Germanos, Nicholas M Civ USAF HQ ACC/A7NS

From: James Dumont
Sent: Monday, July 15, 2013 2:01 PM
To: Germanos, Nicholas M Civ USAF HQ ACC/A7NS

Subject: RE: Revised Draft EIS for the Burlington VT, F-35 basing; Information for Review
Attachments: Dumont NEPA Comments 7 15 13 F 35A as filed.pdf; Statement of Questions as filed.pdf

Mr. Germanos, enclosed please find my comments. Please email back to me to confirm receipt! Thanks.

The comments consist of a Memorandum by me and four attachments: 1) Larson Appraisal Service report, 2) Statement of Questions for Appeal in Vermont Superior Court Environmental Division Docket No. 42-4-13 Vtec, 3) Leas & Joseph Health Effects Report, and 4) Chapter 47 of Glen Ballou, Handbook for Sound Engineers.

Because of the size of the attachments, I am sending only the Memorandum and the Statement of Questions in this email. The rest will follow. Thanks.

Jim

James A. Dumont, Esq.

DEPARTMENT OF THE AIR FORCE

RE: F-35A OPERATIONAL BASING
ENVIRONMENTAL IMPACT STATEMENT

Comments Submitted on Behalf of Richard Joseph et al. Under the National Environmental Policy Act and the National Historic Preservation Act

The undersigned counsel submits these comments on behalf of Richard Joseph and the many other residents of Winooski, Burlington and South Burlington that counsel represents.

INTRODUCTION -- THE INDEPENDENT CONSTITUTIONAL AND STATUTORY MISSION OF THE VERMONT AIR NATIONAL GUARD, AND ITS RELEVANCE TO THE EIS GP-18

The role of each state's National Guard is constitutionally and historically distinct from that of the Army, Air Force and Navy.

> The legal basis for the modern National Guard is found in the U.S. Constitution. Collectively known as the "Militia Clauses," these portions of the U.S. Constitution represent a compromise between federalists and antifederalists. The clauses were an attempt by moderates to strike a balance between vehement states' rights advocates and those who campaigned for total federal control of the military. To that aim, they allowed Congress to activate each individual state's militia and put it under the power of the President; however, the President could only use the militia for a limited number of purposes. This limit on federal authority over the militia allowed the Militia Clauses to serve as an important check on the power of the federal government. While the U.S. Constitution has been interpreted to grant the federal government supremacy in the area of military affairs, the first Militia Clause concurrently limits the federal government's use of the militia to "execute the Laws of the Union, suppress Insurrections and repel Invasions." Despite this limit, federal involvement in the National Guard has expanded greatly over time. For example, Congress, pursuant to its authority under the second Militia Clause, has empowered the President to "prescribe regulations, and issue orders, necessary to organize, discipline, and govern the National Guard." Despite this authority, the individual states still retain most control over the National Guard when it is not called into federal service by the President.

M. Salo, *President or Governor: Who Will Determine Whether the National Guard Helps Secure the Border?* 47 Houston Law Review 437, 440 (Spring 2010). The author concludes:

> Conclusion.

> The U.S. Constitution grants Congress both the power to raise armies and to call forth the militia of the several states in certain instances. Pursuant to the former, Congress has created a dual enlistment system in which new members of the National Guards of the several states simultaneously enlist in the National Guard of the United States, which is considered a reserve component of the federal military. Congress has delegated some power to the executive branch to federalize National Guardsmen under this dual enlistment system. However, unless Congress declares war, national emergency, or otherwise authorizes, the executive branch is limited, to a certain extent, by a statutory requirement to receive gubernatorial consent before it can move a member of the National Guard into his role as a member of the National Guard of the United States. For missions within U.S. territory, the President would have to obtain this consent before he could federalize a state's National Guard in its role as a reserve component of the federal military.

47 Houston Law Review 459-60.

Reviewing the state of the law governing the National Guard in 2005, the Air Force Law Review observed that "It is long-settled law that the governor of each state has almost unbridled power over its militia." J. F. Romano, *State Militias and the United States: Changed Responsibilities for a New Era*, 56 Air Force Law Review 233 (2005).

Not surprisingly, the United States Supreme Court has held that a Maryland Air National Guard pilot is not a federal employee regardless of whether he was serving as a "civilian" or a "military" employee of the Guard while piloting an Air Guard airplane. When the Maryland Air National Guard pilot negligently flew his Air Guard plane so that it collided with a civilian airplane, killing all on board the civilian plane, the pilot's actions were those of the State of Maryland, not the federal government. The Court noted:

> It is not argued here that military members of the Guard are federal employees, even though they are paid with federal funds and must conform to strict federal requirements in order to satisfy training and promotion standards. Their appointment by state authorities and the immediate control exercised over them by the States make it apparent that military members of the Guard are employees of the States, and so the courts of appeals have uniformly held.

Maryland for the use of Levin v. United States, 381 U.S. 41 (1965).

The Governor of Vermont, in exercising his "almost unbridled" control of the Air Guard and the Army Guard under federal law, is bound by the *Vermont* constitution and by *Vermont* statutes. The Vermont Constitution, Chapter 2, § 59 states that "The inhabitants of this state shall be trained and armed for its defense..." That training and arming must be consistent with regulations adopted by the Congress and the Vermont legislature. The Vermont legislature has adopted sections 361(b) and 601 of Title 20. These statutes make two principles clear: 1) only those federal regulations approved of by the Governor of Vermont will regulate the Vermont National Guard when it is not in "federalized" status; and 2) the Governor of Vermont possesses the authority and carries the duty to regulate and command the Vermont Guard to protect Vermonters in the event of riot, rebellion, insurrection within the state, opposition to the service of process, invasion, disaster or emergency.

> 361(b): The organized militia shall be known as the national guard, and shall consist of such organizations and personnel of such arm, service, corps or department as may from time to time be required by the federal government to be maintained in the state, organized in accordance with regulations prescribed therefor by the federal government and approved by the governor. The governor may alter, divide, annex, consolidate, disband or reorganize the same and create new organizations, when the regulations prescribed by the federal government shall so require, in order that the national guard of this state shall conform to any system of drill, discipline, administration and instruction now or hereafter prescribed for the armed forces of the United States. The governor shall prescribe all necessary regulations for the government of the national guard pursuant to this section
>
> 601: The commander in chief or, in his absence, the lieutenant governor, or, in the absence of both, the adjutant and inspector general, in case of riot, rebellion or insurrection within the state or in case of great opposition to the service of legal process, whether civil or criminal, or in case of invasion or imminent danger thereof, or in case of disaster, or emergency proclaimed by the governor, may call out the national guard, or such parts thereof as he or she deems necessary, and

> may order such force into camp for instruction and drill. Until discharged by order of the commander in chief such force shall be subject to his or her order and shall be governed by the regulations prescribed for the army of the United States; and the commander in chief may order the same into camp for instruction and drill when in his or her judgment the interests of the state require.

In contrast, the United States Air Force is prohibited from engaging in the suppression of riot, rebellion, insurrection or opposition to the service of process unless specifically authorized to do so by Congress or unless *federal* laws cannot be enforced. See 47 Houston Law Review at pages 449-459 (discussing the Posse Comitatus Act).

There is at least one book devoted entirely to the history of the Air National Guard, Rene J. Francillon's *The United States Air National Guard; A complete reference work to the ANG history, aircraft, units and insignia* (Aerospace Publishing 1993). Its opening sentence states: "The National Guard concept – placing military forces under the control of local governments instead of the central government – is a uniquely American phenomenon." It continues ""In non-mobilized status these units are commanded by the governors of the 50 states… Upon being called into service by the President, or Congress or both, ANG units have, like all other units of the United States Armed Forces, the President of the United States as their commander-in-chief." It notes that the Army Air Force was transformed into the United States Air Force, and the National Guard was divided into the Army National Guard and the Air National Guard, by the National Security Act of 1947, Public Law 253.

The State's independent constitutional and statutory mission for its Guard units means that, unless "federalized" under the control of the President, Guard units remain subject to state law. One such law, obviously, is § 601, quoted above. The Supremacy Clause of the U.S. Constitution does not apply federal law to the operation of a Vermont National Guard airplane

by *state* employees carrying out the *state* constitution and *state* statutes under the supervision of the *state* Governor. Nor does the Supremacy Clause apply federal law to the construction of facilities by *state* employees at a *municipally*-owned airport to serve that *state-operated* airplane. As the Supreme Court explained in Maryland in the use of Levin v. Department of Defense, even though Air Guard pilots fly aircraft owned by the federal government, they are state employees accountable to the State's Governor when they do so. But the DEIS fails to address any state laws; it wrongly assumes that no Vermont laws whatsoever will govern the construction of improvements for the F-35A or the operation of the F-35A were it allowed to operate in Vermont. Vermont statutory law (Act 250), the Vermont common law of nuisance, South Burlington's zoning ordinance, and South Burlington's noise ordinance (part of its Public Nuisance Ordinance) set forth regulatory and mitigation measures that implement Vermont's police power authority. Vermont's Governor also has the state constitutional and state statutory authority to implement mitigation measures as the Commander in Chief of the National Guard during construction and operation. The DEIS' completely fails to identify these regulatory and mitigation requirements and opportunities, in violation of the Air Force's own regulations and those of the Council on Environmental Quality (CEQ), 32 C.F.R. § 989.22 and 40 C.F.R. §§ 1502.14, 1502.16 and 1508.20. These failings are discussed in section I, below, along with other substantial defects in the DEIS' presentation and review of mitigation measures.

On the other hand, if the Department of the Air Force takes the position that state and local land use laws are preempted, that position triggers another clear mandate of NEPA that has been violated – the duty in the EIS to identify state and local land use laws that would be in conflict with the project. 40 C.F.R. §§ 1502.16(c), 1506.2(d). In this DEIS, the Air Force neither GP-18

addresses how state and local laws could regulate or mitigate the project's impacts, nor does it identify the state and local laws that it claims the Air Guard can supersede by invoking preemption. For a DEIS purporting to provide evaluation of the environmental effects of basing of an aircraft with unprecedented land use impacts – imposing noise, on the ground, at Lmax values of 115 db, four times louder than existing aircraft, and inflicting 65 dB DNL on thousands of residents -- at a state Air Guard base, this omission renders the document essentially. It lacks the most basic information needed by the decision-maker and the public and required by federal law. In part II, below, counsel addresses this critical failing.

It is a basic principle of NEPA law that the definition of a project's "Purpose and Need" determines the scope of the alternatives to that project that are reasonable to consider. In establishing the Purpose and Need for the F-35A, the DEIS wrongly assumed that the purpose of the Air Force is the same as the purpose of the Vermont Air National Guard, and that the need by the Air Guard for a new fighter plane is the same as the need that the Air Force may have. Once the differing missions of the two agencies are recognized, reasonable alternatives to basing the F-35A at the Vermont Air Guard become readily apparent, such as meeting the combined needs of the Air Force and the Air Guard by stationing F-25A jets at an Air Force basis, not an Air Guard base, and meeting the Air Guard's needs with aircraft other than the F-35A. These alternatives, and the duty under NEPA to examine their costs and benefits, are addressed in Part III of this memorandum. GP-20

A fourth major flaw in the DEIS pertains to health impacts on children, over a thousand of whom will be placed in harm's way by the project. The DEIS uses out of date health information and fails to recognize the now generally accepted harm to cognitive development of NO-8

children who are exposed to chronic noise of the loudness and frequency proposed. And, in another failure to examine mitigation, the DEIS wholly fails to consider *any* mitigation measures that the Air Guard could and should engage in to minimize or avoid entirely these tragic impacts on children. This is discussed in part IV.

A fifth failing is the absence of any discussion of the harm to the financial resources of the thousands of homeowners who will lose significant equity in their homes if the F-35A is allowed to operate, and of the millions of dollars of lost tax base that the City of Winooski in particular will suffer. An EIS by law must examine the reasonably likely impacts that will flow from the project, and also means to mitigate these impacts. This EIS does neither, with respect to these impacts. This is discussed in part V. SO-1

A sixth major error is the DEIS' treatment of historic properties. The DEIS refers generically to historic district properties in Winooski but does not identify what they consist of, or where they are located, or what the impacts on them would be. In fact, properties listed on the National Register of Historic Places comprise the core of Winooski's character and its recent revitalization -- and yet will fall within the highest noise zone of the F-35A, subjected daily to Lmax values of 115 dB, violating the public health standards of the World Health Organization and the National Institutes of Occupational Safety and Health. They will be subject to DNL noise levels of 65 dB or higher, rendering them unsuitable for residential use – even though most of them are historic *residential* properties. An EIS that fails to identify these historic residential properties, fails to determine whether they are residential or not, fails to assess the impacts of 65 DNL or louder noise on their continued viability as historic residential properties, and fails to consider alternatives to the project that would avoid these impacts, makes a mockery of both CR-1

NEPA and the National Historic Preservation Act, discussed below in part VI. The United States Air Force can and must do better.

I. THE DEIS UNLAWFULLY FAILS TO CONSIDER MITIGATION MEASURES AVAILABLE UNDER STATE LAW

NO-1

Section 989.22 of the Air Force's NEPA regulations state (emphasis added):

> **§ 989.22 Mitigation.**
>
> (a) When preparing EIAP documents, indicate clearly whether mitigation measures (40 CFR 1508.20) must be implemented for the alternative selected. If using Best Management Practices (BMPs), identify the specific BMPs being used and include those BMPs in the mitigation plan. Discuss mitigation measures in terms of "will" and "would" when such measures have already been incorporated into the proposal. Use terms like "may" and "could" when proposing or suggesting mitigation measures. Both the public and the Air Force community need to know what commitments are being considered and selected, and who will be responsible for implementing, funding, and monitoring the mitigation measures.
>
> (b) The proponent funds and implements mitigation measures in the mitigation plan that is approved by the decision-maker. Where possible and appropriate because of amount, the proponent should include the cost of mitigation as a line item in the budget for a proposed project. The proponent must ensure compliance with mitigation requirements, monitoring their effectiveness, and must keep the EPF informed of the mitigation status. The EPF reports its status, through the MAJCOM, to HQ USAF/A7CI when requested. Upon request, the EPF must also provide the results of relevant mitigation monitoring to the public.
>
> (c) The proponent may "mitigate to insignificance" potentially significant environmental impacts found during preparation of an EA, in lieu of preparing an EIS. The FONSI for the EA must include these mitigation measures. Such mitigations are legally binding and must be carried out as the proponent implements the project. If, for any reason, the project proponent later abandons or revises in environmentally adverse ways the mitigation commitments made in the FONSI, the proponent must prepare a supplemental EIAP document before continuing the project. If potentially significant environmental impacts would result from any project revisions, the proponent must prepare an EIS.

> (d) For each FONSI or ROD containing mitigation measures, the proponent prepares a plan specifically identifying each mitigation, discussing how the proponent will execute the mitigations, identifying who will fund and implement the mitigations, and stating when the proponent will complete the mitigation. The mitigation plan will be forwarded, through the MAJCOM EPF to HQ USAF/A7CI for review within 90 days from the date of signature of the FONSI or ROD.

The CEQ regulations define mitigation to include:

> (a) Avoiding the impact altogether by not taking a certain action or parts of an action.
>
> (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
>
> (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
>
> (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
>
> (e) Compensating for the impact by replacing or providing substitute resources or environments.

40 C.F.R. § 1508.20.

The discussion of alternatives is "the heart" of the EIS, according to CEQ. 40 C.F.R. § 1502.14. The Air Force has a duty to "rigorously explore and objectively evaluate all reasonable alternatives." Included within the alternatives that must be rigorously explored and objectively evaluated are "alternatives not within the jurisdiction of the lead agency" – the Air Force – and "appropriate mitigation." 40 C.F.R. § 1502.14(a), (c) and (f). See also § 1502.16(h).

This DEIS fails to meet these standards. Sections 2.6, BR2.6, BR 2.7 and BR 2.8 discuss only a limited set of mitigation measures that consist entirely of scheduling of aircraft flights and

education of pilots to minimize noise during take-off and landing.

The DEIS also notes, in passing, that the City of Burlington *might* extend its FAA Part 150 buyout of homes to include homes impacted by the F-35A. There is no plan by "the proponent" of the project, the Air Force, to institute any buy-out, nor any identification of how many homes might be purchased, nor any analysis of the cost of or who will fund the buy-out, nor any date of completion. This mention of suggested possible mitigation does not constitute rigorous identification and objective evaluation of the extent or effectiveness of the potential mitigation. This does not suffice under the Air Force's own regulation or the CEQ standard.

Wholly absent from the discussion of mitigation is identification of mitigation measures that state and local officials may impose. Vermont Act 250, found at 10 V.S.A. chapter 151, and South Burlington's zoning ordinance and noise ordinance are not mentioned. All three are "mitigation" as defined by CEQ. Application of Act 250 and the local ordinances may result in:

(a) Avoiding the impact altogether by not taking a certain action or parts of an action.

If an Act 250 permit is denied, or a zoning permit is denied, construction of the new facilities needed for the F-35A will not occur. If an Act 250 permit or a zoning permit is denied for the "change of use" contemplated for the existing runway – an already permitted use – then operation of the F-35A will not occur. The Air Force and the Air Guard are already well aware of this prospect, as the undersigned has provided notice to them of the Act 250 Jurisdictional Opinion which he has sought on behalf of his clients. The question of whether the construction of new facilities for the F-35A, and the operation of the F-35A on existing runways, requires an Act 250 permit is presently

before the Environmental Division of the Vermont Superior Court, in docket no. 42-4-13 Vtec. A copy of the Statement of Questions for Appeal, that will be decided by that Court, is attached to these comments. The Environmental Board and the Environmental Court have determined under 10 V.S.A. S 6086(8) that noise above 55 dB Lmax at residences is incompatible with residential use and areas of frequent human use and has denied permits on that basis. In Re: McLean Enterprises Corporation, #281147-1-EB, Findings of Fact, Conclusions of Law, and Order at p. 65-66 (November 24, 2004), Re: Alpine Stone Corporation ADA Chester Corp. and Ugo Quazzo, No. 2S1103-EB, Findings of Fact, Concl. Of Law, and Order, at 32 (Vt. Envtl. Bd, Feb. 4 2002); Big Rock Gravel Act 250 Permit, Docket No. 45-3-12 Vtec (Nov. 28, 2012) pp.7-8. If there is state jurisdiction, no reasonable reader of these rulings would conclude that the F-35A would meet these standards.

Application of Act 250 or the local zoning ordinance and noise ordinance also may result in:

> (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
>
> (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
>
> (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

The Act 250 District Commission or the Environmental Division, or the South Burlington Development Review Board, or the code enforcement officer, may issue conditions on operation

that go well beyond those suggested in the DEIS, such as imposing noise limits. Section 4 of the South Burlington Nuisance ordinance states:

> It shall be unlawful for any person to make or cause to be made any loud or unreasonable noise. Noise shall be deemed to be unreasonable when it disturbs, injures or endangers the peace or health of two or more unrelated people or when it endangers the health, safety or welfare of the community. Any such noise shall be considered to be a noise disturbance and a public nuisance.

The Act 250 District Commission and the South Burlington DRB and the South Burlington code enforcement officer have the authority not only to deny a permit to the Air Guard for the F-35A but also to require the Air National Guard to fund noise mitigation measures that would reduce noise impacts, such as providing individual hearing protection equipment to South Burlington and Winooski residents. The DEIS, again, is silent on any mitigation measures other than flight scheduling.

> Application of state common law may result in:
>
> (e) Compensating for the impact by replacing or providing substitute resources or environments.

Under the Vermont common law of nuisance and of trespass, the Vermont Air National Guard and/or the City of Burlington may be ordered to compensate landowners for the interference with the reasonable enjoyment of, and diminution in value of, their property that would arise from operation of the F-35As. Operation of the F-16s, which produce ¼ of the noise that the F-35As would produce, already has reduced property values in South Burlington by tens of millions of dollars. See the attached report from Larson Appraisal Services dated July 13, 2013, finding that the average loss of value of the 110 homes purchased in the 65 DNL zone under Part 150 is $33,534 per home. The DEIS predicts that three thousand additional homes would be placed in

the 65 DNL zone by operation of the F-35A, resulting in nearly $100 million in property losses. Who will pay these losses – the State or the City? How will thousands of homeowners be compensated – will they each need to bring suit in Superior Court? At what cost to the Vermont court system and the public? The DEIS is silent on all these issues.

Finally, Vermont's Governor, as the Commander in Chief of the National Guard during construction and operation, would have the authority to order mitigation measures beyond those considered in the DEIS. She or he could order: a) a halt to flights of the F-35A; b) that compensation be paid to affected landowners; c) that F-35As land and take off only at specified, publicized times so that school administrators and parents can provide hearing protection to children at those times, and school activities can be scheduled around these disruptions; d) that the Air Guard or other State agency provide hearing protection to children and members of the public; e) that the Air Guard or other State agency provide sound-proofing to schools, businesses and homes; and f) that the Air Guard or other State agency provide medical monitoring to affected children and adults.

The DEIS falls far below the requirements of NEPA, as established by the U.S. Supreme Court:

> The requirement that an EIS contain a detailed discussion of possible mitigation measures flows both from the language of the Act and, more expressly, from CEQ's implementing regulations. Implicit in NEPA's demand that an agency prepare a detailed statement on "any adverse environmental effects which cannot be avoided should the proposal be implemented," 42 U.S.C. § 4332(C)(ii), is an understanding that the EIS will discuss the extent to which adverse effects can be avoided. See D. Mandelker, NEPA Law and Litigation § 10:38 (1984). More generally, omission of a reasonably complete discussion of possible mitigation measures would undermine the "action-forcing" function of NEPA. Without such a discussion, neither the agency nor other interested groups and individuals can properly evaluate the severity of the adverse effects. An adverse effect that can be fully remedied by, for example, an inconsequential public expenditure is certainly

> not as serious as a similar effect that can only be modestly ameliorated through the commitment of vast public and private resources. Recognizing the importance of such a discussion in guaranteeing that the agency has taken a "hard look" at the environmental consequences of proposed federal action, CEQ regulations require that the agency discuss possible mitigation measures in defining the scope of the EIS, 40 CFR § 1508.25(b) (1987), in discussing alternatives to the proposed action, § 1502.14(f), and consequences of that action, § 1502.16(h), and in explaining its ultimate decision, § 1505.2(c).

Robertson v. Methow Valley Citizens Council, 490 U.S. 332 (1989).

II. THE DEIS UNLAWFULLY FAILS TO CONSIDER STATE AND LOCAL LAND USE REGULATIONS THAT WOULD CONFLICT WITH THE PROJECT

GP-21

The two-fold purpose of an EIS has been repeatedly recognized by CEQ and the courts. It is to provide the decision-maker *and* the public *each* with sufficient information about the goals, alternatives and effects of a proposed federal action so that the decision-maker can make an informed decision and so that the public can utilize the tools of American democracy to affect that result.

> We thus endeavor to determine whether the final supplemental EIS satisfies the two purposes of an EIS: (1) to provide decisionmakers with enough information to aid in the substantive decision whether to proceed with the project in light of its environmental consequence; and (2) to provide the public with information and an opportunity to participate in gathering information. *Citizens for a Better Henderson v. Hodel,* 768 F.2d 1051, 1056 (9th Cir.1985); *California v. Block,* 690 F.2d 753, 761 (9th Cir.1982) (the "form, content and preparation [of the EIS] foster both informed decision-making and informed public participation"); 40 C.F.R. § 1502.1 (purpose of EIS is to "provide full and fair discussion of significant environmental impacts and ... [to] inform the decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts ...").

Oregon Natural Resources Council v. Marsh, 832 F.2d 1489, 1492-93 (9th Cir.1987) *rev'd in part on other grounds* 490 U.S. 360 (1990). The process is not intended to a purely technocratic one, made by a federal official closeted in a room filled with studies. The process is intended to

ignite public involvement and public debate, and that involvement and debate is intended to inform the final decision. Calvert Cliffs Coordinating Comm., Inc. v. U.S. Atomic Energy Commission, 449 F.2d 1109, 1123 (D.C. Cir. 1971)(Intent of NEPA is to use the EIS process to educate the public about the proposal and thus allow them to "rais[e] a wide range of environmental issues in order to affect particular Commission decisions."); Natural Resources Defense Council v. Morton, 458 F.2d 827, 833 (D.C. Cir. 1972) ("Congress contemplated that the Impact Statement would constitute the environmental source material for the information of the Congress as well as the Executive, in connection with the making of relevant decisions, and would be available to enhance enlightenment of-and by-the public.")

Section 1502.16 states that an EIS "shall" include discussion of "(c) Possible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned. (See § 1506.2(d).)" Section 1506.2(d) states:

> To better integrate environmental impact statements into State or local planning processes, statements shall discuss any inconsistency of a proposed action with any approved State or local plan and laws (whether or not federally sanctioned). Where an inconsistency exists, the statement should describe the extent to which the agency would reconcile its proposed action with the plan or law.

If it is the position of the Air Force to be that the Air Guard need not comply with Act 250, the South Burlington zoning ordinance or the South Burlington noise ordinance, the Air Force must comply with § 1502.16 and 1506.2(d). The regulations use the word "shall."

Failure to comply with these sections frustrates the intent of Congress in adopting NEPA that federal agencies work in cooperation with state and local governments.

> … The policy goals of NEPA are to be achieved "in cooperation with State and

> local governments." Section 101(a), 42 U.S.C. § 4331(a).
>
> When local zoning regulations and procedures are followed in site location decisions by the Federal Government, there is an assurance that such "environmental" effects as flow from the special uses of land-the safety of the structures, cohesiveness of neighborhoods, population density, crime control, and esthetics-will be no greater than demanded by the residents acting through their elected representatives. There is room for the contention, and there may even be a presumption, that such incremental impact on the environment as is attributable to the particular land use proposed by the Federal agency is not "significant," that the basic environmental impact from the project derives from the land use pattern, approved by local authorities, that prevails generally for the same kind of land use by private persons.
>
> When, on the other hand, the Federal Government exercises its sovereignty so as to override local zoning protections, NEPA requires more careful scrutiny. NEPA has full vitality, and its policies cannot be taken as effectuated by local land use control, where the proposal of the Federal Government reflects a distinctive difference in kind from the types of land use, proposed by private and local government sponsors, that can fairly be taken as within the scope of local controls.

Maryland-National Capital Park and Planning Commission v. U.S. Postal Service, 487 F.2d 1029, 1036-37 (D.C.Cir. 1973).

Is it the intent of the Air Force and the Air Guard to disregard Act 250 and local law? If so, that choice needs to be part of the public disclosure and public debate that NEPA directs must occur before the Air Force makes a decision, as required by 40 C.F.R. § 1502.1, Oregon Natural Resources Council v. Marsh, Calvert Cliffs, and Natural Resources Defense Council v. Morton. It would frustrate the basic purpose of NEPA to keep under wraps, until after the Air Force has made its decision, the Air Guard's intent to comply, or not comply, with the state and local land use laws duly adopted by the General Assembly of Vermont and the South Burlington City Council.

III. THE DEIS UNLAWFULLY RELIES ON AN OVERLY NARROW STATEMENT OF PURPOSE AND NEED AND FAILS TO CONSIDER REASONABLE ALTERNATIVES

The statement of purpose and need, in any DEIS, is the controlling concept. Only those alternatives that will serve that purpose and need will be considered. A statement of purpose and need that is so narrow that it allows for consideration only of the outcome that the federal agency has already decided it favors is at odds with the basic purposes of Act. It not only will deprive the decision-maker of relevant information about realistic alternatives, but it will prevent public knowledge or and debate about the realistic choices that are available to the agency. Then-Judge Thomas described the problem in a case he decided before he was selected as a Justice of the United States Supreme Court:

> We have held before that an agency bears the responsibility for deciding which alternatives to consider in an environmental impact statement. *See North Slope Borough v. Andrus,* 642 F.2d 589, 601 (D.C.Cir.1980). We have also held that an agency need follow only a "rule of reason" in preparing an EIS, *see Natural Resources Defense Council, Inc. v. Morton,* 458 F.2d 827, 834, 837 (D.C.Cir.1972), and that this rule of reason governs "both *which* alternatives the agency must discuss, and the *extent* to which it must discuss them," *Alaska v. Andrus,* 580 F.2d at 475; *see Allison v. Department of Transp.,* 908 F.2d 1024, 1031 (D.C.Cir.1990). It follows that the agency thus bears the responsibility for defining at the outset the objectives of an action. *See City of Angoon v. Hodel,* 803 F.2d at 1021; *cf.* 40 C.F.R. § 1502.13. As the phrase "rule of reason" suggests, we review an agency's compliance with NEPA's requirements deferentially. We uphold an agency's definition of objectives so long as the objectives that the agency chooses are reasonable, and we uphold its discussion of alternatives so long as the alternatives are reasonable and the agency discusses them in reasonable detail.
>
> We realize, as we stated before, that the word "reasonable" is not self-defining. Deference, however, does not mean dormancy, and the rule of reason does not give agencies license to fulfill their own prophecies, whatever the parochial impulses that drive them. Environmental impact statements take time and cost money. <u>Yet an agency may not define the objectives of its action in terms so unreasonably narrow that only one alternative from among the environmentally benign ones in the agency's power would accomplish the goals of the agency's action, and the EIS would become a foreordained formality.</u> *See City of New York*

> *v. Department of Transp.,* 715 F.2d at 743. Nor may an agency frame its goals in terms so unreasonably broad that an infinite number of alternatives would accomplish those goals and the project would collapse under the weight of the possibilities.
>
> Instead, agencies must look hard at the factors relevant to the definition of purpose. When an agency is asked to sanction a specific plan, *see* 40 C.F.R. § 1508.18(b)(4), the agency should take into account the needs and goals of the parties involved in the application. *See, e.g., Louisiana Wildlife Fed'n v. York,* 761 F.2d 1044, 1048 (5th Cir.1985) (per curiam); *Roosevelt Campobello Int'l Park Comm'n v. EPA,* 684 F.2d 1041, 1046-47 (1st Cir.1982). Perhaps more importantly, an agency should always consider the views of Congress, expressed, to the extent that the agency can determine them, in the agency's statutory authorization to act, as well as in other congressional directives. *See City of New York v. Department of Transp.,* 715 F.2d at 743-45 (Congress instructed the Department of Transportation to create safety regulations for carrying nuclear fuel by interstate highway; the Department was not required to discuss the unreasonable alternative of carrying nuclear fuel around New York City by barge); *cf. Izaak Walton League of Am. v. Marsh,* 655 F.2d 346, 372 (D.C.Cir.) ("When Congress has enacted legislation approving a specific project, the implementing agency's obligation to discuss alternatives in its [EIS] is relatively narrow."), *cert. denied,* 454 U.S. 1092, 102 S.Ct. 657, 70 L.Ed.2d 630 (1981).
>
> Once an agency has considered the relevant factors, it must define goals for its action that fall somewhere within the range of reasonable choices. We review that choice, like all agency decisions to which we owe deference, on the grounds that the agency itself has advanced. *See SEC v. Chenery Corp.,* 332 U.S. 194, 196, 67 S.Ct. 1575, 1577, 91 L.Ed. 1995 (1947).

Citizens of Burlington, Inc., v. Busey, 938 F.2d 190 (D.C.Cir. 1991).

The Department of the Air Force, in this matter, has done just what Justice Thomas warned against. In disregard of the views of Congress, the drafters of the U.S. Constitution and the Vermont legislature discussed above, Section 1 of the DEIS, the "Purpose and Need" section, assumes that the role of the Vermont Air National Guard is the same as that of the Air Force. The Air Guard is treated as a nothing more than one component of the Combat Air Forces, along with the Air Combat Command (ACC) and the Air Force Reserve Command (AFRC).

Therefore, if the ACC has a "need" for the F-35A as the "premier air-to-ground strike fighter," necessarily so does the Air Guard generally and the Vermont Air Guard in particular.

This unexamined assumption should not have formed the basis for the DEIS's statement of Purpose and Need. In Alliance for Legal Action v. Federal Aviation Administration, 69 Fed Appx 617 (4th Cir. 2003), the F.A.A. prepared an EIS to consider whether to expand an airport to accommodate the needs of FedEx. The Court of Appeals ruled that the goals of FedEx must be considered in determining the purpose and need for the expansion, as well as the goals set by Congress for the F.A.A.

> The statement of a project's purpose and need is left to the agency's expertise and discretion, and we defer to the agency if the statement is reasonable. *Friends of Southeast's Future.* 153 F.3d at 1066-67. The reasonableness of a given statement of purpose and need depends first on the nature of the proposed federal action. Here, the FAA prepared the EIS to consider the environmental impacts of its approval of a proposal sponsored from outside the agency. In this situation, the project sponsor's goals play a large role in determining how the purpose and need is stated. *See Citizens Against Burlington, Inc. v. Busey,* 938 F.2d 190, 196 (D.C.Cir.1991); *La. Wildlife Fed'n v. York,* 761 F.2d 1044, 1048 (5th Cir.1985) (per curiam). *But see Van Abbema v. Fornell,* 807 F.2d 633, 638 (7th Cir.1986) (noting that the agency should consider the project's "*general* goal ... to deliver coal from mine to utility," not the sponsor's goal of building a coal dock). At the same time, the goals that Congress has set for the agency must also figure into the formulation of the statement. *Citizens Against Burlington,* 938 F.2d at 196.

More important to the public than FedEx's goals are the constitutional and statutory missions of the Air Guard in general and the Vermont Air National Guard in particular. The DEIS wrongly assumed them to be the same as those of the Air Force. Instead of taking a "hard look" at the factors defining the purpose and need for this project by the Vermont Air Guard or any Air Guard unit, the Air Force took no look at all. There is no mention, much less evaluation, of why the Vermont Air Guard or any Air Guard unit needs a stealth air-to-ground attack fighter such as the F-35A. There is no mention, much less evaluation, of how the F-35A

would or would not assist the Vermont Air Guard or any Air Guard in carrying out the mission of the Air Guard as compared to the F-16.

Francillon's *The United States Air National Guard* explains (p.9) that over the course of its history the mission of each Air National Guard unit has been "the protection of life (such as by flying search-and-rescue missions) and property (such as by providing specially-fitted C-130s to fight forest fires)" and "the preservation of peace, order and public safety (for example, by airlifting riot-control units)..." Upon cessation of World War II, the first statement of the Air Guard's mission, set forth in the Report of the Chief of the Nation Guard Bureau, included "To provide sufficient organizations in each state so trained and equipped as to enable them to function efficiently at existing strength in the protection of life and property and the preservation of peace, order and public safety, under competent orders of the state authorities." Francillon, pp.38-39. Would the F-35A assist in these missions? Would replacement of F-16s by F-35As render these missions more difficult? The DEIS is silent on these critical factors.

As a result of this lacuna, the range of reasonable alternatives was unlawfully restricted. Reasonable alternatives that should have been considered were not considered – basing the F-35As proposed for Burlington at an Air Force base instead of at another Air Guard base, or basing *all* of the F-35As at Air Force bases. The DEIS *assumes* that if the F-35A is to be placed into use, it must be placed into use at at least one Air Guard facility and, apparently, the Air Force favors Burlington over other Air Guard bases. The DEIS never explains the basis for that assumption -- which unspoken assumption has had the effect of trumping every single other factor in the entire DEIS.

The failure to consider *any* no-Air Guard option violated 40 C.F.R. § 1502.14 (consideration of reasonable alternatives is "the heart" of an EIS; the agency has a duty to "rigorously explore and objectively evaluate all reasonable alternatives"). It also violated Air Force NEPA regulation 989.8, which states

> **§ 989.8 Analysis of alternatives.**
>
> (a) The Air Force must analyze reasonable alternatives to the proposed action and the "no action" alternative in all EAs and EISs, as fully as the proposed action alternative.
>
> (b) "Reasonable" alternatives are those that meet the underlying purpose and need for the proposed action and that would cause a reasonable person to inquire further before choosing a particular course of action. Reasonable alternatives are not limited to those directly within the power of the Air Force to implement. They may involve another government agency or military service to assist in the project or even to become the lead agency. The Air Force must also consider reasonable alternatives raised during the scoping process (see § 989.18) or suggested by others, as well as combinations of alternatives. The Air Force need not analyze highly speculative alternatives, such as those requiring a major, unlikely change in law or governmental policy. If the Air Force identifies a large number of reasonable alternatives, it may limit alternatives selected for detailed environmental analysis to a reasonable range or to a reasonable number of examples covering the full spectrum of alternatives.
>
> (c) The Air Force may expressly eliminate alternatives from detailed analysis, based on reasonable selection standards (for example, operational, technical, or environmental standards suitable to a particular project). In consultation with the EPF, the appropriate Air Force organization may develop written selection standards to firmly establish what is a "reasonable" alternative for a particular project, but they must not so narrowly define these standards that they unnecessarily limit consideration to the proposal initially favored by proponents. This discussion of reasonable alternatives applies equally to EAs and EISs.
>
> (d) Except in those rare instances where excused by law, the Air Force must always consider and assess the environmental impacts of the "no action" alternative. "No action" may mean either that current management practice will not change or that the proposed action will not take place. If no action would result in other.predictable actions, those actions should be discussed within the no

> action alternative section. The discussion of the no action alternative and the other alternatives should be comparable in detail to that of the proposed action.

Since the DEIS contains no analysis of the no-Air Guard option, the DEIS does not evaluate this option "as fully as the proposed action alternative" and does not evaluate this obvious means of continuing "the current management practice" at the Burlington Air Guard station.

IV. THE DEIS UNLAWFULLY FAILS TO CONSIDER CURRENT INFORMATION ON THE HEALTH IMPACTS ON CHILDREN OF LOUD NOISE

The attached report from Mr. Joseph and Mr. Leas summarizes the failure of the DEIS to consider current information as to the health effects of loud noise. Referring to the World Health Organization's report, *Burden of Disease from Environmental Noise*, 2011, the report focuses on section C2.5.5 of the DEIS (emphasis added):

> **Significant omission**
> While the revised DEIS properly includes a number of studies demonstrating the association between noise exposure and cognitive impairment in children, the important confirmation of the findings and the development of the exposure-response relationship found in the recent WHO study are omitted. What the WHO study shows is that 50% of the children in the 65 dB noise zone are expected to suffer cognitive impairment. There are currently approximately 1500 children living in the proposed F-35 65 dB noise contour. The number of children expected to suffer cognitive impairment will increase each year the F-35 is based in Burlington. An acknowledgement of the magnitude of this special risk to the children of our community is omitted in the revised DEIS—both in Appendix C and also in the discussion of environmental impacts in Volume I under the heading of "Protection of Children" and elsewhere. Beyond generalized statements of the vulnerability of children, there is no mention whatsoever of specific harmful effects of the F-35 on children.

See also the attached copy of Chapter 47 of Ballou, Glen, *Handbook for Sound Engineers* (Elsevier,2008), showing that the predicted 115 dB levels on the ground for even relatively short periods of time violate WHO and NIOSH standards for adults as well as children. Section 1502.16 of the CEQ regulations required the DEIS to identify and evaluate these impacts.

The DEIS thus not only fails to address the Vermont statutes that ordinarily would protect Vermonters against the production of noise loud enough to harm children will or will not apply to this project, but it also fails to even *mention* that there is a medical consensus that 50% of the children in Winooski would suffer cognitive impairment if the F-35A were to become operational at the Burlington Air Guard base and produce the level of noise that the DEIS itself says the F-35As will produce. This DEIS falls far short of the intent of Congress in adopting NEPA.

V. THE DEIS UNLAWFULLY FAILS TO CONSIDER DAMAGE TO PROPERTY INTERESTS AND MUNICIPAL TAX BASE AND HOW THESE DAMAGES MAY BE MITIGATED

Section 4332 of Title 42 states:

> The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this chapter, and (2) all agencies of the Federal Government shall--
>
> **(A)** utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;
>
> **(B)** identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by subchapter II of this chapter, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;
>
> **(C)** include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on--
>
> (i) the environmental impact of the proposed action,

> **(ii)** any adverse environmental effects which cannot be avoided should the proposal be implemented,
>
> -
>
> **(iii)** alternatives to the proposed action,
>
> **(iv)** the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
>
> **(v)** any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Section 1502.16 requires that an EIS evaluate all environmental consequences from the proposed action, both direct and indirect. The CEQ regulations flesh out the meaning of "the human environment" and what must be examined in an EIS. Section 1508.14 states:

> *Human environment* shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. (See the definition of "effects" (§ 1508.8).) This means that economic or social effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment.

The attached report from Larson Appraisal Services addresses an issue of immense importance to the affected community – the loss of value of homes. Mr. Larson reports an average loss of value of $33,534 per home in those areas of South Burlington already affected by 65 DNL of military aircraft noise. The DEIS predicts that over three thousand more homes will be placed within this zone. BR4-81. If the same average impact is found for those homes, the losses to the community would exceed $100 million.

The DEIS is silent about: 1) the impact on these thousands of additional homeowners of falling within the 65 DNL zone; 2) the impact on residential neighborhoods if 65 dB DNL homes are purchased and razed as part of a FAA Part 150 mitigation program, leaving vacant blocks in what are now residential areas; 3) the impacts on Winooski and Burlington of losing $100 million from their tax bases; 4) mitigation that is available under federal law or state law, such as claims by homeowners under the Federal Tort Claims Act against the Department of the Air Force or claims for nuisance against the City of Burlington and the State of Vermont under and Coty v. Ramsey Associates, Inc., 149 Vt. 451 (1988), or part 150 home-purchases and razing; and 5) the effect on the character of the historic City of Winooski if substantial portions of its historic core were to be purchased and razed as part of a Part 150 program. As to each of these areas, it is important and legally required by NEPA, that *other decision-makers* -- members of the public, the governance of the City of Burlington, the governance of the City of Winooski, and the governance of the State, recognize *now*, as part of the NEPA process, before the Air Force decision is made, what decisions they may be called upon to make if the F-35A becomes operational and affected homes lose $100 million in equity. Environmental Defense Fund v. Army Corps of Engineers, 492 F.2d 1123, 1136 (5th Cir. 1974).

The failure to identify and evaluate the harm to homeowners, to the tax base, to residential neighborhoods and to Winooski's character was error under § 4332 and 40 C.F.R. § 1502.16. The failure to identify or evaluate how these losses could be mitigated through financial compensation was error as well. 40 C.F.R. § 1502.14(a), (c) and (f); 40 C.F.R. § 1502.16(h); 32 C.F.R. § 989.22.

VI. THE DEIS UNLAWFULLY FAILS TO IDENTIFY AND EVALUATE HARM TO HISTORIC PROPERTIES

A sixth major error is the DEIS' treatment of historic properties. This error arises under both NEPA and the National Historic Preservation Act.

Section 1502.15 and 1502.16 of the CEQ regulations states:

> 1502.15 Affected environment. The environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration. The descriptions shall be no longer than is necessary to understand the effects of the alternatives. Data and analyses in a statement shall be commensurate with the importance of the impact, with less important material summarized, consolidated, or simply referenced. Agencies shall avoid useless bulk in statements and shall concentrate effort and attention on important issues. Verbose descriptions of the affected environment are themselves no measure of the adequacy of an environmental impact statement.
>
> § 1502.16 Environmental consequences. This section forms the scientific and analytic basis for the comparisons under § 1502.14. It shall consolidate the discussions of those elements required by sections 102(2)(C)(i), (ii), (iv), and (v) of NEPA which are within the scope of the statement and as much of section 102(2)(C)(iii) as is necessary to support the comparisons. The discussion will include the environmental impacts of the alternatives including the proposed action, any adverse environmental effects which cannot be avoided should the proposal be implemented, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented. This section should not duplicate discussions in § 1502.14. It shall include discussions of:
>
> (a) Direct effects and their significance (§ 1508.8).
>
> (b) Indirect effects and their significance (§ 1508.8).
>
> (c) Possible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned. (See § 1506.2(d).)
>
> (d) The environmental effects of alternatives including the proposed action. The comparisons under § 1502.14 will be based on this discussion.

(e) Energy requirements and conservation potential of various alternatives and mitigation measures.

(f) Natural or depletable resource requirements and conservation potential of various alternatives and mitigation measures.

(g) Urban quality, historic and cultural resources, and the design of the built environment, including the reuse and conservation potential of various alternatives and mitigation measures.

(h) Means to mitigate adverse environmental impacts (if not fully covered under § 1502.14(f)).

Section 470f of Title 16 (commonly referred to as § 106 of the National Historic Preservation Act) states:

> The head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the head of any Federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register.

The regulations issued by the Advisory Council on Historic Preservation include a mandate that historic properties be *identified* during the NEPA process that the impacts on these identified properties be *assessed* and that a mitigation plan be developed for each property during the NEPA process. 36 CFR § 800.8(c)(1) states (emphasis added):

> (1) *Standards for developing environmental documents to comply with Section 106*. During preparation of the EA or draft EIS (DEIS) the agency official shall:
>
> (i) Identify consulting parties either pursuant to § 800.3(f) or through the NEPA scoping process with results consistent with § 800.3(f);
>
> (ii) Identify historic properties and assess the effects of the undertaking on

> such properties in a manner consistent with the standards and criteria of §§ 800.4 through 800.5, provided that the scope and timing of these steps may be phased to reflect the agency official's consideration of project alternatives in the NEPA process and the effort is commensurate with the assessment of other environmental factors;
>
> (iii) Consult regarding the effects of the undertaking on historic properties with the SHPO/THPO, Indian tribes and Native Hawaiian organizations that might attach religious and cultural significance to affected historic properties, other consulting parties, and the Council, where appropriate, during NEPA scoping, environmental analysis, and the preparation of NEPA documents;
>
> (iv) Involve the public in accordance with the agency's published NEPA procedures; and
>
> (v) Develop in consultation with identified consulting parties alternatives and proposed measures that might avoid, minimize or mitigate any adverse effects of the undertaking on historic properties and describe them in the EA or DEIS.

Section 800.4 requires actual identification of historic sites, including if necessary field work.

Section 800.5 requires identification of site-specific impacts, including:

> (iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
>
> (v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;

The F-35A DEIS refers generically to historic district properties. It does not identify what they consist of, or where they are located, or what the impacts on them would be from noise. Is there one historic building or are there one hundred of them? Are they "eligible" or are they "listed?" Are they commercial buildings or residences? Will their *use* be affected by noise of 65 dB DNL or louder? None of these questions are asked or answered.

In fact, reference to the National Park Service's website reveals that these properties are

primarily residential, they are located both in Winooski and in Burlington, that they are all already "listed" and that there are many of them. The listed properties include but are not limited to the following: 1) "Mill District" which goes from the north bank of the river north to Center and Canal Streets, and from the south bank to Bartlett Street; 2) the district later was expanded to include 110 West Canal Street and other streets in Burlington; 3) the Winooski Block on East Allen and Main Streets in Winooski; and 4) the Methodist Episcopal Church on 24 W. Allen St.in Winooski. Without the benefit of an EIS that actually identifies these properties, counsel submits the following roughly accurate additional information about these areas gathered from community members:

> Spinner Place. This is a recently revitalized student resident complex that includes around 320 beds and retail/office/restaurant space on the first floor.
>
> VSAC Office Building. This too is a recently revitalized office building with over 300 people employed there. The state leases one floor for one of its departments.
>
> Woolen Mill Apartments. This is a large old mill building rehabbed over 30 years ago an apartment building. There are about 120 apartments in the complex and they are currently adding 31 new apartments in a separate building with additions.
>
> Champlain Mill. This is an old mill building recently renovated into an up-scale office building. Currently over 300 persons work there and there is room for another 300 as soon as parking requirements can be figured out.
>
> Cascade Condominiums. This consists of are about 72 residential condominium units.
>
> Keens Crossing. This is a mixed-rent apartment complex of 250 apartments, also revitalized in recent years.
>
> Riverside. This is an apartment complex currently under construction. It will house 72 apartments.
>
> Community College of Vermont. This is a recently rehabilitated college

classroom and office building that serves a growing student enrollment. About 1500 students attend classes there every semester, including summer.

Chace Mill, Burlington. This is an old mill building currently remodeled into a mixed-use complex.

Most if not all of these historic, largely residential, properties, will fall within the highest noise zone of the F-35A, subjected daily to Lmax values of 115 dB, violating the public health standards of the World Health Organization and the National Institutes of Occupational Safety and Health. See attached copy of Chapter 47 of Ballou, Glen, *Handbook for Sound Engineers* (Elsevier, 2008), showing WHO and NIOSH standards. The residents of these historic properties will be subject to DNL noise levels of 65 dB or higher, rendering them *unsuitable for residential use* – even though most of them are historic *residential* properties.

The Air Force's failure to identify these properties, assess the likely impacts on them, and propose measures to mitigate or minimize impacts, is a flagrant departure from the legal standards imposed by NEPA and the NHPA. Counsel asks that this matter be referred to the Advisory Council pursuant to 36 C.F.R. § 800.8(c)(2).

Conclusion

The DEIS should be revised to address each of the concerns identified above, and then reissued to the public.

July 15, 2013

Richard Joseph et al.

BY:
James A. Dumont
James A. Dumont, Esq.

James A. Dumont, Esq. PO Box 229, 15 Main St. Bristol VT 05443 jim@dumontlawvt.com

State of Vermont
Environmental Division
of the
Superior Court

Re: Request for Jurisdictional Opinion re:
Changes in Physical Structures and Use at
Burlington International Airport for F-35A
Vermont Air National Guard Jets

Environmental Court Docket No.42-4-13 Vtec
Jurisdictional Opinion #4-231

APPELLANTS' STATEMENT OF QUESTIONS FOR APPEAL

Now come Appellants, by and through the Law Office of James A. Dumont, Esq., PC, and they submit the following questions for appeal pursuant to V.R.E.C.P. 5(f).

1. Under Act 250 and Land Use Panel Rules 2 and 34, does the proposal of the State of Vermont Air National Guard (VT ANG) and the City of Burlington to base F-35 jets at the Burlington International Airport (BIA) and the $2.3 million worth of new construction that VT ANG proposes to undertake at the BIA to accommodate the F-35 jets, and the resulting acquisition by the City of Burlington of residential properties, razing of those homes, and creation of large areas of empty lots in residential neighborhoods, in order to mitigate the increased noise impacts of F-35 jets, as set forth in the City of Burlington's noise mitigation plans and policies and its longstanding noise mitigation practices, require an amendment to Act 250 permits already issued to the City of Burlington and/or VT ANG (including but not limited to Permits 4C0015, 4C0331, 4C0034 and 4C0034-9, pertaining to the runways that F-35 jets would use and/or the land on which the new facility would be constructed), because the change of use and/or the construction and/or the acquisition and razing of homes and the changes to residential neighborhoods will be "material changes?"

2. Under Act 250 and Land Use Panel Rules 2 and 34, does the proposal of the VT ANG and the City of Burlington to base F-35 jets at the BIA and the $2.3 million worth of new construction that VT ANG proposes to undertake at the BIA to accommodate the F-35 jets, and the resulting introduction into residential neighborhoods -- affecting thousands of residences -- of unprecedented levels of noise substantially exceeding generally accepted state and federal standards for residential use of property, require an amendment to Act 250 permits already issued to the City of Burlington and/or VT ANG (including but not limited to Permits 4C0015, 4C0331, 4C0034 and 4C0034-9 pertaining to the runways that F-35 jets would use and/or the land on which the new facility would be constructed), because the change of use and/or the

construction will be "material changes?"

3. Under Act 250 and Land Use Panel Rules 2 and 34, does the proposal of the VT ANG and the City of Burlington to base F-35 jets at the BIA and the $2.3 million worth of new construction that VT ANG proposes to undertake at the BIA to accommodate the F-35 jets, and the resulting acquisition by the City of Burlington of residential properties, razing of those homes, and creation of large areas of empty lots in residential neighborhoods, in order to mitigate the increased noise impacts of F-35 jets, as set forth in the City of Burlington's noise mitigation plans and policies and its longstanding noise mitigation practices, require an act 250 permit or Act 250 permits because the change of use and/or the construction and/or the acquisition and razing of homes and the changes to residential neighborhoods will be "substantial changes?"

4. Under Act 250 and Land Use Panel Rules 2 and 34, does the proposal of the VT ANG and the City of Burlington to base F-35 jets at the BIA and the $2.3 million worth of new construction that VT ANG proposes to undertake at the BIA to accommodate the F-35 jets, and the resulting introduction into residential neighborhoods -- affecting thousands of residences -- of unprecedented levels of noise substantially exceeding generally accepted state and federal standards for residential use of property, require an Act 250 permit or Act 250 permits because the change of use and/or the construction will be "substantial changes?"

5. Under Act 250 and Land Use Panel Rules 2 and 34, do the plans of the VT ANG to base F-35 jets at the BIA and the $2.3 million in construction needed for the F-35s, require an Act 250 permit or permits, or an amended Act 250 permit or permits, on the basis of the detailed factual allegations submitted by Appellants to the District Coordinator in the submissions dated December 12, 2012, January 29, 2013, and February 21, 2013?

6. A. Do the City of Burlington and the VT ANG have the burden of proving the affirmative defense that the proposal to base F-35 jets at the Burlington International Airport (BIA) and the $2.3 million worth of new construction that VT ANG proposes to undertake at the BIA to accommodate the F-35 jets, the resulting introduction into residential neighborhoods -- affecting thousands of residences -- of unprecedented levels of noise substantially exceeding generally accepted state and federal standards for residential use of property, and the resulting acquisition by the City of Burlington of residential properties, razing of those homes, and creation of large areas of empty lots in residential neighborhoods, in order to mitigate the increased noise impacts of F-35 jets, as set forth in the City of Burlington's noise mitigation plans and policies and its longstanding noise mitigation practices, all are exempt from Act 250 jurisdiction because of an alleged federal purpose or alleged federal preemption of state law? If so, can the City of Burlington and the VT ANG meet that burden?

   B. Did the District Coordinator err as a matter of law in ruling that the proposed changes are exempt from Act 250 on the basis that they would serve a federal purpose because under the Vermont Constitution, the statutes governing the VT ANG and the definition of "development" in Act 250 and the Land Use Panel rules, the construction of the $2.3 million facility to serve

the VT ANG constitutes the construction of improvements for a "state purpose" including the VT ANG's "state purpose" of assisting in the defense of the United States of America, and because there is no exemption for state purposes that also serve federal purposes?

C. Did the District Coordinator err as a matter of law in ruling that the proposed changes are preempted from review under the Supremacy Clause on the theory that Appellants' concern about noise impacts means they actually seek to regulate the movement and operation of aircraft, because *i)* Appellants actually seek a ruling in the present matter solely that a permit or permit amendment must be obtained under the material change or substantial change standards; *ii)* it would be premature to rule that any or all of the orders or conditions that might be imposed by the District Commission necessarily would be preempted; and *iii)* there is no federal preemption of generally applicable state environmental laws governing airports unless the application of those laws would have the *actual effect* of interfering with aircraft *safety* (see, e.g., Goodspeed Airport LLC v. East Haddam Inland Wetlands & Watercourses Commission, 634 F.3d 206 [2d Cir. 2011])?

D. Are any or all of these activities alleged in paragraph A exempt?

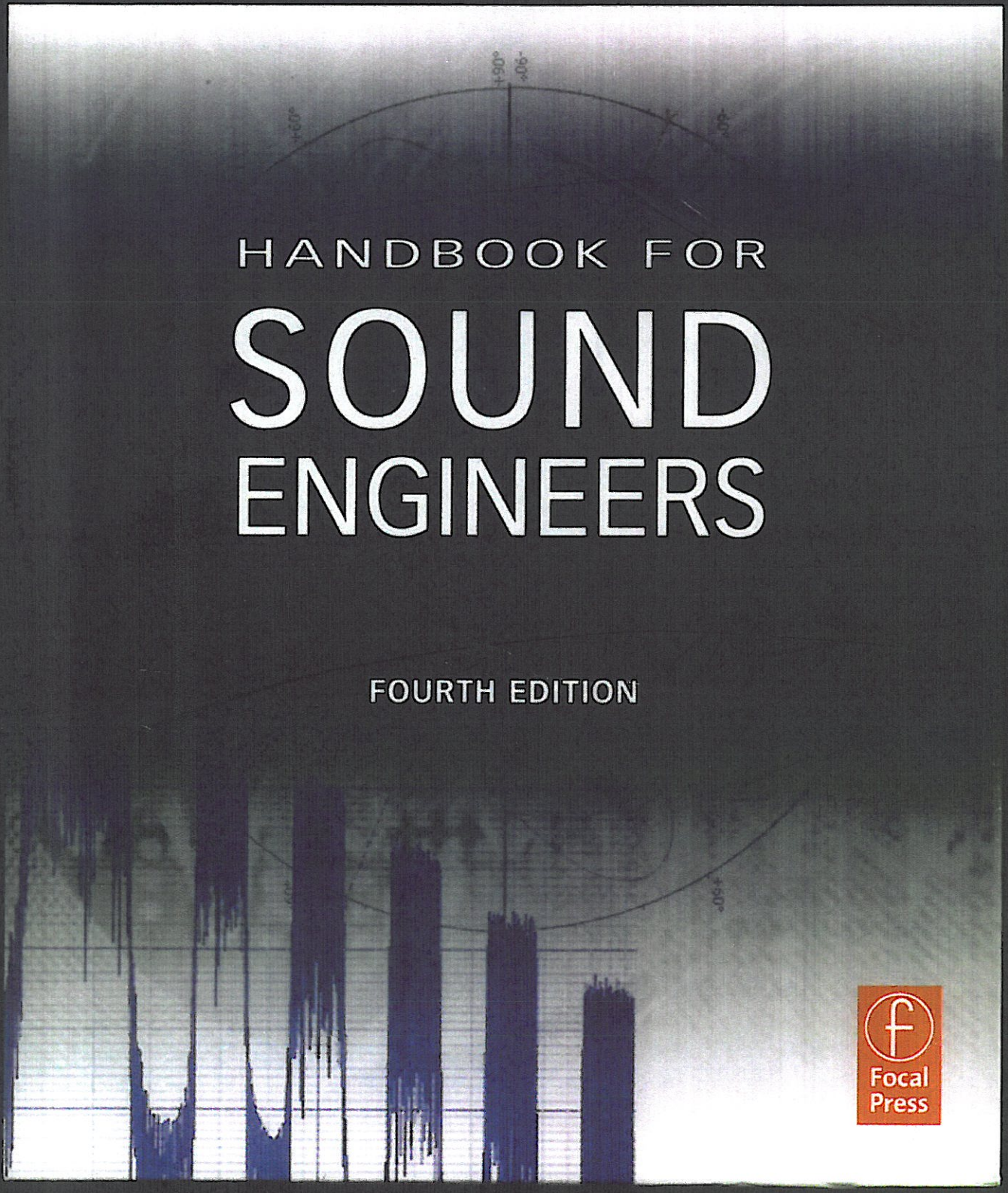
E. Even any or all of these activities would otherwise be exempt, if they constitute a material change to an existing permit, must the City of Burlington and/or the VT ANG obtain a permit amendment?

May 2, 2013

BY:
James A. Dumont

James A. Dumont, Esq.
PO Box 229
15 Main St.
Bristol, VT 05443
Jim@Dumontlawvt.com

GLEN BALLOU



HANDBOOK FOR SOUND ENGINEERS

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Contributors

Audio and Aco
Don and Caro

Fundamentals o
Pat Brown

Psychoacoustic
Peter Xinya Z

Acoustical Nois
Doug Jones

Acoustical Trea
Jeff Szymansk

Small Room Ac
Doug Jones

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Dr. Wolfgang

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Dominique J.

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Chapter 47

What's the Ear For? How to Protect It

by Les Blomberg and Noland Lewis

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47.1 What's the Ear For?

An ear is for listening, and for the lucky few, listening to music is their job. But an ear is for much more—lose your hearing, and besides not hearing music, you lose your connection with other people. Hearing is the sense most related to learning and communication, and is the sense that connects you to ideas and other people. Helen Keller, who lost both her sight and hearing at a young age, said that hearing loss was the greater affliction for this reason.

To professionals in the music industry, their hearing is their livelihood. To be able to hear well is the basis for sound work. Protecting your hearing will determine whether you are still working in the industry when you are 64, or even whether you can still enjoy music, and it will determine whether you will hear your spouse and grandchildren then, too.

47.1.1 *What Does Hearing Damage Sound Like?*

Hearing loss is the most common preventable workplace injury. Ten million Americans have noise-induced hearing loss. Ears can be easily damaged, resulting in partial or complete deafness or persistent ringing in the ears.

Hearing loss isn't necessarily quiet. It can be a maddening, aggravating buzz or ringing in the ear, called *tinnitus*. Or it may result in a loss of hearing ability, the ability to hear softer sounds at a particular frequency. The threshold of hearing, the softest sounds that are audible for each frequency, increases as hearing loss progresses. Changes in this threshold can either be a temporary threshold shift (TTS) or a permanent threshold shift (PTS). Often these changes occur in the higher frequencies of 3000 to 6000 Hz, with a notch or significant reduction in hearing ability often around 4000 Hz.

A single exposure to short-duration, extreme loud noise or repeated and prolonged exposure to loud noises are the two most common causes of hearing loss. Examples of the first might be exposure to noise from discharging firearms, while the second might be the cumulative effects of working in a noisy environment such as manufacturing or in loud concert venues. Some antibiotics, drugs, and chemicals can also cause permanent injury.

Hearing damage isn't the only health effect of noise. Workers in noisy workplaces have shown a higher likelihood of heart disease and heart attacks. Numerous other stress-related effects have been documented, including studies that have shown that women in noisy environments tend to gain weight.

47.2 How Loud Is Too Loud? OSHA, NIOSH, EPA, WHO

As in other industries, workers in the sound industry are covered by the occupational noise exposure standard found in the Code of Federal Regulations (29 CFR 1910.95). Occupational Safety and Health (OSHA) regulation requires that workers' exposures not exceed those in Table 47-1.

Table 47-1. Permissible Noise Exposures

Duration per Day, Hours	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

Noise levels are measured with a sound level meter or dosimeter (a sound level meter worn on the employee) that can automatically determine the average noise level. Often, noise levels are represented in terms of a daily dose. For example, a person who was exposed to an average level of 90 dBA for four hours would have received a 50% dose, or half of her allowable exposure.

Administrative controls—such as the boss saying, "Don't work in noisy areas, or do so for only short times," and/or engineering controls—such as quieter machines—are required to limit exposure. Hearing protection may also be used, although it is not the preferred method. Moreover, the regulation requires that, for employees whose exposure may equal or exceed an 8-hour time-weighted average of 85 dB, the employer shall develop and implement a monitoring program in which employees receive an annual hearing test. The testing must be provided for free to the employee. The employer is also required to provide a selection of hearing protectors and take other measures to protect the worker.

Compliance by employers with the OSHA regulations, as well as enforcement of the regulation, is quite variable, and often it is only in response to requests from employees. It is quite possible that professionals in the field have never had an employer-sponsored hearing test, and are not participating in a hearing conservation program as required.

Unfortunately, OSHA's regulations are among the least protective of any developed nation's hearing protections standards. Scientists and OSHA itself have known for more than a quarter-century that between 20 and 30% of the population exposed to OSHA-permitted noise levels over their lifetime will suffer substantial hearing loss, see Table 47-2. As a result, the National Institute of Occupational Safety and Health (NIOSH), a branch of the Centers for Disease Control and Prevention (CDC), has recommended an 85 dB standard as shown in Table 47-3. Nevertheless, NIOSH recognizes that approximately 10% of the population exposed to the lower recommended level will still develop hearing loss.

Table 47-2. NIOSH's 1997 Study of Estimating Excess Risk of Material Hearing Impairment

Average Exposure Level–dBA	Risk of Hearing Loss Depending on the Definition of Hearing Loss Used
90 (OSHA)	25–32%
85 (NIOSH)	8–14%
80	1–5%

While 25–30% of the population will suffer substantial hearing loss at OSHA permitted levels, everyone would suffer some hearing damage.

Table 47-3 compares the permissible or recommended daily exposure times for noises of various levels. The table is complicated but instructive. The first three columns represent the recommendations of the Environmental Protection Agency (EPA) and World Health Organization (WHO) and starts with the recommendation that the 8-hour average of noise exposure not exceed 75 dBA. The time of exposure is reduced by half for each 3 dBA that is added; a 4-hour exposure is 78 dBA, and a 2-hour exposure is 81 dBA. This is called a 3 dB exchange rate, and is justified on the principle that a 3 dB increase is a doubling of the energy received by the ear, and therefore exposure time ought to be cut in half. The EPA and WHO recommendations can be thought of as safe exposure levels. The NIOSH recommendations in the next three columns represent an increased level of risk of hearing loss and are not protective for approximately 10% of the population. NIOSH uses a 3 dB exchange rate, but the 8-hour exposure is 10 dB higher than EPA—that is, 85 dBA. Finally, the OSHA limits are in the last two columns. OSHA uses a 5 dB exchange rate, which results in much longer exposure times at higher noise levels, and the 8-hour exposure is 90 dBA. Between 20 and 30% of people exposed to OSHA-permitted levels will experience significant hearing loss over a lifetime of expo-

Table 47-3. EPA, WHO, NIOSH, and OSHA Recommended Decibel Standards

	EPA and WHO			NIOSH			OSHA	
dBA	Hours	Min	s	Hours	Min	s	Hours	Min
75	8							
76								
77								
78	4							
79								
80								
81	2							
82								
83								
84	1							
85				8				
86								
87		30						
88				4				
89								
90		15					8	
91				2				
92								
93		7	30					
94				1				
95							4	
96		3	45					
97					30			
98								
99		1	53					
100					15		2	
101								
102			56					
103					7	30		
104								
105			28				1	60
106					3	45		
107								
108			14					
109					1	53		
110							0.5	30
111			7					
112						56		
113								
114			4					
115						28	0.25	15

sure. It is important to note that everyone exposed to the OSHA-permitted levels over their lifetime will experience some hearing loss.

It is important to remember that each of these recommendations assumes that one is accounting for all of the noise exposure for the day. Someone who is working in a noisy environment, then goes home and uses power tools or lawn equipment, is further increasing the risk and exposure.

The U.S. Environmental Protection Agency (EPA) and the World Health Organization (WHO) have recommended a 75 dB limit, as shown in Table 47-3, as a safe exposure with minimal risk of hearing loss. The WHO goes on to recommend that exposure such as at a rock concert be limited to four times per year.

47.3 Indicators of Hearing Damage

There are several indicators of hearing damage. Since the damage is both often slow to manifest itself and progressive, the most important indicators are the ones that can be identified before permanent hearing damage has occurred.

The first and most obvious indicator is exceeding the EPA and WHO safe noise levels. As noise 8 hours, risk of suffering hearing loss also increases.

Exceeding the safe levels by, for example, working at OSHA-permitted noise levels doesn't necessarily mean you will suffer substantial hearing loss; some people will suffer substantial loss, but everyone will suffer some level of hearing damage. The problem is that there is no way to know if you are in the one quarter to one third of the population who will suffer substantial hearing loss at a 90 dBA level or the two thirds to thre quarters of the population who will lose less—at least, not until it is too late and the damage has occurred. Of course, by greatly exceeding OSHA limits, you can be assured that you will have significant hearing loss.

There are two types of temporary hearing damage that are good indicators that permanent damage will occur if exposure continues. The first is tinnitus, a temporary ringing in the ears following a loud or prolonged noise exposure. Work that induces tinnitus is clearly too loud, and steps should immediately be taken to limit exposure in the future.

The second type of temporary damage that is a useful indicator of potential permanent damage is a temporary threshold shift (TTS). Temporary changes in the threshold of hearing, the softest sounds that are audible for each frequency, are a very good indicator that continued noise exposure could lead to permanent hearing loss. Although ways to detect TTS without costly equipment are now being developed, the subjective experience of your hearing sounding different after noise exposure currently provides the best indication of problems.

It is important to remember that the absence of either of these indicators does not mean you will not suffer hearing loss. The presence of either is a good indication that noise exposure is too great.

Regular hearing tests can't detect changes in hearing before they become permanent, but if frequent enough, they can detect changes before they become severe. It is particularly important, therefore, that people exposed to loud noises receive regular hearing tests.

Finally, there are often indicators that serious hearing damage has occurred, such as difficulties understanding people in crowded, noisy situations (loud restaurants, for example), the need to say "What?" frequently, or asking people to repeat themselves. Often it is not the person with the hearing loss, but rather others around him or her, who are the first to recognize these problems due to the slow changes to hearing ability and denial that often accompany them. While it is impossible to reverse hearing damage, hearing loss can be mitigated somewhat by the use of hearing aids, and further damage can be prevented. It is important to remember that just because you have damaged your hearing doesn't mean you can't still make it much worse.

47.4 Protecting Your Hearing

Protecting your hearing is reasonably straightforward: avoid exposure to loud sounds for extended periods of time. This can be accomplished by either turning down the volume or preventing the full energy of the sound from reaching your ears.

There are several strategies for protecting your hearing if you believe or determine that your exposure exceeds safe levels. As Table 47-3 indicates, you can reduce *the noise level* or *reduce the exposure time*, or both.

While reducing exposure time is straightforward it is not always possible, in which case turning down the volume by using quieter equipment, maintaining a greater distance from the noise source, using barriers or noise-absorbing materials, or utilizing hearing protection (either earplugs or over-the-ear muffs, or both) are required.

Typical earplugs or earmuffs are often criticized for changing the sound and hindering communication. Hearing protection in general is far better at reducing noise in the higher frequencies than the lower frequen-

cies, so typical hearing protection significantly changes the sound a wearer is hearing. Consonant sounds in speech occur in the frequencies that are more greatly attenuated by some hearing protectors.

There are, however, a number of hearing protection devices designed to reduce noise levels in all frequencies equally. Often referred to as musician's earplugs, these can come in inexpensive models or custom-molded models. The advantage of a flat or linear attenuation of noise across all frequencies is that the only change to the sound is a reduction in noise level.

47.4.1 Protecting Concert-Goers and Other Listeners

Ears are for listening, and when it comes to music, there are often many ears listening to the music. They too, like music professionals, are at risk of hearing loss. Loud music is exciting; that is the physiology of loud. It gives us a shot of adrenaline. Also, more neurons are firing in our brain and our chest is resonating with the low-frequency sounds.

When humans evolved, the world was much quieter than it is today. Infrequent thunder was about it for loud noise. Hearing evolved to be a very important sense with respect to our survival, working 24/7 to keep us informed about the changing conditions of our environment. Noise wakes us up, because if it didn't wake our forebears up when trouble entered the camp, they might not live long enough to create descendants. Noise is an important warning device—think of a child's crying or screaming. During most of human history, when it was loud, trouble was involved. Physiologically, loud noises give us a shot of adrenaline, gearing us up to either fight or flee. Today, while neither fight nor flight is an appropriate response to loud noise, we still receive that shot of adrenaline. This is the reason for the popularity of loud movie soundtracks, loud exercise gyms, and loud music. It adds excitement and energy to activities. But it is also the reason for the stress-related effects of noise.

There is great incentive to turn it up, especially since the consequences are often not experienced until years later when the extent of hearing damage becomes apparent. People come to concert venues for excitement, not to be bored, and they come willingly; in fact, they pay to inflict whatever damage might be caused. Still, it is not a well-informed decision, and often minors are in the audience. But mostly, it isn't necessary. The desired physiological responses occur at lower noise levels. Moreover, it makes little sense for an industry to degrade the experience of listening to music in the future for whatever marginal gain comes from turning it up a few more decibels now.

Fortunately, even small gestures to turn it down have noticeable impacts. Because every 3 dB decrease halves exposure, small decreases in sound pressure level can vastly increase public safety.

47.4.2 Protecting the Community

Noise can spill over from a venue into the community. The term *noise* has two very different meanings. When discussing hearing loss, noise refers to a sound that is loud enough to risk hearing loss. In a community setting, noise is aural litter. It is audible trash. Noise is to the soundscape as litter is to the landscape. When noise spills over into the community, it is the aural equivalent of throwing McDonald's wrappers onto someone else's property.

When noise reaches the community, often it has lost its higher-frequency content, as that is more easily attenuated by buildings, barriers, and even the atmosphere. What is often left is the bass sound.

Solutions to community noise problems are as numerous as the problems themselves, and usually require the expertise of architectural acousticians. In general, carefully aimed distributed speaker systems are better than large stacks for outdoor venues. Barriers can help, but not in all environmental conditions, and their effectiveness tends to be limited to nearer neighbors. Moreover, barriers need to be well designed, with no gaps.

Indoor walls with higher sound transmission class (STC) ratings are better than ones with lower ratings. STC ratings, however, do not address low-frequency sounds that are most problematic in community noise situations, so professional advice is important when seeking to design better spaces or remedy problems.

Windows and doors are particularly problematic, as even these small openings can negate the effects of very well-soundproofed buildings. They also tend to be the weakest point, even when shut.

Sound absorption is useful for reducing transmission through walls, but in general, decoupling the interior and exterior so that the sound vibrations that hit the interior wall do not cause the exterior wall to vibrate and reradiate the noise is more effective. There are numerous products available to achieve both decoupling and sound absorption.

Often, however, employing these techniques is not an option for the sound engineer. In that case, controlling sound pressure levels and low-frequency levels are the best solution.

47.5 Too Much of a Good Thing

In today's world, noise represents one of the more serious pollutants, Fig. 47-1. Some are the by-product of our society such as lawn mowers, jackhammers, traffic, and public transportation.

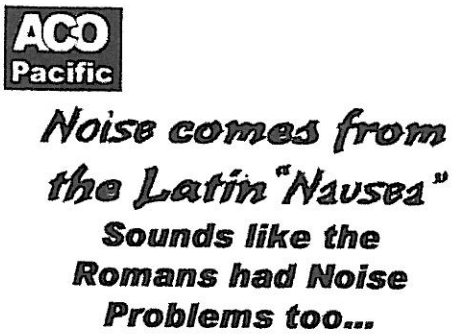


Figure 47-1. Derivation of noise. Courtesy ACO Pacific.

We deliberately subject ourselves to a Pandora's box of sounds that threaten not only our hearing but our general health. Personal sources like MP3 players, car stereos, or home theaters are sources we can control, yet many remain oblivious to their impact, Fig. 47-2. In the public domain clubs, churches, auditoriums, amphitheaters, and stadiums are part of the myriad of potential threats to hearing health. From a nuisance to a serious health risk, these sources impact attendees, employees, and neighbors alike. As pointed out previously, levels of 105 dBA for 1 hour or less may result in serious and permanent hearing damage. Recent studies have shown other factors such as smoking, drugs of all types, and that overall health appear to accelerate the process.

Figure 47-2. Loud sounds from passing cars are often aggravating to passers by. Courtesy ACO Pacific.

High sound levels are just part of the problem. Sound does not stop at the property line. Neighbors and neighborhoods are affected. Numerous studies have shown persistent levels of *noise* affect sleeping patterns, even increase the potential for heart disease. Studies by Johns Hopkins have shown hospital noise impacts patients in the neonatal wards and other patients' recovery time.

Communities all over the world have enacted various forms of noise ordinances. Some address *noise* based on the annoyance factor. Others specify noise limits with sound pressure level (SPL), time of day, and day of the week regulations. The problem, noise (sound), is a transient event. Enforcement and compliance are often very difficult, especially when treated as an annoyance.

47.5.1 A Compliance and Enforcement Tool

There are various tools to monitor noise. One very useful tool is "the SLARM™ by ACO Pacific. The following will use the SLARM™ to explain the importance of noise-monitoring test gear. The SLARM™ tool was developed to meet the needs of the noise abatement market. The SLARM™ performs both compliance and enforcement roles, offering accurate measurement, alarm functions, and very important history.

For the business owner dealing with neighborhood complaints, the SLARM™ provides a positive indication of SPL limits—permitting employees to control the levels or even turn off the sound. The History function offers a positive indication of compliance.

On the enforcement side, no longer does enforcement have to deal with finger-pointing complaints. They now may be addressed hours or days after the event and resolved. There is also the *uniform effect*. Police pull up armed with a sound level meter (SLM) and the volume goes down. Businesses now can demonstrate compliance. Yes—it is an oversimplification— but the concept works. Agreements are worked out. Peace and quiet return to the neighborhood.

47.5.1.1 The SLARMSolution™

The SLARM™ (Sound Level Alarm and Monitor) is a package of three basic subsystems in a single standalone device:

1. A sound level meter designed to meet or exceed Type 1 specifications.
2. Programmable threshold detectors providing either SPL or Leq alarm indications.
3. Monitor—a data recorder storing SPL data, and Led values for about 3 weeks on a rolling basis, as well as logging unique Alarm events, scheduled

threshold changes, maintenance events,and calibration information.

The SLARM™ may operate standalone. A PC is not required for normal Alarm operation. The data is maintained using flash and ferro-ram devices.

The SLARM™ provides USB and serial connectivity. It may be connected directly to a PC or via optional accessories directly to an Ethernet or radio link such as Bluetooth™.

PC operation is in conjunction with the included SLARMSoft™ software package.

47.5.1.2 SLARMSoft™ Software Suite

SLARMWatch™. A package with password-protected setup, calibration, downloading, display, and clearing of the SLARM™'s SPL history. The history data may be saved and imported for later review and analysis, Fig. 47-3.

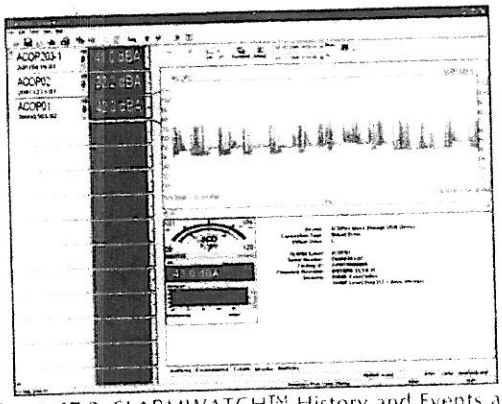


Figure 47-3. SLARMWATCH™ History and Events and three SLARM™ displays. Courtesy ACO Pacific.

SLARMAnalysis™. Part of SLARMWatch™ provides tools for the advanced user to review the SLARM™ history files. SLARMWatch™ allows saving and storage of this file for later review and analysis. SLARMAnalysis™ provides Leq, Dose and other calculations with user parameters, Fig. 47-4.

SLARMScheduler™. Part of the SLARMWatch™ package, allows 24/7 setting of the Alarm thresholds. This permits time of day and day of the week adjustments to meet the needs of the community, Fig. 47-5.

WinSLARM™. A display of SPL, Leqs, Range, and Alarm settings with digital, analog bar graph, and meter displays, as well as a Histogram window that provides a

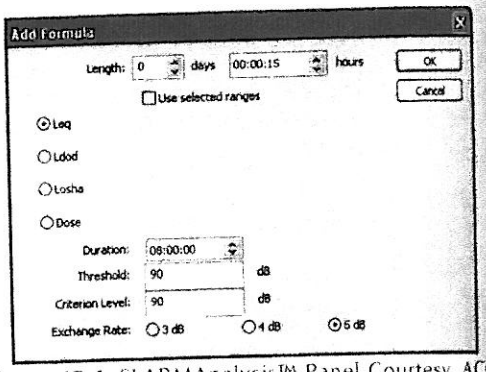


Figure 47-4. SLARMAnalysis™ Panel Courtesy, ACO Pacific.

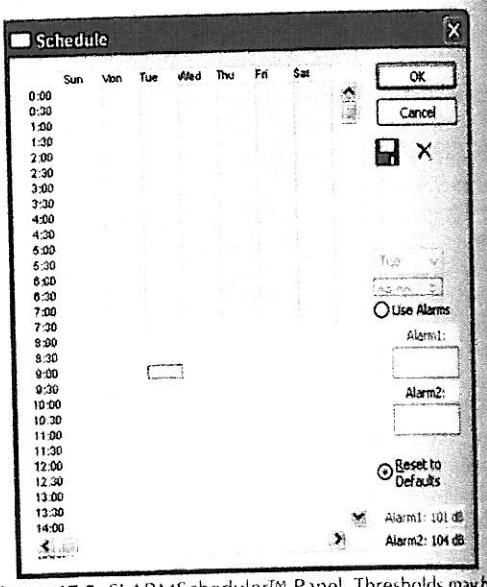


Figure 47-5. SLARMScheduler™ Panel. Thresholds may be individually set for each ALARM over a 24-hour, 7-day period. Courtesy ACO Pacific.

25 second view of recent SPL on a continuous basis. The WinSlarm™ display may be sized permitting single or multiple SLARM™s to be shown, Fig.47-6.

SLARMAlarm™. Operates independently from SLARMWatch™. The package monitors SLARM™s providing digital display of SPL and Leqs values while also offering SMS, text, and email messaging of Alarm events via an Internet connection from the PC, Fig. 47-7.

SLARMNet™. The SLARM™ and the SLARMSoft™ package allow multiple SLARM™s to be

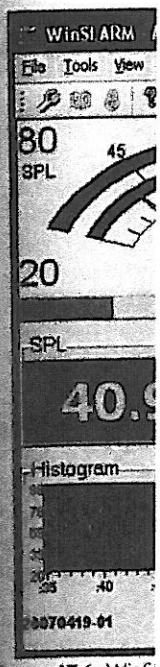


Figure 47-6. WinS
at SPL, Leq Thresh
Pacific.

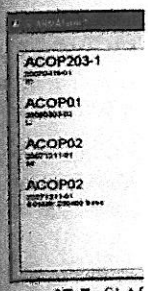


Figure 47-7. SLAF
Note: ACOP2 h
adaptor) connecti

connected to a r
alarm indication:

47.5.1.3 SLARM

The SLARM™
Fig. 47-8.

The **Microphon**
7052/4052 mic
with the SLARI

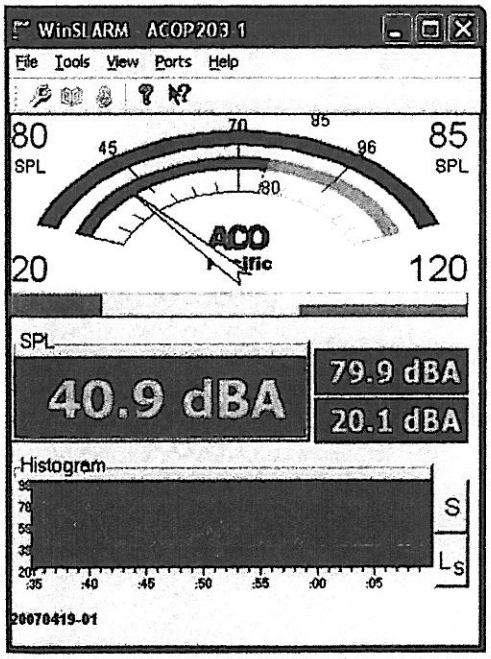


Figure 47-6. WinSLARM™ display provides a real-time look at SPL, Leq Thresholds, and recent events. Courtesy ACO Pacific.

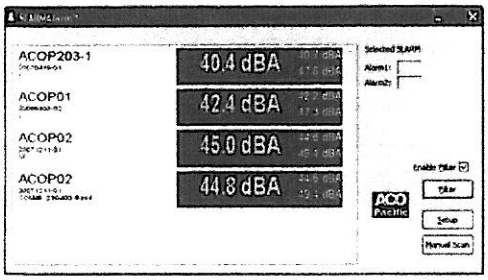


Figure 47-7. SLARMAlarm™ display with three SLARM™s. Note: ACOP2 has both USB and Ethernet (via a serial adaptor) connections. Courtesy ACO Pacific.

connected to a network providing real-time data with alarm indications to multiple locations.

47.5.1.3 SLARM™ Operation

The SLARM™ operates in the following manner, Fig. 47-8.

The Microphone and Microphone Preamplifier. The 7052/4052 microphone and preamplifier are supplied with the SLARM™ system. The 7052 is a Type 1.5™ ½ inch free-field measurement microphone featuring a titanium diaphragm. The microphone has a frequency response from <5 Hz to 22 kHz and an output level of 22 mV/Pa (−33 dBV/Pa). The 4052 preamplifier is powered from 12 Vdc supplied by the SLARM™ and has a response <20 Hz to >100 kHz. Together they permit measurements approaching 20 dBA. The MK224 electret capsule is available, offering 8 Hz to 20 kHz response, and 50 mV/Pa (−26 dBV/Pa) performance providing a lower noise floor. The diaphragm is quartz coated nickel.

The Preamplifier (Gain Stage). A low noise gain stage is located after the microphone input. This stage performs two tasks. The first limits the low-frequency input to just under 10 Hz. This reduces low-frequency interference from wind or doors slamming, things we do not hear due to the roll-off of our hearing below 20 Hz. The gain of this stage is controlled by the microcontroller providing two 100 dB measurement ranges 20 to 120 dB and 40 to 140 dBSPL. Most measurements are performed with the 20 to 120 dBSPL ranges. Custom ranges to >170 dBSPL are available as options. The output of the gain stage is supplied to three analog filter stages "A", "C" and "Z" (Linear).

Analog A- and C-Weighted Filters. The gain stage is fed to the C-weighted filter. C-weighted filters have a −3 dB response limit of 31.5 Hz to 8 kHz. C-weighted filters are very useful when resolving issues with low frequencies found in music and industrial applications. The output of the C-weighted filter is connected to both the analog switch providing filter selection and the input of the A-weighted element of the filter system. Sound levels measured with the C-weighted filter are designated as dBC (dBSPL C weighted).

The A-weighted response is commonly found in industrial and community noise ordinances. A weighting rolls off low-frequency sounds. Relative to 1 kHz, the roll-off is −19.4 dB at 100 Hz (a factor of 1:10) and −39.14 at 31.5 Hz (a factor of 1:100). The A response significantly deemphasizes low-frequency sounds. Sound levels measured with the A-weighted filter are designated as dBA (dBSPL A weighted). The output of the A-weighted filter is sent to the analog switch.

Analog Z-Weighting (Linear) Filter. The Z designation basically means the electrical output of the microphone is not weighted. The SLARM™ Z-weighting response is 2 Hz to >100 kHz. The response of the system is essentially defined by the response of the microphone and preamp. Z weighting is useful where measurements of frequency response are desired, or

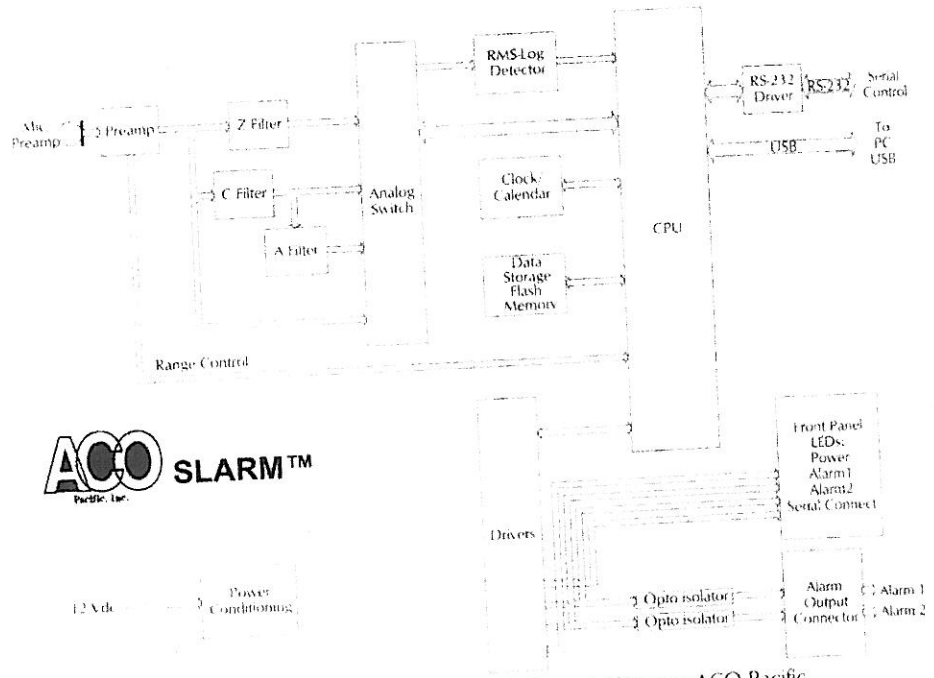


Figure 47-8. SLARM™ functional block diagram. Courtesy ACO Pacific.

where low or high frequencies are important. Remember the microphone response determines the response. Sound levels measured with the Z weighted filter are designated as dBZ (dBSPL Z weighted).

Analog Switch. The outputs of the A-, C-, and Z-weighted filters connect to the analog switch. The switch is controlled by the microcontroller. The selection of the desired filter is done at setup using the utilities found in SLARMWatch™.

Selection of the filter as with the other SLARM™ settings is password protected. Permission must be assigned to the user by the administrator before selection is possible. This is essential to minimize the possibility of someone changing measurement profiles that may result in improper ALarm activation or inaccurate measurements.

RMS Detection and LOG Conversion. The output of the analog switch goes to the RMS detection and Logarithmic conversion section of the SLARM™. The RMS detector is a true RMS detector able to handle crest factors of 5–10. This is different from an averaging detector set up provide rms values from sine wave (low crest factor) inputs. The response of the detector exceeds the response limits of the SLARM™.

The output of the RMS detector is fed to the Log (Logarithmic) converter. A logarithmic conversion range of over 100 dB is obtained. The logarithmic output then goes to the A/D section of the microcontroller.

Microcontroller. The microcontroller is the digital heart of the SLARM™. A microcontroller (MCU) does all the internal calculations and system maintenance.

SPL, Leq. The digital data from the internal A/D is converted by the MCU to supply dBSPL, and Leq values for both storage in the on-board flash memory and inclusion in the data stream supplied to the USB and serial ports. These are complex mathematical calculations involving log and anti-log conversation and averaging.

The SPL values are converted to a rolling average. The results are sent to the on-board flash memory that maintains a rolling period of about 2 to 3 weeks.

Leq generation in the SLARM™ involves two independent calculations with two programmable periods. A set of complex calculations generates the two Leq values.

Thresholds and Alarms. The results of the Averaging and Leq calculations are compared by the micro-

controller with the Threshold levels stored in the on-board ferro-ram. Threshold levels and types—SPL or Leq—are set using the Settings tools provided in SLARMWatch™. These thresholds are updated by the SLARMScheduler™ routine.

If the programmed threshold limits are exceeded the microcontroller generates an output to an external driver IC. The IC decodes the value supplied by the microcontroller, lighting the correct front panel ALARM LED, and also activating an opto-isolator switch. The opto-switch contacts are phototransistors. The transistor turns on when the opto-isolator LED is activated. The result—a contact closure signaling the outside world of the ALarm.

Real-time Clock. The SLARM™ has an on-board real-time clock. Operating from an internal lithium cell, the real-time clock timestamps all of the recorded history, event logging, and controls the SLARMScheduler™ operation. The Settings panel in SLARMWatch™ allows user synchronization with a PC.

Communicating with the Outside World. SLARM™ may be operated Standalone (without a PC). The SLARM™ provides both USB 2.0 and RS232 serial connections. The USB port is controlled by the microcontroller and provides full access to the SLARM settings, History flash memory, and firmware update capability.

The RS232 is a fully compliant serial port capable of up to 230 k Baud. The serial port may be used to monitor the data stream from the SLARM™. The serial port may also be used to control the SLARM™ settings.

Ethernet and Beyond. Utilizing the wide variety of after-market accessories available, the USB and Serial ports of the SLARM™ may be connected to the Ethernet and Internet. RF links like Bluetooth® and WiFi are also possible. Some accessories will permit the SLARM™ to become an Internet accessory without a PC, permitting remote access from around the world.

The SLARMSoft™ package permits the monitoring of multiple SLARM™s through the SLARMNet™. The SLARMAlarm™ software not only provides a simple digital display of multiple SLARM™s also permits transmission of SMS, text and email of ALarm events. This transmission provides the SLARM™ ID, Time, Type, and Level information in a short message. The world is wired.

History. The on-board flash and ferro-ram memories store measurements, events, settings, user access, and the SLARM™ Label. The SLARM™ updates the flash memory every second. SPL/Leq data storage is on a rolling 2 to 3 week basis. ALARM events, user access, and setting changes are also logged. These maybe downloaded, displayed, and analyzed using features found in SLARMWatch™.

47.5.1.3.1 Applications

SLARM™ applications are virtually unlimited. Day-to-day applications are many. Children's day care centers, hospitals, classrooms, offices, clubs, rehearsal halls, auditoriums, amphitheaters, concert halls, churches, health clubs, and broadcast facilities are among the locations benefitting from sound level monitoring. Industrial and community environments include: machine shops, assembly lines, warehouses, marshaling yards, construction sites and local law enforcement of community noise ordinances.

The following are examples of recent SLARMSolution™.

A Healthy Solution. Located in an older building with a lot of flanking problems, the neighbors of a small women's health club were complaining about the music used with the exercise routines. Negotiations were at a standstill until measurements were made.

Music levels were measured in the health club and a mutually acceptable level established. A SLARM™ (operating standalone—no PC) was installed to monitor the sound system and a custom control accessory developed to the customer's specifications. If the desired SPL limits were exceeded for a specific period of time, the SLARM™ disabled the sound system, requiring a manual reset. The result, a Healthy Solution.

Making a Dam Site Safer. A SLARM™ (operating standalone—no PC) combined with an Outdoor Microphone assembly (ODM) located 300 ft away, monitors the 140+ dBSPL of a Gate Warning Horn. The operator over 100 miles away controls the flood gates of the dam, triggering the horn. The PLC controls the gate operation and monitors power to the horn but not the acoustic output. The SLARMSolution™ monitors the sound level from the horn. The thresholds were set for the normal level and a minimum acceptable level. The minimum level alarm or no alarm signal prompts maintenance action. The SLARM™'s history provides proof of proper operation. Alarm events are time-stamped and logged.

Is It Loud Enough? Tornado, fire, nuclear power plant alarms and sirens as well as many other public safety and industrial warning devices can benefit from monitoring. Using the SLARM™'s standalone operation and

the ODM microphone assembly make these remote installations feasible.

A Stinky Problem. A Medivac helicopter on its life-saving mission quickly approaches the hospital helipad and sets down. On the ground, the helicopter engines idle, prepared for a quick response to the next emergency.

The problem: the exhaust fumes from the engines drift upward toward the HVAC vents eight stories above. Specialized carbon filters and engineering staff run to the HVAC controls to turn them off—often forgetting to turn them back on, costing the hospital over $50,000 a year and hundreds of manhours provided limited success.

A standalone SLARM™ with an ODM microphone mounted on the edge of the helipad detects arriving helicopters and turns off the HVAC intakes. As the helicopter departs, the vents are turned back on automatically. The SLARM™ not only provides control of the HVAC but also logs the arrival and departure events for future review, Fig. 47-9.

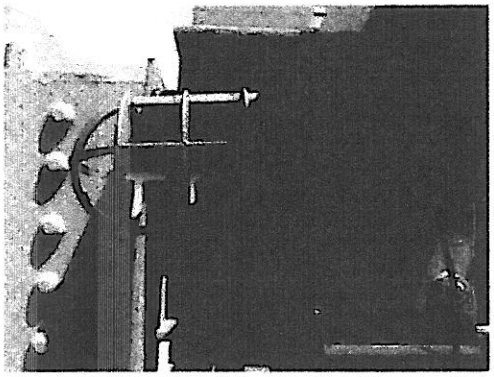


Figure 47-9. ODM microphone assembly mounted on helipad. Courtesy ACO Pacific.

Too Much of a Good Thing Is a Problem. Noise complaints are often the result of *Too Much of a Good Thing*. A nightclub housed on the ground floor of a condo complex faced increased complaints from both condo owners and patrons alike.

The installation of a SLARM™ connected to the DJ's and sound staff's PC allowed them to monitor actual sound levels and alarm them of exceedance. The combination of the SLARM™'s positive indication of compliance and accidence assures maintenance of proper levels.

Protecting the Audience. Community and national regulations often specify noise limits for patrons and employees alike. Faced with the need to assure their audiences' hearing was not damaged by *Too Much of a Good Thing*, a major broadcast company chose the SLARMSolution™.

Two SLARM™s were used to monitor stage and auditorium levels. These units made use of both SPL and Leq Alarm settings. In addition, SLARMAnalysis™ is utilized to extrapolate daily Leq and dose estimates. The installations used the standard SLARM™ mic package and ACO Pacific's 7052PH phantom microphone system. The phantom system utilized the miles of microphone cables running through the complex. This made microphone placement easier. The results were proof of compliance, and the assurance that audience ears were not damaged.

NAMM 2008 – Actual Measurements from the Show Floor. A SLARM™ was installed in a booth at the Winter NAMM 2008 show in Anaheim, CA. The microphone was placed at the back of the booth about 8 ft above the ground away from the booth traffic (people talking).

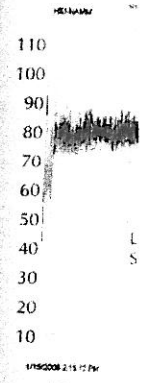
The following charts utilized SLARMWatch™'s History display capability as well as the SLARMAnalysis™ package. The SLARM™ operated standalone in the booth with the front panel LEDs advising the booth staff of critical noise levels.

The charts show the results of all four days of NAMM and Day 2. Day 2 was extracted from the data using the Zoom feature in SLARMWatch™. The booth was powered down in the evening, thus the Quiet periods shown and the break in the history sequence. The floor traffic quickly picked up at the beginning of the show day.

An 8 hour exposure at these levels has the potential of permanent hearing damage. The booth was located in one of the quieter areas of the NAMM Exhibition floor. Levels on the main show floor were at least 10–15 dB higher than those shown on the graphs.

47.6 Summary

We live in a world of sounds and noise. Some is enjoyable, some annoying, and all potentially harmful to health. Devices like the SLARM™ represent a unique approach to sound control and monitoring and a useful tool for sound and noise pollution control. We hope we have provided insight into how much sound—noise to some—is part of our world to enjoy responsibly. Also so alerting you to the potential harm sound represents.



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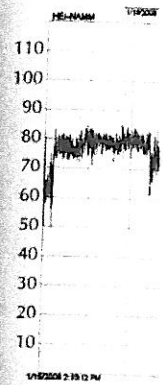

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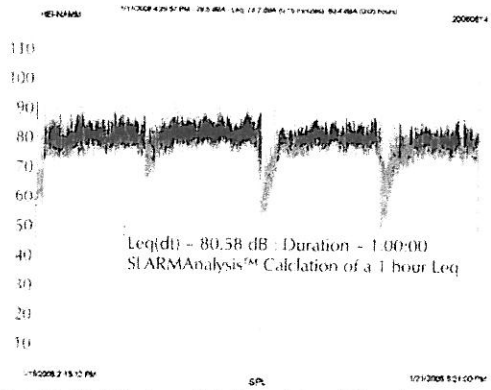

Figure 47-10. This is a dBA (A weighted SPL) for all 4 days of NAMM. The booth power was shut down in the evening and then turned on for the exhibition. The SLARM™ restarted itself each morning and logged automatically during this time. It was not connected to a computer. The black indications are of sound levels exceeding the thresholds set in the SLARM™. Courtesy ACO Pacific.

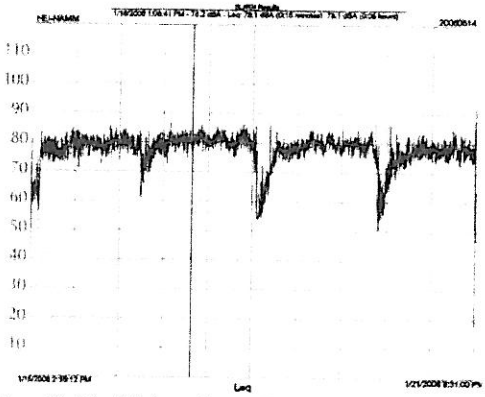

Figure 47-11. All four days 15 s LeqA. Courtesy ACO Pacific.

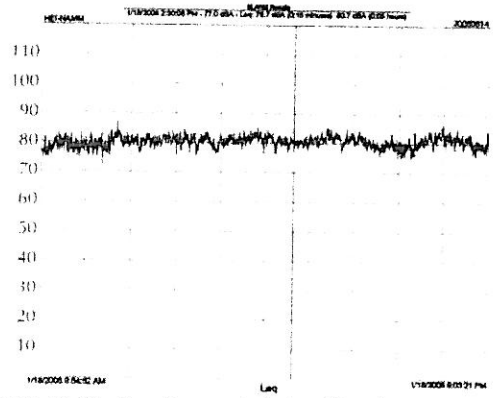

Figure 47-12. Day 2—a typical day. This chart is the Leq (15 s) dBA. This basically represents the running average sound level. Courtesy ACO Pacific.