

PURPOSE OF THE REPORT

The purpose of this report is to recommend to the City Development Committee a policy for the use of asphaltic concrete (Asphalt) for road resealing.

BACKGROUND

The purpose of resealing is to prevent damage caused by water entering the sub-structure of Waitakere City's 720 km of sealed roads, and thus avoid high reconstruction costs.

In the order of 60 km of sealed road needs to be resealed annually. Of the total resealed length about 95% is resealed with stone-chip-on-bitumen (Chip-seal), and the remainder is resealed with asphalt concrete (Asphalt). Slurry seals are no longer applied owing to their short life.

During the 2001/2002 resealing season some residents complained about new Chip-seal and wanted its immediate replacement with Asphalt. The reason given was the undesirability of the increased traffic noise; for example, two households in Golf Road complained when Chip-seal replaced slurry seal over a 300 m section of that road.

The New Lynn Community Board subsequently on (1 July 2002), resolved as follows:

"That the matter of Chip-seal sealing as opposed to Asphalt road surfaces be brought to the Annual Plan Special Committee and that any relevant information covering financial and policy aspects from North Shore City, Auckland City and any other appropriate source be included.

2201/2002

On 22 July 2002 the Director: City Services convened a workshop in the Council Chamber to go through the issues with affected residents. All Councillors and Community Board Members had the opportunity to attend. As a result of this workshop there is a greater appreciation of the issues. As well, the workshop requested staff to report to the City Development Committee on a policy for the use of Asphalt seals taking into account relevant issues, and the practice of other Auckland Road Controlling Authorities.

STRATEGIC CONTEXT

The Council's 'Well Being Support' pathway to a sustainable city has an objective that 'Citizens have a safe and healthy environment'.

The Council's 'Urban Village' pathway to a sustainable city has an objective that 'people can get easily and safely where they need to go by walking, cycling, passenger transport, or private vehicle, and businesses can efficiently move their goods and services'.

Any policy on the use of Asphalt to quieten traffic needs to be balanced in regard to the above objectives and affordability.

ISSUES

A51-A54 Attached at pages A51 to A54 is a detailed technical report which addresses the issues raised at the 22 July 2002 workshop and provides information requested by elected members. The issues are summarised below.

Traffic Noise

Traffic noise is generated by engine noise and tyre/road noise, but tyre/road noise is less significant at normal urban traffic speeds (below 70 kph).

The basic unit of loudness is the 'dBA' (A weighted decibel). It has the property that a 10 dBA increase represents a perceived doubling of loudness. Traffic loudness varies throughout the day as the traffic volume varies.

Traffic noise from new Chip-seal is about three dBA louder than from an Asphalt seal for higher speeds, but that this difference reduces over a few months to become imperceptible (as the chips bed into the bitumen). The immediate difference after resealing can annoy some more sensitive residents who may persist with complaints. However, the significant perceptible increase in loudness is of a short duration of only two months.

The World Health Organisation (WHO) advises that a lifetime of exposure to an *average* noise of 70 dBA will not cause hearing impairment and that exposure to noise should not exceed 85 dBA over eight hours. Road traffic noise in Waitakere City is within these standards.

Residents attending the 22 July 2002 workshop challenged this fact. Consequently, staff commissioned expert measurement of the loudness of individual cars passing along 18 month old Chip-seal and Asphalt surfaced segments of Te Atatu Road (on the Peninsula). On average the loudness from the Chip-seal surface was 0.4 dBA greater compared to Asphalt surfaces. At No. 241 Golf Road, 1m from the house façade, the levels recorded were 69.0 dBA and 63.6 dBA, three months and nine months respectively after chip sealing.

In regard to general disturbance any noise reduction measures should be prioritised in accordance with prevailing traffic volumes above a threshold. A traffic volume of about 10,000 veh/day is indicative for Waitakere from UK practice. There is no New Zealand equivalent threshold.

Loose Chips

Over the first few days after resealing with Chip-seal, loose chips can result in additional noise when they drum the under-bodies of passing cars, and can cause annoyance if they are flicked onto footpaths and verges. These adverse effects can be minimised by quality control to ensure good workmanship and management.

Road Structure Requirements

Asphalt could not be used for noise reduction where the road base is flexible, because it is brittle and would be subjected to cracking, consequent water penetration, and failure of the road structure.

On the other hand Asphalt has greater shear strength than Chip-seal and should be used in areas subject to high shear stress, such as industrial roads, intersections, cul-de-sac turning heads, and high volume roads where heavy traffic turns, starts, and stops frequently.

New subdivision roads are Asphalt sealed to sustain the high volumes of heavy vehicle movement associated with building work during the first few years of development. Subsequently, as the asphalt wears out these roads are normally resealed with Chip-seal.

Safety

Chip-seal and Asphalt have different surface friction characteristics and these may determine the choice in particular cases. On the one hand protruding stone chips allow surface water to disperse, mitigating a potential for aquaplaning, while on the other hand they are more easily polished by tyre action with consequent erosion of stopping and cornering safety.

Cost

Resealing is a major budget item. For the 2002/2003 financial year Council has budgeted \$2,700,000 for essential resealing work (less Transfund subsidy of \$1,300,000).

Asphalt is three times more expensive than Chip-seal, taking into unit rates and lifetimes of these materials. Transfund will not subsidise additional Asphalt for traffic noise reduction except perhaps in special cases, for example, where a classroom is very close to higher speed or higher volume traffic.

To reseal in Asphalt only the city's roads having traffic of 10,000 vehicles/day, for example, will cost an extra \$668,000 per year for about six years and about \$620,000 per year thereafter.

This additional cost will not be subsidised by Transfund New Zealand and Council's share and will require a \$13 increase in the annual household rate for all households, but would be spent on about 7% only of residential streets.

Resealing Backlog

To minimise expenditure Council follows a 'just in time' reseal program in which some resealing work is deferred on the basis of assessed risk. Recent reports on the state of the network indicates that the backlog needs to be reduced, and an additional \$300,000 per year is required over the next 10 years, taking into account the spike in oil price and the expectation of a period of sustained oil prices.

If Council decided to reduce traffic noise by means of increased Asphalt reseals, a further budget increase would be required over funding the backlog of reseals for structural maintenance. Elimination of the structural backlog would take priority over Asphalt sealing for noise reduction only.

Other Auckland Region Practice

The resealing practice in Auckland, North Shore and Manukau Cities has been similar to that in Waitakere City. All three Councils apply Asphalt on heavily trafficked roads, intersections, industrial roads and other high stress areas such as cul-de-sac heads; other roads are Chip sealed.

Auckland City allows Asphalt seal for residential roads with traffic 10,000 vehicles/day, but taking into account safety, structural and budgetary restraints.

North Shore City has comprehensively studied the option of using Asphalt seals to quieten traffic. This included a survey of residents' 'willingness to pay'. Those willing to pay were a clear minority and thus the North Shore City Council confirmed a policy of Chip sealing except where the structural and safety characteristics of Asphalt are beneficial.

POLICY OPTIONS

The Council has two distinct options in regard to resealing and traffic noise as follows:

1. current practice, that is replace Chip-seal, or Slurry, with Chip-seal except in special cases; or
2. replace Chip-seal, or Slurry, with Asphalt giving priority to roads with higher traffic volumes.

The information provided in this report shows that there will be an increased cost of at least \$668,000 per year for minor benefits, thus option 1 is recommended.

CONCLUSION

It is concluded that the Council should adhere to Option 1 (current practice) because:

- loose-chip effects are short term only and can be minimised through good management and quality control;
- extra noise from new Chip seal is moderate and of short duration;
- the much higher cost of Asphalt has the potential for a large impact on Council's annual budget;
- it is considered that a majority of ratepayers would not be willing to pay the higher cost for asphalt;
- Transfund New Zealand will not pay the higher cost for Asphalt except in special cases; and
- is consistent with the practice of other Council's in the Auckland Region.

RECOMMENDATIONS

1. That the information be received.
2. That the Council's road resealing policy be as follows:
 - (a) re-sealing existing Chip-seal, or Slurry seal, with Chip seal, except where safety and/or structural factors are proven to necessitate Asphalt seal, or in special cases where noise control is very desirable, such as where a classroom or hospital-ward is located close to high speed traffic;
 - (b) sealing existing Asphalt with Asphalt seal, except where budgetary constraints, or safety and/or structural factors are proven to necessitate Chip seal, or in special cases such as residential sub-division roads where due to durability considerations Asphalt is still required; and
 - (c) quality control of contract management to minimise the short-term adverse effects of loose chip.
3. That each Community Board be advised in terms of this report and the City Development Committee's resolutions.

Report prepared by: Ross Hill, Service Manager: Transport Assets.



APPENDIX

TECHNICAL REPORT – ROAD RESEALING OPTIONS

1 Traffic Noise

1.1 Noise Level

The basic unit of loudness is the 'dBA' (A weighted decibel). It has the property that a 10 dBA increase represents a perceived doubling of loudness. Traffic loudness varies throughout the day as the traffic volume varies.

An overall measure for traffic noise is the 'dBA (18 hour L10)'. This is the level exceeded for only 10% of the time during the 18 hours between 6 am and midnight. This measure has the property that a 1 dBA increase is just perceptible. Also, a doubling of traffic volume does not result in a doubling in loudness, the increase is 3 dBA.

The table below provides typical outdoor traffic noise levels for given amounts of traffic, together with the percentage of road in Waitakere City having up to the stated amount of traffic. The noise levels are outside 10m from the edge of the carriageway; a level carriageway and 5% heavy vehicles are assumed.

It can be seen for example that about 95% of Waitakere roads would have noise levels less than about 68 dBA. Inside houses the traffic noise is normally 10 dBA or 20 dBA less depending on whether windows are open or closed.

Traffic Volume (1000 veh/day)	Traffic Noise (18 hour L10 dBA)	% of WCC Sealed Network
40	73	100
30	72	99.5
25	71	99
20	70	98
15	69	96
10	67	93
5	64	86
1	57	65

1.2 Noise Source

Traffic noise is generated by engine noise and tyre/road noise but tyre/road noise is subdominant at normal urban traffic speeds (below 70 kph).

The literature is generally consistent in reporting that traffic noise from new Chip-seal is about 3 dBA louder than from an Asphalt seal for higher speeds, but that this difference reduces over a few months to become imperceptible (as the chips bed into the bitumen). The immediate difference after resealing can annoy some more sensitive residents who may persist with complaints. However, the significant perceptible increase in loudness is of short duration, about 2 months or 2.5%, relative to the life of the reseal, 6 to 8 years say.

Residents attending the 22 July 2002 workshop challenged this fact. Consequently, staff commissioned expert measurement of the loudness of individual cars passing along 18 month old Chip-seal and Asphalt surfaced segments of Te Atatu Road (on the Peninsula). On average the

loudness from the Chip-seal surface was 0.4 dBA greater, confirming the well-known result that the loudness difference is negligible for mature Chip-seal and Asphalt surfaces. At No. 241 Golf Road, 1 m from the house façade, the levels recorded were 69.0 dBA and 63.6 dBA, 3 months and 9 months respectively after chip sealing. Further measurements are to be made during the 2003/2004 chip sealing season, to establish the relationship between traffic noise and age of chip seal over the first few months after sealing.

Over the first few days after resealing with Chip-seal, loose chips can result in additional noise when they drum the under-bodies of passing cars, and can cause annoyance if they are flicked onto footpaths and verges. These adverse effects can be minimised by good workmanship and management and are transitory.

1.3 Acceptable Traffic Noise Level

In regard to safety, the World Health Organisation (WHO) advises that prolonged exposure to a daily noise level of 85 dBA over 8 hours is potentially hazardous. WHO states further that, for most people, a lifetime of exposure to an average noise of 70 dBA will not cause hearing impairment. These results indicate upper limits for physical well-being. It is apparent that this is not an issue in regard to road traffic noise in Waitakere City.

In regard to general disturbance any noise reduction measures should be prioritised in accordance with prevailing traffic volumes above a threshold. A traffic volume of about 10,000 veh/day is indicative for Waitakere from UK practice. There is no New Zealand equivalent threshold.

2 Road Structure Requirements

2.1 Durability

Asphalt could not be used for noise reduction where the road base is flexible, because Asphalt is brittle and would be subject to cracking, consequent water penetration, and failure of the road structure.

On the other hand Asphalt has greater shear strength than Chip-seal and should be used in areas subject to high shear stress, such as industrial roads, intersections and cul-de-sac turning heads, and high volume roads where heavy traffic turns, starts, and stops frequently.

New subdivision roads are Asphalt sealed to sustain the high volumes of heavy vehicle movement associated with off road building work during the first few years of development. Residential subdivision roads are normally resealed in Chip-seal.

2.2 Safety

Chip-seal and Asphalt have different surface friction characteristics and these may determine choice in particular cases. On the one hand protruding stone chips allow surface water to disperse, mitigating a potential for aquaplaning, while on the other hand they are more easily polished by tyre action with consequent erosion of stopping and cornering safety.

3 Cost

3.1 Resealing Costs

Resealing is a major budget item. For the 2002/2003 financial year Council is expected to spend about \$M2.7 on essential resealing work. Transfund has approved this for funding assistance and the refund is expected to be \$M1.3.

AS2

A6

Transfund is careful in regard to the relative amounts of Chip-seal and Asphalt used by Road Controlling Authorities. Asphalt is 3 times more expensive than Chip-seal, unit rates and lifetimes of these materials accounted for. Transfund will not subsidise additional Asphalt for traffic noise reduction except perhaps in special cases, for example, where a classroom is very close to higher speed, higher volume traffic.

3.2 Conversion Cost

A cost analysis covering all Waitakere City's sealed residential streets is tabled below.

Traffic Volume Range (1000 veh/day)	Chip Seal Length (km)	ASPHALT Seal Conversion Cost (\$1000/PA)	Additional Maintenance Cost (\$1000/PA)
> 25	6.1	167	143
20 - 25	4.6	101	101
15 - 20	9.0	156	156
10 - 15	16.7	244	220

Note [1]: Data from Waitakere City RAMM Database 2002 [2] Costs affected by seal life and road width

It has been assumed that the conversions are affected when resealing becomes necessary. The conversion would take about 6 years to complete owing to the 6-year life of Chip-seal subject to the tabled traffic volumes. Following the conversion period the indicated increased annual Asphalt maintenance cost would apply in perpetuity.

It follows that to convert all roads having traffic down to about 10,000 veh/day, for example, about \$668,000 per year would be required for about 6 years, and about a \$620,000 per year thereafter.

Since this increase would not be subsidised by Transfund New Zealand Council's share (\$M1.3) of the annual reseal budget (M2.7) would increase by 43%. This would require a \$13 increase in the annual household rate for all households, but would be spent on about 7% only of residential streets.

3.3 Resealing Backlog

To minimise expenditure Council follows a 'just in time' reseal program in which some resealing work is deferred on the basis of assessed risk. Recent reports on the state of the network indicates that the backlog needs to be reduced, and that for this an additional \$300,000 per year is required over the next 10 years, compounded by the spike in oil price and the expectation of a period of sustained oil prices.

Clearly, if Council decided to quieten traffic by means of increasing the proportion of Asphalt reseals, the budget for this would have to be in addition to the additional budget required to manage the backlog of reseals for structural maintenance. More likely implementation would be deferred pending the elimination of the structural backlog.

4. Other Auckland Region Practice

The resealing practice in Auckland, North Shore and Manukau Cities has been similar to that in Waitakere City. All three Councils apply Asphalt on heavily trafficked roads, intersections, industrial roads and other high stress areas such as cul-de-sac heads; other roads are Chip sealed.

AS3 17

Auckland City allows Asphalt seal for residential roads with traffic down to 10,000 veh/day, but taking into account safety, structural and budgetary restraints.

North Shore City has comprehensively studied the option of using Asphalt seals to quieten traffic. This included a survey of residents' 'willingness to pay'. Those willing to pass were a clear minority and this influenced the Council's decision to adhere to its previous policy, based on the use of Chip seals except where the structural and safety characteristics of Asphalt dictate.

~~AS4~~

A8

11 POLICY FOR RESEALING ROADS WITH ASPHALT CONCRETE

12.13 pm Cr Dallow returned to the meeting.

360/2003

MOVED by Cr Clews, seconded Cr Fenton:

That the information be received.

CARRIED

361/2003

MOVED by Cr Brady, seconded Cr Clews:

1. That the Council's road resealing policy be as follows:
 - (a) re-sealing existing Chip-seal, or Slurry seal, with Chip seal, except where safety and/or structural factors are proven to necessitate Asphalt seal, or in special cases where noise control is very desirable, such as where a classroom or hospital-ward is located close to high speed traffic;
 - (b) sealing existing Asphalt with Asphalt seal, except where budgetary constraints, or safety and/or structural factors are proven to necessitate Chip seal, or in special cases such as residential sub-division roads where due to durability considerations Asphalt is still required; and
 - (c) quality control of contract management to minimise the short-term adverse effects of loose chip.
2. That each Community Board be advised in terms of this report and the City Development Committee's resolutions.
3. That Council forward a copy of this report and minutes of the meeting, with a letter to the individual ratepayers and ratepayer groups, who participated in the workshops.

CARRIED

362/2003

MOVED by Cr Hulse, seconded Cr Yates:

That a report be brought back to the Long Term Council Community Plan and Annual Plan Committee clarifying the roading asset management plans and the reseal programme to allow Councillors to debate the full strategic implication of this programme and the possibilities that may exist to apply this budget more appropriately.

CARRIED

Norval Road

NORVAL ROAD

No Stopping

1:500

All

Civic Centre

Waipareira Avenue

Existing No Stopping Lines

Proposed No Stopping Lines

Vehicle Testing Station

Moselle Avenue

