TECHNICAL REVIEW AND EVALUATION OF APPLICATION FOR AIR QUALITY PERMIT NO. 35636

I. Introduction

Phelps Dodge Sierrita, Inc. (PDSI) has submitted in accordance with Paragraph 14.a of the Consent Decree CIV 04-312 TUC FRZ ("CD") a significant permit revision to its Title V operating permit, M190699P2-99. The CD requires PDSI submit to ADEQ "An application for a PSD Permit for the Dual Primary Crusher, which shall include, among other things, the following requirements: (i) a BACT analysis for particulate matter for the Dual Primary Crusher, and (ii) the Air Impact Analysis."

PSD Permit is defined in section II of the CD as "PSD Permit shall mean an installation/construction permit issued in accordance with 40 CFR §52.21 and SIP rules R9-3-301, R9-3-304, and R9-3-305. Such permit may be processed as a significant permit revision/modification pursuant to A.A.C. R18-2-320 or 40 CFR Part 71, whichever is applicable, provided the substantive requirements of 40 CFR §52.21 and SIP rules R9-3-301, R9-3-304, R9-3-305 (e.g. apply BACT, perform Air Impact Analysis) are satisfied in processing the Final Revised Permit."

II. Best Available Control Technology Analyses

The term "best available control technology" is defined in A.A.C.R18-2-101.19 as follows:

> "[A]n emission limitation, including a visible emissions standard, based on the maximum degree of reduction for each air pollutant listed in R18-2-101(97)(a) which would be emitted from any proposed major source or major modification, taking into account energy, environmental, and economic impact and other costs, determined by the Director in accordance with R18-2-406(A)(4) to be achievable for such source or modification."

The procedures for establishing BACT are set forth in A.A.C. R18-2-A.406.A.4 as follows:

> "BACT shall be determined on a case-by-case basis and may constitute application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment, clean fuels, or innovative fuel combustion techniques, for control of such pollutant. In no event shall such application of BACT result in emissions of any pollutant, which would exceed the emissions allowed by any applicable new source performance standard or national emission standard for hazardous air pollutants under

> Articles 9 and 11 of this Chapter. If the Director determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice, or operation and shall provide for compliance by means which achieve equivalent results."

The U.S. EPA's interpretive policies relating to BACT analyses are set forth in several informal guidance documents. Most notable among these are the following:

- "Guidelines for Determining Best Available Control Technology (BACT)," December 1978.
- "Prevention of Significant Deterioration Workshop Manual," October 1980.
- "New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting," Draft. October 1990.

The Department generally uses what is termed a "top-down procedure when making BACT determinations. This procedure is designed to ensure that each determination is made consistent with the two core criteria for BACT: Consideration of the most stringent control technologies available, and a reasoned justification, considering energy, environment and economic impacts and other costs, of any decision to require less than the maximum degree of reduction in emissions.

The framework for the top-down BACT analysis procedure used by the Department comprises five key steps, as discussed in detail below. The five-step procedure mirrors the analytical framework set forth in the draft 1990 guidance document. However, it should be noted that the Department does not necessarily adhere to the prescriptive process described in the draft 1990 guidance document. Strict adherence to the detailed top-down BACT analysis process described in that draft document would unnecessarily restrict the Department's judgment and discretion in weighing various factors before making case-by-case BACT determinations. Rather, as outlined in the 1978 and 1980 guidance documents, the Department has broad flexibility in applying its judgment and discretion in making these determinations.

Step 1 - Identify all control options. The process is performed on a source-by-source and pollutant-by-pollutant basis and begins with the identification of available control technologies and techniques. For BACT purposes, "available" control options are those technologies and techniques, or combinations of technologies and techniques, with a practical potential for application to the subject emission units and pollutants. These may include fuel cleaning or treatment, inherently lower-polluting processes, and end-of-pipe control devices. All identified control options are listed in this step. Those that are identified as being technically infeasible or as having unreasonable energy, economic or environmental impacts or other unacceptable costs are eliminated in subsequent steps.

Step 2 - Eliminate technically infeasible control options. In this step, the technical feasibility of identified control options is evaluated with respect to source-specific factors. Technically feasible control options are those that have been demonstrated to function efficiently on identical or similar processes. In general, if a control option has been demonstrated to function efficiently on the same type of emission unit, or another unit with similar exhaust streams, the control option is presumed to be technically feasible. For presumably technically feasible control options, demonstrations of technical infeasibility must show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the control option from being employed successfully on the subject emission unit. Technical feasibility need not be addressed for control options that are less effective than the control option proposed as BACT by the permit applicant.

Step 3 - Characterize control effectiveness of technically feasible control options. For each control option that is not eliminated in Step 2, the overall control effectiveness for the pollutant under review is characterized. The control option with the highest overall effectiveness is the "top" control option. If the top control option is proposed by the permit applicant as BACT, no evaluation is required under Step 4, and the procedure moves to Step 5. Otherwise, the top control option and other identified control options that are more effective than that proposed by the permit applicant must be evaluated in Step 4. A control option that can be designed and operated at two or more levels of control effectiveness may be presented and evaluated as two or more distinct control options (i.e., an option for each control effectiveness level).

Step 4 - Evaluate more effective control options. If any identified and technically feasible control options are more effective than that proposed by the permit applicant as BACT, rejection of those more effective control options must be justified based on the evaluation conducted in this step. For each control option that is more effective than the option ultimately selected as BACT, the rationale for rejection must be documented for the public record. Energy, environmental, and economic impacts and other costs of the more effective control options, including both beneficial and adverse (i.e., positive and negative) impacts, are listed and considered.

Step 5 - Establish BACT. Finally, the most effective control technology not rejected in Step 4 is proposed as BACT. To complete the BACT process, an enforceable emission limit representing BACT must be included in the PSD permit. This emission limit must be enforceable as a practical matter. In order for the emission limit to be enforceable as a practical matter, in the case of a numerical emission limitation, the permit must specify a reasonable compliance averaging time, consistent with established reference methods. The permit must also include compliance verification procedures (i.e., monitoring requirements) designed to show compliance or non-compliance on a time period consistent with the applicable emission limit. Materials considered by the applicant and by the Department in identifying and evaluating available control options include the following:

- Entries in the RACT/BACT/LAER Clearinghouse (RBLC) maintained by the U.S. EPA. This database is the most comprehensive and up-to-date listing of control technology determinations available.
- Information provided by pollution control equipment vendors.
- Information provided by industry representatives and by other State permitting authorities. This information is particularly valuable in clarifying or updating control technology information that has not yet been entered into the RACT/BACT/LAER Clearinghouse.

The BACT evaluation and proposed BACT determination for the dual primary crusher is discussed in the following section.

III. Dual Primary Crusher BACT Analysis

An important consideration in reviewing potential BACT emission limits is past BACT determinations for similar sources. The EPA's RACT/BACT/LAER Clearinghouse is a database accessed via the EPA Technology Transfer Network (TTN) website. The RBLC database contains only one metallic minerals processing plant, a lead mine, has been listed in the RBLC over the past 10 years. The BACT emission limit for this primary ore crusher, used in mining operations, is 0.05 grams per dry standard cubic meter (g/dscm).

A. Available Control Technologies

Particulate Matter (PM) emissions are removed from exhaust gases using various types of wet and dry air pollution control devices, including fabric filters, electrostatic precipitators (ESP), and various types of low and high energy wet scrubbers. Each of these control devices utilizes some or all of the six available mechanisms for collecting particles: gravitational settling, centrifugal impaction, inertial impaction, direct interception, diffusion, and electrostatic effects. The mineral products industry typically uses wet scrubbers and fabric filters to control PM emissions from rock crushing processes. In addition, dry cyclones and wet suppression (e.g., water sprays) have been used in the metallic mineral industry on a limited basis.

Table 1 below lists available control technologies identified by PDSI

Table 1: Available Control Technologies

Primary Crusher—Available PM Control Technologies
Wet Scrubber
High Efficiency Wet Scrubber
Fabric Filter Baghouse
Electrostatic Precipitators
Dry Cyclone
Wet Suppression

B. Technical Feasibility of Control Technologies

The technical feasibility of each control option identified in step one was evaluated with respect to source-specific factors. Fabric filter baghouses and wet scrubbers are commonly used for particulate emission control in the metallic mineral processing industry. Exhaust characteristics such as temperature, moisture content, particle loading, and particle size distribution must be considered when these systems are applied to a particular exhaust stream. Other factors such as the ability to dispose of collected particles (whether wet or dry), should also be considered.

Of the available control technologies listed in Table 1, the ESP technology has not been applied to any crushing, screening, material transfer, or other ambient temperature processes in the metallic minerals or non-metallic minerals processing industries. PDSI's BACT analysis considered the ESP as technically infeasible control option for the dual primary crusher.

C. Ranking of PM Control Technologies

The available and technically feasible control technologies were ranked in the order of descending control efficiency. This information is summarized in table 2 below:

Table 2: Ranking of Feasible Control Options

Control Ranking	**Control Options**	**Control Efficiency**
1	High Energy Wet Scrubber	99+%
2	Fabric Filter Baghouse	99+%
3	Wet Scrubber	85 to 90%
4	Dry Cyclone	80 to 90%
5	Wet Suppression	75%

The fabric filter baghouse is ranked second due to the likelihood of high-moisture conditions in the dual primary crusher's exhaust stream. The crusher's dump hopper is equipped with water sprays to control fugitive dust. This water enters the crusher with the ore and has the potential of becoming entrained in the control device intake air. The effectiveness of the baghouse may be reduced when its fabric is blinded due to high moisture content. Hence, the high energy wet scrubber is preferred over the fabric filter baghouse.

D. Environmental, Energy, and Economic Impacts Evaluation

The high efficiency wet scrubber can remove greater than 99 percent of PM emissions regardless of the inlet moisture content, and is therefore the top ranked control option. The positive environmental impact from using the Ducon Dynamic Gas Scrubber, Type UW-4, Model III, will be the removal of up to 4,993 lb-PM/hr or 21,869 ton-PM emissions per year. This estimate is based on 8,760 potential operating hours per year.

The Ducon Dynamic Gas Scrubber has lower energy demands than either the fabric filter baghouse or the venture scrubber; which is the other type of high efficiency wet scrubber; due to its relatively low pressure drop.

PDSI evaluated the economic impact of the Ducon scrubber using capital cost estimates which assumed that a new scrubber would have been purchased, shipped and installed in 1996. The annual operating costs included the annualized capital costs at the assumed 1996 interest rate, as well as costs for operation, maintenance, utilities, and indirect costs. The best case cost effectiveness using the Ducon scrubber is $19 per ton of pollutant removed.

E. BACT Determination

Under worst-case conditions, a PM control efficiency of 99.86 percent is required to meet the outlet NSPS PM emission standard of 0.022 gr/dscf. PDSI proposed that BACT for the dual primary crusher should be compliance with the applicable NSPS emission standard, 0.05 g/dscm, equivalent to 0.022 gr/dscf. Therefore, BACT was determined as:

- The use of the three-stage, high efficiency wet scrubber; and
- PM emission limit = 0.05 g/dscm = 0.022 gr/dscf.

III. Air Emissions Modeling

A. Air Impact Analysis

The Air Impact Analysis (AIA) was performed according to the Compliance Measure Specified in Paragraph 15, “Dual Primary Crusher,” of the Consent Decree (CD). Paragraph 15 of the CD requires that “Phelps Dodge shall perform an air quality impact analysis at least as stringent as the Air Impact Analysis, and submit the results of such analysis to both EPA and ADEQ…” The CD defines Air Impact Analysis as meaning "the 'Modeling Protocol for Phelps Dodge Sierrita, Inc.'s Primary Crushing Unit PM_{10} Air Quality Analysis' attached to this Consent Decree as Appendix 2."

The AIA Modeling Protocol specifies that PM_{10} impacts from the dual primary crusher's scrubber stack shall be assessed using the EPA dispersion model, Industrial Source Complex short-term Version 3 (ISC3). In addition, the protocol contains the PM10 emission rate to be modeled, the scrubber stack characteristics, a description of the required receptor network, and specified meteorological dataset.

The PM10 National Ambient Air Quality Standards (NAAQS) are 150 $\mu g/m^3$ (24-hour) and 50 $\mu g/m^3$ (annual). Table 3 below shows the maximum predicted impacts of the dual primary crusher compared to the Arizona and National Air Quality Standards, as well as Class I and Class II Area significance thresholds with respect to PSD applicability.

Table 3: Comparisons to Ambient Standards – Dual Primary Crusher Air Impact Analysis

Average Period	**Maximum Crusher Impact ($\mu g/m^3$)**	**Maximum Back-ground ($\mu g/m^3$)**	**Total Maximum Impact ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**	**PSD Significance Threshold ($\mu g/m^3$)**	
					Class I	**Class II**
24-Hour	0.17	98	98	150	1	5
Annual	0.03	20	20	50	-	1

The maximum predicted impacts of the dual primary crusher are approximately 1,000 times below the applicable Arizona and National Ambient Quality Standards. The Class I Area significance threshold is 1 $\mu g/m^3$ (24-hour), and the maximum 24-hour impact of the crusher is 0.17 $\mu g/m^3$ at the property boundary. The Class II Area significance thresholds are 5 $\mu g/m^3$ (24-hour) and 1 $\mu g/m^3$ (annual), compared to maximum crusher impacts of 0.17 $\mu g/m^3$ and 0.03 $\mu g/m^3$, respectively.

B. Additional Air Impact Analysis

PDSI also conducted an Additional Air Impact Analysis (AAIA). The AAIA differs from the AIA Protocol in one respect: the receptor locations are difined by the "Process Area Boundary" rather than the Property Boundary. The Process Area Boundary (PAB) lies within the property boundary, and was approved by ADEQ. Table 4 below summarizes the modeling results.

Table 4: Comparisons to Ambient Standards – Dual Primary Crusher Additional Air Impact Analysis

Average Period	Maximum Crusher Impact (μg/m³)	Maximum Back-ground (μg/m³)	Total Maximum Impact (μg/m³)	NAAQS (μg/m³)	PSD Significance Threshold (μg/m³)	
					Class I	Class II
24-Hour	0.2	98	98	150	1	5
Annual	0.03	20	20	50	-	1

C. Growth Related Impacts

The installation of the dual primary crusher did not result in any industrial, commercial or residential growth in the area. The modification did not require the hiring of additional workers, and was made primarily to reduce production costs by reducing hauling truck distances. Therefore, no growth-related air emissions are generated by the dual primary crusher.

D. Soil and Vegetation Impacts

No impacts to soils and vegetation are expected, since the preliminary modeling analysis showed no significant impact area exists at or beyond the facility boundary. Also, because the particulate emissions from the primary crusher consist solely of naturally occurring dust particles, no impacts on vegetation are expected.

E. Visibility Impacts

The dispersion modeling indicates that no significant off-site transport of PM_{10} will occur, and so no visibility impacts are expected to occur in the vicinity of this project. There are no nearby scenic vistas, airports, parks, or points of special historical significance which might be affected by reductions on visibility. For these reasons, a visibility analysis was not conducted.