeled Attainment Test**
42

43 • **Introduction**
44

45 With acceptable performance, the model can be utilized to make future-year attainment
46 projections. For any given (future) year, an attainment projection is made by calculating a
47 concentration termed the Future Design Value (FDV). This calculation is made for each monitor
48 included in the analysis, and then compared to the NAAQS (150 µg/m³). If the FDV at every
49 monitor located within a nonattainment area is smaller than the NAAQS, this would demonstrate
50 attainment for that area in that future year.
51

1 A maintenance plan must demonstrate continued attainment of the NAAQS for a span of ten
 2 years. This span is measured from the time EPA approves the plan, a date which is somewhat
 3 uncertain during plan development. To be conservative, attainment projections were made for
 4 2019, 2028, and 2030. An assessment was also made for 2024 as a “spot-check” against emission
 5 trends within the ten year span.

6
 7 • **PM₁₀ Baseline Design Values**
 8

9 For any monitor, the FDV is greatly influenced by existing air quality at that location. This can
 10 be quantified and expressed as a Baseline Design Value (BDV). The BDV is consistent with the
 11 form of the 24-hour PM₁₀ NAAQS; that is, that the probability of exceeding the standard should
 12 be no greater than once per calendar year. Quantification of the BDV for each monitor is
 13 included in the TSD, and is consistent with EPA guidance.

14
 15 Hourly PM₁₀ observations are taken from FRM filters spanning five monitors in three
 16 maintenance areas: Salt Lake County, Utah County, and the city of Ogden.

17
 18 In Table IX.A.12. 5, baseline design values are given for Ogden, Hawthorne, Magna, Lindon, and
 19 North Provo. These values were calculated based on data collected during the 2011-2014 time
 20 period.

21
 22 **Table IX.A.12. 5 Baseline design values listed for each monitor.**
 23

Site	Maintenance Area	2011-2014 BDV
Ogden	Ogden City	88.2 µg/m ³
Hawthorne	Salt Lake County	100.9 µg/m ³
Magna	Salt Lake County	70.5 µg/m ³
Lindon	Utah County	111.4 µg/m ³
North Provo	Utah County	124.4 µg/m ³

24
 25
 26 • **Relative Response Factors**
 27

28 In making future-year predictions, the output from the CMAQ 4.7.1 model is not considered to be
 29 an absolute answer. Rather, the model is used in a relative sense. In doing so, a comparison is
 30 made using the predicted concentrations for both the year in question and a pre-selected base-
 31 year, which for this plan is 2011. This comparison results in a Relative Response Factor (RRF).
 32 RRFs are calculated as follows:

- 33
 34 1) Modeled PM₁₀ concentrations are calculated for each grid cell in the modeling domain
 35 over the 39-day wintertime 2009-2010 episode. Of particular interest are the nine grid
 36 cells (3x3 window) that are collocated with each monitor. The monitor, itself is located in
 37 the window’s center cell.
 38
 39 2) For every simulated day, the maximum daily PM₁₀ concentration for each of these nine-
 40 cell windows is identified.
 41
 42 3) For each monitor, the top 20% of these 39 values are averaged to formulate a modeled
 43 PM₁₀ peak concentration value (PCV).
 44
 45 4) At each monitor, the RRF is calculated as the ratio between future-year PCV and base-
 46 year PCV: **RRF = FPCV / BPCV**

1
2
3
4 • **Future Design Values and Results**
5

6 Finally, for each monitor, the FDV is calculated by multiplying the baseline design value by the
7 relative response factor: **FDV = RRF * BDV**. These FDV's are compared to the NAAQS in order
8 to determine whether attainment is predicted at that location or not. The results for each of the
9 monitors are shown below in Table IX.A.12. 6.

10
11 **Table IX.A.12. 6 Baseline design values, relative response factors, and future design**
12 **values for all monitors and future years. Units of design values are $\mu\text{g}/\text{m}^3$, while RRF's are**
13 **dimensionless.**
14

Monitor	2011 BDV	2019 RRF	2019 FDV	2024 RRF	2024 FDV	2028 RRF	2028 FDV	2030 RRF	2030 FDV
Ogden	88.2	1.05	92.6	1.04	91.7	1.02	90.0	1.05	92.6
Hawthorne	100.9	1.09	110.0	1.09	110.0	1.09	110.0	1.12	113.0
Magna	70.5	1.14	80.4	1.13	79.7	1.11	78.3	1.15	81.1
Lindon	111.4	1.16	129.2	1.12	124.8	1.11	123.7	1.16	129.2
North Provo	124.4	1.15	143.1	1.12	139.3	1.10	136.8	1.15	143.1

15
16
17 For all future-years and monitors, no FDV exceeds the NAAQS. Therefore continued attainment
18 is demonstrated for all three maintenance areas.
19
20
21

22 **(2) Attainment Inventory**
23

24 The attainment inventory is discussed in EPA guidance (Calcagni) as another one of the core
25 provisions that should be considered by states for inclusion in a maintenance plan.
26

27 According to Calcagni, the stated purpose of the attainment inventory is to establish the level of
28 emissions during the time periods associated with monitoring data showing attainment.
29

30 In cases such as this, where a maintenance demonstration is founded on a modeling analysis that
31 is used in a relative sense, the baseline inventory modeled as the basis for comparison with every
32 projection year model run is best suited to act as the attainment inventory. For this analysis, a
33 baseline inventory was compiled for the year 2011. This year also falls within the span of data
34 representing current attainment of the PM_{10} NAAQS.
35

36 Calcagni speaks about the projection inventory as well, and notes that it should consider future
37 growth, including population and industry, should be consistent with the base-year attainment
38 inventory, and should document data inputs and assumptions. Any assumptions concerning
39 emission rates must reflect permanent, enforceable measures.
40

41 Utah compiled projection inventories for use in the quantitative modeling demonstration. The
42 years selected for projection included 2019, 2024, 2028, and 2030. The emissions contained in
43 the inventories include sources located within a regional area called a modeling domain. The

1 modeling domain encompasses all three areas within the state that were designated as
2 nonattainment areas for PM₁₀: Salt Lake County, Utah County, and Ogden City, as well as a
3 bordering region see Figure IX.A.12. 1.

4
5 Since this bordering region is so large (owing to its creation to assess a much larger region of
6 PM_{2.5} nonattainment), a “core area” within this domain was identified wherein a higher degree of
7 accuracy would be important. Within this core area (which includes Weber, Davis, Salt Lake,
8 and Utah Counties), SIP-specific inventories were prepared to include seasonal adjustments and
9 forecasting to represent each of the projection years. In the bordering regions away from this
10 core, the 2011 National Emissions Inventory was downloaded from EPA and inserted to the
11 analysis. It remained unchanged throughout the analysis period.

12
13 There are four general categories of sources included in these inventories: large stationary
14 sources, smaller area sources, on-road mobile sources, and off-road mobile sources.

15
16 For each of these source categories, the pollutants that were inventoried included: particulate
17 matter with an aerodynamic diameter of ten microns or less (PM₁₀), sulfur dioxide (SO₂), oxides
18 of nitrogen (NO_x), volatile organic compounds (VOC), and ammonia. SO₂ and NO_x are
19 specifically defined as PM₁₀ precursors, that is, compounds that, after being emitted to the
20 atmosphere, undergo chemical or physical change to become PM₁₀. Any PM₁₀ that is created in
21 this way is referred to as secondary aerosol. The CMAQ model also considers ammonia and
22 VOC to be contributing factors in the formation of secondary aerosol.

23
24 The unit of measure for point and area sources is the traditional tons per year, but the CMAQ
25 model includes a pre-processor that converts these emission rates to hourly increments throughout
26 each day for each episode. Mobile source emissions are reported in terms of tons per day, and are
27 also pre-processed by the model.

28
29 The basis for the point source and area inventories, for the base-year attainment inventory as well
30 as all future-year projection inventories, was the 2011 tri-annual inventory of actual emissions
31 that had already been compiled by the Division of Air Quality.

32
33 Area sources, off-road mobile sources, and generally also the large point sources were projected
34 forward from 2011, using population and economic forecasts from the Governor’s Office of
35 Management and Budget.

36
37 Mobile source emissions were calculated for each year using MOVES2010 in conjunction with
38 the appropriate estimates for vehicle miles traveled (VMT). VMT estimates for the urban
39 counties were based on a travel demand model that is only run periodically for specific projection
40 years. VMT for intervening years were estimated by interpolation.

41
42 Since this SIP subsection takes the form of a maintenance plan, it must demonstrate that the area
43 will continue to attain the PM₁₀ NAAQS throughout a period of ten years from the date of EPA
44 approval. It is also necessary to “spot check” this ten-year interval. Hence, projection inventories
45 were prepared for the following years: 2019, 2024, 2028, (the ten-year mark from anticipated
46 EPA approval), and 2030. 2011 was established as the baseline period.

47
48 The following tables are provided to summarize these inventories. As described, they represent
49 point, area, on-road mobile, and off-road mobile sources in the modeling domain. They include
50 PM₁₀, SO₂, NO_x, VOC, and ammonia.

51

1 The first Table IX.A.12. 7 shows the baseline emissions for each of the areas within the
 2 modeling domain. The second Table IX.A.12. 8 is specific to this nonattainment area, and
 3 shows the emissions from the baseline through the projection years.
 4
 5
 6

7 **Table IX.A.12. 7 Baseline Emissions throughout the Modeling Domain**
 8

2011 Baseline	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline Sum of Emissions (tpd)	Ogden City NA-Area	Area Sources	0.85	0.08	2.12	5.67	0.86
		NonRoad	0.90	0.00	1.32	0.91	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.09	0.05	12.18	8.58	0.22
		Provo NA Total	3.84	0.13	15.62	15.16	1.08
	Salt Lake County NA-Area	Area Sources	4.61	0.05	0.73	32.62	1.53
		NonRoad	7.12	0.32	11.71	6.38	0.00
		Point Source	4.04	8.90	15.56	2.97	0.20
		Mobile Sources	10.95	0.28	57.96	35.35	1.14
		Salt Lake City NA Total	26.72	9.55	85.96	77.32	2.87
	Utah County NA-Area	Area Sources	2.19	0.02	0.22	1.16	0.83
		NonRoad	3.53	0.02	4.24	2.31	0.00
		Point Source	0.28	0.29	1.03	0.18	0.18
		Mobile Sources	4.90	0.13	24.64	11.89	0.49
		Surrounding Areas Total	10.90	0.46	30.13	15.54	1.50
	Surrounding Areas	Area Sources	537.49	13.60	228.31	629.52	331.22
		NonRoad	34.53	0.10	60.77	72.57	0.01
		Point Source	17.64	283.15	538.86	63.96	6.08
		Mobile Sources	22.80	193.52	434.92	6.47	1.67
		Surrounding Areas Total	612.46	490.37	1262.86	772.52	338.98
	2011 Total	653.92	500.51	1394.57	880.54	344.43	

9
 10
 11
 12
 13 **Table IX.A.12. 8 Salt Lake County Nonattainment Area; Actual Emissions for 2011 and**
 14 **Emission Projections for 2019, 2024, 2028, and 2030.**
 15

Year	NA-Area	Source Category	PM10	SO2	NOx	VOC	NH3
2011 Baseline	Ogden City NA-Area	Area Sources	0.85	0.08	2.12	5.67	0.86
		NonRoad	0.90	0.00	1.32	0.91	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.09	0.05	12.18	8.58	0.22
		2011 Total	3.84	0.13	15.62	15.16	1.08
2019	Ogden City NA-Area	Area Sources	0.61	0.08	1.21	3.87	0.88
		NonRoad	1.00	0.00	0.84	0.77	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.07	0.06	6.68	5.26	0.17
		2019 Total	3.68	0.14	8.73	9.90	1.05
2024	Ogden City NA-Area	Area Sources	0.65	0.12	1.16	4.18	0.95
		NonRoad	1.05	0.00	0.70	0.77	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.11	0.06	4.50	4.19	0.17
		2024 Total	3.81	0.18	6.36	9.14	1.12
2028	Ogden City NA-Area	Area Sources	0.71	0.10	1.21	4.38	0.99
		NonRoad	1.13	0.00	0.66	0.78	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.17	0.05	3.12	3.42	0.17
		2028 Total	4.01	0.15	4.99	8.58	1.16
2030	Ogden City NA-Area	Area Sources	0.71	0.08	1.21	4.50	0.99
		NonRoad	1.17	0.00	0.64	0.80	0.00
		Point Source	0.00	0.00	0.00	0.00	0.00
		Mobile Sources	2.22	0.05	2.83	3.26	0.17
		2030 Total	4.10	0.13	4.68	8.56	1.16

1
2
3
4 More detail concerning any element of the inventory can be found at the appropriate section of
5 the Technical Support Document (TSD). More detail about the general construction of the
6 inventory may be found in the Inventory Preparation Plan.
7
8

9 **(3) Emissions Limitations**

10
11 As discussed above, the larger sources within the nonattainment areas were individually
12 inventoried and modeled in the analysis.
13

14 A subset of these “large” sources was subsequently identified for the purpose of establishing
15 emission limitations as part of the Utah SIP. This subset includes any source located within any
16 of the three current nonattainment areas for PM₁₀: Salt Lake County, Utah County, or Ogden City
17 whose actual emissions of PM₁₀, SO₂, or NO_x exceeded 100 tons in 2011, or who had the
18 potential to emit 100 tpy of any of these pollutants. A source might also be included in the subset
19 if it was currently regulated for PM₁₀ under section IX, Part H of the Utah SIP. There were
20 several sources in Davis County that were close enough to the border so as to have originally
21 been included in the original PM₁₀ SIP.
22

23 As discussed before, the emission limits for these sources had already been reflected in the
24 projected emissions inventories used in the modeling analysis. Only those limits for which credit
25 is being taken in the SIP have been incorporated specifically into the SIP. Many of these limits
26 appear in state issued Approval Orders or Title V Operating Permits. Such regulatory documents
27 typically include many emission limits and operating restrictions. However, the limits found in
28 the SIP cannot be changed unless the State provides, and EPA approves, a SIP revision.
29

30 These limits are incorporated in the Utah SIP at Section IX, Part H (formerly Sections 1 and 2 of
31 Appendix A to Section IX, Part A), and as such are federally enforceable.
32

33 These conditions support a demonstration of maintenance through 2030.
34
35

36 **(4) Emission Reduction Credits**

37
38 Under Utah’s new source review rules in R307-403-8, banking of emission reduction credits
39 (ERCs) is permitted to the fullest extent allowed by applicable Federal Law as identified in 40
40 CFR 51, Appendix S, among other documents. Under Appendix S, Section IV.C.5, a permitting
41 authority may allow banked ERCs to be used under the preconstruction review program (R307-
42 403) as long as the banked ERCs are identified and accounted for in the SIP control strategy.
43

44 Existing Emission Reduction Credits, for PM₁₀, SO₂, and NO_x, were included in the modeled
45 demonstration of maintenance outlined in Subsection IX.A.12.c(1).
46

47 The subsequent crediting of any emission reduction of PM₁₀, or precursors thereto, whether pre-
48 existing or established subsequent to the approval of this SIP revision, remains permissible. In
49 general, credits must be in excess and must be established by actual, verifiable, and enforceable
50 reductions in emissions. Additionally, these ERCs cannot be used to offset major new sources or
51 major modifications at existing sources in PM_{2.5} nonattainment areas.
52

1 Once **Ogden City** is redesignated to attainment for PM₁₀, permitting new PM₁₀ sources or major
2 modifications to existing PM₁₀ sources will be conducted under the rules of the Prevention of
3 Significant Deterioration program.
4
5
6

7 **(5) Additional Controls for Future Years**

8
9 Since the emission limitations discussed in subsection IX.A.12.c.(3) are federally enforceable
10 and, as demonstrated in IX.A.10.c(1) above, are sufficient to ensure continued attainment of the
11 PM₁₀NAAQS, there is no need to require any additional control measures to maintain the PM₁₀
12 NAAQS.
13
14

15 **(6) Mobile Source Budget for Purposes of Conformity**

16
17 The transportation conformity provisions of section 176(c)(2)(A) of the Clean Air Act (CAA)
18 require regional transportation plans and programs to show that "...emissions expected from
19 implementation of plans and programs are consistent with estimates of emissions from motor
20 vehicles and necessary emissions reductions contained in the applicable implementation plan..."
21 EPA's transportation conformity regulation (40 CFR 93, Subpart A, last amended at 77 FR 14979,
22 March 14 2012) also requires that motor vehicle emission budgets must be established for the
23 last year of the maintenance plan, and may be established for any years deemed appropriate (see
24 40 CFR 93.118(b)(2)(i)). If the maintenance plan does not establish motor vehicle emissions
25 budgets for any years other than the last year of the maintenance plan, the conformity regulation
26 requires that a "demonstration of consistency with the motor vehicle emissions budget(s) must be
27 accompanied by a qualitative finding that there are not factors which would cause or contribute to
28 a new violation or exacerbate an existing violation in the years before the last year of the
29 maintenance plan." The normal interagency consultation process required by the regulation (40
30 CFR 93.105) shall determine what must be considered in order to make such a finding.
31

32 Thus, for a Metropolitan Planning Organization's (MPO's) Regional Transportation Plan (RTP),
33 analysis years that are after the last year of the maintenance plan (in this case 2030), a conformity
34 determination must show that emissions are less than or equal to the maintenance plan's motor
35 vehicle emissions budget(s) for the last year of the implementation plan.
36

37 EPA's MOVES2014 was used to calculate mobile source emissions, and road dust projections
38 were calculated using the January 2011 update to AP-42 Method for Estimating Re-Entrained
39 Road Dust from Paved Roads (Chapter 13, released 76 FR 6329 February 4, 2011).
40

41 Utah has determined that mobile sources are not significant contributors of SO₂ for this
42 maintenance plan. As such, this maintenance plan does not establish a motor vehicle emissions
43 budget for SO₂.
44

45 **(a) Ogden City Mobile Source PM₁₀ Emissions Budgets**

46
47 In this maintenance plan, Utah is establishing transportation conformity motor vehicle emission
48 budgets (MVEB) for PM₁₀ (direct) and NO_x for 2030.
49

50 **(i) Direct PM₁₀ Emissions Budget**

51

1 Direct (or “primary”) PM₁₀ refers to PM₁₀ that is not formed via atmospheric chemistry. Rather,
2 direct PM₁₀ is emitted straight from a mobile or stationary source. With regard to the emission
3 budget presented herein, direct PM₁₀ includes road dust, brake wear, and tire wear as well as
4 PM₁₀ from exhaust.

5
6 As presented in the Technical Support Document for on-road mobile sources, the estimated on-
7 road mobile source emissions for Salt Lake County, in 2030, of direct sources of PM₁₀ (road dust,
8 brake wear, tire wear, and exhaust particles) were 0.71 tons per winter-weekday. These mobile
9 source PM₁₀ emissions were included in the maintenance demonstration in Subsection
10 IX.A.10.c.(1) which estimates a maximum PM₁₀ concentration of 92.6 µg/m³ in 2030 within the
11 Salt Lake County portion of the modeling domain. The above PM₁₀ mobile source emission
12 figure of 0.71 tons per day (tpd) would traditionally be considered as the MVEB for the
13 maintenance plan. However, and as discussed below, the modeled concentration is 57.4 µg/m³
14 below the NAAQS of 150 µg/m³, and represents potential PM₁₀ emissions that may be considered
15 for allocation to the PM₁₀ MVEB.

16
17 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
18 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
19 compliance with the maintenance requirement. These additional emissions that can be allocated
20 to the applicable MVEB are considered the “safety margin.” As defined in 40 CFR 93.101,
21 safety margin represents the amount of emissions by which the total projected emissions from all
22 sources of a given pollutant are less than the total emissions that would satisfy the applicable
23 requirement for demonstrating maintenance. The implementation plan can then allocate some or
24 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

25
26 The safety margin for the Ogden City portion of the domain equates to 57.4 µg/m³.

27
28 To evaluate the portion of safety margin that could be allocated to the PM₁₀ MVEB, modeling
29 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.

30
31 Using the same emission projections for point and area and non-road mobile sources, the
32 SMOKE 3.6 emissions model was re-run using 1.50 tons of PM₁₀ per winter-weekday for mobile
33 sources (and 1.00 tons/winter-weekday of NO_x). The revised maintenance demonstration for
34 2030 still shows maintenance of the PM₁₀ standard.

35
36 It estimates a maximum PM₁₀ concentration of 97.0 µg/m³ in 2030 within the Ogden City portion
37 of the modeling domain. This value is 53.0 µg/m³ below the NAAQ Standard of 150 µg/m³, but
38 4.4 µg/m³ higher than the previous value.

39
40 This shows that the safety margin is at least 0.79 tons/day of PM₁₀ (1.50 tons/day minus 0.71
41 tons/day) and 0.30 tons/day of NO_x (1.00 tons/day minus 0.70 tons/day). This maintenance plan
42 allocates this portion of the safety margin to the mobile source budgets for Ogden City, and
43 thereby sets the direct PM₁₀ MVEB for 2030 at 1.50 tons/winter-weekday.

44 45 **(ii) NO_x Emissions Budget**

46
47 Through atmospheric chemistry, NO_x emissions can substantially contribute to secondary PM₁₀
48 formation. For this reason, NO_x is considered a PM₁₀ precursor.

49
50 As presented in the Technical Support Document for on-road mobile sources, the estimated on-
51 road mobile source NO_x emissions for Ogden City in 2030 were 0.70 tons per winter-weekday.
52 These mobile source PM₁₀ emissions were included in the maintenance demonstration in

1 Subsection IX.A.10.c.(1) which estimates a maximum PM₁₀ concentration of 92.6 µg/m³ in 2030
2 within the Ogden City portion of the modeling domain. The above NO_x mobile source emission
3 figure of 0.70 tons per day (tpd) would traditionally be considered as the MVEB for the
4 maintenance plan. However, and as discussed below, the modeled concentration is 57.4 µg/m³
5 below the NAAQS of 150 µg/m³, and represents potential NO_x emissions that may be considered
6 for allocation to the NO_x MVEB.

7
8 EPA's conformity regulation (40 CFR 93.124(a)) allows the implementation plan to quantify
9 explicitly the amount by which motor vehicle emissions could be higher while still demonstrating
10 compliance with the maintenance requirement. These additional emissions that can be allocated
11 to the applicable MVEB are considered the "safety margin." As defined in 40 CFR 93.101,
12 safety margin represents the amount of emissions by which the total projected emissions from all
13 sources of a given pollutant are less than the total emissions that would satisfy the applicable
14 requirement for demonstrating maintenance. The implementation plan can then allocate some or
15 all of this "safety margin" to the applicable MVEBs for transportation conformity purposes.

16
17 The safety margin for the Ogden City portion of the domain equates to 57.4 µg/m³.

18
19 To evaluate the portion of safety margin that could be allocated to the PM₁₀ MVEB, modeling
20 was re-run for 2030 with additional emissions attributed to the on-road mobile sources.

21
22 Using the same emission projections for point and area and non-road mobile sources, the
23 SMOKE 3.6 emissions model was re-run using 1.00 tons of NO_x per winter-weekday for on-road
24 mobile sources (and 1.50 tons/winter-weekday of PM₁₀). The revised maintenance demonstration
25 for 2030 still shows maintenance of the PM₁₀ standard.

26
27 It estimates a maximum PM₁₀ concentration of 97.0 µg/m³ in 2030 within the Ogden City portion
28 of the modeling domain. This value is 53.0 µg/m³ below the NAAQ Standard of 150 µg/m³, but
29 4.4 µg/m³ higher than the previous value.

30
31 This shows that the safety margin is at least 0.30 tons/day of NO_x (1.00 tons/day minus 0.70
32 tons/day) and 0.79 tons/day of PM₁₀ (1.50 tons/day minus 0.71 tons/day). This maintenance plan
33 allocates this portion of the safety margin to the mobile source budgets for Ogden City, and
34 thereby sets the NO_x MVEB for 2030 at 1.00 tons/winter-weekday

35
36
37 **(b) Net Effect to Maintenance Demonstration**

38
39 Using the procedure described above, some of the identified safety margin indicated earlier in
40 Subsection IX.A.12.c(6) has been allocated to the mobile vehicle emissions budgets. The results
41 of this modification are presented below.

42
43 **(i) Inventory: The emissions inventory was adjusted as shown below:**

44
45
46 in 2030: PM₁₀ was adjusted by adding 0.79 ton/day (tpd) of safety margin to 0.71
47 tpd inventory for a total of 1.50 tpd, and

48
49 NO_x was adjusted by adding 0.30 tpd of safety margin to 0.70 tpd
50 inventory for a total of 1.00 tpd,

1
2 **(ii) Modeling:**
3

4 The effect on the modeling results throughout the domain is summarized in the following
5 Table IX.A.12. 9 (which shows predicted concentrations in $\mu\text{g}/\text{m}^3$). It demonstrates that
6 with the allocation of the safety margin, the NAAQS is still maintained through 2030 in
7 all areas.
8
9

10
11 **Table IX.A.12. 9 Modeling of Attainment in 2030, Including the Portion of the Safety**
12 **Margin Allocated to Motor Vehicles**
13

Air Quality Monitor	Predicted Concentrations in 2030 $\mu\text{g}/\text{m}^3$	
	A	B
Ogden	92.6	97.0

14
15 **Notes:** Column A shows concentrations presented previously as part of the modeled attainment test.
16 Column B shows concentrations resulting from allocation of a portion of the safety margin.
17
18
19

20 **(7) Nonattainment Requirements Applicable Pending Plan Approval**
21

22 CAA 175A(c) - *Until such plan revision is approved and an area is redesignated as attainment,*
23 *the requirements of CAA Part D, Plan Requirements for Nonattainment Areas, shall remain in*
24 *force and effect.* The Act requires the continued implementation of the nonattainment area
25 control strategy unless such measures are shown to be unnecessary for maintenance or are
26 replaced with measures that achieve equivalent reductions. *Utah will continue to implement the*
27 *control measures identified under the Clean Data Policy.*
28
29

30 **(8) Revise in Eight Years**
31

32 CAA 175A(b) - *Eight years after redesignation, the State must submit an additional plan revision*
33 *which shows maintenance of the applicable NAAQS for an additional 10 years.* Utah commits to
34 submit a revised maintenance plan eight years after EPA takes final action redesignating the
35 *Ogden City* area to attainment, as required by the Act.
36
37

38 **(9) Verification of Continued Maintenance**
39

40 Implicit in the requirements outlined above is the need for the State to determine whether the area
41 is in fact maintaining the standard it has achieved. There are two complementary ways to
42 measure this: 1) by monitoring the ambient air for PM_{10} , and 2) by inventorying emissions of
43 PM_{10} and its precursors from various sources.
44

45 The State will continue to maintain an ambient monitoring network for PM_{10} in accordance with
46 40 CFR Part 58 and the Utah SIP. The State anticipates that the EPA will continue to review the

1 ambient monitoring network for PM₁₀ each year, and any necessary modifications to the network
2 will be implemented.

3
4 Additionally, the State will track and document measured mobile source parameters (e.g., vehicle
5 miles traveled, congestion, fleet mix, etc.) and new and modified stationary source permits. If
6 these and the resulting emissions change significantly over time, the State will perform
7 appropriate studies to determine: 1) whether additional and/or re-sited monitors are necessary,
8 and 2) whether mobile and stationary source emission projections are on target.

9
10 The State will also continue to collect actual emissions inventory data from all sources of PM₁₀,
11 SO₂, and NO_x in excess of 25 tons (in aggregate) per year, as required by R307-150.

12 13 14 15 **(10) Contingency Measures**

16
17 *CAA 175A(d) - Each maintenance plan shall contain contingency measures to assure that the*
18 *State will promptly correct any violation of the standard which occurs after the redesignation of*
19 *the area to attainment. Such provisions shall include a requirement that the State will implement*
20 *all control measures which were contained in the SIP prior to redesignation.*

21
22 For Ogden City there was no nonattainment SIP. Therefore this revision need only address such
23 contingency measures as may be necessary to mitigate any future violation of the standard.

24
25 The contingency plan must also ensure that the contingency measures are adopted expeditiously
26 once triggered. The primary elements of the contingency plan are: 1) the list of potential
27 contingency measures, 2) the tracking and triggering mechanisms to determine when
28 contingency measures are needed, and 3) a description of the process for recommending and
29 implementing the contingency measures.

30 31 **(a) Tracking**

32
33 The tracking plan for the Salt Lake County, Utah County, and Ogden City areas consists of
34 monitoring and analyzing PM₁₀ concentrations. In accordance with 40 CFR 58, the State will
35 continue to operate and maintain an adequate PM₁₀ monitoring network in Salt Lake County,
36 Utah County, and Ogden City.

37 38 39 **(b) Triggering**

40
41 Triggering of the contingency plan does not automatically require a revision to the SIP, nor does
42 it necessarily mean the area will be redesignated once again to nonattainment. Instead, the State
43 will normally have an appropriate timeframe to correct the potential violation with
44 implementation of one or more adopted contingency measures. In the event that violations
45 continue to occur, additional contingency measures will be adopted until the violations are
46 corrected.

47
48 Upon notification of a potential violation of the PM₁₀ NAAQS, the State will develop appropriate
49 contingency measures intended to prevent or correct a violation of the PM₁₀ standard.
50 Information about historical exceedances of the standard, the meteorological conditions related to
51 the recent exceedances, and the most recent estimates of growth and emissions will be reviewed.
52 The possibility that an exceptional event occurred will also be evaluated.

1
2 Upon monitoring a potential violation of the PM₁₀ NAAQS, including exceedances flagged as
3 exceptional events but not concurred with by EPA, the State will take the following actions.
4

- 5 • The State will identify the source(s) of PM₁₀ causing the potential violation, and report
6 the situation to EPA Region VIII within four months of the potential violation.
7
- 8 • The State will identify a means of corrective action within six months after a potential
9 violation. The maintenance plan contingency measures to be considered and selected
10 will be chosen from the following list or any other emission control measures deemed
11 appropriate based on a consideration of cost-effectiveness, emission reduction potential,
12 economic and social considerations, or other factors that the State deems appropriate:
13
 - 14 - Re-evaluate the thresholds at which a red or yellow burn day is triggered, as
15 established in R307-302;
 - 16
 - 17 - Expand the road salting and sanding program in R307-307 to include Weber
18 County.
19

20 The State will then hold a public hearing to consider the contingency measures identified to
21 address the potential violation. The State will require implementation of such corrective action
22 no later than one year after a violation is confirmed. Any contingency measures adopted and
23 implemented will become part of the next revised maintenance plan submitted to the EPA for
24 approval.
25

26 It is also possible that contingency measures may be pre-implemented, where no violation of the
27 2006 PM₁₀ NAAQS has yet occurred.
28
29



State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQ-051-15

MEMORANDUM

TO: Air Quality Board

THROUGH: Bryce C. Bird, Executive Secretary

FROM: Bill Reiss, Environmental Engineer

DATE: August 21, 2015

SUBJECT: PROPOSE FOR PUBLIC COMMENT: Repeal Existing SIP Subsections IX. Part H. 1, 2, 3, and 4 and Re-enact with SIP Subsections IX. Part H. 1, 2, 3, and 4: Control Measures for Area and Point Sources, Emission Limits and Operating Practices, PM₁₀ Requirements.

Introduction:

This item supports a proposed maintenance plan for Utah's three PM₁₀ nonattainment areas, Salt Lake County, Utah County, and Ogden City.

The existing State Implementation Plan (SIP) for PM₁₀, affecting Salt Lake and Utah Counties, was adopted in 1991 and included numerous controls on specific stationary sources of PM₁₀, SO₂ and NO_x. Emission limits reflecting controls at these sources were included in the SIP, thus making them federally enforceable.

SIP limits affecting Utah County were revised in 2002, and effectively approved into the SIP by EPA in 2003.

As part of this maintenance plan, the list of stationary sources to be included in the SIP was reconsidered, particularly as it applies to Salt Lake County. Criteria were established to include sources located in any of the nonattainment areas with actual emissions (in 2011), or with potentials to emit, that are at least 100 tons per year for PM₁₀, SO₂, or NO_x.

Using these criteria means that some sources will not be retained in the revised Part H, while other new sources, that did not exist when the original SIP was written, will be added.

There are no SIP sources in the Ogden City nonattainment area.

Contingency Measures:

The maintenance plan, if approved, will allow Utah to request that EPA redesignate these areas back to attainment for PM₁₀. The Clean Air Act requires, under Section 175A(d), that any such plan revision must contain contingency provisions to assure the State will promptly correct any violation of the standard which occurs after the redesignation of the area. Furthermore, these provisions must include a requirement that the State will implement all measures which were contained in the SIP for the area prior to redesignation.

As discussed above, some of the stationary sources that had appeared in the existing SIP did not meet the emissions criteria, and therefore were not retained in this revised Part H.

Certain emission limits for these sources may be candidates for these contingency provisions should the respective areas be redesignated and should there be a subsequent violation of the PM₁₀ standard. Because of the 2002 SIP revision for Utah County, this affects only sources that had been listed in the Salt Lake County portion of the SIP. As such, these sources and their respective SIP conditions from the existing SIP have been identified in section (10) of the maintenance plan proposed for SIP Section IX.A.10. There were no SIP sources in the Ogden City nonattainment area.

SIP Organization:

As originally written in 1991, the PM₁₀ nonattainment SIP for Salt Lake and Utah Counties included an Appendix A wherein the emission limits for specific stationary sources were included in the SIP. This Appendix A was later reorganized as SIP Section IX Part H.

In 2005, Utah prepared a revision to the PM₁₀ plan that showed continued attainment through the year 2017. This revision, also structured as a maintenance plan, included the changes to Part H that gave it its present form. The PM₁₀ provisions of Part H are contained in subsections 1 – 4, while the PM_{2.5} provisions are contained in subsections 11, 12, and 13.

As presently structured, subsections 1 – 3 contain:

- H.1. – General Requirements that apply to all listed sources
- H.2. – Source-Specific Limitations in Salt Lake and Davis Counties
- H.3. – Source-Specific Limitations in Utah County

As proposed, the focus of these three subsections will remain the same.

Existing subsection H.4, “Establishment of Alternative Requirements,” is not part of the proposal. Rather, H.4 is being re-purposed to include “Interim Emission Limits and Operating Practices.”

These interim limits are intended to cover sources that are phasing-in control measures implemented as part of the PM_{2.5} SIP. The end of the phase-in period will be January 1, 2019. As the control technology at these sources becomes operational, these interim limits will be superseded by the limits appearing in subsections H 1 – 3.

Staff Recommendation: Staff recommends that the Board propose for public comment to repeal existing SIP Subsections IX Part H 1, 2, 3, and 4 and re-enact with SIP Subsections IX Part H 1, 2, 3, and 4: Control Measures for Area and Point Sources, Emission Limits and Operating Practices, PM₁₀ Requirements, as proposed.

1 **H.1 General Requirements: Control Measures for Area and Point Sources,**
2 **Emission Limits and Operating Practices, PM10 Requirements**
3

- 4 a. Except as otherwise outlined in individual conditions of this Subsection IX.H.1 listed below, the
5 terms and conditions of this Subsection IX.H.1 shall apply to all sources subsequently addressed
6 in Subsection IX.H.2 and IX.H.3. Should any inconsistencies exist between these two
7 subsections, the source specific conditions listed in IX.H.2 and IX.H.3 shall take precedence.
8
- 9 b. The definitions contained in R307-101-2, Definitions, apply to Section IX, Part H.
10
- 11 c. Any information used to determine compliance shall be recorded for all periods when the source
12 is in operation, and such records shall be kept for a minimum of five years. Any or all of these
13 records shall be made available to the Director upon request, and shall include a period of two
14 years ending with the date of the request.
15
- 16 d. All emission limitations listed in Subsections IX.H.2 and IX.H.3 apply at all times, unless
17 otherwise specified in the source specific conditions listed in IX.H.2 and IX.H.3.
18
- 19 e. Stack Testing.
- 20
- 21 i. As applicable, stack testing to show compliance with the emission limitations for the
22 sources in Subsection IX.H.2 and I.X.H.3 shall be performed in accordance with the
23 following:
- 24 A. Sample Location: The emission point shall be designed to conform to the
25 requirements of 40 CFR 60, Appendix A, Method 1, or other EPA-approved
26 methods acceptable to the Director.
- 27 B. Volumetric Flow Rate: 40 CFR 60, Appendix A, Method 2 or other EPA-
28 approved testing methods acceptable to the Director.
- 29 C. PM10: 40 CFR 51, Appendix M, Methods 201a and 202, or other EPA approved
30 testing methods acceptable to the Director. If a method other than 201a is used,
31 the portion of the front half of the catch considered PM10 shall be based on
32 information in Appendix B of the fifth edition of the EPA document, AP-42, or
33 other data acceptable to the Director.
- 34 D. SO2: 40 CFR 60 Appendix A, Method 6C or other EPA-approved testing
35 methods acceptable to the Director.
- 36 E. NOx: 40 CFR 60 Appendix A, Method 7E or other EPA-approved testing
37 methods acceptable to the Director.
- 38 F. Calculations: To determine mass emission rates (lb/hr, etc.) the pollutant
39 concentration as determined by the appropriate methods above shall be
40 multiplied by the volumetric flow rate and any necessary conversion factors to
41 give the results in the specified units of the emission limitation.
- 42 G. A stack test protocol shall be provided at least 30 days prior to the test. A pretest
43 conference shall be held if directed by the Director. The emission point shall be
44 designed to conform to the requirements of 40 CFR 60, Appendix A, Method 1,
45 and Occupational Safety and Health Administration (OSHA) approvable access
46 shall be provided to the test location.
- 47 H. The production rate during all compliance testing shall be no less than 90% of the
48 maximum production rate achieved in the previous three (3) years. If the desired
49 production rate is not achieved at the time of the test, the maximum production
50 rate shall be 110% of the tested achieved rate, but not more than the maximum

allowable production rate. This new allowable maximum production rate shall remain in effect until successfully tested at a higher rate. The owner/operator shall request a higher production rate when necessary. Testing at no less than 90% of the higher rate shall be conducted. A new maximum production rate (110% of the new rate) will then be allowed if the test is successful. This process may be repeated until the maximum allowable production rate is achieved.

f. Continuous Emission and Opacity Monitoring.

i. For all continuous monitoring devices, the following shall apply:

- A. Except for system breakdown, repairs, calibration checks, and zero and span adjustments required under paragraph (d) 40 CFR 60.13, the owner/operator of an affected source shall continuously operate all required continuous monitoring systems and shall meet minimum frequency of operation requirements as outlined in R307-170 and 40 CFR 60.13. Flow measurement shall be in accordance with the requirements of 40 CFR 52, Appendix E; 40 CFR 60 Appendix B; or 40 CFR 75, Appendix A.
- B. The monitoring system shall comply with all applicable sections of R307-170; 40 CFR 13; and 40 CFR 60, Appendix B – Performance Specifications.

ii. Opacity observations of emissions from stationary sources shall be conducted in accordance with 40 CFR 60, Appendix A, Method 9.

g. Petroleum Refineries.

i. Limits at Fluid Catalytic Cracking Units (FCCU)

- A. FCCU SO₂ Emissions
 - I. By no later than January 1, 2018, each owner or operator of an FCCU shall comply with an SO₂ emission limit of 25 ppmvd @ 0% excess air on a 365-day rolling average basis and 50 ppmvd @ 0% excess air on a 7-day rolling average basis.
 - II. Compliance with this limit shall be determined by following 40 C.F.R. §60.105a(g).
- B. FCCU PM Emissions
 - I. By no later than January 1, 2018, each owner or operator of an FCCU shall comply with an emission limit of 1.0 pounds PM per 1000 pounds coke burned on a 3-hour average basis.
 - II. Compliance with this limit shall be determined by following the stack test protocol specified in 40 C.F.R. §60.106(b) or 40 C.F.R. §60.104a(d) to measure PM emissions on the FCCU. Each owner operator shall conduct stack tests once every three (3) years at each FCCU.
 - III. By no later than January 1, 2019, each owner or operator of an FCCU shall install, operate and maintain a continuous parameter monitor system (CPMS) to measure and record operating parameters from the FCCU for determination of source-wide PM₁₀ emissions.

ii. Limits on Refinery Fuel Gas.

- A. All petroleum refineries in or affecting any PM_{2.5} nonattainment area or any PM₁₀ nonattainment or maintenance area shall reduce the H₂S content of the refinery plant gas to 60 ppm or less as described in 40 CFR 60.102a. Compliance shall be based on a rolling average of 365 days. The owner/operator

1 shall comply with the fuel gas monitoring requirements of 40 CFR 60.107a and
2 the related recordkeeping and reporting requirements of 40 CR 60.108a. As used
3 herein, refinery “plant gas” shall have the meaning of “fuel gas” as defined in 40
4 CFR 60.101a, and may be used interchangeably.

5 B. For natural gas, compliance is assumed while the fuel comes from a public
6 utility.

7
8 iii. Sulfur Removal Units

9 A. All petroleum refineries in or affecting any PM10 nonattainment or maintenance
10 area shall require:

11 I. Sulfur removal units/plants (SRUs) that are at least 95% effective in
12 removing sulfur from the streams fed to the unit; or

13 II. SRUs that meet the SO2 emission limitations listed in 40 CFR
14 60.102a(f)(1) or 60.102a(f)(2) as appropriate.

15 B. The amine acid gas and sour water stripper acid gas shall be processed in the
16 SRU(s).

17 C. Compliance shall be demonstrated by daily monitoring of flows to the SRU(s).
18 Continuous monitoring of SO2 concentration in the exhaust stream shall be
19 conducted via CEM as outlined in IX.H.1.f above. Compliance shall be
20 determined on a rolling 30-day average.

21
22 iv. No Burning of Liquid Fuel Oil in Stationary Sources

23 A. No petroleum refineries in or affecting any PM10 nonattainment or maintenance
24 area shall be allowed to burn liquid fuel oil in stationary sources except during
25 natural gas curtailments or as specified in the individual subsections of Section
26 IX, Part H.

27 B. The use of diesel fuel meeting the specifications of 40 CFR 80.510 in standby or
28 emergency equipment is exempt from the limitation of IX.H.1.g.iv.A above.

29
30 v. Requirements on Hydrocarbon Flares.

31 A. Beginning January 1, 2018, all hydrocarbon flares at petroleum refineries located
32 in or affecting a designated PM10 nonattainment area within the State shall be
33 subject to the flaring requirements of NSPS Subpart Ja (40 CFR 60.100a–109a),
34 if not already subject under the flare applicability provisions of Subpart Ja.

35 B. By no later than January 1, 2019, all major source petroleum refineries in or
36 affecting a designated PM10 nonattainment area within the State shall install and
37 operate a flare gas recovery system or equivalent flare gas minimization
38 process(es) designed to limit hydrocarbon flaring from each affected flare to
39 levels below the values listed in 40 CFR 60.103a(c), except during periods when
40 one or more process units, connected to the affected flare, are undergoing startup,
41 shutdown or experiencing malfunction. Flare gas recovery is not required for
42 dedicated SRU flare and header systems, or HF flare and header systems.
43

1 **H.2 Source Specific Emission Limitations in Salt Lake County PM10**
2 **Nonattainment/Maintenance Area**

3
4 a. Big West Oil Company

5
6 i. Source-wide PM10 Cap
7 By no later than January 1, 2019, combined emissions of PM10 shall not exceed
8 1.037 tons per day (tpd).

9
10 A. Setting of emission factors:

11
12 The emission factors derived from the most current performance test
13 shall be applied to the relevant quantities of fuel combusted. Unless
14 adjusted by performance testing as discussed in IX.H.2.a.i.B below, the
15 default emission factors to be used are as follows:

16
17 Natural gas:

18 Filterable PM10: 1.9 lb/MMscf

19 Condensable PM10: 5.7 lb/MMscf

20
21 Plant gas:

22 Filterable PM10: 1.9 lb/MMscf

23 Condensable PM10: 5.7 lb/MMscf

24
25 Fuel Oil: The PM10 emission factor shall be determined from the latest
26 edition of AP-42

27
28 Cooling Towers: The PM10 emission factor shall be determined from
29 the latest edition of AP-42

30
31 FCC Stacks: The PM10 emission factor shall be established by stack test.

32
33 B. The default emission factors listed in IX.H.2.a.i.A above apply until such
34 time as stack testing is conducted as outlined below:

35
36 PM10 stack testing on the FCC shall be conducted at least once every
37 three (3) years. Stack testing shall be performed as outlined in IX.H.1.e.

38
39 C. Compliance with the source-wide PM10 Cap shall be determined for
40 each day as follows:

41
42 Total 24-hour PM10 emissions for the emission points shall be calculated
43 by adding the daily results of the PM10 emissions equations listed below
44 for natural gas, plant gas, and fuel oil combustion. These emissions shall
45 be added to the emissions from the cooling towers, and the FCCs to
46 arrive at a combined daily PM10 emission total. For purposes of this
47 subsection a “day” is defined as a period of 24-hours commencing at
48 midnight and ending at the following midnight.
49

1 Daily gas consumption shall be measured by meters that can delineate
2 the flow of gas to the boilers, furnaces and the SRU incinerator.

3
4 The equation used to determine emissions for the boilers and furnaces
5 shall be as follows:

6
7 Emission Factor (lb/MMscf) * Gas Consumption (MMscf/24 hrs)/(2,000
8 lb/ton)

9
10 Daily fuel oil consumption shall be monitored by means of leveling
11 gauges on all tanks that supply combustion sources.

12
13 The daily PM10 emissions from the Catalyst Regeneration System shall
14 be calculated using the following equation:

15
16
$$E = FR * EF$$

17
18 Where:

19 E = Emitted PM10

20 FR = Feed Rate to Unit (kbbls/day)

21 EF = emission factor (lbs/kbbl), established by most recent stack test

22
23 Results shall be tabulated for each day, and records shall be kept which
24 include the meter readings (in the appropriate units) and the calculated
25 emissions.

26
27 ii. Source-wide NOx Cap

28 By no later than January 1, 2019, combined emissions of NOx shall not exceed
29 0.80 tons per day (tpd).

30
31 A. Setting of emission factors:

32
33 The emission factors derived from the most current performance test
34 shall be applied to the relevant quantities of fuel combusted. Unless
35 adjusted by performance testing as discussed in IX.H.2.a.ii.B below, the
36 default emission factors to be used are as follows:

37
38 Natural gas: shall be determined from the latest edition of AP-42

39 Plant gas: assumed equal to natural gas

40 Diesel fuel: shall be determined from the latest edition of AP-42

41
42 Where mixtures of fuel are used in a Unit, the above factors shall be
43 weighted according to the use of each fuel.

44
45 B. The default emission factors listed in IX.H.2.a.ii.A above apply until
46 such time as stack testing is conducted as outlined below:

47
48 NOx stack testing on natural gas/refinery fuel gas combustion equipment
49 above 40 MMBtu/hr shall be conducted at least once every three (3)
50 years. At that time a new flow-weighted average emission factor in
51 terms of: lbs/MMBtu shall be derived for each combustion type listed in

IX.H.2.a.ii.A above. Stack testing shall be performed as outlined in IX.H.1.e.

C. Compliance with the source-wide NOx Cap shall be determined for each day as follows:

Total 24-hour NOx emissions shall be calculated by adding the emissions for each emitting unit. The emissions for each emitting unit shall be calculated by multiplying the hours of operation of a unit, feed rate to a unit, or quantity of each fuel combusted at each affected unit by the associated emission factor, and summing the results.

Daily plant gas consumption at the furnaces, boilers and SRU incinerator shall be measured by flow meters. The equations used to determine emissions shall be as follows:

$$\text{NOx} = \text{Emission Factor (lb/MMscf)} * \text{Gas Consumption (MMscf/24 hrs)} / (2,000 \text{ lb/ton})$$

Where the emission factor is derived from the fuel used, as listed in IX.H.2.a.ii.A above

Daily fuel oil consumption shall be monitored by means of leveling gauges on all tanks that supply combustion sources.

The daily NOx emissions from the Catalyst Regeneration System shall be calculated using the following equation:

$$\text{NOx} = (\text{Flue Gas, moles/hr}) \times (\text{ADV ppm} / 10^6) \times (30.006 \text{ lb/mole}) \times (\text{operating hr/day}) / (2000 \text{ lb/ton})$$

Where ADV = average daily value from NOx CEM as outlined in IX.H.1.f

Total daily NOx emissions shall be calculated by adding the results of the above NOx equations for natural gas and plant gas combustion to the estimate for the Catalyst Regeneration System.

For purposes of this subsection a “day” is defined as a period of 24-hours commencing at midnight and ending at the following midnight.

Results shall be tabulated for each day, and records shall be kept which include the meter readings (in the appropriate units) and the calculated emissions.

iii. Source-wide SO2 Cap
By no later than January 1, 2019, combined emissions of SO2 shall not exceed 0.60 tons per day (tpd).

A. Setting of emission factors:

1 The emission factors derived from the most current performance test
2 shall be applied to the relevant quantities of fuel combusted. The default
3 emission factors to be used are as follows:

4
5 Natural Gas - 0.60 lb SO₂/MMscf gas

6
7 Plant Gas - The emission factor to be used in conjunction with plant gas
8 combustion shall be determined through the use of a continuous
9 emissions monitor, which shall measure the H₂S content of the fuel gas
10 in ppmv. Daily emission factors shall be calculated using average daily
11 H₂S content data from the CEM. The emission factor shall be calculated
12 as follows:

13
14 Emission Factor (lb SO₂/MMscf gas) = [(24 hr avg. ppmv
15 H₂S)/10⁶]*(64 lb SO₂/lb mole)*[(10⁶ scf/MMscf)/(379 scf/lb mole)]

16
17 SRUs: The emission rate shall be determined by multiplying the sulfur
18 dioxide concentration in the flue gas by the mass flow of the flue gas.
19 The sulfur dioxide concentration in the flue gas shall be determined by
20 CEM as outlined in IX.H.1.f.

21
22 Fuel oil: The emission factor to be used for combustion shall be
23 calculated based on the weight percent of sulfur, as determined by
24 ASTM Method D-4294-89 or EPA-approved equivalent acceptable to the
25 Director, and the density of the fuel oil, as follows:

26
27 EF (lb SO₂/k gal) = density (lb/gal) * (1000 gal/k gal) * wt. % S/100 *
28 (64 lb SO₂/32 lb S)

29
30 Where mixtures of fuel are used in a Unit, the above factors shall be
31 weighted according to the use of each fuel.

32
33 B. Compliance with the source-wide SO₂ Cap shall be determined for each
34 day as follows:

35
36 Total daily SO₂ emissions shall be calculated by adding the daily SO₂
37 emissions for natural gas and plant fuel gas combustion, to those from
38 the FCC and SRU stacks.

39
40 The daily SO₂ emission from the FCC Catalyst Regeneration System
41 shall be calculated using the following equation:

42
43 $SO_2 = FG * (ADV/1,000,000) * (64 \text{ lb/mole}) * (\text{operating hours/day}) /$
44 (2000 lb/ton)

45
46 Where:

47 FG = Flue Gas in moles/hour

48 ADV = average daily value from SO₂ CEM as outlined in IX.H.1.f

49
50 Daily natural gas and plant gas consumption shall be determined through
51 the use of flow meters.

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Daily fuel oil consumption shall be monitored by means of leveling gauges on all tanks that supply combustion sources.

Results shall be tabulated for each day, and records shall be kept which include the CEM readings for H₂S (averaged for each one-hour period), all meter readings (in the appropriate units), and the calculated emissions.

iv. Emergency and Standby Equipment

A. The use of diesel fuel meeting the specifications of 40 CFR 80.510 is allowed in standby or emergency equipment at all times.

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- b. Bountiful City Light and Power: Power Plant
 - i. Emissions to the atmosphere shall not exceed the following rates and concentrations:
 - A. GT #1 (5.3 MW Turbine)
Exhaust Stack: 0.6 g NO_x / kW-hr
 - B. GT #2 and GT #3 (each TITAN Turbine)
Exhaust Stack: 7.5 lb NO_x / hr
 - ii. Compliance to the above emission limitations shall be determined by stack test. Stack testing shall be performed as outlined in IX.H.1.e.
 - A. Each turbine shall be tested at least once per year.
 - iii. Combustion Turbine Startup / Shutdown Emission Minimization Plan
 - A. Startup begins when natural gas is supplied to the combustion turbine(s) with the intent of combusting the fuel to generate electricity. Startup conditions end within sixty (60) minutes of natural gas being supplied to the turbine(s).
 - B. Shutdown begins with the initiation of the stop sequence of a turbine until the cessation of natural gas flow to the turbine.
 - C. Periods of startup or shutdown shall not exceed two (2) hours per combustion turbine per day.

1 c. Central Valley Water Reclamation Facility: Wastewater Treatment Plant

2
3 i NO_x emissions from the operation of all engines at the plant shall not exceed
4 0.648 tons per day.

5
6 ii. Compliance with the emission limitation shall be determined by summing the
7 emissions from all the engines. Emission from each engine shall be calculated
8 from the following equation:

9
10 Emissions (tons/day) = (Power production in kW-hrs/day) x (Emission factor in
11 grams/kW- hr) x (1 lb/453.59 g) x (1 ton/2000 lbs)

12
13 A. The NO_x emission factor for each engine shall be derived from the most
14 recent stack test. Stack tests shall be performed in accordance with
15 IX.H.1.e. Each engine shall be tested at least every three years from
16 the previous test.

17
18 B. NO_x emissions shall be calculated on a daily basis.

19
20 C. A day is equivalent to the time period from midnight to the following
21 midnight.

22
23 D. The number of kilowatt hours generated by each engine shall be
24 determined by examination of electrical meters, which shall record
25 electricity production on a continuous basis.

26
27

1 d. Chevron Products Company

2
3 i. Source-wide PM10 Cap

4 By no later than January 1, 2019, combined emissions of PM10 shall not exceed
5 0.715 tons per day (tpd).
6

7 A. Setting of emission factors:
8

9 The emission factors derived from the most current performance test
10 shall be applied to the relevant quantities of fuel combusted. Unless
11 adjusted by performance testing as discussed in IX.H.2.d.i.B below, the
12 default emission factors to be used are as follows:
13

14 Natural gas:

15 Filterable PM10: 1.9 lb/MMscf

16 Condensable PM10: 5.7 lb/MMscf
17

18 Plant gas:

19 Filterable PM10: 1.9 lb/MMscf

20 Condensable PM10: 5.7 lb/MMscf
21

22 HF alkylation polymer: shall be determined from the latest edition of
23 AP-42 (HF alkylation polymer treated as fuel oil #6)
24

25 Diesel fuel: shall be determined from the latest edition of AP-42
26

27 Cooling Towers: shall be determined from the latest edition of AP-42
28

29 FCC Stack:

30 The PM10 emission factors shall be based on the most recent stack test
31 and verified by parametric monitoring as outlined in IX.H.1.g.i.B.III
32

33 B. The default emission factors listed in IX.H.2.d.i.A above apply until such
34 time as stack testing is conducted as outlined below:
35

36 PM10 stack testing on the FCC stack shall be conducted at least once
37 every three (3) years. Stack testing shall be performed as outlined in
38 IX.H.1.e.
39

40 C. Compliance with the source-wide PM10 Cap shall be determined for
41 each day as follows:
42

43 Total 24-hour PM10 emissions for the emission points shall be calculated
44 by adding the daily results of the PM10 emissions equations listed below
45 for natural gas, plant gas, and fuel oil combustion. These emissions shall
46 be added to the emissions from the cooling towers, the FCC and the
47 SRUs to arrive at a combined daily PM10 emission total. For purposes
48 of this subsection a "day" is defined as a period of 24-hours commencing
49 at midnight and ending at the following midnight.
50

1 Daily natural gas and plant gas consumption shall be determined through
2 the use of flow meters.

3
4 Daily fuel oil consumption shall be monitored by means of leveling
5 gauges on all tanks that supply combustion sources.

6
7 The equation used to determine emissions for the boilers and furnaces
8 shall be as follows:

9
10 Emission Factor (lb/MMscf) * Gas Consumption (MMscf/24 hrs)/(2,000
11 lb/ton)

12
13 Results shall be tabulated for each day, and records shall be kept which
14 include the meter readings (in the appropriate units) and the calculated
15 emissions.

16
17 ii. Source-wide NOx Cap

18 By no later than January 1, 2019, combined emissions of NOx shall not exceed
19 2.1 tons per day (tpd).

20
21 A. Setting of emission factors:

22
23 The emission factors derived from the most current performance test
24 shall be applied to the relevant quantities of fuel combusted. Unless
25 adjusted by performance testing as discussed in IX.H.2.d.ii.B below, the
26 default emission factors to be used are as follows:

27
28 Natural gas: shall be determined from the latest edition of AP-42

29 Plant gas: assumed equal to natural gas

30 Alkylation polymer: shall be determined from the latest edition of AP-
31 42 (as fuel oil #6)

32 Diesel fuel: shall be determined from the latest edition of AP-42

33
34 Where mixtures of fuel are used in a Unit, the above factors shall be
35 weighted according to the use of each fuel.

36
37 B. The default emission factors listed in IX.H.2.d.ii.A above apply until
38 such time as stack testing is conducted as outlined below:

39
40 NOx stack testing on natural gas/refinery fuel gas combustion equipment
41 above 100 MMBtu/hr shall be conducted at least once every three (3)
42 years. At that time a new flow-weighted average emission factor in
43 terms of: lbs/MMbtu shall be derived for each combustion type listed in
44 IX.H.2.d.ii.A above. Stack testing shall be performed as outlined in
45 IX.H.1.e.

46
47 C. Compliance with the source-wide NOx Cap shall be determined for each
48 day as follows:

49
50 Total 24-hour NOx emissions shall be calculated by adding the emissions
51 for each emitting unit. The emissions for each emitting unit shall be

1 calculated by multiplying the hours of operation of a unit, feed rate to a
2 unit, or quantity of each fuel combusted at each affected unit by the
3 associated emission factor, and summing the results.

4
5 A NO_x CEM shall be used to calculate daily NO_x emissions from the
6 FCCU. Emissions shall be determined by multiplying the nitrogen
7 dioxide concentration in the flue gas by the mass flow of the flue gas.
8 The NO_x concentration in the flue gas shall be determined by a CEM as
9 outlined in IX.H.1.f.

10
11 For purposes of this subsection a “day” is defined as a period of 24-hours
12 commencing at midnight and ending at the following midnight.

13
14 Daily natural gas and plant gas consumption shall be determined through
15 the use of flow meters.

16
17 Daily fuel oil consumption shall be monitored by means of leveling
18 gauges on all tanks that supply combustion sources.

19
20 Results shall be tabulated for each day, and records shall be kept which
21 include the meter readings (in the appropriate units) and the calculated
22 emissions.

23
24 iii. Source-wide SO₂ Cap

25 By no later than January 1, 2019, combined emissions of SO₂ shall not exceed
26 1.05 tons per day (tpd).

27
28 A. Setting of emission factors:

29
30 The emission factors derived from the most current performance test
31 shall be applied to the relevant quantities of fuel combusted. The default
32 emission factors to be used are as follows:

33
34 FCC Regenerator: The emission rate shall be determined by the FCC
35 Regenerator SO₂ CEM as outlined in IX.H.1.f

36
37 SRUs: The emission rate shall be determined by multiplying the sulfur
38 dioxide concentration in the flue gas by the mass flow of the flue gas.
39 The sulfur dioxide concentration in the flue gas shall be determined by
40 CEM as outlined in IX.H.1.f.

41
42 Natural gas: $EF = 0.60 \text{ lb/MMscf}$

43
44 Fuel oil & HF Alkylation polymer: The emission factor to be used for
45 combustion shall be calculated based on the weight percent of sulfur, as
46 determined by ASTM Method D-4294-89 or EPA-approved equivalent
47 acceptable to the Director, and the density of the fuel oil, as follows:

48
49 $EF (\text{lb SO}_2/\text{k gal}) = \text{density (lb/gal)} * (1000 \text{ gal/k gal}) * \text{wt.\% S}/100 *$
50 $(64 \text{ lb SO}_2/32 \text{ lb S})$

1 Plant gas: the emission factor shall be calculated from the H2S
2 measurement obtained from the H2S CEM. The emission factor shall be
3 calculated as follows:
4

$$5 \text{ EF (lb SO}_2\text{/MMscf gas)} = (24 \text{ hr avg. ppmdv H}_2\text{S}) / 10^6 * (64 \text{ lb SO}_2\text{/lb} \\ 6 \text{ mole)} * (10^6 \text{ scf/MMscf}) / (379 \text{ scf/lb mole})$$

7
8 Where mixtures of fuel are used in a Unit, the above factors shall be
9 weighted according to the use of each fuel.
10

11 B. Compliance with the source-wide SO₂ Cap shall be determined for each
12 day as follows:
13

14 Total daily SO₂ emissions shall be calculated by adding the daily SO₂
15 emissions for natural gas and plant fuel gas combustion, to those from
16 the FCC and SRU stacks.
17

18 Daily natural gas and plant gas consumption shall be determined through
19 the use of flow meters.
20

21 Daily fuel oil consumption shall be monitored by means of leveling
22 gauges on all tanks that supply combustion sources.
23

24 Results shall be tabulated for each day, and records shall be kept which
25 include the CEM readings for H₂S (averaged for each one-hour period),
26 all meter readings (in the appropriate units), and the calculated
27 emissions.
28

29 iv. Emergency and Standby Equipment and Alternative Fuels
30

31 A. The use of diesel fuel meeting the specifications of 40 CFR 80.510 is
32 allowed in standby or emergency equipment at all times.
33

34 B. HF alkylation polymer may be burned in the Alky Furnace (F-36017).
35

36 C. Plant coke may be burned in the FCC Catalyst Regenerator.
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e. Hexcel Corporation: Salt Lake Operations

i. The following limits shall not be exceeded for fiber line operations:

A. 4.42 MMscf of natural gas consumed per day.

B. 0.061 MM pounds of carbon fiber produced per day.

C. Compliance with each limit shall be determined by the following methods:

I. Natural gas consumption shall be determined by examination of natural gas billing records for the plant.

II. Fiber production shall be determined by examination of plant production records.

III. Records of consumption and production shall be kept on a daily basis for all periods when the plant is in operation.

ii. After a shutdown and prior to startup of a fiber line, all control equipment shall be started and remain in operation during production. Control equipment on each fiber line may consist of incinerators, baghouses, and regenerative thermal oxidizers.

A. The proper operation of control equipment shall be determined by maintaining records of control equipment that is not operating while the fiber line(s) in production.

1 f. Holly Refining and Marketing Company

2
3 i. Source-wide PM10 Cap

4 By no later than January 1, 2019, PM10 emissions (filterable + condensable)
5 from all sources shall not exceed 0.416 tons per day (tpd).
6

7 A. Setting of emission factors:
8

9 The emission factors derived from the most current performance test
10 shall be applied to the relevant quantities of fuel combusted. Unless
11 adjusted by performance testing as discussed in IX.H.2.g.i.B below, the
12 default emission factors to be used are as follows:
13

14 Natural gas or Plant gas:

15 non-NSPS combustion equipment: 7.65 lb PM10/MMscf

16 NSPS combustion equipment: 0.52 lb PM10/MMscf
17

18 Fuel oil:

19 The filterable PM10 emission factor for fuel oil combustion shall be
20 determined based on the sulfur content of the oil as follows:
21

22
$$\text{PM10 (lb/1000 gal)} = (10 * \text{wt. \% S}) + 3.22$$

23

24 The condensable PM10 emission factor for fuel oil combustion shall be
25 determined from the latest edition of AP-42.
26

27 Cooling Towers: The PM10 emission factor shall be determined from
28 the latest edition of AP-42.
29

30 FCC Wet Scrubbers:

31 The PM10 emission factors shall be based on the most recent stack test
32 and verified by parametric monitoring as outlined in IX.H.1.g.i.B.III
33

34 B. The default emission factors listed in IX.H.2.g.i.A above apply until such
35 time as stack testing is conducted as outlined below:
36

37 Stack testing on all NSPS combustion equipment shall be conducted at
38 least once every three (3) years. At that time a new flow-weighted
39 average emission factor in terms of: lb PM10/MMBtu shall be derived.
40 Stack testing shall be performed as outlined in IX.H.1.e.
41

42 C. Compliance with the source-wide PM10 Cap shall be determined for
43 each day as follows:
44

45 Total 24-hour PM10 emissions for the emission points shall be calculated
46 by adding the daily results of the PM10 emissions equations listed below
47 for natural gas, plant gas, and fuel oil combustion. These emissions shall
48 be added to the emissions from the cooling towers and wet scrubbers to
49 arrive at a combined daily PM10 emission total. For purposes of this
50 subsection a “day” is defined as a period of 24-hours commencing at
51 midnight and ending at the following midnight.

1
2 Daily natural gas and plant gas consumption shall be determined through
3 the use of flow meters on all gas-fueled combustion equipment.
4

5 Daily fuel oil consumption shall be monitored by means of leveling
6 gauges on all tanks that supply fuel oil to combustion sources.
7

8 The equations used to determine emissions for the boilers and furnaces
9 shall be as follows:
10

11 Emissions (tons/day) = Emission Factor (lb/MMscf) * Natural/Plant Gas
12 Consumption (MMscf/day)/(2,000 lb/ton)
13

14 Emissions (tons/day) = Emission Factor (lb/kgal) * Fuel Oil
15 Consumption (kgal/day)/(2,000 lb/ton)
16

17 Results shall be tabulated for each day, and records shall be kept which
18 include all meter readings (in the appropriate units), fuel oil parameters
19 (wt. %S), and the calculated emissions.
20

21 ii. Source-wide NOx Cap

22 By no later than January 1, 2019, NOx emissions into the atmosphere from all
23 emission points shall not exceed 2.09 tons per day (tpd).
24

25 A. Setting of emission factors:
26

27 The emission factors derived from the most current performance test
28 shall be applied to the relevant quantities of fuel combusted. Unless
29 adjusted by performance testing as discussed in IX.H.2.g.ii.B below, the
30 default emission factors to be used are as follows:
31

32 Natural gas/refinery fuel gas combustion using:

33 Low NOx burners (LNB): 41 lbs/MMscf

34 Ultra-Low NOx (ULNB) burners: 0.04 lbs/MMbtu

35 Next Generation Ultra Low NOx burners (NGULNB): 0.10 lbs/MMbtu

36 Selective catalytic reduction (SCR): 0.02 lbs/MMbtu

37 All other combustion burners: 100 lb/MMscf
38

39 Where:

40 "Natural gas/refinery fuel gas" shall represent any combustion of natural
41 gas, refinery fuel gas, or combination of the two in the associated burner.
42

43 All fuel oil combustion: 120 lbs/Kgal
44

45 B. The default emission factors listed in IX.H.2.f.ii.A above apply until
46 such time as stack testing is conducted as outlined in IX.H.1.e or by
47 NSPS.
48

49 C. Compliance with the Source-wide NOx Cap shall be determined for each
50 day as follows:
51

1 Total daily NOx emissions for emission points shall be calculated by
2 adding the results of the NOx equations for plant gas, fuel oil, and
3 natural gas combustion listed below. For purposes of this subsection a
4 “day” is defined as a period of 24-hours commencing at midnight and
5 ending at the following midnight.
6

7 Daily natural gas and plant gas consumption shall be determined through
8 the use of flow meters.
9

10 Daily fuel oil consumption shall be monitored by means of leveling
11 gauges on all tanks that supply combustion sources.
12

13 The equations used to determine emissions for the boilers and furnaces
14 shall be as follows:
15

16 Emissions (tons/day) = Emission Factor (lb/MMscf) * Natural Gas
17 Consumption (MMscf/day)/(2,000 lb/ton)
18

19 Emissions (tons/day) = Emission Factor (lb/MMscf) * Plant Gas
20 Consumption (MMscf/day)/(2,000 lb/ton)
21

22 Emissions (tons/day) = Emission Factor (lb/MMBTU) * Burner Heat
23 Rating (BTU/hr) * 24 hours per day /(2,000 lb/ton)
24

25 Emissions (tons/day) = Emission Factor (lb/kgal) * Fuel Oil
26 Consumption (kgal/day)/(2,000 lb/ton)
27

28 Results shall be tabulated for each day; and records shall be kept which
29 include the meter readings (in the appropriate units), emission factors,
30 and the calculated emissions.
31

32 iii. Source-wide SO2 Cap

33 By no later than January 1, 2019, the emission of SO2 from all emission points
34 shall not exceed 0.31 tons per day (tpd).
35

36 A. Setting of emission factors:

37 The emission factors listed below shall be applied to the relevant
38 quantities of fuel combusted:
39

40 Natural gas - 0.60 lb SO2/MMscf
41

42 Plant gas - The emission factor to be used in conjunction with plant gas
43 combustion shall be determined through the use of a CEM which will
44 measure the H2S content of the fuel gas in parts per million by volume
45 (ppmv). Daily emission factors shall be calculated using average daily
46 H2S content data from the CEM. The emission factor shall be calculated
47 as follows:
48

49 $(\text{lb SO}_2/\text{MMscf gas}) = (24 \text{ hr avg. ppmv H}_2\text{S})/10^6 * (64 \text{ lb SO}_2/\text{lb}$
50 $\text{mole}) * (10^6 \text{ scf/MMscf})/(379 \text{ scf / lb mole})$
51

1 Fuel oil - The emission factor to be used in conjunction with fuel oil
2 combustion shall be calculated based on the weight percent of sulfur, as
3 determined by ASTM Method D-4294-89 or EPA-approved equivalent,
4 and the density of the fuel oil, as follows:

5
6 $(\text{lb of SO}_2/\text{kgal}) = (\text{density lb/gal}) * (1000 \text{ gal/kgal}) * (\text{wt. \%S})/100 *$
7 $(64 \text{ g SO}_2/32 \text{ g S})$
8

9 The weight percent sulfur and the fuel oil density shall be recorded for
10 each day any fuel oil is combusted.

11
12 B. Compliance with the Source-wide SO₂ Cap shall be determined for each
13 day as follows:

14
15 Total daily SO₂ emissions shall be calculated by adding daily results of
16 the SO₂ emissions equations listed below for natural gas, plant gas, and
17 fuel oil combustion. For purposes of this subsection a “day” is defined
18 as a period of 24-hours commencing at midnight and ending at the
19 following midnight.
20

21 The equations used to determine emissions are:

22
23 $\text{Emissions (tons/day)} = \text{Emission Factor (lb/MMscf)} * \text{Natural Gas}$
24 $\text{Consumption (MMscf/day)} / (2,000 \text{ lb/ton})$
25

26 $\text{Emissions (tons/day)} = \text{Emission Factor (lb/MMscf)} * \text{Plant Gas}$
27 $\text{Consumption (MMscf/day)} / (2,000 \text{ lb/ton})$
28

29 $\text{Emissions (tons/day)} = \text{Emission Factor (lb/kgal)} * \text{Fuel Oil}$
30 $\text{Consumption (kgal/24 hrs)} / (2,000 \text{ lb/ton})$
31

32 For purposes of these equations, fuel consumption shall be measured as
33 outlined below:

34
35 Daily natural gas and plant gas consumption shall be determined through
36 the use of flow meters.
37

38 Daily fuel oil consumption shall be monitored by means of leveling
39 gauges on all tanks that supply combustion sources.
40

41 Results shall be tabulated for every day; and records shall be kept which
42 include the CEM readings for H₂S (averaged for each one-hour period),
43 all meter readings (in the appropriate units), fuel oil parameters (density
44 and wt. %S, recorded for each day any fuel oil is burned), and the
45 calculated emissions.
46

47 iv. Emergency and Standby Equipment

48
49 A. The use of diesel fuel meeting the specifications of 40 CFR 80.510 is
50 allowed in standby or emergency equipment at all times.
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g. Kennecott Utah Copper (KUC): Mine

i. Bingham Canyon Mine (BCM)

A. Maximum total mileage per calendar day for ore and waste haul trucks shall not exceed 30,000 miles.

KUC shall keep records of daily total mileage for all periods when the mine is in operation. KUC shall track haul truck miles with a Global Positioning System or equivalent.

B. KUC shall use ultra-low sulfur diesel fuel in its haul trucks.

C. To minimize emissions at the mine, the owner/operator shall:

I. Control emissions from the in-pit crusher with a baghouse.

II. Use ore conveyors as the primary means for transport of crushed ore from the mine to the concentrator.

D. To minimize fugitive dust on roads at the mine, the owner/operator shall perform the following measures:

I. Apply water to all active haul roads as weather and operational conditions warrant, and shall apply a chemical dust suppressant to active haul roads located outside of the pit influence boundary no less than twice per year.

II. Chemical dust suppressant shall be applied as weather and operational conditions warrant on unpaved access roads that receive haul truck traffic and light vehicle traffic.

E. KUC is subject to the requirements in the 1994 federally approved Fugitive Emissions and Fugitive Dust rules, R307-1-4.5.

1 h. Kennecott Utah Copper (KUC): Power Plant and Tailings Impoundment

2
3 i. Utah Power Plant

4
5 A. Boilers #1, #2, and #3 shall not be operated upon commencing
6 operations of Unit #5 (combined-cycle, natural gas-fired combustion
7 turbine).

8
9 B. Unit #5 shall not exceed the following emission rates to the atmosphere:

10
11 Pollutant lb/hr lb/event ppmdv
12 (15% O₂ dry)

13
14 I. PM₁₀ with duct firing:

15 Filterable + condensable 18.8

16
17 II. NO_x:

18 Startup/shutdown 395 2.0

19
20 III. Startup / Shutdown Limitations:

21
22 1. The total number of startups and shutdowns together
23 shall not exceed 690 per calendar year.

24
25 2. The NO_x emissions shall not exceed 395 lbs from each
26 startup/shutdown event, which shall be calculated using
27 manufacturer data.

28
29 3. Definitions:

30
31 (i) Startup cycle duration ends when the unit
32 achieves half of the design electrical generation
33 capacity.

34
35 (ii) Shutdown duration cycle begins with the
36 initiation of turbine shutdown sequence and ends
37 when fuel flow to the gas turbine is
38 discontinued.

39
40 C. Upon commencement of operation of Unit #5*, stack testing to
41 demonstrate compliance with the emission limitations in IX.H.2.h.i.B
42 shall be performed as follows for the following air contaminants

43
44 * Initial compliance testing for the natural gas turbine and duct burner is
45 required. The initial test date shall be performed within 60 days after
46 achieving the maximum heat input capacity production rate at which the
47 affected facility will be operated and in no case later than 180 days after
48 the initial startup of a new emission source.

49
50 The limited use of natural gas during maintenance firings and break-in
51 firings does not constitute operation and does not require stack testing.

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condensable	0.29	
(ii) NO _x Units 1, 2 & 3		426.5
2. Unit #4		
(i) PM ₁₀		
filterable	0.029	
filterable + condensable	0.29	
(ii) NO _x		384

IV. If the units operated during the months specified above, stack testing to show compliance with the emission limitations in H.2.h.i.D.II and III shall be performed as follows for the following air contaminants:

Pollutant	Test Frequency	Initial Test
1. PM ₁₀	3 years	*
2. NO _x	3 years	*

* Initial compliance testing is required for Unit #4 after low NO_x burner installation. The initial test date shall be performed within 60 days after achieving the maximum heat input capacity production rate at which the affected facility will be operated and in no case later than 180 days after the initial startup of a new emission source.

The limited use of natural gas during maintenance firings and break-in firings does not constitute operation and does not require stack testing.

E. The following requirements are applicable to Units #1, #2, #3, and #4 during the period March 1 to October 1 inclusive:

I. Emissions to the atmosphere from the indicated emission point shall not exceed the following rates and concentrations:

Pollutant	grains/dscf	ppmdv (3% O ₂)
68°F, 29.92 in Hg		
1. Units #1, #2, and #3		
(i) PM ₁₀ filterable	0.029	
(ii) NO _x Units #1, #2, and #3		426.5
2. Unit #4		
(i) PM ₁₀ filterable	0.029	

(ii) NO_x

384

II. If the units operated during the months specified above, stack testing to show compliance with the emission limitations in H.2.h.i.E.I shall be performed as follows for the following air contaminants:

Pollutant	Test Frequency
1. PM ₁₀	every year
2. NO _x	every year

The limited use of natural gas during maintenance firings and break-in firings does not constitute operation and does not require stack testing.

F. The sulfur content of any fuel burned shall not exceed 0.66 lb of sulfur per million BTU per test.

I. Coal increments will be collected using ASTM 2234, Type I conditions A, B, or C and systematic spacing.

II. Percent sulfur content and gross calorific value of the coal on a dry basis will be determined for each gross sample using ASTM D methods 2013, 3177, 3173, and 2015.

III. KUC shall measure at least 95% of the required increments in any one month that coal is burned in Units #1, #2, #3 or #4.

ii. Tailings Impoundment

A. No more than 50 contiguous acres or more than 5% of the total tailings area shall be permitted to have the potential for wind erosion.

I. Wind erosion potential is the area that is not wet, frozen, vegetated, crusted, or treated and has the potential for wind erosion.

II. KUC shall conduct wind erosion potential grid inspections monthly between February 15 and November 15. The results of the inspections shall be used to determine wind erosion potential.

III. If KUC or the Director of Utah Division of Air Quality (Director) determines that the percentage of wind erosion potential is exceeded, KUC shall develop a corrective action plan and implementation schedule within 60 days following verbal notification by either party. KUC shall then meet with the Director, to discuss the modified fugitive dust controls/operational practices, and an implementation schedule for such.

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- B. If between February 15 and November 15 KUC’s weather forecast is for a wind event (a wind event is defined as wind gusts exceeding 25 mph for more than one hour) the procedures listed below shall be followed within 48 hours of issuance of the forecast. KUC shall:
 - I. Alert the Utah Division of Air Quality promptly.
 - II. Continue surveillance and coordination of appropriate measures.

- C. KUC is subject to the requirements in the 1994 federally approved Fugitive Emissions and Fugitive Dust rule, R307-1-4.5.

1 i. Kennecott Utah Copper (KUC): Smelter & Refinery

2
3 i. Smelter

4
5 A. Emissions to the atmosphere from the indicated emission points shall
6 not exceed the following rates and concentrations:

7
8 I. Main Stack (Stack No. 11)

9 1. PM10

- 10 a. 89.5 lbs/hr (filterable, daily average)
11 b. 439 lbs/hr (filterable + condensable, daily
12 average)

13
14 2. SO₂

- 15 a. 552 lbs/hr (3 hr. rolling average)
16 b. 422 lbs/hr (daily average)

17
18 3. NO_x

- 19 a. 154 lbs/hr (daily average)

20
21 II. Holman Boiler

22
23 1. NO_x

- 24 a. 9.34 lbs/hr, 30-day average
25 b. 0.05 lbs/MMBTU, 30-day average

26
27 B. Stack testing to show compliance with the emissions limitations of
28 Condition (A) above shall be performed as specified below:

29
30

Emission Point	Pollutant	Test Frequency
I. Main Stack (Stack No. 11)	PM10	every year
	SO ₂	CEM
	NO _x	CEM
II. Holman Boiler	NO _x	CEM or alternate method determined according to applicable NSPS standards

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41 C. During startup/shutdown operations, NO_x and SO₂ emissions are
42 monitored by CEMS or alternate methods in accordance with applicable
43 NSPS standards.
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ii. Refinery:

A. Emissions to the atmosphere from the indicated emission point shall not exceed the following rate:

Emission Point	Pollutant	Maximum Emission Rate
The sum of two (Tankhouse) Boilers	NO _x	9.5 lbs/hr
Combined Heat Plant	NO _x	5.96 lbs/hr

8
9

B. Stack testing to show compliance with the above emission limitations shall be performed as follows:

Emission Point	Pollutant	Testing Frequency
Tankhouse Boilers	NO _x	every three years
Combined Heat Plant	NO _x	every year

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To determine mass emission rate, the pollutant concentration as determined by the appropriate methods above, shall be multiplied by the volumetric flow rate and any necessary conversion factors to give the results in the specified units of the emission limitation. Stack testing will be performed only on boilers operating more than 100 hours per calendar year for steam generation for the facility.

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C. Standard operating procedures shall be followed during startup and shutdown operations to minimize emissions.

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iii. Molybdenum Autoclave Project (MAP):

A. Emissions to the atmosphere from the Natural Gas Turbine combined with Duct Burner and with Turbine Electric Generator (TEG) Firing shall not exceed the following rate:

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Emission Point	Pollutant	Maximum Emission Rate
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Combined Heat Plant NOx 5.01 lbs/hr

B. Stack testing to show compliance with the above emission limitations shall be performed as follows:

Emission Point	Pollutant	Testing Frequency
Combined Heat Plant	NOx	every year

To determine mass emission rates (lbs/hr, etc.), the pollutant concentration as determined by the appropriate methods above, shall be multiplied by the volumetric flow rate and any necessary conversion factors to give the results in the specified units of the emission limitation.

C. Standard operating procedures shall be followed during startup and shutdown operations to minimize emissions.

- 1 j. PacifiCorp Energy: Gadsby Power Plant
2
3 i. Steam Generating Unit #1:
4 A. Emissions of NOx shall be no greater than 179 lbs/hr
5
6 B. The owner/operator shall install, certify, maintain, operate, and quality-
7 assure a CEM consisting of NOx and O2 monitors to determine
8 compliance with the NOx limitation. The CEM shall operate as outlined
9 in IX.H.1.f.
10
11 ii. Steam Generating Unit #2:
12 A. Emissions of NOx shall be no greater than 204 lbs/hr
13
14 B. The owner/operator shall install, certify, maintain, operate, and quality-
15 assure a continuous emission monitoring system (CEMS) consisting of
16 NOx and O2 monitors to determine compliance with the NOx limitation.
17
18 iii. Steam Generating Unit #3:
19 A. Emissions of NOx shall be no greater than
20 I. 142 lbs/hr, applicable between November 1 and February 28/29
21 II. 203 lbs/hr, applicable between March 1 and October 31
22
23 B. The owner/operator shall install, certify, maintain, operate, and quality-
24 assure a CEM consisting of NOx and O2 monitors to determine
25 compliance with the NOx limitation. The CEM shall operate as outlined
26 in IX.H.1.f.
27
28 iv. Steam Generating Units #1-3:
29 A. The owner/operator shall use only natural gas as a primary fuel and No. 2
30 fuel oil or better as back-up fuel in the boilers. The No. 2 fuel oil may be
31 used only during periods of natural gas curtailment and for maintenance
32 firings. Maintenance firings shall not exceed one-percent of the annual
33 plant Btu requirement. In addition, maintenance firings shall be
34 scheduled between April 1 and November 30 of any calendar year.
35 Records of fuel oil use shall be kept and they shall show the date the fuel
36 oil was fired, the duration in hours the fuel oil was fired, the amount of
37 fuel oil consumed during each curtailment, and the reason for each firing.
38
39 v. Natural Gas-fired Simple Cycle Turbine Units:
40 A. Total emissions of NOx from all three turbines shall be no greater than
41 22.2 lbs/hour (15% O2, dry) based on a 30-day rolling average.
42
43 B. Total emissions of NOx from all three turbines shall be no greater than
44 600 lbs/day. For purposes of this subsection a “day” is defined as a
45 period of 24-hours commencing at midnight and ending at the following
46 midnight.
47
48 C. The owner/operator shall install, certify, maintain, operate, and quality-
49 assure a CEM consisting of NOx and O2 monitors to determine
50 compliance with the NOx limitation. The CEM shall operate as outlined
51 in IX.H.1.f.

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- vi. **Combustion Turbine Startup / Shutdown Emission Minimization Plan**
 - A. Startup begins when the fuel valves open and natural gas is supplied to the combustion turbines
 - B. Startup ends when either of the following conditions is met:
 - I. The NOx water injection pump is operational, the dilution air temperature is greater than 600 °F, the stack inlet temperature reaches 570 °F, the ammonia block valve has opened and ammonia is being injected into the SCR and the unit has reached an output of ten (10) gross MW; or
 - II. The unit has been in startup for two (2) hours.
 - C. Unit shutdown begins when the unit load or output is reduced below ten (10) gross MW with the intent of removing the unit from service.
 - D. Shutdown ends at the cessation of fuel input to the turbine combustor.
 - E. Periods of startup or shutdown shall not exceed two (2) hours per combustion turbine per day.

1 k. Tesoro Refining & Marketing Company

2
3 i. Source-wide PM10 Cap

4 By no later than January 1, 2019, combined emissions of PM10 shall not exceed
5 2.25 tons per day (tpd).
6

7 A. Setting of emission factors:
8

9 The emission factors derived from the most current performance test
10 shall be applied to the relevant quantities of fuel combusted. Unless
11 adjusted by performance testing as discussed in IX.H.2.k.i.B below, the
12 default emission factors to be used are as follows:
13

14 Natural gas:

15 Filterable PM10: 1.9 lb/MMscf

16 Condensable PM10: 5.7 lb/MMscf
17

18 Plant gas:

19 Filterable PM10: 1.9 lb/MMscf

20 Condensable PM10: 5.7 lb/MMscf
21

22 Fuel Oil: The PM10 emission factor shall be determined from the latest
23 edition of AP-42
24

25 Cooling Towers: The PM10 emission factor shall be determined from
26 the latest edition of AP-42
27

28 FCC Wet Scrubbers:

29 The PM10 emission factors shall be based on the most recent stack test
30 and verified by parametric monitoring as outlined in IX.H.1.g.i.B.III
31

32 B. The default emission factors listed in IX.H.2.k.i.A above apply until such
33 time as stack testing is conducted as outlined below:
34

35 PM10 stack testing on the FCCU wet gas scrubber stack shall be
36 conducted at least once every three (3) years. Stack testing shall be
37 performed as outlined in IX.H.1.e.
38

39 C. Compliance with the Source-wide PM10 Cap shall be determined for
40 each day as follows:
41

42 Total 24-hour PM10 emissions for the emission points shall be calculated
43 by adding the daily results of the PM10 emissions equations listed below
44 for natural gas, plant gas, and fuel oil combustion. These emissions shall
45 be added to the emissions from the cooling towers and wet scrubber and
46 to the estimate for the SRU/TGTU/TGI to arrive at a combined daily
47 PM10 emission total. For purposes of this subsection a "day" is defined
48 as a period of 24-hours commencing at midnight and ending at the
49 following midnight.
50

1 Daily natural gas and plant gas consumption shall be determined through
2 the use of flow meters.

3
4 Daily fuel oil consumption shall be monitored by means of leveling
5 gauges on all tanks that supply combustion sources.

6
7 The equation used to determine emissions for the boilers and furnaces
8 shall be as follows:

9
10 Emission Factor (lb/MMscf) * Gas Consumption (MMscf/24 hrs)/(2,000
11 lb/ton)

12
13 Results shall be tabulated for each day, and records shall be kept which
14 include the meter readings (in the appropriate units) and the calculated
15 emissions.

16
17 ii. Source-wide NOx Cap

18 By no later than January 1, 2019, combined emissions of NOx shall not exceed
19 1.988 tons per day (tpd).

20
21 A. Setting of emission factors:

22
23 The emission factors derived from the most current performance test
24 shall be applied to the relevant quantities of fuel combusted. Unless
25 adjusted by performance testing as discussed in IX.H.2.k.ii.B below, the
26 default emission factors to be used are as follows:

27
28 Natural gas/refinery fuel gas combustion using:

29 Low NOx burners (LNB): 41 lbs/MMBtu

30 Ultra-Low NOx (ULNB) burners: 0.04 lbs/MMBtu

31 Diesel fuel: shall be determined from the latest edition of AP-42

32
33 B. The default emission factors listed in IX.H.2.k.ii.A above apply until
34 such time as stack testing is conducted as outlined below:

35
36 NOx stack testing on natural gas/refinery fuel gas combustion equipment
37 above 100 MMBtu/hr shall be conducted at least once every three (3)
38 years. At that time a new flow-weighted average emission factor in
39 terms of: lbs/MMBtu shall be derived for each combustion type listed in
40 IX.H.2.k.ii.A above. Stack testing shall be performed as outlined in
41 IX.H.1.e.

42
43 C. Compliance with the source-wide NOx Cap shall be determined for each
44 day as follows:

45
46 Total 24-hour NOx emissions shall be calculated by adding the emissions
47 for each emitting unit. The emissions for each emitting unit shall be
48 calculated by multiplying the hours of operation of a unit, feed rate to a
49 unit, or quantity of each fuel combusted at each affected unit by the
50 associated emission factor, and summing the results.

1 A NO_x CEM shall be used to calculate daily NO_x emissions from the
2 FCCU wet gas scrubber stack. Emissions shall be determined by
3 multiplying the nitrogen dioxide concentration in the flue gas by the
4 mass flow of the flue gas. The NO_x concentration in the flue gas shall be
5 determined by a CEM as outlined in IX.H.1.f.

6
7 Daily natural gas and plant gas consumption shall be determined through
8 the use of flow meters.

9
10 Daily fuel oil consumption shall be monitored by means of leveling
11 gauges on all tanks that supply combustion sources.

12
13 For purposes of this subsection a “day” is defined as a period of 24-hours
14 commencing at midnight and ending at the following midnight.

15
16 Results shall be tabulated for each day, and records shall be kept which
17 include the meter readings (in the appropriate units) and the calculated
18 emissions.

19
20 iii. Source-wide SO₂ Cap

21 By no later than January 1, 2019, combined emissions of SO₂ shall not exceed
22 3.1 tons per day (tpd).

23
24 A. Setting of emission factors:

25
26 The emission factors derived from the most current performance test
27 shall be applied to the relevant quantities of fuel combusted. The default
28 emission factors to be used are as follows:

29
30 Natural gas: EF = 0.60 lb/MMscf

31 Propane: EF = 0.60 lb/MMscf

32 Diesel fuel: shall be determined from the latest edition of AP-42

33
34 Plant fuel gas: the emission factor shall be calculated from the H₂S
35 measurement or from the SO₂ measurement obtained by direct
36 testing/monitoring as follows:

37
38
$$EF \text{ (lb SO}_2\text{/MMscf gas)} = [(24 \text{ hr avg. ppmdv H}_2\text{S)} / 10^6] [(64 \text{ lb SO}_2\text{/lb mole)}] [(10^6 \text{ scf/MMscf}) / (379 \text{ scf/lb mole})]$$

39
40
41 Where mixtures of fuel are used in a unit, the above factors shall be
42 weighted according to the use of each fuel.

43
44 B. Compliance with the source-wide SO₂ Cap shall be determined for each
45 day as follows:

46
47 Total daily SO₂ emissions shall be calculated by adding the daily SO₂
48 emissions for natural gas, plant fuel gas, and propane combustion to
49 those from the wet gas scrubber stack.

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Daily SO₂ emissions from the FCCU wet gas scrubber stack shall be determined by multiplying the SO₂ concentration in the flue gas by the mass flow of the flue gas. The SO₂ concentration in the flue gas shall be determined by a CEM as outlined in IX.H.1.f.

Daily SO₂ emissions from other affected units shall be determined by multiplying the quantity of each fuel used daily at each affected unit by the appropriate emission factor.

Daily natural gas and plant gas consumption shall be determined through the use of flow meters.

Daily fuel oil consumption shall be monitored by means of leveling gauges on all tanks that supply combustion sources.

Results shall be tabulated for each day, and records shall be kept which include the CEM readings for H₂S (averaged for each one-hour period), all meter readings (in the appropriate units), and the calculated emissions.

iv. Emergency and Standby Equipment

- A. The use of diesel fuel meeting the specifications of 40 CFR 80.510 is allowed in standby or emergency equipment at all times.

1 1. University of Utah: University of Utah Facilities

2
3 i. Emissions to the atmosphere from the listed emission points in Building 303
4 shall not exceed the following concentrations:

Emission Point	Pollutant	ppmdv (3% O2 dry)
A. Boiler #3	NO _x	187
B. Boilers #4a & #4b	NO _x	9
C. Boilers #5a & #5b	NO _x	9
D. Turbine	NO _x	9
E. Turbine and WHRU Duct burner	NO _x	15

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18
19 *Boiler #4 will be replaced with Boiler #4a and #4b by 2018.

20
21 ii. Testing to show compliance with the emissions limitations of Condition i above
22 shall be performed as specified below:

Emission Point	Pollutant	Initial Test	Test Frequency
A. Boiler #3	NO _x	*	every 3 years
B. Boilers #4a & 4b	NO _x	2018	every 3 years
C. Boilers #5a & 5b	NO _x	2017	every 3 years
D. Turbine	NO _x	*	every 3 years
E. Turbine and WHRU Duct burner	NO _x	*	every 3 years

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38 * Initial tests have been performed and the next test shall be performed within 3
39 years of the last stack test.

40
41 iii. After January 1, 2019, Boiler #3 shall only be used as a back-up/peaking
42 boiler and shall not exceed 300 hours of operation per rolling-12 months.
43 Boiler #3 may be operated on a continuous basis if it is equipped with low
44 NO_x burners or is replaced with a boiler that has low NO_x burners.

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- m. West Valley Power Holdings, LLC.: West Valley Power Plant.
 - i. Emissions of NO_x from each individual turbine shall be no greater than 5 ppm_{dv} (15% O₂, dry) based on a 30-day rolling average.
 - ii. Total emissions of NO_x from all five turbines shall be no greater than 37 lbs/hour (15% O₂, dry) based on a 30-day rolling average.
 - iii. The NO_x emission rate (lb/hr) shall be calculated by multiplying the NO_x concentration (ppm_{dv}) generated from CEMs and the volumetric flow rate. The 30-day rolling average shall be calculated by adding previous 30 days data on a daily basis. The CEM shall operate as outlined in IX.H.1.f.
 - iv. Combustion Turbine Startup / Shutdown Emission Minimization Plan
 - A. Startup begins when natural gas is supplied to the combustion turbine(s) with the intent of combusting the fuel to generate electricity. Startup conditions end within sixty (60) minutes of natural gas being supplied to the turbine(s).
 - B. Shutdown begins with the initiation of the stop sequence of a turbine until the cessation of natural gas flow to the turbine.
 - C. Periods of startup or shutdown shall not exceed two (2) hours per combustion turbine per day.

H.3 Source Specific Emission Limitations in Utah County PM10 Nonattainment/Maintenance Area

a. Brigham Young University: Main Campus

i. All central heating plant units shall operate on natural gas from November 1 to February 28 each season beginning in the winter season of 2013-2014. Fuel oil may be used as backup fuel during periods of natural gas curtailment. The sulfur content of the fuel oil shall not exceed 0.0015 % by weight.

ii. Emissions to the atmosphere from the indicated emission point shall not exceed the following concentrations:

Emission Point	Pollutant	ppm (7% O ₂ dry)*		lb/hr	
A. Unit #1	NO _x	95	36	9.55	5.44
B. Unit #4	NO _x	127	36	38.5	19.2
C. Unit #6	NO _x	127	36	38.5	19.2

* Unit #1 limit is 95 ppm (9.55 lb/hr) until it operates for more than 300 hours during a rolling 12-month period, then the limit will be 36 ppm (5.44 lb/hr). The limit for units #4 and #6 is 127 ppm (38.5 lb/hr) and starting on January 1, 2017, the limit will then be 36 ppm (19.2 lb/hr).

Emission Point	Pollutant	ppm (7% O ₂ dry)		lb/hr	
D. Unit #2	NO _x	331		37.4	
E. Unit #3	NO _x	331		37.4	
F. Unit #5	NO _x	331		74.8	

iii. Stack testing to show compliance with the above emission limitations shall be performed as follows:

Emission Point	Pollutant	Initial test	Test Frequency
A. Unit #1	NO _x	&	every three years
B. Unit #2	NO _x	#	every three years
C. Unit #3	NO _x	#	every three years
D. Unit #4	NO _x	#	every three years
E. Unit #5	NO _x	#	every three years
F. Unit #6	NO _x	#	every three years

Stack tests shall be performed in accordance with IX.H.1.e.

& If Unit #1 is operated for more than 100 hours per rolling 12-month period, the stack test shall be performed within 60 days of exceeding 100 hours of operations. Unit #1 shall only be operated as a back-up boiler to Units #4 and #6 and shall not be operated more than 300 hours per rolling 12-month period. If Unit #1 operates more than 300 hours per rolling 12-month

1 period, then low NO_x burners with Flue Gas Recirculation shall be installed
2 and tested within 18 months of exceeding 300 hours of operation and the
3 maximum NO_x concentration shall be 36 ppm.
4

5 # The test shall be performed at least every 3 years based on the date of the last
6 stack test. Units #4 and #6 shall be retested by March 1, 2017.
7

8 iv. Central Heating Plant Natural Gas-Fired Boilers
9

10 A. Startup and shutdown events shall not exceed 216 hours per boiler per
11 12-month rolling period.
12

13 B. The sulfur content of any coal or any mixture of coals burned shall not
14 exceed either of the following:
15

16 I. 0.54 pounds of sulfur per million BTU heat input as determined
17 by ASTM Method D-4239-85, or approved equivalent
18

19 II. 0.60% by weight as determined by ASTM Method D-4239-85,
20 or approved equivalent.
21

22 For the sulfur content of coal, Brigham Young University shall either:
23

24 III. Determine the weight percent sulfur and the fuel heating value
25 by submitting a coal sample to a laboratory, acceptable to the
26 Director, on no less than a monthly basis; or
27

28 IV. For each delivery of coal, inspect the fuel sulfur content
29 expressed as weight % determined by the vendor using methods
30 of the ASTM; or
31

32 V. For each delivery of coal, inspect documentation provided by the
33 vendor that indirectly demonstrates compliance with this
34 provision.
35
36

1 b. Geneva Nitrogen Inc.: Geneva Nitrogen Plant

2
3 i. Prill Tower:

4
5 PM₁₀ emissions (filterable and condensable) shall not exceed 0.236 ton/day
6 PM_{2.5} emissions (filterable and condensable) shall not exceed 0.196 ton/day

7
8 A day is defined as from midnight to the following midnight.

9
10 ii. Testing

11
12 A. Stack testing shall be performed as specified below:

13
14 I. Frequency: Emissions shall be tested every three years. The test
15 shall be performed as soon as possible and in no case later than
16 December 31, 2017.

17
18 B. The daily limit shall be calculated by multiplying the most recent stack
19 test results by the appropriate hours of operation for each day.

20
21 iii. Montecatini Plant:

22
23 NO_x emissions shall not exceed 30.8 lb/hr

24
25 iv. Weatherly Plant:

26
27 NO_x emissions shall not exceed 18.4 lb/hr

28
29 v. Testing

30
31 Stack testing to show compliance with the NO_x emission limitations shall be
32 performed every three years.

33
34 The test for the Montecatini Plant shall be performed as soon as possible and in no
35 case later than December 31, 2017, and the test for the Weatherly Plant shall be
36 performed as soon as possible and in no case later than December 31, 2018.

37
38 vi. Start-up/Shut-down

39
40 A. Startup / Shutdown Limitations:

41
42 I. Planned shut-down and start-up events shall not exceed 50 hours
43 per acid plant (Montecatini or Weatherly) per 12-month rolling
44 period.

45
46 II. Total startup and shutdown events shall not exceed four hours
47 per acid plant in any one calendar day.

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c. PacifiCorp Energy: Lake Side Power Plant

i. Block #1 Turbine/HRSG Stacks:

A. Emissions of NO_x shall not exceed 14.9 lb/hr on a 3-hr average basis

B. Compliance with the above conditions shall be demonstrated as follows:

I. NO_x monitoring shall be through use of a CEM as outlined in IX.H.1.f

ii. Block #2 Turbine/HRSG Stacks:

A. Emissions of NO_x shall not exceed 18.1 lb/hr on a 3-hr average basis

B. Compliance with the above conditions shall be demonstrated as follows:

I. NO_x monitoring shall be through use of a CEM as outlined in IX.H.1.f

iii. Startup / Shutdown Limitations:

A. Block #1:

I. Startup and shutdown events shall not exceed 613.5 hours per turbine per 12-month rolling period.

II. Total startup and shutdown events shall not exceed 14 hours per turbine in any one calendar day.

III. Cumulative short-term transient load excursions shall not exceed 160 hours per 12-month rolling period.

IV. During periods of transient load conditions, NO_x emissions from the Block #1 Turbine/HRSG Stacks shall not exceed 25 ppmvd at 15% O₂.

B. Block #2:

I. Startup and shutdown events shall not exceed 553.6 hours per turbine per 12-month rolling period.

II. Total startup and shutdown events shall not exceed 8 hours per turbine in any one calendar day.

III. Cumulative short-term transient load excursions shall not exceed 160 hours per 12-month rolling period.

IV. During periods of transient load conditions, NO_x emissions from the Block #1 Turbine/HRSG Stacks shall not exceed 25 ppmvd at 15% O₂.

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C. Definitions:

- I. Startup is defined as the period beginning with turbine initial firing until the unit meets the lb/hr emission limits listed in IX.H.3.c.i and ii above.
- II. Shutdown is defined as the period beginning with the initiation of turbine shutdown sequence and ending with the cessation of firing of the gas turbine engine.
- III. Transient load conditions are those periods, not to exceed four consecutive 15-minute periods, when the 15-minute average NOx concentration exceeds 2.0 ppmv dry @ 15% O2. Transient load conditions include the following:
 - 1. Initiation/shutdown of combustion turbine inlet air-cooling.
 - 2. Rapid combustion turbine load changes.
 - 3. Initiation/shutdown of HRSG duct burners.
 - 4. Provision of Ancillary Services and Automatic Generation Control.
- IV. For purposes of this subsection a “day” is defined as a period of 24-hours commencing at midnight and ending at the following midnight.

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e. Payson City Corporation: Payson City Power

b. Emissions of NO_x shall be no greater than 1.54 ton per day for all engines combined.

c. Compliance with the emission limitation shall be determined by summing the emissions from all the engines. Emission from each engine shall be calculated from the following equation:

$$\text{Emissions (tons/day)} = (\text{Power production in kW-hrs/day}) \times (\text{Emission factor in grams/kW-hr}) \times (1 \text{ lb}/453.59 \text{ g}) \times (1 \text{ ton}/2000 \text{ lbs})$$

i. The NO_x emission factor for each engine shall be derived from the most recent stack test. Stack tests shall be performed in accordance with IX.H.1.e. Each engine shall be tested at least every three years from the previous test.

ii. NO_x emissions shall be calculated on a daily basis.

iii. A day is equivalent to the time period from midnight to the following midnight.

iv. The number of kilowatt hours generated by each engine shall be recorded on a daily basis with an electrical meter.

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f. Provo City Power: Power Plant

i. NO_x emissions from the operation of all engines at the plant shall not exceed 2.45 tons per day.

ii. Compliance with the emission limitation shall be determined by summing the emissions from all the engines. Emission from each engine shall be calculated from the following equation:

$$\text{Emissions (tons/day)} = (\text{Power production in kW-hrs/day}) \times (\text{Emission factor in grams/kW-hr}) \times (1 \text{ lb}/453.59 \text{ g}) \times (1 \text{ ton}/2000 \text{ lbs})$$

A. The NO_x emission factor for each engine shall be derived from the most recent stack test. Stack tests shall be performed in accordance with IX.H.1.e. Each engine shall be tested every 8,760 hours of operation or at least every three years from the previous test, whichever occurs first.

B. NO_x emissions shall be calculated on a daily basis.

C. A day is equivalent to the time period from midnight to the following midnight.

D. The number of kilowatt hours generated by each engine shall be recorded on a daily basis with an electrical meter.

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g. Springville City Corporation: Whitehead Power Plant

i. NOx emissions from the operation of all engines at the plant shall not exceed 1.68 tons per day.

ii. Internal combustion engine emissions shall be calculated from the operating data recorded by the CEM. CEM will be performed in accordance with IX.H.1.f. A day is equivalent to the time period from midnight to the following midnight. Emissions shall be calculated for NOx for each individual engine by the following equation:

$$D = (X * K)/453.6$$

Where:

X = grams/kW-hr rate for each generator (recorded by CEM)

K = total kW-hr generated by the generator each day (recorded by output meter)

D = daily output of pollutant in lbs/day

1 **H.4 Interim Emission Limits and Operating Practices**
2

3 a. The terms and conditions of this Subsection IX.H.4 shall apply to the sources listed in
4 this section on a temporary basis, as a bridge between the 1991 PM10 State
5 Implementation Plan and this PM10 Maintenance Plan. For all other point sources listed
6 in IX.H.2 and IX.H.3 the limits apply upon approval by the Utah Air Quality Board of the
7 PM10 Maintenance Plan. These bridge requirements are needed to impose limits on the
8 sources that have time delays for implementation of controls. During this timeframe, the
9 sources listed in this section may not meet the established limits listed in IX.H.2 and
10 IX.H.3. As the control technology for the sources listed in this section is installed and
11 operational, the terms and conditions listed in IX.H.1 through 3 become applicable and
12 those limits replace the limits in this subsection.
13

14 b. Petroleum Refineries:
15

16 i. All petroleum refineries in or affecting the PM₁₀ nonattainment/maintenance area
17 shall, for the purpose of this PM₁₀ Maintenance Plan:
18

19 A. Achieve an emission rate equivalent to no more than 9.8 kg of SO₂ per
20 1,000 kg of coke burn- off from any Catalytic Cracking unit by use of
21 low-SO_x catalyst or equivalent emission reduction techniques or
22 procedures, including those outlined in 40 CFR 60, Subpart J. Unless
23 otherwise specified in IX.H.2, compliance shall be determined for each
24 day based on a rolling seven-day average.
25

26 B. Compliance Demonstrations.
27

28 I. Compliance with the maximum daily (24-hr) plant-wide
29 emission limitations for PM₁₀, SO₂, and NO_x shall be
30 determined by adding the calculated emission estimates for all
31 fuel burning process equipment to those from any stack-tested or
32 CEM-measured source components. NO_x and PM₁₀ emission
33 factors shall be determined from AP-42 or from test data.
34

35 For SO_x, the emission factors are:
36

37 Natural gas: EF = 0.60 lb/MMscf

38 Propane: EF = 0.60 lb/MMscf

39 Plant gas: the emission factor shall be calculated from the H₂S
40 measurement required in IX.H.1.g.ii.A.
41

42 Fuel oils (when permitted): The emission factor shall be
43 calculated based on the weight percent of sulfur, as determined
44 by ASTM Method D-4294-89 or approved equivalent, and the
45 density of the fuel oil, as follows:
46

47 $EF \text{ (lb SO}_2\text{/k gal)} = \text{density (lb/gal)} * (1000 \text{ gal/k gal)} * \text{wt.\%}$
48 $S/100 * (64 \text{ lb SO}_2/32 \text{ lb S)}$
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Where mixtures of fuel are used in an affected unit, the above factors shall be weighted according to the use of each fuel.

- II. Daily emission estimates for stack-tested source components shall be made by multiplying the latest stack-tested hourly emission rate times the logged hours of operation (or other relevant parameter) for that source component for each day. This shall not preclude a source from determining emissions through the use of a CEM that meets the requirements of R307-170.

1 c. Big West Oil Company

2
3 i. PM₁₀ Emissions

4
5 A. Combined emissions of filterable PM₁₀ from all external combustion
6 process equipment shall not exceed the following:

- 7
8 I. 0.377 tons per day, between October 1 and March 31;
9 II. 0.407 tons per day, between April 1 and September 30.

10
11 B. Emissions shall be determined for each day by multiplying the
12 appropriate emission factor from section IX.H.4.a.(2) by the relevant
13 parameter (e.g. hours of operation, feed rate, or quantity of fuel
14 combusted) at each affected unit, and summing the results for the group
15 of affected units.

16
17 The daily primary PM₁₀ contribution from the Catalyst Regeneration
18 System shall be calculated using the following equation:

19
20 Emitted PM₁₀ = (Feed rate to FCC in kbbbl/time) * (22 lbs/kbbl)

21
22 wherein the emission factor (22 lbs/kbbl) may be re-established by stack
23 testing. Total 24-hour PM₁₀ emissions shall be calculated by adding the
24 daily emissions from the external combustion process equipment to the
25 estimate for the Catalyst Regeneration System.

26
27 ii. SO₂ Emissions

28
29 A. Combined emissions of sulfur dioxide from all external combustion
30 process equipment shall not exceed the following:

- 31
32 I. 2.764 tons/day, between October 1 and March 31;
33 II. 3.639 tons/day, between April 1 and September 30.

34
35 B. Emissions shall be determined for each day by multiplying the
36 appropriate emission factor from section IX.H.4.a.(2) by the relevant
37 parameter (e.g. hours of operation, feed rate, or quantity of fuel
38 combusted) at each affected unit, and summing the results for the group
39 of affected units.

40
41 The daily SO₂ emission from the Catalyst Regeneration System shall be
42 calculated using the following equation:

43
44 SO₂ = [43.3 lb SO₂/hr / 7,688 bbl feed/day] x [(operational feed rate in
45 bbl/day) x (wt% sulfur in feed / 0.1878 wt%) x (operating hr/day)]

46
47 The FCC feed weight percent sulfur concentration shall be determined by
48 the refinery laboratory every 30 days with one or more analyses.
49 Alternatively, SO₂ emissions from the Catalyst Regeneration System
50 may be determined using a Continuous Emissions Monitor (CEM) in
51 accordance with IX.H.1.f.

1
2 Emissions from the SRU Tail Gas Incinerator (TGI) shall be determined
3 for each day by multiplying the sulfur dioxide concentration in the flue
4 gas by the mass flow of the flue gas.
5

6 Total 24-hour SO₂ emissions shall be calculated by adding the daily
7 emissions from the external combustion process equipment to the values
8 for the Catalyst Regeneration System and the SRU.
9

10 iii. NO_x Emissions

11
12 A. Combined emissions of NO_x from all external combustion process
13 equipment shall not exceed the following:
14

- 15 I. 1.027 tons per day, between October 1 and March 31;
16 II. 1.145 tons per day, between April 1 and September 30.
17

18 B. Emissions shall be determined for each day by multiplying the
19 appropriate emission factor from section IX.H.4.a.(2) by the relevant
20 parameter (e.g. hours of operation, feed rate, or quantity of fuel
21 combusted) at each affected unit, and summing the results for the group
22 of affected units.
23

24 The daily NO_x emission from the Catalyst Regeneration System shall be
25 calculated using the following equation:
26

$$27 \text{NO}_x = (\text{Flue Gas, moles/hr}) \times (180 \text{ ppm} / 1,000,000) \times (30.006 \text{ lb/mole}) \times$$

28 (operating hr/day)
29

30 wherein the scalar value (180 ppm) may be re-established by stack
31 testing.
32

33 Alternatively, NO_x emissions from the Catalyst Regeneration System
34 may be determined using a Continuous Emissions Monitor (CEM) in
35 accordance with IX.H.1.f.
36

37 Total 24-hour NO_x emissions shall be calculated by adding the daily
38 emissions from gas-fired compressor drivers and the external combustion
39 process equipment to the value for the Catalyst Regeneration System.

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d. Chevron Products Company

i. PM₁₀ Emissions

A. Combined emissions of filterable PM₁₀ from all external combustion process equipment shall be no greater than 0.234 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

ii. SO₂ Emissions

A. Combined emissions of sulfur dioxide from gas-fired compressor drivers and all external combustion process equipment, including the FCC CO Boiler and Catalyst Regenerator, shall not exceed 0.5 tons/day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

Alternatively, SO₂ emissions from the FCC CO Boiler and Catalyst Regenerator may be determined using a Continuous Emissions Monitor (CEM) in accordance with IX.H.1.f.

iii. NO_x Emissions

A. Combined emissions of NO_x from gas-fired compressor drivers and all external combustion process equipment, including the FCC CO Boiler and Catalyst Regenerator and the SRU Tail Gas Incinerator, shall be no greater than 2.52 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

Alternatively, NO_x emissions from the FCC CO Boiler and Catalyst Regenerator may be determined using a Continuous Emissions Monitor (CEM) in accordance with IX.H.1.f.

iv. Chevron shall be permitted to combust HF alkylation polymer oil in its Alkylation unit.

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e. Holly Refining and Marketing Company

i. PM₁₀ Emissions

A. Combined emissions of filterable PM₁₀ from all combustion sources, shall be no greater than 0.44 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2), or from testing as described below, by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

ii. SO₂ Emissions

A. Combined emissions of SO₂ from all sources shall be no greater than 4.714 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

Emissions from the FCCU wet scrubbers shall be determined using a Continuous Emissions Monitor (CEM) in accordance with IX.H.1.f.

iii. NO_x Emissions:

A. Combined emissions of NO_x from all sources shall be no greater than 2.20 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

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f. Tesoro Refining & Marketing Company

i. PM₁₀ Emissions

- A. Combined emissions of filterable PM₁₀ from gas-fired compressor drivers and all external combustion process equipment, including the FCC/CO Boiler (ESP), shall be no greater than 0.261 tons per day.

Emissions for gas-fired compressor drivers and the group of external combustion process equipment shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

ii. SO₂ Emissions

- A. Combined emissions of SO₂ from gas-fired compressor drivers and all external combustion process equipment, including the FCC/CO Boiler (ESP), shall not exceed the following:

- I. November 1 through end of February: 3.699 tons/day
II. March 1 through October 31: 4.374 tons/day

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

Emissions from the ESP stack (FCC/CO Boiler) shall be determined by multiplying the SO₂ concentration in the flue gas by the mass flow of the flue gas.

The SO₂ concentration in the flue gas shall be determined by a continuous emission monitor (CEM).

iii. NO_x Emissions

- A. Combined emissions of NO_x from gas-fired compressor drivers and all external combustion process equipment shall be no greater than 1.988 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.



State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQ-051-15

MEMORANDUM

TO: Air Quality Board

THROUGH: Bryce C. Bird, Executive Secretary

FROM: Bill Reiss, Environmental Engineer

DATE: August 21, 2015

SUBJECT: PROPOSE FOR PUBLIC COMMENT: Repeal Existing SIP Subsections IX. Part H. 1, 2, 3, and 4 and Re-enact with SIP Subsections IX. Part H. 1, 2, 3, and 4: Control Measures for Area and Point Sources, Emission Limits and Operating Practices, PM₁₀ Requirements.

Introduction:

This item supports a proposed maintenance plan for Utah's three PM₁₀ nonattainment areas, Salt Lake County, Utah County, and Ogden City.

The existing State Implementation Plan (SIP) for PM₁₀, affecting Salt Lake and Utah Counties, was adopted in 1991 and included numerous controls on specific stationary sources of PM₁₀, SO₂ and NO_x. Emission limits reflecting controls at these sources were included in the SIP, thus making them federally enforceable.

SIP limits affecting Utah County were revised in 2002, and effectively approved into the SIP by EPA in 2003.

As part of this maintenance plan, the list of stationary sources to be included in the SIP was reconsidered, particularly as it applies to Salt Lake County. Criteria were established to include sources located in any of the nonattainment areas with actual emissions (in 2011), or with potentials to emit, that are at least 100 tons per year for PM₁₀, SO₂, or NO_x.

Using these criteria means that some sources will not be retained in the revised Part H, while other new sources, that did not exist when the original SIP was written, will be added.

There are no SIP sources in the Ogden City nonattainment area.

Contingency Measures:

The maintenance plan, if approved, will allow Utah to request that EPA redesignate these areas back to attainment for PM₁₀. The Clean Air Act requires, under Section 175A(d), that any such plan revision must contain contingency provisions to assure the State will promptly correct any violation of the standard which occurs after the redesignation of the area. Furthermore, these provisions must include a requirement that the State will implement all measures which were contained in the SIP for the area prior to redesignation.

As discussed above, some of the stationary sources that had appeared in the existing SIP did not meet the emissions criteria, and therefore were not retained in this revised Part H.

Certain emission limits for these sources may be candidates for these contingency provisions should the respective areas be redesignated and should there be a subsequent violation of the PM₁₀ standard. Because of the 2002 SIP revision for Utah County, this affects only sources that had been listed in the Salt Lake County portion of the SIP. As such, these sources and their respective SIP conditions from the existing SIP have been identified in section (10) of the maintenance plan proposed for SIP Section IX.A.10. There were no SIP sources in the Ogden City nonattainment area.

SIP Organization:

As originally written in 1991, the PM₁₀ nonattainment SIP for Salt Lake and Utah Counties included an Appendix A wherein the emission limits for specific stationary sources were included in the SIP. This Appendix A was later reorganized as SIP Section IX Part H.

In 2005, Utah prepared a revision to the PM₁₀ plan that showed continued attainment through the year 2017. This revision, also structured as a maintenance plan, included the changes to Part H that gave it its present form. The PM₁₀ provisions of Part H are contained in subsections 1 – 4, while the PM_{2.5} provisions are contained in subsections 11, 12, and 13.

As presently structured, subsections 1 – 3 contain:

- H.1. – General Requirements that apply to all listed sources
- H.2. – Source-Specific Limitations in Salt Lake and Davis Counties
- H.3. – Source-Specific Limitations in Utah County

As proposed, the focus of these three subsections will remain the same.

Existing subsection H.4, “Establishment of Alternative Requirements,” is not part of the proposal. Rather, H.4 is being re-purposed to include “Interim Emission Limits and Operating Practices.”

These interim limits are intended to cover sources that are phasing-in control measures implemented as part of the PM_{2.5} SIP. The end of the phase-in period will be January 1, 2019. As the control technology at these sources becomes operational, these interim limits will be superseded by the limits appearing in subsections H 1 – 3.

Staff Recommendation: Staff recommends that the Board propose for public comment to repeal existing SIP Subsections IX Part H 1, 2, 3, and 4 and re-enact with SIP Subsections IX Part H 1, 2, 3, and 4: Control Measures for Area and Point Sources, Emission Limits and Operating Practices, PM₁₀ Requirements, as proposed.

1 **H.1 General Requirements: Control Measures for Area and Point Sources,**
2 **Emission Limits and Operating Practices, PM10 Requirements**
3

4 a. Except as otherwise outlined in individual conditions of this Subsection IX.H.1 listed below, the
5 terms and conditions of this Subsection IX.H.1 shall apply to all sources subsequently addressed
6 in Subsection IX.H.2 and IX.H.3. Should any inconsistencies exist between these two
7 subsections, the source specific conditions listed in IX.H.2 and IX.H.3 shall take precedence.
8

9 b. The definitions contained in R307-101-2, Definitions, apply to Section IX, Part H.
10

11 c. Any information used to determine compliance shall be recorded for all periods when the source
12 is in operation, and such records shall be kept for a minimum of five years. Any or all of these
13 records shall be made available to the Director upon request, and shall include a period of two
14 years ending with the date of the request.
15

16 d. All emission limitations listed in Subsections IX.H.2 and IX.H.3 apply at all times, unless
17 otherwise specified in the source specific conditions listed in IX.H.2 and IX.H.3.
18

19 e. Stack Testing.
20

21 i. As applicable, stack testing to show compliance with the emission limitations for the
22 sources in Subsection IX.H.2 and I.X.H.3 shall be performed in accordance with the
23 following:

24 A. Sample Location: The emission point shall be designed to conform to the
25 requirements of 40 CFR 60, Appendix A, Method 1, or other EPA-approved
26 methods acceptable to the Director.

27 B. Volumetric Flow Rate: 40 CFR 60, Appendix A, Method 2 or other EPA-
28 approved testing methods acceptable to the Director.

29 C. PM10: 40 CFR 51, Appendix M, Methods 201a and 202, or other EPA approved
30 testing methods acceptable to the Director. If a method other than 201a is used,
31 the portion of the front half of the catch considered PM10 shall be based on
32 information in Appendix B of the fifth edition of the EPA document, AP-42, or
33 other data acceptable to the Director.

34 D. SO2: 40 CFR 60 Appendix A, Method 6C or other EPA-approved testing
35 methods acceptable to the Director.

36 E. NOx: 40 CFR 60 Appendix A, Method 7E or other EPA-approved testing
37 methods acceptable to the Director.

38 F. Calculations: To determine mass emission rates (lb/hr, etc.) the pollutant
39 concentration as determined by the appropriate methods above shall be
40 multiplied by the volumetric flow rate and any necessary conversion factors to
41 give the results in the specified units of the emission limitation.

42 G. A stack test protocol shall be provided at least 30 days prior to the test. A pretest
43 conference shall be held if directed by the Director. The emission point shall be
44 designed to conform to the requirements of 40 CFR 60, Appendix A, Method 1,
45 and Occupational Safety and Health Administration (OSHA) approvable access
46 shall be provided to the test location.

47 H. The production rate during all compliance testing shall be no less than 90% of the
48 maximum production rate achieved in the previous three (3) years. If the desired
49 production rate is not achieved at the time of the test, the maximum production
50 rate shall be 110% of the tested achieved rate, but not more than the maximum

allowable production rate. This new allowable maximum production rate shall remain in effect until successfully tested at a higher rate. The owner/operator shall request a higher production rate when necessary. Testing at no less than 90% of the higher rate shall be conducted. A new maximum production rate (110% of the new rate) will then be allowed if the test is successful. This process may be repeated until the maximum allowable production rate is achieved.

f. Continuous Emission and Opacity Monitoring.

i. For all continuous monitoring devices, the following shall apply:

- A. Except for system breakdown, repairs, calibration checks, and zero and span adjustments required under paragraph (d) 40 CFR 60.13, the owner/operator of an affected source shall continuously operate all required continuous monitoring systems and shall meet minimum frequency of operation requirements as outlined in R307-170 and 40 CFR 60.13. Flow measurement shall be in accordance with the requirements of 40 CFR 52, Appendix E; 40 CFR 60 Appendix B; or 40 CFR 75, Appendix A.
- B. The monitoring system shall comply with all applicable sections of R307-170; 40 CFR 13; and 40 CFR 60, Appendix B – Performance Specifications.

ii. Opacity observations of emissions from stationary sources shall be conducted in accordance with 40 CFR 60, Appendix A, Method 9.

g. Petroleum Refineries.

i. Limits at Fluid Catalytic Cracking Units (FCCU)

- A. FCCU SO₂ Emissions
 - I. By no later than January 1, 2018, each owner or operator of an FCCU shall comply with an SO₂ emission limit of 25 ppmvd @ 0% excess air on a 365-day rolling average basis and 50 ppmvd @ 0% excess air on a 7-day rolling average basis.
 - II. Compliance with this limit shall be determined by following 40 C.F.R. §60.105a(g).
- B. FCCU PM Emissions
 - I. By no later than January 1, 2018, each owner or operator of an FCCU shall comply with an emission limit of 1.0 pounds PM per 1000 pounds coke burned on a 3-hour average basis.
 - II. Compliance with this limit shall be determined by following the stack test protocol specified in 40 C.F.R. §60.106(b) or 40 C.F.R. §60.104a(d) to measure PM emissions on the FCCU. Each owner operator shall conduct stack tests once every three (3) years at each FCCU.
 - III. By no later than January 1, 2019, each owner or operator of an FCCU shall install, operate and maintain a continuous parameter monitor system (CPMS) to measure and record operating parameters from the FCCU for determination of source-wide PM₁₀ emissions.

ii. Limits on Refinery Fuel Gas.

- A. All petroleum refineries in or affecting any PM_{2.5} nonattainment area or any PM₁₀ nonattainment or maintenance area shall reduce the H₂S content of the refinery plant gas to 60 ppm or less as described in 40 CFR 60.102a. Compliance shall be based on a rolling average of 365 days. The owner/operator

1 shall comply with the fuel gas monitoring requirements of 40 CFR 60.107a and
2 the related recordkeeping and reporting requirements of 40 CR 60.108a. As used
3 herein, refinery “plant gas” shall have the meaning of “fuel gas” as defined in 40
4 CFR 60.101a, and may be used interchangeably.

5 B. For natural gas, compliance is assumed while the fuel comes from a public
6 utility.

7
8 iii. Sulfur Removal Units

9 A. All petroleum refineries in or affecting any PM10 nonattainment or maintenance
10 area shall require:

11 I. Sulfur removal units/plants (SRUs) that are at least 95% effective in
12 removing sulfur from the streams fed to the unit; or

13 II. SRUs that meet the SO2 emission limitations listed in 40 CFR
14 60.102a(f)(1) or 60.102a(f)(2) as appropriate.

15 B. The amine acid gas and sour water stripper acid gas shall be processed in the
16 SRU(s).

17 C. Compliance shall be demonstrated by daily monitoring of flows to the SRU(s).
18 Continuous monitoring of SO2 concentration in the exhaust stream shall be
19 conducted via CEM as outlined in IX.H.1.f above. Compliance shall be
20 determined on a rolling 30-day average.

21
22 iv. No Burning of Liquid Fuel Oil in Stationary Sources

23 A. No petroleum refineries in or affecting any PM10 nonattainment or maintenance
24 area shall be allowed to burn liquid fuel oil in stationary sources except during
25 natural gas curtailments or as specified in the individual subsections of Section
26 IX, Part H.

27 B. The use of diesel fuel meeting the specifications of 40 CFR 80.510 in standby or
28 emergency equipment is exempt from the limitation of IX.H.1.g.iv.A above.

29
30 v. Requirements on Hydrocarbon Flares.

31 A. Beginning January 1, 2018, all hydrocarbon flares at petroleum refineries located
32 in or affecting a designated PM10 nonattainment area within the State shall be
33 subject to the flaring requirements of NSPS Subpart Ja (40 CFR 60.100a–109a),
34 if not already subject under the flare applicability provisions of Subpart Ja.

35 B. By no later than January 1, 2019, all major source petroleum refineries in or
36 affecting a designated PM10 nonattainment area within the State shall install and
37 operate a flare gas recovery system or equivalent flare gas minimization
38 process(es) designed to limit hydrocarbon flaring from each affected flare to
39 levels below the values listed in 40 CFR 60.103a(c), except during periods when
40 one or more process units, connected to the affected flare, are undergoing startup,
41 shutdown or experiencing malfunction. Flare gas recovery is not required for
42 dedicated SRU flare and header systems, or HF flare and header systems.
43

1 **H.2 Source Specific Emission Limitations in Salt Lake County PM10**
2 **Nonattainment/Maintenance Area**

3
4 a. Big West Oil Company

5
6 i. Source-wide PM10 Cap
7 By no later than January 1, 2019, combined emissions of PM10 shall not exceed
8 1.037 tons per day (tpd).

9
10 A. Setting of emission factors:

11
12 The emission factors derived from the most current performance test
13 shall be applied to the relevant quantities of fuel combusted. Unless
14 adjusted by performance testing as discussed in IX.H.2.a.i.B below, the
15 default emission factors to be used are as follows:

16
17 Natural gas:

18 Filterable PM10: 1.9 lb/MMscf

19 Condensable PM10: 5.7 lb/MMscf

20
21 Plant gas:

22 Filterable PM10: 1.9 lb/MMscf

23 Condensable PM10: 5.7 lb/MMscf

24
25 Fuel Oil: The PM10 emission factor shall be determined from the latest
26 edition of AP-42

27
28 Cooling Towers: The PM10 emission factor shall be determined from
29 the latest edition of AP-42

30
31 FCC Stacks: The PM10 emission factor shall be established by stack test.

32
33 B. The default emission factors listed in IX.H.2.a.i.A above apply until such
34 time as stack testing is conducted as outlined below:

35
36 PM10 stack testing on the FCC shall be conducted at least once every
37 three (3) years. Stack testing shall be performed as outlined in IX.H.1.e.

38
39 C. Compliance with the source-wide PM10 Cap shall be determined for
40 each day as follows:

41
42 Total 24-hour PM10 emissions for the emission points shall be calculated
43 by adding the daily results of the PM10 emissions equations listed below
44 for natural gas, plant gas, and fuel oil combustion. These emissions shall
45 be added to the emissions from the cooling towers, and the FCCs to
46 arrive at a combined daily PM10 emission total. For purposes of this
47 subsection a “day” is defined as a period of 24-hours commencing at
48 midnight and ending at the following midnight.
49

1 Daily gas consumption shall be measured by meters that can delineate
2 the flow of gas to the boilers, furnaces and the SRU incinerator.

3
4 The equation used to determine emissions for the boilers and furnaces
5 shall be as follows:

6
7 Emission Factor (lb/MMscf) * Gas Consumption (MMscf/24 hrs)/(2,000
8 lb/ton)

9
10 Daily fuel oil consumption shall be monitored by means of leveling
11 gauges on all tanks that supply combustion sources.

12
13 The daily PM10 emissions from the Catalyst Regeneration System shall
14 be calculated using the following equation:

15
16
$$E = FR * EF$$

17
18 Where:

19 E = Emitted PM10

20 FR = Feed Rate to Unit (kbbls/day)

21 EF = emission factor (lbs/kbbl), established by most recent stack test

22
23 Results shall be tabulated for each day, and records shall be kept which
24 include the meter readings (in the appropriate units) and the calculated
25 emissions.

26
27 ii. Source-wide NOx Cap

28 By no later than January 1, 2019, combined emissions of NOx shall not exceed
29 0.80 tons per day (tpd).

30
31 A. Setting of emission factors:

32
33 The emission factors derived from the most current performance test
34 shall be applied to the relevant quantities of fuel combusted. Unless
35 adjusted by performance testing as discussed in IX.H.2.a.ii.B below, the
36 default emission factors to be used are as follows:

37
38 Natural gas: shall be determined from the latest edition of AP-42

39 Plant gas: assumed equal to natural gas

40 Diesel fuel: shall be determined from the latest edition of AP-42

41
42 Where mixtures of fuel are used in a Unit, the above factors shall be
43 weighted according to the use of each fuel.

44
45 B. The default emission factors listed in IX.H.2.a.ii.A above apply until
46 such time as stack testing is conducted as outlined below:

47
48 NOx stack testing on natural gas/refinery fuel gas combustion equipment
49 above 40 MMBtu/hr shall be conducted at least once every three (3)
50 years. At that time a new flow-weighted average emission factor in
51 terms of: lbs/MMBtu shall be derived for each combustion type listed in

IX.H.2.a.ii.A above. Stack testing shall be performed as outlined in IX.H.1.e.

C. Compliance with the source-wide NOx Cap shall be determined for each day as follows:

Total 24-hour NOx emissions shall be calculated by adding the emissions for each emitting unit. The emissions for each emitting unit shall be calculated by multiplying the hours of operation of a unit, feed rate to a unit, or quantity of each fuel combusted at each affected unit by the associated emission factor, and summing the results.

Daily plant gas consumption at the furnaces, boilers and SRU incinerator shall be measured by flow meters. The equations used to determine emissions shall be as follows:

$$\text{NOx} = \text{Emission Factor (lb/MMscf)} * \text{Gas Consumption (MMscf/24 hrs)} / (2,000 \text{ lb/ton})$$

Where the emission factor is derived from the fuel used, as listed in IX.H.2.a.ii.A above

Daily fuel oil consumption shall be monitored by means of leveling gauges on all tanks that supply combustion sources.

The daily NOx emissions from the Catalyst Regeneration System shall be calculated using the following equation:

$$\text{NOx} = (\text{Flue Gas, moles/hr}) \times (\text{ADV ppm} / 10^6) \times (30.006 \text{ lb/mole}) \times (\text{operating hr/day}) / (2000 \text{ lb/ton})$$

Where ADV = average daily value from NOx CEM as outlined in IX.H.1.f

Total daily NOx emissions shall be calculated by adding the results of the above NOx equations for natural gas and plant gas combustion to the estimate for the Catalyst Regeneration System.

For purposes of this subsection a “day” is defined as a period of 24-hours commencing at midnight and ending at the following midnight.

Results shall be tabulated for each day, and records shall be kept which include the meter readings (in the appropriate units) and the calculated emissions.

iii. Source-wide SO2 Cap
By no later than January 1, 2019, combined emissions of SO2 shall not exceed 0.60 tons per day (tpd).

A. Setting of emission factors:

1 The emission factors derived from the most current performance test
2 shall be applied to the relevant quantities of fuel combusted. The default
3 emission factors to be used are as follows:
4

5 Natural Gas - 0.60 lb SO₂/MMscf gas
6

7 Plant Gas - The emission factor to be used in conjunction with plant gas
8 combustion shall be determined through the use of a continuous
9 emissions monitor, which shall measure the H₂S content of the fuel gas
10 in ppmv. Daily emission factors shall be calculated using average daily
11 H₂S content data from the CEM. The emission factor shall be calculated
12 as follows:
13

14 Emission Factor (lb SO₂/MMscf gas) = [(24 hr avg. ppmv
15 H₂S)/10⁶]*(64 lb SO₂/lb mole)*[(10⁶ scf/MMscf)/(379 scf/lb mole)]
16

17 SRUs: The emission rate shall be determined by multiplying the sulfur
18 dioxide concentration in the flue gas by the mass flow of the flue gas.
19 The sulfur dioxide concentration in the flue gas shall be determined by
20 CEM as outlined in IX.H.1.f.
21

22 Fuel oil: The emission factor to be used for combustion shall be
23 calculated based on the weight percent of sulfur, as determined by
24 ASTM Method D-4294-89 or EPA-approved equivalent acceptable to the
25 Director, and the density of the fuel oil, as follows:
26

27 EF (lb SO₂/k gal) = density (lb/gal) * (1000 gal/k gal) * wt. % S/100 *
28 (64 lb SO₂/32 lb S)
29

30 Where mixtures of fuel are used in a Unit, the above factors shall be
31 weighted according to the use of each fuel.
32

33 B. Compliance with the source-wide SO₂ Cap shall be determined for each
34 day as follows:
35

36 Total daily SO₂ emissions shall be calculated by adding the daily SO₂
37 emissions for natural gas and plant fuel gas combustion, to those from
38 the FCC and SRU stacks.
39

40 The daily SO₂ emission from the FCC Catalyst Regeneration System
41 shall be calculated using the following equation:
42

43 $SO_2 = FG * (ADV/1,000,000) * (64 \text{ lb/mole}) * (\text{operating hours/day}) /$
44 (2000 lb/ton)
45

46 Where:

47 FG = Flue Gas in moles/hour

48 ADV = average daily value from SO₂ CEM as outlined in IX.H.1.f
49

50 Daily natural gas and plant gas consumption shall be determined through
51 the use of flow meters.

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Daily fuel oil consumption shall be monitored by means of leveling gauges on all tanks that supply combustion sources.

Results shall be tabulated for each day, and records shall be kept which include the CEM readings for H₂S (averaged for each one-hour period), all meter readings (in the appropriate units), and the calculated emissions.

iv. Emergency and Standby Equipment

A. The use of diesel fuel meeting the specifications of 40 CFR 80.510 is allowed in standby or emergency equipment at all times.

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- b. Bountiful City Light and Power: Power Plant
 - i. Emissions to the atmosphere shall not exceed the following rates and concentrations:
 - A. GT #1 (5.3 MW Turbine)
Exhaust Stack: 0.6 g NO_x / kW-hr
 - B. GT #2 and GT #3 (each TITAN Turbine)
Exhaust Stack: 7.5 lb NO_x / hr
 - ii. Compliance to the above emission limitations shall be determined by stack test. Stack testing shall be performed as outlined in IX.H.1.e.
 - A. Each turbine shall be tested at least once per year.
 - iii. Combustion Turbine Startup / Shutdown Emission Minimization Plan
 - A. Startup begins when natural gas is supplied to the combustion turbine(s) with the intent of combusting the fuel to generate electricity. Startup conditions end within sixty (60) minutes of natural gas being supplied to the turbine(s).
 - B. Shutdown begins with the initiation of the stop sequence of a turbine until the cessation of natural gas flow to the turbine.
 - C. Periods of startup or shutdown shall not exceed two (2) hours per combustion turbine per day.

1 c. Central Valley Water Reclamation Facility: Wastewater Treatment Plant

2
3 i NO_x emissions from the operation of all engines at the plant shall not exceed
4 0.648 tons per day.

5
6 ii. Compliance with the emission limitation shall be determined by summing the
7 emissions from all the engines. Emission from each engine shall be calculated
8 from the following equation:

9
10 Emissions (tons/day) = (Power production in kW-hrs/day) x (Emission factor in
11 grams/kW- hr) x (1 lb/453.59 g) x (1 ton/2000 lbs)

12
13 A. The NO_x emission factor for each engine shall be derived from the most
14 recent stack test. Stack tests shall be performed in accordance with
15 IX.H.1.e. Each engine shall be tested at least every three years from
16 the previous test.

17
18 B. NO_x emissions shall be calculated on a daily basis.

19
20 C. A day is equivalent to the time period from midnight to the following
21 midnight.

22
23 D. The number of kilowatt hours generated by each engine shall be
24 determined by examination of electrical meters, which shall record
25 electricity production on a continuous basis.

26
27

1 d. Chevron Products Company

2
3 i. Source-wide PM10 Cap

4 By no later than January 1, 2019, combined emissions of PM10 shall not exceed
5 0.715 tons per day (tpd).
6

7 A. Setting of emission factors:
8

9 The emission factors derived from the most current performance test
10 shall be applied to the relevant quantities of fuel combusted. Unless
11 adjusted by performance testing as discussed in IX.H.2.d.i.B below, the
12 default emission factors to be used are as follows:
13

14 Natural gas:

15 Filterable PM10: 1.9 lb/MMscf

16 Condensable PM10: 5.7 lb/MMscf
17

18 Plant gas:

19 Filterable PM10: 1.9 lb/MMscf

20 Condensable PM10: 5.7 lb/MMscf
21

22 HF alkylation polymer: shall be determined from the latest edition of
23 AP-42 (HF alkylation polymer treated as fuel oil #6)
24

25 Diesel fuel: shall be determined from the latest edition of AP-42
26

27 Cooling Towers: shall be determined from the latest edition of AP-42
28

29 FCC Stack:

30 The PM10 emission factors shall be based on the most recent stack test
31 and verified by parametric monitoring as outlined in IX.H.1.g.i.B.III
32

33 B. The default emission factors listed in IX.H.2.d.i.A above apply until such
34 time as stack testing is conducted as outlined below:
35

36 PM10 stack testing on the FCC stack shall be conducted at least once
37 every three (3) years. Stack testing shall be performed as outlined in
38 IX.H.1.e.
39

40 C. Compliance with the source-wide PM10 Cap shall be determined for
41 each day as follows:
42

43 Total 24-hour PM10 emissions for the emission points shall be calculated
44 by adding the daily results of the PM10 emissions equations listed below
45 for natural gas, plant gas, and fuel oil combustion. These emissions shall
46 be added to the emissions from the cooling towers, the FCC and the
47 SRUs to arrive at a combined daily PM10 emission total. For purposes
48 of this subsection a "day" is defined as a period of 24-hours commencing
49 at midnight and ending at the following midnight.
50

1 Daily natural gas and plant gas consumption shall be determined through
2 the use of flow meters.

3
4 Daily fuel oil consumption shall be monitored by means of leveling
5 gauges on all tanks that supply combustion sources.

6
7 The equation used to determine emissions for the boilers and furnaces
8 shall be as follows:

9
10 Emission Factor (lb/MMscf) * Gas Consumption (MMscf/24 hrs)/(2,000
11 lb/ton)

12
13 Results shall be tabulated for each day, and records shall be kept which
14 include the meter readings (in the appropriate units) and the calculated
15 emissions.

16
17 ii. Source-wide NOx Cap

18 By no later than January 1, 2019, combined emissions of NOx shall not exceed
19 2.1 tons per day (tpd).

20
21 A. Setting of emission factors:

22
23 The emission factors derived from the most current performance test
24 shall be applied to the relevant quantities of fuel combusted. Unless
25 adjusted by performance testing as discussed in IX.H.2.d.ii.B below, the
26 default emission factors to be used are as follows:

27
28 Natural gas: shall be determined from the latest edition of AP-42

29 Plant gas: assumed equal to natural gas

30 Alkylation polymer: shall be determined from the latest edition of AP-
31 42 (as fuel oil #6)

32 Diesel fuel: shall be determined from the latest edition of AP-42

33
34 Where mixtures of fuel are used in a Unit, the above factors shall be
35 weighted according to the use of each fuel.

36
37 B. The default emission factors listed in IX.H.2.d.ii.A above apply until
38 such time as stack testing is conducted as outlined below:

39
40 NOx stack testing on natural gas/refinery fuel gas combustion equipment
41 above 100 MMBtu/hr shall be conducted at least once every three (3)
42 years. At that time a new flow-weighted average emission factor in
43 terms of: lbs/MMbtu shall be derived for each combustion type listed in
44 IX.H.2.d.ii.A above. Stack testing shall be performed as outlined in
45 IX.H.1.e.

46
47 C. Compliance with the source-wide NOx Cap shall be determined for each
48 day as follows:

49
50 Total 24-hour NOx emissions shall be calculated by adding the emissions
51 for each emitting unit. The emissions for each emitting unit shall be

1 calculated by multiplying the hours of operation of a unit, feed rate to a
2 unit, or quantity of each fuel combusted at each affected unit by the
3 associated emission factor, and summing the results.

4
5 A NOx CEM shall be used to calculate daily NOx emissions from the
6 FCCU. Emissions shall be determined by multiplying the nitrogen
7 dioxide concentration in the flue gas by the mass flow of the flue gas.
8 The NOx concentration in the flue gas shall be determined by a CEM as
9 outlined in IX.H.1.f.

10
11 For purposes of this subsection a “day” is defined as a period of 24-hours
12 commencing at midnight and ending at the following midnight.

13
14 Daily natural gas and plant gas consumption shall be determined through
15 the use of flow meters.

16
17 Daily fuel oil consumption shall be monitored by means of leveling
18 gauges on all tanks that supply combustion sources.

19
20 Results shall be tabulated for each day, and records shall be kept which
21 include the meter readings (in the appropriate units) and the calculated
22 emissions.

23
24 iii. Source-wide SO2 Cap

25 By no later than January 1, 2019, combined emissions of SO2 shall not exceed
26 1.05 tons per day (tpd).

27
28 A. Setting of emission factors:

29
30 The emission factors derived from the most current performance test
31 shall be applied to the relevant quantities of fuel combusted. The default
32 emission factors to be used are as follows:

33
34 FCC Regenerator: The emission rate shall be determined by the FCC
35 Regenerator SO2 CEM as outlined in IX.H.1.f

36
37 SRUs: The emission rate shall be determined by multiplying the sulfur
38 dioxide concentration in the flue gas by the mass flow of the flue gas.
39 The sulfur dioxide concentration in the flue gas shall be determined by
40 CEM as outlined in IX.H.1.f.

41
42 Natural gas: $EF = 0.60 \text{ lb/MMscf}$

43
44 Fuel oil & HF Alkylation polymer: The emission factor to be used for
45 combustion shall be calculated based on the weight percent of sulfur, as
46 determined by ASTM Method D-4294-89 or EPA-approved equivalent
47 acceptable to the Director, and the density of the fuel oil, as follows:

48
49 $EF (\text{lb SO}_2/\text{k gal}) = \text{density (lb/gal)} * (1000 \text{ gal/k gal}) * \text{wt.\% S}/100 *$
50 $(64 \text{ lb SO}_2/32 \text{ lb S})$

1 Plant gas: the emission factor shall be calculated from the H2S
2 measurement obtained from the H2S CEM. The emission factor shall be
3 calculated as follows:
4

$$5 \text{ EF (lb SO}_2\text{/MMscf gas)} = (24 \text{ hr avg. ppmdv H}_2\text{S}) / 10^6 * (64 \text{ lb SO}_2\text{/lb} \\ 6 \text{ mole)} * (10^6 \text{ scf/MMscf}) / (379 \text{ scf/lb mole})$$

7
8 Where mixtures of fuel are used in a Unit, the above factors shall be
9 weighted according to the use of each fuel.
10

11 B. Compliance with the source-wide SO₂ Cap shall be determined for each
12 day as follows:
13

14 Total daily SO₂ emissions shall be calculated by adding the daily SO₂
15 emissions for natural gas and plant fuel gas combustion, to those from
16 the FCC and SRU stacks.
17

18 Daily natural gas and plant gas consumption shall be determined through
19 the use of flow meters.
20

21 Daily fuel oil consumption shall be monitored by means of leveling
22 gauges on all tanks that supply combustion sources.
23

24 Results shall be tabulated for each day, and records shall be kept which
25 include the CEM readings for H₂S (averaged for each one-hour period),
26 all meter readings (in the appropriate units), and the calculated
27 emissions.
28

29 iv. Emergency and Standby Equipment and Alternative Fuels
30

31 A. The use of diesel fuel meeting the specifications of 40 CFR 80.510 is
32 allowed in standby or emergency equipment at all times.
33

34 B. HF alkylation polymer may be burned in the Alky Furnace (F-36017).
35

36 C. Plant coke may be burned in the FCC Catalyst Regenerator.
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e. Hexcel Corporation: Salt Lake Operations

i. The following limits shall not be exceeded for fiber line operations:

A. 4.42 MMscf of natural gas consumed per day.

B. 0.061 MM pounds of carbon fiber produced per day.

C. Compliance with each limit shall be determined by the following methods:

I. Natural gas consumption shall be determined by examination of natural gas billing records for the plant.

II. Fiber production shall be determined by examination of plant production records.

III. Records of consumption and production shall be kept on a daily basis for all periods when the plant is in operation.

ii. After a shutdown and prior to startup of a fiber line, all control equipment shall be started and remain in operation during production. Control equipment on each fiber line may consist of incinerators, baghouses, and regenerative thermal oxidizers.

A. The proper operation of control equipment shall be determined by maintaining records of control equipment that is not operating while the fiber line(s) in production.

1 f. Holly Refining and Marketing Company

2
3 i. Source-wide PM10 Cap

4 By no later than January 1, 2019, PM10 emissions (filterable + condensable)
5 from all sources shall not exceed 0.416 tons per day (tpd).
6

7 A. Setting of emission factors:
8

9 The emission factors derived from the most current performance test
10 shall be applied to the relevant quantities of fuel combusted. Unless
11 adjusted by performance testing as discussed in IX.H.2.g.i.B below, the
12 default emission factors to be used are as follows:
13

14 Natural gas or Plant gas:

15 non-NSPS combustion equipment: 7.65 lb PM10/MMscf

16 NSPS combustion equipment: 0.52 lb PM10/MMscf
17

18 Fuel oil:

19 The filterable PM10 emission factor for fuel oil combustion shall be
20 determined based on the sulfur content of the oil as follows:
21

22
$$\text{PM10 (lb/1000 gal)} = (10 * \text{wt. \% S}) + 3.22$$

23

24 The condensable PM10 emission factor for fuel oil combustion shall be
25 determined from the latest edition of AP-42.
26

27 Cooling Towers: The PM10 emission factor shall be determined from
28 the latest edition of AP-42.
29

30 FCC Wet Scrubbers:

31 The PM10 emission factors shall be based on the most recent stack test
32 and verified by parametric monitoring as outlined in IX.H.1.g.i.B.III
33

34 B. The default emission factors listed in IX.H.2.g.i.A above apply until such
35 time as stack testing is conducted as outlined below:
36

37 Stack testing on all NSPS combustion equipment shall be conducted at
38 least once every three (3) years. At that time a new flow-weighted
39 average emission factor in terms of: lb PM10/MMBtu shall be derived.
40 Stack testing shall be performed as outlined in IX.H.1.e.
41

42 C. Compliance with the source-wide PM10 Cap shall be determined for
43 each day as follows:
44

45 Total 24-hour PM10 emissions for the emission points shall be calculated
46 by adding the daily results of the PM10 emissions equations listed below
47 for natural gas, plant gas, and fuel oil combustion. These emissions shall
48 be added to the emissions from the cooling towers and wet scrubbers to
49 arrive at a combined daily PM10 emission total. For purposes of this
50 subsection a “day” is defined as a period of 24-hours commencing at
51 midnight and ending at the following midnight.

1
2 Daily natural gas and plant gas consumption shall be determined through
3 the use of flow meters on all gas-fueled combustion equipment.
4

5 Daily fuel oil consumption shall be monitored by means of leveling
6 gauges on all tanks that supply fuel oil to combustion sources.
7

8 The equations used to determine emissions for the boilers and furnaces
9 shall be as follows:
10

11 Emissions (tons/day) = Emission Factor (lb/MMscf) * Natural/Plant Gas
12 Consumption (MMscf/day)/(2,000 lb/ton)
13

14 Emissions (tons/day) = Emission Factor (lb/kgal) * Fuel Oil
15 Consumption (kgal/day)/(2,000 lb/ton)
16

17 Results shall be tabulated for each day, and records shall be kept which
18 include all meter readings (in the appropriate units), fuel oil parameters
19 (wt. %S), and the calculated emissions.
20

21 ii. Source-wide NOx Cap

22 By no later than January 1, 2019, NOx emissions into the atmosphere from all
23 emission points shall not exceed 2.09 tons per day (tpd).
24

25 A. Setting of emission factors:
26

27 The emission factors derived from the most current performance test
28 shall be applied to the relevant quantities of fuel combusted. Unless
29 adjusted by performance testing as discussed in IX.H.2.g.ii.B below, the
30 default emission factors to be used are as follows:
31

32 Natural gas/refinery fuel gas combustion using:

33 Low NOx burners (LNB): 41 lbs/MMscf

34 Ultra-Low NOx (ULNB) burners: 0.04 lbs/MMbtu

35 Next Generation Ultra Low NOx burners (NGULNB): 0.10 lbs/MMbtu

36 Selective catalytic reduction (SCR): 0.02 lbs/MMbtu

37 All other combustion burners: 100 lb/MMscf
38

39 Where:

40 "Natural gas/refinery fuel gas" shall represent any combustion of natural
41 gas, refinery fuel gas, or combination of the two in the associated burner.
42

43 All fuel oil combustion: 120 lbs/Kgal
44

45 B. The default emission factors listed in IX.H.2.f.ii.A above apply until
46 such time as stack testing is conducted as outlined in IX.H.1.e or by
47 NSPS.
48

49 C. Compliance with the Source-wide NOx Cap shall be determined for each
50 day as follows:
51

1 Total daily NOx emissions for emission points shall be calculated by
2 adding the results of the NOx equations for plant gas, fuel oil, and
3 natural gas combustion listed below. For purposes of this subsection a
4 “day” is defined as a period of 24-hours commencing at midnight and
5 ending at the following midnight.
6

7 Daily natural gas and plant gas consumption shall be determined through
8 the use of flow meters.
9

10 Daily fuel oil consumption shall be monitored by means of leveling
11 gauges on all tanks that supply combustion sources.
12

13 The equations used to determine emissions for the boilers and furnaces
14 shall be as follows:
15

16 Emissions (tons/day) = Emission Factor (lb/MMscf) * Natural Gas
17 Consumption (MMscf/day)/(2,000 lb/ton)
18

19 Emissions (tons/day) = Emission Factor (lb/MMscf) * Plant Gas
20 Consumption (MMscf/day)/(2,000 lb/ton)
21

22 Emissions (tons/day) = Emission Factor (lb/MMBTU) * Burner Heat
23 Rating (BTU/hr) * 24 hours per day /(2,000 lb/ton)
24

25 Emissions (tons/day) = Emission Factor (lb/kgal) * Fuel Oil
26 Consumption (kgal/day)/(2,000 lb/ton)
27

28 Results shall be tabulated for each day; and records shall be kept which
29 include the meter readings (in the appropriate units), emission factors,
30 and the calculated emissions.
31

32 iii. Source-wide SO2 Cap

33 By no later than January 1, 2019, the emission of SO2 from all emission points
34 shall not exceed 0.31 tons per day (tpd).
35

36 A. Setting of emission factors:

37 The emission factors listed below shall be applied to the relevant
38 quantities of fuel combusted:
39

40 Natural gas - 0.60 lb SO2/MMscf
41

42 Plant gas - The emission factor to be used in conjunction with plant gas
43 combustion shall be determined through the use of a CEM which will
44 measure the H2S content of the fuel gas in parts per million by volume
45 (ppmv). Daily emission factors shall be calculated using average daily
46 H2S content data from the CEM. The emission factor shall be calculated
47 as follows:
48

49 $(\text{lb SO}_2/\text{MMscf gas}) = (24 \text{ hr avg. ppmv H}_2\text{S})/10^6 * (64 \text{ lb SO}_2/\text{lb}$
50 $\text{mole}) * (10^6 \text{ scf/MMscf})/(379 \text{ scf / lb mole})$
51

1 Fuel oil - The emission factor to be used in conjunction with fuel oil
2 combustion shall be calculated based on the weight percent of sulfur, as
3 determined by ASTM Method D-4294-89 or EPA-approved equivalent,
4 and the density of the fuel oil, as follows:

5
6 $(\text{lb of SO}_2/\text{kgal}) = (\text{density lb/gal}) * (1000 \text{ gal/kgal}) * (\text{wt. \%S})/100 * (64 \text{ g SO}_2/32 \text{ g S})$
7

8
9 The weight percent sulfur and the fuel oil density shall be recorded for
10 each day any fuel oil is combusted.

11
12 B. Compliance with the Source-wide SO₂ Cap shall be determined for each
13 day as follows:

14
15 Total daily SO₂ emissions shall be calculated by adding daily results of
16 the SO₂ emissions equations listed below for natural gas, plant gas, and
17 fuel oil combustion. For purposes of this subsection a “day” is defined
18 as a period of 24-hours commencing at midnight and ending at the
19 following midnight.

20
21 The equations used to determine emissions are:

22
23 $\text{Emissions (tons/day)} = \text{Emission Factor (lb/MMscf)} * \text{Natural Gas Consumption (MMscf/day)} / (2,000 \text{ lb/ton})$
24

25
26 $\text{Emissions (tons/day)} = \text{Emission Factor (lb/MMscf)} * \text{Plant Gas Consumption (MMscf/day)} / (2,000 \text{ lb/ton})$
27

28
29 $\text{Emissions (tons/day)} = \text{Emission Factor (lb/kgal)} * \text{Fuel Oil Consumption (kgal/24 hrs)} / (2,000 \text{ lb/ton})$
30

31
32 For purposes of these equations, fuel consumption shall be measured as
33 outlined below:

34
35 Daily natural gas and plant gas consumption shall be determined through
36 the use of flow meters.

37
38 Daily fuel oil consumption shall be monitored by means of leveling
39 gauges on all tanks that supply combustion sources.

40
41 Results shall be tabulated for every day; and records shall be kept which
42 include the CEM readings for H₂S (averaged for each one-hour period),
43 all meter readings (in the appropriate units), fuel oil parameters (density
44 and wt. %S, recorded for each day any fuel oil is burned), and the
45 calculated emissions.

46
47 iv. Emergency and Standby Equipment

48
49 A. The use of diesel fuel meeting the specifications of 40 CFR 80.510 is
50 allowed in standby or emergency equipment at all times.
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g. Kennecott Utah Copper (KUC): Mine

i. Bingham Canyon Mine (BCM)

A. Maximum total mileage per calendar day for ore and waste haul trucks shall not exceed 30,000 miles.

KUC shall keep records of daily total mileage for all periods when the mine is in operation. KUC shall track haul truck miles with a Global Positioning System or equivalent.

B. KUC shall use ultra-low sulfur diesel fuel in its haul trucks.

C. To minimize emissions at the mine, the owner/operator shall:

I. Control emissions from the in-pit crusher with a baghouse.

II. Use ore conveyors as the primary means for transport of crushed ore from the mine to the concentrator.

D. To minimize fugitive dust on roads at the mine, the owner/operator shall perform the following measures:

I. Apply water to all active haul roads as weather and operational conditions warrant, and shall apply a chemical dust suppressant to active haul roads located outside of the pit influence boundary no less than twice per year.

II. Chemical dust suppressant shall be applied as weather and operational conditions warrant on unpaved access roads that receive haul truck traffic and light vehicle traffic.

E. KUC is subject to the requirements in the 1994 federally approved Fugitive Emissions and Fugitive Dust rules, R307-1-4.5.

1 h. Kennecott Utah Copper (KUC): Power Plant and Tailings Impoundment

2
3 i. Utah Power Plant

4
5 A. Boilers #1, #2, and #3 shall not be operated upon commencing
6 operations of Unit #5 (combined-cycle, natural gas-fired combustion
7 turbine).

8
9 B. Unit #5 shall not exceed the following emission rates to the atmosphere:

10
11 Pollutant lb/hr lb/event ppmdv
12 (15% O₂ dry)

13
14 I. PM₁₀ with duct firing:

15 Filterable + condensable 18.8

16
17 II. NO_x:

18 Startup/shutdown 395 2.0

19
20 III. Startup / Shutdown Limitations:

21
22 1. The total number of startups and shutdowns together
23 shall not exceed 690 per calendar year.

24
25 2. The NO_x emissions shall not exceed 395 lbs from each
26 startup/shutdown event, which shall be calculated using
27 manufacturer data.

28
29 3. Definitions:

30
31 (i) Startup cycle duration ends when the unit
32 achieves half of the design electrical generation
33 capacity.

34
35 (ii) Shutdown duration cycle begins with the
36 initiation of turbine shutdown sequence and ends
37 when fuel flow to the gas turbine is
38 discontinued.

39
40 C. Upon commencement of operation of Unit #5*, stack testing to
41 demonstrate compliance with the emission limitations in IX.H.2.h.i.B
42 shall be performed as follows for the following air contaminants

43
44 * Initial compliance testing for the natural gas turbine and duct burner is
45 required. The initial test date shall be performed within 60 days after
46 achieving the maximum heat input capacity production rate at which the
47 affected facility will be operated and in no case later than 180 days after
48 the initial startup of a new emission source.

49
50 The limited use of natural gas during maintenance firings and break-in
51 firings does not constitute operation and does not require stack testing.

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Pollutant Test Frequency

- I. PM₁₀ 3 years
- II. NO_x 3 years

D. The following requirements are applicable to Units #1, #2, #3, and #4 during the period November 1 to February 28/29 inclusive:

- I. During the period from November 1, to the last day in February inclusive, only natural gas shall only be used as a fuel, unless the supplier or transporter of natural gas imposes a curtailment. The power plant may then burn coal, only for the duration of the curtailment plus sufficient time to empty the coal bins following the curtailment. The Director shall be notified of the curtailment within 48 hours of when it begins and within 48 hours of when it ends.
- II. When burning natural gas the emissions to the atmosphere from the indicated emission point shall not exceed the following rates and concentrations:

Pollutant grains/dscf ppmdv (3% O₂)
68°F, 29.92 in. Hg

- 1. PM₁₀ Units #1, #2, #3 and #4
 - filterable 0.004
 - filterable +
condensable 0.03
- 2. NO_x:
Units #1, #2 and #3 (each) 336
- 3. NO_x
Unit #4 336
(Unit 4 after January 1, 2018) 60

III. When using coal as a fuel during a curtailment of the natural gas supply, emissions to the atmosphere from the indicated emission point shall not exceed the following rates and concentrations:

Pollutant grains/dscf ppmdv (3% O₂)
68°F, 29.92 in Hg

- 1. Units #1, #2 and #3
 - (i) PM₁₀
 - filterable 0.029
 - filterable +

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condensable	0.29	
(ii) NO _x Units 1, 2 & 3		426.5
2. Unit #4		
(i) PM ₁₀		
filterable	0.029	
filterable + condensable	0.29	
(ii) NO _x		384

IV. If the units operated during the months specified above, stack testing to show compliance with the emission limitations in H.2.h.i.D.II and III shall be performed as follows for the following air contaminants:

Pollutant	Test Frequency	Initial Test
1. PM ₁₀	3 years	*
2. NO _x	3 years	*

* Initial compliance testing is required for Unit #4 after low NO_x burner installation. The initial test date shall be performed within 60 days after achieving the maximum heat input capacity production rate at which the affected facility will be operated and in no case later than 180 days after the initial startup of a new emission source.

The limited use of natural gas during maintenance firings and break-in firings does not constitute operation and does not require stack testing.

E. The following requirements are applicable to Units #1, #2, #3, and #4 during the period March 1 to October 1 inclusive:

I. Emissions to the atmosphere from the indicated emission point shall not exceed the following rates and concentrations:

Pollutant	grains/dscf	ppmdv (3% O ₂)
68°F, 29.92 in Hg		
1. Units #1, #2, and #3		
(i) PM ₁₀ filterable	0.029	
(ii) NO _x Units #1, #2, and #3		426.5
2. Unit #4		
(i) PM ₁₀ filterable	0.029	

(ii) NO_x

384

II. If the units operated during the months specified above, stack testing to show compliance with the emission limitations in H.2.h.i.E.I shall be performed as follows for the following air contaminants:

Pollutant	Test Frequency
1. PM ₁₀	every year
2. NO _x	every year

The limited use of natural gas during maintenance firings and break-in firings does not constitute operation and does not require stack testing.

F. The sulfur content of any fuel burned shall not exceed 0.66 lb of sulfur per million BTU per test.

I. Coal increments will be collected using ASTM 2234, Type I conditions A, B, or C and systematic spacing.

II. Percent sulfur content and gross calorific value of the coal on a dry basis will be determined for each gross sample using ASTM D methods 2013, 3177, 3173, and 2015.

III. KUC shall measure at least 95% of the required increments in any one month that coal is burned in Units #1, #2, #3 or #4.

ii. Tailings Impoundment

A. No more than 50 contiguous acres or more than 5% of the total tailings area shall be permitted to have the potential for wind erosion.

I. Wind erosion potential is the area that is not wet, frozen, vegetated, crusted, or treated and has the potential for wind erosion.

II. KUC shall conduct wind erosion potential grid inspections monthly between February 15 and November 15. The results of the inspections shall be used to determine wind erosion potential.

III. If KUC or the Director of Utah Division of Air Quality (Director) determines that the percentage of wind erosion potential is exceeded, KUC shall develop a corrective action plan and implementation schedule within 60 days following verbal notification by either party. KUC shall then meet with the Director, to discuss the modified fugitive dust controls/operational practices, and an implementation schedule for such.

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- B. If between February 15 and November 15 KUC’s weather forecast is for a wind event (a wind event is defined as wind gusts exceeding 25 mph for more than one hour) the procedures listed below shall be followed within 48 hours of issuance of the forecast. KUC shall:
 - I. Alert the Utah Division of Air Quality promptly.
 - II. Continue surveillance and coordination of appropriate measures.
- C. KUC is subject to the requirements in the 1994 federally approved Fugitive Emissions and Fugitive Dust rule, R307-1-4.5.

1 i. Kennecott Utah Copper (KUC): Smelter & Refinery

2
3 i. Smelter

4
5 A. Emissions to the atmosphere from the indicated emission points shall
6 not exceed the following rates and concentrations:

7
8 I. Main Stack (Stack No. 11)

9 1. PM10

- 10 a. 89.5 lbs/hr (filterable, daily average)
11 b. 439 lbs/hr (filterable + condensable, daily
12 average)

13 2. SO₂

- 14 a. 552 lbs/hr (3 hr. rolling average)
15 b. 422 lbs/hr (daily average)

16 3. NO_x

- 17 a. 154 lbs/hr (daily average)

18
19
20
21 II. Holman Boiler

22 1. NO_x

- 23 a. 9.34 lbs/hr, 30-day average
24 b. 0.05 lbs/MMBTU, 30-day average

25
26
27 B. Stack testing to show compliance with the emissions limitations of
28 Condition (A) above shall be performed as specified below:

29
30

Emission Point	Pollutant	Test Frequency
31 I. Main Stack 32 (Stack No. 11)	PM10	every year
	SO ₂	CEM
	NO _x	CEM
33 II. Holman Boiler	NO _x	34 CEM or alternate 35 method determined 36 according to applicable 37 NSPS standards

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39
40

41 C. During startup/shutdown operations, NO_x and SO₂ emissions are
42 monitored by CEMS or alternate methods in accordance with applicable
43 NSPS standards.
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ii. Refinery:

A. Emissions to the atmosphere from the indicated emission point shall not exceed the following rate:

Emission Point	Pollutant	Maximum Emission Rate
The sum of two (Tankhouse) Boilers	NO _x	9.5 lbs/hr
Combined Heat Plant	NO _x	5.96 lbs/hr

8
9

B. Stack testing to show compliance with the above emission limitations shall be performed as follows:

Emission Point	Pollutant	Testing Frequency
Tankhouse Boilers	NO _x	every three years
Combined Heat Plant	NO _x	every year

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To determine mass emission rate, the pollutant concentration as determined by the appropriate methods above, shall be multiplied by the volumetric flow rate and any necessary conversion factors to give the results in the specified units of the emission limitation. Stack testing will be performed only on boilers operating more than 100 hours per calendar year for steam generation for the facility.

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C. Standard operating procedures shall be followed during startup and shutdown operations to minimize emissions.

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iii. Molybdenum Autoclave Project (MAP):

A. Emissions to the atmosphere from the Natural Gas Turbine combined with Duct Burner and with Turbine Electric Generator (TEG) Firing shall not exceed the following rate:

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Emission Point	Pollutant	Maximum Emission Rate
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Combined Heat Plant NOx 5.01 lbs/hr

B. Stack testing to show compliance with the above emission limitations shall be performed as follows:

Emission Point	Pollutant	Testing Frequency
Combined Heat Plant	NOx	every year

To determine mass emission rates (lbs/hr, etc.), the pollutant concentration as determined by the appropriate methods above, shall be multiplied by the volumetric flow rate and any necessary conversion factors to give the results in the specified units of the emission limitation.

C. Standard operating procedures shall be followed during startup and shutdown operations to minimize emissions.

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- j. PacifiCorp Energy: Gadsby Power Plant
 - i. Steam Generating Unit #1:
 - A. Emissions of NOx shall be no greater than 179 lbs/hr
 - B. The owner/operator shall install, certify, maintain, operate, and quality-assure a CEM consisting of NOx and O2 monitors to determine compliance with the NOx limitation. The CEM shall operate as outlined in IX.H.1.f.
 - ii. Steam Generating Unit #2:
 - A. Emissions of NOx shall be no greater than 204 lbs/hr
 - B. The owner/operator shall install, certify, maintain, operate, and quality-assure a continuous emission monitoring system (CEMS) consisting of NOx and O2 monitors to determine compliance with the NOx limitation.
 - iii. Steam Generating Unit #3:
 - A. Emissions of NOx shall be no greater than
 - I. 142 lbs/hr, applicable between November 1 and February 28/29
 - II. 203 lbs/hr, applicable between March 1 and October 31
 - B. The owner/operator shall install, certify, maintain, operate, and quality-assure a CEM consisting of NOx and O2 monitors to determine compliance with the NOx limitation. The CEM shall operate as outlined in IX.H.1.f.
 - iv. Steam Generating Units #1-3:
 - A. The owner/operator shall use only natural gas as a primary fuel and No. 2 fuel oil or better as back-up fuel in the boilers. The No. 2 fuel oil may be used only during periods of natural gas curtailment and for maintenance firings. Maintenance firings shall not exceed one-percent of the annual plant Btu requirement. In addition, maintenance firings shall be scheduled between April 1 and November 30 of any calendar year. Records of fuel oil use shall be kept and they shall show the date the fuel oil was fired, the duration in hours the fuel oil was fired, the amount of fuel oil consumed during each curtailment, and the reason for each firing.
 - v. Natural Gas-fired Simple Cycle Turbine Units:
 - A. Total emissions of NOx from all three turbines shall be no greater than 22.2 lbs/hour (15% O2, dry) based on a 30-day rolling average.
 - B. Total emissions of NOx from all three turbines shall be no greater than 600 lbs/day. For purposes of this subsection a “day” is defined as a period of 24-hours commencing at midnight and ending at the following midnight.
 - C. The owner/operator shall install, certify, maintain, operate, and quality-assure a CEM consisting of NOx and O2 monitors to determine compliance with the NOx limitation. The CEM shall operate as outlined in IX.H.1.f.

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- vi. **Combustion Turbine Startup / Shutdown Emission Minimization Plan**
 - A. Startup begins when the fuel valves open and natural gas is supplied to the combustion turbines
 - B. Startup ends when either of the following conditions is met:
 - I. The NOx water injection pump is operational, the dilution air temperature is greater than 600 °F, the stack inlet temperature reaches 570 °F, the ammonia block valve has opened and ammonia is being injected into the SCR and the unit has reached an output of ten (10) gross MW; or
 - II. The unit has been in startup for two (2) hours.
 - C. Unit shutdown begins when the unit load or output is reduced below ten (10) gross MW with the intent of removing the unit from service.
 - D. Shutdown ends at the cessation of fuel input to the turbine combustor.
 - E. Periods of startup or shutdown shall not exceed two (2) hours per combustion turbine per day.

1 k. Tesoro Refining & Marketing Company

2
3 i. Source-wide PM10 Cap

4 By no later than January 1, 2019, combined emissions of PM10 shall not exceed
5 2.25 tons per day (tpd).
6

7 A. Setting of emission factors:
8

9 The emission factors derived from the most current performance test
10 shall be applied to the relevant quantities of fuel combusted. Unless
11 adjusted by performance testing as discussed in IX.H.2.k.i.B below, the
12 default emission factors to be used are as follows:
13

14 Natural gas:

15 Filterable PM10: 1.9 lb/MMscf

16 Condensable PM10: 5.7 lb/MMscf
17

18 Plant gas:

19 Filterable PM10: 1.9 lb/MMscf

20 Condensable PM10: 5.7 lb/MMscf
21

22 Fuel Oil: The PM10 emission factor shall be determined from the latest
23 edition of AP-42
24

25 Cooling Towers: The PM10 emission factor shall be determined from
26 the latest edition of AP-42
27

28 FCC Wet Scrubbers:

29 The PM10 emission factors shall be based on the most recent stack test
30 and verified by parametric monitoring as outlined in IX.H.1.g.i.B.III
31

32 B. The default emission factors listed in IX.H.2.k.i.A above apply until such
33 time as stack testing is conducted as outlined below:
34

35 PM10 stack testing on the FCCU wet gas scrubber stack shall be
36 conducted at least once every three (3) years. Stack testing shall be
37 performed as outlined in IX.H.1.e.
38

39 C. Compliance with the Source-wide PM10 Cap shall be determined for
40 each day as follows:
41

42 Total 24-hour PM10 emissions for the emission points shall be calculated
43 by adding the daily results of the PM10 emissions equations listed below
44 for natural gas, plant gas, and fuel oil combustion. These emissions shall
45 be added to the emissions from the cooling towers and wet scrubber and
46 to the estimate for the SRU/TGTU/TGI to arrive at a combined daily
47 PM10 emission total. For purposes of this subsection a “day” is defined
48 as a period of 24-hours commencing at midnight and ending at the
49 following midnight.
50

1 Daily natural gas and plant gas consumption shall be determined through
2 the use of flow meters.

3
4 Daily fuel oil consumption shall be monitored by means of leveling
5 gauges on all tanks that supply combustion sources.

6
7 The equation used to determine emissions for the boilers and furnaces
8 shall be as follows:

9
10 Emission Factor (lb/MMscf) * Gas Consumption (MMscf/24 hrs)/(2,000
11 lb/ton)

12
13 Results shall be tabulated for each day, and records shall be kept which
14 include the meter readings (in the appropriate units) and the calculated
15 emissions.

16
17 ii. Source-wide NOx Cap

18 By no later than January 1, 2019, combined emissions of NOx shall not exceed
19 1.988 tons per day (tpd).

20
21 A. Setting of emission factors:

22
23 The emission factors derived from the most current performance test
24 shall be applied to the relevant quantities of fuel combusted. Unless
25 adjusted by performance testing as discussed in IX.H.2.k.ii.B below, the
26 default emission factors to be used are as follows:

27
28 Natural gas/refinery fuel gas combustion using:

29 Low NOx burners (LNB): 41 lbs/MMBtu

30 Ultra-Low NOx (ULNB) burners: 0.04 lbs/MMBtu

31 Diesel fuel: shall be determined from the latest edition of AP-42

32
33 B. The default emission factors listed in IX.H.2.k.ii.A above apply until
34 such time as stack testing is conducted as outlined below:

35
36 NOx stack testing on natural gas/refinery fuel gas combustion equipment
37 above 100 MMBtu/hr shall be conducted at least once every three (3)
38 years. At that time a new flow-weighted average emission factor in
39 terms of: lbs/MMBtu shall be derived for each combustion type listed in
40 IX.H.2.k.ii.A above. Stack testing shall be performed as outlined in
41 IX.H.1.e.

42
43 C. Compliance with the source-wide NOx Cap shall be determined for each
44 day as follows:

45
46 Total 24-hour NOx emissions shall be calculated by adding the emissions
47 for each emitting unit. The emissions for each emitting unit shall be
48 calculated by multiplying the hours of operation of a unit, feed rate to a
49 unit, or quantity of each fuel combusted at each affected unit by the
50 associated emission factor, and summing the results.

1 A NO_x CEM shall be used to calculate daily NO_x emissions from the
2 FCCU wet gas scrubber stack. Emissions shall be determined by
3 multiplying the nitrogen dioxide concentration in the flue gas by the
4 mass flow of the flue gas. The NO_x concentration in the flue gas shall be
5 determined by a CEM as outlined in IX.H.1.f.

6
7 Daily natural gas and plant gas consumption shall be determined through
8 the use of flow meters.

9
10 Daily fuel oil consumption shall be monitored by means of leveling
11 gauges on all tanks that supply combustion sources.

12
13 For purposes of this subsection a “day” is defined as a period of 24-hours
14 commencing at midnight and ending at the following midnight.

15
16 Results shall be tabulated for each day, and records shall be kept which
17 include the meter readings (in the appropriate units) and the calculated
18 emissions.

19
20 iii. Source-wide SO₂ Cap

21 By no later than January 1, 2019, combined emissions of SO₂ shall not exceed
22 3.1 tons per day (tpd).

23
24 A. Setting of emission factors:

25
26 The emission factors derived from the most current performance test
27 shall be applied to the relevant quantities of fuel combusted. The default
28 emission factors to be used are as follows:

29
30 Natural gas: EF = 0.60 lb/MMscf

31 Propane: EF = 0.60 lb/MMscf

32 Diesel fuel: shall be determined from the latest edition of AP-42

33
34 Plant fuel gas: the emission factor shall be calculated from the H₂S
35 measurement or from the SO₂ measurement obtained by direct
36 testing/monitoring as follows:

37
38
$$EF \text{ (lb SO}_2\text{/MMscf gas)} = [(24 \text{ hr avg. ppmdv H}_2\text{S)} / 10^6] [(64 \text{ lb SO}_2\text{/lb mole)}] [(10^6 \text{ scf/MMscf}) / (379 \text{ scf/lb mole})]$$

39
40
41 Where mixtures of fuel are used in a unit, the above factors shall be
42 weighted according to the use of each fuel.

43
44 B. Compliance with the source-wide SO₂ Cap shall be determined for each
45 day as follows:

46
47 Total daily SO₂ emissions shall be calculated by adding the daily SO₂
48 emissions for natural gas, plant fuel gas, and propane combustion to
49 those from the wet gas scrubber stack.

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Daily SO₂ emissions from the FCCU wet gas scrubber stack shall be determined by multiplying the SO₂ concentration in the flue gas by the mass flow of the flue gas. The SO₂ concentration in the flue gas shall be determined by a CEM as outlined in IX.H.1.f.

Daily SO₂ emissions from other affected units shall be determined by multiplying the quantity of each fuel used daily at each affected unit by the appropriate emission factor.

Daily natural gas and plant gas consumption shall be determined through the use of flow meters.

Daily fuel oil consumption shall be monitored by means of leveling gauges on all tanks that supply combustion sources.

Results shall be tabulated for each day, and records shall be kept which include the CEM readings for H₂S (averaged for each one-hour period), all meter readings (in the appropriate units), and the calculated emissions.

iv. Emergency and Standby Equipment

- A. The use of diesel fuel meeting the specifications of 40 CFR 80.510 is allowed in standby or emergency equipment at all times.

1 1. University of Utah: University of Utah Facilities

2
3 i. Emissions to the atmosphere from the listed emission points in Building 303
4 shall not exceed the following concentrations:

Emission Point	Pollutant	ppmdv (3% O2 dry)
5 6 A. Boiler #3	NO _x	187
7 8 B. Boilers #4a & #4b	NO _x	9
9 10 C. Boilers #5a & #5b	NO _x	9
11 12 D. Turbine	NO _x	9
13 14 E. Turbine and WHRU 15 Duct burner	NO _x	15

16
17 *Boiler #4 will be replaced with Boiler #4a and #4b by 2018.

18
19
20
21 ii. Testing to show compliance with the emissions limitations of Condition i above
22 shall be performed as specified below:

Emission Point	Pollutant	Initial Test	Test Frequency
23 24 A. Boiler #3	NO _x	*	every 3 years
25 26 B. Boilers #4a & 4b	NO _x	2018	every 3 years
27 28 C. Boilers #5a & 5b	NO _x	2017	every 3 years
29 30 D. Turbine	NO _x	*	every 3 years
31 32 E. Turbine and WHRU 33 Duct burner	NO _x	*	every 3 years

34
35 * Initial tests have been performed and the next test shall be performed within 3
36 years of the last stack test.

37
38
39 iii. After January 1, 2019, Boiler #3 shall only be used as a back-up/peaking
40 boiler and shall not exceed 300 hours of operation per rolling-12 months.
41 Boiler #3 may be operated on a continuous basis if it is equipped with low
42 NO_x burners or is replaced with a boiler that has low NO_x burners.
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- m. West Valley Power Holdings, LLC.: West Valley Power Plant.
 - i. Emissions of NO_x from each individual turbine shall be no greater than 5 ppm_{dv} (15% O₂, dry) based on a 30-day rolling average.
 - ii. Total emissions of NO_x from all five turbines shall be no greater than 37 lbs/hour (15% O₂, dry) based on a 30-day rolling average.
 - iii. The NO_x emission rate (lb/hr) shall be calculated by multiplying the NO_x concentration (ppm_{dv}) generated from CEMs and the volumetric flow rate. The 30-day rolling average shall be calculated by adding previous 30 days data on a daily basis. The CEM shall operate as outlined in IX.H.1.f.
 - iv. Combustion Turbine Startup / Shutdown Emission Minimization Plan
 - A. Startup begins when natural gas is supplied to the combustion turbine(s) with the intent of combusting the fuel to generate electricity. Startup conditions end within sixty (60) minutes of natural gas being supplied to the turbine(s).
 - B. Shutdown begins with the initiation of the stop sequence of a turbine until the cessation of natural gas flow to the turbine.
 - C. Periods of startup or shutdown shall not exceed two (2) hours per combustion turbine per day.

H.3 Source Specific Emission Limitations in Utah County PM10 Nonattainment/Maintenance Area

a. Brigham Young University: Main Campus

i. All central heating plant units shall operate on natural gas from November 1 to February 28 each season beginning in the winter season of 2013-2014. Fuel oil may be used as backup fuel during periods of natural gas curtailment. The sulfur content of the fuel oil shall not exceed 0.0015 % by weight.

ii. Emissions to the atmosphere from the indicated emission point shall not exceed the following concentrations:

Emission Point	Pollutant	ppm (7% O ₂ dry)*		lb/hr	
A. Unit #1	NO _x	95	36	9.55	5.44
B. Unit #4	NO _x	127	36	38.5	19.2
C. Unit #6	NO _x	127	36	38.5	19.2

* Unit #1 limit is 95 ppm (9.55 lb/hr) until it operates for more than 300 hours during a rolling 12-month period, then the limit will be 36 ppm (5.44 lb/hr). The limit for units #4 and #6 is 127 ppm (38.5 lb/hr) and starting on January 1, 2017, the limit will then be 36 ppm (19.2 lb/hr).

Emission Point	Pollutant	ppm (7% O ₂ dry)		lb/hr	
D. Unit #2	NO _x	331		37.4	
E. Unit #3	NO _x	331		37.4	
F. Unit #5	NO _x	331		74.8	

iii. Stack testing to show compliance with the above emission limitations shall be performed as follows:

Emission Point	Pollutant	Initial test	Test Frequency
A. Unit #1	NO _x	&	every three years
B. Unit #2	NO _x	#	every three years
C. Unit #3	NO _x	#	every three years
D. Unit #4	NO _x	#	every three years
E. Unit #5	NO _x	#	every three years
F. Unit #6	NO _x	#	every three years

Stack tests shall be performed in accordance with IX.H.1.e.

& If Unit #1 is operated for more than 100 hours per rolling 12-month period, the stack test shall be performed within 60 days of exceeding 100 hours of operations. Unit #1 shall only be operated as a back-up boiler to Units #4 and #6 and shall not be operated more than 300 hours per rolling 12-month period. If Unit #1 operates more than 300 hours per rolling 12-month

1 period, then low NO_x burners with Flue Gas Recirculation shall be installed
2 and tested within 18 months of exceeding 300 hours of operation and the
3 maximum NO_x concentration shall be 36 ppm.
4

5 # The test shall be performed at least every 3 years based on the date of the last
6 stack test. Units #4 and #6 shall be retested by March 1, 2017.
7

8 iv. Central Heating Plant Natural Gas-Fired Boilers
9

10 A. Startup and shutdown events shall not exceed 216 hours per boiler per
11 12-month rolling period.
12

13 B. The sulfur content of any coal or any mixture of coals burned shall not
14 exceed either of the following:
15

16 I. 0.54 pounds of sulfur per million BTU heat input as determined
17 by ASTM Method D-4239-85, or approved equivalent
18

19 II. 0.60% by weight as determined by ASTM Method D-4239-85,
20 or approved equivalent.
21

22 For the sulfur content of coal, Brigham Young University shall either:
23

24 III. Determine the weight percent sulfur and the fuel heating value
25 by submitting a coal sample to a laboratory, acceptable to the
26 Director, on no less than a monthly basis; or
27

28 IV. For each delivery of coal, inspect the fuel sulfur content
29 expressed as weight % determined by the vendor using methods
30 of the ASTM; or
31

32 V. For each delivery of coal, inspect documentation provided by the
33 vendor that indirectly demonstrates compliance with this
34 provision.
35
36

1 b. Geneva Nitrogen Inc.: Geneva Nitrogen Plant

2
3 i. Prill Tower:

4
5 PM₁₀ emissions (filterable and condensable) shall not exceed 0.236 ton/day
6 PM_{2.5} emissions (filterable and condensable) shall not exceed 0.196 ton/day

7
8 A day is defined as from midnight to the following midnight.

9
10 ii. Testing

11
12 A. Stack testing shall be performed as specified below:

13
14 I. Frequency: Emissions shall be tested every three years. The test
15 shall be performed as soon as possible and in no case later than
16 December 31, 2017.

17
18 B. The daily limit shall be calculated by multiplying the most recent stack
19 test results by the appropriate hours of operation for each day.

20
21 iii. Montecatini Plant:

22
23 NO_x emissions shall not exceed 30.8 lb/hr

24
25 iv. Weatherly Plant:

26
27 NO_x emissions shall not exceed 18.4 lb/hr

28
29 v. Testing

30
31 Stack testing to show compliance with the NO_x emission limitations shall be
32 performed every three years.

33
34 The test for the Montecatini Plant shall be performed as soon as possible and in no
35 case later than December 31, 2017, and the test for the Weatherly Plant shall be
36 performed as soon as possible and in no case later than December 31, 2018.

37
38 vi. Start-up/Shut-down

39
40 A. Startup / Shutdown Limitations:

41
42 I. Planned shut-down and start-up events shall not exceed 50 hours
43 per acid plant (Montecatini or Weatherly) per 12-month rolling
44 period.

45
46 II. Total startup and shutdown events shall not exceed four hours
47 per acid plant in any one calendar day.

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c. PacifiCorp Energy: Lake Side Power Plant

i. Block #1 Turbine/HRSG Stacks:

A. Emissions of NO_x shall not exceed 14.9 lb/hr on a 3-hr average basis

B. Compliance with the above conditions shall be demonstrated as follows:

I. NO_x monitoring shall be through use of a CEM as outlined in IX.H.1.f

ii. Block #2 Turbine/HRSG Stacks:

A. Emissions of NO_x shall not exceed 18.1 lb/hr on a 3-hr average basis

B. Compliance with the above conditions shall be demonstrated as follows:

I. NO_x monitoring shall be through use of a CEM as outlined in IX.H.1.f

iii. Startup / Shutdown Limitations:

A. Block #1:

I. Startup and shutdown events shall not exceed 613.5 hours per turbine per 12-month rolling period.

II. Total startup and shutdown events shall not exceed 14 hours per turbine in any one calendar day.

III. Cumulative short-term transient load excursions shall not exceed 160 hours per 12-month rolling period.

IV. During periods of transient load conditions, NO_x emissions from the Block #1 Turbine/HRSG Stacks shall not exceed 25 ppmvd at 15% O₂.

B. Block #2:

I. Startup and shutdown events shall not exceed 553.6 hours per turbine per 12-month rolling period.

II. Total startup and shutdown events shall not exceed 8 hours per turbine in any one calendar day.

III. Cumulative short-term transient load excursions shall not exceed 160 hours per 12-month rolling period.

IV. During periods of transient load conditions, NO_x emissions from the Block #1 Turbine/HRSG Stacks shall not exceed 25 ppmvd at 15% O₂.

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C. Definitions:

- I. Startup is defined as the period beginning with turbine initial firing until the unit meets the lb/hr emission limits listed in IX.H.3.c.i and ii above.
- II. Shutdown is defined as the period beginning with the initiation of turbine shutdown sequence and ending with the cessation of firing of the gas turbine engine.
- III. Transient load conditions are those periods, not to exceed four consecutive 15-minute periods, when the 15-minute average NOx concentration exceeds 2.0 ppmv dry @ 15% O2. Transient load conditions include the following:
 - 1. Initiation/shutdown of combustion turbine inlet air-cooling.
 - 2. Rapid combustion turbine load changes.
 - 3. Initiation/shutdown of HRSG duct burners.
 - 4. Provision of Ancillary Services and Automatic Generation Control.
- IV. For purposes of this subsection a “day” is defined as a period of 24-hours commencing at midnight and ending at the following midnight.

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e. Payson City Corporation: Payson City Power

b. Emissions of NO_x shall be no greater than 1.54 ton per day for all engines combined.

c. Compliance with the emission limitation shall be determined by summing the emissions from all the engines. Emission from each engine shall be calculated from the following equation:

$$\text{Emissions (tons/day)} = (\text{Power production in kW-hrs/day}) \times (\text{Emission factor in grams/kW-hr}) \times (1 \text{ lb}/453.59 \text{ g}) \times (1 \text{ ton}/2000 \text{ lbs})$$

i. The NO_x emission factor for each engine shall be derived from the most recent stack test. Stack tests shall be performed in accordance with IX.H.1.e. Each engine shall be tested at least every three years from the previous test.

ii. NO_x emissions shall be calculated on a daily basis.

iii. A day is equivalent to the time period from midnight to the following midnight.

iv. The number of kilowatt hours generated by each engine shall be recorded on a daily basis with an electrical meter.

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f. Provo City Power: Power Plant

i. NO_x emissions from the operation of all engines at the plant shall not exceed 2.45 tons per day.

ii. Compliance with the emission limitation shall be determined by summing the emissions from all the engines. Emission from each engine shall be calculated from the following equation:

$$\text{Emissions (tons/day)} = (\text{Power production in kW-hrs/day}) \times (\text{Emission factor in grams/kW-hr}) \times (1 \text{ lb}/453.59 \text{ g}) \times (1 \text{ ton}/2000 \text{ lbs})$$

A. The NO_x emission factor for each engine shall be derived from the most recent stack test. Stack tests shall be performed in accordance with IX.H.1.e. Each engine shall be tested every 8,760 hours of operation or at least every three years from the previous test, whichever occurs first.

B. NO_x emissions shall be calculated on a daily basis.

C. A day is equivalent to the time period from midnight to the following midnight.

D. The number of kilowatt hours generated by each engine shall be recorded on a daily basis with an electrical meter.

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g. Springville City Corporation: Whitehead Power Plant

i. NOx emissions from the operation of all engines at the plant shall not exceed 1.68 tons per day.

ii. Internal combustion engine emissions shall be calculated from the operating data recorded by the CEM. CEM will be performed in accordance with IX.H.1.f. A day is equivalent to the time period from midnight to the following midnight. Emissions shall be calculated for NOx for each individual engine by the following equation:

$$D = (X * K)/453.6$$

Where:

X = grams/kW-hr rate for each generator (recorded by CEM)

K = total kW-hr generated by the generator each day (recorded by output meter)

D = daily output of pollutant in lbs/day

1 **H.4 Interim Emission Limits and Operating Practices**

2
3 a. The terms and conditions of this Subsection IX.H.4 shall apply to the sources listed in
4 this section on a temporary basis, as a bridge between the 1991 PM10 State
5 Implementation Plan and this PM10 Maintenance Plan. For all other point sources listed
6 in IX.H.2 and IX.H.3 the limits apply upon approval by the Utah Air Quality Board of the
7 PM10 Maintenance Plan. These bridge requirements are needed to impose limits on the
8 sources that have time delays for implementation of controls. During this timeframe, the
9 sources listed in this section may not meet the established limits listed in IX.H.2 and
10 IX.H.3. As the control technology for the sources listed in this section is installed and
11 operational, the terms and conditions listed in IX.H.1 through 3 become applicable and
12 those limits replace the limits in this subsection.

13
14 b. Petroleum Refineries:

15
16 i. All petroleum refineries in or affecting the PM₁₀ nonattainment/maintenance area
17 shall, for the purpose of this PM₁₀ Maintenance Plan:

18
19 A. Achieve an emission rate equivalent to no more than 9.8 kg of SO₂ per
20 1,000 kg of coke burn- off from any Catalytic Cracking unit by use of
21 low-SO_x catalyst or equivalent emission reduction techniques or
22 procedures, including those outlined in 40 CFR 60, Subpart J. Unless
23 otherwise specified in IX.H.2, compliance shall be determined for each
24 day based on a rolling seven-day average.

25
26 B. Compliance Demonstrations.

27
28 I. Compliance with the maximum daily (24-hr) plant-wide
29 emission limitations for PM₁₀, SO₂, and NO_x shall be
30 determined by adding the calculated emission estimates for all
31 fuel burning process equipment to those from any stack-tested or
32 CEM-measured source components. NO_x and PM₁₀ emission
33 factors shall be determined from AP-42 or from test data.

34
35 For SO_x, the emission factors are:

36
37 Natural gas: EF = 0.60 lb/MMscf

38 Propane: EF = 0.60 lb/MMscf

39 Plant gas: the emission factor shall be calculated from the H₂S
40 measurement required in IX.H.1.g.ii.A.

41
42 Fuel oils (when permitted): The emission factor shall be
43 calculated based on the weight percent of sulfur, as determined
44 by ASTM Method D-4294-89 or approved equivalent, and the
45 density of the fuel oil, as follows:

46
47 $EF \text{ (lb SO}_2\text{/k gal)} = \text{density (lb/gal)} * (1000 \text{ gal/k gal)} * \text{wt.\%}$
48 $S/100 * (64 \text{ lb SO}_2/32 \text{ lb S)}$

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Where mixtures of fuel are used in an affected unit, the above factors shall be weighted according to the use of each fuel.

- II. Daily emission estimates for stack-tested source components shall be made by multiplying the latest stack-tested hourly emission rate times the logged hours of operation (or other relevant parameter) for that source component for each day. This shall not preclude a source from determining emissions through the use of a CEM that meets the requirements of R307-170.

1 c. Big West Oil Company

2
3 i. PM₁₀ Emissions

4
5 A. Combined emissions of filterable PM₁₀ from all external combustion
6 process equipment shall not exceed the following:

- 7
8 I. 0.377 tons per day, between October 1 and March 31;
9 II. 0.407 tons per day, between April 1 and September 30.

10
11 B. Emissions shall be determined for each day by multiplying the
12 appropriate emission factor from section IX.H.4.a.(2) by the relevant
13 parameter (e.g. hours of operation, feed rate, or quantity of fuel
14 combusted) at each affected unit, and summing the results for the group
15 of affected units.

16
17 The daily primary PM₁₀ contribution from the Catalyst Regeneration
18 System shall be calculated using the following equation:

19
20 Emitted PM₁₀ = (Feed rate to FCC in kbbbl/time) * (22 lbs/kbbl)

21
22 wherein the emission factor (22 lbs/kbbl) may be re-established by stack
23 testing. Total 24-hour PM₁₀ emissions shall be calculated by adding the
24 daily emissions from the external combustion process equipment to the
25 estimate for the Catalyst Regeneration System.

26
27 ii. SO₂ Emissions

28
29 A. Combined emissions of sulfur dioxide from all external combustion
30 process equipment shall not exceed the following:

- 31
32 I. 2.764 tons/day, between October 1 and March 31;
33 II. 3.639 tons/day, between April 1 and September 30.

34
35 B. Emissions shall be determined for each day by multiplying the
36 appropriate emission factor from section IX.H.4.a.(2) by the relevant
37 parameter (e.g. hours of operation, feed rate, or quantity of fuel
38 combusted) at each affected unit, and summing the results for the group
39 of affected units.

40
41 The daily SO₂ emission from the Catalyst Regeneration System shall be
42 calculated using the following equation:

43
44 SO₂ = [43.3 lb SO₂/hr / 7,688 bbl feed/day] x [(operational feed rate in
45 bbl/day) x (wt% sulfur in feed / 0.1878 wt%) x (operating hr/day)]

46
47 The FCC feed weight percent sulfur concentration shall be determined by
48 the refinery laboratory every 30 days with one or more analyses.
49 Alternatively, SO₂ emissions from the Catalyst Regeneration System
50 may be determined using a Continuous Emissions Monitor (CEM) in
51 accordance with IX.H.1.f.

1
2 Emissions from the SRU Tail Gas Incinerator (TGI) shall be determined
3 for each day by multiplying the sulfur dioxide concentration in the flue
4 gas by the mass flow of the flue gas.
5

6 Total 24-hour SO₂ emissions shall be calculated by adding the daily
7 emissions from the external combustion process equipment to the values
8 for the Catalyst Regeneration System and the SRU.
9

10 iii. NO_x Emissions

11
12 A. Combined emissions of NO_x from all external combustion process
13 equipment shall not exceed the following:
14

- 15 I. 1.027 tons per day, between October 1 and March 31;
16 II. 1.145 tons per day, between April 1 and September 30.
17

18 B. Emissions shall be determined for each day by multiplying the
19 appropriate emission factor from section IX.H.4.a.(2) by the relevant
20 parameter (e.g. hours of operation, feed rate, or quantity of fuel
21 combusted) at each affected unit, and summing the results for the group
22 of affected units.
23

24 The daily NO_x emission from the Catalyst Regeneration System shall be
25 calculated using the following equation:
26

27
$$\text{NO}_x = (\text{Flue Gas, moles/hr}) \times (180 \text{ ppm} / 1,000,000) \times (30.006 \text{ lb/mole}) \times$$

28 (operating hr/day)
29

30 wherein the scalar value (180 ppm) may be re-established by stack
31 testing.
32

33 Alternatively, NO_x emissions from the Catalyst Regeneration System
34 may be determined using a Continuous Emissions Monitor (CEM) in
35 accordance with IX.H.1.f.
36

37 Total 24-hour NO_x emissions shall be calculated by adding the daily
38 emissions from gas-fired compressor drivers and the external combustion
39 process equipment to the value for the Catalyst Regeneration System.

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d. Chevron Products Company

i. PM₁₀ Emissions

A. Combined emissions of filterable PM₁₀ from all external combustion process equipment shall be no greater than 0.234 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

ii. SO₂ Emissions

A. Combined emissions of sulfur dioxide from gas-fired compressor drivers and all external combustion process equipment, including the FCC CO Boiler and Catalyst Regenerator, shall not exceed 0.5 tons/day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

Alternatively, SO₂ emissions from the FCC CO Boiler and Catalyst Regenerator may be determined using a Continuous Emissions Monitor (CEM) in accordance with IX.H.1.f.

iii. NO_x Emissions

A. Combined emissions of NO_x from gas-fired compressor drivers and all external combustion process equipment, including the FCC CO Boiler and Catalyst Regenerator and the SRU Tail Gas Incinerator, shall be no greater than 2.52 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

Alternatively, NO_x emissions from the FCC CO Boiler and Catalyst Regenerator may be determined using a Continuous Emissions Monitor (CEM) in accordance with IX.H.1.f.

iv. Chevron shall be permitted to combust HF alkylation polymer oil in its Alkylation unit.

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e. Holly Refining and Marketing Company

i. PM₁₀ Emissions

A. Combined emissions of filterable PM₁₀ from all combustion sources, shall be no greater than 0.44 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2), or from testing as described below, by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

ii. SO₂ Emissions

A. Combined emissions of SO₂ from all sources shall be no greater than 4.714 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

Emissions from the FCCU wet scrubbers shall be determined using a Continuous Emissions Monitor (CEM) in accordance with IX.H.1.f.

iii. NO_x Emissions:

A. Combined emissions of NO_x from all sources shall be no greater than 2.20 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

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f. Tesoro Refining & Marketing Company

i. PM₁₀ Emissions

- A. Combined emissions of filterable PM₁₀ from gas-fired compressor drivers and all external combustion process equipment, including the FCC/CO Boiler (ESP), shall be no greater than 0.261 tons per day.

Emissions for gas-fired compressor drivers and the group of external combustion process equipment shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

ii. SO₂ Emissions

- A. Combined emissions of SO₂ from gas-fired compressor drivers and all external combustion process equipment, including the FCC/CO Boiler (ESP), shall not exceed the following:

- I. November 1 through end of February: 3.699 tons/day
II. March 1 through October 31: 4.374 tons/day

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.

Emissions from the ESP stack (FCC/CO Boiler) shall be determined by multiplying the SO₂ concentration in the flue gas by the mass flow of the flue gas.

The SO₂ concentration in the flue gas shall be determined by a continuous emission monitor (CEM).

iii. NO_x Emissions

- A. Combined emissions of NO_x from gas-fired compressor drivers and all external combustion process equipment shall be no greater than 1.988 tons per day.

Emissions shall be determined for each day by multiplying the appropriate emission factor from section IX.H.4.a.(2) by the relevant parameter (e.g. hours of operation, feed rate, or quantity of fuel combusted) at each affected unit, and summing the results for the group of affected units.