AN ASSESSMENT OF GIBRALTAR ROCK'S AIR QUALITY PLAN

by

Paradise Watchdogs/Ban the Quarry - www.banthequarry.org

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Introduction

Paradise Watchdogs/Ban the Quarry is a community environmental action group. We are concerned with environmental health issues, and we are issuing this document in response to the Gibraltar Rock Air Quality Plan regarding their proposed construction of a quarry in the area.

This paper does not evaluate the engineering calculations, data, or source references cited in the Gibraltar Rock report, with only a few exceptions. In the case of the diesel generator, the reference cited in defense of the technology used is cited incorrectly. Additionally, as noted several places in this assessment, the Gibraltar Rock calculations are questioned. However, this paper is not an engineering assessment and most of the data in the Gibraltar Rock Air Quality Plan is accepted as published.

AIR QUALITY INDEX AND GIBRALTAR ROCK'S AIR POLLUTION PROJECTIONS

The Department of Environmental Protection (DEP) category that most closely resembles the emission data as submitted by the Gibraltar Rock's Air Quality Plan is the air quality index (AQI). The AQI measure five major air pollutants, sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and particulate matter (PM) 10 microns (μ) and smaller (PM 10). More recently, the Environmental protection Agency (EPA), in response to health concerns, now also monitors particulate matter 2.5 μ and smaller (PM 2.5). One μ equals one-millionth of a meter.

Each pollutant is measured on a scale and given an index value. The highest index value of any pollutant at a given moment is expressed as the AQI score. This is useful information, particularly for sensitive (and allergic) individuals who need to adjust their life style according to the condition of the air they breathe. The DEP's local Ozone Action Partnership has stepped

up outreach efforts to sensitive groups. This information is shared with the news media on a daily basis. AQI information can be found in the *Philadelphia Inquirer* newspaper.

An AQI value under 50 is considered good. A score of 51 to 100 is satisfactory except for unusually sensitive persons. A score of 101 to 150 is unhealthy for those in sensitive groups, and 151 to 200 is unhealthy for all persons.

The AQI for this area varies.[1] We find that, on some days, the AQI can be well under 50. On other days, the AQI is in the moderate range. At noon, on the muggy day of August 25, 2003, the AQI for this southeastern area of Pennsylvania was 66, and thus regarded as moderate. However these local AQI reports are a little misleading, as they do not include an AQI index for PM 2.5, inasmuch as there is no station reporting on PM 2.5 in this area. The nearest site where PM 2.5 is measured is Easton, PA, some 60 miles away. At that location, on August 25, 2003, the PM 2.5 was 39 micrograms (μg) of particulate matter per cubic meter ($\mu g/m^3$), which converts to an AQI of 98, still moderate but barely so. On June 26, 2003, a clear bright day, the AQI for Chester was 159, Bristol 161, and Norristown 147 (without regard for PM 2.5). It appears that on most days the air is unhealthy for sensitive groups, and often enough unhealthy for all persons. This area is designated by the regional office of DEP as "severe nonattainment" for ozone.[2]

GIBRALTAR ROCK'S PROJECTIONS FOR AIR POLLUTION

Diesel Generator

The diesel generator emission data from Gibraltar Rock is questioned for four reasons:

1. Are the hours reported for the diesel generator accurate? Gibraltar Rock has reported that the emission data is for 1167 hours of operation in 2005 (from the Air Quality Plan). However, the diesel generator will power a portable crusher that Gibraltar Rock

will operate 8760 hours per year. The emission data for the generator would have to be increased by a factor of 7.5 to account for all the hours the crusher will be operated.

2. There are other diesel engines in the total Gibraltar Rock complex, but the clean air plan submitted for approval acknowledges only one. This stationary diesel generator, operating at 4° of retardation for 3.192 hours a day (365 days a year, or 1167 hours per year), will produce 1.22 tons per year (tpy) of PM 10 and 0.41 tpy of PM 2.5, according to Gibraltar Rock's Air Quality Plan. But, during the same period of time, 1 year, 24,988 trucks (Gibraltar data) will be entering and leaving the site. Many of these trucks will be older diesels, with their distinguishing puffs of black soot. Gibraltar Rock will also have diesel-powered earth-moving and grading equipment. Emissions from these sources are not included, nor are we advised that these other diesel engines will be tuned for minimum NO_x and fine particulate emissions. Consequently, Gibraltar Rock's Air Quality data for "total facility" diesel emissions are incorrect inasmuch as it is only a fraction of the total diesel engine emissions that will be produced.

3. Does 4° of retardation for the diesel generator represent the best available technology (BAT), as Gibraltar Rock claims? This is important because the purpose of engine retardation is to reduce NO_x emissions. These are critical because they are converted by sunlight into ground-level ozone. And, as stated, the proposed Gibraltar Rock site is part of an area that DEP reports as "severe nonattainment" for ozone. Consequently, in regard to human health, it is imperative that this generator and the entire fleet of diesel engines satisfy the BAT criteria, which have been frequently endorsed and often quoted, but not always put into practice by Gibraltar Rock, as noted here.

Gibraltar Rock's reference for emissions data on the diesel generator and for BAT is an EPA document[3] last revised in 1996. In this 7-year-old, now out-of-date, reference, engine retardation is not described as the best available technology, but is instead a technology of

compromise. According to the EPA, 4° of retardation for the reduction of NO_x will achieve a modest 25% decrease but at a cost of increasing fuel consumption by 2% and adding to other pollutants, particularly soot and carbon monoxide. If diesel engine timing is retarded 8°, NO_x will be reduced by 40%, fuel consumption will go up by 6%, soot and CO will be increased, and the high temperature of the exhaust gas will shorten the life of the exhaust valves.

This EPA document[2] then continues with a discussion of additional technology for achieving cleaner air. It discusses the possibility of running a diesel engine slightly lean and thereby reduces NO_x by 30%, at a cost of increased emissions of hydrocarbons and a fuel penalty of 5%.

The BAT described by Gibraltar Rock (4° of retardation) claims a control efficiency of 41%. However, the best available technology, as per the above EPA document, includes the use of postcombustion controls. Several are discussed, including selective catalytic reduction (SCR) and nonselective catalytic reduction (NSCR). NO_x on lean-burn engines can be reduced by 90 to 95% with catalytic oxidation. NO_x on rich-burn engines can be reduced 90 to 99% with nonselective catalytic reduction. The advantage of NSCR is the simultaneous reduction of NO_x, unburned hydrocarbons (soot), and carbon monoxide.

Recently, on August 23, 2003, citing health concerns, DEP announced an opportunity for diesel fleet operators to acquire new emission control technology:

> It will reimburse applicants up to 100 percent of the costs to purchase and install diesel retrofit technology as part of a competitive grant process. . . DEP also is accepting applications from parties interested in reducing emissions from idling diesel vehicles by installing idling reduction technology. Since last year, DEP's Bureau of Air Quality has been administering a grant to the Wissahickon School District, Montgomery County. The grant funds installation of retrofit devices on more than 40 buses and helps purchase cleaner ultra-low sulfur diesel fuel. . . .

DEP is accepting applications until Oct. 21 in order to have a pool of potential projects for anticipated federal and private funding.[4]

As industry strives to meet increasingly stringent EPA clean air mandates, there have been substantial improvements in diesel technology during the 7 years since the original EPA publication. There are new Tier 2 standards for clean diesel engines that will take effect in 2004, but the Gibraltar Rock Air Quality Plan does not indicate that they will retrofit an older generator with the best available technology to meet these standards. Additionally, there are new CARB standards for emission certification. The new clean diesel engine technology, using sensors and computers not available in 1996, does not rely on timing retardation (Gibraltar Rock's antiquated technology) but uses variable injection timing, high-pressure fuel injection, turbo charging, and complex controls to optimize the mix of air and fuel to reduce particulates, volatile organic compounds (VOC) and NO_x.

4. Is the NOx for the diesel generator correct? The Gibraltar Rock Air Quality Plan provides two values for the diesel generator. Uncontrolled, the generator produces 13.13 tpy of NO_x. Controlled, the diesel generator produces 6.05 tpy. However, according to the EPA document cited above, [2] only a 25% reduction in NO_x can be achieved by 4° of retardation. Clearly, a 25% reduction of 13.13 tpy is not 6.05 tpy.

One final comment can be made about the proposed diesel generator. Because NO_x emissions are not visible, it would be very tempting for the operator to cut back on the promised 4° of retardation in the interest of more power, reduced fuel consumption, a lower operating temperature, and longer exhaust valve life.

Dependence on Employees

Gibraltar Rock's clean air plan is dependent on the due diligence of employees. As stated in this plan, "Personnel will visually monitor emissions from crushing operations." Dust abatement BAT is repeatedly described as using water sprays, but here there is cause for concern. Some or most of the water spray application depends on employee attention, availability, and initiative. The Gibraltar Rock document implies that employees must make a judgment call for when to turn on the water sprays. Obviously, if the wet suppression system is not turned on, dust emissions will increase. Due diligence, or the lack thereof, on the part of Gibraltar Rock employees will obviously have a significant impact on the actual air pollution produced, and thus the health conditions of employees and neighbors.

Questionable and Missing Data

There are several places in the Gibraltar Rock Air Quality Plan where the data for PM 10 and PM 2.5 are identical. Because PM 2.5 is a subset of PM 10, in cases where the PM 10 data is the same as PM 2.5, that means that there are no particles smaller than 10 μ and larger than 2.5 μ. This is probably never actually the case. However, in the data supplied by Gibraltar Rock, both the portable generator (uncontrolled) and the crushing plant (uncontrolled) have identical emissions for both PM 10 and PM 2.5. Additionally, the acknowledged emissions from blast drilling are peculiar inasmuch as there are no emissions of particles smaller than 10 μ and larger than 2.5 μ. This is clearly an error.

The stated emission from blast drilling seems low, given that drilling is historically a notorious source of particulate matter. Drilling by its very nature is a pulverizing process that produces vast amounts of dust particles of all sizes. Curiously, in Gibraltar Rock's Air Quality Plan, there is no discussion in the section on BAT for controlling the dust associated with drilling.

The stated emissions from the crushing plant seem low. The conveyors and transfer points are evidently completely sealed, because there are zero emissions for both PM 10 and PM 2.5. However, in the Gibraltar document where BAT is discussed, a zero emission is not claimed. The BAT section of the clean air plan simply states that PM 10 and PM 2.5 will "be significantly controlled."

Near the end of the Gibraltar Air Quality Plan (pages are not numbered), there are data on dust from unpaved and paved roads. However, in the section on BAT, there is no mention of using wet suppression techniques or any other procedures to reduce road dust. Interestingly, the BAT section, without saying what the technology is, continues with "any possibility of fugitive dust emissions due to the operation of the loaders and the use of in-plant roads will be significantly eliminated." This is difficult to understand: dust is *either* significantly reduced or eliminated, but not significantly eliminated.

Emissions from blasting are omitted. There is no discussion of this significant source of particulate matter.

At one point, the PM 10 and PM 2.5 for bulldozing, scraping, and grading are given as 2.49 tpy and 0.76 tpy, respectively. At another place in the Gibraltar Rock document, however, those numbers are given as 1.17 tpy and 0.36 tpy.

In Gibraltar Rock's Air Quality Plan there is a chart listing total facility emissions for PM 10 as 14.51 tpy. However, this number is misleading, because it does not include PM 10 from unpaved roads, paved roads, material handling at the asphalt plant, and material handling at the ready-mix concrete plant. When these other sources are added, using Gibraltar data, the total for PM 10 is 23.02 tpy. A similar correction is offered for PM 2.5. The total facility figure of 3.85 tons becomes 6.05 tons when the additional dust sources are added.

The Gibraltar Rock data for bulldozing, scraping, and grading also requires an explanation. I cannot imagine removing 3,000 cubic yards of overburden with just 1 hour of operation, or 50,000 cubic yards in 19 hours. Given these peculiarities in the Gibraltar Rock report, the emission data are questioned.

Daily Variance

It is also important to note that the emission data in the Gibraltar Rock report assumes a constant daily output, with each day being 1/365th of a year. In reality, production will surely vary, with some days being busier and dustier than others. Also, dry weather conditions will generate more road and production dust than on wet days. High winds will generate additional dust. Dust from wind erosion of stockpiles is dependent on wet suppression, which in turn is dependent on employee due diligence. This will be a busy quarry, with a reported 24,988 trucks entering and leaving per year. If the quarry operates 300 days a year and 10 hours a day, that is one truck every 7 minutes, on average. Consequently, for any number of reasons, if there is a confluence of high dust production from all sources and a high AQI value, the health conditions downwind from the quarry will be particularly worrisome.

GIBRALTAR ROCK EMISSIONS AND THE AMBIENT POLLUTION INVENTORY

Emissions generated by Gibraltar Rock will obviously have a negative impact on this area's AQI. On some days, when the ambient inventory of all pollutants that make up the AQI are low, emissions from Gibraltar Rock will not pose a serious health risk to area residents. These favorable days, however, are few in number. Some components in the AQI, such as PM 2.5, are almost always above the DEP health threshold. Other AQI components in the AQI, such as PM 10, stay at or above the health threshold most of the time. Components such as ozone are a serious health risk for area residents. Consequently, there is no such thing as insignificant increases in the components that make up the AQI. On days when the Gibraltar Rock

operations push the ambient air inventory of toxic pollutants into the unhealthy range, every degree of air degradation will be highly significant for those who are finding it harder to breathe and experiencing lung and/or heart damage.

SPECIFIC POLLUTANTS AND GIBRALTAR ROCK'S EMISSION DATA

All the references to health effects associated with air pollution, unless otherwise stated, were obtained from either the Environmental Protection Agency (EPA) or the National Institute of Occupational Safety and Health (NIOSH) sources. The pollutants discussed here are sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, particulate matter 10 μ and smaller, and particulate matter 2.5 μ and smaller.

Sulfur Dioxide (SO_2)

Health threshold:

3 hours--500 parts per billion (ppb)

24 hours--140 ppb

Annual mean--30 ppb

Gibraltar Rock's emissions: Gibraltar Rock will not produce SO_2. As published in their report, Gibraltar Rock will produce 4.45 tpy of sulfur oxide (SO_x), all from three sources: the diesel generator, the asphalt plant, and the asphalt tank heater. However, SO_x becomes SO_2. Secondary sulfates are formed in the atmosphere involving photochemical changes to sulfur oxides.

Because $SO_2$is a toxic substance, it is appropriate to consider, as a question of air quality, the amount of sulfur that will be released directly from the quarry operations. Sulfides that may be present in the dust from stone-crushing operations include ferrous sulfate, lead sulfate, and sulfuric acid. Sulfur in local water supplies is not uncommon.

Typical ambient air quality: Readings for this area have consistently been less than 10 ppb.

Health discussion: When the SO_2 rises above 144 ppb (AQI of 100), the results are unhealthy for sensitive persons. Individuals, particularly those with asthma, will experience chest tightness and breathing difficulties. At a score above 150, asthmatics will experience wheezing and have a possible aggravation of heart and lung disease. There is a significant correlation between high sulfate levels and absence from work and school because of illness.

Carbon Monoxide (CO)

Health threshold:

I hour--35 parts per million (ppm)

8 hours--9.0 ppm

Gibraltar Rock's emissions: As published in their report, by the year 2009, Gibraltar Rock will produce 20.01 tpy of CO.

Typical ambient air quality: The reading for August 27, 2003 was 0.4 ppm.

Health discussion: Because carbon monoxide binds with hemoglobin in the blood, displacing oxygen, this is a harmful emission for those with pulmonary and cardiac impairment. On days when the ambient level of CO is unhealthy, the CO emissions from Gibraltar Rock will increase the distress of vulnerable individuals, reducing exercise tolerance, and increasing cardiovascular symptoms, such as chest pains.

Nitrogen Dioxide (NO_2) and Ozone (O_3)

Health threshold:

Annual mean for NO_2--50 ppb

1 hour --125 ppb

8 hours--85 ppb

Gibraltar Rock's emissions: Gibraltar Rock does not produce nitrogen dioxide nor does it produce ozone. These pollutants are grouped together because Gibraltar Rock does produce NO_x and VOC, precursors, in the presence of sunlight, of NO_2 and ozone. In their published report, Gibraltar Rock lists their emissions for NO_x at 6.04 tpy and VOC at 0.48 tpy by the year 2009.

Typical ambient air quality: At 8:25 AM on August 7th, 2003, Norristown had 143 ppb of NO_x, three times higher than at any of the other 51 stations in Pennsylvania that read NO_x. This area is designated by the EPA as "severe nonattainment" for ozone.

Health discussion: Even short exposure to NO_2 affects lung function, asthma, coughing, and respiratory infections and contributes to structural changes in the lung. High NO_2 levels are associated with increases in hospital emergency room admissions with pulmonary problems. NO_2, in the presence of sunlight, is converted to ground-level ozone, one of the most harmful of all air pollutants. Ozone adds to breathing difficulties, particularly for asthmatics, and, acting as a sunburn for the lungs, contributes to long-term respiratory damage. The American Lung Association notes that "even when ozone is present in low levels, inhaling it triggers a variety of health problems including chest pains, coughing, nausea, throat irritation and congestion. It can worsen bronchitis, heart disease, emphysema and asthma."[5] Ozone also has a detrimental effect on plants, trees, and the environment. Gibraltar Rock's production of NO_x and VOC will add to the already high and unhealthy levels of ozone in this area.

Particulate Matter 10 µ and Smaller (PM 10)

Health threshold: The EPA/DEP standard for PM 10 calls for an average daily limit of 50 µg/m^3. (1 µg equals one-millionth of a gram. There are 907,185 grams per ton.)

Gibraltar Rock's emissions: The total from all sources is estimated at 23.02 tpy.

Typical ambient air quality: On August 6, 2003, at 11:25 AM, the PM 10 level for Norristown, PA (only data center in Montgomery County) was 16 µg/m^3. But, on August 7, 2003, at 8:25 AM, the Norristown PM 10 level was 54, which exceeds the health level of 50 µg/m^3. On August 27, 2003, the Norristown reading for PM 10 was 28. The Gibraltar Rock property is approximately midway between two PM 10 reporting stations, Norristown and Reading. Frequently, one or the other will have an air quality reading above 50 µg/m^3. Also, both stations will frequently be above this maximum threshold for healthy air.

Health discussion: When the limit of 50 µg/m^3 is exceeded, individuals, particularly those with asthma, will experience an aggravation of lung disease. An AQI above 150 (254 µg/m^3) will produce respiratory effects in the general population.

Particulate Matter 2.5 µ and Smaller (PM 2.5)

Health threshold: The DEP's health level for PM 2.5 is 15 µg/m^3 (daily average).

Gibraltar Rock's emissions: When all the sources in the Air Quality Plan are included, Gibraltar Rock will produce 6.05 tons of PM 2.5 per year.

Typical ambient air quality: Pennsylvania measures PM 2.5 at three stations, Easton, Kittanning and Arendtsville. I have checked frequently with the DEP web page[1] on current air quality

conditions at these sites. Rain seems to make a difference. After several days of rain, on September 2, 2003, the PM 2.5 reading at Easton was 5, a rare event (rain being the last word in wet abatement). Almost always, all three sites are above the 15 μg/m^3 threshold. For example, at noon, on August 8, 2003, a clear beautiful day here in New Hanover Township, the air quality at these three stations was 20, 24, and 45 μg/m^3, respectively. All three were above the acceptable limit, with Arendtsville being three times the recommended maximum level of 15 μg/m^3. However, on a rainy day, August 16, 2003, the reading at Easton for this particulate was 41 μg/m^3; readings at the other two monitoring sites were 43 and 44 μg/m^3, almost three times the amount of fine particulate the standard aims to achieve. On August 27, 2003, the Easton reading for PM 2.5 was 29 μg/m^3.

Health discussion: The complexity of this subject increases with a lack of information on how quickly particulate matter settles out of the air stream. Fine particles (PM 2.5) present the greatest health risk, travel further, and stay in the air stream longer than larger particles. Prevailing winds put some people at greater risk than others. Standards for PM 2.5 address particulate matter that lodges in the gas exchange areas of the lungs and is the culprit in many pulmonary disorders.

This is arguably the most worrisome of all pollutants for two reasons:

- Scientific studies are increasingly reporting on the damage to lungs from fine particulate matter.
- Dust in general is about nuisance, but PM 2.5 dust is about lung damage and mortality.

The ambient air inventory of this pollutant is consistently above the health threshold of 15 μg/m^3. Consequently, all increases by Gibraltar Rock's quarry activities are far from insignificant.

PM 2.5 above the stated threshold increases the aggravation of heart and lung disease and significantly contributes to premature mortality in persons with cardiopulmonary disease and the elderly. Other sensitive groups include children, those with asthma, and persons with infectious respiratory disease like pneumonia. In the words of the EPA, there is a "statistically significant correlation between concentrations of PM 2.5 and premature death, as well as aggravation of pulmonary and cardiovascular disease."[6]

Gibraltar Rock's estimate of their contributions to air pollution will on some days push the critical level of pollutants into an unhealthy level for sensitive individuals and, on other days, Gibraltar Rock will push some pollutants to unhealthy levels for all persons

OTHER CONSIDERATIONS

At-Risk Populations Within 1 Mile of the Proposed Quarry

When the site of the proposed Gibraltar Rock quarry was first zoned as Heavy Industrial (HI), the area was essentially rural and there was virtually no appreciation for the adverse health effects of fine and invisible particulate matter. Over time, the population has grown, with new housing developments. A school for exceptional children, Perkiomen Valley Academy (PVA), is now located within about 1000 feet of the proposed quarry. Within 2000 feet, the New Hanover-Upper Frederick Elementary School has been expanded with the addition of new classrooms on five different occasions. More recently, the Heritage Building Group, Inc. has been granted New Hanover Township approval for a housing project for approximately 1000 senior citizens. The Heritage complex, including a residence with nursing care, will be located directly across Route 73 from the proposed Gibraltar quarry site.

What was once praised as "open space" is now rapidly becoming suburban sprawl vulnerable to the easy spread of fine particulate matter and quarry generated dust. Research on the adverse

health effects of PM 2.5 led to the EPA standards for this particulate in 1997. A change in scientific understanding must now lead to a change in land use policy. "Open space," regarded as a virtuous condition at the time when our zoning ordinance was passed, is no longer seen as the solution, but as the problem. The site of the proposed Gibraltar Rock quarry is "open space," inappropriate for quarry activities. It does not protect citizens with necessary natural filters of trees and vegetation to isolate quarry emissions from the population in general and sensitive individuals in particular.

Within a mile of the proposed quarry, three susceptible populations can be identified:

- Within 1 half-mile, nearly 760 students attend the PVA and New Hanover Upper Frederick schools.
- Within 1 half-mile, about 1000 senior citizens will reside at Heritage.
- A third group of approximately 1000 residents lives within roughly 1 mile of the proposed quarry property.

According to the Director of PVA, the school has a higher than expected rate of children with asthma. It is assumed that the public school (New Hanover-Upper Frederick) and adult populations have incidence of respiratory illnesses consistent with data provided by the American Lung Association for Montgomery County.[7] (Actually, the figures below are conservative because the senior citizen population at Heritage can be expected to have a higher incidence of respiratory disorders than the general adult population.) Without the addition of quarry dust, the following health problems can be estimated:

- 102 children will experience asthmatic attacks in a given year
- 101 adults will have asthma
- 71 adults will be diagnosed with chromic bronchitis within the past year
- 26 adults will have emphysema

When these numbers are added, based on the American Lung Association data for Montgomery County, there are approximately 300 persons with respiratory ailments living or going to school within 1 mile of the proposed Gibraltar Rock quarry. There are other health concerns as well. A number of persons with cardiovascular disorders live within this area. Many cardiovascular patients have difficulties with breathing, adding to the number of people with respiratory problems cited above.

This is the place to raise the issue of rights. Counsel for Gibraltar Rock has stated on several occasions before the New Hanover Township Zoning Hearing Board that his client has a right to use his property within the provision of the zoning ordinance. We do not dispute that right, but wish rather to raise the question of the rights of others. With respect to approximately 300 persons who have breathing difficulties, do they have a right not be coerced to breathe air that will hasten the cause of death?

AIR POLLUTION ISSUES NOT IN THE GIBRALTAR ROCK AIR QUALITY PLAN

It is a disappointment that the Gibraltar Rock Air Quality Plan does not open up the complex subject of dust production and health. There are hundreds of published scientific studies on this subject, many of them thoughtfully reviewed by the National Institute of Occupational Safety and Health (NIOSH). Both employees and neighbors are at risk, but the extent of this risk is not discussed. NIOSH recommends methods for measuring and monitoring these health risks, but the Gibraltar Rock Air Quality report makes no references to these recommendations. Exit policies for employees showing excess pulmonary distress are also not discussed. And, consistent with these omissions, is a lack of discussion on the liability of Gibraltar Rock for health problems encountered by the neighbors of the proposed quarry.

A certain irony cannot be overlooked. The Department of Environmental Protection requires the mining applicant to do a preblast inspection of certain vulnerable and historic structures. The mining company has responsibility for damages to these structures caused by blasting.

Unfortunately, there is no corresponding DEP requirement to protect the human environment and require a prequarry inspection of the pulmonary function levels of vulnerable persons who live in the same vicinity as vulnerable historic structures. Presumably, if the mining company has responsibility for damages to buildings, it also has responsibility for measured damages to pulmonary function that exceeds normal expectations.

According to their testimony at the New Hanover Zoning Hearing Board, Gibraltar Rock has not performed a chemical analysis of their core sample. Consequently, they have no knowledge about the presence or absence of certain minerals and compounds. There is a degree of negligence in this omission. Some minerals and certain compounds are particularly toxic and/or carcinogenic. Several compounds on the DEP list of serious air pollution substances are typically found in quarry operations. These are not acknowledged and obviously not discussed in the Gibraltar Rock Air Quality report.

Perhaps the most striking omission in the Gibraltar Rock Air Quality Plan is the absence of any mention of silicon dioxide (SiO_2) or respirable silica. Silica, a very common quarry substance, is always present in the dust that is generated. Silica is highly toxic and is related to many health concerns, including silicosis, an irreversible but preventable disease. Silicosis is a diffuse nodular pulmonary fibrosis caused by inhalation and deposition of respirable crystalline silica smaller than 10 μ in diameter. The deposition efficiency is estimated at 50% for particles of approximately 4 μ. Lung degradation can be and often is asymptomatic. There are three forms of silicosis:

- The chronic form of silicosis occurs after 10 or more years of exposure.
- The accelerated form develops in 5 to 10 years.

- An acute form of silicosis comes from high exposure that ranges from a few weeks to 5 years, and is usually associated with blast drilling.

As the NIOSH has stated, "Occupational exposures to respirable crystalline silica are associated with the development of silicosis, lung cancer, pulmonary tuberculosis, and airways diseases. These exposures may also be related to the development of autoimmune disorders, chronic renal disease, and other adverse health effects."[8] The American Thoracic Society recommends an annual tuberculin test for persons with silicosis and for all persons with 25 years of exposure to crystalline silica.

There are NIOSH-recommended employee exposure limits for dust particles and toxic substances.[8] These recommendations are not acknowledged by Gibraltar Rock, and no commitment is given that they will be met. For example, the Gibraltar Rock Air Quality report does not acknowledge the NIOSH-recommended exposure limit of 0.05 mg/m^3 of respirable crystalline silica, using a time-weighted average (TWA) for up to 10 hours a day, 40 hours a week. Additionally, in the above-cited NIOSH hazard review,[8] there is a significant risk of chronic silicosis even when working a lifetime within this exposure limit.*

Another example of missing information is the lack of any reference to certain compounds of magnesium, including tremolite. Tremolite is the most virulent carcinogenic form of asbestos.[9] It has been found at Rose's Quarry in Lafayette, Montgomery County.[10] Residents of this community have a right to know whether tremolite will be added to the pollutants in the air they breathe, and Gibraltar Rock is negligent in having no idea about the presence or absence of tremolite.

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*This permissible exposure limit is also established by the Occupational Safety and Health Administration (OSHA), and the Mine Safety and Health Administration (MSHA)].

The EPA keeps track of 188 toxic air pollutants. Gibraltar Rock has not yet provided a chemical analysis report to determine if their proposed quarry would add to certain toxic air pollutants. Some of these pollutants are compounds that may be present in quarry dust.

The following list of pollutants has been determined to be toxic by the EPA. It is as true for these substances as it is for the pollutants that make up the AQI: there is little room in the ambient air inventory for additional toxic substances.

There are 67 counties in the Commonwealth. The number after each substance is the rank order of Montgomery County's ambient air quality for that substance compared to the rest of Pennsylvania[11]:

Beryllium compounds.....16

Arsenic compounds.....21

Cadmium compounds.....8

Cobalt compounds..... ...26

Lead.....13

Manganese.....18

Mercury.....6

Nickel compounds.....11

Phosphorus compounds.....2

Selenium.....26

The mineral beryllium deserves special attention. Pennsylvania has added beryllium to the federal list of toxic airborne compounds, thus making Pennsylvania standards more stringent than the national standards. It is imperative for Gibraltar Rock to acknowledge this Pennsylvania standard and be prepared to address the intention of the DEP. Gibraltar Rock is negligent in not performing a chemical analysis to determine if the lungs of area residents will be given additional levels of toxic and carcinogenic beryllium, as well as the other pollutants

listed above. The residents of New Hanover Township and the surrounding area deserve to know the extent to which the proposed Gibraltar Rock quarry will add toxic compounds to the air they breathe.

SUMMARY OF HEALTH RISK ANALYSIS

Standards are useful. They state the maximum level of a given pollutant consistent with the protection of human health. Standards can, however, prove to be a source of frustration if decision makers passively stand aside and allow sources of pollution to exceed the health limits. With respect to the many sources and types of air pollution, Gibraltar Rock is experimenting with the health of employees and neighbors without first informing the subjects of their risks and securing their permission.

EPA has reported on the health risks associated with particular pollutants, often mentioning pulmonary function and breathing difficulties, particularly for those who suffer from asthma. The significance and prevalence of diseases and death associated with pollution should not be underestimated. The American Lung Association has pointed out that pulmonary disease is the third leading cause of death, and of the five leading causes of death, pulmonary disease is growing the fastest.[12] Moreover, asthma (a condition in which the bronchial tubes become inflamed and swollen) is also a growing concern, having increased 75% from 1980 to 1994. Today, 144.2 children per 1000, ages 5 to 17 years, have been diagnosed with asthma. It is the third leading cause of hospitalization for children. Additionally, this area is among the highest in the country in hospitalization rates for asthma.

In a study of respiratory tuberculosis, the authors reported that the nonmetallic mining and quarry industry had elevated levels of death by respiratory tuberculosis.[13] Within this industry, crushing and grinding machine operators is the occupation with the highest proportionate mortality rates. NIOSH states that over a working lifetime of 40 to 45 years, workers have a 1 in

100 chance of developing silicosis, even when only exposed to permissible exposure limits (PEL) as set by OSHA and NIOSH.

The reader is referred to other reports discussing the health hazards of quarry workers.[14-18] The effects of particulate matter on illness and death have been studied extensively. Dockery and Pope conducted a meta-analysis of U.S. studies of particulate air pollution published between 1990 and 1993. They reached the conclusion that each increase in the PM 10 level of 10 μg/m^3 increased the relative rate of death from all causes by 1%.[17]

More recently, with the introduction of monitoring stations for PM 2.5, it has been possible to measure separately the health effects of coarse (between 10 and 2.5 μ) and fine particulate matter (PM 2.5). This new technology has enabled Pope and associates to conclude that for each 10 μg/m^3 elevation of fine particulate matter, there is an increase of approximately 4% in death from all causes, a 6% increase in cardiopulmonary fatalities, and an 8% increase in lung mortality.[18]

This study[18] adds support to the July 1997 decision by the EPA to adopt standards for PM 2.5. It is to be noted that the EPA has prevailed in legal challenges against this standard. The Supreme Court, in the American Trucking Association decision of February 2001, rejected cost-benefit arguments in standards setting. And, significantly, the health science in support of the PM 2.5 standards was not questioned. The EPA predicts that attainment of the standard would reduce premature death by 15,000 cases a year and reduce serious respiratory problems in children by 250,000 cases a year.

The entire Heritage planned development for over 1000 senior citizens will be across Route 73 from the proposed quarry. The number of elderly persons soon to be living close to the proposed Gibraltar Rock quarry is a sufficient reason on its own for the rejection of this quarry proposal. Senior citizens are a population at risk. If the owners of the Heritage property go

forward with their announced intention to build a nursing care facility, that would require a license from the Pennsylvania Department of Health, which would lead to an environmental assessment of dust, noise, glare, blasting and traffic. The outcome of that study cannot be determined in advance, but given the circumstances, it is very unlikely that the Pennsylvania Department of Health would grant a license for a nursing facility at this location. Their concerns are justified. In the words of Samat and colleagues, "Persons made frail by advanced heart and lung disease are more susceptible to the adverse effects of air pollution."[19]

If DEP grants an approval of Gibraltar Rock's application for a noncoal mining permit, they will be at odds with both the Department of Health, as noted above, and with the Pennsylvania Department of Labor and Industry. That is, if the quarry were already in place and the Boyertown School District wished to build what is now the New Hanover-Upper Frederick Elementary School, that decision would trigger the need for approval by the Department of Labor and Industry (L&I). We are advised by local school officials that L&I would most likely reject the site, for reasons consistent with those of the Department of Health.

CONCLUSION

We Paradise Watchdogs/Ban the Quarry expect the Department of Environmental Resources to have policies that are consistent and reciprocal with other departments of state government, protect citizens who are at risk, and deny a noncoal mining permit in this instance.

We note that the current ambient air inventory of dust, both PM 10 and PM 2.5, is at or above the health threshold established by EPA. Quarry activities are inherently dusty. Illness and death from PM 10 and PM 2.5 have been amply documented. Similarly, the site of the proposed Gibraltar Rock quarry is in an area of "severe nonattainment" for zone. Moreover, increases in ozone are associated with increased death rates. Additionally, the proposed quarry is in the

midst of a suburban development with two vulnerable populations, children and the elderly, each within a half-mile of the proposed quarry.

The data clearly support the conclusion that both the employees of Gibraltar Rock and the residents in the area have every reason to be concerned for their health. With each degradation of air quality, employees can receive a degree of protection with appropriate respirators and regular physical examinations. Close neighbors of the quarry are not so fortunate. Houses have replaced what was once a wide barrier of vegetation and trees. There is an excess of open space. Consequently there is insufficient filtration to protect the health of vulnerable children and senior citizens, thus making this location unacceptable for quarry operations.

After a review of the literature, a study of the current ambient air, and an evaluation of the air pollution projected by Gibraltar Rock's calculation, we have reached one unavoidable conclusion. The Gibraltar Rock operation will add to the toxicity of the ambient air and this will lead to subtle but measurable changes in the pulmonary function of both employees and area residents. For those with sensitive respiratory systems, ambient air toxicity will hasten the progression of their disease and contribute to premature mortality. The proposed Gibraltar Rock quarry must be rejected.

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