October 31, 2012

VIA FIRST CLASS MAIL AND EMAIL (rosemontairpermit@azdeq.gov)

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Re: **Rosemont Copper Company**
Draft Air Quality Control Permit No. 55223

Dear Sir:

The following comments are submitted on behalf of the undersigned:

1. The permit application submitted by Rosemont does not accurately reflect the facility that Rosemont intends to construct and the operations that it intends to conduct.

    a. Extensive reports from other governmental agencies and letters from Rosemont describe modified operations that will significantly alter the air emission sources and profiles; these documents have been in the public domain since before Rosemont applied for its ADEQ permit (November 15, 2011).

    b. More recently, just after ADEQ proposed the Draft Permit, Rosemont released a detailed technical study describing significant operational changes that will impact the air emissions analysis. For example, the 8/28/12 Rosemont Feasibility Study anticipates a mine life of 21-22 years and production of 667 million tons of sulfide ore (plus 1,243 million tons of waste rock), compared to ADEQ's 8/6/12 Technical Document giving a mine life of 16 years and a production of 123 million tons of sulfide and oxide ore and waste.

    c. Additionally, the aforementioned Feasibility Study for the Rosemont Mine notes that the engineering for the project was suspended in July 2011. Therefore, assertions by Rosemont regarding the air quality impacts of the modifications to the facilities cannot be adequately evaluated without the engineering information for the project reconfiguration.

    d. While Rosemont and ADEQ may benefit from ADEQ's analysis to date, both ADEQ and the public will be better served by review and analysis of the

actual project that Rosemont intends to build and operate, rather than a project that both the applicant and ADEQ knows will not be built.

e. The permit modification process is inapplicable because the facility and operations changes from the original application are so extensive as to essentially constitute a new facility.

f. ADEQ's assertions in public meetings that it only is able to consider the application submitted is an admission that it is has no obligation to undertake due diligence to ensure that the information in an air quality application is correct and/or current. Using ADEQ's logic, a source could submit a permit application with fraudulent or knowingly false information and ADEQ would have no choice but to accept and consider it. This is inconsistent with the agency's mission to protect public health and the environment.

2. An analysis of Rosemont's and ADEQ's data shows that potential emissions of hazardous air pollutants (HAPs) exceeds both the 10 ton threshold for the emissions of a single HAP and the 25 ton threshold for all HAP emissions. Thus, the source must be considered as a Class I Major Source pursuant to the Clean Air Act section 112(b) and Arizona law, A.R.S. sections 49-426.03-426.06.

a. Even with an exceptional control efficiency rate of 99.9% the proposed Rosemont Mine has the potential to emit more than 10 tons per year of manganese and is likely to emit more than 10 tons per year each of lead and chromium.

b. The proposed Rosemont Mine has the potential to emit more than 25 tons per year of all HAPs combined.

c. The ADEQ proposed draft permit states that the total annual emissions of hazardous air pollutants (HAPs) do not exceed 3 tons per year. However, Rosemont's own source material (Baseline Geochemical Characterization, Rosemont Copper; report by TetraTech dated June 2007) indicates that the Rosemont copper ore contains elements that would be emitted as HAPs in the course of the mining processes (even at the exceptional 99.9% control efficiency) at amounts far greater than indicated in the permit.

d. Section 112(b) of the Clean Air Act and the Arizona State Hazardous Air Pollutants Program (Title 18, Chapter 2, Article 17 of the Arizona Administrative Code), clearly state that the emission of these HAPs qualify this project as a major source and require its air quality permit to be a Class I Permit.

e. Potential HAPs that would be emitted include: chromium, lead, and arsenic.

3. The modeling procedures are technically deficient, and the mitigation measures proposed in the permit not only fail to provide an adequate margin of safety but are unproven, leading to the likelihood that emissions will create an imminent and substantial endangerment to public health through violation of the NAAQS, in violation of ARS 49-426.07.

   Examples of modeling deficiencies in the Rosemont Air Quality application include, but are not limited to:

   a. ADEQ has supplied no documentation in its draft permit or other materials that demonstrate that the use of the AERMOD modeling by Rosemont has been sufficiently reviewed and analyzed for quality and reliability. As enumerated in the more detailed SSSR comments, significant deficiencies have been identified with previous Rosemont air quality modeling including its dispersion modeling.

   b. There is inadequate explanation and technical justification of imputed data where the time series records were interrupted. As noted in the detailed SSSR comments, when time series data sets show interruptions, it is a common practice to impute missing data to enable the calculation algorithms for the time series to function. ADEQ did not provide sufficient description of the imputed data for public review and thus there is no confidence in the modeling results.

   c. Use of ozone data from the Chiricahua National Monument as a baseline is questionable. Again, as noted in the detailed SSSR comments, Rosemont represented that ozone levels at the Chiricahua Monument area were the closest and most representative of the project site. This site is 94 miles away and in a relatively remote area. The proximity of the Rosemont site to an urban area of approximately 1 million residents brings into serious question the representative nature of the Chiricahua data.

      This deficiency is further exacerbated when you consider that Saguaro National Park is only 20 miles from the mine site. Ozone has been monitored at Saguaro National Park since 1987 - first by the National Park Service, more recently by Pima County Department of Environmental Quality. Pima County also operates an ozone monitor at the Fairgrounds. These two monitoring sites generally have the highest levels of ozone in the Tucson Basin. Either of them would be a more appropriate baseline site than Chiricahua National Monument.

   d. Emission control requirements in the draft permit were based on particulate data that exclude higher wind readings that Rosemont deemed as a "statistical outlier" and ignored. No technical basis is provided for the exclusion of this data. As discussed in SSSR's technical comments, EPA previously raised

this data exclusion in their comments regarding the Forest Service draft EIS and indicated that stronger discussion and justification was needed. A review of the historical meteorological conditions of the Rosemont site suggests that once this site is disturbed, the frequency of dust storms will be a more routine occurrence rather than an a rare ("statistical outlier") event.

e. As indicated by observations at nearby BLM and Forest Service stations, the winds in this area routinely reach speeds of 50 miles per hour. This calls into question the use of 3 miles/hour as an average wind speed for some of the modeling dispersion calculations. As discussed in SSSR's technical comments, the meteorological assumptions used by the Rosemont modeling and relied upon by ADEQ as the basis for the permit are severely flawed. The frequency, duration and intensity of high winds results in a higher probability that airborne emissions from the Rosemont site will travel longer distances than would otherwise be expected, and that populations in Corona de Tucson, Vail, Sonoita, Tucson and other areas some distance from the project will be exposed to various air pollutants, including particulate matter (PM) and hazardous air pollutants (HAPs.)

The permit fails to adequately consider the complex capability of wind to entrain and transport sediment or salts depending on variables such as height, topography, temperature, and humidity.

The observations, assumptions, and interpretations supporting Rosemont's claims in its reports, as well as ADEQ's apparent adoption of ADEQ's reports, are not technically credible.

4. <u>In its present form, the Rosemont air permit and supporting documents indicate the probability of a NAAQS violation. A NAAQS violation, which will result in a non-attainment designation, will have significant adverse social and economic impacts on all or portions of Pima County.</u>

a. Highest modeled emissions of PM10 for Tucson area is within 98% of NAAQS; one modeled result showed a PM10 NAAQS exceedance.

b. Tucson area background ozone (O3) is already at 99% of NAAQS; DEIS alternatives could increase NOX (key precursor to O3) by 5%, triggering NAAQS violation of O3.

c. Emissions from the Rosemont Mine could result in Pima County being designated as a non-attainment area for NAAQs, thus requiring widespread pollution controls throughout Pima County. This would result is significant adverse social and economic impacts on all or portions of Pima County in the event the air pollution from the Rosemont Mine causes Pima County to become a non-attainment area.

d. ADEQ did not require modeling of all primary air pollutants under NAAQS, especially carbon monoxide and lead. The only pollutant for which specific modeling was undertaken was particulate matter. The comments on other NAAQS primary pollutants relied on surrogate information from other entities including Pima County and the federal government. There was no modeling for carbon monoxide or lead, both criteria air pollutants under the Clean Air Act and are associated with mining projects similar to the proposed Rosemont Copper Mine.

   Pima County, in rejecting a proposed air permit for the facility, specifically noted the omission of carbon monoxide modeling, especially the potentially high levels from the blasting processes.

5. The proposed permit and supporting documentation do not analyze or address visibility impacts in nearby Class I areas (national parks and designated wilderness areas). The NAAQS mitigation measures have not been shown to be adequate to protect visibility for these Class I areas. In addition, ADEQ failed to consider the proposed Rosemont Mine cumulatively with other sources that impact visibility in Class I areas.

   a. The proposed permit does not analyze potential visibility impairment from the mine project in the Saguaro National Park, a Class I area that is located approximately 20 miles from the proposed mine. As documented in Section 11.4 of the Arizona State Implementation Plan for Regional Haze adopted in January, 2011, the Saguaro National Park is one of two Class I areas in Arizona expected to show continuing visibility degradation in 2018. The regional haze plan did not include potential impacts from the Rosemont Mine; therefore, any additional impairment caused by the project will only further contribute to an already unacceptable problem.

   b. Saguaro National Park is a significant community resource that attracts over 600,000 visitors per year. Obviously, impairing the scenic vistas will adversely impact the visitor experience and the regional economy that depends on tourism.

   c. The Clean Air Act requires that air quality related values in Class 1 areas be protected from significant deterioration.

6. The permit fails to control the substantial amounts of particulate matter, especially "toxic dust," that will be emitted from operations, particularly the dry-stack tailings facility. These emissions will have a substantial adverse effect on public health and social and economic factors. Rosemont should prepare a dry-stack tailings management plan and submit it to ADEQ for evaluation and public review and comment, prior to issuance of the permit. The plan must (a) address the potential

significant amounts of potential uncontrolled particulate emissions (PM10 and PM 2.5) from the dry stack tailing facility; (b) analyze the tailings not only for Hazardous Air Pollutants but for other constituents, such as thallium, and (c) assure minimization of uncontrolled emissions from the tailings piles that could threaten public health and safety.

a. Repeatedly throughout southern Arizona, tailings facilities at existing mines cause significant impairment of air quality, even "white-out" conditions. The tailings facilities at these other mines all use the conventional wet tailing method. By using dry-stack tailings, Rosemont is likely to exacerbate this condition.

b. Particulate pollution exposure can cause a range of health problems including premature death, increased hospital and emergency room visits for cardiovascular and respiratory problems, and development of chronic respiratory disease. These health impacts particularly impact the young and old in this region.

c. Additionally, particulate pollution emanating from mines contain various constituent contaminants that pose health threats by themselves and are carcinogenic, neurotoxic and teratogenic.

d. Rosemont's own dry stack tailings consultant references a source for information about dry stack tailings that says that, "[d]ust generation is a common problem in arid climates and can occur relatively quickly after tailings disposal due to the low moisture content of the placed material."[1]

7. Pima County, rather than ADEQ, is the proper permitting agency under the Clean Air Act and the Arizona State Implementation Plan.

a. County issuance and administration of this permit is required by A.R.S. §49-402(B).

b. ADEQ has no statutory authority to usurp Pima County's jurisdiction. The authority cited by ADEQ is procedural and not substantive.

c. ADEQ misinterpreted the court's decision to justify its usurpation of Pima County jurisdiction.

8. ADEQ did not conduct an "administrative completeness" review of the Rosemont air permit, as required by AAC R18-1-503.

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[1] http://www.tailings.info/disposal/drystack.htm referenced by Rosemont Copper Company, Filtered Tailings Dry Stacks , Current State of Practice, Final Report, AMEC Earth & Environmental, Inc., November 2008

a. In response to a specific Public Records Request, ADEQ provided no documents evidencing any sort of "administrative completeness" review of the Rosemont air permit. Rather, ADEQ stated that the Rosemont air permit application, dated 11/15/11, was deemed "administratively complete" solely by the passage of time and the expiration of the Licensing Time Frame (LTF) requirement for "administrative completeness."

b. ARS 41-1074(C) requires that an application be "deemed administratively complete" if the agency fails to provide to the applicant a notice of "administrative completeness" prior to expiration of the LTF time period (assuming no earlier tolling of the LTF requirement based on the agency's request for additional information). Since there is neither ADEQ documentation of an "administrative completeness" review nor a notice to Rosemont, it is obvious that ADEQ failed to conduct an "administrative completeness" review, in violation of applicable laws and rules.

9. <u>These comments incorporate by reference in totality the technical comments submitted by Save the Scenic Santa Ritas (SSSR) (copy attached).</u>

Based on the foregoing comments, ADEQ should not approve the proposed Rosemont Air Quality Control Permit No.55223, should return jurisdiction for this matter to Pima County and should require Rosemont to submit an entirely new application to Pima County. At a minimum, ADEQ should require Rosemont to submit new information to ADEQ extensively amending the current application responsive to the concerns addressed above, and ADEQ should conduct further analysis of the extensive new information, with a new, adequate Notice and Comment period.

Thank you in advance for your consideration

Sincerely,

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Save the Scenic Santa Ritas Submission to ADEQ - Draft Air Quality Control Permit No. 55223

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Re: **Rosemont Copper Company**
Draft Air Quality Control Permit No. 55223

Dear Sir:

The following comments are submitted on behalf of the undersigned:

INTRODUCTION

The Health and Safety Subcommittee of Save the Scenic Santa Ritas (SSSR) submits these comments on the proposed draft air quality permit for the proposed Rosemont Mine. This is in response to the Arizona Department of Environmental Quality (ADEQ) call for public comment. The signatories reside at locations specifically included by Rosemont as being within a zone of impact and exposure to air pollutants that emanate from the proposed mine project, and therefore have legal standing in any legal actions related to the issuance of said permit and any activities and actions following with respect to the mine project from the ADEQ. In addition, at the end of this submission, we present credentials of individual members of this group with expertise in areas related to the air pollution permit.

PRELIMINARY STATEMENT

ADEQ must not issue the draft permit. ADEQ must deny this permit because the applicant's operation has the potential to emit Hazardous Air Pollutants (HAPs) above the threshold values of 10 tons per year (tpy) for an individual listed HAP and/or 25 tpy for all other Hazardous Air Pollutants combined as called for in Section 112(b) of the Clean Air Act.

In citing Section 112(b) of the Clean Air Act, ADEQ must also declare that the Rosemont mine is a major source of HAP, and therefore requires reapplication for a Class I permit.

Finally, there are too many deficiencies and mistakes in the initial application submitted by Rosemont, including incorrect assumptions, models and analyses, to consider any permit until Rosemont has completed studies to correct all of these inconsistencies and has resubmitted this new information in an application for a Class I permit.

Most of the materials in this submission address three major themes:

I. Showing that the proposed mine has the **potential to emit** hazardous air pollutants and will exceed the thresholds laid out in Section 112(b) of the Clean Air Act.
II. Failure to protect Class I areas from degradation caused by air pollutants.
III. Faulty modeling of dispersion, exposure, and impact of pollutants emanating from the mine.

The first theme is sufficient to deny a Class II permit outright. The second and third themes would require considerable changes and revisions for any permit to make it a scientifically supportable legal document.

I. HAZARDOUS AIR POLLUTANTS UNDER SECTION 112(B) OF THE CLEAN AIR ACT

The proposed draft permit has problems with regard to hazardous air pollutants (HAPs) as described and listed under Section 112(b) of the Clean Air Act. Much of the information upon which ADEQ has based its proposed permit repeats materials directly from Rosemont's application for a permit, with little or no modification. This suggests that ADEQ has accepted Rosemont's materials as technically correct. However, we (SSSR) present several scenarios that effectively challenge the science of Rosemont's claims, and therefore invalidates ADEQ's basing part of its permit on Rosemont's background materials.

The proposed air permit fails to consider the potential to emit hazardous air pollutants in excess of the thresholds prescribed by the Clean Air Act listed in Section 112(b). These potential emissions would violate the Clean Air Act with respect to both individual pollutants and combined totals of listed hazardous air pollutants.

The technical document submitted by Rosemont to ADEQ contains a table that states that the total annual emissions of hazardous air pollutants (HAPs) would not exceed 3.37 tpy. We do not accept the accuracy of that number. An amendment to the permit application from Rosemont of March 2012 further indicates HAPs would not exceed 0.003 tpy based on revised requirements for air filters and changes in the Mine Plan of Operations, which removes certain processing steps. We submit that the original number is incorrect, and the revised number is at best questionable and is likely way too low.

Section 112(b) of the Clean Air Act contains a list of specifically regulated chemicals, which includes *compounds* of antimony, arsenic, beryllium, cadmium, chromium, lead, manganese, mercury, nickel, selenium, fine mineral fibers and

radioactive substances. Geochemists typically report all the substances, except fine mineral fibers, as *elements*. However, these elements, with the exception of gold and some noble metals, rarely appear in nature as the free element. Rather they exist as various compounds, usually oxides, chlorides, phosphates, sulfides, and sulfates. Therefore, because Section 112(b) states that *compounds* of these are listed, the most conservative assumption is that the elements appear as oxides in the lowest possible valence state. For the source ore materials that Rosemont will process, the compounds are mainly oxides and sulfides, but the small presence of fluoride in the source material indicates a possible set of compounds with fluorine. The most likely geochemical situation here is that the fluoride is incorporated into any phosphate based minerals present, and very likely these are the compounds of the radioactive elements present in the source material, except for any gaseous radon trapped in soil mantle.

Section 112(b) looks at the **potential to emit** HAPs which exceed 10 tpy for a single substance and/or 25 tpy of all HAPs combined. Levels of individual HAPs above the 10 tpy level are in excess of the single HAP criterion, and levels of all HAPs which total more than 25 tpy are in excess of the combined HAP criterion.

One of the major reasons for observation for possible exceedances under the various scenarios presented by a potential mining project stems from the enormous volumes and sheer tonnage of materials that mine operations will process. These volumes likely will overcome any limits associated with the amounts of trace and minor concentrations of selected elements in the source materials and waste products. The situation can be illustrated by a simple example: a very tiny amount (the concentration of a trace contaminant in the source material) when multiplied by a very large number (tonnage of ore processed) results in a prediction of the amounts of these elements that might otherwise be overlooked.

In Rosemont's original submission for a Class II air permit, it stated that its processes and pollution control systems had 95-99+% efficiency and effectiveness. ADEQ has required a change in the filtering equipment for particulates with a more efficient capture system, and after updating the system specifications Rosemont now claims will provide 99.99% particulate control.

SSSR has evaluated several scenarios assuming various levels of control and pollution prevention. Initially, the analyses were restricted to 95%, 99% and 99.9% controls, which would mean that 5%, 1% and 0.1% of the trace hazardous substances in the source material *would not be controlled, and* ***therefore potentially emitted***. The amendment claim that pollution control will be at a level of 99.99% requires analysis on the assumption that 0.01% remains uncontrolled and therefore has the potential to be emitted.

We have several preliminary remarks with respect to these claims:

Since nowhere in the documents submitted by Rosemont, or the documents associated with the draft air permit, is information provided on the chemical and mineralogical composition of the particulates and items being controlled, certain Rosemont claims cannot be substantiated. These are:

1. It is unknown if the particulates contain fine mineral fibers. The number of such fibers allowed in any HAP is extremely small and analysis must be confirmed microscopically. The mineral fiber problem relates to asbestos, asbestiform minerals, and erionite.

2. It is unknown if the particulates contain radioactive materials. The background geochemical characterization of the source ore material had specific radionuclide analyses. SSSR, however, considers this insufficient in scope because while they consider alpha, beta and gamma emitters, as well as radium and uranium content, they ignore thorium and the mildly radioactive lanthanide elements. There is no requirement in the draft permit to determine if the emissions include radioactive materials, which tend to disperse as volatile or gaseous compounds as opposed to particulates. How will gaseous pollutants be accounted for? Gaseous compounds will also routinely include compounds of selenium, fluorine and mercury.

3. There is no analysis of the chemical and mineralogical composition of the materials which would be released following initial blasting to get at the ore beds. Again, the question becomes one of accounting for fine mineral fibers and radio-nuclides released by the mining process. This is especially important if there is radon trapped in the mineral strata that might not otherwise diffuse to the surface and enter the atmosphere.

4. Statements of 99.99% efficiency in any process challenge the limitations of the Second Law of Thermodynamics, which states that in all energy exchanges, if no energy enters or leaves the system, the potential energy of that system will always be less than the energy that it started with. No thermodynamic analysis of this possibility appears in any of the documents, and that can immediately cast doubt on the correctness of these numbers. The Mine Plan of Operations could conceivably indeed process enough materials to **prevent** or **remove** from possible emission 99.99% of the original source trace element content, but the processes will not **run** at 99.99% efficiency because of the Second Law of Thermodynamics. As removal efficiencies of processes approach 100%, the ability to achieve this degree of pollution control will likely require a large equipment component, running at considerably less than 99.99% efficiency because of energy and entropy penalties. In order for the processes to operate at the stated efficiency, they would almost have to be of infinite size. There are also cost penalties associated with all of these actions.

The background document on geochemistry of the source materials[1] lists the elemental composition of the ore source materials. From this report the median concentrations of the elements whose compounds are listed under Section 112(b) are obtained. Median concentrations are used because the statistical distribution of a given element in various ore samples studied has what is called by statisticians "a long tailed distribution." Therefore simple arithmetic averages do not appropriately characterize the statistical distribution and properties underlying these chemical data. Further, the data from various ore samples were consolidated to produce the range of data in the report by constituent. Aitchison[2] has noted that the data fall into the category of *compositional data* because the analysis attempted a complete geochemical characterization of the ore source material. Statistical study of *compositional data* requires certain specialized approaches, but there is no explicit statement in the background documents on this matter, and therefore it is not known if they were applied to the geochemical analysis data. SSSR, mindful of the need to consider the requirements and limitations associated with statistical methods for *compositional data* in this submission and its presentations, has applied them where appropriate.

Median concentrations of toxic elements whose compounds are listed in Clean Air Act Section 112(b) in the source materials:

Pb 80 mg/kg	As 15 mg/kg	Cr 30 mg/kg	Ni 7 mg/kg	Sb 2 mg/kg
Cd 1 mg/kg	Se 12 mg/kg	Be 0.8 mg/kg	Mn 800 mg/kg	

Maximum production rate: 376,000 tpd of ore source material

Mine will operate 365 days of the year[3]

Emission level = annual production x concentration of element in source material x gravimeter factor (the gravimetric factor converts the formula weight of the element to the formula weight of its oxide compound)

Scenario 1

This scenario compares potential emissions of the listed chemical HAPs as oxides, when subject to 95%, 99%, 99.9% and 99.99% controls. Thus the analysis looks at 5% release of HAPs from the source material, 1% release, 0.1% release and 0.01% release respectively. In its original submission to the Forest Service for the DEIS and the ADEQ for a Class II air permit, Rosemont's Mine Plan of Operations routinely claims 95% to 99+% efficiencies and effectiveness of its

[1] *Baseline Geochemical Characterization, Rosemont Copper;* report by TetraTech dated June 2007

[2] J. Aitchison (*The Statistical Analysis of Compositional Data,* Chapman and Hall, London, 1986)

[3] Rosemont application for Class II Permit: 11-15-11, page 2-2

pollution control processes at various operating steps. In amended submissions to ADEQ, Rosemont claimed 99.99% efficiency and effectiveness with mandated and self-initiated process changes. SSSR looked at several possible process efficiencies to develop the various scenarios. Given a particular level of process efficiency, the potential to emit toxic substances is related to the portion of the source material which is *uncontrolled and therefore not prevented from possible emission*.

Antimony (Sb_2O_3): 2 x 376 x 0.001 x 1/0.417 = 1.69 tpd
5% level = 31 tpy: **exceedance**
1% level = 6.2 tpy
0.1% level = 0.62 tpy
0.01% level = 0.06 tpy

Arsenic (As_2O_3): 15 x 376 x 10^{-9} x 10^6 x 1/0.757 = 7.45 tpd
5% level = 136 tpy: **exceedance**
1% level = 27.2 tpy: **exceedance**
0.1% level = 2.72 tpy
0.01% level =0.27 tpy

Beryllium (BeO): 0.8 x 0.376 x 2.77 = 0.83 tpd
5% level = 15.0 tpy: **exceedance**
1% level = 3.0 tpy
0.1% level = 0.30 tpy
0.01% level = 0.02 tpy

Cadmium (CdO): 1 x 0.376 x 1.14 = 0.42 tpd
5% level = 7.5 tpy
1% level + 1.5 tpy
0.1% level = 0.15 tpy
0.01% level = 0.015 tpy

Chromium (Cr_2O_3): 30 x 0.376 x 2,92 = 32.93 tpd
5% level = 600 tpy: **exceedance**
1% level = 120 tpy: **exceedance**
0.1% level = 12 tpy: **exceedance**
0.01% level = 1.2 tpy

Lead (PbO_2): 80 x 0.376 x 1.08 = 32.48 tpd
5% level = 595 tpy: **exceedance**
1% level = 119 tpy: **exceedance**
0.1% level = 11.9 tpy: **exceedance**
0.01% level = 1.19 tpy

Manganese (MnO_2): 800 x 0.376 x 1.58 = 475.26 tpd
5% level = 8,650 tpy: **exceedance**
1% level = 1,730 tpy: **exceedance**

0.1% level = 173 tpy: **exceedance**
0.01% level = 17.3 tpy: **exceedance**

Nickel (NiO): 8 x 0.376 x 1.27 = 3.82 tpd
5% level = 77.5 tpy: **exceedance**
1% level = 15.5 tpy: **exceedance**
0.1% level =1.55 tpy
0.01% level = 0.155 tpy

Selenium (SeO_2): 12 x 0.376 x 1.405 = 6.34 tpd
5% level = 115.5 tpy: **exceedance**
1% level = 11.5 tpy: **exceedance**
0.1% level = 2.31 tpy
0.01% level = 0.23 tpy

Total HAPs **potentially emitted** to the atmosphere:
5% level = 9,600+ tpy: **exceedance** of combined HAPs
1% level = 1,900+ tpy: **exceedance** of combined HAPs
0.1% level = 190 tpy: **exceedance** of combined HAPs
0.01% level = 19 tpy

Findings of scenario 1:

- At 95% control – arsenic, antimony, beryllium, chromium, lead, manganese, nickel and selenium all exceed individual HAP limits of 10 tpy. At 99% control – arsenic, chromium, lead, manganese, nickel and selenium all exceed individual HAP limits of 10 tpy. At 99.9% control – chromium, lead, and manganese all exceed individual HAP limits of 10 tpy. **At 99.99% control, manganese exceeds the individual substance HAP limit of 10tpy.**

  Thus, even at 99.99% control, Rosemont still cannot prevent an exceedance of a listed hazardous substance under Section 112(b), and that is for manganese.

- At 95% control, 99% control and 99.9% control, the combined threshold for HAP exceedances of 25 tpy occurs. At 99.99% control, Rosemont is below the 25 tpy combined threshold for HAPs.

  The high presence of manganese in the ore source materials is responsible for the very high numbers obtained.

- The numbers suggested in the Rosemont submission about HAPs are not consistent with these estimates, and therefore highly suspect.

The above findings lead immediately to the following conclusion:

Since this scenario supports the **potential to emit** HAPs above the individual threshold for manganese even under Rosemont's most favorable claims, **ADEQ must declare Rosemont a major source, deny and withdraw the Class II permit, and require Rosemont to submit a new application for a Class I permit. This application must include documentation to show that it will achieve at least 99.99% pollution prevention from *all* components of the system, *including disposal reservoirs*.**

Scenario 2:

Certain elements have greater environmental mobility than suggested in Scenario 1. Specifically, arsenic, lead and selenium will attach to aerosols, have volatile compound forms, and thus exhibit more than one mode of possible release and dispersion. In particular, arsenic will concentrate in sulfuric acid-based mists and aerosols to levels often exceeding levels estimated from standard chemical equilibrium calculation programs. **Arsenic, chromium, manganese and selenium** can be photochemically oxidized in the presence of sulfate and NO_x and then bind to aerosols. Further, most selenium compounds and selected lead compounds are volatile. Lead, if it is emitted as lead sulfates will also concentrate in and absorb on sulfuric acid-based mists and aerosols. **These additional mechanisms provide even greater support for denial of the proposed permit because of the higher levels of emissions of HAPs.**

Scenario 3:

This scenario looks at each element as oxide compounds to determine what the *minimum* level of emissions that, if otherwise *uncontrolled*, would produce exceedances and violations of Section 112(b). Two numbers are presented, the maximum emission level possible, and the percentage of this maximum level needed to cause an exceedance. The threshold here is 10 tpy for each individual element as an oxide.

> Arsenic: 0.42% of arsenic content of the source material, if released will exceed 10 tpy.
>
> Antimony: 1.7% of antimony content of the source material, if released will exceed 10 tpy
>
> Beryllium: 3.7% of the beryllium content of the source material, if released will exceed 10 tpy
>
> Cadmium: 8.3% of the cadmium content of the source material, if released will exceed 10 tpy
>
> Chromium: 0.09% of the chromium content of the source material, if released will exceed 10 tpy.

Lead: 0.09% of the lead content of the source material, if released will exceed 10 tpy.

Nickel: 0.79% of the nickel content of the source material, if released will exceed 10 tpy

Se: 0.3% of the selenium of the source material, if released will exceed 10 tpy

The situation with manganese requires separate discussion. Because of its extraordinarily high levels in the source materials, (almost 2½ times the amount of copper to be extracted) the analysis in scenario 3 is not appropriate. Basically, the amount of manganese that must be isolated and prevented from being released requires separate processing, and its required efficiency will become an issue with respect to any thermodynamic analysis required because of the Second Law of Thermodynamics discussion. **Therefore ADEQ must separately address the issue of manganese control in a Class I permit.**

Manganese presents an unusual problem. Further, ADEQ may have to address the potential for high levels of airborne manganese. These were actually detected in the air over Phoenix in 2010.[4] Although the explanations for these high levels with regards to sources and mechanisms have come under serious challenges and are highly controversial, the authenticity of the data have not been disputed. Further high levels of manganese have been implicated in a toxic smoke syndrome disease in a few instances for cattle, horses and other livestock.[5] Since there are working ranches almost adjacent to the Rosemont site, these entities are at special risk.

Under the above scenario, chromium and lead require more than 99.9% control efficiency. There is some skepticism about the statistical differences between 99.9% and the required controls of 99.91+%. Therefore, under this scenario, chromium and lead could have the **potential to emit** above the 10 tpy individual threshold.

The **potential to emit** was established without regard to observed or estimated emissions from actual process controls. Section 112(b) only requires one to establish the **potential to emit** without any regard as to actual emission data or observations. However, ADEQ has implied in a response to reporter Tony Davis at the *Arizona Daily Star* (October, 2012 email correspondence), that it would only consider the Section 112(b) requirements based on actual process data or estimates. This is because, among other things, most new sources try to avoid a

[4] Ilya Sandra Perlingieri, Chemtrails -- *The Consequences of Toxi Metals and Chemical Aerosols on Human Health, Part I.* -- Global Research, May 12, 2010.
[5] U.M. Cowgill, "Smelter Smoke Syndrome in Farm Animals and Manganese Deficiency in Northern Oklahoma," *Journal of Environmental Pollution*, Series A: **22**(4) 251-272 (1980)

Class I permit by providing extra levels of treatment and control to bring them voluntarily below any HAPs thresholds, and they believe that Rosemont has done so here.

Scenario 4

Scenarios 1, 2 and 3 did not require an analysis of the processes of the Mine Plan of Operations. The **potential to emit** was established from the known composition of source ores and claimed efficiencies by Rosemont with respect to pollutant emissions. Scenario 4 looks at specific elements of the processes in the Mine Plan of Operations.

Two process components of the Mine Plan of Operations are of immediate concern: the initial blasting step, which has already been briefly discussed in preliminary comments before Scenario 1, and the dry stack disposal. In the latter process, one must know when the equipment are cleaned: if the materials collected in the molybdenum dust collectors, cartridge air filters and electrostatic precipitators are hosed and made into slurry and transported to that disposal operation, or if the solid wastes are hauled away. When Rosemont officials were asked in a public meeting where the solid waste products from these control equipment units would go after the cleaning of this equipment, the response was that they would be slurried and sent to the dry stack disposal pit. Therefore, this scenario examines the dry stack as a source of HAPs emissions.

The first thing to note is that all emissions off the dry stack are fugitive, and these emissions occur in spite of any watering down of the slurry layers to prevent dusting off. Under certain conditions of high winds and high solar radiation, the watering process may result in aerosol formation, which causes greater emissions by providing a second mechanism for atmospheric emission. Also because of the high level of solar radiation intensity[6], photochemical reactions may cause specific HAPs, notably arsenic and selenium to be oxidized and become attached to a sulfuric acid mist phase in amounts that exceed what many equilibrium chemical calculations may estimate. Also a sulfate-based mist will adsorb lead compounds present in the waste products.

The greatest concern for spread of emissions occurs when winds in the area exceed 25 mph. The proposed draft permit allows Rosemont to suspend certain dust control processes. During these periods, the emission potential of HAPs becomes very large. Therefore, one needs to have a sense of the frequency of occurrence of winds at the Rosemont site that exceed 25 mph. The study by Dr. Robert Maddox for his comments on the Forest Service DEIS provides this analysis.[7]

[6] NOAA weather station data
[7] http://www.squidinkbooks.com/madweather/pdfs/Rosemont-DEIS-Comments-Air-Quality-RAM.pdf.

Using sample data from Rosemont's own reports and comparing it to NWS and BLM meteorological measurement placements on nearby public lands, the following is observed:

- Maximum hourly wind speeds differ routinely by as much 1.5 m/s between the Rosemont site and nearby sites maintained by federal agencies.
- Maximum wind gusts are two to three times higher than the maximum hourly wind speeds.
- If the sample of data presented is representative, the 25mph threshold will be breached at least seven days in any month, or as much as possibly 84-90 days of the year. That means that one can expect Rosemont to suspend controls for the dry stack some 23% of the time. Thus, at least for one day out of almost four, the possibility of large-scale HAPs emissions are great.

In looking at these data, it is assumed that Rosemont is unlikely to be in a position to respond instantly to turning on and off dust control operations. There is likely some lag time in this action before the system is shut off when wind gusts go above 25mph, and some lag time when the winds calm down before Rosemont can turn the dust control systems back on.

Emissions off the dry stack calculations:

- Assume that the cartridges, precipitators and dust collectors collect 99.99% of the particulates which contain HAPs.

- Also assume that the pollution controls against air emissions from the dry stacks are potentially non-operative for up to 23% of a given year.

An important question to consider is whether the dry stack piles have the **potential to emit** more than either 10 tpy of an individual chemical listed as a HAP or 25 tpy for all listed HAPs combined. It is not clear that one can disaggregate the data on individual oxides of specific elements from the materials in the dry disposal operation and make estimates on the individual elements. This is because of the mixed nature of the dry stack disposal receiving different hazardous elements at different times from different processes. Therefore, the emphasis will be on looking at a global analysis of total combined HAPs emissions to exceed the 25 tpy threshold.

There are two major cases. The first looks only at maximum wind gusts. The answer depends on how long the maximum gusts last if the following occurs:

a) If the gusts last on the average for 1 hour, then the **potential to emit** individual HAPs in excess of the combined HAPs of 25 tpy is possible because the maximum emission rate is 0.51 tpd, and over a year's time it would require only 50 days to breach the combined HAPs exceedance threshold.

b) If the gusts last on the average of 49 minutes, the thresholds will be breached in a year's time.
c) If the gusts last on the average of half an hour a day, then the **potential to emit** in excess of the combined total requires more days than are likely to be documented in a given year with appropriate maximum gusting winds because the maximum emission rate is 0.26 tpy.
d) If the gusts last an average of more than 1 hour, then many thresholds for HAPs are likely to be breached routinely, including some individual HAPs.

However, Rosemont's consultants did not report the duration of maximum wind gusts at the site. It isn't clear if they directly measured this parameter. Since this is a deficiency in their characterization for the site, we must infer from other data at NWS sites on nearby federal lands, that maximum gusts have sufficient duration on a sufficient number of days to create the **potential to emit** HAPs off the dry disposal piles that can exceed the threshold of 25 tpy.

The second major case looks at **potential to emit** occurring during the periods where pollution controls apply. It is still possible to model such systems under non-turbulent or mildly turbulent conditions, but too many assumptions would need to be made on how the interphase transport processes will occur. Hetzroni has compiled and critically examined the various interphase transport models available.[8] Dr. Robert Maddox's work showed a median maximum wind speed of about 20mph. Using a typical *exponential* scaling factor of 0.6 for wind speeds, the maximum emission rate would be 0.06 tpd. This is in the order of magnitude of Rosemont's claims about HAP emissions directly from its processing streams as fugitive and non-fugitive emissions. At this rate, assuming in spite of hosing operations, the emissions can occur at this rate, it would still take more than a year to **potentially emit** more than 25 tpy of combined HAPs.

A third minor case looks at a blended situation: a combination of downtime and controlled periods. Only in cases where the average maximum gusts last for more than 2 hours, even if there are very few days in the year when that happens, it is possible to breach the thresholds of the **potential to emit** HAPs. The question here becomes whether such a combination of circumstances typically occurs during the monsoon seasons during the period without rains to wash out pollutants from the atmosphere.

Basically this means that the dry stack disposal pile does not prevent the **potential to emit** HAPs in excess of the two thresholds, although this potential is at the forbearance of meteorological conditions. Since the extent to which these meteorological conditions favor Rosemont's case are unpredictable, prudent environmental management uses a *worst case* assumption-that these conditions will be unfavorable for a sufficient period of time and will create the **potential to emit**. Therefore, ADEQ must still declare Rosemont a Class I major source because its process emissions, although they remove the bulk of the HAPs found

[8] G. Hetzroni, *Handbook of Multiphase Systems*, McGraw-Hill, New York 1985

as particulates, merely transfer this material to another system component from which they may become a major source of HAPs to the atmosphere.

Also, none of the calculations consider the formation of aerosols. The mechanisms and models here are also subject to different assumptions, and Hetzroni (ibid) was again consulted along with the *Handbook of Aerosols*[9]. Although aerosol calculations are not presented here, any numbers that come from such an analysis are added to existing emissions data, and therefore increase the **potential to emit**.

Additional Comments

Augusta Resource, the parent company of Rosemont Copper, submitted a revised Feasibility Study in August 2012. This plan considerably changes the character of the review because the current Mine Plan of Operations upon which an air permit is to be based has changed so much that it affects the air pollution related issues of the proposed project.

One of the processes that has been removed is the electrowinning process. However, Augusta has indicated that should economic conditions warrant, it would reactivate this component of the Mine Plan of Operations. In the interim, however, the ore to be processed will be primarily sulfide based, whereas before, the ore to be processed was a combination of oxide based and sulfide based. If the electrowinning process is revived, it uses a chelating agent to extract copper prior to electrolytic processing. While the chemical very strongly favors extraction of copper, it has the following several chemical characteristics that would generate additional HAPs:

1. The chemical has a hydrocarbon matrix (petrochemical matrix), which can bind arsenic, cadmium, lead, and selenium. These chemical complexes are volatile and can be vented in the raffinate recycle step of the previous Mine Plan of Operations if the electrowinning process is reactivated. These volatiles are HAPs.
2. The chelate will bind to any metal that has +2 chemical valence, although it binds preferentially to copper. The second highest bind potential is for nickel, which Rosemont's original processing schemes would control through pH adjustment with sulfuric acid, the source of the sulfuric acid emissions. But the chelate will also bind to cadmium, cobalt, gold, lead, mercury, silver and *radium*. The chelate thus becomes a mechanism for the release of mercury and radioactive materials under Section 112(b).
3. The formation of volatile complexes with selenium, as given in characteristic 1., is catalyzed by the presence of mercury. Normally mercury is not of concern because of its very small trace levels in the

[9] R. Dennis, Editor Handbook on Aerosols, *TID-26608*, Technical Information Center, US Department of Energy (1976).

source materials, but the selenium complexes can be mercury-selenium complexes, giving mercury a chance to contribute to HAPs.

ADEQ has not considered the dry stack fugitive emissions issue at all in its permit, nor has it required a monitoring program for the dry stack in the permit, but rather indicated that a monitoring program for the dry stack would be developed following issuance of the permit. SSSR's understanding of the reason for this is that ADEQ does not count fugitive emissions from minor sources for certain NAAQS primary pollutant initial determinations. However, that "exception" to the consideration of fugitive emissions does **not** apply when HAPs are involved, and ADEQ must now consider the dry stack disposal and monitoring in any proposed permit because the **potential to emit** HAPS makes Rosemont a major source. The possibilities that the dry stack, if it becomes the location source for the bulk of potential HAPs, will provide sufficient emissions to confirm the **potential to emit** very high levels of HAPs from the waste pile.

Arsenic and lead require special regulatory controls in the proposed permit.

Arsenic and lead are the two major toxic element contaminants of most copper ores. They are also among the most toxic materials to human health. Arsenic is a carcinogen and lead is a neurotoxin. Gradients of both pollutants are measurable as one moves away from mine sites. With respect to arsenic, University of Arizona studies show a gradient of arsenic in vegetation and along roadways, and air-monitoring stations detect arsenic away from copper mines in Arizona. Further, lead is a primary air pollutant under NAAQS. The State of Arizona must re-initiate in 2012 monitoring of airborne lead as a primary air pollutant under NAAQS. The proposed permit and the background documents from Rosemont do not contain any clear statement that lead is even being addressed. **ADEQ must place special controls dealing specifically with arsenic and lead in any permit it issues.**

The proposed mine will also have the potential to emit environmentally significant amounts of compounds of other elements which have not been specifically listed under Section 112(b), but where deposition of these elements into aquatic systems and deposition on soils from which vegetation may take up these element will cause violations of other environmental laws, notably the Clean Water Act.

The elements in question are copper, zinc and fluorine. Since the mine will produce copper, copper emissions to the atmosphere would likely be highly limited, but Rosemont has submitted a revised feasibility study recently which removes processes for recovery of oxide based copper ores and relegates them to waste products, in which case the possibility of copper emission becomes more likely. Copper and zinc are toxic to aquatic life if deposited in streams or aquatic habitats. Fluorine is a risk to aquatic and terrestrial animals through fluorosis, a bone disease. The source material contains these elements in the amounts indicated in the background geochemical reports.

Cu 300 mg/kg Zn 100 mg/kg F 6 mg/kg

The draft ADEQ proposed permit omits consideration of several regulated pollutants which are found in almost every geological strata of many copper mines in the United States.

Certain pollutants are geochemical constituents of landscape material for many known copper mining operations in the United States, as well as mining operations in many other countries. These include asbestos and asbestiform minerals, and the zeolite mineral erionite. **The presence of tremolite, an asbestos mineral, embedded in quartz has been confirmed at the Rosemont site in the background geochemistry report.** The Clean Air Act has specific regulatory sections that address asbestos and asbestiform minerals, which are also listed in Section 112(b) as "fine mineral fibers." Yet nothing has been said or remarked about them in any background Rosemont documents or the proposed draft air permit. Not reporting on the material does not mean it is not present. This would be especially true for erionite, which is very difficult to detect unless one is using highly sensitive mineralogical instrumentation and techniques. Even in trace quantities, these mineral substances are health hazards if released to the environment. The blasting process will certainly release these materials to the environment. These substances are direct causal agents of the form of lung cancer known as mesothelioma. The Center for Disease Control and the Occupational Safety and Health Administration have jointly called for programs to control the release and human exposure to asbestiform minerals and erionite.[10,11]

II. CLASS I AREAS HAVE NOT BEEN EFFECTIVELY PROTECTED BY THE PROPOSED DRAFT PERMIT

Aerosols also cause haze and visibility reduction but are not included in the analyses presented.

There is no consideration of aerosols as haze formers in either the permit application or the proposed permit. The CALPUFF model used to analyze visibility problems is not suited to look at this issue. However, if aerosols will become a significant component of fugitive emissions, **ADEQ must revise the permit to address this deficiency in the visibility analyses.**

[10] **Epidemiology: Fear in the dust,** online 9 December 2010 | *Nature* 468, 884-885 (2010) | doi:10.1038/468884a; Updated online: 10 December 2010

[11] ***Report on Carcinogens, Twelfth Edition*** **(2011)**, http://ntp.niehs.nih.gov/go/roc12

In response to a Forest Service request, Rosemont's consultants have run additional modeling studies with CALPUFF to study visibility problems of selected Class I air sheds. Originally, the modeling studies only considered Saguaro National Forest. These studies, submitted in a report dated April 4, 2011, suffer from the same problems of the previous CALPUFF submission to the Forest Service, and are so deficient that they cannot be accepted to support any conclusions which Rosemont's consultants have made with regard to impacts on Class I areas.

There are problems with estimates of wet deposition in Class I areas because Rosemont has used faulty rainfall analyses. This is tied to problems with the selection of reference sites for meteorological data and in the use of data from selected reference sites of other networks.

NWS sites for rainfall and precipitation analysis were not used, even those located in Class I areas. That calls into question the appropriateness and correctness of deposition modeling for pollutants in the Class I areas reported by the consultants. On this point, Rosemont's consultants used an average figure of 18in for precipitation at the mine site and its vicinity. When Dr. Robert Maddox used the University of Oregon online calculator with the data from various Rosemont sites, the modeling output was uniformly higher than 18in across all sites, and reached as high as 25inches at selected sites. He has graciously provided the following data from his computer analyses for inclusion in this submission.

He used a high resolution, interactive program on-line that provides rainfall estimates generated by the PRISM system at Oregon State.[12]

This is the accepted state-of-art procedure for estimating rainfall in complex terrain (includes all nearby rain observations and considers elevation, slope and aspect for each grid point). At 800 m grid resolution the PRISM data indicate average annual rainfall (for the period 1971-2000) at the Rosemont site of:

Barrel Canyon USGS stream gauge = **21.25 inches**
On-site weather station (*i.e,*. center of pit) = **24.87 inches**
Highest terrain on ridge above pit = **25.22 inches**

Empire RAWS site = **18.04 inches**

The strongly sloped terrain at the Rosemont site produces a very substantial gradient in rainfall – and basically the single value of **18 inches** used by Rosemont cannot be used to "represent" the site annual rainfall. As a result, the **accuracy and validity** of all calculations with regard to wet deposition of all primary and secondary air pollutants at all Class I sites are subject to challenge**.**

III. DEFICIENCIES AND INADEQUACIES IN THE MODELING

[12] http://www.prism.oregonstate.edu/docs/

ADEQ, in answering questions from reporter Tony Davis of the *Arizona Daily Star (October, 2012 email correspondence)*, indicated that their staff guided Rosemont through a series of modeling calculations using ADEQ approved modeling procedures and formulas, as well as the program AERMOD, to assure that atmospheric emissions from the mine project do not affect NAAQS criteria for primary and second air pollutants in urban areas and Class I areas.

SSSR has serious questions about any modeling undertaken, especially where use of AERMOD is concerned, because Rosemont's past modeling for dispersion and other purposes has shown major deficiencies of experimental design, statistical assumptions, collection of data, processing of data, and quality control. ADEQ has supplied no documentation in its draft permit or other materials that demonstrate that the problems enumerated herein with respect to use of AERMOD by Rosemont have been corrected, nor has the agency provided evidence that the data inputs to the formulas and models used have been reviewed and analyzed to ensure the quality and reliability. The past problems Rosemont has incurred with respect to dispersion modeling are extensive enough that a graduate student seeking a PhD in statistics could produce a high quality dissertation based on Rosemont's mistakes.

The use of non-homogeneous time series data from NWS sites due to a change of site location during the period of background studies renders the meteorological time series measurements and correlations of Rosemont unusable.

The NWS site at Tucson airport was shut down and moved to the NWS site at University of Arizona campus. The result is an interrupted series which is not statistically homogeneous in its two parts but which is used by Rosemont's consultants for dispersion calculation parameters.

Questionable use of the data from the Chiricahua National Forest as a baseline.

Rosemont's consultants posited that the ozone levels at the Chiricahua Monument area were the closest and most representative of the project site. This site is 94 miles away. The basis for this determination is not clear in the Rosemont submission. The comment about the representative nature of the Chiricahua data is neither supported nor justified in the reports accepted by ADEQ. On the other hand, data from Saguaro National Park, which is much closer, was neither discussed nor used.

The proposed permit has relied on uncritically analyzed data of dispersion modeling, essentially accepting a "data dump" without commentary or explanation in Rosemont's revised submission.

Rosemont has submitted additional air quality data in response to inquiries from the Forest Service with respect to its Draft EIS, to Pima County with respect to its subsequently rejected air permit, and to ADEQ with respect to the proposed take over of a permitting operation from the County. The data presented are not accompanied by information to suggest that these additional data correct modeling problems previously pointed out to the Forest Service in comments on the Draft EIS. Rosemont has indicated that they have taken the various comments on the Draft EIS into consideration in submitting a revised Mine Plan of Operations, although no changes with respect to correcting the past problems appear in that document. The material submitted to ADEQ shows no evidence that deficiencies in methodology, quality control or measurement analysis and statistics have been corrected. There is no *new* context for the information given, and it is not clear whether these additional data are reruns of existing scenarios which have been tweaked with a modified modeling algorithm, or are indeed new modeling analyses designed to respond to previously indicated deficiencies. Rather, it appears that the data submissions are simply "computer data dumps" designed to overwhelm the reader and leave it to the reader to figure it all out.

AERMOD analyses are based on a faulty quality assurance plan, and the latest data submissions show no evidence of corrections and improvements for this plan. Rather they repeat the information from previous submissions unamended.

In the original submission of data using the AERMOD model, the consultant report indicated that problems with the meteorological weather package caused a loss of one-quarter year's worth of data, and chose to impute repeat the data from the same quarter of the following year. Further, the start-up operation occurred three months *before* the quality assurance plan was in place. In presenting additional and new data, there was no discussion on improvements or changes in the quality assurance plan, only a rehash of the preceding information. Additional concerns about the plan relate to the selection of data from stations with reference data, the choices and justification for stations, and relationships between the locations of these stations and the reference site being studied. None of these have been addressed in the additional documented submissions.

Additional issues on an outlier datum of high particulate levels used in various modeling calculations and considered by ADEQ in the draft permit.

ADEQ has increased required controls for particulate matter after having factored into its analysis a very high particulate background reading, which Rosemont chose to ignore as a statistical outlier. What ADEQ did not recognize is that the "outlier" may actually be a more common and reasonable number for particulate levels rather than an outlier.

Since the appearance of the original datum occurred in the background monitoring program, the immediate conclusion is that the period of baseline data collection was inadequate and should have been extended.

When US EPA reviewed these data their comments on the Forest Service draft EIS indicated that the treatment of the datum as an outlier needed stronger discussion and justification. EPA noted that **only** wind conditions indicative of a dust storm might allow the suspected datum to be treated as an outlier. A review of the historical meteorological conditions of the Rosemont site suggests that once this site is disturbed, the frequency of dust storms will be a more routine occurrence rather than an a rare event. The winds in the area routinely reach speeds of 50 miles/hr (as indicated by nearby BLM/USFS surface observations). That immediately calls into question the use of 3 miles/hour as an average wind speed for some of the modeling dispersion calculations. In fact, the wind situation underlies a major problem with the modeling undertaken and reported as a basis for the permit. The frequency, duration and intensity of high winds results in a high possibility that airborne emissions from the Rosemont site will travel longer distances than would otherwise be expected, and that populations in the Corona de Tucson, Vail, Sonoita, and other distant areas will be exposed to various air pollutants, including HAPs.

The meteorological characterization of the mine site suffered from faulty experimental design.

The placement of the meteorological instrumentation at the Rosemont site for background studies shows that the instrument package for a single site was sheltered considerably from the conditions it was supposed to monitor. The terrain has high variable gradients and slopes and other features such that a single highly compromised station cannot accurately capture the meteorological characteristics of the site. More than one site was needed. Simple common sense would consider at least four stations: one located at the pit (as was done but sheltered from its measurements), one on elevation of terrain to consider the conditions at the top of the proposed dry stack, one on the northern edge of site to cover terrain changes, and one at the southern end of the site, possibly at an elevation that is half way above the proposed disposal pit. And these may still not be sufficient depending on what some field studies show about the need to adjust the monitoring network. Regardless, **the meteorological data reported from that site are highly flawed and limited and cannot be considered representative of the entire meteorology of the site, and those data cannot support Rosemont's conclusions.**

AERMOD as a modeling strategy does not address the problems of aerosols very well, yet aerosols are expected to become a significant component of atmospheric emissions, especially the fugitive ones. One of the environmental treatment processes with respect to the dry stack disposal of waste rock involved spraying to prevent aerosol formation and to control dusting. Under some of the severe wind conditions at the site, these processes can actually encourage aerosol formation rather than suppress it. Another problem is the aerosols will become photochemically active, and cause the formation of sulfuric acid mist, because of the high sulfur content of the waste rock.

AERMOD does not have a chemical reaction component and cannot address chemical reactions that occur from the interactions of various pollutant plumes under various meteorological conditions. There is a very strong possibility given the meteorological conditions at the Rosemont mine site that photochemical reactions involving aerosols and particulate matter will occur, which increase the possible emissions of arsenic, selenium, chromium and manganese. AERMOD will not accommodate this situation. Further, AERMOD will not be able to handle any chemical interactions between the pollutant plume from the Rosemont mine as it interacts with other urban plumes from stationary and mobile sources in the City of Tucson.

ADEQ has reduced the potential for NO_x emissions from vehicular traffic servicing the mine operations. This particular pollutant is the catalyst and main reactant in many photochemical reactions. In the presence of sulfur oxides, it will produce sulfuric acid, and this in turn will concentrate arsenic and selenium and photochemically oxidize them. Chromium and manganese, because they have many stable valence states, can also be photochemically oxidized if they are in the aerosol plume. Both elements are powerful oxidizing agents and can also catalyze chemical reactions among the toxic geochemical constituents in the waste streams and dry stack. Arsenic can be photochemically oxidized to arsenate providing another mechanism for arsenic release.[13]

AERMOD was used in part to predict the dispersion of atmospheric emissions from the site on the urban areas of Tucson and surrounding communities. At best, AERMOD can only look at the linear interaction of urban plumes. The possibility of ozone formation in the urban environment related to the photochemical reactions of mine emission with the urban plumes is not covered in the background information which Rosemont has supplied, nor in the materials of the proposed draft air permit. However, the issue of nitrogen oxide control is totally related to the possibility that Tucson could become a non-attainment area for ozone.

AERMOD does not have a chemical reaction component but CALPUFF does. However, it is not clear from either the materials that Rosemont's consultants have used or language in the proposed permit that the chemical reaction component of CALPUFF was used.

SSSR brings to the attention of ADEQ the problems of failure to require modeling of the exposure from all primary air pollutants under NAAQS, especially carbon monoxide and lead.

[13] M. Lescano, C.S. Zalazar, A.E. Cassano, R.J. Brandi, "As(III) Oxidation of Water Applying a Combination of Hydrogen Peroxide and UVC radiation," *Photochem. Phoobiol. Sci*. **10**: 1792-1803 (2011)

The only pollutant for which specific modeling was undertaken was for particulate matter. The comments on other NAAQS primary pollutants relied on surrogate information from other sources, notably networks of Pima County, and the Federal Government. There was no modeling for carbon monoxide or lead. Yet Pima County, in rejecting a proposed air permit for the facility, specifically noted the omission of carbon monoxide, especially the potentially high levels from the blasting processes. Rosemont's background documents, as recently as December 2011, state that carbon monoxide should not be one of the pollutants they must consider. **Rosemont is wrong in its proposal, and ADEQ is wrong not to require analysis and modeling for carbon monoxide.** It is toxic and its production is great as acknowledged in the proposed permit.

Carbon monoxide has a special connection to the production of HAPs under Section 112(b). The blasting process produces thermal effects with very high temperatures sufficient to allow certain chemical interactions between carbon monoxide and heavy metals in the particulates. The process behaves like an *uncontrolled coke oven*, and the reactions involved are coke oven reactions. Coke oven emissions are specifically listed in Section 112(b). Carbon monoxide is a powerful chemical reducing agent, and can combine under high temperatures with nickel, iron and other metals to form metal carbonyl compounds. These carbonyl compounds are established airborne carcinogens. There is no statements in any of the background documents or technical analyses presented which discuss this chemical reacting system, nor are there technically supportable statements that negate or contradict the possibilities of these specific chemical reactions. Therefore, having mentioned them in this submission, **ADEQ must now address the failure to model carbon monoxide exposure as a health problem and primary air pollutant under NAAQS, as well as address the special HAP possibilities associated with carbon monoxide reactions in revisions to its proposed permit.**

The State of Arizona is required to re-initiate in 2012 monitoring of levels of atmospheric **lead**. This element is also a primary air pollutant under the Clean Air Act. Simply because leaded gasoline is no longer sold in the United States does not mean lead is not a problem. There is no discussion or provision for monitoring lead in any of the Rosemont background documents or the proposed permit. **Thus the proposed permit potentially violates the Clean Air Act with respect to lead.**

Finally, the proposed permit has not included sufficient information and requirements on monitoring or monitoring plans to assure that the proposed mine meets requirements of protection of human health and protection of environmental values.

In conclusion, there are so many problems related to the materials submitted by Rosemont and the proposed language of the air permit, that ADEQ must not issue the proposed draft permit, but must call for a massive resubmission and correction of Rosemont data, and then after careful analysis of the resubmission, propose

another permit for public commentary that corrects all of the faults and deficiencies of this submission and other submissions from the public.

Signatories and Credentials

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Dr. Fisher has fifty years of professional experience in air pollution sciences, technologies, and ecological and human health impacts. He holds appropriate degrees, including PhD, and has worked both nationally and internationally on air pollution research, regulatory and policy problems. He worked for EPA from the time it was created as a research scientist engineer, and later for more than twenty-six years at the State Department as a senior scientist and treaty officer for air pollution affairs on one of the international commissions.

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