PIMA COUNTY DEPARTMENT OF ENVIRONMENTAL QUALITY
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Ursula Kramer, P.E.
Director

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October 31, 2012

BY CERTIFIED MAIL & EMAIL
massey.eric@azdeq.gov

Mr. Eric Massey
Air Quality Division Director
Arizona Department of Environmental Quality
1110 W. Washington Street
Phoenix, AZ 85007

Dear Mr. Massey,

Pima County Air Quality Control District (PCAQCD) has reviewed Arizona Department of Environmental Quality's (ADEQ) proposed Rosemont Copper Company (RCC) Air Quality Control Permit Number 55223 and supporting materials. While ADEQ has legal authority to assert jurisdiction over this source, the PCAQD objects to the department's characterization that this was necessary because there was uncertainty as to the state and county permitting requirements. The PCAQD further objects to the statement in the ADEQ fact sheet that "To address this uncertainty and ensure that duplicative air quality permits are not required, pursuant to ARS 49-402(B) and R9-3-1101 of the Arizona State Implementation Plan (SIP), has asserted complete air quality jurisdiction." At no time has the PCAQCD discussed or stated that there would be multiple state and county air quality permits issued to this source and does not believe there has been confusion or uncertainty regarding permitting of the mine.

As one of Rosemont's multiple positions regarding applicability of SIP requirements, the company argued that the Pima County SIP was only enforceable in non-attainment areas. Therefore, the company argued, they were not subject to the Pima County SIP. The PCAQD does not believe this to be true and notes that ADEQ included the Pima County SIP in the proposed permit.

The PCAQD further objects to ADEQ's characterization that the permit imposes "very stringent requirements." The reduction of 47 tons of PM_{10} from point sources is insignificant compared to the approximately 1,000 tons per year of fugitive emissions the source will be emitting. As demonstrated by the air quality modeling, the proposed mine will significantly degrade air quality in Pima County. The modeling has shown the mine will increase ambient PM_{10} concentrations from 37 $\mu g/m^3$ to 147 $\mu g/m^3$. While the modeled PM_{10} concentrations are below

the National Ambient Air Quality Standard of 150 $\mu g/m^3$, the margin of error inherent in modeling could easily place the region in non-attainment.

With regards to compliance and enforcement of the permit after issuance, the fact sheet states "ADEQ's preference would be to delegate those responsibilities to PCAQCD." The PCAQCD would consider taking compliance and enforcement responsibilities only if ADEQ returned jurisdiction to Pima County and would not take delegation of this source.

The PCAQD has developed specific comments on the proposed permit in Attachment A and comments on the air quality modeling in Attachment B.

If you have any questions regarding these comments, you may contact me at (520) 243-7400.

Sincerely,

Ursula Kramer

Ursula Kramer, P.E.
Control Officer, Pima County Air Quality Control District

UK/vb

cc: C. H. Huckelberry, County Administrator, PDEQ
John Bernal, Deputy County Administrator for PW

ATTACHMENT A

SPECIFIC COMMENTS

Pima County Air Quality Control District
33 N. Stone Avenue, Suite 700, Tucson AZ 85701

Attachment A – Specific Comments

1. Jurisdiction

   In the fact sheet for the Public Meeting and Hearing, ADEQ stated that the department was seeking comment from the public on whether PCAQCD should receive delegation for compliance of the facility.

   The PCAQCD would consider taking compliance and enforcement responsibilities only if ADEQ returned jurisdiction to Pima County and would not take delegation of this source.

2. Authorized Representative

   Should PCAQCD agree to receive complete or partial jurisdiction of the permit, all parts of the permit that refer to the Director will need to be revised to Pima County Control Officer to provide a clear delineation that all reports and any compliance related documentation shall be submitted to the Pima County Control Officer and not the Director.

3. On page 17 of 54 of the permit, the permit states that the Permittee shall have a person on site or on-call certified in EPA Reference Method 9. PCAQCD believes that a person certified in Method 9 should be onsite and not on-call.

4. PCAQCD seeks clarification on what the limitation in II.A.6 of Attachment B is based upon. What status/classification is the Permittee avoiding?

5. Similarly, Permit condition II.A.7 of Attachment B limits the amount of Ammonium Nitrate Fuel Oil. Is the limitation for fugitives and what classification or other applicable requirement being avoided by limiting the fugitive emissions?

6. Permit condition II.C.1 of Attachment B lacks the recording units (tons) of ANFO blasted.

7. Permit condition II.C.5 of Attachment B. How does ADEQ address enforcement of this provision requiring visible emissions surveys at places where the facility fugitive dust generating activities are within 300 feet of the property boundary line? How specific should the records be and what is the significance of the 300 feet?

   In addition, it seems the citation used here (A.A.C. R18-2-306.A.4) is for recordkeeping; however, there is no recordkeeping requirement mentioned in II.C.5. The reporting citation requirement in A.A.C. R18-2-306.A.5 should also be included as there is a requirement to "report" excess emissions.

8. The citation used for Permit condition II.C.7 of Attachment B (A.A.C. R18-2-306.A.3.c) is a monitoring requirement with no corresponding condition being monitored. PCAQCD seeks clarification on the purpose of requiring the notification of purchasing equipment listed in Attachment C. Only NSPS equipment requires notification under 40 CFR 60.7(a)(1).

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9. Permit condition III.D.2.i of Attachment B requires that the Permittee remove accumulated material as expeditiously as practicable on an as needed basis. PCAQCD seeks clarification on the practical enforceability of this condition. In addition, the permit condition is too vague, too general, and cannot be a material permit condition as it does not meet the given criteria in A.A.C R.18-2-331.

10. Permit condition III.D.2.k requires the installation of chutes. Does ADEQ classify chutes as air pollution control equipment (APC)? If so what are the established emission reductions from the use of chutes. If the chutes are not APC, then it follows that the condition cannot be a material permit condition.

11. Permit condition IV.C.2 of Attachment B requires that the Permittee remove accumulated material as expeditiously as practicable on an as needed basis. PCAQCD seeks clarification on the practical enforceability of this condition. In addition, the permit condition is too vague, too general, and cannot be a material permit condition as it does not meet the given criteria in A.A.C R.18-2-331.

12. Permit condition IV.C.2.c requires the installation of chutes. Does ADEQ classify chutes as APC? If so what are the established emission reductions from the use of chutes. If the chutes are not APC, then it follows that the condition cannot be a material permit condition.

13. The citing of A.A.C R18-2-702.B for the 20% opacity limit in VIII.B.1.a (2) of Attachment "B" does not apply to Open Areas, Roadways & Streets, Storage Piles, and Material Handling. This rule is only applicable to sources that are existing point sources as defined in A.A.C R18-2-702.A and not nonpoint/fugitive sources.

    PCAQCD believes A.A.C R18-2-614 which limits the opacity from nonpoint sources (fugitive emissions) to 40% is applicable. Pursuant to A.R.S. 49-402.D, PCAQCD believes that the 20% opacity provision in PCC 17.16.050.B is also applicable, a more stringent provision for nonpoint sources in Pima County and should be part of the permit.

14. PCAQCD requests clarification on whether the plan referred to in VIII.B.1.b (5) of Attachment "B" is a Tailings Construction Plan or Tailings Management Plan. In addition, PCAQCD recommends this plan be submitted to the Director through a significant revision. This will afford the public the opportunity to have input on the Tailings Construction Plan.

    PCAQCD proposed the Tailings Plan conditions and wind speed requirements in the RCC's Pima County proposed draft permit. PCAQCD has improved upon these requirements to provide greater flexibility to regulated entities and address other uncertainties regarding such a prescriptive condition. PCAQCD is available to discuss these improvements with ADEQ at your earliest convenience.

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15. ADEQ has omitted the mineral tailings rule from the draft permit. PCAQCD believes that A.A.C R18-2-608 Mineral Tailings is an applicable requirement and must be included in the permit.
16. The Dust Control Plan in Appendix E is not specific enough. It is simply a general outline that describes what RCC will accomplish, but not how. The plan should specify the schedules, how much material(s) will be used and how its effectiveness will be determined. PCAQCD understands that frequencies can be hourly, less frequent or more frequent and depend upon the traffic density, meteorological conditions, and operational considerations. RCC, however, needs to describe how this will be accomplished or determined in order to provide a reasonable assurance of compliance. For example, an inspection of the affected areas twice daily is one method. A statement of periodic inspections is not descriptive enough as the period could be interpreted to mean weekly, biweekly etc.

ATTACHMENT B

AIR QUALITY MODELING COMMENTS

By Dr. E.A. Betterton, Professor
Head, Department of Atmospheric Sciences
Director, Institute of Atmospheric Physics

E. A. Betterton. October 30, 2012

Comments on Rosemont Air Permit Application (November 15, 201) and on AQEQ Draft Permit (#55223, August 6, 2012)

Overall

1. Rosemont has redefined their mine. They should be required to resubmit an air permit application to ADEQ that describes the mine they intend to develop. They should also be required to resubmit a new EIS to the Forest Service.
2. Their air permit application to ADEQ (November 15, 2011), was followed up 4 months later with a 484-page amendment (March 19, 2012) - nearly three times the length of the original application. Then 6 months after submitting the amendment, Rosemont informed the Forest Service (not ADEQ) in a brief letter (September 12, 2012) that they will not build the mine described in the EIS (or the air permit application). Instead of recovering copper from two ore bodies – copper oxide and copper sulfide – by two very different techniques, only copper sulfide will be processed. Below, I will contrast the out-of-date ADEQ air permit application, the Forest Service update letter, and the original EIS in order to highlight the confusion over just what mine Rosemont plans to develop and what impacts the mine might have on air quality.
3. Over the past few years, Rosemont has drilled more than 250 bore holes. Over a 4-month period (November 2011 – February 2012) they drilled just 12 more which provided sufficient data to overturn the results from all the other holes combined. They now claim that the copper sulfide ore is much richer than previously believed while the copper oxide ore is only marginally economical to recover. So they will process only copper sulfide ore (which is *not* what the air permit application states). Apparently, the cutoff grade for the copper oxide deposit is 0.10%, yet in spite of the fact that the deposit contains 0.17% copper - roughly 70% greater than the cutoff grade – it is now considered "marginal".
4. In the Forest Service update letter Rosemont refers to this as the Barrel Alternative but that is not correct. The true Barrel Alternative described in the original EIS includes heap leaching of 57,000 tons per day of copper oxide ore, a process which was deleted in the update letter. It is noteworthy that in November, 2011, Rosemont stated that "There are no alternate scenarios proposed…" (§2.3, pg. 2-9), yet just nine months later they backed away from their EIS and Mine Plan of Operations (2007) in favor of a completely different mine.
5. Copper oxide ore will now be treated as waste rock, not a valuable mineral. In fact, nearly 40% of the open-pit rock will be regarded as waste which means that the waste rock pile will be larger than that described in the ADEQ application and so the AERMOD particulate emissions factors, which are dependent on size and elevation of the source, are not correct. AERMOD should be run again with the correct waste rock pile dimensions and emissions factors.
6. The deleted solvent extraction/electrowinning plant included a large diesel-fired water heater whose emissions were included when calculating the ADEQ permit model estimates of PM, NOx, and CO, all of which are now incorrect because the

emissions sources are incorrect. The air model should accurately reflect the sources that are actually present in order to be credible.

7. Rosemont claims that it is "reviewing the opportunity" for processing copper sulfide ore with increased efficiency and for increasing throughput for the milling and flotation operations (2012 Forest Service letter). If they do indeed increase throughput they *must* also increase the production of tailings, a major potential source of particulate matter (PM_{10} and $PM_{2.5}$). Therefore the AERMOD emissions estimates used for the ADEQ permit application cannot be correct.
8. No specifics are given for how Rosemont will increase the efficiency of their concentrator. One obvious method would be to use a finer grind in order to liberate more copper sulfide minerals, but this method would undermine their stated intention to employ a coarse grind (Reclamation and Closure Plan, pg. 36, July, 2007). A finer grind would increase wind erosion potential of the tailings and other dust sources such as conveyors, and transfer points. The emissions factors used in the AERMOD simulation of dust emissions for ADEQ thus are questionable until Rosemont clarifies exactly how increased extraction efficiencies are to be realized, especially if there is to be a finer grind and different particle size distribution.
9. It is puzzling that in spite of the expected increased throughput, the "mill production rate is still lower than that described in the air permit and modeling application." (1012 Forest Service letter). Increased throughput of ore through the concentrator must result from more open-pit mining, and more crushing, which must lead to more milling, more intensive use of conveyor belts and transfer points, and higher production of tailings, all of which will lead to more airborne particulate matter. AERMOD should be run with the true tailings pile dimensions, particle size distributions, and emissions factors.
10. In the alternative described in the Forest Service letter (but not in the ADEQ application), materials processing over the life of the mine will change substantially from that declared in the *2009* Forest Service update:

Material processed	**2012 Forest Service letter life of mine (tons)***	**Change from 2009 Forest Service update**
Sulfide ore	661,429,000	+21%
Waste rock	1,249,161,000	+1.0%
Total rock	1,910,590,000	+3.4%

*The erroneous tonnages given in the 2012 Forest Service update letter have been corrected here.

Since Rosemont now states that they will be processing 21% more sulfide ore with an increase of just 1.0% of the waste rock this implies that they have discovered a substantially richer ore. The increased ore grade is can be estimated:

$$\frac{\text{Sulfide (FS 2009)}}{\text{Waste (FS 2009)}} = \frac{546,338}{1,847,777 + 68,181} = 29\% \text{ ore to waste}$$

$$\frac{\text{Sulfide (FS update 2012)}}{\text{Waste (FS update 2012)}} = \frac{661,429}{1,910,590} = 35\% \text{ ore to waste}$$

$$\text{therefore increase in sulfide ore grade} = \frac{35-29}{29} = 21\%$$

On the other hand, Rosemont claims that because their copper concentrate will be of a higher grade the concentrate shipments will drop by 10% from 484,700 ton per year to 439,000 ton per year, thereby implying that the increased concentrate grade is only 10%, which appears contradictory. The true process rates and shipment rates should be used as the basis for the AERMOD model.

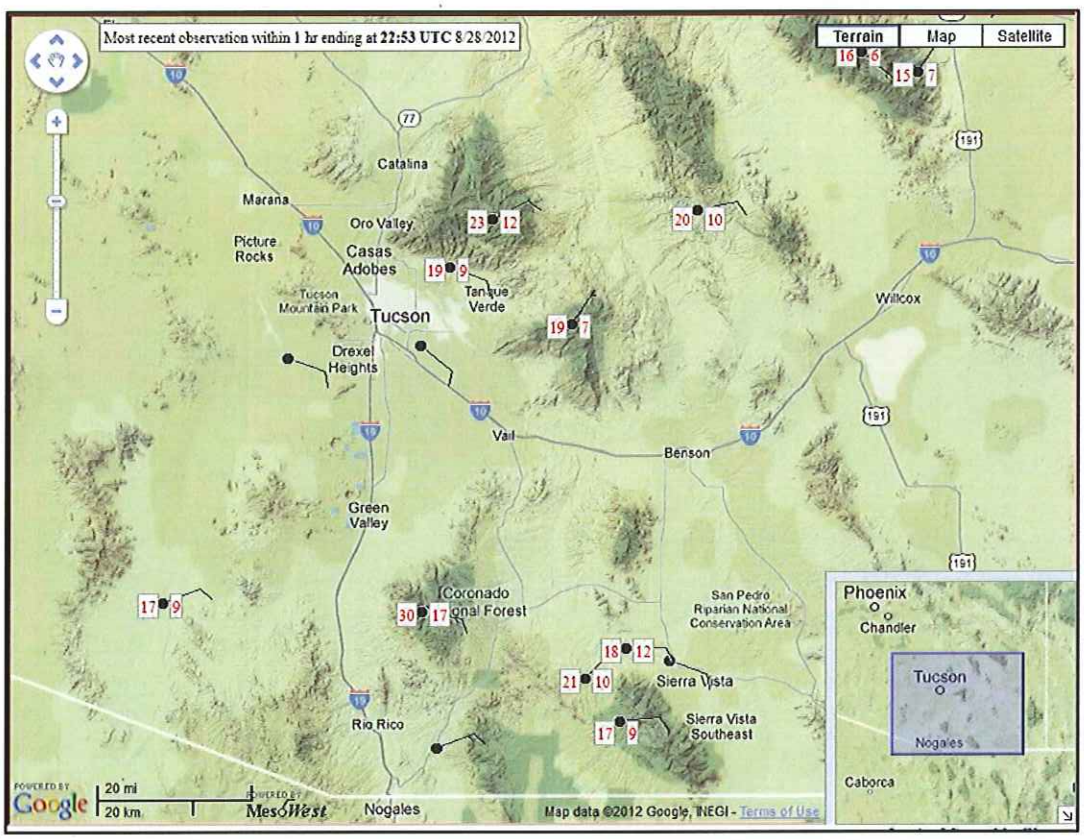
11. Overall, the mining operations described in the EIS, the two Forest Service updates and the ADEQ air permit application have changed so much and so often that is difficult to know what agency is evaluating what mine.

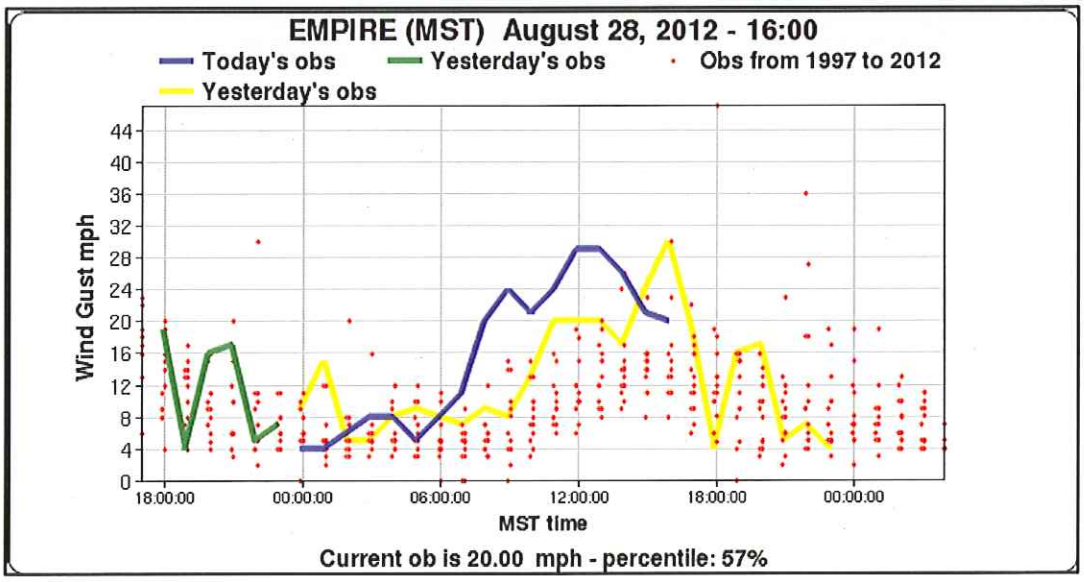
Meteorology

Others have noted that Rosemont's protocol for collecting background meteorological data at the site states that they checked their instrumentation every two weeks yet they apparently did not realize that their data logger was malfunctioning for a period of 3-months thereby calling into question the integrity of their protocol and data set.

Rosemont also leans heavily on the wind rose obtained from their station located high up on the mountain side, far removed from the open pit mine, tailings pile and haulage road areas. The wind rose shows a predominance of low speed, westerly winds, as expected for mountain-influenced drainage winds. Rosemont pays little attention to the occurrence of high speed easterlies lower in the valley that occur regularly in this part of Pima County and that can deliver windblown dust and other pollutants such as NO_X from the I-10 corridor to Rosemont and to the Tucson valley. The screen shots taken from the Mesowest web site on August 28, 2012, clearly illustrate this point (see below). The Empire RAWS station, where easterly winds gusting up to about 30 miles per hour were observed, is just a few miles from Rosemont's proposed tailings pile. The Empire RAWS data should be included in the AERMOD modeling effort.

E. A. Betterton. October 30, 2012





Particulate Matter

PM10: Rosemont has striven to ensure that their modeled PM_{10} does not exceed the 24-hour NAAQS standard (150 μg/m^3), but one should not lose sight of the fact that their predicted emissions (147 μg/m^3) are about 7-times the commonly observed level of about 20 μg/m^3 at the site. The impact will clearly be evident, and should be modeled accurately.

Rosemont continues to ignore its own PM_{10} data. At the Rosemont site on July 16, 2006, they observed a 24-h PM_{10} value of 71.3 μg/m^3, which they dismiss because it is an inconveniently high "outlier". ADEQ deems that it "is a statistical outlier" the reasons for which are "unknown". However, it is not an outlier and the reasons *are* known. A regional dust storm occurred that was also observed on the other side of the Santa Rita Mountains. Green Valley recorded a 1-h PM_{10} (at 7pm) of 147 μg/m^3 on the same day, while Corona de Tucson (70 μg/m^3 vs.30 μg/m^3), and South Tucson (60 μg/m^3 vs. 24 μg/m^3) reported 24-h PM_{10} values that were more than double their respective July averages.

These observations also clearly demonstrate that the west side and east side of the Santa Rita Mountains are meteorologically linked and that Rosemont should include the potential impact of Tucson's urban plume on their modeled air quality. As has been noted before, the purpose of the modeling is to add the expected emissions to what already exists in the ambient air, including any residual Tucson plume, to simulate the total impact of the mine. ADEQ modeling guidelines state "a modeling analysis *must* consider worst-case scenarios ..." (emphasis added). Rosemont consistently fails to do this.

Tailings Pile Emissions: The AERMOD study poorly describes wind erosion emissions from a *single* tailings pile with unknown dimensions, and undefined wind speeds. In fact, there are actually *two* tailings piles described in the Reclamation and Closure Plan (July 2007, pg. 36). A north stack is to be used for years 1-14 to store 375 M ton and a South stack will be used for years 15-19; with 170 M ton. A total of 545 M ton total (375+170), not 500 M ton stated elsewhere in the reports. Tailings tests were performed on P80 60 μm (80% passing 230 mesh); not the P80 104 μm described in the closure plan.

These are just two more examples of the disjointed planning and modeling efforts – not even the number of tailings piles seems to be known with certainty.

They also state that the dust control measures are discussed "in detail" in the Reclamation and Closure Plan (June 2007). They are not.

The Mine Plan of Operations (2007, pg 23) has a total waste rock capacity of approximately 980 M ton with the lower Barrel Canyon area reserved for tailings storage. It is claimed that the coarse grind (80% <150 mesh (104 μm)) as opposed to the more commonly used fine grind (80% <250-325 mesh (63.5 μm-43.2 μm)) will help to control windblown dust but will the proposed higher efficiency concentrator operations be obtained from a finer grind thereby neutralizing this dust control measure?

Rosemont also states that a waste rock buttress will be built around the tailings perimeter and that this will advance ahead of the tailings stacking to reduce wind

exposure, but what height above the tailings will the buttress be built, and what is the open wind fetch over the tailings? The buttress will only protect a limited area downwind, and its effect is dependent on its height.

Rosemont states that it will use dozers to place the tailings (pg. 27), and smooth drum rollers to pack the edge of the tailings near the buttress but this appears to have been ignored in the AERMOD modeling. Rosemont also alludes to the fact that it is considering the use of a binder, but they never actually commit to doing so. Why not continuously roll the entire tailings pile and amend the surface with a binder?

Haulage Emissions: the Mine Plan of Operations calls for a mine that will operate 24-h/day, 365-day/y for 21 years. This partly accounts for the incredible 2 million vehicle miles travelled per year (equivalent to 800 transcontinental trips per year). Just a small error in the estimated vehicle emissions factor/mile will be magnified into a huge error in annual PM estimates. The AERMOD model should be used to run sensitivity tests to determine how uncertainties in emissions factors will propagate into uncertainties in ambient PM

Apparently dust suppressants will now be used on the haul roads but not on the tailings piles or other fugitive dust sources. The Reclamation and Closure Plan (pg 37; Tetra Tech July 2007) stated that binders such as Enviro Tac "are currently being investigated" for use during the operational phase of the mine. Five years later, there is still no plan for active dust suppression on the tailings or conveyor system, as promised.

Fugitive emissions, including those from the tailings pile(s), which dominate all PM sources (see Table below), are not considered by ADEQ because Rosemont is a "non-categorical source" under State law.

Category	Non-fugitive (ton/y)	Fugitive (ton/y)
PM	78	**3490**
PM_{10}	40	**947**
$PM_{2.5}$	11	**106**
NOx	17	**154**

According to the Mine Plan of Operations a second conveyor will apparently be built "along the upper ridge area" to allow temporary disposal of tailings for placement by dozers – this dust source was not modeled, and certainly should be if the conveyor is at high altitude and exposed to strong winds. There is no description of how the temporarily-stored, dozer-compacted tailings will be transferred to the permanent tailings pile(s).

Monitoring and Record Keeping: ADEQ states that EPA Method 22 will be used to survey fugitive dust sources daily within 300 ft of the property boundary line. However,

in other documents ADEQ states that "ambient air begins at the process area boundary (PAB)." "Therefore ADEQ does not recognize property boundaries, fence lines, or public access as the boundary between ambient air and the source." "Permit applicants are required to demonstrate modeled compliance with standards and guidelines at receptors spaced along and outside the PAB." Rosemont does not appear to have followed these guidelines when establishing boundary conditions in AERMOD.

It should be noted in this context that Method 22 is very simple and provides little protection. Essentially, an uncertified observer views a potential outdoor dust source for about 10 minutes and then makes a note if any emissions were visible during that time period. Nothing more is required of the observer.

Nitrogen Oxides and Ozone

It is difficult to determine exactly what NO and NO_2 levels are predicted because of confusing and incomplete documentation. As just one example, in ADEQ's draft air permit they state that Rosemont used a NO_2/ NO_X ratio of 0.5 when in fact Rosemont appears to have used a ratio of 0.05. Also ADEQ lists NOx, not NO_2, as would have been expected, in their Table of emissions.

Rosemont chose to use an extremely low NO_2/NO_X ratio and a very low background ozone level when implementing the ozone limiting method (OLM) within AERMOD to simulate future NO_2 levels. The net result is to minimize predicted NO_2 thereby allowing them to meet the NAAQS, which they come close to exceeding anyway. Instead of using an in-stack ratio of 5%, which not even the diesel engine manufacturer can guarantee, they should have used the EPA recommended ratio of 50%. The default in AERMOD assumes 10%, which is twice what Rosemont has used.

Internal combustion engines inherently generate NOx (i.e., NO + NO_2) because at high temperatures nitrogen and oxygen in the air combine chemically:

$$N_2 + 3/2\ O_2 = NO + NO_2$$

The relative amounts of NO and NO_2 are highly variable, temperature-dependent and engine-specific. Rosemont should therefore be required to take the conservative approach to predict air quality, as required by both EPA and ADEQ, and use the higher ratio of 50%.

When the exhaust leaves the diesel engine stack, the remaining NO can react with ambient ozone (O_3) to form more NO_2:

$$NO + O_3 = NO_2 + O_2$$

The <u>ozone limiting method</u> (OLM) within AERMOD assumes that the extent of this secondary reaction is limited by the availability of ambient ozone.

If the O_3 concentration is lower than the NO concentration, then not all of the NO can be converted to NO_2 and the predicted NO_2 is low. Rosemont uses a background annual average ozone of ≈45 ppbv, which means that no matter how much NO is injected into the air by mining operations the predicted NO_2 cannot exceed about 45 ppbv and the NAAQS (53 ppbv) cannot be exceeded, even theoretically.

Rosemont has gone to great lengths to minimize the amount of ambient ozone in their model by claiming that ozone levels observed in the pristine Chiricahua Mountains 100 miles distant better represent the background ozone expected at the mine located just a few miles downwind from Tucson, even though the PM_{10} data discussed above clearly demonstrate that the Tucson and Rosemont air sheds are connected. Rosemont has thus twice worked to minimize the predicted NO_2 – first through abnormally low direct exhaust stack emissions and second through low chemical conversion of remaining NO by available ozone.

Rosemont uses an annual average value of $NO_2 \approx 2$ ppbv as background. The predicted *total* annual average NO_2, including emissions and background, is estimated from ADEQ's draft air permit to be 14 ppbv, so the predicted NO_2 emissions from Rosemont's mining operations appear to be approximately are 12 ppbv NO_2 (14-2). But it should be noted that my estimates are uncertain because of the lack of reliable data in the modeling documentation.

I should re-iterate that Rosemont's selection of Alamo Lake observations to represent background NO_2 is highly questionable. It is apparently designed to minimize predicted NO_2 burdens, especially considering that the annual average for Pima County is about 25-times higher (2 ppbv vs. 55 ppbv, annual average).

Since even with these distorted model inputs predicted NO_2 is nearly at the NAAQS, and since Pima County is already close to exceeding ozone standards, this modeling should be redone using conservative assumptions as required by both ADEQ and EPA. In fact, because ozone and NOx levels are tightly coupled in a series of non-linear chemical equations a detailed photochemical model simulation should be run, not just the OLM, which a simple stoichiometric calculation.

Finally, in an attempt to improve on early air quality forecasts (mainly PM and NO_X) Rosemont has agreed to install "cleaner" Tier 4 diesel engines in 6 of its 28 haul trucks. But the Tier 4 trucks will not arrive until years after mining operations commence. Rosemont should be required to operate only Tier 4 trucks from year 1. They argue that they have already ordered 22 trucks with Tier 2 engines, but there is no reason why they cannot amend the order. Rosemont should not have placed the order until *after* the air permit was issued.