BRITISH COLUMBIA

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

POLICY FOR ASSESSING AND MITIGATING NOISE IMPACTS FROM NEW AND UPGRADED NUMBERED HIGHWAYS

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Prepared for;

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BACKGROUND

This policy replaces the 1993 version of the B.C. Ministry of Transportation and Infrastructure (MoTI) Noise Policy and provides an updated procedure to determine if the community noise impacts anticipated to be associated with the upgrading of existing numbered highways or the construction of new numbered highways, as planned by the MoTI, warrant noise mitigation consideration.

KEY POLICY UPDATES/CHANGES

The key updates/changes from the 1993 policy include:

- Replacement of the 24-hour Equivalent Sound Level, or $L_{eq}(24)$, with the Day-Night Average Sound Level, or L_{dn}, as the principal measure of traffic noise exposure in residential areas,
- Expansion of the policy's scope to include highways other than freeways and expressways,
- Introduction of fixed upper limits for allowable traffic noise exposures,
- Introduction of dual noise impact thresholds for Moderate and Severe noise impacts,
- Increasing the maximum noise barrier height from 3 m to 5 m,
- Allowing mitigation measures to be implemented outside the highway right-of-way,
- Allowing mitigation for land uses other than residential and education facilities,
- Allowing mitigation measures for the benefit of other than ground-floor receivers.

KEY POLICY OBJECTIVES

These updates/changes are intended to:

- Bring the policy more in line with current national and international practices,
- Broaden the scope of highway projects that the policy can effectively address,
- Avoid incremental or "creeping" noise impacts in situations where pre-project noise levels are already higher than considered appropriate for residential land use,
- Provide a broader range of mitigation options thereby increasing the flexibility which project managers will have in selecting appropriate mitigation measures for projects with varying degrees of noise impact,
- Protect public health and welfare by avoiding, to the extent practically possible, through project design and/or mitigation measures, situations in which:
  - Communities adjacent to highways are exposed to daily average noise levels clearly inconsistent with a healthy residential environment,
  - Communities are subjected to increases in their daily average noise exposures that would markedly increase the intrusiveness and disruptiveness of noise in their lives,

- Project-related noise significantly compromises the intended functioning of public facilities such as schools, libraries and churches as well as passive parks and other particularly noise-sensitive outdoor spaces.

SCOPE OF NOISE POLICY

The updated MoTI noise policy addresses highway traffic-related noise impacts and the potential need for mitigation measures from the following types of projects:

- Construction of new numbered highways,
- Upgrading of existing numbered highways.

TYPES OF NOISE-SENSITIVE LAND USES

The MoTI policy addresses noise impacts at the following types of noise-sensitive land uses:

- Residential (all types of permanent residences),
- Educational Facilities,
- Hospitals,
- Libraries, Churches and Museums,
- Passive Parks and other land uses where quiet and tranquillity are essential attributes.

ELIGIBILITY OF LAND USES FOR MITIGATION

To be eligible for mitigation consideration, noise-sensitive land uses or developments must predate the highway project at hand. Developments must receive planning approval from the appropriate local authority prior to the first public announcement of the highway project or the designation (through gazetting) of the affected lands as potential future highway right-of-way.

NOISE METRIC FOR ASSESSING NOISE IMPACT AT RESIDENCES

The noise metric used to quantify the highway noise environment at residential land uses shall be the Day-Night Average Sound Level, or L_{dn}. The L_{dn} is an energy-based daily average sound level similar to the 24-hour Equivalent Sound Level, or $L_{eq}(24)$, employed in earlier versions of the MoTI noise policy. Both the L_{dn} and the $L_{eq}(24)$ are expressed in units of A-weighted decibels, or dBA. However, in computing the L_{dn}, a 10 dBA penalty is applied to all noise levels measured, or predicted to occur, during the night-time hours, that is between 22:00 and 07:00 hours. This penalty reflects the greater sensitive of communities to noise at night.

NOISE IMPACT THRESHOLDS FOR RESIDENTIAL LAND USES

Communities can be impacted by noise in two ways: firstly by exposure to excessive absolute levels of noise (i.e., absolute noise impacts) which can interfere with sleep, speech and the use and enjoyment of property; secondly, by exposure to excessive project-related "increases" in noise (i.e., relative noise impacts) that tend to increase expressed levels of human annoyance and which may be considered environmental degradation.

The policy takes a "dual-threshold" approach in identifying noise impacts that warrant mitigation consideration so as to better address the range of possible impacts associated with highway projects and to provide greater flexibility in selecting mitigation measures consistent with the projected degree of impact. These thresholds are shown in two forms in Figures 1 and 2.

In Figure 1, baseline, or pre-project, noise levels (L_{dn}s) are plotted on the horizontal axis while total, post-project (10 years after project completion) noise levels are plotted on the vertical axis. Mitigation consideration shall be warranted for noise impact situations falling within the Moderate and Severe impact zones. Note that mitigation will only be carried out where total post-project noise levels are clearly dominated by highway traffic. In Figure 2, pre-project noise levels are shown on the horizontal axis while the project-related increases in total noise exposure required to warrant mitigation consideration are plotted on the vertical axis. The Moderate and Severe noise impact threshold values are presented in tabular form in Table 1.

NOISE IMPACT THRESHOLDS FOR NON-RESIDENTIAL LAND USES

Hospitals

While hospitals may not provide truly on-going, or long-term, residency situations for many of their patients, it is recognized that adequate rest is critical to patient recovery. Therefore noise impact mitigation for hospitals will be considered on a case-by-case basis using the same procedure employed for permanent residences.

Educational Facilities

Mitigation measures will be considered at educational facilities where it is anticipated that, during the noisiest hour of the day, post-project traffic noise levels, ten years after project completion, will reach L_{eq}(max-hr) 40 dBA inside classrooms or other highly noise sensitive spaces. School facades are generally capable of reducing traffic noise levels by at least 20 dBA, provided windows are closed. Therefore, where post-project noise levels at a school facade are predicted to be L_{eq}(max-hr) 60 dBA or higher, the potential need for mitigation must be investigated. This will often involve measurement of noise levels inside unoccupied classrooms.

Libraries, Churches, Museums

Churches, libraries, and museums are, like schools, sensitive to the intrusion of noise that can interfere with speech communications and concentration. Therefore, unless unique circumstances exist at a particular facility, the noise impact threshold for these types of public buildings will be the same as specified above for educational facilities.

Passive Parks and other land uses where quiet and tranquillity are essential attributes

Passive parks and other land uses (cemeteries, formal memorials, outdoor performance spaces, special natural features, and sites of religious or spiritual significance) for which tranquillity is a desirable, if not essential attribute, will be considered for mitigation on a case-by-case basis.

MITIGATION OBJECTIVES

To be considered sufficiently effective, mitigation measures must be able to reduce total noise exposures (from highway and non-highway sources) at fronting residences, schools etc., by at least 5 dBA. Larger noise reductions should be sought where feasible and cost-effective, particularly where project-related noise impacts at residences are predicted to be “Severe”.

MITIGATION MEASURES

Cost-benefit Considerations

The costs and benefits of mitigation measures must be weighed by MoTI Project Managers based on the particular conditions and considerations of each project. Benchmark mitigation cost guidelines have been established on a per-benefiting household basis. These are $25,000 per directly-benefiting residential unit in Moderate noise impact situations, and $40,000 per directly-benefiting residential unit in Severe noise impact situations.

Noise Barriers

Noise barriers may be located either inside or, subject to arrangements being made with landowners, outside the MoTI right-of-way. Barriers may be made of a wide variety of materials (pre-cast concrete, concrete block, steel, timber, plastic and other recycled materials, as well as earth berms). They may be sound reflective or sound absorptive. The height of vertical noise barriers (walls) is limited to 5 m. Earth berms or berm-wall combinations may be of any height.

Low-Noise Pavements

Some relatively porous pavement designs can reduce tire noise and, hence, overall highway traffic noise levels, by 4 to 7 dBA when new. However, this noise reduction tends to diminish over time. To be considered effective, low-noise pavements should be capable of providing an average noise reduction effect of at least 3 dBA over a ten-year period.

Noise Control at the Receiver

Where receivers of noise overlook, or will overlook, a highway, it may not be possible to achieve effective noise shielding even from a 5 m high roadside barrier or a berm/wall of practical total height. Where residences are isolated or widely spaced, barriers may not be cost-effective because of the substantial lengths required per residence. In such cases, consideration may be given to upgrading the sound insulation capacity of building facades. Mitigation of this type may also be considered for use at schools and other noise-sensitive public buildings.

Noise Impact Avoidance

Decisions made during the planning, design or construction phases of a highway project that result in reduced noise exposures at adjacent sensitive land uses (and possibly the prevention of exceedance of either Moderate or Severe Impact thresholds), but do not involve actual mitigation works, may be considered “noise impact avoidance”. Examples include selection of the least impactful route option, or the one best utilizing natural or man-made noise screening features. Other potential impact avoidance approaches are speed control or the use of low-noise pavement.

POST- PROJECT COMPLETION NOISE MONITORING

Once the highway project is completed and traffic patterns have stabilized (no more than a year after completion), post-project, 24-hour noise monitoring may be carried out at selected, representative noise receiver locations. Such monitoring will serve to both confirm noise predictions and to assess the effectiveness of mitigation measures.

Figure 1; Project-Related Traffic Noise Impact Thresholds

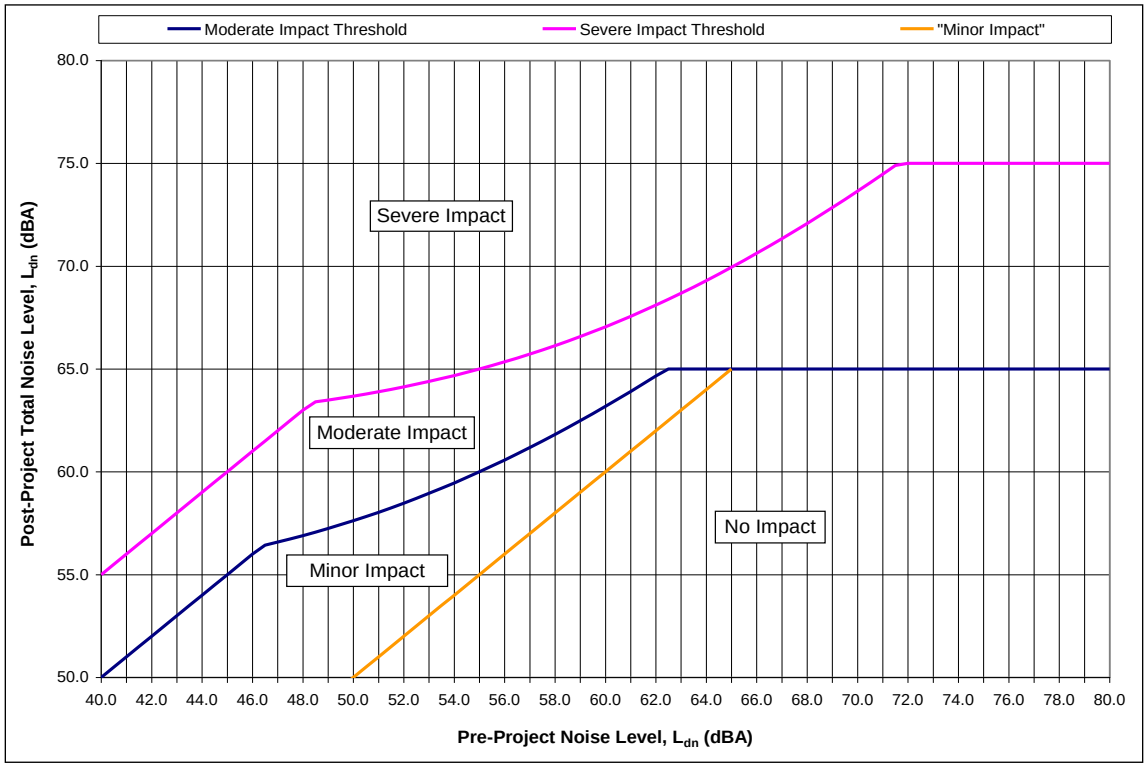

Figure 2; Increases in Total Noise Levels Permitted by Impact Thresholds of Figure 1.

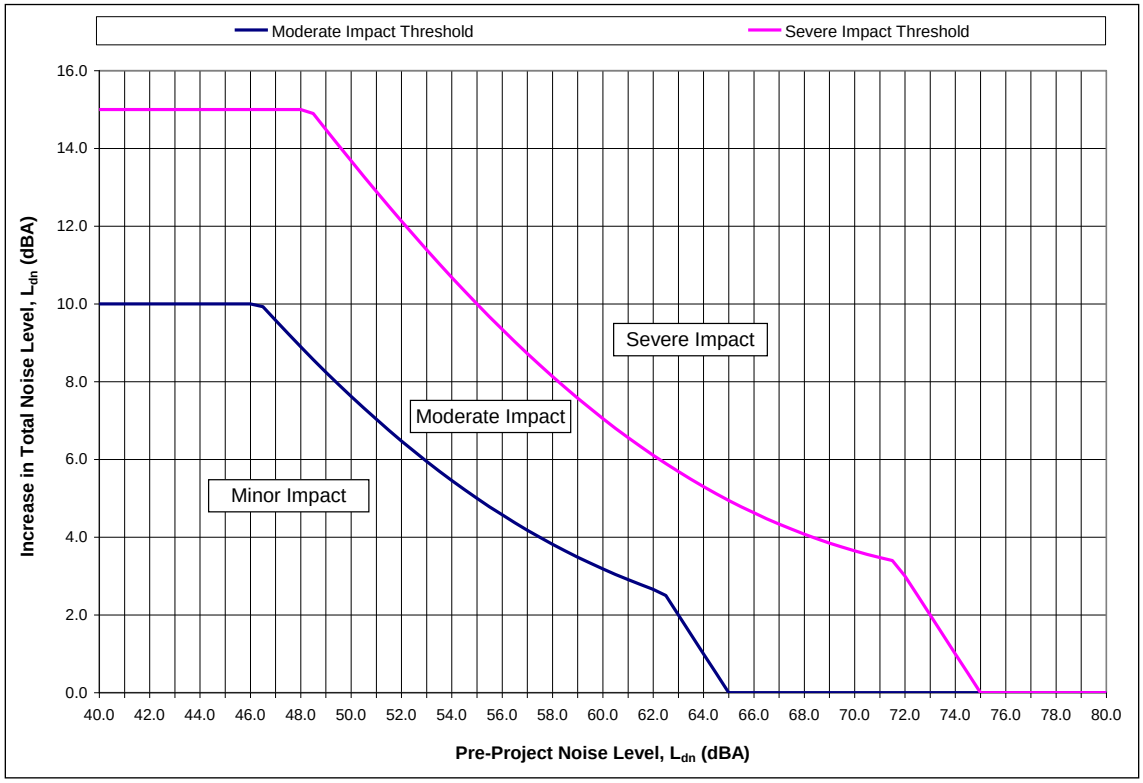

Table 1; Post-Project Total L_{dn} Values and Increases in Total L_{dn} Corresponding to Noise Impact Thresholds of Figures 1 and 2 Respectively.

Pre-Project L_{dn} (dBA)	Post-Project Total L_{dn} (dBA) (Figure 1)			Increase in Total L_{dn} (dBA) (Figure 2)		
	Minor Impact	Moderate Impact	Severe Impact	Minor Impact	Moderate Impact	Severe Impact
40.0	40.0	50.0	55.0	0.0	10.0	15.0
41.0	41.0	51.0	56.0	0.0	10.0	15.0
42.0	42.0	52.0	57.0	0.0	10.0	15.0
43.0	43.0	53.0	58.0	0.0	10.0	15.0
44.0	44.0	54.0	59.0	0.0	10.0	15.0
45.0	45.0	55.0	60.0	0.0	10.0	15.0
46.0	46.0	56.0	61.0	0.0	10.0	15.0
47.0	47.0	56.6	62.0	0.0	9.6	15.0
48.0	48.0	56.9	63.0	0.0	8.9	15.0
49.0	49.0	57.2	63.5	0.0	8.2	14.5
50.0	50.0	57.6	63.7	0.0	7.6	13.7
51.0	51.0	58.0	63.9	0.0	7.0	12.9
52.0	52.0	58.5	64.1	0.0	6.5	12.1
53.0	53.0	59.0	64.4	0.0	6.0	11.4
54.0	54.0	59.5	64.7	0.0	5.5	10.7
55.0	55.0	60.0	65.0	0.0	5.0	10.0
56.0	56.0	60.6	65.3	0.0	4.6	9.3
57.0	57.0	61.2	65.7	0.0	4.2	8.7
58.0	58.0	61.8	66.1	0.0	3.8	8.1
59.0	59.0	62.5	66.6	0.0	3.5	7.6
60.0	60.0	63.2	67.1	0.0	3.2	7.1
61.0	61.0	63.9	67.6	0.0	2.9	6.6
62.0	62.0	64.7	68.1	0.0	2.7	6.1
63.0	63.0	65.0	68.7	0.0	2.0	5.7
64.0	64.0	65.0	69.3	0.0	1.0	5.3
65.0	64.0	65.0	69.9	0.0	0.0	4.9
66.0	64.0	65.0	70.6	0.0	0.0	4.6
67.0	64.0	65.0	71.3	0.0	0.0	4.3
68.0	64.0	65.0	72.1	0.0	0.0	4.1
69.0	64.0	65.0	72.8	0.0	0.0	3.8
70.0	64.0	65.0	73.6	0.0	0.0	3.6
71.0	64.0	65.0	74.5	0.0	0.0	3.5
72.0	64.0	65.0	75.0	0.0	0.0	3.0
73.0	64.0	65.0	75.0	0.0	0.0	2.0
74.0	64.0	65.0	75.0	0.0	0.0	1.0
75.0	64.0	65.0	75.0	0.0	0.0	0.0
76.0	64.0	65.0	75.0	0.0	0.0	0.0
77.0	64.0	65.0	75.0	0.0	0.0	0.0
78.0	64.0	65.0	75.0	0.0	0.0	0.0
79.0	64.0	65.0	75.0	0.0	0.0	0.0
80.0	64.0	65.0	75.0	0.0	0.0	0.0