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January 7, 2016

Nicole Cromwell
Zoning Coordinator
City County Planning Department
2825 3rd Ave. North, 4th Floor
Billings, MT 59103

RE: County Zone Change #669
Project Number 15-217
Billings Flying Service
Our File No.: 75830.001

Dear Ms. Cromwell:

As you are aware, this firm has been retained by Stony Ridge Development, LLC ("Stony Ridge"), which owns property in the Stony Ridge Subdivision. The subdivision is located immediately south and across Highway 3 from the property which is sought to be rezoned and is within 300 feet of the property.[1] Stony Ridge is owned by James and Christine Scott who reside in Stony Ridge Subdivision.

As a matter of principle, Stony Ridge is not inclined to protest commercial development in Yellowstone County. The Scotts are fully supportive of both private property rights and economic development and understand that the exercise of such rights and the benefits of economic development often come at a price in terms of impact on those who live in surrounding areas. However, the proposed zone changes are believed to be sufficiently inappropriate that Stony Ridge feels compelled to raise its concerns and objections to the zone change request, all as more fully set forth below.

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[1] Note, the County records show Skyline Partnership owning Lots 1 through 3, Block 1, Stony Ridge Subdivision. By Warranty Deed dated November 14, 1994, and recorded at Document #1764825, Records of the Clerk and Recorder of Yellowstone County, Lot 1, Block 1, Skyline Heights Subdivision was transferred by Skyline Partnership to Stony Ridge Development, LLC. Lot 1, Block 1, of Skyline Heights was subdivided by plat dated December 14, 1994, and recorded under Document #1767389, Records of the Clerk and Recorder of Yellowstone County. Lot 5 was subsequently transferred to James and Christine Scott. Therefore, all but Lot 5, Block 1, Stony Ridge Subdivision, is owned by Stony Ridge Development, LLC, and Skyline Partnership does not own any of the lots in the subdivision. The Department of Revenue has been contacted to change the tax records. This does not change anything substantively, but we felt it appropriate to point out the discrepancy in order to establish why only Stony Ridge is raising objections.

I. INTRODUCTION.

There are two zone changes being sought. A zone change from Agricultural - Open Space (A-1) to Public zoning is requested for the north 600 feet of the subject parcels and the change to Controlled Industrial (CI) is sought for the south approximately 1,300 feet of the parcels. Our position is the failure of either request to satisfy applicable requirements for approval warrant denial of the application.

Although the zone change application does not contain a lot of details, it is understood that the intended purpose for the north 600 feet of the subject property, assuming approval of the zone change, is to locate a heliport for the Billings Flying Service, to stage its fleet of CH-47D Chinook helicopters. Based on published reports in the Billings Gazette, these helicopters are to be used solely in connection with its commercial helicopter service versus any passenger service and although they may be used to fight fires, as stated by Mr. Blain in a September 5, 2015, Billings Gazette article, "if you need something heavy put in a weird place, we're your folks..." In the same article Mr. Blain reported the Chinook helicopters have "the largest lift-capacity [of any] helicopter in the world." We do not believe this intended use qualifies as a public or semi-public use which is critical to the Public zoning classification.

The application does not set forth any particular intended development in the portion of the parcels for which CI zoning is requested. Presumably the zoning is sought to allow as expansive use as possible for future subdivision and development either by Billings Flying Service or, more likely, by a developer following sale of the parcels. No doubt, this expansive zoning makes economic sense to Billings Flying Service. The more it can sell the southern parcels for, the less it ends up costing for the north parcels which it intends to use. But what makes economic sense for Billings Flying Service is not the determining factor in a zone change application; rather the focus is on the appropriateness of the zone classification(s) being sought in light of the 11 criteria articulated for zone change review and in particular, the impact of the zone change on the Yellowstone County Growth Policy factors.

For the reasons set forth below, it is submitted both zone changes fail to satisfy the requirements for approval.

II. PUBLIC ZONE AND HELIPORT ISSUES.

The Public zone change request is discussed first. It is readily apparent that the sole purpose for the Public zoning request is to allow the heliport to be located at the site. We are keenly aware that a zone change application should focus primarily on the allowed uses in the requested zoning, rather than on the specific intended use; otherwise, any zone change application with an identified use would turn into the equivalent of a special review. However, even a casual review of the allowed uses in Controlled Industrial (the classification being sought for south 1,300 feet) and the allowed uses in the Public zoning classification, few allowed uses in Public zoning which are not allowed in Controlled Industrial – the key one being "Transportation by Air."

Because the readily apparent sole basis for the Public zoning versus Controlled Industrial zoning, it is asserted that focus on the heliport versus other allowed uses is appropriate in this instance.

As a threshold matter, it is asserted that use of the Public zoning to locate a heliport which will be used by a for-profit company for commercial uses versus passenger traffic made available to the public is fundamentally inconsistent with the core intent of the Public zone.

In Section 27-301 of the Yellowstone County Zoning Regulations ("the Zoning Regulations"), the Zoning Regulations set forth a general statement of intent that Billings and the 4 ½ mile buffer located in county be "divided into ... districts in which the erection, construction, alteration, reconstruction, repair or use of buildings, structures and land shall be regulated and restricted." The regulations then establish 25 zoning districts and provide a definition of the core requirements for each district. The core requirements for Public zoning are as follows:

> PUBLIC: The Public zone is intended to reserve land **exclusively for public or semi-public uses** in order to preserve and provide adequate land for a variety of community facilities which **serve the public health, safety and general welfare**. (emphasis added).

The terms "public or semi-public" and "airport" are not defined terms. The terms are, therefore, to be construed by their common meaning in light of the context. § 1-2-106, MCA.

Webster's Third New International Dictionary defines the key terms as follows:

> PUBLIC: of, relating to, or affecting the people as an organized community.
>
> SEMI PUBLIC: 1: having some of the features of a public institution; specif: maintained as a public service by a private nonprofit organization 2: open to some persons (as the families and guests of members) outside the regular constituency but not to the general public.
>
> AIRPORT: a tract of land or water that is adapted and maintained for the landing and takeoff of aircraft and at which facilities for their shelter, supply, and repair are provided: a terminal point for air passengers and cargo.

Using the plain meaning of the terms "public" and "semi public," in order to qualify for Public zoning, the intended use must be intended to be for the exclusive benefit of the Billings or Yellowstone County community, or have some features of a public institution, and open to a group of individuals, and that the use provide a benefit to the public health, safety and general welfare of the Billings or Yellowstone County community.

Turning to the word "airport," while the term may be susceptible of a variety of meanings, including any landing or takeoff strip, the more commonly used context is to define it as a terminal point for air passengers and cargo. The Billings ordinances define the term "airport" in an even more limited fashion as "the 'Billings Logan International Airport." Billings City Ordinances, § 5-101.

It is submitted that, based on the plain meaning of the zoning regulations, in order to qualify for Public zoning, an airport would have to be one which benefits the public or at least a significant segment of the public in order to qualify as semi-public, and in either case, be intended to benefit our community's health, safety and general welfare. The intended use by Billings Flying Service falls well outside these requirements. It is a private (versus public or semi-public) facility, intended to benefit only the owners of Billings Flying Service rather than the community as a whole and the customers appear to consist largely, and perhaps, exclusively, of businesses or entities located outside our community and likely, the state of Montana.[2]

Billings Flying Service employs the logical fallacy technically known as "affirming the consequent" (which is more commonly known as putting the cart before the horse). It assumes that because airports are allowed in the Public zone, all airports qualify as a Public use and in doing so Billings Flying Service dispenses with the requirement that the intended use fit the threshold requirement of Public zoning – that is, that the airport be used exclusively for public or semi-public use in order to serve the health, safety and general welfare of the public.[3]

It is submitted that a heliport intended to stage larger Chinook helicopters designed on a for-profit basis, for commercial use, as opposed to public passenger services, cannot be said to be one which exclusively benefits the public health, safety and general welfare. In short, while a public airport can be sited on land zoned Public, a private use airport is not a proper basis for seeking Public zoning.

It is significant to note that what Billings Flying Service really intends to install is a heliport. The term "heliport" is a defined term in the Zoning Regulations as follows:

> HELIPORT: Any facility whose **primary purpose** is for the landing or taking off of helicopters. This would include any accessory uses or structures related to the principal use as a heliport, such as maintenance and overhaul, fueling, service, storage, tie-down areas and hangars. (emphasis added)[4]

Zoning Regulations, § 27-301. The only zone in which heliports are specifically allowed is in the Medical Corridor Permit Zoning. Zoning Regulations, § 27-911. Even there,

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[2] Materials provided by Billings Flying Service at the neighbor meeting ironically touted the fact that helicopters ordinarily would "not operate in the county.." as a benefit.

[3] Although Billings Flying Service may have an FAA service for passenger service (see the Billings Flying Service Website at http://billingsflyingservice.com), it is our understanding the intent is to use the site to stage the large Chinook helicopters which are not designed for transporting passengers.

[4] By defining the term "heliport" as one which has as its primary function, the landing or taking off of helicopters, the language does not prevent an airport, which would include air traffic of all kinds, from being used by helicopters to land or takeoff as one of the many, but not the "primary" use.

bulk storage of fuel is not allowed. Although a nonprofit hospital heliport would clearly constitute "public or semi-public" use, it is clear there could be a for-profit medical center in the zone and as such, the only expressly sanctioned location for a heliport in a for-profit context is in the Medical Corridor. Under the Applicant's theory of Public zoning, all one would have to do is seek Public zoning anywhere in the City or County in order to install a private use heliport. This reading would gut the clear intention of the Zoning Regulations to limit facilities which are to operate primarily as heliports to the Medical Corridor.[5]

It is also significant to note that prior to adoption of the Unified Zoning Code in 1997, the City Zoning Code allowed heliports in five zoning districts, Central Business District, Highway Commercial, Controlled Industrial, Heavy Industrial and Public; but in all instances, special review was required. Airports or heliports were not referenced as an allowed use in the County Code prior to the adoption of the Unified Zoning Code. Billings Flying Service is effectively arguing that by merely labeling the property as Public under the Zoning Regulations, it should be able to install a private, for-profit, heliport without the requirement of special review or any other form of safeguard. It is submitted that the protection to the public afforded by what was previously provided by the special review process is at least indirectly provided under the Public zoning Category only if the requirement that property zoned Public be used exclusively for public or semi-public purposes is applied literally and not in the cavalier fashion advanced by Billings Flying Service.

It is anticipated that Billings Flying Service will argue that the uses allowed in the Public zone are more expansive than argued by Stony Ridge. And it is true that Public zoning does allow a number of types of use. However, a review of the allowed uses in the Public zoning which are set out in the Zoning Regulations, § 27-306, evidences both the limited nature of the allowed uses and the nexus between the allowed uses and a public or semi-public benefit (save and except the third category discussed below), and which allowed uses fall into the following general categories:

(i) uses which are nonprofit in nature and/or which serve the public in general (for example, public swimming pools and public golf courses which are included in Division G, Category 79);

(ii) uses which involve essential services which, although operated by a for-profit enterprise, benefit a broad section of the community (for example, uses listed in Division E, Category 48 relating to communication operations and 49 relating to electric, gas and sanitary services); and

(iii) limited commercial uses which are likely be low impact and which would allow Public zoned land to be productive (for example, agricultural production listed in Division A, Category 01).

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5 Using the approach advanced by the applicant, the private parkland owned by Hoop Dreams, LLC (see Tax Code 34951), which is part of a real estate development located in the Western Subdivision at the corner of King Avenue and South 44th Street West, could install a heliport.

It is important to note that providing services to the public in general is not enough; rather the use must be either operated by the public or a non-profit or fall in the essential services category. For example, only public animal shelters are allowed under Division 1, Category 07, but dog grooming services which are available in a number of the commercial/industrial zoning districts and which would provide services to the public, are not allowed uses in the Public zone. Legal services which would be available to the public in general, are allowed in all commercial zones, save and except the Public zone. Division I, Category 81. Health services are allowed in all commercial zones, including the Public zone, but if retail sales involve more than an accessory use, not in the Public zone. Division I, Category 80.

Another concern regarding the Public zone request relates to the potential for loud and potentially even a dangerous level of the noise involved with the Chinook helicopters landing and taking flight to the extent that they fly directly over residential developments. Billings Flying Service has attempted to minimize the noise issue relating to the intended use. For example, it asserts, without support of a professional noise study and instead relying on their own tests, that the noise level will be less than highway noise and that the maximum levels recorded were 50 decibels (dBa). The time allowed to respond to the zone change application did not allow Stony Ridge to retain an acoustical expert. In the article *Managing Helicopter Noise,* a copy of which is attached as Exhibit 1, it suggests that for medium helicopters (a step or two below the behemoth Chinooks), flights should be at least 2,000 feet above ground level to reach the acceptable dBa level of 65. Attached as Exhibit 2 is a chart which indicates 50 dBa would be the equivalent of a dishwasher noise in the next room. Billings Flying Service states in its application that highway noise levels reached 100 dBas in their measurements. Attached as Exhibit 3 are pages from the FHWA Traffic Noise Model User's Guide which indicate a heavy truck generates 82.5 dBa at 50 feet travelling at 50 miles per hour. A February 20, 2014, Billings Gazette article involving Chinook helicopters being operated by Billings Flying Service out of its existing location, quoted neighbor Falon Nicholls, who stated "[t]hey flew right over our house, and it was vibrating... It was as loud as the biggest thunderstorm I have ever heard." It is submitted that Billings Flying Service figures are, at a minimum, misleading and absent a noise study which resolves the legitimate concern of flights directly overhead residential neighborhoods, a zone change should be denied on noise levels concerns alone.

Finally, it is submitted that Public zoning of the north 600 feet of the subject parcels is inappropriate in terms of the overall policy as articulated by the Yellowstone County Growth Policy and the 12 criteria to be used when reviewing zone change applications. These factors are discussed in more detail in Section V. below.

III. CONTROLLED INDUSTRIAL ZONING.

Turning next to the Controlled Industrial zone request, it is submitted this zoning is inappropriate for the subject parcels. The purpose of the Controlled Industrial zone is defined as follows:

> CONTROLLED INDUSTRIAL: The Controlled Industrial zone is intended to accommodate a variety of business, warehouse and light industrial uses related to wholesale plus other business and light industries not compatible with other commercial zones, but which need not be restricted in industrial or general commercial zones, and to provide locations directly accessible to arterial and other transportation systems where they can conveniently serve the business and industrial centers of the city and county.

Zoning Regulations, § 27-301.

Attached as Exhibit 4 is a Yellowstone County zoning map which establishes that all of the Controlled Industrial zone lands in Yellowstone County are located along the Interstate. To inject a small Controlled Industrial zone tract south and east of Agricultural-Open Space and north of residential zoned areas (all of which are significantly more restrictive in terms of allowed uses) could well amount to illegal spot zoning. The test of whether unconstitutional spot zoning has occurred requires a three-part analysis.

> We consider three factors when determining whether a zoning amendment constitutes spot zoning. *Little,* 193 Mont. at 346, 631 P.2d at 1289. We first evaluate whether the requested use differs significantly from the prevailing use in the area. *Little,* 193 Mont. at 346, 631 P.2d at 1289. We next determine whether the area proposed for rezoning is small, although not solely in physical size. *Little,* 193 Mont. at 346, 631 P.2d at 1289. Finally, we evaluate whether the requested change resembles special legislation designed to benefit only one or a few landowners at the expense of the surrounding landowners or general public. *Little,* 193 Mont. at 346, 631 P.2d at 1289.

N. 93 Neighbors, Inc. v. Bd. of Cty. Comm'rs of Flathead Cty., 332 Mont 327, ¶ 65, 137 P3d 557 (2006).

In the instant case, the allowed uses under Controlled Industrial are considerably more expansive than the adjacent Public zoning to the east and north, the residential development immediately to the south and a mile down the road in the Rehberg Ranch Estate development, as well as the agricultural zoning to west. Comparing CI to even Highway Commercial (HC) zoning illustrates the expansiveness of the CI zoning. In Division D, Manufacturing, most categories are either allowed or allowed subject to special review in the CI zone and not in the HC zone or only subject to special review as opposed to allowed without review in the CI zone. A good example is a poultry slaughtering facility which is allowed subject to special review in CI but not allowed in HC. In the wholesale trade categories, the same holds true, many uses are allowed in CI and not in HC or allowed only subject to special review.

The area sought to be rezoned is approximately 40 acres, which is relatively small in comparison to the lands surrounding it.

Although the record is not developed, it would appear that Billings Flying Service is interested only in the north parcel sought to be zoned Public but is seeking the Controlled Industrial zoning for the south parcel in order to capitalize on the expansive allowed uses and to use the sale proceeds on the south parcel to subsidize the cost of the north parcel. As such, absent a determination that the entire strip of land bordering Highway 3 west of the airport extending to the Rehberg Ranch Estate should be developed as Controlled Industrial, granting Controlled Industrial zoning to the south parcel solely to provide an economically viable project for Billings Flying Service would amount to a special benefit to the applicant at the expense of the surrounding property owners.

IV. AN ALTERNATIVE APPROACH.

As noted in the introductory remarks, Stony Ridge does support private property rights and commercial development. In discussing this matter with various developers and realtors, the undersigned was often met with the question, "what use would you recommend?" It is true the parcels are arguably underutilized (although it is hard to call the mainstay of the Yellowstone County economy as "underutilization"), and given the proximity to the airport, development does raise issues. But to answer this question, Stony Ridge retained Sanderson Stewart, a leading engineering firm in this area, to prepare an analysis of an alternative approach which uses most prominently the Highway Commercial and Residential Professional zones with appropriate buffering to accommodate the interests of neighboring land owners. The approach developed by Sanderson Stewart would ideally be developed as a Planned Unit Development pursuant to Article 27-1300 of the Zoning Regulations, but could be done by the flexible zoning afforded by the Highway Commercial zoning. Included in the proposal is a mix of residential and residential professional development as well.[6] Attached as Exhibit 5 is a copy of their report and a representative from Sanderson Stewart will be available to briefly discuss this alternative approach at the Zoning Commission hearing. The report presents two alternatives, one which assumes a heliport is not constructed and one which assumes a heliport is constructed. The primary point of this presentation is to establish there are viable development options which do not involved the wide-open CI zoning requested and, more importantly, options which are more consistent with the Yellowstone County Growth Policy and the 12 criteria discussed below.

V. ANALYSIS OF GROWTH POLICY AND 12 CRITERIA.

The Zoning Commission is required to analyze a zone change based on the 12 criteria set forth in Zoning Regulations, § 27-1509. In addition it is necessary to consider the impact of the zone change request in terms of the 2008 Growth Policy. These factors, to the extent applicable, are discussed below, with a contrast, where

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[6] The Zone Change Application suggests the airport noise and vertical limitations render the property of limited development potential. The airport influence map indicates a dBa of 60 in most of the property and 65 dBa in a small portion. Neither is incompatible with the proposed development. See Billings Code of Ordinances, §5-409, Table A. With regard to height limitations, the Airport Areas of Influence/Height and Hazard Limitation Zone map indicates the property is not significantly impacted by height restrictions.

appropriate, with the proposed zone change and the proposal presented by Sanderson Stewart:

12-Criteria Analysis.

Criteria 1. Are the zone changes consistent with the comprehensive plan? This issue is addressed in terms of the compliance with the nine factors set forth in the 2008 Growth Policy as follows:

a. Land Use Element. The alternative plan evidences a predictable land use plan which is consistent with, as opposed to in direct conflict with the existing land uses, especially the residential uses to the south of the parcel and further west in the Rehberg Ranch Estates development. To suggest that allowing private, for-profit heliport and the only controlled industrial zone land outside the Interstate corridor represents "predictable land use" ignores the obvious.

b. Economic Development Element. The alternative plan does provide for economic development but in a manner which compliments rather than conflicting with existing uses. Note, one of the articulated goals under this element is the goal of presenting attractive entryways into our community. What better way to accomplish this than having an attractive development as air travelers leave the airport and head west along Highway 3 as opposed to unsightly industrial development.

c. Aesthetic Element. There can be little doubt the alternative plan presents a more aesthetically pleasing result than would exist if the development were accomplished with uses allowed under Controlled Industrial zoning but not under Highway Commercial zoning.

d. Natural Resources Element. It is submitted this element is not impacted either way.

e. Open Space and Recreational Element. The alternative plan incorporates (I assume walking paths or the like), which tie nicely into this articulated goal; whereas, a Controlled Industrial development would likely have little use for these components.

f. Transportation Element. It is submitted this element is not impacted either way.

g. Public Facilities and Services Element. This element is primarily a procedural one and the zoning Category itself is not relevant.

h. Cultural and Historic Resources Element. It is submitted this element is not impacted either way.

i. Community Health Element. It is submitted this element is not impacted either way.

Criteria 2. through 9. These criteria factors are deemed not impacted by the proposed zoning in any meaningful way.

Criteria 10. Consideration of the peculiar suitability of the property. This property is located adjacent to the airport and just north and east of substantial residential developments. As an entryway into the City of Billings the proposed use for CI development as opposed to the types of development anticipated in the Sanderson Stewart illustrations establishes the proposed zone change is lacking in this category.

Criteria 11. The impact on the value of buildings. The adverse impact of either the noise from the heliport or the types of uses which could be developed under the CI zoning will both have a deleterious impact on the value of the residential developments to the south and if the CI zoning were extended further west, on the Rehberg Ranch Estates development as well.

Criteria 12. Whether the zoning encourages the most appropriate use of land throughout the county. On this factor, the proposed zone changes fail. The heliport is an attempt inappropriately to extend the Public zoning to a purely private use and to extend the CI zoning to an isolated area far from existing CI zoning.

VI. CONCLUSION.

Public zoning is inappropriate for the reasons set forth – the intended use is not public or semi-public and the project has not been adequately vetted in terms of noise issues. Controlled Industrial zoning is inappropriate because it would allow industrial development close to residential development and does not represent the type of predictable development mandated by the Yellowstone County Growth Policy. Finally, there are better alternatives which will allow the property to be more productively used and developed while at the same time minimizing impacts on existing uses.

Sincerely,

Tim Filz

Enclosures
TAF/jp

Cc: Stony Ridge Development, LLC (w/ encl)

Managing Helicopter Noise

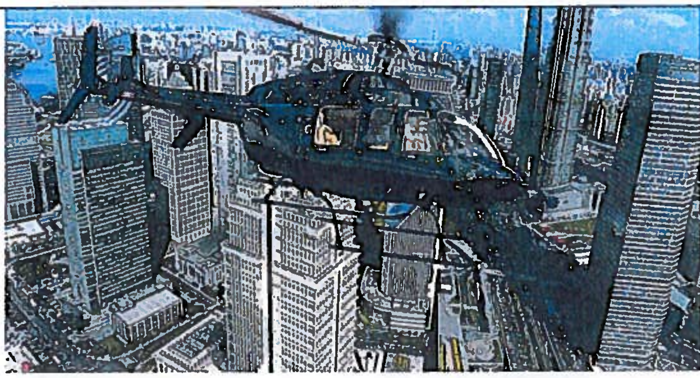
It's key to keeping access to urban areas

Patrick R. Veillette | *Business & Commercial Aviation* *Mar 1, 2015*

While the sound of spinning rotors may mean lifesaving, safety or profit to members of the rotary-wing community, to most in the general population, the sound is just noise. Too often, unwelcome noise. And that's a problem for everyone.

According to "Noise Management in Mixed-Use Urban Environments," presented by the New Zealand Planning Institute, "Noise is an unwanted sound. The effects of noise vary, starting at the lowest end with being an annoyance. The next level occurs when the noise is loud enough to make normal speech difficult to hear. Above that, even louder noise can make concentration difficult and interfere with important mental tasks such as learning, reviewing documents, doing math or where focus on the meaning of words is critical."

"Noise has even more serious effects when it leads to stress-related mental health decline," it continued, "and of course, if the noise occurs during sleep periods, then fatigue and disrupted sleep patterns can cause irritability, changes in behavior, and reduced ability to work or perform tasks."

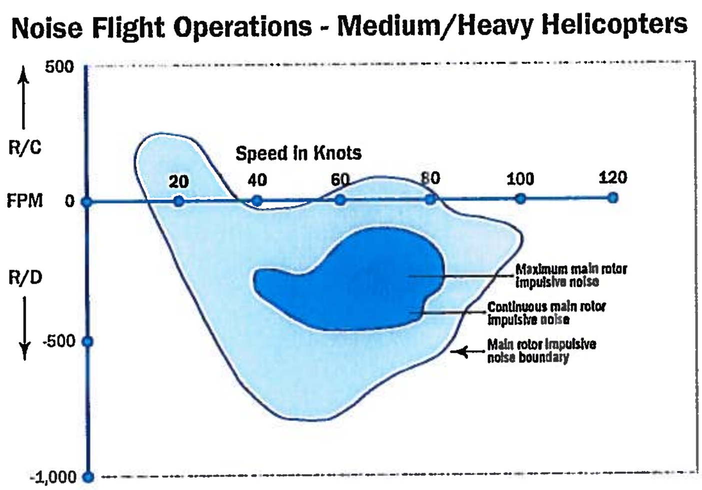


There are numerous characteristics of helicopter sound that cause it to be objectionable to many within earshot. To begin with, noises with a beat or pulsating qualities tend to be more annoying. The main-rotor and anti-torque systems in turbine helicopters tend to dominate the acoustical signature.

The distinctive aerodynamic rotor blade slap noise generated by helicopter rotors is difficult to disguise. Blade slap (technically "Blade Vortex Interaction," or simply BVI) noise occurs during descent for landing and results from interaction of a main-rotor blade with previously shed tip vortices. These interactions generate a complex unsteady pressure field that propagates below the rotor as high impulsive noise. High-Speed Impulsive (HSI) noise is caused by transonic flow shock formation on the advancing main-rotor blade, primarily near the blade's tip. This noise tends to propagate forward of the helicopter.

Meanwhile, tail-rotor noise is annoying to humans because its higher frequency (as compared to that of the main rotor's noise) occurs directly in the hearing spectrum to which human ears are the most sensitive.

The loudness of a helicopter's noise signature is an obvious factor. The Effective Perceived Noise Level (EPNL) generated by helicopters is measured in units of EPNdBs (Effective Perceived Noise Decibels), a methodology that closely weights the frequencies that a normal human ear can hear, and tends to disregard the frequencies that the typical human cannot perceive. Using the test methods outlined in FAR Part 36 Appendix H, the EPNdB of the Bell 412HP at flyover, for example, is measured at 93.4, according to the manufacturer, which is equivalent to a Boeing 777-200 at takeoff.



According to the American Planning Society, "Sound frequency must also be taken into consideration. A sound spectrum analysis of helicopter noise shows that most of the energies are confined to the low frequencies which, although more acceptable than high-frequency sounds, are more apt to produce speech interference." Speech interference is just one of many important considerations that must be proactively managed in noise management.

Keith Hayward, head of research at the Royal Aeronautical Society, was called upon by London authorities to provide expert testimony on the issue of helicopter noise. According to Hayward, non-acoustic characteristics such as the frequency of noise and purpose of flight operations tend to be more important than the actual sound in determining the public's acceptance of helicopter activity.

Frequent rotary flight operations over a noise-sensitive location are almost guaranteed to annoy citizens and often result in legislative and regulatory restriction. For nearly a decade, Long Island, New York, residents have inundated public officials with complaints about helicopter noise. In response, in 2011, Sen. Charles Schumer (D-N.Y.) sponsored legislation that would have heavily restricted helicopter operations over the heavily populated island. The legislation was blocked by the Republican-controlled House, but Schumer subsequently teamed with Rep. Tim Bishop, a fellow Democrat from Long Island, to get the Department of Transportation to mandate an overwater route for helicopters transiting the island. The "North Shore Route" required helicopters to fly 1 mi. off the island's north shore for the purpose of noise abatement.

Credit: Eastern Regional Helicopter Council, Google Maps

Of course, moving traffic from one place simply shifts it and thereby assaults the calm elsewhere. In 2013, the Eastern Region Helicopter Council received and processed 1,848 complaints from 94 distinct households, with the majority of those from residents on Long Island's North Fork. (A graphic of the concentration of noise complaints is available at http://www.planenoise.com/case-studies.php.) Hundreds of irritated residents from Southold, Shelter Island and Southampton packed public meetings in August 2014 to protest the increased helicopter approaches and departures at neighboring East Hampton Airport, where it is estimated that 65% of summertime helicopter traffic lands.

Helicopter activities located close to residential areas generate more noise issues than those frequenting commercial or industrial zones. According to the Royal Aeronautical Society's Hayward, "Prevailing ambient noise levels affect perceptions, and a quieter setting will accentuate airborne noise, especially if radiated from above. This is particularly important when locating heliports and defining the flight paths for arriving and departing helicopters."

Residents of Torrance, California, have complained loudly about the increase in flight operations there over the years and object particularly to low-flying helicopters. As it happens, Robinson Helicopter Co. employs 1,300 people in its factory and headquarters, located at Zamperini Field, a busy, public-use general aviation airport located just 3 mi. from Torrance's central business district.

In response to those and other complaints from the region, the FAA issued its "Report on the Los Angeles Helicopter Noise Initiative" in May 2013, which suggested, among other things, raising helicopter traffic altitudes and moving flight paths around Torrance to lessen their noise impact on those below. The agency is working with the city to test community-recommended arrival and departure routes located over the Pacific Coast Highway and Crenshaw Boulevard to mask helicopter noise with that of the road traffic.

A similar tactic has been proposed in the "Windy City" by Chicago Helicopter Express CEO Trevor Heffernan. The helicopter tour operation wants to utilize flight routes over expressways and train tracks when conducting tours.

Heffernan is also proposing a 2,000-ft. AGL flight path to further lessen the noise impact. The FAA's "Report to Congress: Nonmilitary Helicopter Urban Noise Study," published in 2004, cites numerous studies in which noise reduction benefits could be achieved with higher altitude flight. This is a policy mandated by pilots utilizing the London Heliport where the pattern altitude is 1,000 ft. MSL and flown over the river.

According to data published in the HAI's *Fly Neighborly Guide*, a doubling of height or distance reduces noise by 6 to 7 dBA. In order for a light/small helicopter to meet the generally accepted criteria of 65 dBA over a noise-sensitive area, it should fly at altitudes no less than 1,000 ft. AGL, and for medium helicopters, the recommended height is 2,000 ft. AGL. If those noise targets seem ambitious, consider that a quiet bedroom has a noise level just under 40 dBA, and a busy office is around 60 dBA. Voice communications start to become difficult around 65 dBA. above grd

Even though flying higher results in substantial noise reduction, doing so can have safety implications. For instance, requiring helicopters to fly at higher altitudes in the Los Angeles Basin could create traffic conflicts with the fixed-wing aircraft operating in that already congested airspace. (Incidentally, according to the FAA's report on Los Angeles helicopter noise, there are 138 heliports in the LA Basin.)

Night helicopter operations are a particular problem in the urban environment. The absence of daytime road traffic to mask helicopter noise can make the latter all the more noticeable and bothersome. Furthermore, temperature inversions turn an abnormally high portion of the sound energy back toward the ground and the most severe inversions usually occur at night and in the early morning hours, times when helicopter noise has the most adverse effect upon people.

"Have Your Say On Helicopter Noise" is a website frequented by Londoners bothered by rotary-wing operations there. Of the 240 posts found recently at the site, the large majority of the complaints centered on helicopters circling for prolonged periods of time at around 2 a.m. "I find it very distressing getting up every night for this reason," one resident, who lives near the London Heliport, wrote. "I also sleep with earplugs, but the noise is too loud."

Limiting the number of helicopter operations at night can significantly reduce noise complaints. Unfortunately it's hard for the public to distinguish civil from police, medevac or military helicopters, particularly at night, and thus commercial operators might be blamed for noise not of their making.

That ambiguity raises the matter of perceived usage, and its impact on public attitudes toward helicopters. According to the FAA's study of nonmilitary helicopter noise in cities, helicopters used in public service operations, such as law enforcement, medical transport and firefighting are regarded more benignly than those carrying sightseers or executives. The former were regarded as "time critical and provide a 'noise excusable' public service," the study found. Conversely, local communities aren't as forgiving when the helicopters creating the noise are carrying Wall Streeters to weekends at the beach or reporters gathering news video.

Daily coverage of traffic reports, accidents, fires and police pursuits are standard fare for helicopters engaged in electronic news gathering (ENG). But for all the public benefit they provide, they, too, can become part of the noise problem.

When a 10-mi. section of Los Angeles's infamous Interstate 405 was closed over one weekend in July 2011 as part of a highway improvement project, local media predicted a "carmageddon" would result. It didn't, but the news helicopters covering the non-event were so numerous and their flights so incessant that those below exposed to the din demanded action from the authorities.

Accordingly, Sen. Diane Feinstein (D-Calif.) teamed with Rep. Adam Schiff (D-Calif.) to enact an amendment mandating the industry find solutions to the helicopter noise problem "or else" Congress would force the FAA to impose severe restrictions.

In response, the FAA delivered its 2013 report on helicopter operations in the Los Angeles area. Among its recommendations was that news helicopter operators embrace voluntary measures to include limiting hovering times, increasing distance between hovering aircraft, raising operating altitudes and pooling their video coverage. The Professional Helicopter Pilots Association (PHPA) urged the Southern California Radio and Television News Association to consider pooling resources as well. Doing so has reduced noise complaints from the public.

Moreover, the use of improved cameras that can obtain good images from farther away has also helped to lessen the sound congestion near major news events. These successful methods are now included among the best practices on the PHPA's website (**http://www.phpa.org**) to reduce sound complaints.

There are other potential mitigation strategies. Main-rotor impulsive noise increases during maneuvering, thus pilots should avoid abrupt maneuvering and/or rapid initiation of descent, particularly around high usage areas such as heliports. This is a policy in place for pilots operating into the London Heliport. There the pattern altitude is 1,000 ft. MSL and flown over the Thames River. All turns should be made as far as practical over the water above 500 ft. An excellent discussion of the additional noise caused during maneuvering is contained in the HAI's *Fly Neighborly Guide*.

Hayward's noise management recommendations to London officials included requiring approach-to-landing over water or over high ambient noise areas, which would include freeways. Meanwhile, the New Zealand Planning Institute's website points out that noise provisions can normally be more lenient within commercial and industrial zones, and recommends these for consideration in helicopter routings.

While routing helicopters over major transportation corridors can avoid impacting residential areas, the practice has the additional benefit of providing pilots with navigational cues. After all, in densely built-up urban environments, major roadways may be the most readily identifiable surface features for orienting pilots in VFR conditions. Within the L.A. Basin, allowing helicopters to fly the freeways at lower altitudes also allows them to safely pass under the numerous approach and departure paths that exist throughout Southern California's complex airspace.

There are caveats to this methodology, of course. For example, the iconic Hollywood Bowl is just 850 ft. west of the Hollywood Freeway (U.S. 101) and is host to hundreds of musical events each year. A helicopter's beats are unwelcome when attendees there are trying to enjoy a concert. NOTAMs have not been effective in keeping pilots clear of the area during performances. Requests by Hollywood Bowl management to shift helicopter flight routes closer to Interstate 5 met with objections from residential areas under the revised routes. The FAA's Los Angeles study suggested the establishment of a no-fly zone during performance season.

Obviously, optimal helicopter route planning to avoid noise-sensitive areas requires comprehensive evaluation of each specific region of concern, including those tasked with air traffic management.

Distance and the placement of barriers between the helicopter's flight operations and neighbors can be another effective means of controlling unreasonable noise. In its "Noise Management in Mixed-Use Urban Environments," the New Zealand Planning Institute recommends close consideration of the helipad's location, orientation and design; the specification of helicopters that comply with lower noise levels; planning arrival and departure routes as far away as possible from noise sensitive neighborhoods; and employing barriers such as solid walls, fences, insulation, double-glazed windows or even hills, depressions or berms to control or reduce noise. Unfortunately, when close to helipads some noise barriers can create a collision potential. The effects of reflected sound need to be considered within the design and orientation of barriers as well as the location of the helipad itself.

Since public objection can result in severe limitations on helicopter operations, helicopter operators are wise to proactively manage the noise their aircraft generate. While there is no single remedy that can be implemented on a large-scale basis in urban areas to mitigate helicopter noise, development of noise abatement procedures in cooperation with local authorities and neighborhoods, along with adoption of "*Fly Neighborly*" guidelines, are modern necessities for the rotary-wing community. Time will tell if the voluntary actions taken by Los Angeles helicopter operators comprise an adequate compromise for all involved. Regardless, those kinds of collective actions are necessary to keep the urban helicopter viable. **B&CA**

DOWNLOAD the HAI's *Fly Neighborly Guide* tap here in the digital edition, or go to AviationWeek.com/Flyguide

Discuss this Article 2

rex@heliexp.com on Feb 24, 2015

Another significant safety consideration when contemplating flying higher altitudes and the impact this may have on approach and departure paths is settling with power for approaches and maximum power demands for departures. To conduct an approach from an initial altitude of 2,000' AGL, a steep approach, defined as 15 degrees, would require a horizontal component of approximately 7,700'.

To conduct an approach from 2,000' AGL within the FAA's prescribed 4,000' horizontal distance for a heliport the approach path would require an angle of around 30 degrees. If by chance there was pressure to stay at altitude even longer in an attempt to reduce the noise signature even more and conduct the approach within a 2,000' horizontal distance the angle would then increase to 45 degrees. Coupled with a poorly sited heliport which does not take into account local wind patterns or only has a single approach departure path where a tail wind is a predominate possibility; settling with power would be a real concern.

Initiating a climb to an altitude of 2,000' over a distance of 4,000' or less may also not be achievable in certain makes and models of helicopters under specific load configurations and environmental conditions, not to mention the potential for generating higher noise levels under these higher power demand situations.

As stated, being proactive through proper heliport site selection and flight path preplanning in collaboration with certified aviation professionals is a major factor in the

SOUTH REDDING 6-LANE PROJECT

LOUDNESS COMPARISON CHART (dBA)

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Jet Fly-over at 1000 ft	110	Rock Band
Gas Lawn Mower at 3 ft	100	
	90	Food Blender at 3 ft
Diesel Truck at 50 ft at 50 mph Noisy Urban Area, Daytime	80	Garbage Disposal at 3 ft Vacuum Cleaner at 10 ft
Gas Lawn Mower at 100 ft Commercial Area	70	Normal Speech at 3 ft
Heavy Traffic at 300 ft	60	Large Business Office
Quiet Urban, Daytime	50	Dishwasher Next Room
Quiet Urban, Nighttime Quiet Suburban, Nighttime	40	Theater, Large Conference Room (Background)
Quiet Rural, Nighttime	30	Library Bedroom at Night, Concert Hall (Background)
	20	Broadcast/Recording Studio
	10	
Lowest Threshold of Human Hearing	0	Lowest Threshold of Human Hearing

An increase of 3 dBA is barely perceptible to the human ear.

City of Redding California · Shasta County Regional Transportation Planning Agency · Caltrans

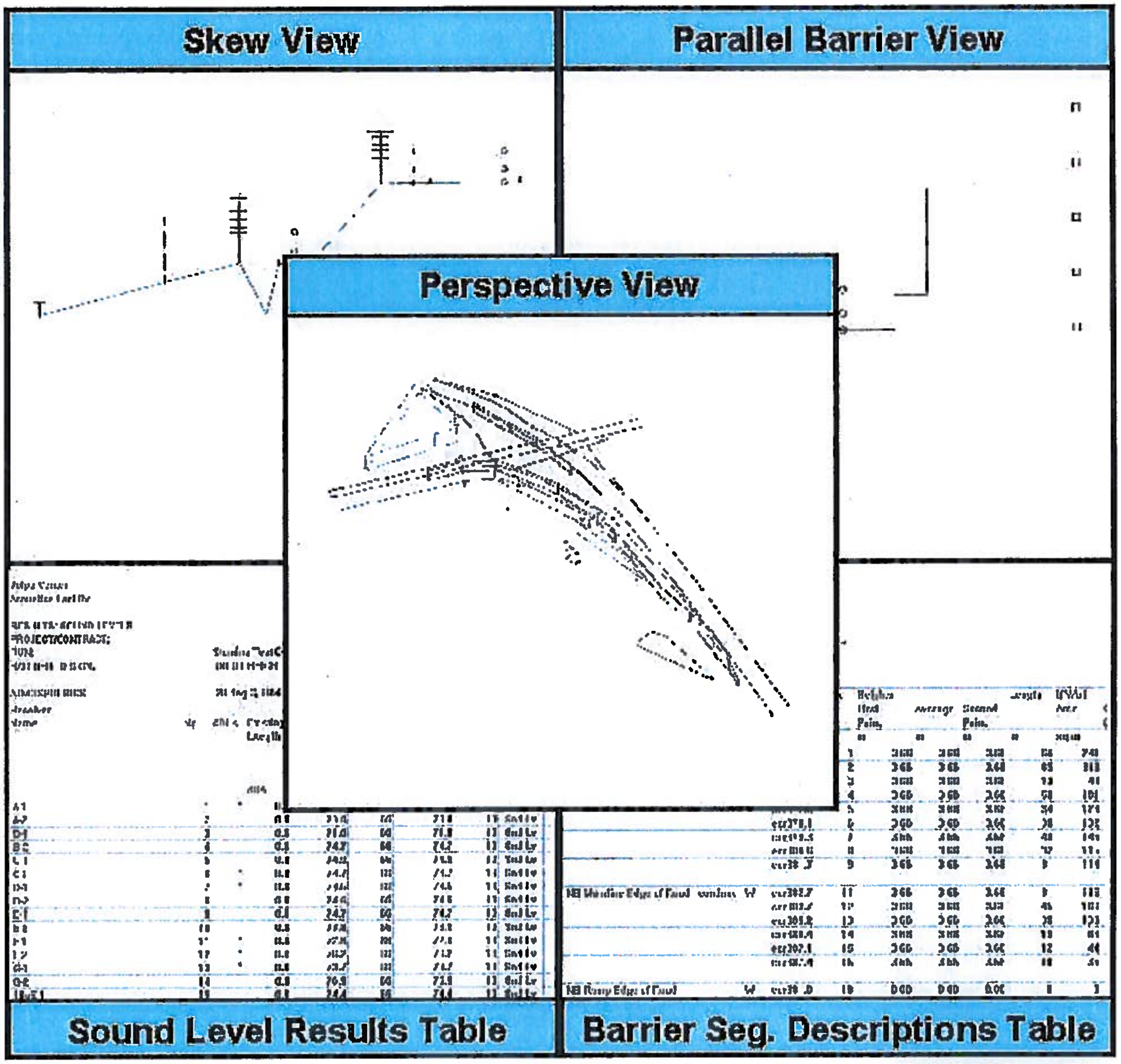
tabbies EXHIBIT 2

U.S. Department
of Transportation
Federal Highway
Administration

FHWA TRAFFIC NOISE MODEL®
USER'S GUIDE

FHWA-PD-96-009
DOT-VNTSC-FHWA-98-1

Final Report
January 1998



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APPENDIX F

REMEL DATA BASE

The FHWA Traffic Noise Model (TNM) computes a noise level through a series of adjustments to a reference sound level. The reference sound level is found in the REMEL data base.

The REMEL Data Base was developed by the U.S. Department of Transportation, Research and Special Programs Administration, John A. Volpe National Transportation Systems Center, Acoustics Facility (Volpe Center), in support of the FHWA, Office of Environment and Planning and Office of Engineering and Highway Operations Research and Development, and a 25-State National Pooled-Fund Study, titled: "Highway Noise Model Data Base Development."

The REMEL data base is an entirely new data base of vehicle noise emission levels that resulted from 1994/1995 measurements of over 6000 vehicle pass-bys events. These events include constant-flow REMEL data, interrupted-flow REMEL data, and subsource-height data measured in 9 states across the country.

Specifically, constant-flow measurements were performed by the Volpe Center, with the assistance of the Maryland State Highway Administration (MSHA), at 40 sites in California, Connecticut, Florida, Kentucky, Maryland, Massachusetts, New Jersey, Michigan, and Tennessee. Measurements were made at 7.5-, 15-, and 30-m offset positions from the centerline of the near travel lane. Data for constant vehicle speeds between 10 and 70 mph were obtained, as well as data for idling vehicles. The constant-flow data help correct many of the limitations of STAMINA 2.0/OPTIMA, such as limited speed ranges, vehicle types, and the inability to account for vehicles on grade.

Interrupted-flow measurements were performed by the Volpe Center, with the assistance of MSHA, Vanderbilt University, the University of Central Florida, and Ohio University, at 5 sites in Florida, Kentucky, and Tennessee. Measurements were made at a 15-m offset position from the centerline of the near travel lane. Data were collected as vehicles accelerated to, and decelerated from constant speeds at various points along the roadway, typically 15, 30, 60, 120, 240, 300, and 400 m from the stop line, i.e., toll booth, stop sign, or similar vehicle idling position. The interrupted-flow data facilitate the modeling of traffic at various traffic-control devices, such as toll booths, traffic lights, and highway ramps, by allowing the development of a relationship between interrupted-flow data and the corresponding constant-flow data.

Lastly, one-third octave-band subsource-height measurements were performed by Florida Atlantic University under the direction of FHWA, Florida DOT, and the Volpe Center. Measurements were performed for the same conditions represented by the constant- and interrupted-flow measurements. The subsource-height data allowed for a percent-energy apportioning of the constant-flow noise levels to fractional noise representative of typical vehicle noise subsources, i.e., engine/exhaust noise and tire/pavement noise.

The REMEL data and related subsource-height data were used to develop the regression equations of sound level versus speed versus frequency versus subsource-height required for TNM. The general

$B+\Delta E_b$ is the height of the tire/pavement-noise portion of the regression curve;
$C+\Delta E_c$ is the height of the engine/exhaust-noise portion of the regression curve;
D1 through J2 are for the sixth-order polynomial fit through the one-third octave-band spectral data as a function of speed; and
K1 and K2 calibrate the A-levels resulting from the sixth-order polynomial fit, such that they are essentially equal to the A-levels from the A-level REMEL equations expressed independent of frequency, i.e., $L_E(s)$ instead of $L_E(s,f)$.

Finally, to apportion REMELs to fractional noise levels representative of the "tire/pavement" and "engine/exhaust" subsources, one-third octave-band subsource-height adjustments were applied to all regression equations.

The general subsource-height-ratio equation, expressed as a function of frequency, is defined as follows:

$$\text{Subsource-height-ratio}\ (f) = L + [1\text{-}L\text{-}M][1+e^{[(N\log f)+P]}]^{Q}$$

where: L is the subsource-height ratio at low frequencies;
1-M is the subsource-height ratio at high frequencies; and
N, P, and Q control the exponential transition which occurs at the mid-frequencies.

In total, the regression equations developed for TNM are as follows:

- 10 subsource, one-third octave-band, average-pavement (data from both DGAC and PCC pavements combined) regressions for constant-flow vehicles on level grade;
- 24 subsource, one-third octave-band, specific-pavement (representing data from three pavement types: DGAC, PCC, and open-graded asphaltic concrete (OGAC)) regressions for constant-flow vehicles on level grade;
- 2 subsource, one-third octave-band, grade/interrupted-flow adjustment regressions (heavy trucks); and
- 8 subsource, one-third octave-band, adjustment regressions for interrupted-flow vehicles (autos, medium trucks, buses, and motorcycles).

These regressions exist in TNM as a matrix of coefficients expressed as a function of vehicle type, vehicle speed, one-third octave-band frequency, pavement type, roadway grade condition, traffic-flow condition, and vehicle subsource height. The coefficients have been integrated into the Data Base of TNM and are used for computing sound levels in the vicinity of a roadway, and for designing noise barriers. It is important to note that this relatively complex matrix is transparent to the TNM user.

The measurements, analysis and results are documented in more detail in the Volpe Center Final Report, "Development of the Reference Energy Mean Emission Level Data Base for the FHWA Traffic Noise Model (FHWA TNM®), Version 1.0."[2] Supplemental documentation includes References 4 and 5.

form of the regression equations differs from that used by STAMINA 2.0/OPTIMA in that it contains not only a "tire/pavement noise" component that increases with vehicle speed (similar to STAMINA 2.0/ OPTIMA), but also an "engine/exhaust noise" component that is independent of vehicle speed. Baseline regression equations were developed for automobiles (A), medium trucks (MT), heavy trucks (HT), buses (B), and motorcycles (MC). The resultant curves are presented in Figure 76. Baseline conditions refer to dense-graded asphaltic concrete (DGAC) and Portland cement concrete (PCC) pavements combined (referred to as "Average" pavement in this User's Guide), level-graded roadways, and constant-flow traffic.

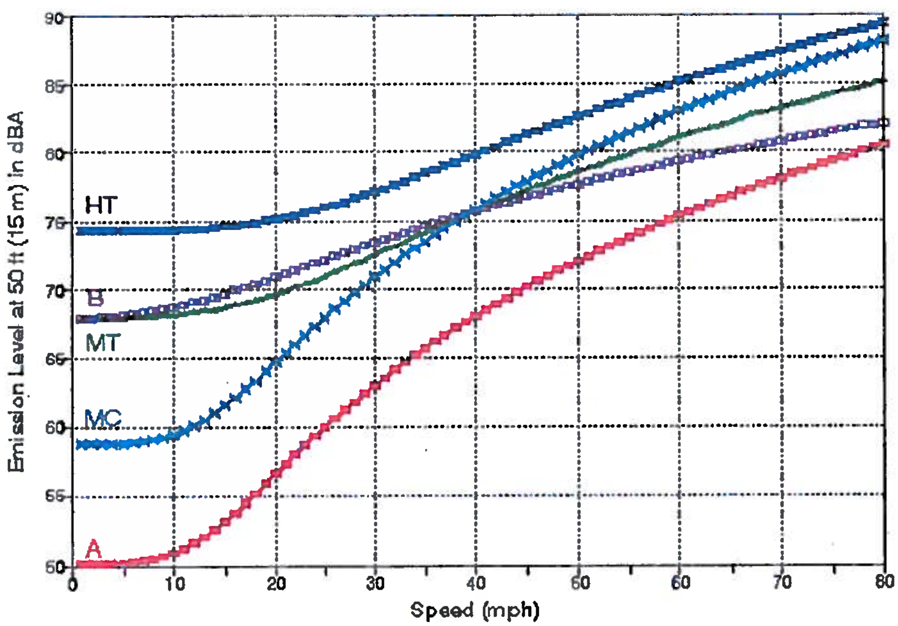

Figure 76. Emission level comparison.

To account for specific pavement types, grade conditions, and interrupted-flow traffic, similar regression equations were developed by applying adjustments to the "tire/pavement noise" component and/or the "engine/exhaust noise" component of the above baseline regression curves.

The general REMEL equation, expressed as a function of vehicle speed (mph) and frequency (Hz), is defined as follows:

$$
\begin{aligned}
L_E(s,f) = \; & 10*\log_{10}[10^{(C+)Ec)/10} + (s^{A/10})(10^{(B+)Eb)/10})] \\
& - (K1+K2*s) + D1+D2*s + (E1+E2*s)\log_{10}f \\
& + (F1+F2*s)(\log_{10}f)^2 + (G1+G2*s)(\log_{10}f)^3 \\
& + (H1+H2*s)(\log_{10}f)^4 + (I1+I2*s)(\log_{10}f)^5 \\
& + (J1+J2*s)(\log_{10}f)^6
\end{aligned}
$$

where: A is the slope of the tire/pavement-noise portion of the regression curve;