ROAD TRAFFIC NOISE —THE SELECTION OF A PREFERRED ROUTE

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1. INTRODUCTION

For new road projects the route selection process is an essential part of determining the preferred route. This includes many selection parameters of which noise is just one. Technical information which includes some form of noise assessment needs to be provided at the Value Management Workshop which would occur early in the road design and is a requirement of the EIS process. However, normally little or no data is available regarding the different options with the exception of several coloured lines on a map. The required input to the VM workshop is that these route options need to somehow be ranked. Time frame is 1 week and the budget may only be a few thousand dollars.

This article should not be considered as a research paper but rather as a technical note which may prove beneficial to those assessing road traffic noise in order to satisfy RTA requirements.

Wilkinson Murray s involvement in road traffic noise projects which have required a route selection process has led to the development of a simple assessment procedure. The procedure is described in this article

When faced with 6 different coloured lines on a map which represent 6 route options to be assessed, how can you decide which is the best overall from a noise perspective? Are 10 residences set back 50m from a new road better or worse than a combination of 5 residences set back 25m with a further 5 residences set back 100m. What happens if some of these residences are already affected by road traffic noise. Imagine how much harder the selection becomes when there are possibly 400 to 500 residences at varying distances up to 300m and beyond.

Without a site visit or the option of doing detailed calculations (the route selection assessment is normally restricted to a desktop study with limited budget and without a detailed road design) the assessment has to be based on professional judgement and intuition.

An assessment procedure has been developed, which probably supports the intuition, which uses a simple numbers approach to break the overall selection process into a number of smaller packages that allow comparison and can be handled with greater ease.

To assess the future likely impact of road traffic noise, three basic parameters have been chosen.

¥ Number of residential properties potentially affected.
¥ Future absolute noise level at each residence.
¥ Change in noise level (both increase and decrease) from existing situation at each residence.

In other words, the more residences affected the worse the route, the higher the noise level, the worse the route and the bigger the increase the worse the route.

2. WHAT DO YOU NEED ?

Aerial photography and perhaps the opportunity to speak on the phone with someone (Project Manager) who is reasonably familiar with the area;

¥ a scale rule;
¥ a simple spreadsheet; and
¥ the ability to count.

3. WHAT IS THE BASIS OF CALCULATING EXISTING AND FUTURE NOISE LEVELS ?

In the absence of information at the early stage of any project it is likely that the number of vehicles, vehicle distribution, traffic speed and road surface will all remain the same for each route. The parameters which will vary are, distance to each residence, natural shielding and road gradient. Since the road design (ie cut, fill and gradient) is not fixed at this early stage then it is impossible to account accurately for these factors. Realistically, distance from the centre line of the proposed road alignment to each residence is the only readily available parameter to assess future noise levels. In a similar fashion, distance from the centre line of the existing road alignment is the only readily available parameter to assess existing noise level.

4. WHAT TO DO ?

Previous assessments conducted by Wilkinson Murray have considered a region 300m either side of the route centre line. This has been based on the area over which information has been readily available. The recent change in EPA guidelines may indicate that 500m or even further is a more appropriate distance within which to include residences.

The procedure requires counting residences along each route option and compiling a spreadsheet for each route option (including the do nothing). A sample spreadsheet is attached.

The first step involves getting a decent size map and enough space on the office floor to spread it out. It is then necessary to split the areas either side of the existing and new routes into the following different distance categories from each route: 0-50m, 50-100m, 100-200m, 200-300m. Just use a scale rule and draw lines parallel to each of the route options. The first distance category realistically deals with residences within 25-50m from the edge of a road. The move from one distance category to the next therefore typically represents equal changes in traffic noise level when allowing for geometric spreading and ground effects.

The second stage involves dividing the route options into different sections along their length (chainages) which simply makes residences easier to count and recount. This should typically be about 10 sections and preferably based on obvious features such as intersections with existing roads.

Thirdly, for any one of the 6 options for each residence it is necessary work out how far the residence is from the existing road and how far it would be from the route option being assessed. For example, if a residence will end up being 50-100m from the new alignment, this residence must be added to one of the columns within the 50-100m category depending on its distance from the existing alignment.

The fourth stage involves repeating this process for all the other options.

The fifth stage involves applying the various weightings shown at the top of each column. The weightings have been selected by using a paired comparison procedure in conjunction with experience in the likely effects of absolute traffic noise level and of changes in traffic noise level on potential annoyance. This is explained in more detail below.

The weightings range from 0.4 to 6.4 and have been selected starting with a weighting of 1. This represents the situation where there is no change in noise level at a residence set back 200-300m from the existing road. If noise levels are higher (residences are closer) or increases are bigger, a weighting greater than 1 needs to be applied since it would represent a greater impact. Similarly if noise levels were to reduce a weighting less than 1 needs to be applied.

However for the same change in noise level either up or down the procedure recognises that the increase is perceived to be worse than the decrease. For example a route which improves noise at 50 residences but makes it worse at 50 is not considered to be as as good as a route, for the same changes in noise level, which increases noise at 10 and reduces noise at 10.

Since a 10dBA increase in noise level is widely accepted to be a subjective doubling in noise, this has been used to loosely set the weightings by comparing the different distance categories. The weightings have then been refined by comparing different situations and deciding which would be better or worse.

Finally, it is necessary to total the number of residences affected and calculate the total weighting for each route option. Basically the lowest total is the route which affects the least number of residences and the lowest weighted total is the route with the least impact.

Impress the client by issuing a report with a clear ranking and be satisfied with the quality of your work. Don t be disappointed when you realise there were at least 25 other route selection assessment parameters and the quietest route didn t win. At least the fees for future noise control may make up for the disappointment that noise was not the most important selection parameter.

5. SUCCESS AND IMPROVEMENTS

The success of the procedure is hard to define since noise is only 1 of many selection parameters and of course all 6 route options are never built or even assessed in more detail. However the procedure has certainly helped the author prepare a quantitative assessment which appears to match the intuition.

This procedure is far from perfect in many ways but does meet its objective. Minor adjustments have already been made to this procedure when dealing with specific projects. Two examples are given below.

Some projects have had one route option, which involves an upgrade of an existing alignment with the other options in virgin areas. This means the existing route would remain open to traffic but with a lower flow. In these instances it has been necessary to adjust the weighting for any residence. This has been done by moving it into a different distance category depending on the difference in traffic numbers between the existing and future flow.

Some projects have had route options in undulating terrain and it has been quite obvious where cut and fill will be required. Again adjustments can be made by moving the number of residences from one distance category to another to account for more shielding or reduced ground effects. These adjustments require professional judgement but in shallow cut where shielding of approximately 5dBA would be achieved would be similar to approximately a change of 1 distance category. For a deeper cut this may equate to a change of 2 distance categories.

In using this technique I have been able to criticise it and feel that it could be improved. However this would require more detailed input information and time to assess these details, both of which are not available at the early stage. In addition the improvement in accuracy that they may bring is not considered warranted at this early stage of a project when noise is just 1 of many selection parameters.

The author would welcome any feedback

Option	Distance from Proposed Alignment																			
	0 - 50					50 - 100					100 - 200					200 - 300				
Distance from existing alignment	>300	200-300	100-200	50-100	0-50	>300	200-300	100-200	50-100	0-50	>300	200-300	100-200	50-100	0-50	>300	200-300	100-200	50-100	0-50
Weighting	6.4	5	3.7	3	2.2	4	3	2.3	1.7	0.9	2.2	1.7	1.3	.85	.7	1.5	1	.8	.6	.4
Chainage Wilkinson Rd to Murray St	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0
Murray St to Heggie Ave	10	5	0	10	5	0	10	5	0	10	5	0	10	5	0	10	5	0	10	5
Heggie Ave to Athol Ln	0	0	10	0	0	10	0	0	10	0	0	10	0	0	10	0	0	10	0	0
Athol Ln to Benbow Pde	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
PROPERTIES	20	15	10	20	15	10	20	15	10	20	15	10	20	15	10	20	15	10	20	15
PROPERTIES x WEIGHTING	128	75	37	60	33	40	60	35	17	18	33	17	23	13	7	30	15	8	12	6
WEIGHTED TOTAL	333					170					93					71				
	PROPERTY TOTAL 305																			
	WEIGHTED GRAND TOTAL 667																			