



Janice K. Brewer  
Governor

# ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Henry R. Darwin  
Director

DEC 18 2014

Mr. Jared Blumenfeld  
Regional Administrator  
U.S. Environmental Protection Agency, Region IX  
75 Hawthorne Street, ORA-1  
San Francisco, CA 94105

RE: *Arizona State Implementation Plan Revision, Maintenance Plan for the Morenci Sulfur Dioxide Planning Area (1971 NAAQS)*

*Jared*  
Dear Mr. Blumenfeld:

Consistent with the provisions of Arizona Revised Statutes Title 49, §§ 49-104, 49-106, and 49-404 (Enclosure 1) and the Code of Federal Regulations Title 40, §§ 51.102-51.104, the Arizona Department of Environmental Quality (ADEQ) hereby adopts and submits to the U.S. Environmental Protection Agency (EPA) the December 2014, *Arizona State Implementation Plan Revision, Maintenance Plan for the Morenci Sulfur Dioxide Planning Area (1971 NAAQS)*, as a revision to the Arizona State Implementation Plan (SIP).

This SIP revision demonstrates that the Morenci Planning Area will continue to meet the 1971 health-based 24-hour average and annual average SO<sub>2</sub> National Ambient Air Quality Standards (NAAQS) for a second maintenance period, through 2030. The SIP revision includes background information, information on the historical monitoring network, a projected emissions inventory, control measures, and maintenance demonstration.

The Morenci Sulfur Dioxide Nonattainment Area State Implementation and Maintenance Plan and redesignation request was submitted to the U.S. Environmental Protection Agency (EPA) in June 2002. The SIP revision summarized the progress of the area towards attaining the SO<sub>2</sub> standards, demonstrated that all Clean Air Act (CAA) requirements had been satisfied, and included a maintenance plan to assure the area would continue to attain the standard after redesignation, through 2015. EPA approved the plan and redesignated the area to attainment effective June 25, 2004 (69 FR 22447; April 26, 2004). Section 175A(a) of the CAA requires states to demonstrate maintenance of the NAAQS for at least ten years after redesignation to attainment. The effective first maintenance period for the Morenci area is 2004 through 2015.

A subsequent SIP revision, under CAA Section 175A(b), is due eight years after an area is redesignated to attainment in order to provide for maintenance of the NAAQS for an additional 10 years after the expiration of the first 10-year maintenance period. The information contained

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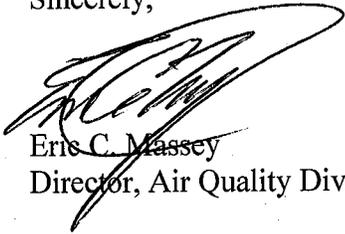
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in this document shows that the air quality standards will continue to be maintained from the expiration of the first maintenance period through 2030.

Enclosure 2 contains the SIP Completeness Checklist. Enclosure 3 contains paper copies and one exact duplicate electronic copy of the December 2014 Maintenance Plan for your review and action. ADEQ requests that EPA approve the December 2014 Maintenance Plan.

If you have any questions, please contact me at (602) 771-2308.

Sincerely,



Eric C. Massey  
Director, Air Quality Division

Enclosures (3)

cc: Colleen McKaughan, EPA, w/o enclosures



Janice K. Brewer  
Governor

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Henry R. Darwin  
Director

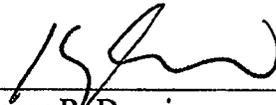
May 2, 2014

TO: Eric Massey  
Division Director  
Air Quality Division

Under A.R.S. §49-104(D)(2), I authorize you, Eric Massey, Division Director, Air Quality Division, Arizona Department of Environmental Quality, to perform any act, including execution of any pertinent documents, which I as Director of the Arizona Department of Environmental Quality am authorized or required to do by law with respect to A.R.S. Title 49, chapters 1 and 3 and any other acts relating to air quality including personnel actions.

This authority shall remain in effect until it is revoked or upon your separation from the Arizona Department of Environmental Quality. You may further delegate this authority in the best interest of the agency, however, those delegations must be in writing and you must forward a copy of any further delegations to me.

This delegation is effective May 2, 2014, and revokes all earlier delegations. I ratify all acts performed by you as Air Quality Division Director concerning the duties and functions in this delegation letter.

  
Henry R. Darwin  
Director

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**ENCLOSURE 1**

*Arizona Revised Statutes §§ 49-104, 49-106, and 49-404*

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#### 49-104. Powers and duties of the department and director

A. The department shall:

1. Formulate policies, plans and programs to implement this title to protect the environment.
2. Stimulate and encourage all local, state, regional and federal governmental agencies and all private persons and enterprises that have similar and related objectives and purposes, cooperate with those agencies, persons and enterprises and correlate department plans, programs and operations with those of the agencies, persons and enterprises.
3. Conduct research on its own initiative or at the request of the governor, the legislature or state or local agencies pertaining to any department objectives.
4. Provide information and advice on request of any local, state or federal agencies and private persons and business enterprises on matters within the scope of the department.
5. Consult with and make recommendations to the governor and the legislature on all matters concerning department objectives.
6. Promote and coordinate the management of air resources to assure their protection, enhancement and balanced utilization consistent with the environmental policy of this state.
7. Promote and coordinate the protection and enhancement of the quality of water resources consistent with the environmental policy of this state.
8. Encourage industrial, commercial, residential and community development that maximizes environmental benefits and minimizes the effects of less desirable environmental conditions.
9. Assure the preservation and enhancement of natural beauty and man-made scenic qualities.
10. Provide for the prevention and abatement of all water and air pollution including that related to particulates, gases, dust, vapors, noise, radiation, odor, nutrients and heated liquids in accordance with article 3 of this chapter and chapters 2 and 3 of this title.
11. Promote and recommend methods for the recovery, recycling and reuse or, if recycling is not possible, the disposal of solid wastes consistent with sound health, scenic and environmental quality policies. Beginning in 2014, the department shall report annually on its revenues and expenditures relating to the solid and hazardous waste programs overseen or administered by the department.
12. Prevent pollution through the regulation of the storage, handling and transportation of solids, liquids and gases that may cause or contribute to pollution.
13. Promote the restoration and reclamation of degraded or despoiled areas and natural resources.
14. Assist the department of health services in recruiting and training state, local and district health department personnel.

15. Participate in the state civil defense program and develop the necessary organization and facilities to meet wartime or other disasters.

16. Cooperate with the Arizona-Mexico commission in the governor's office and with researchers at universities in this state to collect data and conduct projects in the United States and Mexico on issues that are within the scope of the department's duties and that relate to quality of life, trade and economic development in this state in a manner that will help the Arizona-Mexico commission to assess and enhance the economic competitiveness of this state and of the Arizona-Mexico region.

17. Unless specifically authorized by the legislature, ensure that state laws, rules, standards, permits, variances and orders are adopted and construed to be consistent with and no more stringent than the corresponding federal law that addresses the same subject matter. This provision shall not be construed to adversely affect standards adopted by an Indian tribe under federal law.

B. The department, through the director, shall:

1. Contract for the services of outside advisers, consultants and aides reasonably necessary or desirable to enable the department to adequately perform its duties.

2. Contract and incur obligations reasonably necessary or desirable within the general scope of department activities and operations to enable the department to adequately perform its duties.

3. Utilize any medium of communication, publication and exhibition when disseminating information, advertising and publicity in any field of its purposes, objectives or duties.

4. Adopt procedural rules that are necessary to implement the authority granted under this title, but that are not inconsistent with other provisions of this title.

5. Contract with other agencies, including laboratories, in furthering any department program.

6. Use monies, facilities or services to provide matching contributions under federal or other programs that further the objectives and programs of the department.

7. Accept gifts, grants, matching monies or direct payments from public or private agencies or private persons and enterprises for department services and publications and to conduct programs that are consistent with the general purposes and objectives of this chapter. Monies received pursuant to this paragraph shall be deposited in the department fund corresponding to the service, publication or program provided.

8. Provide for the examination of any premises if the director has reasonable cause to believe that a violation of any environmental law or rule exists or is being committed on the premises. The director shall give the owner or operator the opportunity for its representative to accompany the director on an examination of those premises. Within forty-five days after the date of the examination, the department shall provide to the owner or operator a copy of any report produced as a result of any examination of the premises.

9. Supervise sanitary engineering facilities and projects in this state, authority for which is vested in the department, and own or lease land on which sanitary engineering facilities are located, and operate the

facilities, if the director determines that owning, leasing or operating is necessary for the public health, safety or welfare.

10. Adopt and enforce rules relating to approving design documents for constructing, improving and operating sanitary engineering and other facilities for disposing of solid, liquid or gaseous deleterious matter.

11. Define and prescribe reasonably necessary rules regarding the water supply, sewage disposal and garbage collection and disposal for subdivisions. The rules shall:

(a) Provide for minimum sanitary facilities to be installed in the subdivision and may require that water systems plan for future needs and be of adequate size and capacity to deliver specified minimum quantities of drinking water and to treat all sewage.

(b) Provide that the design documents showing or describing the water supply, sewage disposal and garbage collection facilities be submitted with a fee to the department for review and that no lots in any subdivision be offered for sale before compliance with the standards and rules has been demonstrated by approval of the design documents by the department.

12. Prescribe reasonably necessary measures to prevent pollution of water used in public or semipublic swimming pools and bathing places and to prevent deleterious conditions at such places. The rules shall prescribe minimum standards for the design of and for sanitary conditions at any public or semipublic swimming pool or bathing place and provide for abatement as public nuisances of premises and facilities that do not comply with the minimum standards. The rules shall be developed in cooperation with the director of the department of health services and shall be consistent with the rules adopted by the director of the department of health services pursuant to section 36-136, subsection H, paragraph 10.

13. Prescribe reasonable rules regarding sewage collection, treatment, disposal and reclamation systems to prevent the transmission of sewage borne or insect borne diseases. The rules shall:

(a) Prescribe minimum standards for the design of sewage collection systems and treatment, disposal and reclamation systems and for operating the systems.

(b) Provide for inspecting the premises, systems and installations and for abating as a public nuisance any collection system, process, treatment plant, disposal system or reclamation system that does not comply with the minimum standards.

(c) Require that design documents for all sewage collection systems, sewage collection system extensions, treatment plants, processes, devices, equipment, disposal systems, on-site wastewater treatment facilities and reclamation systems be submitted with a fee for review to the department and may require that the design documents anticipate and provide for future sewage treatment needs.

(d) Require that construction, reconstruction, installation or initiation of any sewage collection system, sewage collection system extension, treatment plant, process, device, equipment, disposal system, on-site wastewater treatment facility or reclamation system conform with applicable requirements.

14. Prescribe reasonably necessary rules regarding excreta storage, handling, treatment, transportation and disposal. The rules shall:

(a) Prescribe minimum standards for human excreta storage, handling, treatment, transportation and disposal and shall provide for inspection of premises, processes and vehicles and for abating as public nuisances any premises, processes or vehicles that do not comply with the minimum standards.

(b) Provide that vehicles transporting human excreta from privies, septic tanks, cesspools and other treatment processes shall be licensed by the department subject to compliance with the rules. The department may require payment of a fee as a condition of licensure. After the effective date of this amendment to this section, the department shall establish by rule a fee as a condition of licensure, including a maximum fee. As part of the rule making process, there must be public notice and comment and a review of the rule by the joint legislative budget committee. After September 30, 2013, the department shall not increase that fee by rule without specific statutory authority for the increase. The fees shall be deposited, pursuant to sections 35-146 and 35-147, in the solid waste fee fund established by section 49-881.

15. Perform the responsibilities of implementing and maintaining a data automation management system to support the reporting requirements of title III of the superfund amendments and reauthorization act of 1986 (P.L. 99-499) and title 26, chapter 2, article 3.

16. Approve remediation levels pursuant to article 4 of this chapter.

17. Establish or revise fees by rule pursuant to the authority granted under title 44, chapter 9, article 8 and chapters 4 and 5 of this title for the department to adequately perform its duties. All fees shall be fairly assessed and impose the least burden and cost to the parties subject to the fees. In establishing or revising fees, the department shall base the fees on:

(a) The direct and indirect costs of the department's relevant duties, including employees salaries and benefits, professional and outside services, equipment, in-state travel and other necessary operational expenses directly related to issuing licenses as defined in title 41, chapter 6 and enforcing the requirements of the applicable regulatory program.

(b) The availability of other funds for the duties performed.

(c) The impact of the fees on the parties subject to the fees.

(d) The fees charged for similar duties performed by the department, other agencies and the private sector.

C. The department may:

1. Charge fees to cover the costs of all permits and inspections it performs to ensure compliance with rules adopted under section 49-203, except that state agencies are exempt from paying the fees. Monies collected pursuant to this subsection shall be deposited, pursuant to sections 35-146 and 35-147, in the water quality fee fund established by section 49-210.

2. Contract with private consultants for the purposes of assisting the department in reviewing applications for licenses, permits or other authorizations to determine whether an applicant meets the criteria for issuance of the license, permit or other authorization. If the department contracts with a consultant under this paragraph, an applicant may request that the department expedite the application review by requesting that the department use the services of the consultant and by agreeing to pay the department the costs of the consultant's services. Notwithstanding any other law, monies paid by applicants for

expedited reviews pursuant to this paragraph are appropriated to the department for use in paying consultants for services.

D. The director may:

1. If the director has reasonable cause to believe that a violation of any environmental law or rule exists or is being committed, inspect any person or property in transit through this state and any vehicle in which the person or property is being transported and detain or disinfect the person, property or vehicle as reasonably necessary to protect the environment if a violation exists.
2. Authorize in writing any qualified officer or employee in the department to perform any act that the director is authorized or required to do by law.

#### 49-106. Statewide application of rules

The rules adopted by the department apply and shall be observed throughout this state, or as provided by their terms, and the appropriate local officer, council or board shall enforce them. This section does not limit the authority of local governing bodies to adopt ordinances and rules within their respective jurisdictions if those ordinances and rules do not conflict with state law and are equal to or more restrictive than the rules of the department, but this section does not grant local governing bodies any authority not otherwise provided by separate state law.

#### 49-404. State implementation plan

- A. The director shall maintain a state implementation plan that provides for implementation, maintenance and enforcement of national ambient air quality standards and protection of visibility as required by the clean air act.
- B. The director may adopt rules that describe procedures for adoption of revisions to the state implementation plan.
- C. The state implementation plan and all revisions adopted before September 30, 1992 remain in effect according to their terms, except to the extent otherwise provided by the clean air act, inconsistent with any provision of the clean air act, or revised by the administrator. No control requirement in effect, or required to be adopted by an order, settlement agreement or plan in effect, before the enactment of the clean air act in any area which is a nonattainment or maintenance area for any air pollutant may be modified after enactment in any manner unless the modification insures equivalent or greater emission reductions of the air pollutant. The director shall evaluate and adopt revisions to the plan in conformity with federal regulations and guidelines promulgated by the administrator for those purposes until the rules required by subsection B are effective.

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**ENCLOSURE 2**

*State Implementation Plan Completeness Checklist*

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# STATE IMPLEMENTATION PLAN COMPLETENESS CHECKLIST

## Submittal of

### *Arizona State Implementation Plan Revision for the Morenci Sulfur Dioxide Planning Area (1971 NAAQS)*

40 CFR Part 51, Appendix V, *Criteria for Determining the Completeness of Plan Submissions*, contains the “minimum criteria for determining whether a State Implementation Plan submitted for consideration by EPA is an official submission for purposes of review under §51.103,” *Submission of plans, preliminary review of plans*. Appendix V requires the following to be included in plan submissions for review by EPA:

1. **"A formal letter of submittal from the Governor or his designee, requesting EPA acceptance of the plan or revision thereof (hereafter “the plan”)."** [Appendix V, 2.1(a)]  
See cover letter.
2. **"Evidence that the State has adopted the plan in the State code or body of regulations; or issued the permit, order, consent agreement (hereafter “document”) in final form. That evidence shall include the date of adoption or final issuance as well as the effective date of the plan, if different from the adoption/issuance date."** [Appendix V, 2.1(b)]  
See cover letter
3. **"Evidence that the State has the necessary legal authority under State law to adopt and implement the plan."** [Appendix V, 2.1(c)]  
Refer to Enclosure 1.
4. **"A copy of the actual regulation, or document submitted for approval and incorporation by reference into the plan, including indication of the changes made (such as, redline/strikethrough) to the existing approved plan, where applicable ..."** [Appendix V, 2.1(d)]  
Refer to the Arizona State Implementation Plan Revision Maintenance Plan for the Morenci Sulfur Dioxide Planning Area (1971 NAAQS).
5. **"Evidence that the State followed all of the procedural requirements of the State’s laws and constitution in conducting and completing the adoption/issuance of the plan."** [Appendix V, 2.1(e)]  
Refer to cover letter, Enclosure 3, and Appendix E.
6. **"Evidence that public notice was given of the proposed change consistent with procedures approved by EPA, including the date of publication of such notice."** [Appendix V, 2.1(f)]  
Refer to Enclosure 3, Appendix E.
7. **"Certification that public hearing(s) were held in accordance with the information provided in the public notice and the State’s laws and constitution, if applicable and consistent with the public hearing requirements in 40 CFR 51.102."** [Appendix V, 2.1(g)]  
Refer to Enclosure 3, Appendix E.
8. **"Compilation of public comments and the State’s response thereto."** [Appendix V, 2.1(h)]  
Refer to Enclosure 3, Appendix E.

9. **"Identification of all regulated pollutants affected by the plan."** [Appendix V, 2.2(a)]  
The regulated pollutant is Sulfur Dioxide (SO<sub>2</sub>).
10. **"Identification of the locations of affected sources including the EPA attainment/nonattainment designation of the locations and the status of the attainment plan for the affected areas(s)."** [Appendix V, 2.2 (b)]  
See Enclosure 3, Chapters 1, Chapters 3 and 5.
11. **"Quantification of the changes in plan allowable emissions from the affected sources; estimates of changes in current actual emissions from affected sources or, where appropriate, quantification of changes in actual emissions from affected sources through calculations of the differences between certain baseline levels and allowable emissions anticipated as a result of the revision."** [Appendix V, 2.2(c)]  
See Enclosure 3, Chapters 3, 4, and 5.
12. **"The State's demonstration that the national ambient air quality standards, prevention of significant deterioration increments, reasonable further progress demonstration, and visibility, as applicable, are protected if the plan is approved and implemented. For all requests to redesignate an area to attainment for a national primary ambient air quality standard, under section 107 of the Act, a revision must be submitted to provide for the maintenance of the national primary ambient air quality standards for at least 10 years as required by section 175A of the Act."** [Appendix V, 2.2(d)]  
See Enclosure 3, Chapters 4, 5, and 6.
13. **"Modeling information required to support the proposed revision, including input data, output data, models used, justification of model selections, ambient monitoring data used, meteorological data used, justification for use of offsite data (where used), modes of models used, assumptions, and other information relevant to the determination of adequacy of the modeling analysis."** [Appendix V, 2.2(e)]  
See Enclosure 3, Chapter 5.
14. **"Evidence, where necessary, that emission limitations are based on continuous emission reduction technology."** [Appendix V, 2.2(f)]  
Not applicable.
15. **"Evidence that the plan contains emission limitations, work practice standards and recordkeeping/reporting requirements, where necessary, to ensure emission levels."** [Appendix V, 2.2(g)]  
Not applicable.
16. **"Compliance/enforcement strategies, including how compliance will be determined in practice."** [Appendix V, 2.2(h)]  
See Enclosure 3, Chapter 6.
17. **"Special economic and technological justifications required by any applicable EPA policies, or an explanation of why such justifications are not necessary."** [Appendix V, 2.2(i)]  
No known deviation from EPA policy.

**ENCLOSURE 3**

*Arizona State Implementation Plan Revision*

*Maintenance Plan for the Morenci Sulfur Dioxide Planning Area (1971 NAAQS)*

*December 2014*

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**FINAL**

***Arizona State Implementation Plan Revision***

***Maintenance Plan for the  
Morenci Sulfur Dioxide Planning Area  
(1971 NAAQS)***

**Air Quality Division  
December 18, 2014**

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## Table of Contents

Table of Contents .....	i
List of Executive Summary Figures .....	iii
List of Figures .....	iii
List of Tables .....	iii
List of Appendices .....	iii
EXECUTIVE SUMMARY .....	1
1.0 INTRODUCTION .....	3
1.1 Statement of Introduction and Purpose.....	3
1.2 National Ambient Air Quality Standards.....	3
1.3 Sulfur Dioxide Air Quality Standards.....	3
1.4 Regulatory Background .....	4
1.5 Morenci Sulfur Dioxide Planning Area Description .....	7
1.5.1 Morenci Sulfur Dioxide Planning Area Boundary .....	7
1.5.2 Geography and Climate .....	9
1.5.3 Population .....	9
1.5.4 Economy .....	10
1.6 General SIP Approach – Regulatory Requirements and Guidance .....	10
1.6.1 Clean Air Act Requirements for Maintenance Plans .....	11
1.6.2 Clean Air Act Conformity Provisions.....	11
1.6.3 EPA Guidance.....	12
2.0 AIR QUALITY MONITORING .....	14
2.1 Monitoring Site, Equipment, and Quality Assurance Procedure.....	14
2.2 SO <sub>2</sub> Data Summary .....	15
3.0 EMISSIONS INVENTORIES AND PROJECTIONS TO 2030.....	17
3.1 Emissions Inventories (Historical).....	18
3.1.1 Point Sources .....	18
3.1.2 Area and Mobile Sources.....	18
3.2 2011 Emissions Inventory (Current).....	19
3.2.1 Point Sources .....	19
3.2.2 Totals for Mobile, Area and Point Sources.....	22
3.3 Emissions Projections .....	22
3.3.1 Point Source Projections .....	22
3.3.2 Point Source Projections .....	22
4.0 CONTROL MEASURES .....	25
4.1 Point Sources .....	25
4.2 Area and Mobile Sources.....	25
5.0 MODELING DEMONSTRATION.....	27
5.1 Historical Modeling Analysis .....	27
5.2 Current Modeling Demonstration .....	27
6.0 MAINTENANCE PLAN SUMMARY .....	30
6.1 Emissions Inventories .....	30
6.2 Maintenance Demonstration .....	30
6.3 Ambient Monitoring .....	31
6.5 Contingency Plan .....	32

6.6 Conclusion .....	33
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## List of Executive Summary Figures

ES- 1 Total SO <sub>2</sub> Sources within Morenci Maintenance Area .....	1
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### List of Figures

Figure 1.1: Morenci Sulfur Dioxide Planning Area.....	8
Figure 3.1: Morenci Sulfur Dioxide Planning Area and 50 km Buffer Area Point Sources .....	21
Figure 6.1: SO <sub>2</sub> Emissions for Years 1984-2030 .....	31

### List of Tables

Table 1.1 1971 Sulfur Dioxide National Ambient Air Quality Standards .....	4
Table 1.2 Morenci Sulfur Dioxide Area Description.....	7
Table 1.3 Greenlee County Population Estimates .....	9
Table 1.4 Labor Force Data for Morenci and Clifton .....	10
Table 2.1: State of Arizona Morenci SO <sub>2</sub> Ambient Air Quality Monitors .....	15
Table 2.2: Phelps Dodge Morenci SO <sub>2</sub> Ambient Air Quality Stationary and Mobile Monitors .....	15
Table 3.1: Total Historical Potential to Emit and Actual Emissions in tons for years 1984 and 1999 .....	18
Table 3.2: Historical Greenlee County and Morenci Area and Mobile Source Emissions in tons .....	18
Table 3.3: SO <sub>2</sub> Point Sources within Morenci Planning Area .....	19
Table 3.4: SO <sub>2</sub> Point Sources within 50-km Buffer .....	20
Table 3.5: Total SO <sub>2</sub> Emissions for the Morenci Planning Area-2011 .....	22
Table 3.6: Point Source Projections in Planning Area to 2030.....	23
Table 3.7: Point Source Projections within the 50km Buffer Area.....	23
Table 3.8: Area and Mobile Sources SO <sub>2</sub> Emissions Projections for the Morenci Planning Area .....	24
Table 5.1: Emissions of SO <sub>2</sub> for FMMM and FMSM in Renewal Permits .....	28
Table 5.2: Cumulative Impacts of FMMM and FMSM on the Morenci Maintenance Area .....	29
Table 5.3: Cumulative Impacts of FMMM and FMSM on the Morenci Maintenance Area Boundary .....	29

### List of Appendices

Appendix A <i>Procedures for Processing Requests to Redesignate Areas to Attainment</i> , Memorandum, John Calcagni, Director, Air Quality Management Division, U.S. Environmental Protection	
Appendix B <i>Redesignation of Sulfur Dioxide Nonattainment Areas in the Absence of Monitored Data</i> , Memorandum, John Seitz, Director, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, October 18, 2000	
Appendix C Morenci Maintenance Plan Emissions Inventory	
Appendix D Morenci Modeling Analysis	
Appendix E State Implementation Plan Revision Public Comment and Hearing Documentation	

- E.1 Notice of Public Hearing
- E.2 Public Hearing Agenda
- E.3 Public Hearing Sign-In Sheet
- E.4 Public Hearing Officer Certification and Transcript
- E.5 Responsiveness Summary

## EXECUTIVE SUMMARY

The Morenci Sulfur Dioxide (SO<sub>2</sub>) Maintenance Plan demonstrates that the Morenci planning area will continue to meet the 1971 health-based 24-hour and annual SO<sub>2</sub> National Ambient Air Quality Standards (NAAQS) for a second maintenance period, through 2030.

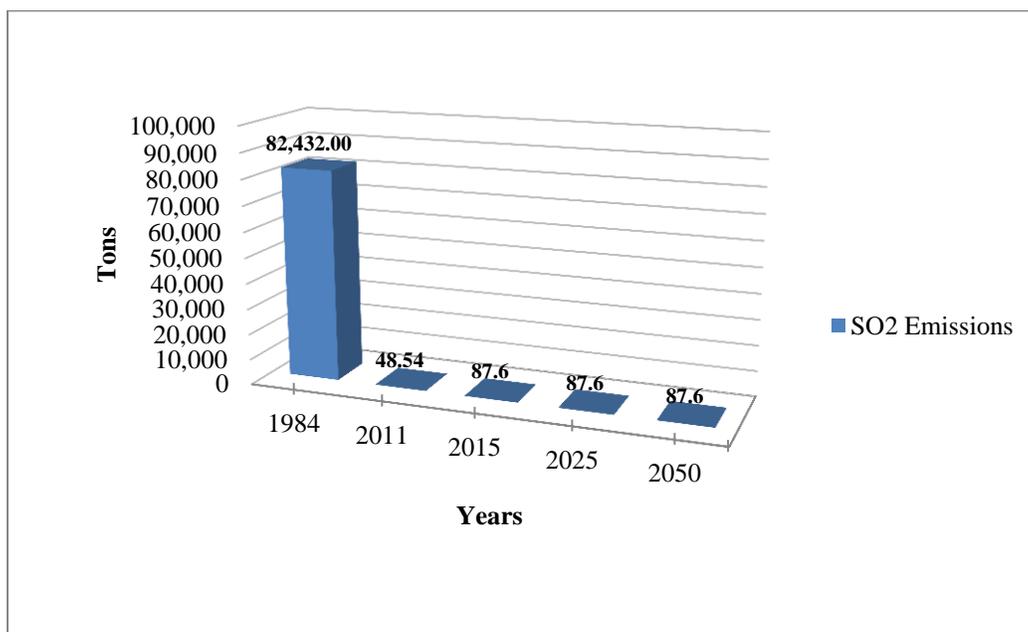
An overview of the NAAQS and Clean Air Act (CAA) Requirements are discussed in further detail in Chapter 1. This chapter also gives a summary of the regulatory background including boundary designations and describes the planning area's geography, climate, population, and economy.

Chapter 2 presents the history of the monitoring network and the monitoring requirements of the planning area. Due to the closure of facility on December 31, 1984, which was the primary source of SO<sub>2</sub> emissions, no ambient monitors are currently in operation within the area. If a new major source is constructed in the planning area, the Arizona Department of Environmental Quality (ADEQ) will develop and implement an appropriate monitoring network according to federal and state regulations.

Emissions inventories in Chapter 3 reveal that while in operation, the Phelps Dodge Mining Company's primary copper smelter was the largest point source in the Morenci Nonattainment Area.<sup>ES[1]</sup> Figure ES-1 shows that no other point, area, or mobile source has generated or currently generates as high a level of SO<sub>2</sub> emissions in the area as the smelter did when in operation. The smelter permanently deactivated in December 1984. Dismantling of the facility began in 1995 and reclamation was completed by December 1996. In 1997, ADEQ verified that the Phelps Dodge Morenci smelter was closed and dismantled. The closure of this facility resulted in permanent significant emissions reductions.

Figure ES-1 illustrates point source emissions reductions due to the closure of the smelter and shows that future emissions remain low enough to not cause a violation of the NAAQS. The 1984 and 2011 levels are based on actual emission estimates, while projected emission estimates are based on the potential to emit (PTE) of extant sources. The 2030 inventory represents emissions projected through the second ten-year maintenance period.

**ES- 1 Total SO<sub>2</sub> Sources within Morenci Maintenance Area**



<sup>ES[1]</sup> Freeport-McMoRan bought the Phelps Dodge Corporation in 2007;<http://seagoedd.org/?s=population+morenci>.

Chapter 4 describes the implementation of primary control measures used to achieve attainment and maintenance of the SO<sub>2</sub> NAAQS. For previous SIP revisions, EPA has considered the closure of the smelter as sufficient to meet reasonably available control measure (RACM) requirements in the Morenci planning area. Additional measures to ensure continued attainment of the SO<sub>2</sub> NAAQS are implemented through state and county permitting requirements. There are also several national programs that integrate engine and fuel controls for highway vehicles and non-road equipment to reduce SO<sub>2</sub> emissions for area and mobile sources.

The modeling analysis contained in Chapter 5 demonstrates continued attainment of the NAAQS. The analysis includes two of the largest sources within the planning area, Freeport McMoRan Mine and Safford Mine. The model estimates that the mines, which emit a combined total of about 169 tons per year of SO<sub>2</sub>, do not contribute to violations of the 1971 SO<sub>2</sub> NAAQS.

Chapter 6 summarizes the measures that ensure continued maintenance of the NAAQS through the year 2030. This discussion shows the permanence and enforceability of the emission reductions responsible for the air quality improvement and attainment of the NAAQS. Maintenance of the SO<sub>2</sub> NAAQS in the Morenci area will be tracked through updates to the emissions inventory and permit applications received for SO<sub>2</sub> emitting sources. The Chapter also includes a commitment to resume ambient monitoring before any new major SO<sub>2</sub> source begins operation in the area.

The permanent and enforceable control measures and projections of future emissions presented in this document demonstrate that the Morenci area will continue to maintain the SO<sub>2</sub> air quality standards. With this submittal, ADEQ requests that EPA approve this maintenance plan for the 1971 SO<sub>2</sub> 24-hour and annual NAAQS through 2030 in accordance with CAA §175A.

## **1.0 INTRODUCTION**

Chapter 1 describes the purpose of this State Implementation Plan (SIP) revision for the Morenci Sulfur Dioxide (SO<sub>2</sub>) Planning Area, summarizes the regulatory background of the area, and provides a general overview of the area and county.

### **1.1 Statement of Introduction and Purpose**

This SIP revision demonstrates that the Morenci Planning Area will continue to meet the 1971 health-based 24-hour average and annual average SO<sub>2</sub> National Ambient Air Quality Standards (NAAQS) for a second maintenance period, through 2030.

The *Morenci Sulfur Dioxide Nonattainment Area State Implementation and Maintenance Plan* and redesignation request was submitted to the U.S. Environmental Protection Agency (EPA) in June 2002. The SIP revision summarized the progress of the area towards attaining the SO<sub>2</sub> standards, demonstrated that all Clean Air Act (CAA) requirements had been satisfied, and included a maintenance plan to assure the area would continue to attain the standard after redesignation, through 2015. EPA approved the plan and redesignated the area to attainment effective June 25, 2004 (69 FR 22447; April 26, 2004). Section 175A(a) of the CAA requires states to demonstrate maintenance of the NAAQS for at least ten years after redesignation to attainment. The effective first maintenance period for the Morenci area is 2004 through 2015.

A subsequent SIP revision, under CAA Section 175A(b), is due eight years after an area is redesignated to attainment in order to provide for maintenance of the NAAQS for an additional 10 years after the expiration of the first 10-year maintenance period. The information contained in this document shows that the air quality standards will continue to be maintained from the expiration of the first maintenance period through 2030.

### **1.2 National Ambient Air Quality Standards**

Title I of the CAA requires EPA to set NAAQS for those pollutants considered harmful to both public health and the environment. EPA set standards for six air pollutants: ground-level ozone, particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide and lead. There are two types of NAAQS: primary and secondary. Primary standards are set to protect human health and established secondary standards protect public welfare, such as decreased visibility and damage to animals, crops, vegetation and buildings.

The standard for each pollutant is set at a maximum concentration in either parts per million (ppm) by volume, parts per billion (ppb) by volume, or micrograms per cubic meter of air (µg/m<sup>3</sup>). Each standard also has a distinct averaging time that provides the necessary level of protection. These standards are reviewed every five years and are retained or revised based on review of scientific literature and analyses.

### **1.3 Sulfur Dioxide Air Quality Standards**

The federal air quality standards for SO<sub>2</sub> were established in 1971 and identified ambient concentrations that affect human health and welfare. The original primary and secondary NAAQS for SO<sub>2</sub> were codified in Volume 42 of the Code of Federal Regulations (CFR), Part 410 (42 CFR Part 410) on April 30, 1971

(36 FR 81875), and recodified in 40 CFR 50.4 and 50.5 on November 25, 1971 (36 FR 22384). On May 22, 1996, EPA promulgated several technical changes; however, no changes were made to the level of the standards at that time (61 FR 25566).<sup>1</sup> Table 1.1 shows the 1971 primary and secondary SO<sub>2</sub> NAAQS, as modified in 1996. Arizona adopted these standards at Arizona Administrative Code (AAC) R18-2-202, effective May 05, 2011.

**Table 1.1 1971 Sulfur Dioxide National Ambient Air Quality Standards**

Final Rule/Decision	Primary/Secondary	Averaging Time	Level		Form
1971	Primary	24-Hour	0.14 ppm	365 µg/m <sup>3</sup>	Not to be exceeded more than once per year
		Annual	0.03 ppm	80 µg/m <sup>3</sup>	Annual arithmetic average
	Secondary <sup>2</sup>	3-Hour	0.5 ppm	1300 µg/m <sup>3</sup>	Not to be exceeded more than once per year
		Annual	0.02 ppm	52 µg/m <sup>3</sup>	Annual arithmetic average
1973	Secondary	Secondary 3-hour SO <sub>2</sub> standard retained, without revision; secondary annual SO <sub>2</sub> standard revoked.			
1996	Primary	Existing primary SO <sub>2</sub> standards retained, without revision.			
Source: <a href="http://www.epa.gov/ttn/naaqs/standards/so2/s_so2_history.html">http://www.epa.gov/ttn/naaqs/standards/so2/s_so2_history.html</a> .					

On June 22, 2010, EPA replaced the existing annual and 24-hour primary SO<sub>2</sub> standards with a new 1-hour SO<sub>2</sub> standard set a level of 75 ppb to better protect public health by reducing public exposure to elevated short-term concentrations of SO<sub>2</sub> (75 FR 35520; effective August 23, 2010). Planning obligations for the 1971 standards, including this renewal of the Morenci maintenance plan, continue until they are subsumed by planning and control requirements associated with new NAAQS.

On December 8, 2009, EPA proposed to retain the current SO<sub>2</sub> secondary standard to provide requisite protection for the direct effects on vegetation and ecosystems (74 FR 64810).<sup>3</sup> At the same time, EPA proposed to add a secondary standard identical to the new primary SO<sub>2</sub> 1-hour standard set at 75 ppb. In its notice of final rulemaking EPA retained the current secondary standard but did not add a secondary standard at the level of the new primary standard (77 FR 20218; April 3, 2012). This plan does not address the 2010 NAAQS for SO<sub>2</sub>.

## 1.4 Regulatory Background

The relationship between major SO<sub>2</sub> point sources and ambient air quality is relatively well defined. The Phelps Dodge Morenci, Inc. copper smelting facility (PDMI) was the largest SO<sub>2</sub> point source in the Morenci area during its operation. Data show that no other point, area or mobile sources contributed in the past or currently contribute at the same levels of SO<sub>2</sub> emissions as those attributed to the smelter.

<sup>1</sup> Technical changes included stating the standards in parts per million (ppm) to make the SO<sub>2</sub> NAAQS consistent with those for other pollutants. The former standards, stated in micrograms per cubic meter (µg/m<sup>3</sup>) are included in this document for consistency with historic data collection, reporting, and analyses.

<sup>2</sup> The 1971 SO<sub>2</sub> NAAQS originally included a secondary standard at 0.02 ppm in an annual arithmetic mean. In 1973 EPA proposed and finalized revocation of the annual mean secondary standard (38 FR 11355; May 7, 1973 and 38 FR 25678; September 14, 1973).

<sup>3</sup> <http://www.epa.gov/ttn/naaqs/standards/so2/fr/20091208p64810.pdf>

PDMI was located next to the Morenci copper mine in the Gila River air shed at an elevation of about 4,500 feet above sea level.<sup>4</sup>

Areas that do not meet the NAAQS may be designated nonattainment for the respective standard. The Morenci SO<sub>2</sub> Nonattainment Area, designated for the 1971 annual and 24-hour primary standards, initially encompassed all of Greenlee County (43 FR 8968; March 3, 1978). At the request of the State of Arizona, the boundaries were reduced to eight whole or partial townships roughly centered on the primary copper smelter in Morenci (44 FR 21261; April 10, 1979). In addition, one adjacent township was designated as unclassifiable.

As required by the CAA, Arizona submitted a SIP in 1971 for all major sources in the State. The portion of the plan pertaining to attainment and maintenance of the NAAQS for SO<sub>2</sub> did not sufficiently define emissions limitations or require permanent control of emissions for existing copper smelters and was disapproved on July 27, 1972 (37 FR 15081). On the same date, EPA proposed revised regulations for control of sulfur oxides emitted by all existing smelters in Arizona (37 FR 15096). These regulations were not finalized due to issues regarding the adequacy of the ambient air quality data used to develop the limits. EPA subsequently established an SO<sub>2</sub> monitoring network around each smelter in the State to gather air quality data from June 1973, through October 1974, and provide a basis for emissions limitations.

EPA and State efforts to develop comprehensive emissions limits continued through the 1970s. In 1977, the State developed rules for the use of Supplementary Control Systems (SCS), which would utilize ambient monitoring data and allow Arizona smelters to intermittently curtail operations and emissions to prevent violations of the SO<sub>2</sub> NAAQS. EPA disapproved this approach and required installation and continuous operation of permanent SO<sub>2</sub> emissions controls adequate to ensure attainment of the NAAQS. On January 4, 1978, EPA published final emissions limits for Arizona smelters based on air quality data from 1973 to 1974 and the use of a proportional rollback model (43 FR 755). The regulations specified maximum emissions rates and compliance test methods for seven Arizona smelters.

The 1977 Clean Air Act Amendments (CAAA) modified smelter control requirements and allowed the temporary use of SCS while final SO<sub>2</sub> emission limits were developed and also allowed more time for certain smelters to install emissions control technology. In response to this action, Arizona began development of new regulations and on September 20, 1979, submitted *Ultimate Sulfur Dioxide Emission Limits for Arizona Copper Smelters* as a proposed revision to the Arizona SIP.<sup>5</sup>

The new regulations were developed using a “Multi-Point Rollback (MPR)” technique. The use of MPR to establish emissions limits addressed the problem of variable SO<sub>2</sub> emissions from smelting operations and variable meteorological conditions, which define ambient concentrations, by correlating the frequency of short-term emissions at various levels with the probability of violating the ambient air quality standards. This technique “rolled back” a yearly emissions profile to a level protective of the standards. The new regulations established stack emission limits for smelters and set requirements for analyzing the impact of fugitive SO<sub>2</sub> emissions on ambient air quality. The rule required all existing primary copper smelters in Arizona to implement control technology sufficient to comply with the new

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<sup>4</sup> The smelter’s geographic coordinates were latitude of 33 3'49.3" N and a longitude coordinate of 109, 20'30.5W.

<sup>5</sup> Site specific emissions limits were promulgated at Arizona Administrative Rules and Regulations (AARR) R9-3-515, later revised and recodified as Arizona Administrative Code (AAC) R18-2-715, Standards of Performance for Existing Primary Copper Smelters; Site-specific Requirements, R18-2-715.01, Standards of Performance for Existing Primary Copper Smelters; Compliance and Monitoring, and R18-2-715.02, Standards of Performance for Existing Primary Copper Smelters; Fugitive Emissions.

stack limits as well as any fugitive emissions controls necessary to assure attainment and maintenance of the NAAQS.

On November 30, 1981, EPA proposed conditional approval of Arizona's Multipoint Rollback (MPR) SIP revision (46 FR 58098). On June 3, 1982, Arizona submitted revisions to correct the conditional approval. EPA formally approved Arizona's MPR rules as a component of the SIP on January 14, 1983 (48 FR 1717). The rules included performance standards for each existing primary copper smelter (see Arizona Administrative Code (AAC) R18-2-715, R18-715.02). Rule R18-2-715.01 (D) identified January 14, 1986, as the general compliance date for the provisions of the Section. Arizona's SIP revisions were designed to meet the requirements of CAA §§ 110 (state implementation plans) and 123 (smelter stack heights) as amended in 1977 and replaced EPA's January 4, 1978, SO<sub>2</sub> control regulations applicable to Arizona copper smelters. To complete the Arizona SO<sub>2</sub> SIP, EPA required that Arizona submit necessary fugitive emissions control strategies and regulations for existing smelters by August 1, 1984.

PDMI was subject to a Delayed Compliance Order from 1981 and an earlier compliance date of January 1, 1985.<sup>6</sup> On March 4, 1982, Phelps Dodge responded to EPA, requesting an 18-month delay in its Compliance Order dates for its Morenci copper smelter, due to financial difficulties. EPA denied the request. On April 17, 1982, PDMI temporarily ceased copper smelting activities, recommencing operations October 12, 1982, initiating use of oxygen-fuel, oxygen sprinkle smelting systems in its number 3 furnaces in November 1982, as mandated in the PDMI Delayed Compliance/Innovative Technology Orders (DCO/ITOs).

PDMI permanently deactivated December 31, 1984. Additionally, all ambient air quality monitoring was discontinued at the time of the shutdown. Dismantlement of the Morenci facility began in 1995 and reclamation was complete by December 1996. On October 29, 1997, the Arizona Department of Environmental Quality (ADEQ) verified that the Phelps Dodge Morenci smelter was closed and dismantled (see the 2002 SIP submittal, section 1.2 for details).

In June 2002, ADEQ submitted to EPA the *Morenci Sulfur Dioxide Nonattainment Area State Implementation and Maintenance Plan* and a request to redesignate the area to attainment. CAA Section 175A(a) requires that maintenance of the NAAQS be demonstrated for at least ten years after redesignation to attainment. The SIP contained demonstrations that the Morenci area attained and would continue to maintain the 1971 SO<sub>2</sub> NAAQS through 2015. The SIP also included a commitment to submit a subsequent SIP revision to ensure maintenance of the NAAQS in the redesignated area for a second maintenance period as required by CAA Section 175A(b). EPA approved the 2002 plan under CAA Sections 110 and 175A and redesignated the area to attainment for the primary SO<sub>2</sub> NAAQS on April 26, 2004(69 FR 22447; effective June 25, 2004).<sup>7</sup>

This SIP revision demonstrates continued attainment of the 1971 primary SO<sub>2</sub> NAAQS for a second maintenance period through 2030.

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<sup>6</sup> The emission regulations violated were defined in Arizona's 1979 SIP and in 40 CFR §52.125(d) and Regulation 7-1-3.6 of the Rules and Regulations for Air Pollution Control of the Arizona State Department of Health (ADHS). After issuance of notices to Phelps Dodge for violations of emission regulations at the Morenci smelter, EPA and PDMI negotiated and agreed to Delayed Compliance/Innovative Technology Orders (DCO/ITOs) under CAA § 113(d)(4)(46 FR 49604 (1984)). EPA issued the final Orders on January 12, 1982 (47 FR 1293). EPA amended the DCO/ITO issued PDMI on July 23, 1984 (49 FR 24090). Although the 1984 amendments to the PDMI consent decree changed some interim compliance dates, the SO<sub>2</sub> compliance deadline remained January 1, 1985.

<sup>7</sup> For additional information on the approval of the Morenci plan see: <http://www.epa.gov/region09/air/az/morenci/index.html>.

## 1.5 Morenci Sulfur Dioxide Planning Area Description

Sections 1.5.1 through 1.5.4 describe the boundary, geography and climate, demographics, and economy of the Morenci planning area.

### 1.5.1 Morenci Sulfur Dioxide Planning Area Boundary

The current boundaries of the planning area are codified at 40 CFR § 81.303 (1979) and are defined by the townships listed in Table 1.2. Figure 1.1, portrays the townships and ranges within the planning area.

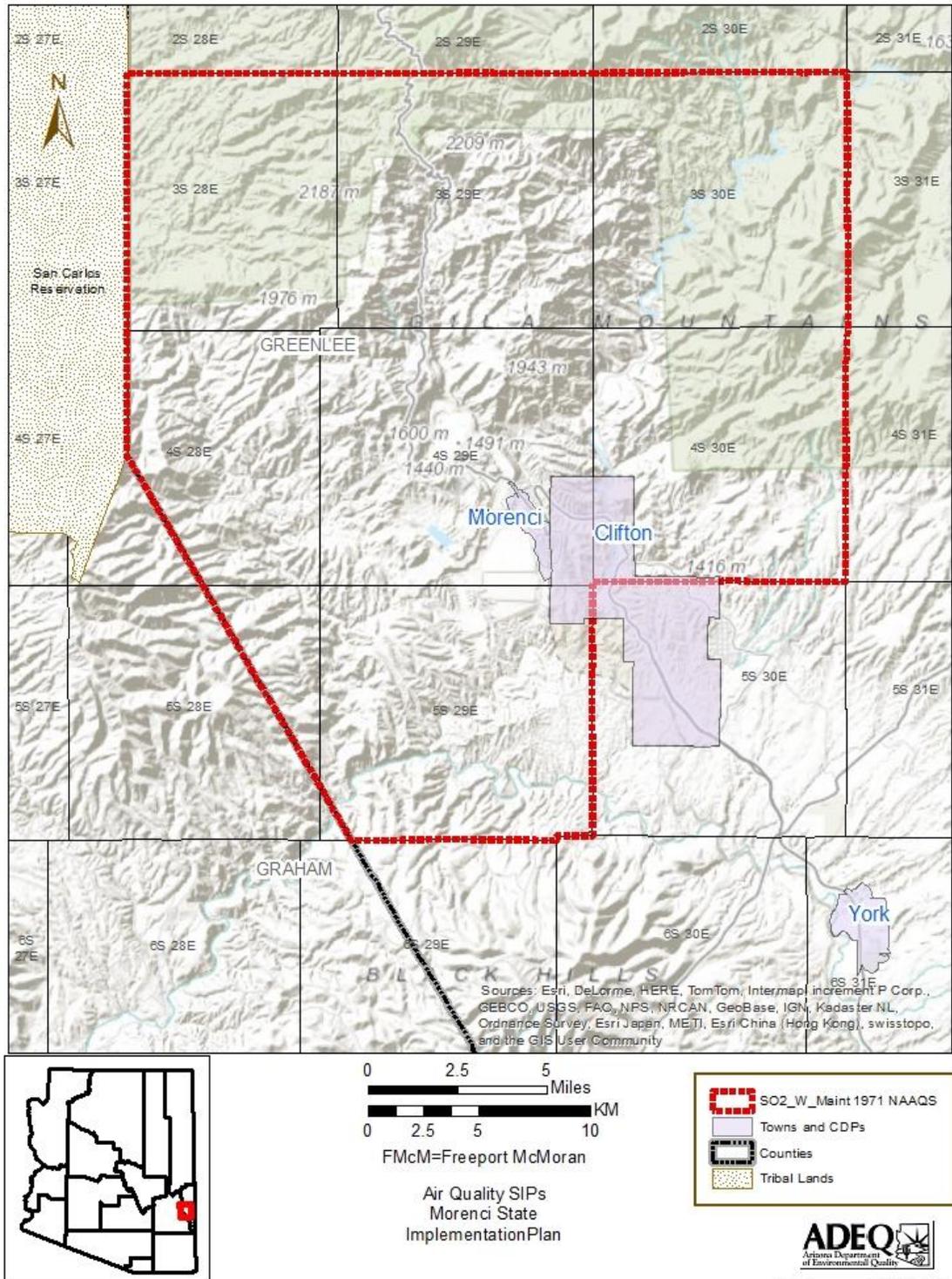
**Table 1.2 Morenci Sulfur Dioxide Area Description**

<b>Designated Area</b>	<b>Better Than National Standards</b>	<b>Cannot Be Classified</b>
T3S, R28E*	X	
T3S, R29E	X	
T3S, R30E	X	
T4S, R28E*	X	
T4S, R29E	X	
T4S, R30E	X	
T5S, R28E*	X	
T5S, R29E*	X	
T5S, R30E		X

\*Only that portion in Greenlee County.<sup>8</sup>

<sup>8</sup> 40 CFR§ 81.303 (1979) Ch. 1 (7-1-10 Edition); (<http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol17/pdf/CFR-2010-title40-vol17-sec81-303.pdf>).

**Figure 1.1: Morenci Sulfur Dioxide Planning Area**



## 1.5.2 Geography and Climate

The Morenci SO<sub>2</sub> Planning Area is located in western Greenlee County approximately nine miles west of the Arizona/New Mexico border. Greenlee County covers a land area of 1,847 square miles and contains diverse terrain and climate, from upland desert at its southern tip to high alpine country rising to more than 9,000 feet above sea level at points along the Mogollon Rim.

The diverse nature of the topography in the County creates wide temperature variations. In the Morenci area, the hottest month of the year is July, when the average daily maximum temperature is 101.4° Fahrenheit (F) and the average daily minimum temperature is 71.3° F. The coolest month of the year is January, when the average daily maximum temperature is 61.2° F and the average daily minimum temperature is 31.1° F. The heaviest rainfall of the year occurs in July and August; average total precipitation for those months is 2.17 inches and 2.27 inches, respectively. The driest months of the year are May and June, when average total precipitation is 0.22 inches and 0.33 inches. The average annual precipitation in the Morenci area is 12.06 inches.<sup>9</sup>

## 1.5.3 Population

Population statistics provide information about the number of people affected by changes in air quality in the Morenci planning area and can be used as a surrogate for estimating current and future emissions from certain source categories (see Chapter 4).

In the 1970s, when rural counties outpaced the growth of urban counties in the U.S., rural Greenlee County grew by slightly more than 10%. However, during the 1980s, Greenlee County's population declined almost 30% and the population in the unincorporated Morenci area, defined as a 'Census Designated Place' (CDP) by the Census Bureau, decreased by 34%.<sup>10</sup>

According to the Arizona Department of Administration (ADOA), the population of Greenlee County in 2011 was estimated at 8,380 residents, which corresponds to the population provided by the U.S. Census Bureau. By 2030, the population in the county is expected to increase by 188 people. The population in the Morenci area is projected to increase by 30 residents by 2030, resulting in a total of 1,512 people. The population of Clifton and Morenci CDP defines the maintenance area population and is approximately 57% of the Greenlee County population. Table 1.3 illustrates the population trend between 2011 and 2030, which indicates a slight increase in Greenlee County, Clifton, and the Morenci CDP.

**Table 1.3 Greenlee County Population Estimates**

Location	2011	2015	2020	2025	2030
Clifton	3,273	3,299	3,323	3,340	3,350
Morenci CDP	1,482	1,489	1,500	1,508	1,512
Greenlee County	8,380	8,437	8,499	8,543	8,568

<http://www.workforce.az.gov/population-projections.aspx>

<sup>9</sup> Source of data is the Arizona Department of Commerce Community Profile for Morenci/Clifton, February 2001.

<sup>10</sup> AZ Dept of Economic Security and U.S. Census Bureau. See page 1.5 of 2002 SIP.

#### 1.5.4 Economy

In 2012, Freeport McMoRan Incorporated (FMMM) generated \$365.4 million through the Safford and Morenci mining operations, which had an economic impact on Greenlee, Graham County, and the State. By the end of the year, FMMM employed over 2,600 people at the Morenci mine. Compensation from FMMM in Greenlee and Graham counties is estimated at \$253.8 million, business taxes at \$15.1 million, and vendor purchases at \$25.5 million, with a direct impact totaling \$294.4 million. The indirect impact totaled \$71 million because of spending from employees, new tax revenues, and vendor purchases. The total from direct and indirect impacts from FMMM is \$365.4 million in Greenlee and Graham counties. The revenue generated from FMMM is estimated at \$1.1 billion dollars.<sup>11</sup>

Other employment sectors in Greenlee County include tourism, agriculture, government, education, retail trade, health and social assistance.<sup>12</sup> The top occupations in Morenci are in the areas of natural resources, construction, and maintenance occupations, which accounts for 28.3% of total income for the city. According to USA City Facts, the unemployment rate is high in Morenci at 16.7%; the national average is 7.9%.<sup>13</sup> Significant economic development is unlikely because 77.1% of land is U.S. Forest Service and U.S. Bureau of Land Management and only 8.1% of land is privately owned. Table 1.4 gives an overview of labor force, unemployment, and unemployment rate for the Morenci and Clifton area.

**Table 1.4 Labor Force Data for Morenci and Clifton**

<b>Employment Statistic (Annual Average)</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>	<b>2011</b>
Morenci Labor Force	792	1,188	996	879	1009	n/a
Morenci Unemployed	59	74	22	22	62	n/a
Morenci Unemployment Rate	7.4%	6.2%	2.2%	2.5%	6.1%	n/a
Clifton Labor Force	n/a	n/a	1155	1025	1257	1549
Clifton Unemployed	n/a	n/a	72	73	205	108
Clifton Unemployment Rate	n/a	n/a	6.2%	7.1%	16.3%	7.0%
Source: Average annual labor force data, Arizona Department of Administration, Local Area Unemployment Statistics, updated December 15, 2011. <sup>14</sup>						

#### 1.6 General SIP Approach – Regulatory Requirements and Guidance

In November 1990, the U.S. Congress enacted a series of amendments to the CAA. One of the primary effects of the revision was to expand and clarify the planning provisions for those areas not meeting the NAAQS. The CAA, as amended, authorizes comprehensive federal and state programs to provide for attainment and maintenance of the NAAQS. Sections 1.6.1 and 1.6.2 outline CAA requirements for SO<sub>2</sub> maintenance areas. In addition, EPA has published guidance documents to clarify environmental

<sup>11</sup> “Morenci”; ([http://www.fcx.com/operations/usa\\_arizona\\_morenci.htm](http://www.fcx.com/operations/usa_arizona_morenci.htm)).

“Economic Benefits of the Morenci and Safford Mines upon Greenlee/Graham Counties and Arizona-2012 ”; ([http://www.fcx.com/sd/pdf/fast\\_facts/2013/MorenciSafford\\_EI\\_2013.pdf](http://www.fcx.com/sd/pdf/fast_facts/2013/MorenciSafford_EI_2013.pdf)).

<sup>12</sup> “Greenlee County industries and sales”; (<http://seagoedd.org/?s=population+morenci>).

<sup>13</sup> <http://www.usacityfacts.com/az/greenlee/morenci/economy/>

<sup>14</sup> Population Projections ;(<http://www.workforce.az.gov/population-projections.aspx>).

“Local Area Unemployment Statistics (LAU)”; (<http://azstats.gov/local-area-unemployment-statistics.aspx>).

regulations relating to maintenance of the NAAQS and to assist in developing approaches for implementing those regulations. Section 1.6.3 summarizes applicable EPA guidance.

### **1.6.1 Clean Air Act Requirements for Maintenance Plans**

Title I, Part A, and Title I, Part D, Subparts 1 and 5 of the CAA contain the nonattainment and maintenance requirements for SO<sub>2</sub> planning areas. Part D, Subpart 1, Section 175A provides the general framework for maintenance plans as summarized below.

#### **CAA § 175A(a). Plan Revision**

Under Section 175A(a) maintenance plans must provide for maintenance of the primary ambient air quality standards for at least 10 years after redesignation, including any additional control measures as may be necessary to ensure such maintenance.

#### **CAA § 175A(b). Subsequent Plan Revisions**

Eight years after redesignation of any area as an attainment area, CAA Section 175(A)(b) requires the state to submit an additional revision of the applicable state implementation plan for maintaining the national primary ambient air quality standard for 10 years after the expiration of the first 10-year maintenance period.

#### **CAA § 175A(c). Nonattainment Requirements Applicable Pending plan Approval**

Under Section 175A(c), pending EPA approval of a SIP revision and request for redesignation of a nonattainment area to attainment, applicable nonattainment area requirements shall remain in full force and effect concerning that area.

#### **CAA § 175A(d). Contingency Provisions**

Section 175A(d) requires maintenance plans to contain any necessary contingency provisions to assure prompt correction of a violation of the NAAQS that occurs after redesignation to attainment. The contingency measures must include a requirement that the state will implement all control measures contained in the SIP for the area prior to redesignation.

### **1.6.2 Clean Air Act Conformity Provisions**

CAA Section 176(c)(1)(A) requires SIPs to contain information regarding the State's compliance with conformity requirements.

#### ***Transportation Conformity***

As stated in 40 CFR § 93.153(b), "Conformity determinations for federal actions related to transportation plans, programs and projects developed, funded, or approved under title 23 U.S.C. or the Federal Transit Act (40 U.S.C. § 1601 *et seq.*) must meet the procedures and criteria of 40 CFR Part 51, subpart T, in lieu of the procedures set forth in this subpart." Title 40 CFR § 93.102(b) waives transportation conformity for SO<sub>2</sub> nonattainment and maintenance areas.

#### ***General Conformity***

General conformity for the Morenci, Greenlee County area must still be addressed to assure SO<sub>2</sub> emissions from any federal actions or plans do not exceed the rates outlined in 40 CFR § 93.153(b) (see 58 FR 63253; November 30, 1993). Criteria for making determinations and provisions for general conformity are located in R18-2-1438 of the Arizona Administrative Code. There are no known federal plans or actions currently affecting air quality in the Morenci area nor are any foreseen through the year

2025. ADEQ commits to review and comment, as appropriate, on any federal agency general conformity determination it receives pursuant to 40 CFR § 93.155 for activities planned for this air quality planning area.

### 1.6.3 EPA Guidance

Applicable guidance for demonstrating maintenance of the NAAQS includes the following EPA memoranda:

The September 4, 1992, Memorandum, *Procedures for Processing Requests to Redesignate Areas to Attainment*, John Calcagni, Director, Air Quality Management Division, U.S. Environmental Protection Agency (see Appendix A), recommends several core provisions for states to consider when developing maintenance plans. These provisions include:

- 1) An **attainment emissions inventory** to identify the level of emissions sufficient to attain the NAAQS,
- 2) A **maintenance demonstration** that either shows that future emissions will not exceed the level of the attainment inventory or includes a modeling analysis to show that the future mix of sources will not cause a violation of the NAAQS,
- 3) Continued operation of an appropriate air quality-monitoring network to verify the attainment status of an area,
- 4) **Verification of continued attainment** through tracking changes in the emissions inventory, or other methods, as well as assurance that the state has the legal authority necessary to implement and enforce all measures used to attain and maintain the NAAQS, and
- 5) A **Contingency Plan** designed to correct any violation of the NAAQS after redesignation of the area to attainment.

EPA's historic redesignation policy has called for eight quarters of clean ambient air quality data as a prerequisite for redesignation of an area to attainment. The October 18, 2000, Memorandum, *Redesignation of Sulfur Dioxide Nonattainment Areas in the Absence of Monitored Data*, from John Seitz, Director of the Office of Air Quality Planning and Standards (see Appendix B), was developed to provide guidance on redesignating SO<sub>2</sub> areas to attainment where an area's historic violations were caused by major point sources of SO<sub>2</sub> emissions that are no longer in operation and where SO<sub>2</sub> monitors were removed immediately following the shutdown of the emissions sources, and therefore lack sufficient air quality data demonstrating attainment of the standard.

The guidance provides an approach for demonstrating attainment and maintenance of the air quality standards and exempts these areas from requirements for continued ambient monitoring. Four separate elements for demonstrating maintenance of the SO<sub>2</sub> NAAQS are outlined below:

- 1) **Emissions inventories** representing actual emissions when violations occurred, current emissions, and emissions projected to the 10th year after redesignation;

- 2) **Dispersion modeling** analysis of all point sources in, and within 50 kilometers (km) of, the nonattainment area boundary showing that no NAAQS violations occur or can be projected for the next 10 years anywhere within the nonattainment area, and that the shutdown source or sources were the dominant cause of the high concentrations in the past;
- 3) Evidence that if the shutdown source or sources resume operation they will be considered new sources and be required to obtain a permit under the **Prevention of Significant Deterioration** program, and
- 4) A **commitment to resume monitoring** before any major SO<sub>x</sub> source commences operation.

## 2.0 AIR QUALITY MONITORING

No ambient monitors are currently in operation within the Morenci SO<sub>2</sub> planning area. The information in this section provides historical background to compare the status of air quality to a time when exceedances of the NAAQS occurred.

Ambient monitoring networks for air quality are established to sample pollution in a variety of representative settings, to assess health and welfare impacts and to assist in determining air pollution sources. These networks contain individual monitoring sites that are operated by a number of government agencies and regulated companies. The data gathered by the monitors within the are statistically analyzed and compared to the NAAQS.

EPA's protocols for SO<sub>2</sub> monitoring are located in the following sections of the Code of Federal Regulations (CFR):

1. 40 CFR Part 50, Appendix A, Reference Method for the Determination of Sulfur Dioxide in the Atmosphere;
2. 40 CFR Part 53, Subpart B, Procedures for Testing Performance Characteristics of Automated Methods for SO<sub>2</sub>, CO, O<sub>3</sub>, and NO<sub>2</sub>; and
3. 40 CFR Part 58, Subpart A, B, and C, Ambient Air Quality Surveillance.

### 2.1 Monitoring Site, Equipment, and Quality Assurance Procedure

An extensive monitoring network was established in the Morenci area with sufficient spatial and temporal coverage to comprehensively evaluate the ambient impact of smelter emissions. In 1969, the Arizona Department of Health, Division of Air Pollution Control (ADH), began monitoring ambient SO<sub>2</sub> air quality in Arizona. ADH established eight coulometric SO<sub>2</sub> monitors around the seven-smelter towns in Arizona, including one in Clifton between October 1, 1969 and December 31, 1969.<sup>15</sup>

Phelps Dodge began ambient SO<sub>2</sub> monitoring at its Morenci smelter facility in 1974. The facility operated coulometric monitors at both stationary and mobile sites. During that same year, the State established two monitoring sites in the same area. The sites were coulometric monitors, but by 1984, both had been replaced with a pulsed fluorescent type.

All monitors owned and operated by PDMI in the area of the Morenci smelter were deactivated when they ceased operations in December 31, 1984. Both State sites were deactivated after the smelter closed in 1985. From 1986 to the present, no ambient SO<sub>2</sub> monitors are operating in the Morenci area.

Historic ambient SO<sub>2</sub> monitoring sites and periods of operation are provided in Table 2.1 and 2.2. For a map of monitor locations and their proximity to the Morenci smelter, see Appendix A, Section A.2 of the 2002 Maintenance Plan.

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<sup>15</sup> Arizona State Department of Health, Environmental Health Services, Division of Air Pollution Control, *Sulfur Dioxide Monitoring Network Study*, 1969.

**Table 2.1: State of Arizona Morenci SO<sub>2</sub> Ambient Air Quality Monitors**

Monitor Site	Site Location	Activation-Deactivation
Cadillac Point	Latitude 33°05'20.1"N, Longitude 109°22'48.8"W	1974-1985
Stargo	Latitude 33°04'17.6"N, Longitude 109°21'46.3"W	1974-1985

**Table 2.2: Phelps Dodge Morenci SO<sub>2</sub> Ambient Air Quality Stationary and Mobile Monitors**

Monitor Site	Site Location	Activation - Deactivation
Cadillac Point	Latitude 33°05'22.9"N, Longitude 109°22'43.7"W	1976-1984
Fina Station	Latitude 33°03'14.3"N, Longitude 109°18'59"W	1974 - 1984
Fairbanks	Latitude 33°02'10.19"N, Longitude 109°19'37.2"W	1976 - 1984
Metcalf	Latitude 33°06'47.1"N, Longitude 109°22'25.2"W	1974 - 1984
Oroville	Latitude 33°05'28.6"N, Longitude 109°18'25.2"W	1974 - 1981
Stargo	Latitude 33°04'14"N, Longitude 109°21'44"W	1974 - 1984
Eagle Creek	Latitude 33°03'20.1"N, Longitude 109°25'33.7"W	1974-1979
Mobile Monitors		
Mobile-Standpipe	Latitude 33°02'58.8"N, Longitude 109°23'9.9"W	1979-1984
Mobile-Center Market	Latitude 33°03'24.7"N, Longitude 109°19'50.4"W	1979-1980
Mobile-Buena Vista	Latitude 33°03'25.8"N, Longitude 109°19'59.3"W	1982-1984
Mobile-Lower Stargo	Latitude 33°03'55.5"N, Longitude 109°21'20.5"W	1981-1984
Mobile-Newton	Latitude 33°04'33.1"N, Longitude 109°21'19.8"W	1980-1982
Source: Air Quality Control for Arizona, Annual Report, Arizona Department of Health Services, 1974 – 1985.		

## 2.2 SO<sub>2</sub> Data Summary

Noted in previous section, ambient monitoring of the Phelps Dodge facility began in 1969. The highest number of recorded exceedances occurred in 1975, with concentrations between 219 to 237 micrograms per cubic meter (µg/m<sup>3</sup>) in the Clifton, Morenci area. Forty-nine exceedances of the SO<sub>2</sub> 24-hour average standard at PDMI were recorded in 1976 and the next highest number, 42 exceedances, occurred in 1982. In 1981, only five exceedances of the SO<sub>2</sub> annual average standard were recorded. Monitoring data provided in Appendix D of the 2002 SIP indicates that the last recorded violation of either the 24-hour or annual SO<sub>2</sub> NAAQS occurred in 1984. Throughout the history of the network, annual average SO<sub>2</sub> levels

were generally one-half of the 1971 NAAQS, which is about 0.030 ppm or 80  $\mu\text{g}/\text{m}^3$ .<sup>16</sup>

Implementation of control measures and subsequent emissions reductions at the Morenci copper smelter area were reflected in reduced ambient SO<sub>2</sub> concentrations beginning in the mid-1970s.<sup>17</sup> Measured maximum concentrations at selected monitoring sites are presented in Appendix D, in the 2002 Morenci Sulfur Dioxide Nonattainment Area Plan, for the period 1979 through 1985.

Due to the shutdown of the primary SO<sub>2</sub> point source and termination of the monitoring network, redesignation of this area was completed according to Director John Seitz's October 18, 2000, Memorandum, *Redesignation of Sulfur Dioxide Nonattainment Areas in the Absence of Monitored Data* (see Appendix B). As outlined in the guidance, redesignation did not require eight current consecutive quarters (two years) of quality-assured, violation-free data. The policy also exempts the Morenci area from maintenance plan requirements for continued monitoring within the area. The maintenance plan should include commitments to resume ambient monitoring before any major source of SO<sub>x</sub> emissions commences operation. In the event any new major point source begins operations in the area, new monitors will be installed to ensure continued attainment. For more information on historical monitoring information, see the 2002 Morenci Sulfur Dioxide Nonattainment Area State Implementation and Maintenance Plan.

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<sup>16</sup> See Arizona Department of Health Services, Bureau of Air Quality Control annual reports 1970 through 1985, EPA Air Quality System annual summary reports, and Appendix D of the 2002 SIP.

<sup>17</sup> See Chapter 2 of the 2002 SIP.

### 3.0 EMISSIONS INVENTORIES AND PROJECTIONS TO 2030

The current boundaries of the Morenci SO<sub>2</sub> planning area lie solely within Greenlee County. However, the maintenance demonstration takes into consideration emissions sources within a 50 km buffer around the boundaries of the maintenance area. The 50 km buffer includes southern portions of Apache County, eastern portions of Graham County and the western parts of three New Mexico counties: Hidalgo, Grant and Catron. The nonattainment area and 50km buffer are illustrated in Figure 3.1.

The Seitz Memo, *Redesignation of Sulfur Dioxide Nonattainment Areas in the Absence of Monitored Data on October 18, 2002*, lists three required inventories in the maintenance plan: an emissions inventory representing actual emissions when violations occurred; an inventory representing current actual and allowable (or potential) emissions; and an inventory that projects allowable (or potential) emissions to the tenth year after redesignation. The guidance further advises, "the inventories should display emissions from each point source of SO<sub>2</sub>, with explanations of significant emissions changes, including source shutdowns." In addition to the inclusive (point, area, and mobile) Morenci Planning Area inventories, the inventory should include emissions from all SO<sub>2</sub> point sources within a 50 km range of the planning area. The following inventories were included in the 2002 maintenance plan.

- **Year 1980-1984 Inventory.** This inventory characterizes emissions at the time the Morenci smelter was still operating and monitored violations of the NAAQS were occurring.
- **Year 1990-1999 Inventory.** The 1999 inventory represents the "current" or "attainment inventory" following the closure of the Morenci smelter.
- **Projected Year 2015 Inventory.** The 2002 plan included a future 2015 inventory to demonstrate, through dispersion modeling, emissions would remain at a level sufficient to maintain the NAAQS.

This SIP revision demonstrates continued attainment of the NAAQS for a second maintenance period through 2030. In addition to the historical inventories listed above, which are included in Section 3.1 for context, updates to current and projected emissions are provided in Sections 3.2 and 3.3 as follows.

- **Year 2011 Inventory.** The 2011 inventory is the updated "current" inventory.
- **Year 2015-2030 (Projected Inventory).** The 2002 plan projected emissions for the first maintenance period, through 2015. This document includes inventory projections of total emissions for the Planning Area and 50 km point source emissions through the second maintenance period or 2030. Continued maintenance of the NAAQS through the second maintenance period is demonstrated, in part, by showing that future emissions of SO<sub>2</sub> are expected to remain well below levels during the time when violations of the NAAQS were occurring.

### 3.1 Emissions Inventories (Historical)

Sections 3.1 through 3.2 describe historical emissions sources and rates for the Morenci Planning Area. The 1984 inventory reflects emissions during the last year of smelter operations. The 1999 inventory was the baseline year for the 2002 maintenance plan submittal, which shows emissions after the closer of the smelter.

#### 3.1.1 Point Sources

During its operation and until its closure on December 31, 1984, the Morenci primary copper smelter was the only major SO<sub>2</sub> point source in the area. Smelting and refining of copper ore at Morenci's primary copper smelter operations produced copper anode for further refining and sale to customers. The Morenci smelter's last full years of operation were 1983 and 1984.

**Table 3.1: Total Historical Potential to Emit and Actual Emissions in tons for years 1984 and 1999**

<b>In Nonattainment area</b>	<b>1984</b>	<b>1999</b>
Potential to Emit (tpy)	297,110.00 (Allowable)	123.533
Actual Emissions (tpy)	82,432.00	0.390
<b>Within 50km Buffer</b>	<b>1984</b>	<b>1999</b>
Potential to Emit (tpy)	Unavailable	186.533
Actual Emissions (tpy)	Unavailable	1.218

#### 3.1.2 Area and Mobile Sources

Area and mobile source emissions estimates for the Morenci Planning Area were derived from EPA's AIR Data for 1999 for Greenlee County and 1984 emissions were derived from the prior 2002 SIP submittal. In the Morenci Planning area, SO<sub>2</sub> emissions from mobile and area sources were approximately 31 tons in 1999. Area source emissions estimates did not include wildfire emissions. Detailed information on population levels and the methodology used to calculate area and mobile source emissions are contained in the 2002 SIP, Appendix C.4.

**Table 3.2: Historical Greenlee County and Morenci Area and Mobile Source Emissions in tons**

<b>Area</b>	<b>1984</b>	<b>1999</b>
Greenlee County	Unavailable	56
Morenci Planning Area	59 <sup>18</sup>	31

<sup>18</sup> There was no data available for 1984, therefore, 1980 data is used to estimate 1984 emissions.

### 3.2 2011 Emissions Inventory (Current)

Year 2011 was selected as the base year for this maintenance plan for consistency with the most recently available National Emissions Inventory data as well as data from the Arizona Department of Environmental Quality (ADEQ) updated Industrial point source inventory. The source categories covered in the emissions inventory include:

- Non-road Mobile (exhaust) sources
- On-roads Mobile (exhaust) sources
- Industrial (point) sources
- Area (non-point) sources

#### 3.2.1 Point Sources

Since 2011, two permitted point sources were located within the Morenci Planning Area and 7 sources of SO<sub>2</sub> emissions were located within the 50 km buffer.

The Phelps Dodge copper smelter was permanently closed in 1984; however, mining operations continue under Freeport McMoRan. Mining operations accounted for the highest emission rates in 2011 from point sources, at 48.5 tons per year (tpy), with a potential to emit of approximately 87.6 tpy. The Morenci Townsite emergency generators accounted for 0.003 tpy of emissions with a potential to emit of 4.90 tpy.

Table 3.3 illustrates the two major point sources in the planning area for 2011. Total emissions generated for 2011 is 48.532 tpy with a combined potential to emit of 92.50 tpy.

**Table 3.3: SO<sub>2</sub> Point Sources within Morenci Planning Area**

Source	2011 (tons/yr)	PTE (tons/yr)
Freeport-McMoran Morenci, Inc.	48.529	87.60
Morenci Townsite WWTP Emergency Generators	0.003	4.90
<b>Total Emissions</b>	<b>48.532</b>	<b>92.50</b>
Data Source: Arizona Department of Environmental Quality (ADEQ) and 2011 NEI		

In 2011, there were thirteen point sources located within 50 km, outside of the boundaries for the Morenci planning area. Table 3.4 illustrates the actual and potential to emit from these facilities in 2011, 38.03 tpy and 167.38 tpy, respectively.

**Table 3.4: SO<sub>2</sub> Point Sources within 50-km Buffer**

Source	Latitude	Longitude	2011 Actual Emissions (tons/yr.)	PTE (tons/yr)	Permit Status as of 2014
Arizona State Prisons - Safford Complex	32.8289	-109.565	0.193	4.96	Terminated
City of Safford – Water Reclamation Plant	32.8424	-109.7241	0.214	24.26	Terminated
CKC Construction Company	32.8563	-109.6878	0.126	33.78	Active
Freeport McMoran Analytical Service Center	32.8165	-109.6482	0.002	0.39	Active
Freeport McMoran Corporation - Bee Canyon Well Field	33.3167	-109.4667	1.044	41.4	Active
Freeport McMoran Corporation - Mud Springs Well Field	33.3833	-109.4833	1.087	36.48	Active
Freeport-McMoran Safford Inc.	32.9473	-109.6509	35	81.2	Active
Glenbar Gin, Inc.	32.9839	-109.8567	0.0012	0.02	Active
Level 3 Communications	32.8351	-109.7081	-	0.21	Terminated
Mt. Graham Regional Medical Center, Inc.	32.8228	-109.7352	0.09	2.804	Terminated
Select Cleaners	32.8327	-109.7161	0.001	0.163	Terminated
Tri County Materials-Hot Mix Asphalt Plant	32.8021	-109.7077	0.155	22.22	Active
USDOJFCI-Safford	32.7667	-109.7167	0.122	24.27	Terminated
<b>Total Emissions</b>			<b>38.05</b>	<b>167.38</b>	
Data Source: Arizona Department of Environmental Quality (ADEQ) and the 2011 NEI					



### 3.2.2 Totals for Mobile, Area and Point Sources

Current emissions estimates for area and mobile sources are derived from EPA's 2011 National Emissions Inventory data.<sup>19</sup> Certified emissions data were scaled to the Morenci area using a population ratio or an area adjustment ratio to that of Greenlee County. Please note that 2011 area emissions estimates include wildfire emissions, which accounts for the large difference between the 1999 and 2011 area source inventories. Wildfire emissions account for 91.43% of total cumulative emissions.

For more information on the calculations, see the emissions inventory data in Appendix C Table 3.5 illustrates area and mobile source emissions for the Morenci planning area. The source categories include on-road mobile, non-road mobile, and area (non-point) sources. The largest source of emissions comes from area sources at 525.67 tpy, which includes wildfire emissions. Point area sources account for 48.532 tpy. The total SO<sub>2</sub> emissions from all these categories are 574.882 tpy. The largest source of emissions is area (Non-point) sources contributing most of the emissions at 525.94 tpy.

**Table 3.5: Total SO<sub>2</sub> Emissions for the Morenci Planning Area-2011**

<b>Source Type</b>	<b>(tons per year)</b>
On-Road Mobile	0.33
Non-Road Vehicle	0.08
Point (Industrial)	48.54
Area (Non-point) Sources	525.94
<b>Total</b>	<b>574.89</b>

### 3.3 Emissions Projections

Sections 3.3.1 and 3.3.2 contain point, area, and mobile source emissions projected through the year 2030. Emissions are projected to ensure compliance with the NAAQS. Difficulties surrounding changes in economic growth, emissions control measures, capital turnover, fuel switching, and technological change make projections hard to estimate, therefore, a conservative forecasting approach was applied to the projections. Conservative forecasting included years 2010 to 2035 and is based on potential to emit.

#### 3.3.1 Point Source Projections

Projecting future SO<sub>2</sub> emissions is problematic due to many factors and uncertainties. Arizona does not anticipate any substantial increase in existing point source emissions between 2011 and 2030, for the planning area. New point sources or upgrades to existing sources of SO<sub>2</sub> will be subject to review through ADEQ's Permitting Program.

#### 3.3.2 Point Source Projections

Emissions projections are conservatively based on potential to emit (PTE) and point source emissions are assumed to remain constant at maximum permitted levels. With the permanent closure of the Morenci smelter, no major point sources exist in the Planning Area or within 50 km of its boundary. Total emissions as illustrated in Table 3.6 shows point source emissions within the planning area totaling 87.60

<sup>19</sup> EPA's 2008 National Emission Inventory, Version 1.5 (released May 16, 2011) was the most recent available data at the time of drafting.

tons of emissions to 2030. Total emissions as illustrated in Table 3.7 shows projected emissions estimates are 201.88 tons to 2030. Combined total emissions for planning and 50km buffer area total 289.48 tons of emissions to 2030.

**Table 3.6: Point Source Projections in Planning Area to 2030**

<b>Source Category</b>	<b>2011 (actuals)</b>	<b>2011 (pte)</b>	<b>2015 (pte)</b>	<b>2020 (pte)</b>	<b>2025 (pte)</b>	<b>2030 (pte)</b>
Freeport McMoran	48.529	87.60	87.60	87.60	87.60	87.60
Morenci Townsite WWTP Emergency Generators	0.003	4.90	-	-	-	-
<b>Total Emissions</b>	<b>48.532</b>	<b>92.50</b>	<b>87.60</b>	<b>87.60</b>	<b>87.60</b>	<b>87.60</b>

Note; Symbol (-) indicates that permit has been terminated.

**Table 3.7: Point Source Projections within the 50km Buffer Area**

<b>Source Category</b>	<b>2011 (actuals)</b>	<b>2011 (pte)</b>	<b>2015 (pte)</b>	<b>2020 (pte)</b>	<b>2025 (pte)</b>	<b>2030 (pte)</b>
CKC Construction Company	0.126	33.78	33.78	33.78	33.78	33.78
Freeport McMoran Analytical Service Center	0.002	0.39	0.39	0.39	0.39	0.39
Freeport McMoran Corporation - Bee Canyon Well Field	1.044	41.4	41.4	41.4	41.4	41.4
Freeport McMoran Corporation - Mud Springs Well Field	1.087	36.48	36.48	36.48	36.48	36.48
Freeport-McMoran Safford Inc.	35	81.2	81.2	81.2	81.2	81.2
Glenbar Gin, Inc.	0.0012	0.02	0.02	0.02	0.02	0.02
Tri Country Materials-Hot Mix Asphalt Plant	0.155	22.22	8.61	8.61	8.61	8.61
<b>Total Emissions</b>	<b>37.4152</b>	<b>215.49</b>	<b>201.88</b>	<b>201.88</b>	<b>201.88</b>	<b>201.88</b>

### 3.3.2 Area, Mobile, Point Source Projections

ADEQ projects that SO<sub>2</sub> emissions from area and mobile sources will grow proportionately with the population of the Planning Area. Appendix D describes the source category emissions and derivation of mobile and area source emissions estimates for the Morenci area in detail.

Table 3.8 contains area and mobile source emissions projections for the Morenci Planning Area through 2030. Actual emissions for 2011 total 574.89 tpy and projections total 613.96 tpy based on PTE.

**Table 3.8: Area and Mobile Sources SO<sub>2</sub> Emissions Projections for the Morenci Planning Area**

<b>Source Type</b>	<b>2011 (tpy)</b>	<b>2015 (tpy)</b>	<b>2020 (tpy)</b>	<b>2025 (tpy)</b>	<b>2030 (tpy)</b>
On-Road Vehicle Sources	0.33	0.30	0.30	0.31	0.33
Non-Road Vehicle Sources(Locomotives and Aircraft)	0.05	0.05	0.05	0.05	0.05
Non-Road Vehicle Sources (Other)	0.03	0.03	0.03	0.03	0.03
Industrial (point) Sources	48.54	87.60	87.60	87.60	87.60
Area(Non-point) Sources (Fires)	525.67	525.67	525.67	525.67	525.67
Area (Non-point) Sources (Other)	0.27	0.27	0.27	0.28	0.28
<b>Total Emissions</b>	<b>574.89</b>	<b>613.92</b>	<b>613.92</b>	<b>613.94</b>	<b>613.96</b>

## **4.0 CONTROL MEASURES**

Sections 4.1 and 4.2 describe SO<sub>2</sub> emission control measures for sources within the Morenci Planning Area and point sources located within the 50 km buffer zone of the Planning Area.

### **4.1 Point Sources**

Nonattainment area plans are required to provide for the implementation of all reasonably available control measures (RACMs) including reductions in emissions from existing sources in the area that may be obtained through reasonably available control technology (RACT). RACT is the emissions control level for sources located in SO<sub>2</sub> nonattainment areas. RACT is determined, in part, by the technological and economic feasibility of the control for the specific source and is generally defined for SO<sub>2</sub> as control technology which will achieve the NAAQS within statutory timeframes.<sup>20</sup> Maintenance plans should ensure that the level of control that allowed the area to reach attainment continues in the future.

#### ***Morenci Copper Smelter***

The PDMI smelter was subject to all requirements in R18-2-715.01 (A)-(T), which define, “Standards of Performance for Existing Primary Copper Smelters; Compliance and Monitoring” and the January 14, 1986, compliance date for the provisions of this rule, in accordance with R18-2-715.01. Compliance was achieved when Phelps Dodge permanently closed the copper smelter on December 31, 1984.

Closure of the copper smelter in 1984 resulted in SO<sub>2</sub> emission reductions in 1985 of at least 46,012 tpy, based on permitted SO<sub>2</sub> stack emission limits effective for PDMI, January 1, 1985. The permanent shutdown of the smelter reduced total emissions in the Planning Area to less than 0.1% of pre-closure levels, which meets RACT requirements.

#### ***Existing Point Sources***

There are currently eight active sources located within the planning area and the 50 km buffer zone. There is two point sources located in the Morenci planning area. There are thirteen point-sources that exist in the 50km buffer zone, details of these facilities are discussed below.

ADEQ issues permits point sources within the planning area. The seven other point sources within the 50km buffer are also permitted by ADEQ. Permit limits combined emissions to 87.60 tons per year for the planning area point sources and less than 201.88 tons per year for the buffer area point sources. In the event a new source moves into the area, or any modifications are made to an existing source, they will be subject to ADEQ’s permitting and monitoring requirements.

### **4.2 Area and Mobile Sources**

Emissions data reflect that SO<sub>2</sub> from area and mobile sources in the Morenci planning area account for approximately 13% of the total area and mobile source emissions in Greenlee County. In 2011 on-road and non-road mobile emissions totaled 0.41 tons. Area sources total 525.94 tons. Of the area source total 522.95 tons were due to wildfires, more than 99% of area source emissions. ADEQ predicts nominal growth in SO<sub>2</sub> emissions for the area through 2030.

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<sup>20</sup> U.S. EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, *SO<sub>2</sub> Guideline Document*, February 1994.

Several EPA programs are related to the sulfur content of fuels. These programs integrate engine and fuel controls for emissions reductions in highway vehicles and non-road equipment. Due to these national programs, future sulfur emissions are likely to be lower than those projected in Chapter 4 of this document. The programs are as follows:

- 1) Tier 2 Vehicle and Gasoline Sulfur Program for passenger vehicles,
- 2) Tier 3 Vehicle and Gasoline Sulfur Program for passenger vehicles,
- 3) Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements for highway trucks and buses, and
- 4) Clean Air Non-road Diesel Rule for non-road diesel equipment.

EPA's Tier 2 program, begun in 2004, implements more stringent emissions standards for the reduction of oxides of nitrogen emissions from all passenger cars and light trucks. To meet the new emission standards the program incorporates gasoline requirements that substantially reduce sulfur levels in gasoline. Sulfur in fuel impairs the effectiveness of vehicle emission control systems and by removing most of the sulfur from gasoline, new emission controls work longer and more efficiently. As a result, the standards reduce the average national sulfur content of gasoline by up to 90%.

EPA's Tier 3 program per FR Vol 79 No 81 published on April 28, 2014, establishes more stringent vehicle emissions standards and will reduce the sulfur content of gasoline beginning in 2017, as part of a systems approach to addressing the impacts of motor vehicles and fuels on air quality and public health. The gasoline sulfur standard will make emission control systems more effective for both existing and new vehicles, and will enable more stringent vehicle emissions standards. The vehicle standards will reduce both tailpipe and evaporative emissions from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles. This will result in significant reductions in pollutants such as ozone, particulate matter, and air toxics across the country and help state and local agencies in their efforts to attain and maintain health-based National Ambient Air Quality Standards.<sup>21</sup>

The 2007 Heavy-Duty Engine and Vehicle standards and Highway Diesel Fuel Sulfur Control program established new oxides of nitrogen and particulate matter emissions standards for heavy-duty highway engines and vehicles. The standards are based on high-efficiency catalytic exhaust emission control technologies. Because emissions control devices are damaged by sulfur, associated regulations reduce the sulfur in highway diesel fuel by 97%.

The Clean Air Non-road Diesel Rule established new oxides of nitrogen and particulate matter emission standards that are applicable to diesel engines used in construction, agricultural, industrial, and other equipment. To prevent damage to emissions control systems, the regulations also require a reduction in sulfur levels in non-road diesel fuel from the current approximately 3,000 parts per million to 15 parts per million when fully implemented. Fuel sulfur reductions are being phased in over a number of years beginning in 2007.

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<sup>21</sup> To see more information regarding EPA's tier program see: <http://www.epa.gov/otaq/tier3.html>.

## 5.0 MODELING DEMONSTRATION

Chapter 5.0 provides an overview of EPA's and ADEQ's modeling demonstration that was conducted for the Morenci Planning Area.

### 5.1 Historical Modeling Analysis

On June 21, 2002, ADEQ submitted to EPA the "Morenci Sulfur Dioxide Nonattainment Area State Implementation and Maintenance Plan" with a request to approve the plan and redesignate the area to attainment for the 1971 primary SO<sub>2</sub> NAAQS. As part of its final rulemaking for the plan, EPA conducted an analysis on the plan based on the October 18, 2000, Memorandum from Director John Seitz to the Regional Office Air Division Directors, "Redesignation of Sulfur Dioxide Nonattainment Areas in the Absence of Monitored Data." The Seitz memo provides guidance for redesignation to attainment in those situations where major point sources are no longer in operation and in the absence of monitoring data. Results of EPA's analysis are contained in the "Technical Support Document for Notice of Direct Final Rulemaking on Sulfur Dioxide (SO<sub>2</sub>) Redesignation Request and Maintenance Plan for Morenci, Arizona, March 2004." An overview of the historical dispersion modeling analysis is provided below.<sup>22</sup>

Phelps Dodge Morenci, Inc permanently closed the smelter on December 31, 1984, and dismantled the facility by December 1996. The area remains sparsely settled and there has been no significant population growth. There are some industrial and commercial activities, estimated emissions are located in Chapter 3.0. There are no significant sources and past violations were attributed to emissions from the smelter, which is no longer in existence. Emissions of SO<sub>2</sub> from other sources have not significantly changed since the closure of the smelter.

Using the criteria established in the Seitz memo, EPA conducted screen modeling to show that the non-smelter sources were insignificant and the smelter was the dominant source, which contributed to high SO<sub>2</sub> concentrations

During the last maintenance plan submission the two largest sources in the 50-kilometer buffer area were, Other sources including several cotton gins and a prison had projected PTE ranging from .01 to .47 tons per year for 2015. No other sources were modeled due to their low output of emissions and because they were outside of the planning area. EPA determined that the ambient SO<sub>2</sub> projection requirement for redesignations and maintenance requirements were satisfied.<sup>23</sup>

### 5.2 Current Modeling Demonstration

For this second maintenance plan, ADEQ conducted a modeling analysis similar to EPA's where the two largest sources in the Maintenance Area or within the 50km buffer were modeled. The Freeport-McMoRan Morenci Mine (FMMM) is located within the Maintenance Area and has a potential to emit (PTE) of 88 tons/year (tpy). The Freeport-McMoRan Safford Mine (FMSM) is located within the 50 km buffer and has a PTE of 81 tpy. No other point sources were modeled because of their low or negligible emissions. Inspection of the individual point sources indicates many are emergency generators with actual emissions less than one tpy and therefore considered negligible.

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<sup>22</sup> For more information, see "Technical Support Document for Notice of Direct Final Rulemaking on Sulfur Dioxide (SO<sub>2</sub>) Redesignation Request and Maintenance Plan for Morenci, Arizona" Air Division U.S. Environmental Protection Agency, Region at: <http://www.epa.gov/region9/air/az/morenci/tsd0415.pdf>.

<sup>23</sup> IBID

Using the data from the two facilities, ADEQ projected emissions to 2030 (based on PTE/maximum allowable emissions). The results show that low levels of point source emissions are expected to persist through the second maintenance period. State and local permitting programs will protect the attainment status of the area for any future sources that may operate nearby. Details of the NSR/PSD program are discussed in chapter 6.

ADEQ issued renewal permits to FMSM and FMMM in February 2012 and October 2013. Table 5.1 summarizes the PTE of SO<sub>2</sub> emissions for FMSM and FMMM based on the two renewal permits and shows that there is no change in total SO<sub>2</sub> emission limits for both facilities.

**Table 5.1: Emissions of SO<sub>2</sub> for FMMM and FMSM in Renewal Permits**

Facility	PTE in renewal permits (tpy)			Modeled Emission (tpy)		
	Point	Fugitive	Total	Point	Fugitive	Total
FMMM	0.8	86.8	87.6	0.78	86.75	87.5
FMSM	50	31	81	50.02	31.03	81.05

The standard EPA screening dispersion model, AERSCREEN (version 11126) was used to estimate the impact of SO<sub>2</sub> sources in or near the Morenci nonattainment area. AERSCREEN is the screening version of AERMOD, EPA’s preferred model for near-field dispersion. AERSCREEN generates estimates of “worst-case” 1-hour concentrations for a single source, without the need for hourly meteorological data, and also includes conversion factors to estimate “worst-case” 3-hour, 8-hour, 24-hour, and annual concentrations. AERSCREEN is intended to produce concentration estimates that are equal to or greater than the estimates produced by AERMOD with a fully developed set of meteorological and terrain data. According to an EPA memorandum dated April 11, 2011, AERSCREEN has replaced SCREEN3 as the recommended screening model.<sup>24</sup>

The AERSCREEN model consists of two main components: 1) the MAKEMET program; and 2) the AERSCREEN command-prompt interface program. The MAKEMET program generates application-specific worst-case meteorology using representative ambient air temperatures, minimum wind speed, and site-specific surface characteristics (albedo, Bowen ratio, and surface roughness obtained with the AERSURFACE tool). The AERSCREEN program interfaces with AERMAP (terrain processor in AERMOD) and BPIPFRM (building downwash tool in AERMOD) to process terrain and building information respectively, and interfaces with the AERMOD model utilizing the SCREEN option to perform the modeling runs.

An initial modeling analysis was performed in 2012 using AERSCREEN version 11126, which is still the most recent version of AERSCREEN. However, the AERSURFACE version (version 08009) used in the 2012 analysis has been updated to the new version 13016. A test run, performed in 2014, indicates that the two versions generated identical surface characteristic parameters.

Another issue, is related to the terrain data. The 2012 analysis used Digital Elevation Model (DEM) data, which are no longer updated by the USGS. Instead, National Elevation Dataset (NED) data are being actively supported and checked for quality. Therefore, NED represents a more up-to-date and improved

<sup>24</sup> According to the EPA’s memorandum dated April 11, 2011, titled “AERSCREEN Released as the EPA Recommended Screening Model”; AERSCREEN has replaced SCREEN3 as the recommended preferred model.

resource for terrain elevations for regulatory modeling purposes. In order to address this issue, a test run was performed to compare modeled concentrations from the FMMM's blasting emissions by using the DEM data vs. the NED data. The results show that the modeled concentrations based on the DEM data and the NED data are nearly identical (150.6  $\mu\text{g}/\text{m}^3$  vs. 150.2  $\mu\text{g}/\text{m}^3$  for 24-hour  $\text{SO}_2$ ).

Based on the discussions above, it is concluded that the 2012 modeling analysis is still valid and no updates are needed. Further details of the modeling analysis are included in Appendix D.

Table 5.2 and 5.3 present the cumulative impact of the FMMM and FMSM facilities on the Morenci Maintenance Area and at the boundary of the Maintenance Area. The modeling results are shown in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) for comparison to the 1971 primary 24-hour and annual  $\text{SO}_2$  NAAQS. The modeling demonstrates that these sources will not cause a violation of the 1971 primary  $\text{SO}_2$  NAAQS

**Table 5.2: Cumulative Impacts of FMMM and FMSM on the Morenci Maintenance Area**

Facility	Average	Max. impact on Morenci maintenance area ( $\mu\text{g}/\text{m}^3$ )	Total modeled conc.	Background conc. ( $\mu\text{g}/\text{m}^3$ )	Total conc. ( $\mu\text{g}/\text{m}^3$ )	NAAQS ( $\mu\text{g}/\text{m}^3$ )	% Standard
FMMM	24-hour	151.5	171.5	20	191.5	365	53%
FMSM		20					
FMMM	Annual	25.3	28.6	5	33.6	80	42 %
FMSM		3.3					

**Table 5.3: Cumulative Impacts of FMMM and FMSM on the Morenci Maintenance Area Boundary**

Facility	Average	Max. impact on Morenci maintenance area boundary ( $\mu\text{g}/\text{m}^3$ )	Total modeled conc.	Background conc. ( $\mu\text{g}/\text{m}^3$ )	Total conc. ( $\mu\text{g}/\text{m}^3$ )	NAAQS ( $\mu\text{g}/\text{m}^3$ )	% Standard
FMMM	24-hour	20	40	20	60	365	16%
FMSM		20					
FMMM	Annual	3.3	6.6	5	11.6	80	15 %
FMSM		3.3					

## **6.0 MAINTENANCE PLAN SUMMARY**

Section 107(d)(3) of the CAA requires that nonattainment areas have a fully approved maintenance plan meeting the requirements of Section 175A before they can be redesignated to attainment. Section 175A also requires submittal of a SIP revision that provides for maintenance of the NAAQS for at least 10 years after the redesignation to attainment. A subsequent SIP revision providing for maintenance of the NAAQS for an additional 10 years is due eight years into the first ten-year maintenance period.

This section addresses the core provisions for maintenance plans as recommended in the September 4, 1992, Memorandum, "Procedures for Processing Requests to Redesignate Areas to Attainment". Additional guidance applicable to the Morenci Planning Area is contained in the October 18, 2000, Memorandum, "Redesignation of Sulfur Dioxide Nonattainment Areas in the Absence of Monitored Data", regarding individual components of maintenance demonstrations for areas where historic violations of the NAAQS were caused by sources that are no longer operating.

### **6.1 Emissions Inventories**

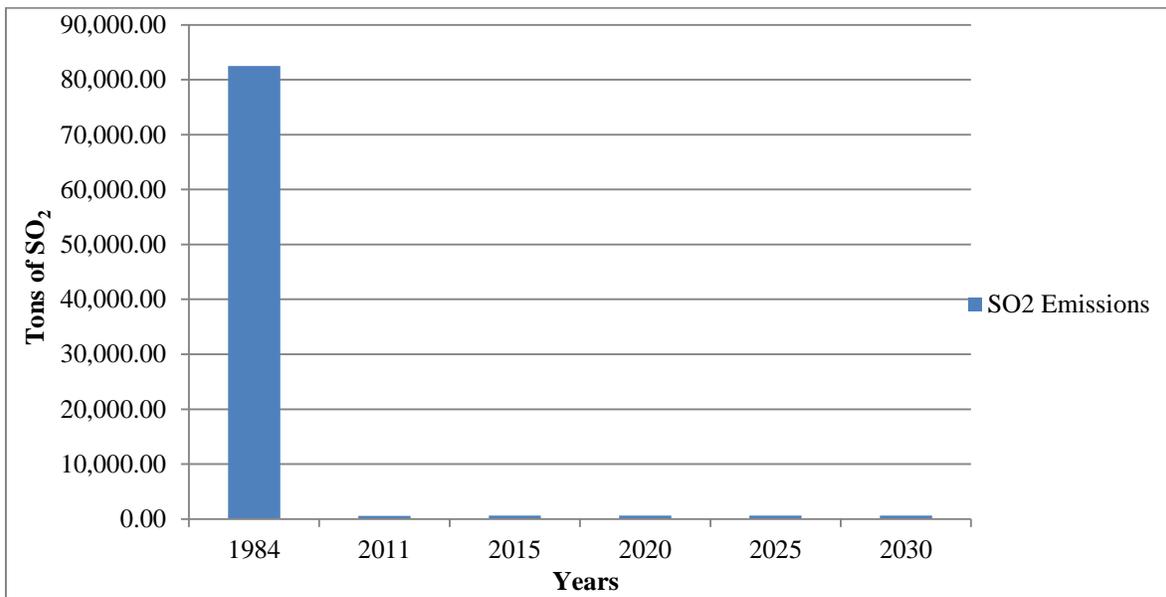
According to the 1992 guidance, states should develop an attainment emissions inventory to identify the level of emissions in an area sufficient to attain a given NAAQS. The October 18, 2000, "Seitz guidance" outlines three inventories that should be included in the maintenance plan: an inventory representing actual emissions during the period when violations of the NAAQS were occurring; an inventory representing current and allowable (or potential) emissions; and an inventory that projects allowable (or potential) emissions to the tenth year after redesignation.

The 2002 SIP contained the recommended historical inventories; a 1984 inventory for the last full year of smelter operations and a 1999 post-smelter inventory; as well as projected point, area, and mobile source emissions for the Morenci Planning Area and point source emissions within 50 km of the Planning Area through the first 10-year maintenance period (2015). Chapter 3 of this document includes a summary of these previously submitted inventories, an updated 2011 "current" inventory, and projected emissions through 2030.

### **6.2 Maintenance Demonstration**

Maintenance plans should provide a demonstration that future emissions of SO<sub>2</sub> will not cause a violation of the NAAQS. Figure 6.1 shows historical emissions based on point sources, current and projected emissions are totals from all sectors, which illustrates continued attainment. This SIP revision demonstrates the level of emissions in the Morenci area will remain well below those that occurred during the period of recorded ambient SO<sub>2</sub> NAAQS violations. Projected emissions and the results of the dispersion modeling analysis contained in Chapter 5 both demonstrate that the Morenci area will continue to maintain the 1971 primary SO<sub>2</sub> NAAQS.

**Figure 6.1: SO<sub>2</sub> Emissions for Years 1984-2030**



The emissions inventories for the Planning Area and 50 km buffer demonstrate a stringent level of protection of ambient air quality (see Chapter 5), the permanent and enforceable emissions reductions due to the closure of the Morenci smelter are greater than needed to attain and maintain the NAAQS. Therefore, the area is expected to continue to exhibit a substantial margin of safety that is protective of the 1971 SO<sub>2</sub> NAAQS.

### **6.3 Ambient Monitoring**

Once an area is redesignated to attainment, continued operation of an appropriate air quality monitoring network is generally required to verify the attainment status of the area. In the Morenci area historic violations were caused by a major point source of SO<sub>2</sub> emissions that is no longer in operation and ambient SO<sub>2</sub> monitors were removed immediately following the shutdown of the emissions source. In such cases, the October 18, 2000, Seitz Memorandum, “Redesignation of Sulfur Dioxide Nonattainment Areas in the Absence of Monitored Data,” exempts these areas from requirements for continued ambient monitoring. The maintenance plan, however, should include commitments to resume ambient monitoring before any major source of SO<sub>2</sub> emissions commences operations.

ADEQ will continue to demonstrate maintenance of the SO<sub>2</sub> NAAQS through updates to the emissions inventory. In addition, ADEQ commits to reestablish an appropriate ambient monitoring network before any major source of SO<sub>2</sub> begins operations in the Morenci Planning Area.

### **6.4 Verification of Continued Attainment**

The state is required to provide assurance that it has the legal authority necessary to implement and enforce all necessary measures used to attain and maintain the NAAQS and include an indication of how it will track the progress of the maintenance plan.

ADEQ anticipates no relaxation of any implemented control measures used to attain and maintain the

ambient air quality standards. ADEQ commits to submit to EPA Region 9 any changes to rules or emission limits applicable to SO<sub>2</sub> sources as a SIP revision. ADEQ also commits to maintain the necessary resources to actively enforce any violations of the provisions contained in this submittal.

Emissions reductions sufficient to meet the NAAQS were accomplished due to the permanent closure of the primary source of SO<sub>2</sub> emissions in the area, the Morenci copper smelter. Freeport-McMoRan Copper & Gold Inc. (successor to Phelps Dodge, owner and operator of the defunct Morenci copper smelter) does not currently hold an active permit, and no subsequent Title V permit application has been submitted to ADEQ for this closed facility. The smelting facility cannot rebuild and reopen without submittal of a New Source Review (NSR) and Title V (Part 70) permit application according to Arizona Revised Statutes (ARS) 49-426 and Arizona Administrative Code, Title 18, Chapter 2, Article 4, Permit Requirements for New Major Sources and Major Modifications to Existing Major Sources. The emission reductions achieved following the closure of this facility are both permanent and enforceable.

Further, *any* new major sources or major modifications to existing point sources of SO<sub>2</sub> are subject to the new source permitting procedures contained in AAC Title 18, Chapter 2, Article 4, specifically, ADEQ's Prevention of Significant Deterioration (PSD) Permitting Program contained in AAC R18-2-406. These regulations were established to preserve the air quality in areas where ambient concentrations are below the NAAQS and require stationary sources to undergo preconstruction review, utilizing Best Available Control Technology (BACT), before the facility is constructed, modified, or reconstructed.

In general, State permitting programs for major and minor sources are contained in Arizona Administrative Code Title 18, Chapter 2, Articles 3 and 4.<sup>25</sup> Although the Morenci Maintenance Area is located entirely within the Arizona state boundary, a portion of the 50 km buffer area extends into New Mexico. The New Mexico Environment Department, Air Quality Bureau has a permitting program for sources constructing within their jurisdiction; not including Bernalillo County and tribal lands.

Maintenance of the SO<sub>2</sub> NAAQS in the Morenci area will be tracked through updates to the emissions inventory and permit applications received for SO<sub>2</sub> emitting sources. Any permitted sources are subject to the monitoring, reporting, and certification procedures contained in AAC R18-2-306 and AAC R18-2-309 respectively. ADEQ has authority pursuant to ARS § 49-101 *et seq.* to monitor and ensure source compliance with all applicable rules and permit conditions for sources in its jurisdiction.

## **6.5 Contingency Plan**

Contingency plans should contain measures to correct any violation of the NAAQS that occurs after redesignation. According to the 1992 guidance *Procedures for Processing Requests to Redesignate Areas to Attainment*, the contingency plan must require, at a minimum, implementation of all measures contained in the Part D nonattainment plan for the area prior to redesignation.

The only threat to the 1971 SO<sub>2</sub> NAAQS in this Planning Area would be from new sources. Because the primary source of SO<sub>2</sub> emissions in the Morenci area permanently closed, measures to ensure continued attainment of the SO<sub>2</sub> NAAQS are PSD and permitting requirements. As noted in Section 6.4, any new

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<sup>25</sup> ADEQ implements a SIP approved PSD program for all regulated NSR pollutants except for PM<sub>10</sub> and greenhouse gases (GHGs). For PM<sub>10</sub> and GHGs, ADEQ implements the Federal PSD program in 40 CFR § 52.21 pursuant to delegation agreements with EPA. A proposed State Implementation Plan revision was submitted to EPA on April 10, 2012, to bring the Arizona SIP for areas under the jurisdiction of ADEQ into compliance with the NSR and PSD requirements of CAA Section 110(a)(2)(C) and 40 C.F.R. Part 51, Subpart I, with the exception of the requirements pertaining to GHGs.

major source proposing to operate in the Morenci area is subject to the provisions of AAC R18-2-406, "Permit Requirements for Sources Located in Attainment and Unclassified Areas." These programs address New Source Review and PSD requirements applicable to SO<sub>2</sub> sources.<sup>26</sup> Under the PSD program stationary sources are required to undergo preconstruction review before the facility is constructed, modified, or reconstructed and to apply BACT. If a new source is not a major source it is required to obtain a permit under minor source permitting rules at AAC R18-2-Article 3.

## **6.6 Conclusion**

The Morenci Planning Area continues to meet the 1971, 24-hour and annual primary SO<sub>2</sub> NAAQS. This submittal demonstrates that all of the essential regulatory elements have been met and the Morenci area will maintain the 1971 primary SO<sub>2</sub> NAAQS for an additional ten years, through year 2030. Maintenance of the NAAQS is demonstrated by the closure of the only significant source of SO<sub>2</sub> emissions in the area, existing limits and controls on the remaining sources, and the requirement to impose PSD requirements on any new stationary sources. ADEQ requests that EPA approve this demonstration of maintenance through year 2030.

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<sup>26</sup> AAC R-18-2-403 "Permits for Sources Located in Nonattainment Areas" and R18-2-406 "Permit requirements for Sources Located in Attainment and Unclassifiable Areas" were adopted effective November 15, 1993, and most recently amended by final rulemaking at 18 A.A.R 1542, effective August 7, 2012. New Source Review standards are defined in 40 CFR § 51.307, Prevention of Significant Deterioration standards, in 40 CFR § 51.166.

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## **Appendix A**

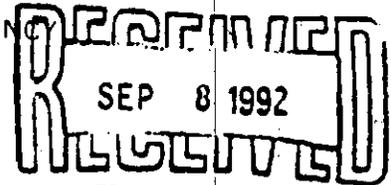
***Procedures for Processing Requests to Redesignate Areas to Attainment,***  
Memorandum, John Calcagni, Director, Air Quality Management Division, U.S.  
Environmental Protection Agency

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
Office of Air Quality Planning and Standards  
Research Triangle Park, North Carolina 27711

AIR PROGRAMS BRANCH



4 SEP 1992

EPA-REGION IV  
ATLANTA, GA.

MEMORANDUM

SUBJECT: Procedures for Processing Requests to Redesignate Areas to Attainment

FROM: John Calcagni, Director  
Air Quality Management Division (MD-15)

TO: Director, Air, Pesticides and Toxics Management Division, Regions I and IV  
Director, Air and Waste Management Division, Region II  
Director, Air, Radiation and Toxics Division, Region III  
Director, Air and Radiation Division, Region V  
Director, Air, Pesticides and Toxics Division, Region VI  
Director, Air and Toxics Division, Regions VII, VIII, IX, and X

Purpose

The Office of Air Quality Planning and Standards (OAQPS) expects that a number of redesignation requests will be submitted in the near future. Thus, Regions will need to have guidance on the applicable procedures for handling these requests, including maintenance plan provisions. This memorandum, therefore, consolidates the Environmental Protection Agency's (EPA's) guidance regarding the processing of requests for redesignation of nonattainment areas to attainment for ozone (O<sub>3</sub>), carbon monoxide (CO), particulate matter (PM-10), sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), and lead (Pb). Regions should use this guidance as a general framework for drafting Federal Register notices pertaining to redesignation requests. Special concerns for areas seeking redesignation from unclassifiable to attainment will be addressed on a case-by-case basis.

Background

Section 107(d)(3)(E) of the Clean Air Act, as amended, states that an area can be redesignated to attainment if the following conditions are met:

1. The EPA has determined that the national ambient air quality standards (NAAQS) have been attained.

2. The applicable implementation plan has been fully approved by EPA under section 110(k).

3. The EPA has determined that the improvement in air quality is due to permanent and enforceable reductions in emissions.

4. The State has met all applicable requirements for the area under section 110 and Part D.

5. The EPA has fully approved a maintenance plan, including a contingency plan, for the area under section 175A.

Each of these criteria is discussed in more detail in the following paragraphs. Particular attention is given to maintenance plan provisions at the end of this document since maintenance plans constitute a new requirement under the amended Clean Air Act. Exceptions to the guidance will be considered on a case-by-case basis.

#### 1. Attainment of the Standard

The State must show that the area is attaining the applicable NAAQS. There are two components involved in making this demonstration which should be considered interdependently. The first component relies upon ambient air quality data. The data that are used to demonstrate attainment should be the product of ambient monitoring that is representative of the area of highest concentration. These monitors should remain at the same location for the duration of the monitoring period required for demonstrating attainment. The data should be collected and quality-assured in accordance with 40 CFR 58 and recorded in the Aerometric Information Retrieval System (AIRS) in order for it to be available to the public for review. For purposes of redesignation, the Regional Office should verify that the integrity of the air quality monitoring network has been preserved.

For PM-10, an area may be considered attaining the NAAQS if the number of expected exceedances per year, according to 40 CFR 50.6, is less than or equal to 1.0. For O<sub>3</sub>, the area must show that the average annual number of expected exceedances, according to 40 CFR 50.9, is less than or equal to 1.0 based on data from all monitoring sites in the area or its affected downwind environs. In making this showing, both PM-10 and O<sub>3</sub> must rely on 3 complete, consecutive calendar years of quality-assured air quality monitoring data, collected in accordance with 40 CFR 50, Appendices H and K. For CO, an area may be considered attaining the NAAQS if there are no violations, as determined in accordance

with 40 CFR 50.8, based on 2 complete, consecutive calendar years of quality-assured monitoring data. For SO<sub>2</sub>, according to 40 CFR 50.4, an area must show no more than one exceedance annually and for Pb, according to section 50.12, an area may show no exceedances on a quarterly basis.

The second component relies upon supplemental EPA-approved air quality modeling. No such supplemental modeling is required for O<sub>3</sub> nonattainment areas seeking redesignation. Modeling may be necessary to determine the representativeness of the monitored data. For pollutants such as SO<sub>2</sub> and CO, a small number of monitors typically is not representative of areawide air quality or areas of highest concentration. When dealing with SO<sub>2</sub>, Pb, PM-10 (except for a limited number of initial moderate nonattainment areas), and CO (except moderate areas with design values of 12.7 parts per million or lower at the time of passage of the Clean Air Act Amendments of 1990), dispersion modeling will generally be necessary to evaluate comprehensively sources' impacts and to determine the areas of expected high concentrations based upon current conditions. Areas which were designated nonattainment based on modeling will generally not be redesignated to attainment unless an acceptable modeling analysis indicates attainment. Regions should consult with OAQPS for further guidance addressing the need for modeling in specific circumstances.

## 2. State Implementation Plan (SIP) Approval

The SIP for the area must be fully approved under section 110(k),<sup>1</sup> and must satisfy all requirements that apply to the area. It should be noted that approval action on SIP elements and the redesignation request may occur simultaneously. An area cannot be redesignated if a required element of its plan is the subject of a disapproval; a finding of failure to submit or to implement the SIP; or partial, conditional, or limited approval. However, this does not mean that earlier issues with regard to the SIP will be reopened. Regions should not reconsider those things that have already been approved and for which the Clean Air Act Amendments did not alter what is required. In contrast, to the extent the Amendments add a requirement or alter an existing requirement so that it adds something more, Regions should consider those issues. In addition, requests from areas known to be affected by dispersion techniques which are inconsistent with EPA guidance will continue to be considered unapprovable under section 110 and will not qualify for redesignation.

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<sup>1</sup>Section 110(k) contains the requirements for EPA action on plan submissions. It addresses completeness, deadlines, full and partial approval, conditional approval, and disapproval.

### 3. Permanent and Enforceable Improvement in Air Quality

The State must be able to reasonably attribute the improvement in air quality to emission reductions which are permanent and enforceable.<sup>2</sup> Attainment resulting from temporary reductions in emission rates (e.g., reduced production or shutdown due to temporary adverse economic conditions) or unusually favorable meteorology would not qualify as an air quality improvement due to permanent and enforceable emission reductions.

In making this showing, the State should estimate the percent reduction (from the year that was used to determine the design value for designation and classification) achieved from Federal measures such as the Federal Motor Vehicle Control Program and fuel volatility rules as well as control measures that have been adopted and implemented by the State. This estimate should consider emission rates, production capacities, and other related information to clearly show that the air quality improvements are the result of implemented controls. The analysis should assume that sources are operating at permitted levels (or historic peak levels) unless evidence is presented that such an assumption is unrealistic.

### 4. Section 110 and Part D Requirements

For the purposes of redesignation, a State must meet all requirements of section 110 and Part D that were applicable prior to submittal of the complete redesignation request. When evaluating a redesignation request, Regions should not consider whether the State has met requirements that come due under the Act after submittal of a complete redesignation request.<sup>3</sup>

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<sup>2</sup>This is consistent with EPA's existing policy on redesignations as stated in an April 21, 1983 memorandum titled "Section 107 Designation Policy Summary." This memorandum states that in order for an area to be redesignated to attainment, the State must show that "actual enforceable emission reductions are responsible for the recent air quality improvement." This element of the policy retains its validity under the amended Act pursuant to section 193. [Note: other aspects of the April 21, 1983 memorandum have since been superseded by subsequent memorandums; interested parties should consult with OAQPS before relying on these aspects, e.g. those relating to required years of air quality data.]

<sup>3</sup>Under section 175A(c), however, the requirements of Part D remain in force and effect for the area until such time as it is redesignated. Upon redesignation to attainment, the requirements that became due under section 175A(c) after submittal of the complete redesignation request would no longer be applicable.

However, any requirements that came due prior to submittal of the redesignation request must be fully approved into the plan at or before the time EPA redesignates the area.

To avoid confusion concerning what requirements will be applicable for purposes of redesignation, Regions should encourage States to work closely with the appropriate Regional Office early in the process. This will help to ensure that a redesignation request submitted by the State has a high likelihood of being approved by EPA. Regions should advise States of the practical planning consequences if EPA disapproves the redesignation request or if the request is invalidated because of violations recorded during EPA's review. Under such circumstances, EPA does not have the discretion to adjust schedules for implementing SIP requirements. As a result, an area may risk sanctions and/or Federal implementation plan implementation that could result from failure to meet SIP submittal or implementation requirements.

a. Section 110 Requirements

Section 110(a)(2) contains general requirements for nonattainment plans. Most of the provisions of this section are the same as those contained in the pre-amended Act. We will provide guidance on these requirements as needed.<sup>4</sup>

b. Part D Requirements

Part D consists of general requirements applicable to all areas which are designated nonattainment based on a violation of the NAAQS. The general requirements are followed by a series of subparts specific to each pollutant. The general requirements appear in subpart 1. The requirements relating to O<sub>3</sub>, CO, PM-10, SO<sub>2</sub>, NO<sub>2</sub>, and Pb appear in subparts 2 through 5. In those instances where an area is subject to both the general nonattainment provisions in subpart 1 as well as one of the pollutant-specific subparts, the general provisions may be subsumed within, or superseded by, the more specific requirements of subparts 2 through 5.

If an area was not classified under section 181 for O<sub>3</sub>, or section 186 for CO, then that area is only subject to the provisions of subpart 1, "Nonattainment Areas in General." In addition to relevant provisions in subpart 1, an O<sub>3</sub> and CO area, which is classified, must meet all applicable requirements in subpart 2, "Additional Provisions for Ozone Nonattainment Areas," and subpart 3, "Additional Provisions for Carbon Monoxide

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<sup>4</sup>General guidance regarding the requirements for SIP's may be found in the "General Preamble to Title I of the 1990 Clean Air Act Amendments," 57 FR 13498 (April 16, 1992).

Nonattainment Areas," respectively, before the area may be redesignated to attainment. All PM-10 nonattainment areas (whether classified as moderate or serious) must similarly meet the applicable general provisions of subpart 1 and the specific PM-10 provisions in subpart 4, "Additional Provisions for Particulate Matter Nonattainment Areas." Likewise, SO<sub>2</sub>, NO<sub>2</sub>, and Pb nonattainment areas are subject to the applicable general nonattainment provisions in subpart 1 as well as the more specific requirements in subpart 5, "Additional Provisions for Areas Designated Nonattainment for Sulfur Oxides, Nitrogen Dioxide, and Lead."

i. Section 172(c) Requirements

This section contains general requirements for nonattainment plans. A thorough discussion of these requirements may be found in the General Preamble to Title I [57 FR 13498 (April 16, 1992)]. The EPA anticipates that areas will already have met most or all of these requirements to the extent that they are not superseded by more specific Part D requirements. The requirements for reasonable further progress, identification of certain emissions increases, and other measures needed for attainment will not apply for redesignations because they only have meaning for areas not attaining the standard. The requirements for an emission inventory will be satisfied by the inventory requirements of the maintenance plan. The requirements of the Part D new source review program will be replaced by the prevention of significant deterioration (PSD) program once the area has been redesignated. However, in order to ensure that the PSD program will become fully effective immediately upon redesignation, either the State must be delegated the Federal PSD program or the State must make any needed modifications to its rules to have the approved PSD program apply to the affected area upon redesignation.

ii. Conformity

The State must work with EPA to show that its SIP provisions are consistent with section 176(c)(4) conformity requirements. The redesignation request should include conformity procedures, if the State already has these procedures in place. Additionally, we currently interpret the conformity requirement to apply to attainment areas. However, EPA has not yet issued its conformity regulations specifying what areas are subject to the conformity requirement. Therefore, if a State does not have conformity procedures in place at the time that it submits a redesignation request, the State must commit to follow EPA's conformity regulation upon issuance, as applicable. If the State submits the redesignation request subsequent to EPA's issuance of the conformity regulations, and the conformity requirement became applicable to the area prior to submission,

the State must adopt the applicable conformity requirements before EPA can redesignate the area.

#### 5. Maintenance Plans

Section 107(d)(3)(E) of the amended Act stipulates that for an area to be redesignated, EPA must fully approve a maintenance plan which meets the requirements of section 175A. A State may submit both the redesignation request and the maintenance plan at the same time and rulemaking on both may proceed on a parallel track. Maintenance plans may, of course, be submitted and approved by EPA before a redesignation is requested. However, according to section 175A(c), pending approval of the maintenance plan and redesignation request, all applicable nonattainment area requirements shall remain in place.

Section 175A defines the general framework of a maintenance plan. The maintenance plan will constitute a SIP revision and must provide for maintenance of the relevant NAAQS in the area for at least 10 years after redesignation. Section 175A further states that the plan shall contain such additional measures, if any, as may be necessary to ensure such maintenance. Because the Act requires a demonstration of maintenance for 10 years after an area is redesignated (not 10 years after submittal of a redesignation request), the State should plan for some lead time for EPA action on the request. In other words, the maintenance demonstration should project maintenance for 10 years, beginning from a date which factors in the time necessary for EPA review and approval action on the redesignation request. In determining the amount of lead time to allow, States should consider that section 107(d)(3)(D) grants the Administrator up to 18 months from receipt of a complete submittal to process a redesignation request. The statute also requires the State to submit a revision of the SIP 8 years after the original redesignation request is approved to provide for maintenance of the NAAQS for an additional 10 years following the first 10-year period [see section 175A(b)].

In addition, the maintenance plan shall contain such contingency measures as the Administrator deems necessary to ensure prompt correction of any violation of the NAAQS [see section 175A(d)]. The Act provides that, at a minimum, the contingency measures must include a requirement that the State will implement all measures contained in the nonattainment SIP prior to redesignation. Failure to maintain the NAAQS and triggering of the contingency plan will not necessitate a revision of the SIP unless required by the Administrator, as stated in section 175A(d).

The following is a list of core provisions that we anticipate will be necessary to ensure maintenance of the relevant NAAQS in an area seeking redesignation from

nonattainment to attainment. We therefore recommend that States seeking redesignation of a nonattainment area consider these provisions. However, any final EPA determination regarding the adequacy of a maintenance plan will be made following review of the plan submittal in light of the particular circumstances facing the area proposed for redesignation and based on all relevant information available at the time.

a. Attainment Inventory

The State should develop an attainment emissions inventory to identify the level of emissions in the area which is sufficient to attain the NAAQS.<sup>5</sup> This inventory should be consistent with EPA's most recent guidance on emission inventories for nonattainment areas available at the time and should include the emissions during the time period associated with the monitoring data showing attainment.<sup>6</sup>

Source size thresholds are 100 tons/year for SO<sub>2</sub>, NO<sub>2</sub>, and PM-10 areas, and 5 tons/year for Pb based upon 40 CFR 51.100(k) and 51.322, as well as established practice for AIRS data. The source size threshold for serious PM-10 areas is 70 tons/year

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<sup>5</sup>Where the State has made an adequate demonstration that air quality has improved as a result of the SIP (as discussed previously), the attainment inventory will generally be the actual inventory at the time the area attained the standard.

<sup>6</sup>The EPA's current guidance on the preparation of emission inventories for O<sub>3</sub> and CO nonattainment areas is contained in the following documents: "Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone: Volume I" (EPA-450/4-91-016), "Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone: Volume II" (EPA-450/4-91-014), "Emission Inventory Requirements for Ozone State Implementation Plans" (EPA-450/4-91-010), "Emission Inventory Requirements for Carbon Monoxide Implementation Plans" (EPA-450/4-91-011), "Guideline for Regulatory Application of the Urban Airshed Model" (EPA-450/4-91-013), "Procedures for Emission Inventory Preparation: Volume IV, Mobile Sources" (EPA-450/4-81-026d), and "Procedures for Preparing Emission Inventory Projections" (EPA-450/4-91-019). The EPA does not currently have specific guidance on attainment emissions inventories for SO<sub>2</sub>. In lieu thereof, States are referred to the guidance on emissions data to be used as input to modeling demonstrations, contained in Table 9.1 of EPA's "Guideline on Air Quality Models (Revised)" (EPA-450/2-78-027R), July 1987, which is generally applicable to all criteria pollutants. Emission inventory procedures and requirements documents are currently being prepared by OAQPS for PM-10 and Pb; these documents are due for release by summer 1992.

according to Clean Air Act section 189(b)(3). However, the inventory should include sources below these size thresholds if these smaller sources were included in the SIP attainment demonstration. Where sources below the 100, 70, and 5 tons/year-size thresholds (e.g., areas with smaller source size definitions) are subject to a State's minor source permit program, these sources need only be addressed in the aggregate to the extent that they result in areawide growth.

For O<sub>3</sub> nonattainment areas, the inventory should be based on actual "typical summer day" emissions of O<sub>3</sub> precursors (volatile organic compounds and nitrogen oxides) during the attainment year. This will generally correspond to one of the periodic inventories required for nonattainment areas to reconcile milestones. For CO nonattainment areas, the inventory should be based on actual "typical CO season day" emissions for the attainment year. This will generally correspond to one of the periodic inventories required for nonattainment areas.

b. Maintenance Demonstration

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, or by modeling to show that the future mix of sources and emission rates will not cause a violation of the NAAQS. Under the Clean Air Act, many areas are required to submit modeled attainment demonstrations to show that proposed reductions in emissions will be sufficient to attain the applicable NAAQS. For these areas, the maintenance demonstration should be based upon the same level of modeling. In areas where no such modeling was required, the State should be able to rely on the attainment inventory approach. In both instances, the demonstration should be for a period of 10 years following the redesignation.

Where modeling is relied upon to demonstrate maintenance, each plan should contain a summary of the air quality concentrations expected to result from application of the control strategy. In the process, the plan should identify and describe the dispersion model or other air quality model used to project ambient concentrations (see 40 CFR 51.46).

In either case, to satisfy the demonstration requirement the State should project emissions for the 10-year period following redesignation, either for the purpose of showing that emissions will not increase over the attainment inventory or for conducting modeling.<sup>7</sup> The projected inventory should consider future growth, including population and industry, should be consistent

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<sup>7</sup>Guidance for projecting emissions may be found in the emissions inventory guidance cited in footnote 6.

with the attainment inventory, and should document data inputs and assumptions. All elements of the demonstration (e.g., emission projections, new source growth, and modeling) should be consistent with current EPA modeling guidance.<sup>8</sup> For O<sub>3</sub> and CO, the projected emissions should reflect the expected actual emissions based on enforceable emission rates and typical production rates.

For CO, a State should address the areawide component of the maintenance demonstration either by showing that future CO emissions will not increase or by conducting areawide modeling. Preferably, the State should carry out hot-spot modeling that is consistent with the Guideline on Air Quality Models (Revised), in order to demonstrate maintenance of the NAAQS. In particular, if the nonattainment problem is related to a pattern of hot-spots then hot-spot modeling should generally be conducted. However, hot-spot modeling is not automatically required. For example, if the nonattainment problem was related solely to stationary point sources, or if highway improvements have been implemented and the associated emission reductions and travel characteristics can be qualitatively documented, then hot-spot modeling is not required. In such cases, adequate documentation as well as the concurrence of Headquarters is needed.

Any assumptions concerning emission rates must reflect permanent, enforceable measures. In other words, a State generally cannot take credit in the maintenance demonstration for reductions unless there are regulations in place requiring those reductions or the reductions are otherwise shown to be permanent. Therefore, the State will be expected to maintain its implemented control strategy despite redesignation to attainment, unless such measures are shown to be unnecessary for maintenance or are replaced with measures that achieve equivalent reductions (see additional discussion under "Contingency Plan"). Emission reductions from source shutdowns can be considered permanent and enforceable to the extent that those shutdowns have been reflected in the SIP and all applicable permits have been modified accordingly.

Modeling used to demonstrate attainment may be relied upon in the maintenance demonstration where the modeling conforms to current EPA guidance and where the State has projected no significant changes in the modeling inputs during the intervening time. Where the original attainment demonstration may no longer be relied upon, States will be expected to remodel using current

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<sup>8</sup>The EPA-approved modeling guidance may be found in the following documents: "Guideline on Air Quality Models (Revised)," OAQPS, RTP, NC (EPA-450/2-78-027R), July 1986; and "PM-10 SIP Development Guideline," OAQPS, RTP, NC (EPA-450/2-86-001), June 1987.

EPA referenced techniques.<sup>9</sup> This may be necessary where, for example, there has been a change in emissions or a change in the siting of new sources or modifications such that air quality may no longer be accurately represented by the existing modeling.

c. Monitoring Network

Once an area has been redesignated, the State should continue to operate an appropriate air quality monitoring network, in accordance with 40 CFR Part 58, to verify the attainment status of the area. The maintenance plan should contain provisions for continued operation of air quality monitors that will provide such verification. In cases where measured mobile source parameters (e.g., vehicle miles traveled congestion) have changed over time, the State may also need to perform a saturation monitoring study to determine the need for, and location of, additional permanent monitors.

d. Verification of Continued Attainment

Each State should ensure that it has the legal authority to implement and enforce all measures necessary to attain and to maintain the NAAQS. Sections 110(a)(2)(B) and (F) of the Clean Air Act, as amended, and regulations promulgated at 40 CFR 51.110(k), suggest that one such measure is the acquisition of ambient and source emission data to demonstrate attainment and maintenance.

Regardless of whether the maintenance demonstration is based on a showing that future emission inventories will not exceed the attainment inventory or on modeling, the State submittal should indicate how the State will track the progress of the maintenance plan. This is necessary due to the fact that the emission projections made for the maintenance demonstration depend on assumptions of point and area source growth.

One option for tracking the progress of the maintenance demonstration, provided here as an example, would be for the State to periodically update the emissions inventory. In this case, the maintenance plan should specify the frequency of any planned inventory updates. Such an update could be based, in part, on the annual AIRS update and could indicate new source growth and other changes from the attainment inventory (e.g., changes in vehicle miles travelled or in traffic patterns). As an alternative to a complete update of the inventory, the State may choose to do a comprehensive review of the factors that were used in developing the attainment inventory to show no significant change. If this review does show a significant change, the State should then perform an update of the inventory.

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<sup>9</sup>See references for modeling guidance cited in footnote 8.

Where the demonstration is based on modeling, an option for tracking progress would be for the State to periodically (typically every 3 years) reevaluate the modeling assumptions and input data. In any event, the State should monitor the indicators for triggering contingency measures (as discussed below).

e. Contingency Plan

Section 175A of the Act also requires that a maintenance plan include contingency provisions, as necessary, to promptly correct any violation of the NAAQS that occurs after redesignation of the area. These contingency measures are distinguished from those generally required for nonattainment areas under section 172(c)(9) and those specifically required for O<sub>3</sub> and CO nonattainment areas under sections 182(c)(9) and 187(a)(3), respectively. For the purposes of section 175A, a State is not required to have fully adopted contingency measures that will take effect without further action by the State in order for the maintenance plan to be approved. However, the contingency plan is considered to be an enforceable part of the SIP and should ensure that the contingency measures are adopted expediently once they are triggered. The plan should clearly identify the measures to be adopted, a schedule and procedure for adoption and implementation, and a specific time limit for action by the State. As a necessary part of the plan, the State should also identify specific indicators, or triggers, which will be used to determine when the contingency measures need to be implemented.

Where the maintenance demonstration is based on the inventory, the State may, for example, identify an "action level" of emissions as the indicator. If later inventory updates show that the inventory has exceeded the action level, the State would take the necessary steps to implement the contingency measures. The indicators would allow a State to take early action to address potential violations of the NAAQS before they occur. By taking early action, States may be able to prevent any actual violations of the NAAQS and, therefore, eliminate the need on the part of EPA to redesignate an area to nonattainment.

Other indicators to consider include monitored or modeled violations of the NAAQS (due to the inadequacy of monitoring data in some situations). It is important to note that air quality data in excess of the NAAQS will not automatically necessitate a revision of the SIP where implementation of contingency measures is adequate to address the cause of the violation. The need for a SIP revision is subject to the Administrator's discretion.

The EPA will review what constitutes a contingency plan on a case-by-case basis. At a minimum, it must require that the State will implement all measures contained in the Part D nonattainment

plan for the area prior to redesignation [see section 175A(d)]. This language suggests that a State may submit a SIP revision at the time of its redesignation request to remove or reduce the stringency of control measures. Such a revision can be approved by EPA if it provides for compensating equivalent reductions. A demonstration that measures are equivalent would have to include appropriate modeling or an adequate justification. Alternatively, a State might be able to demonstrate (through EPA-approved modeling) that the measures are not necessary for maintenance of the standard. In either case, the contingency plan would have to provide for implementation of any measures that were reduced or removed after redesignation of the area.

#### Summary

As stated previously, this memorandum consolidates EPA's redesignation and maintenance plan guidance and Regions should rely upon it as a general framework in drafting Federal Register notices. It is strongly suggested that the Regional Offices share this document with the appropriate States. This should give the States a better understanding of what is expected from a redesignation request and maintenance plan under existing policy. Any necessary changes to existing Agency policy will be made through our action on specific redesignation requests and the review of section 175A maintenance plans for these particular areas, both of which are subject to notice and comment rulemaking procedures. Thus, in applying this memorandum to specific circumstances in a rulemaking, Regions should consider the applicability of the underlying policies to the particular facts and to comments submitted by any person. If your staff members have questions which require clarification, they may contact Sharon Reinders at (919) 541-5284 for O<sub>3</sub>- and CO-related issues, and Eric Ginsburg at (919) 541-0877 for SO<sub>2</sub>-, PM-10-, and Pb-related issues.

cc: Chief, Air Branch, Regions I-X  
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## **Appendix B**

***Redesignation of Sulfur Dioxide Nonattainment Areas in the Absence of Monitored Data***, Memorandum, John Seitz, Director,  
Office of Air Quality Planning and Standards,  
U.S. Environmental Protection Agency, October 18, 2000

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RESEARCH TRIANGLE PARK, NC 27711

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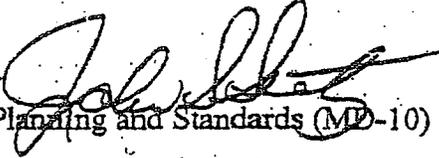
AIR DIVISION  
U.S. EPA, REGION 9

OCT 18

OFFICE OF  
AIR QUALITY PLANNING  
AND STANDARDS

MEMORANDUM

SUBJECT: Redesignation of Sulfur Dioxide Nonattainment Areas in the Absence of Monitored Data

FROM: John S. Seitz, Director   
Office of Air Quality Planning and Standards (MD-10)

TO: Regional Office Air Division Directors

The purpose of this memorandum is to provide guidance on redesignating sulfur dioxide (SO<sub>2</sub>) nonattainment areas to attainment, in cases where the areas' historic violations were caused by major point sources of sulfur oxide (SO<sub>x</sub>) emissions that are no longer in operation. States in some cases have, with our approval, removed SO<sub>2</sub> monitors from these areas immediately following the shutdown of the SO<sub>x</sub> emissions sources. In these cases, states face the prospect of continued nonattainment designations for areas where there is no reasonable basis for assuming that SO<sub>2</sub> violations persist.

This guidance provides an approach for redesignating these areas to attainment in the absence of monitoring data and for exempting these areas from the maintenance plan requirements for continued monitoring within the areas. In addition, this policy describes how attainment and continued maintenance should be demonstrated and how sources currently shut down should be treated if they resume operations. Therefore, this policy amends portions of previous redesignation policies, including "Procedures for Processing Requests to Redesignate Areas to Attainment," memo from John Calcagni, AQMD Director, dated 9/4/92; "Section 107 Designation Policy Summary," memo from Sheldon Meyers, OAQPS Director, dated 4/21/83, pertaining to ambient air quality data showing attainment and maintenance of the SO<sub>2</sub> National Ambient Air Quality Standards (NAAQS); and "Attainment Determination Policy for Sulfur Dioxide Nonattainment Areas," memo from Sally L. Shaver, AQSSD Director, dated 1/26/95. All other provisions of the previous redesignation policies still apply, including provisions relating to contingency measures.

The Environmental Protection Agency's (EPA) historic redesignation policy for SO<sub>2</sub> has called for 8 quarters of clean ambient air quality data for redesignation to attainment. Although EPA has allowed as few as 4 quarters of ambient data if an acceptable modeling analysis has been performed.<sup>1</sup> Areas that lack SO<sub>2</sub> monitors cannot meet even the requirement for 4 quarters of clean data. However, EPA believes that it is not a reasonable use of limited monitoring resources to reestablish monitors in order to collect at least 4 quarters of data in areas where violations of the SO<sub>2</sub> NAAQS were caused by sources that no longer operate.

Despite the absence of clean air quality data, EPA believes that it may approve a State's request to redesignate such SO<sub>2</sub> nonattainment areas to attainment provided that the State submits a maintenance plan that addresses certain criteria.

First, the plan should include 3 emissions inventories:

- (a) An inventory representing actual emissions during the period when there were violations of the SO<sub>2</sub> NAAQS;
- (b) An inventory representing current actual and allowable emissions (or potential emissions, if there is no allowable emissions level); and
- (c) An inventory projecting allowable emissions (or potential emissions, if there is no allowable emissions level) to the 10th year after redesignation.

The inventories should display emissions from each point source of SO<sub>x</sub>, with explanations of significant emissions changes, including source shutdowns.<sup>2</sup> The inventories should include SO<sub>x</sub> emissions from all SO<sub>x</sub> point sources in, and within a 50 kilometer range of, the nonattainment area boundary. Again, if there is no allowable emissions level, potential emissions should be used.

Second, the maintenance plan should include a dispersion modeling analysis of all SO<sub>x</sub> point sources in, and within 50 kilometers of, the nonattainment area boundaries using the emissions inventories described above and the techniques and data prescribed in 40 CFR 51 Appendix W. The modeling analysis should show that:

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<sup>1</sup>See the Meyers memo referenced above. Both the Meyers and Calcagni memos recognize that for SO<sub>2</sub> nonattainment areas monitoring data alone may not be sufficient for redesignating areas to attainment; dispersion modeling may be needed.

<sup>2</sup>The inventories should include other sources if they were included in the attainment demonstration.

- (a) No SO<sub>2</sub> NAAQS violations presently occur or can be projected to occur during the next 10 years anywhere within the nonattainment area; and,
- (b) Point sources, which have since shut down, were the dominant sources contributing to high SO<sub>2</sub> concentrations in the airshed.

Third, the maintenance plan should include evidence that if the SO<sub>x</sub> point source that caused the SO<sub>2</sub> NAAQS violations in the past resumes operation, it would be considered a "new" source. Thus the maintenance plan should show that if this "new" SO<sub>x</sub> source would be a major source, it should obtain a permit conforming to applicable requirements of the Prevention of Significant Deterioration program before resuming operations; or if it would not be a major source, it should obtain a minor source permit under the State's SIP-approved minor source permitting rules in effect at the time it obtains a permit, before it may resume operation. The maintenance plan should provide that before such a permit is issued, the dispersion model should be re-run, using the same meteorological data base, to determine whether re-starting the source would interfere with maintenance, and should provide that the permit will not be issued if the model indicates that re-starting the source would interfere with maintenance.

Fourth, the maintenance plan should include commitments to resume ambient monitoring before any major source of SO<sub>x</sub> emissions commences operation.

This policy applies only to SO<sub>2</sub> nonattainment areas because violations in such areas are generally dominated by relatively few point sources (such as copper smelters or power plants) and have insignificant area and mobile source emission contributions. As a result, there is a direct association between the point sources' emissions and ambient SO<sub>2</sub> concentrations. Dispersion modeling will assure that SO<sub>2</sub> NAAQS violations are no longer occurring and would not be expected to recur in the future.

This guidance memorandum does not impose binding, enforceable requirements on any party, and may not apply to a particular situation based upon the circumstances. The EPA retains the discretion to adopt approaches to addressing maintenance plan provisions that differ from this guidance where appropriate. Any final decisions by EPA regarding a particular SO<sub>2</sub> maintenance plan will only be made in the context of a rulemaking action regarding that maintenance plan based upon the applicable statutory and regulatory provisions, which do contain legally binding requirements. Therefore, interested parties, including States, are free to raise questions and objections about the appropriateness of this guidance or the application of this guidance to a particular situation; EPA will consider whether or not the recommendations in the guidance are appropriate in that situation. The EPA welcomes public comments on this document at any time and will consider those comments in any future revision of this guidance document, which may occur without public notice.

I urge Regions to coordinate closely with OAQPS' Air Quality Standards and Strategies Division in determining whether SO2 redesignation requests may be subject to this policy and to ensure that states' submissions adequately address this and the previous policies' criteria for redesignating SO2 nonattainment areas to attainment.

cc: Lydia Wegman, AQSSD  
David Mobley, EMAD  
Joé Paisie, IPSG  
Rich Ossias, OGC

# SO2 Redesignation Policy Memo

**Policy Purpose:** To amend existing requirements for redesignating SO2 NAAs to attainment, in order to allow for redesignations where:

- (1) past violations were due to emissions from a single source;
- (2) the single source has shut down;
- (3) all monitors have been removed.

**Policy Approach:** Maintenance plan must include:

- (1) **emissions inventories** representing (a) actual emissions when violations occurred; (b) current emissions; and (c) emissions projected to the 10th year after redesignation.
- (2) **dispersion modeling** showing (a) no NAAQS violations occur or can be projected for the next 10 years; and (b) the shutdown sources were the dominant cause of high concentrations in the past.
- (3) evidence that if the shutdown sources resume operation they will be considered new sources and required to obtain a **PSD permit**
- (4) **commitments to resume monitoring** before any major SOx source commences operation.

**Policy Application:** Restricted to SO2 NAAs because SO2 violations are frequently caused by a few point sources

**Policy Benefits:** Allows redesignation of several SO2 NAAs to attainment, without requiring collection of ambient data

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## **Appendix C**

*SO<sub>2</sub> Emissions Inventories for 2011 and Subsequent Years through 2030,*  
Arizona Department of Environmental Quality, June 20, 2014

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# **SO<sub>2</sub> Emissions Inventories for 2011 and Subsequent Years through 2030**

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**Technical Support Document  
for the Morenci SO<sub>2</sub>  
Maintenance Plan**

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**Arizona Department of  
Environmental Quality**

**June 20, 2014**

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## Table of Contents

1. EMISSIONS INVENTORY & METHODOLOGY .....	1
1.1 Emission Inventory for the SO <sub>2</sub> 24-hour and Annual Standard .....	1
1.2 2011 Baseline Emissions Inventory – Methodology .....	1
1.2.1 Population and Area Based Emission Allocation Methodology .....	1
1.2.2 Non-Road Mobile Activities .....	3
1.2.3 On-Road Mobile Activities .....	4
1.2.4 Area (non-point) Activities .....	4
1.2.5 Industrial (point) Sources .....	6
Figure 1: Morenci SO <sub>2</sub> Maintenance Area with 50 Kilometer Buffer .....	10
2. MORENCI SO <sub>2</sub> MAINTENANCE AREA EMISSIONS INVENTORY FOR POINT, AREA AND MOBILE SOURCES FOR THE BASE YEAR 2011 .....	11
3. PROJECTED SO <sub>2</sub> EMISSIONS INVENTORY FOR POINT, AREA AND MOBILE SOURCES THROUGH 2030 .....	11
3.1 Summary of Emissions Projections for 2011 – 2030 .....	13
4. REFERENCES .....	15

## LIST OF TABLES

TABLE 1: ADOA 2011 POPULATION OF MORENCI CDP, CLIFTON, AND GREENLEE CO. ....	2
TABLE 2: NON-ROAD MOBILE SO <sub>2</sub> EMISSIONS FOR GREENLEE COUNTY AND THE MORENCI SO <sub>2</sub> MAINTENANCE AREA .....	3
TABLE 3: ON-ROAD MOBILE SO <sub>2</sub> EMISSIONS FOR GREENLEE COUNTY AND THE MORENCI MAINTENANCE AREA .....	4
TABLE 4: AREA (NON-POINT) SO <sub>2</sub> EMISSIONS FOR GREENLEE COUNTY AND THE MORENCI AREA ..	6
TABLE 5: SO <sub>2</sub> POINT SOURCES WITHIN MORENCI SO <sub>2</sub> MAINTENANCE AREA .....	8
TABLE 6: SO <sub>2</sub> POINT SOURCES WITHIN 50-KM BUFFER, OUTSIDE MORENCI SO <sub>2</sub> MAINTENANCE AREA .....	9
TABLE 7: MORENCI SO <sub>2</sub> MAINTENANCE AREA – 2011 BASELINE EMISSION ESTIMATES .....	11
TABLE 8: MORENCI SO <sub>2</sub> MAINTENANCE AREA 2011 – 2030 POPULATION PROJECTION .....	12
TABLE 9: MORENCI SO <sub>2</sub> MAINTENANCE AREA 2011 – 2030 PROJECTED EMISSION ESTIMATES .....	14

## LIST OF FIGURES

FIGURE 1: MORENCI SO <sub>2</sub> MAINTENANCE AREA WITH 50 KILOMETER BUFFER .....	10
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# 1. EMISSIONS INVENTORY & METHODOLOGY

## 1.1 Emission Inventory for the SO<sub>2</sub> 24-hour and Annual Standard

The following sections in this Technical Support Document (TSD) provide a discussion of the methodologies used to develop the 2011 baseline emissions inventory and future year inventories for the Morenci maintenance area from identified contributing source categories and a presentation of the derived inventories. This TSD was developed to help demonstrate continued maintenance of the 1971 24-hour and annual SO<sub>2</sub> NAAQS for the Morenci SO<sub>2</sub> planning area.

## 1.2 2011 Baseline Emissions Inventory – Methodology

The source categories used in the emissions inventory are a standardized list of sources which has been followed in previous State Implementation Plans (SIPs). These categories include:

- Non-road Mobile (exhaust) sources
- On-road Mobile (exhaust) sources
- Industrial (point) sources
- Area (non-point) sources

Area and Mobile emission data were updated using 2011 National Emission Inventory (NEI) Version 1 data. Since ADEQ permits industrial point sources, ADEQs datasets were used because they were the most accurate and recent SO<sub>2</sub> emissions data for facilities located within the maintenance area and the surrounding 50 km buffer area.

### 1.2.1 *Population and Area Based Emission Allocation Methodology*

ADEQ implemented a top down methodology by utilizing the 2011 NEI Version 1 inventory for Greenlee County. For source categories whose emissions may be significantly associated with the general population, the county-wide emissions reported in the 2011 NEI Version 1, the most recent EPA certified emissions data available, were adjusted to the Morenci Maintenance Area using the population ratio of the Town of Clifton and the Morenci CDP to that of Greenlee County as a metric for scaling county level emissions to the Morenci Maintenance Area<sup>1</sup>.

#### Population adjustments:

2011 Morenci Maintenance Area Pop. = 2011 Clifton Pop. + 2011 Morenci CDP Pop. = 4,755

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<sup>1</sup> The designation “Morenci Maintenance Area” refers to the combined population of the Towns of Morenci and Clifton and the designation “Morenci CDP” refers to the population of the Town of Morenci, AZ.

2011 Greenlee County Pop. = 8,380

Therefore, the Population Adjustment Ratio = 2011 Morenci Maintenance Area Population / 2011 Greenlee County Population, or:

$$4,755 / 8,380 = 0.5674 \text{ (56.74\%)}$$

Population Adjustment Ratio = 56.74 %

**Table 1: ADOA 2011 Population of Morenci CDP, Clifton, and Greenlee Co.**

Location	2011
Morenci CDP	1,482
Clifton	3,273
Morenci Maintenance Area	4,755
Greenlee County	8,380

Source: Arizona Department of Administration (ADOA) <http://www.workforce.az.gov/population-projections.aspx>

Area adjustments:

Source emissions not adjusted from the County level to the Morenci SO<sub>2</sub> Maintenance Area based on the population adjustment ratio calculated above were adjusted based on the Area Adjustment Ratio of 13.31 % calculated below:

$$\text{Greenlee County Area} = 4787.4 \text{ km}^2$$

$$\text{Morenci Maintenance Area} = 637.3 \text{ km}^2$$

Area Adjustment Ratio = Morenci SO<sub>2</sub> Maintenance Area / Greenlee Co Area

$$\text{Area Adjustment Ratio} = 637.3 \text{ km}^2 / 4787.4 \text{ km}^2 = 13.31\%$$

Railway adjustment

Since some of the railways in Greenlee County were outside the maintenance plan boundaries and the remainder railways were inside the SO<sub>2</sub> maintenance area, it was important to appropriately adjust the Greenlee County non-road, locomotive mobile source emissions to the Morenci SO<sub>2</sub> Maintenance Area. Google Earth was used to measure the length of railway both outside and inside the maintenance area. The railway length ratio was found to be approximately 20 % and the calculations are shown below.

$$\text{Greenlee County railway length} = 40 \text{ miles}$$

$$\text{Morenci Maintenance area railway length} = 8 \text{ miles}$$

Railway length Adjustment Ratio = Morenci SO<sub>2</sub> Maintenance Area / Greenlee Co Area

Railway length Adjustment Ratio 8 miles / 40 miles = 20%

### 1.2.2 Non-Road Mobile Activities

For the Non-Road Mobile Activities category, ADEQ employed a top down methodology using the 2011 NEI Version 1 inventory for Greenlee County. The county-wide emissions reported in the 2011 NEI Version 1 were adjusted to the Morenci Maintenance Area using either the population adjustment ratio, the area adjustment ratio, or the railway length adjustment ratio of the Morenci Maintenance Area to that of Greenlee County.

#### Non-Road Mobile Emissions Calculations

The NEI reported a total of 0.33 tons of SO<sub>2</sub> emissions from non-road mobile source activities in Greenlee County (see Table 2) for the year of 2011. Based on the population adjustment ratio of 56.74 % and the railway track ratio of about 20 %, SO<sub>2</sub> emissions from non-road mobile sources in the Morenci SO<sub>2</sub> Maintenance Area were estimated to be 0.08 tons for 2011.

**Table 2: Non-Road Mobile SO<sub>2</sub> Emissions for Greenlee County and the Morenci SO<sub>2</sub> Maintenance Area**

Source	Description	Tons/yr (Greenlee Co.)	Adjustment Ratio	*Tons/yr (Morenci Maintenance Area)
Mobile	Locomotives	0.26	20.00%	0.05
Mobile	Non-Road Equipment - Diesel	0.03	56.74 %	0.02
Mobile	Non-Road Equipment - Gasoline	0.02	56.74 %	0.01
Mobile	Non-Road Equipment - Other	0.00	56.74 %	0.00
	<b>Total</b>	<b>0.31</b>		<b>0.08</b>

Data downloaded on 2-24-2014 from EPA 2011 National Emission Inventory Version 1 (NEI, 2011)

\*Tons per Year (TPY) for the Morenci Maintenance Area were calculated by multiplying TPY (Greenlee Co.) by the Population Adjustment Ratio of 56.74 % or the Area Adjustment Ratio of 13.31%.

### 1.2.3 On-Road Mobile Activities

On-road mobile source activities were calculated by ADEQ by again using a top-down methodology, implementing the 2011 NEI Version 1 inventory for Greenlee County. The county-wide emissions reported in the 2011 NEI Version 1 represent the most recent EPA certified emissions data available. These values were estimated for the Morenci Maintenance Area using the population adjustment ratio of the Morenci CDP and Clifton to that of Greenlee County (56.74%) as a scaling metric for estimating Morenci Maintenance Area SO<sub>2</sub> emissions from county level values.

#### *On-Road Mobile Emissions Calculations*

The 2011 NEI Version 1 reported a total of 0.58 tons of SO<sub>2</sub> emissions from on-road mobile vehicle activities in Greenlee County during 2011 (Table 3). Based on the population adjustment ratio, SO<sub>2</sub> emissions from on-road mobile sources in the Morenci SO<sub>2</sub> Maintenance Area were estimated to be 0.33 tons for the year of 2011 (56.74 % of 0.58 tons).

**Table 3: On-Road Mobile SO<sub>2</sub> Emissions for Greenlee County and the Morenci Maintenance Area**

Source	Description	Tons/yr. (Greenlee County)	Adjustment Ratio	*Tons/yr (Morenci Maintenance Area)
Mobile	On-Road Diesel Heavy Duty Vehicles	0.07	56.74 %	0.04
Mobile	On-Road Diesel Light Duty Vehicles	0.00	56.74 %	0.00
Mobile	On-Road Gasoline Heavy Duty Vehicles	0.03	56.74 %	0.02
Mobile	On-Road Gasoline Light Duty Vehicles	0.48	56.74 %	0.27
	<b>Total</b>	<b>0.58</b>		<b>0.33</b>

Data downloaded on 2-24-2014 from EPA 2011 National Emission Inventory Version 1 (NEI, 2011)

\*Tons per Year (TPY) for the Morenci Maintenance Area were calculated by multiplying TPY (Greenlee Co.) by the Population Adjustment Ratio of 56.74%.

### 1.2.4 Area (non-point) Activities

For Area (non-point) Activities sources, ADEQ again used the top-down methodology for calculation of Morenci Maintenance Area SO<sub>2</sub> emissions based on the 2011 NEI Version 1 for Greenlee County. The county-wide emissions reported in the 2011 NEI Version 1 represent the most recent EPA certified emissions data available for fuel combustion source types. These values were estimated for the Morenci Maintenance Area using the population adjustment ratio

of the Morenci Maintenance Area to that of Greenlee County (56.74%) as a scaling metric for estimating Morenci Maintenance Area SO<sub>2</sub> emissions from county level values, as shown in section 1.2.1. 2011 Greenlee County SO<sub>2</sub> emissions for agricultural field burning, wildfires and prescribed fires are also listed below. These values were estimated for the Morenci Maintenance Area by use of the area adjustment ratio of 13.31%.

#### *Area (non-point) Emissions Calculations*

NEI and ADEQ reported a total of 3,949.93 tons of SO<sub>2</sub> emitted from Area (non-point) source activities in Greenlee County during the year of 2011 (Table 4). While mining activities are included as Area (non-point) SO<sub>2</sub> sources in the 2011 NEI Version 1, ADEQ excluded the Freeport-McMoran Morenci, Inc. mining source activities from Area (non-point) source activities as to eliminate redundancy in this emission report since these emissions are included in Industrial (point) source activities (Section 1.2.5.). Based on the population adjustment ratio of 56.74% and the area adjustment ratio of 13.31%, SO<sub>2</sub> emissions from Area (non-point) sources in the Morenci SO<sub>2</sub> Maintenance Area were estimated to be 525.94 tons for the year of 2011.

**Table 4: Area (non-point) SO<sub>2</sub> Emissions for Greenlee County and the Morenci Area**

Source	Description	Tons/yr. (Greenlee Co.)	Adjustment Ratio	*Tons/yr. (Morenci Maintenance Area)
Fires	Agricultural Field Burning	0.11	13.31%	0.015
Fires	Prescribed Fires	20.38	13.31%	2.71
Fires	Wildfires	3,928.97	13.31%	522.95
Fuel Combustion	Comm/Institutional – Biomass	0.01	56.74 %	0.00
Fuel Combustion	Comm/Institutional - Oil	0.01	56.74 %	0.01
Fuel Combustion	Electric Generation - Natural Gas	0.00	56.74 %	0.00
Fuel Combustion	Electric Generation - Other	0.00	56.74 %	0.00
Fuel Combustion	Industrial Boilers, ICEs - Natural Gas	0.00	56.74 %	0.00
Fuel Combustion	Residential - Natural Gas	0.03	56.74 %	0.02
Fuel Combustion	Residential - Oil	0.01	56.74 %	0.00
Fuel Combustion	Residential - Other	0.00	56.74 %	0.00
Fuel Combustion	Residential - Wood	0.20	56.74 %	0.11
Industrial Processes	Industrial Processes - Oil & Gas Production	0.00	56.74 %	0.00
Miscellaneous	Non-Industrial NEC	0.00	56.74 %	0.00
	Waste Disposal	0.21	56.74 %	0.12
	<b>Total</b>	<b>3949.93</b>		<b>525.94</b>

Source: 2011 National Emission Inventory Version 1 (NEI) (Data was downloaded on 2-24-2014).

### **1.2.5 Industrial (point) Sources**

When building an Emission Inventory (EI) of point sources within the Morenci Maintenance Area, a large discrepancy was found to have occurred in emissions from the Freeport-McMoran Morenci, Inc. Copper Mine (previously permitted as the ‘Phelps Dodge Morenci Mine’ (PDMM)) between the years of 1990-1999 and 2000-2010. Prior to the year 2000, emissions from the facility rarely exceeded 1 ton/yr. From 2000-2010 the facility never emitted less than 25 tons/yr. Review of historical ADEQ EI’s for the facility revealed fugitive emissions from blasting were not reported until the year of 2000 and thus were not included in the 2002 ‘MORENCI SULFUR DIOXIDE NONATTAINMENT AREA STATE IMPLEMENTATION AND MAINTENANCE PLAN’ EI or modeling efforts. Due to this discrepancy, the Morenci Maintenance Area EI and modeling efforts were updated to include these emissions in the currently submitted EI and modeling summary report.

Within the Morenci Maintenance Area, two SO<sub>2</sub> emission facilities were identified: 1) Freeport-McMoran Morenci (FMMM), Inc. and 2) Morenci Townsite Wastewater Treatment Plant (WWTP) Emergency Generators (Table 5).

#### *Freeport-McMoran Morenci, Inc.*

The FMMM open-pit copper mine, ore processing and copper extraction facilities, located at 33.0700 latitude and -109.3433 longitude, has been in existence since the early 1970s. It was originally permitted by the Arizona Department of Health Services (ADHS) and later by ADEQ. FMMM produces copper through conventional milling and froth flotation. ADEQ considers FMMM a major source for NO<sub>x</sub> and particulates. Due to the closing of the Copper smelter in 1985, ADEQ no longer considers FMMM a major source for SO<sub>2</sub> with the facility having a current potential to emit (PTE) of 87.6tons/yr. Recent FMMM emissions inventory data for SO<sub>2</sub> indicate emission levels ranging from 25.0 tons/yr. to 56.0 tons/yr.

Current operating equipment with potential SO<sub>2</sub> emissions at the source includes: 2 SO<sub>2</sub> tanks, 2 industrial boilers working in parallel with 2 gas turbines, 5 small industrial boilers, and one natural gas boiler. The total permitted allowable annual SO<sub>2</sub> emissions from this process equipment is 1.61 tons. In contrast, the facility blasts rock during its regular mining efforts. This blasting has a PTE of 86.75 tons/yr. accounting for a potential of upwards of 98% of the annual FMMM SO<sub>2</sub> emissions originating from this process.

#### *Morenci Townsite WWTP Emergency Generators*

The Morenci Townsite WWTP Emergency Generators permit allows for the emergency generation of power to the Morenci copper mine waste water treatment plant through the operation of four diesel generators. These generators range in size between 72.4 and 181 hp. As these generators are only permitted for use during emergency, maintenance, and testing periods, emissions are minimal (Table 5). This facility accounted for less than 0.01% of total SO<sub>2</sub> emissions from all industrial (point) sources within the Morenci SO<sub>2</sub> Maintenance Area.

#### *50 Kilometer buffer surrounding the Morenci SO<sub>2</sub> Maintenance Area*

SO<sub>2</sub> point source data were assembled for a 50-km buffer area around the Morenci SO<sub>2</sub> Maintenance Area. This area includes portions of Greenlee and Graham counties in Arizona and Catron, Grant, and Hidalgo counties in New Mexico. Sources in the two Arizona counties were determined by the ADEQ permitted facility list. It was confirmed, by the New Mexico Environment Department (NMED), that there were no New Mexico point sources within the 50 km buffer.

There were 15 identified point sources in 2011 in the 50-km buffer region (Figure 1). Two of the point sources are within the Morenci SO<sub>2</sub> Maintenance Area and the remaining 13 are within the 50-km Buffer, but outside the Morenci SO<sub>2</sub> Maintenance Area. Actual emissions and potential to emit (PTE) totals are shown in Tables 5 and 6 in tons per year (tpy).

Table 5 shows that the actual emissions for point sources within the Morenci SO<sub>2</sub> Maintenance Area (i.e. Freeport-McMoran Morenci's Copper Mine and the Morenci Townsite WWTP Emergency Generators) emit well below the PTE limits listed for these sources. Those facilities located within the 50 km buffer show similar emission patterns where actual emissions only total 38.05 tons for the year of 2011, while the PTE for this year was 167.38 tons. In order to be conservative, the PTE was used in the emission estimations for future years. Table 5 presents emission sources found within the Morenci SO<sub>2</sub> Maintenance Area, while Table 6 presents those sources located within the SO<sub>2</sub> 50 km buffer region but not within the Morenci SO<sub>2</sub> Maintenance Area.

**Table 5: SO<sub>2</sub> Point Sources within Morenci SO<sub>2</sub> Maintenance Area**

<b>ID</b>	<b>Source</b>	<b>Latitude</b>	<b>Longitude</b>	<b>2011 (tons/day)</b>	<b>2011 (tons/yr.)</b>	<b>PTE (tons/yr.)</b>	<b>Permit Status as of 2014</b>
1	Freeport-McMoran Morenci, Inc.	33.0700	-109.3433	0.133	48.529	87.60	Active
2	Morenci Townsite WWTP Emergency Generators	33.0650	-109.3422	0.000	0.003	4.90	Terminated
	<b>Total Emissions</b>			<b>0.133</b>	<b>48.532</b>	<b>92.50</b>	

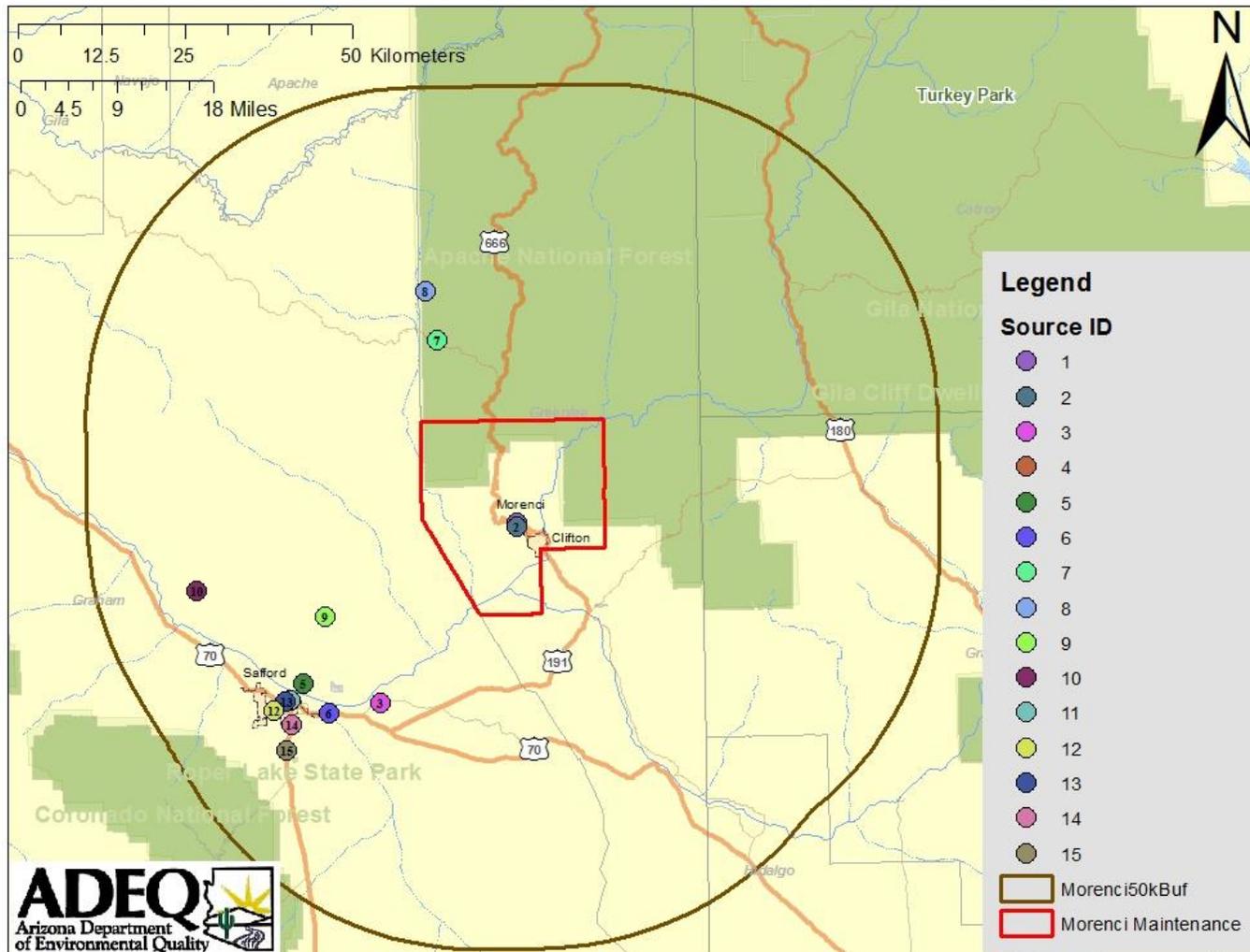
Data Source: Arizona Department of Environmental Quality (ADEQ) and the 2011 NEI Version 1. Data verified by ADEQ Permits Section.

**Table 6: SO<sub>2</sub> Point Sources within 50-km Buffer, outside Morenci SO<sub>2</sub> Maintenance Area**

<b>ID</b>	<b>Source</b>	<b>Latitude</b>	<b>Longitude</b>	<b>2011 Actual Emissions (tons/day)</b>	<b>2011 Actual Emissions (tons/yr.)</b>	<b>PTE (tons/yr.)</b>	<b>Permit Status as of 2014</b>
3	Arizona State Prisons - Safford Complex (2010)	32.8289	-109.565	0.001	0.193	4.96	Terminated
4	City of Safford – Water Reclamation Plant	32.8424	-109.7241	0.001	0.214	24.26	Terminated
5	CKC Construction Company (2012)	32.8563	-109.6878	0.000	0.126	11.60	Active
6	Freeport McMoran - Central Analytical Service Center	32.8165	-109.6482	0.000	0.002	0.39	Active
7	Freeport McMoran Corporation - Bee Canyon Well Field	33.3167	-109.4667	0.003	1.044	8.24	Active
8	Freeport McMoran Corporation - Mud Springs Well Field	33.3833	-109.4833	0.003	1.087	5.62	Active
9	Freeport-McMoran Safford Inc.	32.9473	-109.6509	0.096	35	81.20	Active
10	Glenbar Gin, Inc.	32.9839	-109.8567	0.000	0.012	0.02	Active
11	Level 3 Communications	32.8351	-109.7081	N/A	N/A	0.21	Terminated
12	Mt. Graham Regional Medical Center, Inc.	32.8228	-109.7352	0.000	0.09	2.80	Terminated
13	Select Cleaners (2010)	32.8327	-109.7161	0.000	0.001	0.16	Terminated
14	Tri County Materials - Hot Mix Asphalt Plant	32.8021	-109.7077	0.000	0.155	8.61	Active
15	USDOJ FCI - Safford	32.7667	-109.7167	0.000	0.122	24.27	Terminated
	<b>Total Emissions</b>			<b>0.104</b>	<b>38.05</b>	<b>167.38</b>	

Data Source: Arizona Department of Environmental Quality (ADEQ) and the 2011 NEI Version 1. Data verified by ADEQ Permits Section.

Figure 1: Morenci SO<sub>2</sub> Maintenance Area with 50 Kilometer Buffer



## 2. MORENCI SO<sub>2</sub> MAINTENANCE AREA EMISSIONS INVENTORY FOR POINT, AREA AND MOBILE SOURCES FOR THE BASE YEAR 2011

### *Summary of Estimated Emissions*

Table 7 provides a summary of both annual and daily emissions estimates for the Morenci SO<sub>2</sub> Maintenance Area calculated from the previously identified source categories and each source categories' relative contribution to total SO<sub>2</sub> emissions.

**Table 7: Morenci SO<sub>2</sub> Maintenance Area – 2011 Baseline Emission Estimates**

Source Category	SO <sub>2</sub> Emissions (tons per year)		Morenci Maintenance Area SO <sub>2</sub> Emissions*(tons per day)	Percent of total SO <sub>2</sub> Emissions in Morenci Maintenance Area
	Greenlee County	Morenci Maintenance Area		
On-Road Vehicle Sources	0.58	0.33	0.00090	0.06%
Non-Road Vehicle Sources	0.31	0.08	0.00022	0.01%
Industrial (point) Sources**	N/A	48.54	0.13296	8.44%
Area (non-point) Sources	3,949.93	525.94	1.44094	91.49%
<b>Total</b>	<b>N/A</b>	<b>574.89</b>	<b>1.57502</b>	<b>100.00%</b>

\* Tons per Year/365

\*\* The point sources were located within the Morenci SO<sub>2</sub> Maintenance Area.

## 3. PROJECTED SO<sub>2</sub> EMISSIONS INVENTORY FOR POINT, AREA AND MOBILE SOURCES THROUGH 2030

Projecting future SO<sub>2</sub> emissions requires taking into account economic growth, emissions control measures, capital turnover, fuel switching, technological change, and other activities of impact making accurate projections of SO<sub>2</sub> emissions difficult to forecast. Therefore, conservative forecasting of SO<sub>2</sub> emissions is necessary to ensure future compliance with National Ambient Air Quality Standards (NAAQS).

ADEQ performed conservative forecasts of SO<sub>2</sub> emissions from 2011 to 2030 through the utilization of point source facility PTE values (held constant), in place of actual emissions. The areas of the inventory which could be reasonably associated with population growth are Area (non-point) Sources excluding fires, On-Road Mobile Vehicle Sources (through the use of MOVES),

and Non-Road Mobile Vehicle Sources. The emissions from these source categories were grown for future years based on the population projected growth factor shown in Table 8. Point source emissions (PTE), wildfire and prescribed fire emissions within the Morenci SO<sub>2</sub> Maintenance Area and the 50 km buffer (Table 5 and 6) are assumed to remain constant through 2030. From Table 9 it can be seen that from 2015 to 2030, the tons per year of SO<sub>2</sub> increased by only 0.04 tons. This small change is due mainly to the small increase in population (2.2%) over the same period and the assumption that emissions from fires and the two industrial point sources did not change.

**Table 8: Morenci SO<sub>2</sub> Maintenance Area 2011 – 2030 Population Projection**

Morenci SO <sub>2</sub> Maintenance Area Population Projection					
Source Category	2011	2015	2020	2025	2030
Period		2011-2015	2016-2020	2021-2025	2026-2030
Morenci CDP	1,482	1,489	1,500	1,508	1,512
Clifton	3,273	3,299	3,323	3,340	3,350
Morenci Maintenance Area	4,755	4,788	4,823	4,848	4,862
Greenlee County	8,380	8,437	8,499	8,543	8,568
Population projected growth factor		0.68%	0.73%	0.53%	0.29%

Source: Arizona Department of Administration (ADOA) <http://www.workforce.az.gov/population-projections.aspx>

### Onroad Emissions Projections

EPA considers on-road emissions from the NEI as a more accurate emissions estimate than on-road emissions calculated using MOVES with the default database. Therefore, it was decided to run MOVES for 2011, 2015, 2020, 2025, and 2030 using the national default database and ratio the 2011 MOVES results to 2011 NEI Version 1. The MOVES ratio (MR) is then applied to the 2015, 2020, 2025 and 2030 (default database) MOVES runs. See the following equations for mathematical details.

$$MR_{2011} = \text{MOVES ratio} = \text{2011 NEI Version 1 to 2011 MOVES SO}_2 \text{ Ratio}$$

$$= M_{2011NEI} / M_{2011RUN}$$

Where:

$M_{2011NEI}$  = Greenlee County Onroad Mobile emissions as determined from the 2011 NEI Version 1 = 0.58 tons/yr.

$M_{2011RUN}$  = Greenlee County Onroad Mobile emissions as determined by running MOVES using the 2011 national default database = 0.88 tons/yr.

$$MR_{2011} = \text{MOVES ratio} = 0.58 \text{ tons/yr.} / 0.88 \text{ tons/yr.} = 0.657$$

Once the NEI to MOVES national default ratio is determined, that ratio can then be applied to subsequent year MOVES national default runs to estimate emissions for Greenlee County. An example calculation is provided below.

$$\text{OR}_{\text{GC2015}} = \text{On-road emissions (Greenlee County) 2015} = \text{M}_{2015\text{RUN}} \times \text{MR}_{2011} \text{ ratio} = \\ 0.81 \text{ tons/yr.} \times 0.657 = \underline{0.53 \text{ tons/yr.}}$$

Once the Greenlee County emissions are calculated, those emissions can then be allocated to the Morenci Maintenance Area by using the same population adjustment ratio (0.5674) that was calculated as shown in Section 1.2.1. An example calculation for determining onroad emissions for the Morenci Maintenance Area for 2015 is provided below.

$$\text{OR}_{\text{MMA2015}} = \text{On-road emissions (Morenci Maintenance Area) 2015} =$$

$$\text{OR}_{\text{GC2015}} \times \text{Population ratio Morenci Maintenance Area to Greenlee County} = \\ 0.53 \times 0.5674 = 0.30 \text{ tons/yr.}$$

### **3.1 Summary of Emissions Projections for 2011 – 2030**

This TSD describes the methodologies utilized in developing updated emission inventories for the Morenci SO<sub>2</sub> Maintenance area. A baseline emission inventory was developed for the year 2011 and serves as a base for projecting emissions through 2030. The projection of the Emission Inventory from 2011 to 2030 was performed by increasing portions or the entirety of each category: On-road Vehicle Emissions, Non-road Vehicle Emissions, and Area (non-point) emissions. Both non-road and area source emissions were grown using the population projected growth factors shown in Table 8. The resultant emissions are shown in Table 9. Between 2011 and 2030, emissions are shown to have potentially increased by 6.8% compared to 2011 emissions. The majority of this increase is attributed to growth in emissions from permitted point sources due to the use of PTE for future years compared to actual emissions from the baseline year.

**Table 9: Morenci SO2 Maintenance Area 2011 – 2030 Projected Emission Estimates**

<b>Morenci Maintenance Area SO<sub>2</sub> Emissions (tons per year)</b>						
<b>Source Category</b>	<b>2011</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>	<b>Projection Method</b>
On-Road Vehicle Sources	0.33	0.30	0.30	0.31	0.33	MOVES
Non-Road Vehicle Sources (Locomotives)	0.05	0.05	0.05	0.05	0.05	Population
Non-Road Vehicle Sources (Other)	0.03	0.03	0.03	0.03	0.03	Population
Industrial (point) Sources	48.54	87.60	87.60	87.60	87.60	No change
Area (non-point) Sources (Fires)	525.67	525.67	525.67	525.67	525.67	No change
Area (non-point) Sources (Other)	0.27	0.27	0.27	0.28	0.28	Population
<b>Total</b>	<b>574.89</b>	<b>613.92</b>	<b>613.92</b>	<b>613.94</b>	<b>613.96</b>	

## 4. REFERENCES

2011NEI: National Emission Inventory (NEI), 2011 Arizona and New Mexico Emission Report  
<http://www.epa.gov/ttnchie1/net/2011inventory.html>

Air Quality Division, Arizona Department of Environmental Quality: “MORENCI SULFUR DIOXIDE NONATTAINMENT AREA STATE IMPLEMENTATION AND MAINTENANCE PLAN”, June 2002

2011ADOA: <http://www.azstats.gov/population-estimates.aspx>, 2013-2050 SUB-COUNTY POPULATION PROJECTIONS, “Greenlee.xlsx”

2002Morenci: “MORENCI SULFUR DIOXIDE NONATTAINMENT AREA STATE IMPLEMENTATION AND MAINTENANCE PLAN”, June 2002

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## **Appendix D**

### ***Morenci Modeling Analysis***

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# Modeling Analysis

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Maintenance Plan  
for the Morenci  
Sulfur Dioxide  
Planning Area (1971  
NAAQS)

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Arizona Department of  
Environmental Quality

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## Modeling Analysis

### **1.0 Overview of Modeling Approach**

The standard EPA screening dispersion model, AERSCREEN (version 11126) was used to estimate the impact of SO<sub>2</sub> sources in or near the Morenci nonattainment area. AERSCREEN is the screening version of AERMOD, the EPA's preferred model for near-field dispersion. AERSCREEN generates estimates of "worst-case" 1-hour concentrations for a single source, without the need for hourly meteorological data, and also includes conversion factors to estimate "worst-case" 3-hour, 8-hour, 24-hour, and annual concentrations. AERSCREEN is intended to produce concentration estimates that are equal to or greater than the estimates produced by AERMOD with a fully developed set of meteorological and terrain data. According to the EPA's memorandum dated April 11, 2011, AERSCREEN has replaced SCREEN3 as the recommended screening model.

The AERSCREEN model consists of two main components: 1) the MAKEMET program; and 2) the AERSCREEN command-prompt interface program. The MAKEMET program generates application-specific worst-case meteorology using representative ambient air temperatures, minimum wind speed, and site-specific surface characteristics (albedo, Bowen ratio, and surface roughness). The AERSCREEN program interfaces with AERMAP (terrain processor in AERMOD) and BPIPFRM (building downwash tool in AERMOD) to process terrain and building information respectively, and interfaces with the AERMOD model utilizing the SCREEN option to perform the modeling runs.

Based on the emission inventories as shown in 3.0, the two largest sources in and within 50 kilometers of the Morenci nonattainment area were modeled. The sources modeled were the Freeport-McMoRan Morenci Mine (FMMM) with a PTE of 88 tons/year and the Freeport-McMoRan Safford Mine (FMSM) with a PTE of 81 tons/year. No other point sources were modeled because of their low or negligible emissions. The emission inventory represented in 3.2 lists several SO<sub>2</sub> sources within the 50K buffer with PTE above 5 TPY. Closer inspection of the individual point sources indicates many are emergency generators with actual emission less than 1 TYP and therefore considered negligible to this exercise. The modeling analysis included the following major steps:

- Collected SO<sub>2</sub> source information including emission rates, locations, and release parameters by reviewing the FMMM's Title V permit and the FMSM's Class II permit.
- Determined representative minimum ambient temperature, maximum ambient temperatures, and minimum wind speed by reviewing the meteorological data collected from the Morenci/Safford area. Ran AERSURFACE to generate site-specific surface characteristics (albedo, Bowen ratio, and surface roughness). Ran MAKEMET to generate site-specific worst-case meteorology.
- Downloaded the USGS Digital Elevation Model (DEM) data. Ran the AERMAP terrain processor to take the terrain features into account.

- Modeled FMMM and FMSM separately. Representative background concentrations were added to modeled impacts and the total concentrations were then compared to the NAAQS.
- Estimated the cumulative impacts of the two facilities on the Morenci nonattainment area.

## 2.0 Modeling for Freeport-McMoRan Morenci Mine (FMMM)

### 2.1 Source Inputs

All SO<sub>2</sub> sources along with their maximum allowable emissions are listed in Table 1. Blasting is the dominant source in FMMM, as the emission from blasting activities account for 99 percent of the total facility emission. Other emission sources include SO<sub>2</sub> tanks, small industrial boilers, and steam boiler and turbine units. The total maximum allowable emission for these small sources is less than 1 ton/year. Table 2 summarizes stack release parameters for SO<sub>2</sub> sources. Since Units 1-2 gas turbines and boilers have comparable release parameters, these four sources were combined together and modeled as a single point source. Similarly, SO<sub>2</sub> tanks and small industrial boilers were combined together and modeled as another single point source.

**Table 2.1 SO<sub>2</sub> Sources in the FMMM facility**

Operations	Emission rate (tons/year)	Note
Blasting	86.75	
SO2 Tank #1	0.01	
SO2 Tank #2	0.01	
Unit 1 gas turbine	0.33	Unit 1+Unit 2 gas turbine <=0.33 Unit 1+Unit 2 boiler <=0.13
Unit 1 boiler	0.13	
Unit 2 gas turbine	0.33	
Unit 2 boiler	0.13	
Small Industrial Boiler #1	0.13	Boiler#1+#2+#3+#4+#5 <=0.33
Small Industrial Boiler #2	0.13	
Small Industrial Boiler #3	0.13	
Small Industrial Boiler #4	0.13	
Small Industrial Boiler #5	0.13	
Natural gas start up boiler	0.02	

**Table 2.2 Stack Release Parameters for SO<sub>2</sub> Sources**

Operations	Stack height (m)	Stack diameter (m)	Exit velocity (m/s)	Exit gas temperature (K)
Blasting	N/A	N/A	N/A	N/A
Unit 1 gas turbine	24.4	2.1	19.8	310.9
Unit 1 boiler	21.3	2.4	19.8	310.9
Unit 2 gas turbine	24.4	2.1	19.8	310.9
Unit 2 boiler	21.3	2.4	19.8	310.9
Small Industrial Boiler #1	10.1	7.3	11.6	419.3
Small Industrial Boiler #2	10.1	7.3	11.6	419.3

Small Industrial Boiler #3	10.1	7.3	11.6	419.3
Small Industrial Boiler #4	10.1	7.3	11.6	419.3
Small Industrial Boiler #5	10.1	7.3	11.6	419.3
Natural gas start up boiler	N/A	N/A	N/A	N/A
SO2 Tank #1	N/A	N/A	N/A	N/A
SO2 Tank #2	N/A	N/A	N/A	N/A

## 2.2 Modeling Blasting Operations

Blasting operations generate instantaneous emissions of gaseous pollutants including SO<sub>2</sub>. Historically, ADEQ has used the Open burn/Open Detonation Model (OBODM), developed by Strategic Environmental Research and Development Program (SERDP), to assess impacts from blasting sources. However, upon the review of the OBODM technical documents, it was found that that the OBODM model may not be appropriate for the screening modeling purposes. As the buoyant rise of a plume from a detonation in OBODM strongly depends on the quantity of material detonated, modeling the blasting operations as a single volume source may result in an extremely high plume rise and thus significantly underestimate the ground level impact. An extreme case occurs when the calculated plume height for the imaginary source is far above the top of the surface mixing layer, leading to a zero ground level concentration. This is because OBODM assumes the concentration contribution from the plume material that resides above the top of the surface layer can be neglected. Based on the discussions above, the OBODM model was not used in this modeling analysis. Instead, AERSCREEN was used to conservatively estimate the impacts from the blasting operations.

Blasting operations vary spatially over the mining area. For screening modeling purposes, the blasting activities were assumed to be limited to a 200 by 200-meter area and were modeled a single volume source. Furthermore, a vertical dimension of 30-meter was assumed to represent a conservative estimate of the averaging vertical dimension of a typical blast release. To model a volume source, three parameters including the release height, the initial lateral dimension ( $\sigma_{y0}$ ), and the initial vertical dimension ( $\sigma_{z0}$ ) of initial plume must be defined. According to USER'S GUIDE FOR THE AMS/EPA REGULATORY MODEL – AERMOD, EPA 2004a, the initial lateral dimension ( $\sigma_{y0}$ ) and the initial vertical dimension ( $\sigma_{z0}$ ) were estimated by the following equations:

$$\sigma_{y0} = \text{horizontal dimension of source divided by } 4.3 = 200/4.3 = 46.51 \text{ meters} \quad (\text{Eq. 1})$$

$$\sigma_{z0} = \text{vertical dimension of source divided by } 2.15 = 30/2.15 = 13.95 \text{ meters} \quad (\text{Eq.2})$$

The release height was determined as 15 meters, the height of the center of the volume source.

## 3.0 Meteorological Data

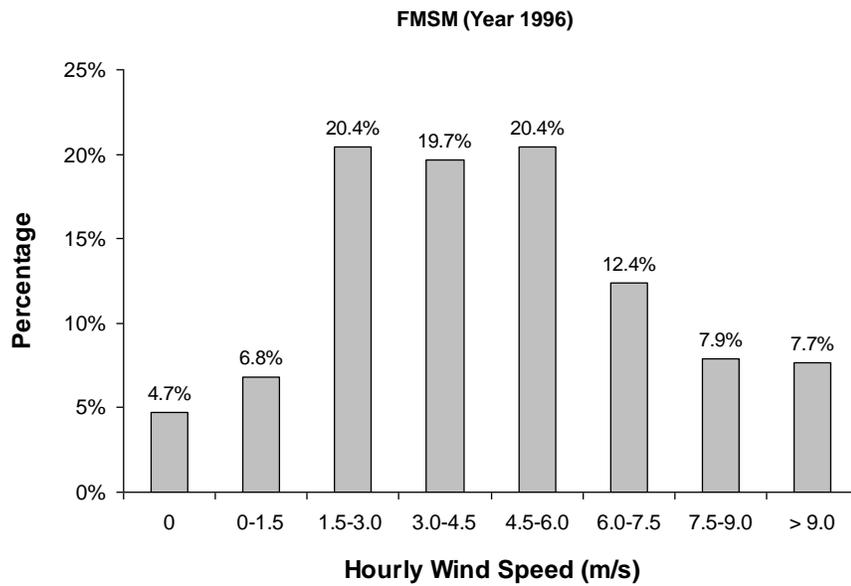
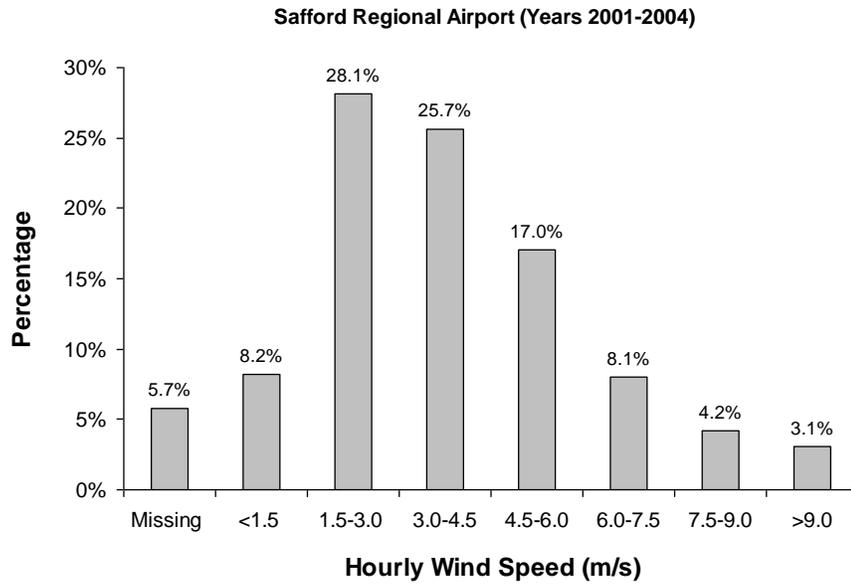
### Minimum Wind Speed

One of the key meteorological parameters for the AERSCREEN inputs is the minimum wind speed. The default minimum wind speed in AERSCREEN is 0.5 m/s. However, this number may be over conservative for modeling 24-hour average SO<sub>2</sub> impacts because a wind speed of 0.5 m/s for continuous 24-hours will represent unrealistic wind conditions in the area of concern. Therefore, the available meteorological data in the Safford/Morenci area were reviewed and the site-specific minimum wind speed was determined.

Three meteorological data sets are available in the Safford/Morenci area:

- ASOS at the Safford Regional Airport (SAD) station: The SAD station was installed in 1997 and the first available meteorological data set was available in 1998. Currently ADEQ has four-year AERMET pre-processed meteorological data sets for SAD (2001-2004). As shown in Figure 1, 8.2 percent of the hourly wind speeds fell below 1.5 m/s and 5.7 percent of the data was missing. For wind speed observations less than 1.5 m/s, the SAD data sets report them as zero (hourly “calm” observations). Dispersion under calm or missing wind conditions is not modeled in AERMOD.
- Safford AZMET station: The Arizona Meteorological Network (AZMET) began full operation in January of 1986 with the mission to provide meteorological data and weather-based information for agricultural and horticultural interests operating in southern and central Arizona. The Safford AZMET data are the most complete data sets available in the Safford area. However, the issue with the AZMET data is that the anemometer height is 10 feet, not 10 meters. Moreover, since this station is located in a flat lower agricultural area, the Safford AZMET wind data may not represent the wind speeds in a mountainous area where FMMM and FMSM are located.
- Freeport-McMoRan Safford Mine (FMSM) station: As part of the permitting effort, FMSM began collecting meteorological data at the project site in October 1993. The most complete one-year period of on-site data is from November 8, 1995 to November 7, 1996. These data have been reviewed and approved by ADEQ for the NAAQS modeling demonstration. As shown in Figure 1, 4.7 percent of the observations are calm (0 m/s) and 6.8 percent of the observations lie in the range from 0 m/s to 1.5 m/s.

As presented above, a small percentage of hourly wind speeds in the Safford/Morenci area are below 1.5 m/s. Moreover, in the Morenci maintenance plan renewal, the averaging time being assessed is 24-hours and annual rather than 1-hour. Therefore, a wind speed of 1.5 m/s was used for the AERSCREEN modeling. It is believed that this wind speed should provide a reasonable but still conservative estimation for modeling 24-hour average and annual impacts.



**Figure 3.1 Hourly Wind Speed from Safford Regional Airport and FMSM Stations**

## Land Use Analysis

When applying the MAKEMET program to prepare the meteorological data for AERSCREEN, the values for three surface characteristics including surface roughness, albedo, and Bowen ratio must be determined. The surface roughness relates the height of obstacles to the wind flow and is, in principle, the height at which the mean horizontal wind speed is zero. The surface roughness length influences the surface shear stress and is an important factor in determining the magnitude of mechanical turbulence and the stability of the boundary layer. The albedo is the fraction of total incident solar radiation reflected by the surface back to space without absorption. The daytime Bowen ratio, an indicator of surface moisture, is the ratio of sensible heat flux to latent heat flux and is used for determining planetary boundary layer parameters for convective conditions driven by the surface sensible heat flux.

Estimates of the surface characteristics were made with 1 km of an imaginary FMMM blasting site using EPA's AERSURFACE program. Surface characteristics were developed based upon twelve sectors by season. The detailed setup is shown below.

```
Land Cover input file opened: arizona_NLCD_090600_erd.tif
AERMET-formatted output file opened: morenci_surface
Type of Coordinates Entered: LATLON
Latitude (decimal degrees): 33.110000
Longitude (decimal degrees): -109.390000
Datum: NAD83
Study Radius for surface roughness (km): 1.0
Is surface roughness varied by sector? Y
# Sectors = 12
Sector beginning directions: 0 30 60 90 120 150 180 210 240 270 300 330
Temporal resolution (ANNUAL, MONTHLY, SEASONAL): SEASONAL
Continuous snow cover for most of the winter? N
Is site located at an airport? N
Is site considered an arid region? Y
Characterization of surface moisture at site: Average
Log file opened: morenci_surface.log
```

### **4.0 Receptors**

Based on the scaled FMMM facility map, the minimum distance to ambient air was determined as 1 km. This is the shortest distance from the potential blasting areas to the FMMM property boundary. The probe distance was set to 10 km. Two receptor spacing values were used: 25-m from 1 km to 5 km; and 50-m from 5 km to 10 km.

### **4.1 Terrain Data**

Given the complex topography of the Morenci nearby area, the terrain features were taken into consideration in the modeling analysis. USGS 1/3 arc-second (~10m resolution) DEM data were used to extract the elevations of receptors and sources.

All AERSCREEN model inputs are summarized in Table 3.

**Table 4.1 Inputs for Modeling FMMM Blasting Operations**

Parameters	Inputs	Input values
Source	Source type	Volume
	Source emission rate	2.5 g/s
	Initial lateral dimension	46.50 m
	Initial vertical dimension	13.95 m
	Volume height	15 m
Building	Include building downwash	No
Meteorology	Minimum temperature	272 k
	Maximum temperature	311 k
	Minimum wind speed	1.5 m/s
	Anemometer height	10 m
	Source of surface characteristics	AERSURFACE
Terrain	Include terrain	Yes
	Coordinate type	Latitude and longitude
	Source latitude	33.11°
	Source longitude	-109.39°
	NAD	83
	Initial Probe distance	10000 m
	Source elevation	1700 m
	Override input elevation with AERMAP derived value	No
Other Inputs	Rural/Urban	Rural
	Minimum ambient distance	1000 m
	Use flagpole receptors	No
	Use discrete receptors	No

## 4.2 Background Concentration

Other than the FMMM facility itself, there are no other major sources of gaseous pollutants in this area. Consequently, background concentrations for the NAAQS modeling analysis should represent “natural” background concentrations. The historical SO<sub>2</sub> monitoring data from San Manuel, Pinal County and Page, Coconino County were taken to determine the “natural” background concentrations (Table 4). The San Manuel data for Years 2005-2007 were collected after the closure of the San Manuel copper smelter and thus may represent the “natural” background concentrations for rural areas. The Page data also have been used by ADEQ as the recommended SO<sub>2</sub> background concentrations for rural areas if the actual measurements are not available. The background concentrations for 24-hour and annual SO<sub>2</sub> were calculated by averaging the maximum measurements over the 3-years of available data from the two monitors. This results in a 24-hour background concentration of 20 µg/m<sup>3</sup> and an annual background concentration of 5 µg/m<sup>3</sup>, respectively.

**Table 4.3 Background Concentrations for 24-hour and Annual SO<sub>2</sub>**

Monitoring Station	Year	Maximum 24-hour average conc. ( $\mu\text{g}/\text{m}^3$ )	Annual conc. ( $\mu\text{g}/\text{m}^3$ )
San Manuel, Pinal County	2007	10	6
	2006	17	5
	2005	8	5
Page, Coconino County	1998	24	4
	1999	17	2
	2000	7	1
<b>Background</b>		<b>20</b>	<b>5</b>

## 5.0 Results

The modeling results for FMMM are summarized in Table 5. As shown in Table 5, these sources will not cause SO<sub>2</sub> NAAQS exceedances in the Morenci nonattainment area. Blasting is the dominant contributor to the modeled SO<sub>2</sub> impacts while the impacts from other sources are nearly negligible. Since blasting was modeled as a surface-based volume source, the modeled maximum concentrations occurred in or near the property boundary of FMMM.

**Table 5.1 Modeling Results for FMMM**

Source	Average	Modeled conc. ( $\mu\text{g}/\text{m}^3$ )	Facility-wide modeled conc. ( $\mu\text{g}/\text{m}^3$ )	Background conc. ( $\mu\text{g}/\text{m}^3$ )	Total conc. ( $\mu\text{g}/\text{m}^3$ )	NAAQS ( $\mu\text{g}/\text{m}^3$ )	% Standard
Blasting	24-hour	150.6	151.5	20	171.5	365	47%
Units 1-2 turbine/boiler		0.74					
Other sources		0.17					
Blasting	Annual	25.1	25.3	5	30.3	80	38%
Units 1-2 turbine/boiler		0.12					
Other sources		0.03					

## 5.1 Modeling for Freeport-McMoRan Safford Mine (FMSM)

Freeport-McMoRan Safford Mine (FMSM) is located approximately 13 km north-northeast of Safford, Graham County. Construction of the facility began in 2006 and the operations consist of open-pit mining, metallic minerals crushing, heap leach, solution extraction/electrowining (SE/EW), and sulfur burning & acid production.

Table 6 lists all FMSM SO<sub>2</sub> sources along with their maximum allowable emissions and related release parameters. There are two major sources within the FMSM facility, one is blasting and the other is sulfur burning & acid production. The combined emissions from the two sources account for approximately 97 percent of the total facility emission. Other emission sources include small industrial generators, heaters, boilers, and firewater pump. The total maximum allowable emission for these minor sources is only 1.6 tons/year,

**Table 5.2 SO<sub>2</sub> Sources in the FMSM facility**

Operations	Emission rate (tons/year)	Stack height (m)	Stack diameter (m)	Exit velocity (m/s)	Exit gas temp. (k)
Blasting	31.03	N/A	N/A	N/A	N/A
Sulfur Burning & Acid Production	48.4	38.1	1.07	29.25	302.6
Generators #1	0.05	6.1	0.30	103.75	645.4
Generator #2	0.0117	6.1	0.30	103.75	645.4
Firewater Pump #1	0.0099	6.1	0.15	24.63	804.3
Firewater Pump #2	0.019	6.1	0.15	24.63	804.3
Sulphur pre-heater	1.13	12.2	0.91	13.65	783.2
Sulphur Furnace Startup Boiler	0.38	7.0	0.30	10.88	505.0
Hot Water Heater	0.015	6.1	0.30	13.78	455.4

The modeling methodology for the blasting source in FMSM was identical to that of FMMM with one exception, different size of the blasting area. As FMSM is much smaller than FMMM, the blasting area in FMSM was assumed to be 100 by 100 meters. The sulfur burning & acid production plant was modeled as a point source. Other minor sources were combined together and modeled as a single point source. Based on the scaled facility map of FMSM, the minimum distance to ambient air for blasting, sulfur burning & acid production, and other minor sources was determined as 1 km, 2.4 km, and 2.4 km, respectively.

The minimum temperature, the maximum ambient temperature, and the minimum wind speed used were identical to those previously presented in the FMMM modeling. A separate AERSURFACE run was conducted to calculate site-specific surface characteristics when modeling blasting and the sulfur burning & acid production individually.

All model inputs for blasting and sulfur burning & acid production are summarized in Table 7 and Table 8, respectively.

**Table 5.3 Inputs for Modeling FMSM Blasting Operations**

Parameters	Inputs	Input values
Source	Source type	Volume
	Source emission rate	0.892 g/s
	Initial lateral dimension	23.26 m
	Initial vertical dimension	13.95 m
	Volume height	15 m
Building	Include building downwash	No
Meteorology	Minimum temperature	272 k
	Maximum temperature	311 k
	Minimum wind speed	1.5 m/s
	Anemometer height	10 m
	Source of surface characteristics	AERSURFACE
Terrain	Include terrain	Yes
	Coordinate type	Latitude and longitude
	Source latitude	32.96°
	Source longitude	-109.67°
	NAD	83
	Initial Probe distance	10000 m
	Source elevation	1230 m
	Override input elevation with AERMAP derived value	No
Other Inputs	Rural/Urban	Rural
	Minimum ambient distance	1000 m
	Use flagpole receptors	No
	Use discrete receptors	No

**Table 5.4 Inputs for Modeling FMSM Sulfur Burning & Acid Production**

Parameters	Inputs	Input values
Source	Source type	Point
	Source emission rate	1.3923 g/s
	Stack height	38.10 m
	Stack inner diameter	1.07 m
	Exit gas velocity	29.25 m/s
	Exit gas temperature	302.6 k
Building	Include building downwash	No
Meteorology	Minimum temperature	272 k
	Maximum temperature	311 k
	Minimum wind speed	1.5 m/s
	Anemometer height	10 m
	Source of surface characteristics	AERSURFACE
Terrain	Include terrain	Yes
	Coordinate type	Latitude and longitude
	Source latitude	32.93°
	Source longitude	-109.705°
	NAD	83
	Initial Probe distance	10000 m
	Source elevation	1230 m
	Override input elevation with AERMAP derived value	No
Other Inputs	Rural/Urban	Rural
	Minimum ambient distance	2400 m
	Use flagpole receptors	No
	Use discrete receptors	No

AERSCREEN was run to model each source (blasting, sulfur burning & acid production, and other sources) separately and then the maximum impacts from each model run were summed up to determine an overall impact from FMSM (regardless of different impact locations at different times). The modeling results for FMSM are summarized in Table 9. As shown in Table 9, the sources in FMSM will not cause SO<sub>2</sub> NAAQS exceedances. The modeled impact from the blasting source was higher than that from the sulfur burning & acid production, mainly due to a relative lower release height.

**Table 5.5 Modeling Results for FMSM**

Source	Average	Modeled conc. (µg/m <sup>3</sup> )	Facility-wide modeled conc. (µg/m <sup>3</sup> )	Background conc. (µg/m <sup>3</sup> )	Total conc. (µg/m <sup>3</sup> )	NAAQS (µg/m <sup>3</sup> )	% Standard
Blasting	24-hour	66.9	112.5	20	132.5	365	36%
Sulfur burning & acid production		44.6					
Other sources		0.97					
Blasting	Annual	11.2	18.8	5	23.8	80	30%
Sulfur burning & acid production		7.4					
Other sources		0.16					

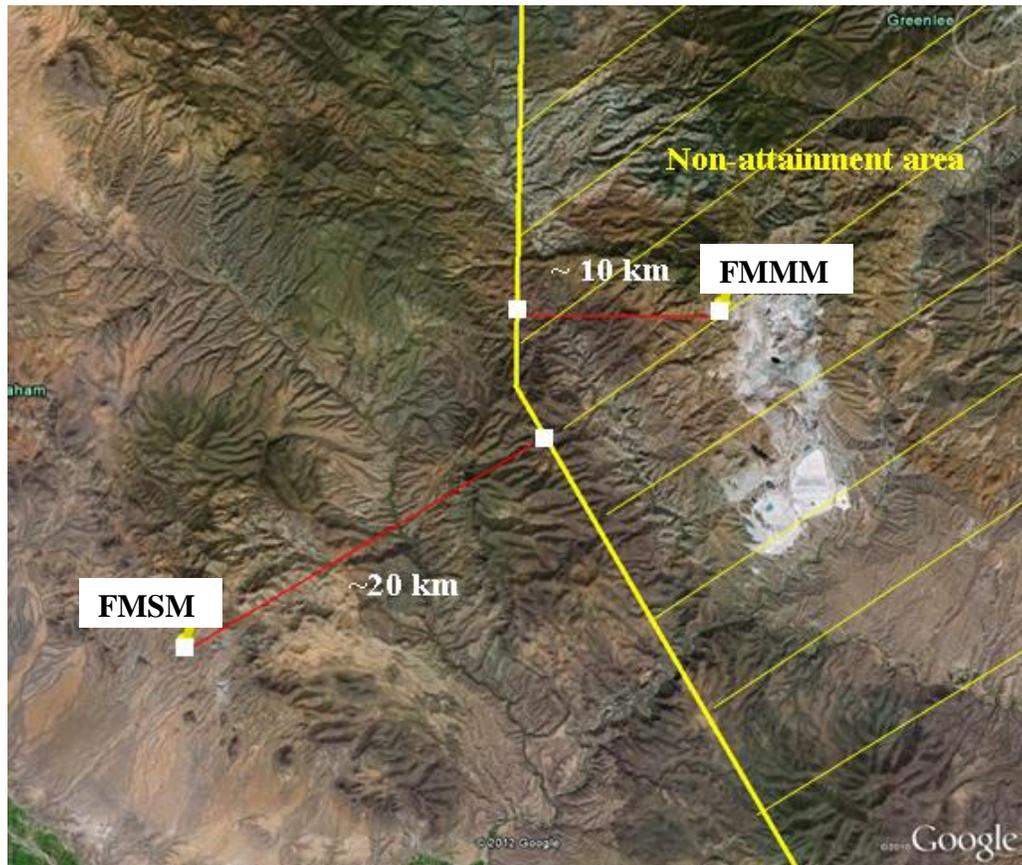
## 6.0 Cumulative Impact Discussion

### 6.1 Cumulative Impacts of FMMM and FMSM on the Morenci Nonattainment Area

Figure 2 shows the locations of the Freeport-McMoRan Morenci Mine (FMMM) and Freeport-McMoRan Safford Mine (FMSM) relative to the Morenci Nonattainment area. FMMM is located within the nonattainment area while FMSM is about 20 km outside of the nonattainment area. As presented in Section 4.2, the maximum 24-hour average and annual average impacts of FMMM on the Morenci Nonattainment area were 151.5 µg/m<sup>3</sup> and 25.3 µg/m<sup>3</sup> respectively, which occurred in or near the property boundary of FMMM. To estimate the cumulative impacts, the impacts of FMSM on the nonattainment area must be determined.

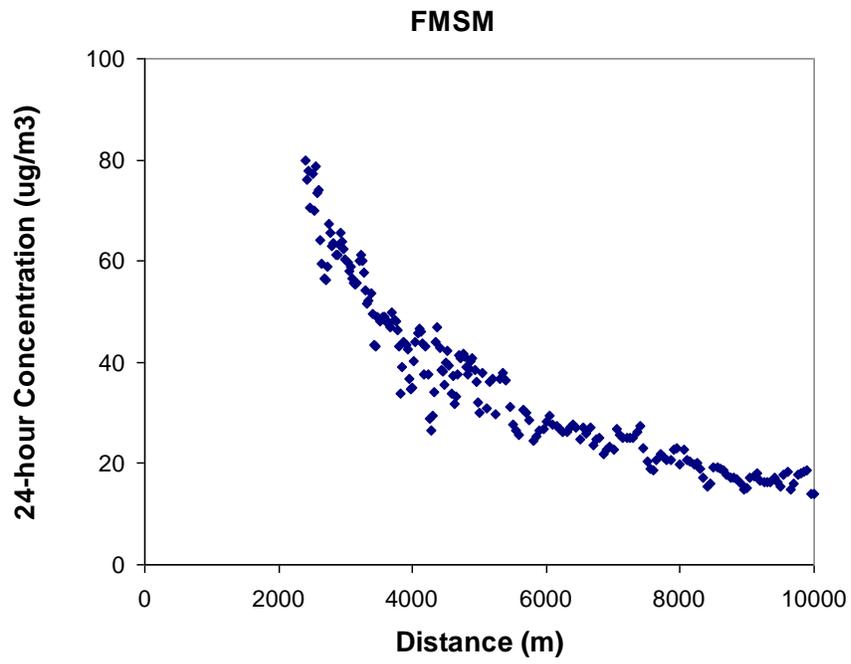
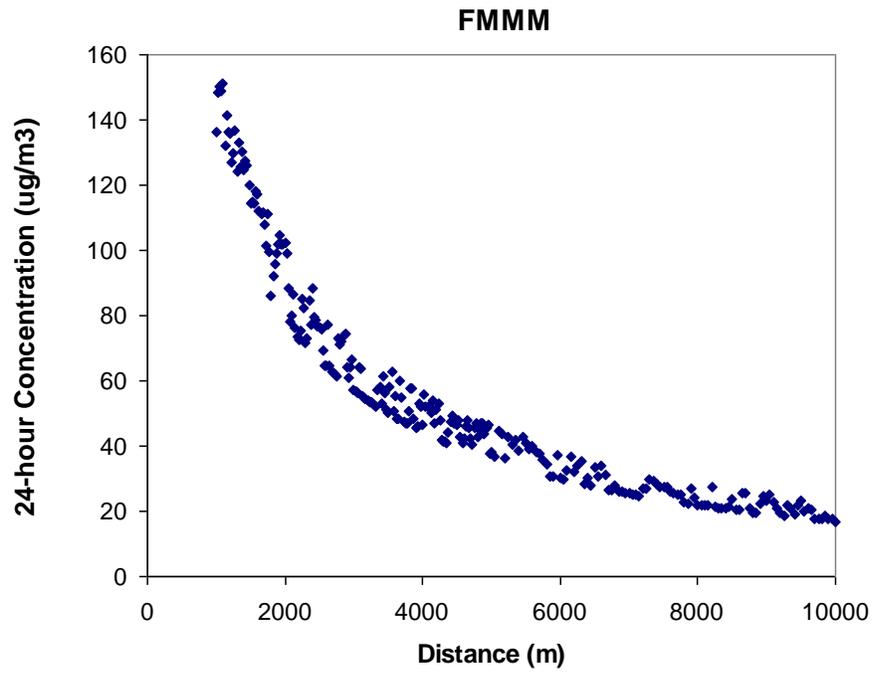
In the AERSCREEN model run, a probe distance (10 km) was used, thus allowing the calculation of the maximum concentration for a given distance less than or equal to 10 km. The results are shown in Figure 3. As indicated in Figure 3, the modeled concentration dropped rapidly with the increasing of the distance. For the receptors that were located at 10 km away from either facility, the maximum modeled 24-hour concentration was less than 20 µg/m<sup>3</sup>. Since the shortest distance from FMSM to the nonattainment area is around 20 km, the impacts of FMSM to the nonattainment area should be far below 20 µg/m<sup>3</sup>. As the ratio of the 24-hour average concentration to the annual average concentration in AERSCREEN is fixed at 6.0, the annual impact of FMSM on the nonattainment area should be much lower than 3.3 µg/m<sup>3</sup>. Furthermore, as the distance between FMSM and FMMM is around 30 km, the impacts of FMSM on the

FMMM surrounding area are expected to be insignificant. In other words, the impacts from FMMM itself dominate the cumulative impacts on the Morenci non-attainment area.



**Figure 6.1 Locations of FMSM and FMMM relative to the Morenci Nonattainment Area**

To be conservative, it was assumed that the maximum 24-hour average and annual average impacts of FMSM on the Morenci Nonattainment area were  $20 \mu\text{g}/\text{m}^3$  and  $3.3 \mu\text{g}/\text{m}^3$ , respectively. Based on this conservative assumption, the cumulative impacts of FMMM and FMSM on the Morenci nonattainment area were estimated and the results are summarized in Table 10. The cumulative impacts were 53 percent and 42 percent of the 24-hour and annual NAAQS, respectively.



**Figure 6.2 Modeled Maximum 24-hour Concentration vs. Distance from Facilities to Receptors**

**Table 6.1 Cumulative Impacts of FMMM and FMSM on the Morenci Nonattainment Area**

Facility	Average	Max. impact on Morenci non-attainment area ( $\mu\text{g}/\text{m}^3$ )	Total modeled conc.	Background conc. ( $\mu\text{g}/\text{m}^3$ )	Total conc. ( $\mu\text{g}/\text{m}^3$ )	NAAQS ( $\mu\text{g}/\text{m}^3$ )	% Standard
FMMM	24-hour	151.5	171.5	20	191.5	365	53%
FMSM		20					
FMMM	Annual	25.3	28.6	5	33.6	80	42 %
FMSM		3.3					

**6.2 Cumulative Impacts on the Morenci Nonattainment Area Boundary**

As shown in Figure 2, the shortest distance from the FMMM modeled source (blasting) to the Morenci nonattainment area boundary is around 10 km. Therefore, the maximum modeled 24-hour impact of FMMM on the boundary was  $20 \mu\text{g}/\text{m}^3$  (see Figure 3). By using the fixed conversion ratio of 6.0 in AERSCREEN, the annual impact of FMMM on the boundary was estimated as  $3.3 \mu\text{g}/\text{m}^3$ . In combination with the impacts from FMSM as discussed in Section 4.4.1, the overall impacts for 24-hour average and annual average were 16 percent and 15 percent of the NAAQS, respectively (Table 11).

**Table 6.2 Cumulative Impacts of FMMM and FMSM on the Morenci Nonattainment Area Boundary**

Facility	Average	Max. impact on Morenci non-attainment area boundary ( $\mu\text{g}/\text{m}^3$ )	Total modeled conc.	Background conc. ( $\mu\text{g}/\text{m}^3$ )	Total conc. ( $\mu\text{g}/\text{m}^3$ )	NAAQS ( $\mu\text{g}/\text{m}^3$ )	% Standard
FMMM	24-hour	20	40	20	60	365	16%
FMSM		20					
FMMM	Annual	3.3	6.6	5	11.6	80	15 %
FMSM		3.3					

## 7.0 Update of Modeling Analysis

The modeling analysis as presented in Sections 4.1-4.4 was conducted in Year 2012. It is necessary to verify if the previous modeling analysis is still valid because any significant changes in source inputs or modeling methodologies since Year 2012 may lead to significant changes in the model results.

ADEQ issued a renewal permit to FMSM and FMMM in February 2012 and October 2013, respectively. Table 12 summarizes the potential to emit (PTE) of SO<sub>2</sub> for FMSM and FMMM based on the two renewal permits. As shown in Table 12, there is no any change in SO<sub>2</sub> emission limits for the two facilities.

**Table 7.1 Emissions of SO<sub>2</sub> for FMMM and FMSM in Renewal Permits**

Facility	PTE in renewal permits (tpy)			Modeled Emission (tpy)		
	Point	Fugitive	Total	Point	Fugitive	Total
FMMM	0.8	86.8	87.6	0.78	86.75	87.5
FMSM	50	31	81	50.02	31.03	81.05

The 2012 modeling analysis used AERSCREEN version 11126, which is still the most recent version of AERSCREEN (no updates). However, the AERSURFACE version (version 08009) used in the 2012 analysis has been updated to the new version 13016. A test run indicates that the two versions generated identical surface characteristic parameters.

Another issue is related to the terrain data. The 2012 analysis used the Digital Elevation Model (DEM) data, which are no longer updated by the USGS. Instead, National Elevation Dataset (NED) data are being actively supported and checked for quality. Therefore, NED represents a more up-to-date and improved resource for terrain elevations for regulatory modeling purposes. In order to address this issue, a test run was performed to compare modeled concentrations from the FMMM's blasting emissions by using the DEM data vs. the NED data. The results show that the modeled concentrations based on the DEM data and the NED data are nearly identical (150.6 µg/m<sup>3</sup> vs. 150.2 µg/m<sup>3</sup> for 24-hour SO<sub>2</sub>).

Based on the discussions above, it is concluded that the 2012 modeling analysis is still valid and no updates are needed.

## **Appendix E.1**

### ***Notice of Public Hearing***

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## **Appendix E.2**

### ***Public Hearing Agenda***

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# Public Hearing Agenda

## AIR QUALITY DIVISION

### HEARING ON PROPOSED

**Arizona State Implementation Plan Revision Maintenance Plan for the Morenci Dioxide Planning Area  
(1971 NAAQS)**

**Morenci Community Center 438 Plaza Drive Morenci, AZ 85540**

**15, December and 15, 2014, at 1:00 p.m.**

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**Pursuant to 40 CFR § 51.102 notice is hereby given that the above referenced meeting is open to the public.**

1. Welcome and Introductions
2. Purposes of the Oral Proceeding
3. Procedure for Making Public Comment
4. Brief Overview of the proposed SIP revision
5. Question and Answer Period
6. Oral Comment Period
7. Adjournment of Oral Proceeding

Copies of the proposal are available for review at the Arizona Department of Environmental Quality (ADEQ) Records Center, First Floor, 1110 W. Washington St., Phoenix, Arizona 85007, 1110 W. Washington St., Phoenix, Arizona, and <http://www.azdeq.gov/environ/air/plan/index.html> and at Clifton Public Library located at 102 School St., Clifton AZ 85533. For additional information regarding the hearing please call Adrian Peshlakai, ADEQ Air Quality Division, at (602) 771 - 6428 or 1-800-234-5677, Ext. 771-6428.

Upon request, the Department will provide appropriate auxiliary aids and services to persons with disabilities, at no charge, to assist in accessible communication to enable people who have speech, hearing, vision, learning, or other impairments to participate equally, including qualified sign language interpreters. To request an auxiliary aid or service, to obtain this document in alternative format, or for further information, please contact Alicia Pollard at (602) 771-4791 or via email at [aap@azdeq.gov](mailto:aap@azdeq.gov) as early as possible to allow time to arrange the accommodation. TTY/TTD Services: 7-1-1. The ADA does not require the Department to take any action that would fundamentally alter the nature of its programs, services or activities, or impose an undue financial or administrative burden on the Department.

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**Appendix E.3**

***Public Hearing Sign-In Sheet***

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# Air Quality Division Sign-In Sheet

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## Please Sign In

SUBJECT-Proposed Arizona State Implementation Plan Revision, Maintenance Plan for the Morenci Sulfur Dioxide Planning Area (1971 NAAQS) DATE- December 15, 2014

<u>NAME</u>	<u>ORGANIZATION</u>	<u>PHONE</u>	<u>E-MAIL</u> (primary method of contact)
1. Adrian Peshlakai	ADEQ	602-771-6428	ap10@azdeg.gov
2. Bruce Friedl	ADEQ	602-771-2259	friedl.bruce@azdeg.gov
3. MICHAEL ORMAN	ADEQ	602-771-4406	mo5@azdeg.gov
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## **Appendix E.4**

### ***Public Hearing Officer Certification and Transcript***

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Air Quality Division

Public Hearing Presiding Officer Certification

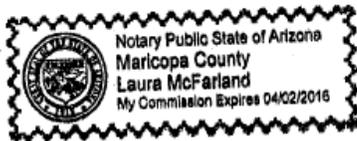
I, Michael Orman, the designated Presiding Officer, do hereby certify that the public hearing held by the Arizona Department of Environmental Quality was conducted on December 15, 2014, at Morenci Community Center at 438 Plaza Drive Morenci Arizona 85540, in accordance with public notice requirements by publication in THE COPPER ERA beginning November 12, 2014. Furthermore, I do hereby certify that the public hearing was recorded from the opening of the public record through concluding remarks and adjournment, and the transcript provided contains a full, true, and correct record of the above-referenced public hearing.

Dated this 16 day of December

[Signature of Michael Orman]
Michael Orman

State of Arizona )
) ss.
County of Maricopa

Subscribed and sworn to before me on this 16 day of December, 2014.



[Signature of Laura McFarland]
Notary Public

My commission expires: 4/2/2016



24

25 Adrian Peshlakai is here representing ADEQ from the Air Quality Division, State  
26 Implementation Plan Section.

27

28 Public notice appeared in the Copper Era and ADEQ's website beginning November 12, 2014.

29 Copies of the proposed SIP revision were made available at the ADEQ Records Center and  
30 ADEQ's website and the Clifton, Arizona library beginning December 15, 2014.

31

32 As the purpose of the public hearing is to receive public from the public and there are no  
33 members of the public present this hearing is adjourned the time is 12:08.

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## **Appendix E.5**

### ***Responsiveness Summary***

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## **RESPONSIVENESS SUMMARY**

**to**

### **Testimony Taken at Oral Proceeding on the December, 2014 Proposed Arizona State Implementation Plan Revision**

The oral proceeding on the December 2014, Proposed Arizona State Implementation Plan Revision, Maintenance Plan for the Morenci Sulfur Dioxide Planning Area (1971 NAAQS), was held on Monday December 15, 2014 at 1:00 p.m., at the Morenci Community Center located at 438 Plaza Drive Morenci, AZ 85540. The Arizona Department of Environmental Quality (ADEQ) received no verbal or written comments on the proposed State Implementation Plan Revision.

No changes were made in response to the public comments, however, during its final review of the proposed State Implementation Plan Revision, ADEQ made typographical corrections to Table 1.4 and added insets in Figure 3.1 to clearly identify sources within the planning area. Other minor revisions were made for clarity, grammar and formatting.