

TO: ASSISTANT CHIEF HIGHWAY ENGINEER
ALL H. Q. DIRECTORS: Prof. Services, Planning & Major Projects
ALL REGIONAL MANAGERS: Prof. Services, Planning & Operations
ALL DISTRICT HIGHWAYS MANAGERS

SUBJECT: MITIGATION OF TRAFFIC NOISE FROM NEW FREEWAYS AND EXPRESSWAYS

REFERENCES:

- Ministry Highway Design Manual
- Policy for Mitigating the Effects of Highway Traffic Noise From Freeways and Expressways, February, 1991.

BACKGROUND:

Until now the Ministry has used an ad hoc policy with regard to noise mitigation. This approach has led to noise fences and walls being erected along the Upper Levels Highway in North Vancouver and planned for the Cassiar Connector. The planning of new expressways and freeways on Vancouver Island, particularly in urban areas, raised public concerns relative to social issues. This caused the preparation of a noise mitigation policy that would apply principles of measurement, unacceptable levels, and mitigation warrants similar to those used elsewhere in North America. While noise effects can come from any class of highway, it is the new expressways and freeways that are perceived by the public as being most invasive.

PROCEDURE:

The attached policy, dated February 91, was prepared by Highway Engineering Branch and approved by the Ministry Executive for immediate application to new freeway and expressway designs. The policy addresses noise mitigation in association with these two types of facilities and does not apply to other road classifications. Application of the policy to mitigate noise will only apply to existing premises at the time the new Freeway and Expressway is publicly announced and designs are underway. Any residential construction adjacent to the planned Freeway/Expressway, occurring subsequent to this event, is not eligible for noise mitigation under the Policy.

A comprehensive chapter on noise mitigation practice will be added to the Ministry Design Manual later this year.

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Attachment

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POLICY
for
MITIGATING THE EFFECTS OF HIGHWAY TRAFFIC NOISE
from
FREEWAYS AND EXPRESSWAYS

HIGHWAY ENGINEERING BRANCH
FEBRUARY, 1991

POLICY FOR MITIGATING THE EFFECTS OF HIGHWAY TRAFFIC NOISE

1.0 Basic Principles

The following are the principles on which this highway noise* control policy has been based. They are intended to meet the needs of people who live close to the new Freeways and Expressways, by protecting them from excessive noise impact, without overly restricting the Ministry in its task of providing these facilities.

- 1.1 No person living on residentially-zoned land adjacent to a provincial Freeway/Expressway should be exposed to levels of traffic noise which are clearly detrimental to their health and welfare.
- 1.2 Noise exposure is an obvious consequence of living near a Freeway/Expressway, and those who do so, particularly in a growing province like British Columbia, must expect that both traffic volumes and noise levels will increase to some degree over time.
- 1.3 People who live in rural, suburban or relatively quiet urban areas should not have their environment degraded to an excessive degree by increased noise levels from projected Freeway/Expressways.
- 1.4 The Ministry, in carrying out its mandate to provide adequate highway facilities for the ever-increasing volumes of traffic in B.C., should not be faced with prohibitively high noise impact mitigation costs. Mitigation should therefore only be carried out where it can be done effectively and at reasonable cost, and where it is supported by the affected public.

* Appendix A describes the nature of Highway Noise Impacts.

2.0 Application of Principles

2.1 Noise Impact Mitigation.

The Ministry will consider noise impact mitigation measures and implement them where reasonable and feasible, whenever the following noise levels, or changes in levels, are expected to result from a Freeway or Expressway project.

- 2.1.1 Highway noise levels* in the design year will be 55 dB or more and exceed pre-project ambient levels by 10 dB or more, or
- 2.1.2 Highway noise levels in the design year will be between 55 and 65 dB and will exceed pre-project ambient levels by an amount progressively decreasing from 10 dB (at 55 dB) to 5 dB (at 60 dB and above), or
- 2.1.3 Highway noise levels in the design year will exceed 65 dB.

(See Figure 1. for a graphical representation of the policy criteria).

2.2 Noise Impact Avoidance

Areas with very low ambient noise levels usually also have low population densities, so that there will be greater opportunity to avoid significant noise impacts from new Freeways through both horizontal and vertical alignment selection. It is therefore recommended, as shown in Figure 1., that efforts be made in the preliminary design phase to avoid potential noise impacts wherever possible, but particularly where projected highway noise levels are below 55 dB but will exceed pre-project ambient noise levels by 10 dB or more. Noise impact avoidance measures could include careful alignment selection and the recognition, in quantities balancing process, of the need for noise shielding using cut sections and earth berms.

* Appendix B defines the effects of various noise levels.

3.0 Application of the Policy

In the application of any noise policy, it is reasonable to exercise a certain degree of flexibility in the interpretation of the criteria. There are several arguments supporting this approach:

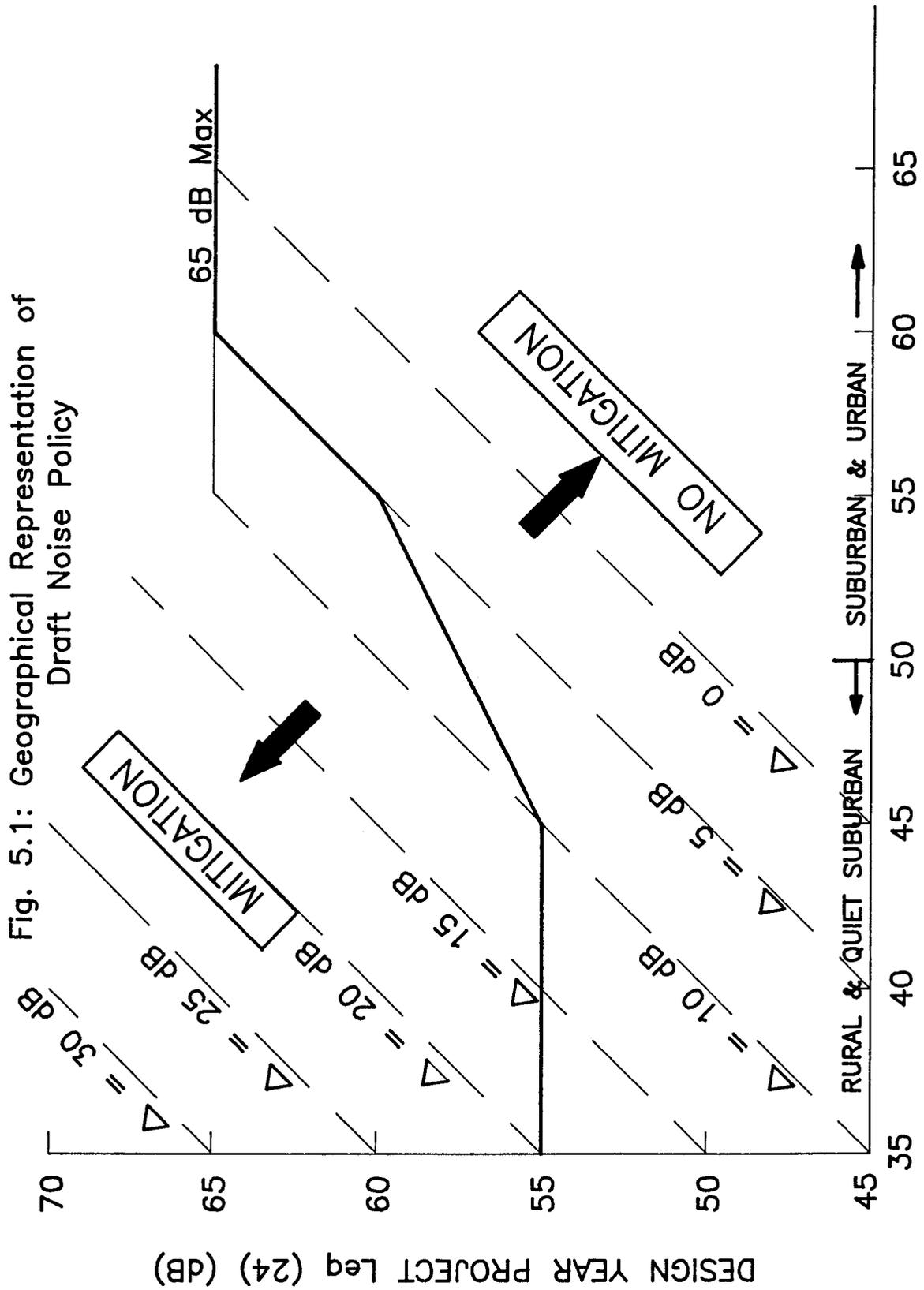
- 3.1 Highway noise measurement and prediction procedures have inherent accuracy limitations (typically plus or minus 1 to 2 dB), as do the traffic volume projections on which the future noise level predictions are based,
- 3.2 The threshold levels for significant noise impact, both absolute noise levels and increases, are indicative of ranges rather than exact values,
- 3.3 No manageable highway noise policy can adequately anticipate or accommodate the wide range of possible circumstances under which it may be applied. Each project will have unique features which will be considered by the Ministry in deciding whether or not mitigation is warranted and/or feasible.

Mitigation should only be carried out where a significant degree of noise attenuation can be achieved with a reasonable level of effort. This minimum significant attenuation is generally taken to be 5 dB at the worst impacted locations - normally the nearest row of residences.

The affected public will be involved in any highway noise abatement plan. This is both to assure that the majority are in favour of the plan and that they appreciate the significant potential visual, shading and view loss implications of the large scale structures typical of effective noise abatement measures carried out within the highway right-of-way.

Noise barrier walls may be constructed directly alongside Freeways or on top of earth berms. In either case they shall not exceed 3m (three) in height.

Fig. 5.1: Geographical Representation of Draft Noise Policy



AMBIENT Leq (24) (dB)

Pre-Project or Design Year W/O Project

APPENDIX A

THE NATURE OF HIGHWAY NOISE IMPACTS

Since noise is an unavoidable by-product of virtually all mechanized forms of transportation, all urban dwellers, and even most residents of rural areas, are routinely exposed to a certain level of intrusive noise from motor vehicles and aircraft. However, when community noise levels from these and other sources become high enough, or when a new or modified noise source causes a large increase in noise levels, negative health and welfare effects can occur.

Land Use Incompatibility/Activity Interference

The noise-sensitive land use of primary concern here is residential. When highway noise reaches a certain level (variously considered to be a 24-hour equivalent sound level of from 55 to 65 dBA), land is no longer considered to be fully compatible with residential use - for residences as normally configured and constructed. Highway noise at these levels can begin to significantly interfere with essential activities of the residents, primarily outdoor speech communication, relaxation and sleep. The degree of interference and the resulting negative effects on health and welfare increase steadily with noise level above this threshold range.

Environmental Degradation/Annoyance

When a new source of intrusive noise increases community noise levels, but not to the point of incompatibility with residential land use, environmental degradation is said to occur. If the increase is substantial enough, this degradation of the quality of life in the community can be expected to produce widespread annoyance and negative public reaction. The degree of negative reaction to a given level of intruding noise depends on the ambient noise levels in the community, the nature of the intruding noise, the residents' prior experience with the noise and their attitudes towards the noise maker. However, it is generally observed that, for a relatively familiar noise without particularly adverse frequency content, such as from road traffic, significant negative reactions due to annoyance can be expected, when the increase in overall community noise level approaches 10 dBA. This corresponds approximately to a doubling of perceived loudness or noisiness.

APPENDIX B

HIGHWAY TRAFFIC NOISE LEVELS AND NOISE LEVEL INCREASES

Impressions of Various Levels of Highway Noise

The following will hopefully assist those not familiar with highway noise measurement and the decibel scale of noise intensity to better appreciate subjectively what the noise levels and criteria discussed herein represent. The measure of community noise used throughout is the 24-hour equivalent sound level or L.(24). This is a single number descriptor representing that steady noise level (expressed in A-weighted decibels or dBA) which would result in the same sound energy exposure as the actual time-varying community sound level. It has been shown to correlate well with subjective impressions of, and public reactions to intrusive noise from a variety of sources and over the wide range of intensities encountered in the community.

- 35 to 40 dBA - ambient noise level range in a rural area far from main roads, or, a quiet living room,
- 50 dBA - ambient noise level in a typical suburban area away from main roads, or, a general office.
- 55 dBA - ambient noise level in a typical urban residential area, not directly on main road: the CMHC's threshold for noise concerns,
- 60 dBA - noisy urban area (30m from centerline of a busy street carrying 10,000 vpd), or, about 70m from centerline of 30,000 vpd highway (eg. Hwy 17 near McKenzie),
- 65 dBA - very noisy urban area, or, about 35m from centerline of a 30,000 vpd highway,.
- 70 dBA - about 15m from centerline of a 30,000 vpd highway, or about 6m from the edge of pavement.

Impressions of Noise Level Increases

- 5 dBA - about a 40% increase in subjective loudness; the threshold of significant change and possible negative reaction (at moderate ambient levels),
- 10 dBA - about a 100% increase in subjective loudness; a "substantial" increase which is likely to produce a significant negative public reaction.