VERMONT ENVIRONMENTAL BOARD
10 V.S.A. Chapter 151

Re: J.P. Carrara & Sons, Inc.
Land Use Permit Application #1R0589-3-EB
(Revised)

FINDINGS OF FACT, CONCLUSIONS OF LAW, AND ORDER

This decision, dated May 31, 1994, pertains to an appeal by Roy and Marilyn Seymour from a permit amendment issued by the District #1 Environmental Commission dated September 22, 1992, to J.P. Carrara & Sons, Inc. (Carrara) that deleted Finding 14 of Land Use Permit #1R0589 and imposed certain monitoring and other conditions on the operation of Carrara's rock quarry. Carrara cross-appealed certain conditions of the permit amendment. For the reasons explained below, the Board has concluded that with appropriate conditions, the project will not cause undue air pollution. The Board has also concluded that the use of a rock hammer at the quarry is a substantial and a material change for which a permit amendment is required.

I. BACKGROUND

This proceeding results from a revocation petition filed in 1990 by certain neighbors to the rock quarry operated by Carrara off Route 103 in the Town of Clarendon. The neighbors alleged that Land Use Permit #1R0589 was violated in a number of respects. After a hearing the Board found a violation of Finding of Fact 14, which states: "There will be no vibration or effect beyond a 200-foot radius from the charge location." The Board ordered Carrara to limit blasting to a level that has no vibration or effect beyond a 200-foot radius or obtain an amendment from the District Commission.

Carrara subsequently filed an application to amend its permit with respect to the blasting parameters for its quarry operation. On July 9, 1992, the District #1 Environmental Commission issued a permit amendment that deletes Finding 14 and imposes additional conditions under which the quarry may operate. After a motion to alter was filed by Carrara, on August 11 the District Coordinator issued a memorandum stating the Commission's decision. On September 22 the District Commission issued its decision in proper form, which was a revised decision.[1]

1 Decisions of a district commission must be signed by the district commission members who made the decision or the Chair on behalf of the commission but may not be delegated to staff, See In re Buttolph, 141 Vt. 601, 604-607 (1982).

On August 3, 1992 Roy and Marilyn Seymour (the Appellants) filed an appeal from the District Commission's July 9 decision; on September 4 Carrara cross-appealed.

On September 30, a prehearing conference was convened by General Counsel Stephanie J. Kaplan. A prehearing conference report and order was issued on November 12, 1992. The parties agreed that a preliminary issue was whether the Board should limit the scope of its review to the effects of blasting on the air under Criterion 1 or whether it should also include other effects of the blasting with respect to additional criteria.

Parties filed briefs on the preliminary issue regarding the scope of the proceeding respectively on November 16 and 18, 1992. On December 9, the Board issued a Memorandum of Decision stating its decision to limit the issue in the appeal to the question of the effects of the blasting under Criterion 1(air).

On January 20, 1993, Carrara filed a motion to dismiss the appeal of the Appellants for failure to comply with orders of the Board.

In response to a request for preliminary evidentiary rulings regarding the scope of the evidence that would be admissible at the hearing, on January 26 Chair Elizabeth Courtney issued a memorandum reiterating that no testimony concerning noise from anything other than blasting would be admitted and that testimony concerning the impacts of the blasting through the air and the ground would be admitted.

During January and early February the parties filed prefiled testimony and evidentiary objections. On February 1 the Appellants filed an opposition to Carrara's motion to dismiss.

The hearings were convened on February 3, 1993, with the following parties participating:

Carrara by James P.W. Goss, Esq.
The Appellants by Jon Readnour, Esq.

At the hearing, the Board orally ruled to deny Carrara's motion to dismiss and to allow testimony on noise from the operation in addition to blasting in order to have information on background noise at the quarry. In response to Carrara's objection that it was not prepared to address

non-blasting operational noise because there had been no notice of it, the Board provided an opportunity to reconvene the hearing, upon the request of Carrara. The hearing was scheduled for June 3.

On April 30, Carrara filed a written objection to the Board's consideration of non-blasting noise, and offered a proposed permit condition as a standard for noise caused by non-blasting activities at the quarry of 69 dBA at the easterly property line of the project on the East Road. On that date, the Appellants filed argument concerning the Board's consideration of noise levels. On May 4, Carrara filed a supplemental legal memorandum and a request for reconsideration of the Board's oral ruling. On May 19, Carrara filed a motion for interlocutory appeal to the Vermont Supreme Court, along with a request that the proceedings be suspended until the Board rules on his motion. On May 21, the Appellants filed a memorandum in opposition to Carrara's motion for interlocutory appeal and a motion for a stay of the permit.

On June 9, the Board issued a Memorandum of Decision in which it denied Carrara's objection to the Board's oral ruling of February 3. On June 10, the Board issued a Memorandum of Decision in which it denied Carrara's motion for interlocutory appeal and the Appellants' motion for stay. The hearing was scheduled for July 14, 1993.

On June 28, Carrara filed a notice of appeal with the Vermont Supreme Court from the Board's June 9 Memorandum of Decision.

On July 1, Chair Courtney sent a memorandum to parties clarifying the purpose for the Board's consideration of non-blasting noise from the quarry.

The hearing was reconvened on July 14. Subsequent to the hearing, Carrara withdrew its appeal to the Supreme Court. On September 7, the parties filed proposed findings of fact and conclusions of law.

The Board deliberated concerning this matter on October 7, 1993 and January 5, 1994. On January 5, following a review of the proposed decision and the evidence and arguments presented in the case, the Board declared the record complete and adjourned the hearing. This matter is now ready for decision. To the extent any proposed findings of fact and conclusions of law are included below, they are

granted; 'otherwise, they are denied.

11: --RECONSIDERATION

Subsequent to issuance of the Land Use Permit and supporting Findings of Fact and Conclusions of Law in this appeal, motions to alter certain conditions of Land Use Permit #3R0589-3-EB and certain supporting Findings of Fact were filed by J. P. Carrara & Sons, Inc. on February 23, 1994 and by Roy and Marilyn Seymour on March 3, 1994, pursuant to Board Rule 31(A).

On February 22, 1994, the Vermont Senate rejected the confirmation of three Board members: Ferdinand Bongartz, Elizabeth Courtney, and Terry Ehrich. This resulted in only three remaining Board members who participated in this appeal. 1 V.S.A. § 172 provides that a majority of the total number of members of a board is required to take an action. Thus, a minimum of five Board members is needed to make a decision.

On March 7, 1994, Governor Howard Dean appointed Board member Arthur Gibb as Chairman of the Environmental Board. On March 14 Chairman Gibb appointed Board member Sam Lloyd as Acting Chair in this appeal. Chairman Gibb determined that under the authority of 3 V.S.A. § 849, former Board members who participated in the Carrara hearings and decision may continue to participate. Accordingly, former Board members Ferdinand Bongartz and Terry Ehrich agreed to remain on this appeal.

On March 29, the Board voted to reconsider certain permit conditions and findings of fact and deliberated on the requested changes. On May 18 the Board conducted a second deliberation and voted to issue this decision.

The revised permit contains the revised conditions, and this decision contains the revised findings of fact. These revised decisions supersede the permit and findings of fact **and conclusions of law dated February 2, 1994 in their entirety.**

III. ISSUES

1. Whether to delete Finding 14 of the Finding of Fact, Conclusions of Law, and Order dated February 17, 1988 and whether additional conditions are necessary in order to insure that no undue air pollution under Criterion 1 will

result from blasting at Carrara's quarry.

-- 2. Whether the-operation-~-of a rock hammer is a material or a substantial change for which a permit amendment is required.

IV. FINDINGS OF FACT

Project Description

1. J.P. Carrara & Sons, Inc. operates a stone quarry on a 59-acre tract of land located on the easterly side of Vermont Route 103 in the Town of Clarendon. The quarry is located between Route 103 on the west and the East Road on the East and South.

2. On February 17, 1988, the Board issued Land Use Permit #1R0589-EB (the permit) authorizing the operation of the quarry, along with supporting findings of fact and conclusions of law. Finding of Fact 14, incorporated by reference into the permit by Condition 1 of the permit, provides in part: "[T]here will be no vibration or effect from the blasts beyond a 200-foot radius from the charge location." This finding was taken verbatim from the prefiled testimony of Carrara's expert witness.

3. After a hearing on a petition to revoke the permit filed by neighbors to the quarry, the Board issued a decision on April 23, 1992 and a revised order on May 13, 1992. The order stated:

> The Permittee shall limit any blasting to a level which has no vibration or effect beyond a 200-foot radius from the charge location or shall obtain an amendment from the District #1 Environmental Commission, or both.

4. On May 20, 1992, Carrara filed an application with the District Commission seeking to amend Finding of Fact 14 to read: "There will be no unreasonable vibration or effect from blasts beyond a 200-foot radius from the charge location."

5. On July 9, 1992, the District Commission issued a decision on the amendment application. This decision

was subsequently modified in response to a motion to alter. The District Commission essentially deleted Finding-of Fact 14 and imposed- additional- conditions;-

6. The area in which the quarry is located is rural residential. A number of homes are located on the East Road in the vicinity of the quarry. The home of the Appellants Roy and Marilyn Seymour is located on the East Road approximately 1,100 feet from the quarry perimeter. The East Road experiences little traffic.

7. The quarry operation consists of a dolomite extraction. Bore holes are drilled vertically by a hydraulic drill into a vertical rock face. The holes are loaded with explosives which are then detonated in a series of delays which fracture the rock into pieces. The pieces are then loaded into trucks and removed off the site for crushing and final processing into end products such as concrete, hot mix aggregate, and rip rap.

8. For approximately two months each year, Carrara rents a hydraulic rock splitter which splits blasted rocks not small enough to be loaded into trucks into pieces which can then be removed from the site. The rock splitter is very loud and disturbing to neighbors. This activity has not been authorized by the District Commission.

9. Carrara subcontracts its drilling and blasting to independent contractors who are responsible for overseeing these operations. The blaster monitors all blasts at the site with a seismograph which measures ground vibration and air blast from the explosions.

10. The permit allows Carrara to use up to 2,500 pounds of explosives per blast event in delays of 250 pounds of explosive, each blast separated by at least 8 milliseconds. Carrara's blaster routinely uses delays of 25 milliseconds. While the perception is of a single blast, the blast is actually comprised of a number of smaller blasts of up to 250 pounds of explosives each. The overall perceived blast duration is between 0.5 and 1.5 seconds. The permit allows up to two blasts per day.

Effect of the Quarry Operation on the Neighbors

11. A number of residences are located on the East Road

that abuts the property on which the quarry is located.

12. The blasting -and--certain other operations at the quarry have caused extreme annoyance and irritation to neighbors who live on the East Road. The blasts are startling and often shocking when there is no warning. In addition to the blasting, two major generators of noise are the drilling to prepare the boreholes for the blasting agent, and the hydraulic rock breaking machine. Sometimes neighbors cannot be outside at their homes because of the noise. When the drilling and rock hammering noises are prolonged, they are extremely irritating. The hammering sound is particularly disturbing.

13. Items sometimes fall off the walls of neighbors' homes, windows rattle, and structures vibrate during the blasts from the quarry. One neighbor experienced a kitchen light swaying on its chain and a shelf on the wall fall off when a blast occurred.

14. Many of the neighbors are concerned that the blasting has caused or will cause damage to their houses and water systems.

15. Appellant Roy Seymour believes that a blast caused a vehicle on an automotive airjack to rock on the jack while he was under the vehicle. Fearing that the vehicle would fall from the jack and crush him, he wrenched himself out from under the vehicle, causing injury to himself. If he had heard a warning that a blast was about to occur, he would not have been under the vehicle.

16. The neighbors believe that Carrara has not been responsive to their concerns about the blasting and noise from the quarry operation.

Blasting Impacts

17. There are five air-related impacts which could result from blasting at the quarry. These are: 1) gases generated by the detonation of the explosive charge which typically consist of carbon monoxide and oxides of nitrogen; 2) dust generated from the fracturing of rock from the blasts; 3) flyrock or the excessive throwing of rock away from the quarry face due to improper blasting technique; 4) noise, which is defined

as the component of sound from blasting which can be perceived by human hearing; and 5) air concussion or air blast, which is the component of sound from blasting which occurs below a frequency which can be perceived by human hearing, but which can rattle windows and structures. In addition, ground vibration from blasting can cause damage.

Gases

18. When explosives are detonated in bore holes at the quarry, the force which fragments the rock results from expanding gases within the hole created by the explosive charge. Some of the gases from the explosive detonation escape into the atmosphere in the form of carbon monoxide and oxides of nitrogen. Proper blasting techniques minimize the releases of gases into the air from the detonation.

19. The quantity of gases produced from blasts at the quarry are relatively small. The gas dissipates quickly and does not pose a hazard for either blasting personnel or surrounding neighbors.

Dust

20. Dust is a natural byproduct of the process of explosive fragmentation of rock. The type of blasting at the quarry is designed to fragment the rock into pieces of manageable size and to avoid pulverizing it.

21. The prevailing wind in the area is from the northwest so that dust generated from blasting generally travels to the southeast. Sometimes the blasting creates a cloud of dust that blows onto the neighbors' properties, depending on the wind direction.

Flyrock

22. Flyrock is the name given to unnecessary or unintended stone which is cast away from a detonation site. Flyrock is a potential cause of death, serious injury, and property damage, and is the most hazardous effect of blasting. Flyrock distances can range up to one mile beyond the quarry limits.

23. Although flyrock incidents occurred during the early stages of the quarry operation, there have been no

documented instances of flyrock at the quarry for several years.

24. Flyrock at the quarry is regulated by the Mine Safety Hazard Administration (MSHA) of the United States Department of Labor. Under MSHA regulations, quarry operators must control hazardous flyrock. MSHA has the ability to fine a quarry owner and shut a quarry operation down for generating excessive flyrock.

Noise and Airblast

25. Airblast and noise are subsets of sound, or vibrations caused through the air by explosive blasts. Noise is the component of that vibration which occurs at a frequency which can be perceived by the human ear, generally above 1,000 hertz. Air concussion, or air blast, is the component of that vibration which usually occurs at frequencies below human perception (below 20 Hz). All airblasts, both audible and inaudible, can cause rattling of windows, vibration of structures, and, in extreme cases, damage to structures, but have less potential to cause damage to structures than ground vibrations. However, when a person senses vibrations from a blast or experiences house rattling, it is difficult to tell whether ground or air vibrations are being sensed.

26. Sound is measured in decibels. A decibel is a unit of measure of air pressure at a specified location. Different scales measure different frequencies of sound waves.

27. Noise, or audible sound, is usually measured on the A weighted decibel scale (dBA). Air blast is measured on either the linear decibel scale (dBL) or the C weighted decibel scale (dBC). The linear scale is the preferred mode of measurement for air blast from explosions.

28. The U.S. Bureau of Mines has adopted recommendations for levels of air blast from explosives which will avoid damage to property surrounding quarries. These are presented in Chapter 5 of the U.S. Bureau of Mines Information Circular 8925/1983 entitled "Explosives and Blasting Procedures Manual" (the Procedures Manual), (Board Exhibit A17) as follows:

TABLE 11. - Maximum recommended airblast levels

Frequency range of instrumentation	Maximum level, dB
0.1 to 200 Hz, flat response.	134 peak.
2 to 200 Hz, flat response.	133 peak
6 to 200 Hz, flat response.	129 peak
C-weighted, slow response	105 c.

29. Airblasts from the project have averaged approximately 101 dBL, below the Bureau of Mines standard.

30. In Chapter 5 of the Procedures Manual entitled "Environmental Effects of Blasting," at page 82, it states:

> Because airblast is a major cause of blasting complaints, merely meeting the levels given in the table is sometimes not sufficient. Airblast levels should be kept as low as possible by using the techniques described later in this section. This will go a long way toward reducing complaints and conflicts with neighbors.

31. The section of the Procedures Manual on reducing airblasts contains nine recommendations for blasting procedures to minimize airblast. The Procedures Manual also recommends that airblasts readings be recorded to provide a record. (Board Exhibit A17)

32. Carrara's expert conducted a noise survey of background operating noise at the quarry on July 5, 1993. This study analyzed noise levels at four locations around the quarry both without quarry equipment operating and with all equipment operating except for the hydraulic rock splitter.

33. Monitoring was conducted with a general radio X1945 Community Noise Analyzer. The sound level was measured for one-half hour without the quarry operating and for one-half hour with the quarry in operation. At the end of the measurement period, the monitoring instrument displayed maximum noise levels (L MAX), commonly used percentage exceedance levels, and average weighted noise levels (L EQ.) for the period measured.

34. The noise survey found maximum noise levels at the

monitoring locations in the range from 61 to 72 dBA. The instrument cannot distinguish between background noises-and quarry noises; therefore, noise from- pas-sing---------- vehicles and aircraft were included.

35. The results of the noise survey indicate that passing traffic established the ambient noise level and often produced the maximum noise level at a monitoring site.

36. The national safety standards for exposure to quarrying noise are designed to ensure that hearing loss, psychological injury, and other adverse health and safety consequences will not result from earth extraction operations. The shorter the duration of the noise, the higher the permissible dBA level of exposure may be.

Ground Vibration

37. Detonation of explosives creates vibrations through the ground. This is caused by a shock wave that crushes the material around the bore hole and creates many of the initial cracks needed for fragmentation. As this wave travels outward, it becomes a seismic, or vibration, wave. As the wave passes a given piece of ground it causes that ground to vibrate. Ground vibrations are measured with seismographs.

38. Ground vibration is measured in terms of particle velocities which are expressed in inches per second (in/sec).

39. Excessively high ground vibration levels can damage structures. Even moderate to low levels of ground vibration can be irritating to neighbors. The Bureau of Mines' publication states:

> Even moderate to low levels of ground vibration can be irritating to neighbors and can cause legal claims of damage and/or nuisance. One of the best protections against claims is good public relations. ... Prompt and sincere response to complaints is important.

40. At the maximum 250 lbs. per delay allowed for blasting at the quarry, it is likely that ground vibrations are

not-causing and will not cause damage to structures and water supplies in the area. However, there is no precise -level-at-which such-damage--beginsto--occur-.- The damage level depends on the type, condition, and age of the structure, the type of ground on which the structure is built, and the frequency of the vibration, in hertz.

41. The Bureau of Mines Procedures Manual states the following, with respect to ground vibration limits:

> [W]here the frequency is above 40 Hz, vibration levels [should] be kept below 0.2 in/sec to minimize damage. However, all mine and quarry blast vibrations, and those from large construction jobs, have frequencies below 40 Hz. For these blasts it is recommended that the vibration level be kept below 0.75 in/sec for homes of modern, drywall construction and below 0.50 in/sec for older homes with plaster-on-lath walls.

42. The Bureau of Mines Procedures Manual also states that many factors influence the reaction of neighbors to ground vibrations from blasting. The Procedures Manual states at page 79:

> People tend to complain about vibrations far below the damage level. The threshold of complaint for an individual depends on health, fear of damage. .., attitude toward the mining operation, diplomacy of the mine operator, how 'often and when blasts are fired, and the duration of the vibrations. The tolerance level could be below 0.1 in/sec where the local attitude is hostile toward mining, where the operator's public relations stance is poor, or where numerous older persons own their homes. On the other hand where the majority of people depend on the mine for their livelihood, and where the mine does a good job of public relations, levels above 0.50 in/sec might be tolerated. By using careful blast design and good public relations

. it is usually possible for an operator to live in harmony with neighbors without resorting to expensive technology.

43. Based on an analysis of the Permittee's blasting records, the Permittee's blasts have averaged 0.2 in/sec and were less than 0.1 in/sec for many of the shots.

44. The Bureau of Mines publication contains five techniques which can be used to reduce ground vibrations. (Board Exhibit P17)

45. The Bureau of Mines graph entitled "U.S. Bureau of Mines Criteria" from Report RI-8507 (November 1980) is designed to ensure that damage to structures from ground vibration will not occur regardless of the frequency of the wave generated by the blast. The standards for ground vibration from blasting are depicted as particle velocity limits on the graph. These limits take into account potential impact from all frequencies of waves generated through the ground from blasting. As long as the particle velocities as measured adjacent to the closest residence to the blast do not fall above the reference line on the Bureau of Mines graph, property damage to neighboring structures should not occur from ground vibration.

46. Particle velocities from the blasts are printed out on readings taken by the seismograph that monitors the blasts. These readings can be compared against the Bureau of Mines graph, providing an easy method of verifying that the permit conditions are being complied with.

47. There have been many complaints over the years since Carrara started blasting at the quarry about houses and windows rattling and shaking as a result of the blasts. It is more likely that these effects are caused by airblasts rather than by ground vibration, but there is no definitive way to determine this. There have also been numerous complaints about changes in the springs and wells of residents in the vicinity of the quarry. Without a survey of all structures and water supplies to determine their condition prior to any blasting, it is not possible to verify whether the blasts have caused the problems.

48. A survey of structures and water supplies in the area of a quarry is strongly recommended by the Bureau of Mines. For coal mines, the Office of Surface Mining-~ regulations require that a preblast survey be conducted, at the homeowners' request, on all homes within a half mile of blasting. The residences along the East Road are located between 1,100 and 2,000 feet from the quarry.

49. The purposes of a preblast survey are twofold. First, it increases communications between the community and the quarry operator. This is beneficial since good public relations are the operator's best means of reducing blasting complaints. Second, a preblast survey provides a baseline record of the condition of a structure against which the effects of blasting can be assessed. Comparing the results of a postblast survey with the preblast survey can help assure equitable resolution of blast damage claims.

50. The Bureau of Mines also recommends good blast record keeping, for two purposes. First, is it useful in determining the cause of undesirable blasting consequences such as flyrock, airblast, ground vibrations, and poor fragmentation. Second, it may also provide reliable evidence in litigation on blast damage or nuisance.

51. The Bureau of Mines recommends use of an air horn prior to each blast that is audible within one-half mile of the quarry.

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52. Carrara must have flexibility in the hours that blasting can take place in order to account for unavoidable logistical and safety problems which commonly arise in the course of a blasting operation. These include hole collapse or flooding that may occur during the loading of a shot, a blocked hole or equipment breakage that may occur during the drilling of a shot, late delivery of explosives at the site, and sudden thunderstorms or misfires. The blasters must have the flexibility, therefore, of at least a two hour time frame in the late morning and a two hour time frame in the early afternoon in order to account for the variations that occur.

53. Proper notification to residents in the vicinity of the quarry is an important safety measure and reduces the annoyance of the blasts --to- neighbors. Carrara has proposed several notification measures, including 1) establishing regular hours within which blasting will take place; 2) posting the hours of blasting on a sign at the entrance to the quarry, as the District Commission required; 3) notifying all neighbors who are parties to this proceeding or who reside within 2,000 feet of the charge location and who so request in writing of the approximate time that a blast is to take place; and 4) using a warning airhorn which will be audible to persons outside their homes within a range of 2,000 feet of the quarry to warn the neighborhood immediately prior to each blast.

V. CONCLUSIONS OF LAW

Criterion 1(air)

Criterion 1 of 10 V.S.A. § 6086(a) requires that, before granting a permit, the Board must find that a project will not result in undue air pollution. The Board considers noise impacts as air pollution under Criterion 1 in the context of potential adverse health effects caused by noise. See Re: John and Joyce Belter, #4C0643-6R-EB, Findings of Fact, Conclusions of Law, and Order (May 28, 1991); Re: Sherman Hollow, Inc., #4C0422-5-EB, Findings of Fact, Conclusions of Law, and Order (Revised) at 30 (Feb. 17, 1989). We believe that adverse health effects can be psychological as well as physical.

We take official notice of our decision in the revocation proceeding in this matter, Land Use Permit #1R0589-EB (Revocation), dated May 12, 1992. The findings in that decision, as well as the evidence in this proceeding, demonstrate that the neighbors to this quarry have been experiencing effects from the noise and vibrations resulting from operation of the quarry and the blasting that have had an adverse psychological effect. That is, the noise and vibrations from the blasting and other aspects of the quarry operation have caused them distress, and their ability to enjoy the peacefulness of rural living to which they were accustomed and to which they have a right to expect has been greatly disturbed.

When originally reviewing the application for this quarry, we relied on Carrara's expert's statement that there

will be no vibration or effect beyond a 200-foot radius from the blast location. This statement, made by Carrara's expert in the prefiled testimony filed in that proceeding, and included as Finding 14 in support of the permit, was also relied upon by the neighbors, who were justified in concluding from that representation that the quarry operation would not affect their homes or their lives. In Re: Dept. of Forest and Parks, Knight Point State Park, Declaratory Ruling #77 (Sept. 8, 1976), the Board stated:

> Parties to an application for a permit have a right to rely upon material representations made by the applicant in the application as defining the nature and scope of the development during construction and term of operation; and once a permit has been issued it is reasonable to expect the permittee to conform to those representations unless circumstances or some intervening factor justify an amendment.

Id. at 3.

The reality has been far different, as neighbors have experienced severe disturbances from the blasts and from other aspects of the quarry operation such as dust blowing onto their properties and noise from the rock hammer.

It is clear from the evidence that the quarry can be operated at a level and in a manner that does not result in an undue adverse effect on air pollution. We are therefore issuing an amended permit with conditions designed to allow the operation of the quarry within reasonable parameters while providing the neighborhood reasonable protection.

According to the Bureau of Mines Procedures Manual, airblast and ground vibration levels should be kept as low as possible to minimize damage to structures and water systems and neighbors' fear of damage due to perceived vibrations and actual physical effects of vibrations such as windows rattling and houses shaking.

At the same time, there are certain minimum requirements for the quarry to continue operating. Standards developed by the United States Bureau of Mines provide a reasonable benchmark, and we have relied on these in determining reasonable limitations within which the quarry

may operate.

We are a-lso mindful--of the- high- level- of distress-and irritation toward the quarry operation that has developed in the neighbors over the years, as discussed above, in some part due to past lack of responsiveness to the neighbors' concerns. We will therefore require Carrara to implement all possible measures to reduce the noise and vibration from the blasting and operation of the quarry, consistent with the recommendations from the Bureau of Mines. This includes requiring a public information and notification program to educate the public and promote safety; a pre-blast survey of all houses and water supplies located within at least 2,000 feet of the quarry perimeter; development of a plan to implement the Bureau of Mines' performance standards for reducing air blast and ground vibrations from blasting; and development of a plan to reduce dust and flyrock generated at the quarry. Successful implementation of these conditions should, over time, result in better relations between the neighbors and Carrara along with a reduction in the neighbors' hostility toward the quarry and fear of damage to their properties.

Carrara's noise survey shows that the noise level during full operation of the quarry, with the exception of the rock hammer, has been as high as 72 dBA at the southwest corner of the property line, and that the highest noise levels were due to passing vehicles rather than from the quarry operation. Because the recording instrument cannot distinguish noise generated by the quarry from other noise at the monitoring locations, and because Carrara has no control over the noise created by passing vehicles and aircraft, the Board believes it is reasonable to establish a maximum average noise level rather than a maximum noise level. The L EQ., which is the average noise weighted over a given time period, allows for occasional louder noises. In no event, however, may noise at any point on the property line exceed 85 dBA. no more than 50 dBA 90 percent of the time.

In order to ensure that the limits are not exceeded, the Board will require Carrara to monitor the noise on an instrument that produces displays of and records the maximum dBA and the L EQ. dBA over a given time period, and to submit the monitoring records to the District Commission. In order for a comparison to be made of the recorded noise levels and the permitted noise levels, the Board will require that the noise be monitored on an instrument that

measures-and displays the noise on the A-weighted scale.

Based upon compliance--with--the--conditions- of the-m- permit, the Board concludes that the quarry operation will not result in undue air pollution.

Rock Splitter

A permit amendment is required for any substantial or material change to a permitted project. Board Rule 34(A). A substantial change is defined at Rule 2(G) as

> any change in a development or subdivision which may result in significant impact with respect to any of the criteria specified in 10 V.S.A. section 6086(a)(l) through (a)(10).

A material change is defined at Rule 2(P) as

> any alteration to a project which has a significant impact on any finding, conclusion, term or condition of the project's permit and which affects one or more values sought to be protected by the Act.

The rock splitter was added to the quarry operations subsequent to the issuance of the Permit in 1988. Accordingly, it is a "change," or "alteration" to the project. Based upon the evidence in the record about the noise of the rock hammer and the disturbance it causes, we believe that its use constitutes both a material and a substantial change. It may result in a significant impact with respect at least to Criteria 1 (noise) and 8 (aesthetics) and is therefore a substantial change. For the same reason, its use also has a significant impact on the permit's findings and conclusions with respect to Criteria 1 (noise) and 8 (aesthetics).

Carrara has not sought or received a permit amendment that authorizes the use of a rock splitter at the quarry. Until such an amendment is obtained, any use of the rock splitter at the quarry violates the permit.

VI. ORDER

1. Land Use Permit Amendment #1R0589-3-EB (Revised) is hereby issued.

2. The use of a rock splitter at the quarry is a material and substantial change to the Permit for which an amendment is required.

3. Jurisdiction is returned to the District #1 Environmental Commission.

Dated at Montpelier, Vermont this 31st day of May, 1994.

ENVIRONMENTAL BOARD

Samuel Lloyd, Acting Chair
Ferdinand Bongartz
Terry Ehrich
William Martinez
Steve E. Wright

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