Local Government Research and Development Scheme

Model Maintenance Program for Unsealed Roads

District Council of Loxton Waikerie
Goyder Regional Council
Adelaide Hills Council
Barossa Council

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## Document History and Status

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Executive Summary

A model has been developed as part of this project, to introduce a balance of science and practical approaches to allow Council’s to experiment with methods to improve the properties of materials selected for replacement of wearing course on unsealed roads (resheeting).

In order to control new innovative ideas in resheeting activities, a best practice approach to material selection involves:

- Staff training.
- Material testing and reporting.
- Analysis of testing results.
- Options for material improvement through blending of materials (e.g. clay).
- Whole of life analysis of options to test the benefits of a solution based on expected performance.
- Options for liquid/powder binder additives.
- Site trials and monitoring.

Subject to the right level of testing and analysis, options can be filtered out and others developed into trials to experiment on cost effective treatments. These trials can be setup in a controlled environment on sections of road and monitored to record key deterioration factors in order to compare performance.

This report presents local government with a framework and tool set to trial different material selections in order to adopt best practice to ensure informed decision making.
1 Introduction

Tonkin Consulting in collaboration with the Australian Road Research Board (ARRB) have worked with Barossa, Goyder, Adelaide Hills and Loxton Waikerie Councils to explore new ways of assessing the performance of various resheeting materials. The project involved trialling new techniques for improving the composition of materials with a view to ultimately improving the in-service performance.

While results of the trials have been established (refer Appendix A), the main focus of the project was to develop a protocol which will assist Councils in the assessment process and decision-making together with monitoring performance of trials prior to applying new treatments to the wide road network. An important element of the process was to explore the whole of life costs and benefits on investing upfront where expensive treatments are being considered (e.g. importing or stabilising materials).
2 The Trial Process Undertaken

Loxton Waikerie, Goyder and Adelaide Hills Council's agreed to use a set of processes to set up trials to compare current practices with new treatments.

The process included the following key steps:

a. Pit material testing and assessing against the ARRB unsealed road material specification.

b. Assessing options to improve material properties through blending, additives and adapting work practices.

c. Examining the whole of life benefit of various treatments based on assumed performance expectations and the selection of options that look financially attractive in the long term.

d. Establishing and monitoring of trial sites.

e. Recording and reviewing findings.

In order to assist in the project Tonkin/ARRB developed a suite of "tools" viz:

1. Material performance assessment spreadsheet.

2. Whole of Life spreadsheet.

3. Formal monitoring procedure.

The results of the trials are presented in Appendix A.
3 Key Findings

3.1 Materials

For Adelaide Hills and Loxton the properties of the materials had a common thread of low plasticity and "course" particle size distribution.

3.1.1 Key Learning 1

Local Government need to recognise the difference between attributes associated with commercial products for basecourse, subbase or won from natural pits, and applied to sealed roads and those attributes for unsealed roads which contribute to a good wearing surface.

3.1.2 Key Learning 2

Prior to considering the use of additives i.e. stabilisation considerations, every effort needs to be made to source material that fits into the acceptable range of grading and plasticity presented in this report. For this to occur clear specifications are needed for suppliers and where material is sourced from local pits, the pit operator needs to blend the stone, gravel and fines in proportion to develop a particle size distribution that is acceptable.

3.1.3 Key Learning 3

While testing material from the pit provides indicative results, testing material post compaction on the road is seen as a requirement to observe how the process of crushing and placing the material is impacting on the final material properties on the road. These are ultimately the properties to assess against.

3.2 Additives

Polycom and lime were used in the trials with mixed success.

3.2.1 Key Learning 4

The use of lime should be limited where PI is nominally greater than 15. For Drews Pit material at Goyder in hindsight the use of lime was inappropriate, however lime/fly ash may be an alternative in future trials.

3.2.2 Key Learning 5

Polycom (as do most polymer and chemical binders) need sufficient fines in the material to work effectively. In consideration of the established trial sections, further monitoring has been recommended for each Council to determine to establish longer term benefits. However during the two year duration of this project the data obtained from monitoring has provided some “positive indicators”.

3.3 Monitoring

The monitoring methodology used was deliberately made simple to allow Councils field staff to collect and take ownership of the data rather than be complex and highly theoretical. In all cases the field record sheets were designed to allow for a systematic and consistent approach to record keeping, which is seen as important should other Council’s embark on trials.

The visual assessments undertaken observed the degree of Dust, Corrugations, Potholes and Loose Material on a course rating of LOW, MEDIUM and HIGH.
Quantitative data from site measurements included:

- depth of rutting depth (mm)
- window height (depth) mm
- loose material (kg/0.5m²)
- Corrugations (depth mm, spacing (m))

3.3.1 Key Learning 6

Dust assessment discernment is very difficult visually. The extent of humidity at time of assessment i.e. overcast, clear or recent rain needs to be recorded.

3.3.2 Key Learning 7

While visual assessment of loose material may not be discernable, the measurement of windrow height and loose material were more indicative.

3.3.3 Key Learning 8

Trial sites should be left without maintenance grading interventions if possible to develop a longer term trend of deterioration in addition to providing a terminal condition that indicates the timely requirement for grading intervention. Several Councils undertook grading operations during the trial period.
4 Protocol for Development of Sheeted Road Material

In order to develop a discipline around the development of treatment options the following protocol flow chart is presented for implementation making use of the tools provided as part of this report, namely the Whole of Life Spreadsheet and the Material Performance Assessment Spreadsheet(Grading Spreadsheet) and Monitoring Procedure.
This flow chart is a key outcome of this project which introduces a set of protocols to follow to assist Councils with assessing materials, identifying ways to improve material properties, assess the financial benefits of certain treatments and introduce trials to monitor performance.

To ensure optimal performance, every effort is needed to blend and improve material properties to comply with the "grading and PI" requirements prior to using additives. (refer Key Learning 2)
5 Use of findings to wider Local Government

In order to continue to develop knowledge on material performance, the existing forums such as the Roads Conference and SALGSOA groups provide a possible way to roll out an awareness and training program to allow other Councils to set up trials and monitor treatment options.

Such an approach presents the opportunity to optimise the performance and management of unsealed roads in addition to providing potential reductions in resheeting frequencies (material conservation) and lower authority asset management costs.

The protocols established are currently being applied for both Kangaroo Island and Kingston Councils and there is opportunity to expand this to their regions.

Tonkin/ARRB would be available to provide support and guidance through Rod Ellis and Bob Andrews.

Key elements to up skill local government as a result of this project are set out in the following sections:

5.1 Material Performance Assessment

A grading specification to provide Council staff some guidance in the winning and manufacture of pavement materials to be used was provided viz:

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<th>Range Percent Finer (passing through sieve)</th>
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<td>0.075</td>
<td>10 - 40</td>
</tr>
</tbody>
</table>

Plasticity Index – 6% Min and 15% Max. This may vary across the state due to annual average rainfall.

In addition, for limestone materials consideration may be taken where a low PI is encountered as some latent natural binding properties may occur.

By sampling and rudimentary testing, material grading curves can be plotted against the desired specification envelope provided in this report. In addition this process identifies material deficiencies and consideration of blending different materials in an attempt to meet specified requirements.

5.2 Material Performance Chart

As part of this project there has been a number of tools used that were developed as part of the LGA Research and Development project.

Of the software tools a spreadsheet which can calculate mix proportions of two different materials to meet a suggested specification would be made available as part of the project. Included in the software is a material performance chart based upon grading and plasticity determinations viz:
Using this diagram the following are recommended for unsealed road surfaces:

- Maximum size (mm) 37.5
- Maximum oversize index (lo)*5%
- Shrinkage product (Sp) 100 – 365 (Max. of 240 preferable)
- Grading coefficient (GC) 16 – 34
- lo = Oversize index (percent retained on 37.5mm sieve)
- † Sp = Linear shrinkage x percent passing 0.425mm sieve)
- ‡ Gc = Percent passing 26.5mm – percent passing 2.36mm) x percent passing 4.75mm)/100

This spreadsheet tool will be made available to local government organisations that wish to undertake trials.

5.3 Whole of Life (WOL) Analysis

In order to assess the whole of life benefit of a treatment a WOL spreadsheet was developed. This enables interactive analysis of the annual cash flow comparisons of a Net Preliminary Value calculation after a certain life for a treatment. Provision was made for a discounted rate.

Factors considered for compulsory treatments include:
- Resheet frequency and cost
- Maintenance frequency and cost
- Binder addition costs

The lowest annual cash flow provides the optimum outcome.

This spreadsheet tool will be made available to local government organisations that wish to undertake trials.
5.4 Outline Trial and Monitoring Process

Between 1998 and 2010, ARRB undertook federal government sponsored project to develop standard testing protocols for conducting field trials on unsealed roads (Andrew & Sharp 2010). Based upon this development Tonkin developed a formal protocol for local government roads as part of the LGA Research and Development involving four rural councils in South Australia.

The material evaluation and performance monitoring process established together with operational instruction and standard reporting forms:

- Condition Assessment Guideline
- Visual Assessment Form
- Site Measurement Form

These forms will be made available to local government organisations that wish to undertake trials.

In order to complement a monitoring regime the following explanatory notes are provided.

The period (preferable monthly) performance monitoring of the pavement is conducted as follows:

- Drive through at 40km/hr – rate the severity of loose material, corrugations, potholes and erosion channels which affect the rideability of the pavement ((low/medium/high) which would necessitate maintenance intervention by patrol grading.
- Surface wear – sweep away the outer and centre windrow (between the outer and inner wheelpaths) in order to bed a 3 metre straight edge on a hard surface and measure the rut depths in both wheelpaths. Use his data to estimate the resurfacing (resheeting) intervals.
- Ravelling – use a 3 metre straight edge, located in the longitudinal direction, to measure outer windrow heights. This provides an indication of the amount of material being ravelled out of the pavement.
- Loose material – mark a 1 metre square area centrally over the centre windrow (between the outer and inner wheelpaths as shown on the diagram below), remove the loose material by sweeping, place it in a bag and retain for future evaluation. Clearly tag the location from which the sample was taken.
- Take a full photographic record of the site, including the testing protocols.
- Note weather information on the day of monitoring.
- Access rainfall records from the nearest meteorology station.
- Install a traffic counter (e.g. pneumatic counter) to record traffic volumes.
It is important that the pavement cross-sections are clearly identified and marked as monitoring locations to ensure that measurements are always taken at the same location. This ensures some consistency in the data and assists in the identification of photographs, etc. The following information should also be recorded:

- Locations close to trial section boundaries: each section may have different performance attributes, e.g. dust transfer at trial section boundaries.
- Drainage channels and culverts.
- Bends where shear forces are significant in terms of promoting greater material loss.

Within these trials it is possible to undertake life cycle analyses from estimates of gravel loss and grading intervention frequencies to evaluate the benefits of such thing as:

a. Additional costs associated with material blending/mobile crushing or roadbed treatments.

b. Effect of transporting better performing limestone as a wearing course and only using laterite as a sub-base material).

c. Performance improvement from alternate maintenance intervention techniques i.e. the trials provide the opportunity to investigate alternate patrol grading maintenance such as wet maintenance practices (a common practice in DPTI) scarify water and compact processes as well as inclusion of stabilisation binders if considered appropriate.

In terms of staff training, unsealed roads training workshop tailored to local materials, asset management and performance could be developed as an outcome of this project.
6 Conclusion

This project has created an opportunity for the four local government organisations involved to collaborate with various associated industries, product suppliers to engage with technical specialists to develop a set of processes facilitating more rational considerations in unsealed road resheeting.

The introduction of some science balanced with involvement of local government works managers has enabled a more systematic approach to experimenting with ways to improve performance of unsealed road construction.

The project lays the foundation for further work across local governments in SA and the authors would encourage local government to continue to create awareness of the project to encourage other Councils to develop trial sites and use forums like the Road Conference and SALGSOA groups to train, up skill and share experiences.

Annually the investment local government makes in resheeting local roads is significant and any improvement in achieving longer lifes and improved surfaces is of great benefit for the wider community.
7 Acknowledgments

The following individuals have invested their time in this project and their contribution is acknowledged with gratitude:

Bim Lange – The Barossa Council
Roy O’Conner and Lee Wallis– Goyder Regional Council
Geoff Hood – Adelaide Hills Council
Rich Noble – District Council Loxton Waikerie
Peter Duffy – (former supplier of Polycom)
Grant Westbury, David Bendo (Downer) (supply of stabilising equipment)
Rod Ellis – Tonkin Consulting
Bob Andrews - ARRB
Appendix A

Sheet Trials Final report
Local Government Research and Development Scheme – Model Maintenance Program for Unsealed Roads – Final Report for Sheeting Trials

The following is a final report on the trials were undertaken as part of this project.

1 Loxton Waikerie – Low Bank Road

1.1 Detail of Trial

Rate Payer complaints have been received related to the dust generated near a sharp bend in Low Bank Road. Ravelling, loose material resulting in potholing and corrugations has created the need for consideration of this trial. The pavement material comprised a well graded calcrete limestone approximating a 40mm rubble.

The preferred treatment selected was DustChek, a dust abatement water additive. The intent being to control dust and possibly reduce grading intervention frequencies (bearing in mind that patrol grading also contributes to loss of wearing course material).

The trial consisted of comparing standard treatment of rip and reform with use of DustChek additive, which is a polycrylamide based product used for mine haul roads or areas where dust problems occur and water is scarce.

The trial site consisted of the following sections:

Untreated Section – 700m ripped to 80mm depth, watered and mixed, watered and double rolled with each layer until compacted.

Treated Section – 1400m ripped to a depth of 80mm, DustChek applied and mixed, laid in 20mm layers, watered and double rolled with each layer until compacted.

Monitoring Stations have been setup with a marker post at the following locations:

Ch 300 – Treated (on the straight)

Ch 500 – Treated (at start of the Bend)

CH 600 – Treated (on the bend)

Ch 1300 – Not Treated

Ch 1700 – Not Treated
Road before rip and reform

Road after rip and reform
1.2 Testing
Material for Low Bank Road

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1.3 Traffic
Traffic Counters were placed by Council from July 2009 to February 2010.

It is not clear whether the results are one way or 2 way flows, however it is assumed they are two way.
The results indicate the following:

The road carries more traffic in August and December than at other times during the recording period.

Typical daily traffic is 15-20 vehicles/day

August increases to 30-40 vehicles/day and 40-60 vehicles/day in December.

The commercial traffic is 32%.

18.9% of Commercial traffic is Class 3 and 6.6% Class 9. The remaining 6.7% vary from class 4 to class 11.

### 1.4 Monitoring

#### 1.4.1 Inspections

The construction work occurred in May 2009 and the site has been inspected 3 times:

- 5/6/2009 – after construction was complete to setup trial
- 13/8/2009 – 10 weeks after construction
- 23/3/2010 – 8 months after construction and after a long hot period
- 6/9/2011 – 26 months after construction

#### 1.4.2 Preliminary Findings

The results in March 2010 indicate there is little visual evidence of any difference between the treated and untreated sections of the road. Dust has not been reduced and there appears to be a reasonable increase in loose material. Windrows and rutting remain low and no corrugations have formed.

The results in September 2011 indicated the visual assessments between the treatments were the same indicating no obvious difference. Of interest there was no observed difference in dust.

From the measurements the following indicators are noted:

- Rutting, windrow heights were more prevalent in the untreated sections
- Loose material after 26 months was more prevalent in the untreated sections

A summary of the visual drive through rating and the site measurements are presented in the following tables.
Dust

Visual Assessment – Low = 1, Medium = 2, High = 3.
Barossa, Goyder, Loxton Waikerie and Adelaide Hills Councils
20090545RB1
Final Report for
Sheeting Trials
Revision: B
15 June 2012
All other indicators were negligible.

1.5 **Conclusion**

The use of Dustchek for this material did not noticeably reduce the dust generation for this material, however there is less rutting, window generation and loose material, which may be an indicator that this material will respond to additives to slow down the rate of deterioration of the wearing surface.

It appears warranted to continue monitoring to determine the expected life increase, as preliminary whole of life estimates indicate the cost of using the additive will be beneficial if the grading frequency and more particularly if the life between resheets is extended.
2 Goyder – Leighton Road

2.1 Detail of Trial

Leighton Road was being resheeted in May 2009 with a material sourced from Drew’s Pit, which is adjacent to the site.

The existing surface was not performing necessitating the need for Council to resheet the road due to its bus route status. The original material is sourced from Mitchell’s pit.

From site observations Drew Pit after crushing was very dusty due to material breakdown with the appearance of higher clay content, however this was misleading as the testing found the pit generates a low PI material, which lacks the ability to bind courser material.

The trial consisted of comparing the untreated Drew’s pit material with quicklime (2% by mass) and polyacrylimide binder (Polycom) insitu stabilised sections and one section where a material was sourced from a commercial operation know as Heinrich’s material.

The following identifies the sections of the trial

Section 1 – Drews pit material treated with Lime mixed using grader tyning and windrowing
Section 2 – Import Heinrichs material

Section 3 – Drew’s Pit treated with Polycom and using Stabilisation Equipment
Section 4 – Drew’s pit treated with lime and using stabilising equipment

Section 5 – Drews Pit material untreated
2.2 Testing

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2.3 Traffic

Traffic Counters were placed by Council from 18 January 2010 to 8 February 2010.

It is not clear whether to results are one way or 2 way flows, however it is assumed they are 2 way.

The results indicate the following:

There was no summary of each day’s traffic, and accordingly fluctuations could not be determined.

Typical daily traffic as represented in the Virtual Week report varied from 25 vehicles on Saturday and 49.3 vehicles on the Monday.

There was 79.7% class 1, 12.9% class 2 and 7.4% Class 3, which is an indication that surprisingly the road carries no commercial traffic. This should be further verified.
2.4 Monitoring

2.4.1 Inspections

The construction work occurred in August 2009 and the site has been inspected 3 times:

- 2/11/2009 – First Readings taken after construction
- 18/1/2010 – 5 months after construction
- 15/3/2010 – 7 months after construction and after a long hot period
- 25/10/2010 – 14 months after construction
- 9/12/2010 – 16 months after construction
- 24/1/2011 – 17 months after construction
- 23/3/2011 – 19 months after construction
- 7/6/2011 – 22 months after construction

2.5 Preliminary Findings

The preliminary findings after 7 months of operation are as follows:

- Dust generated from the untreated material and the grader mix lime is higher then the other sections
- Potholes, corrugations, loose material are not visually noticeable when driving through
- Outside Wheel rutting is getting progressively worse in sections of grader mixed lime treated. Henrich with Lime and recycler mixed displayed rutting above 20mm compared to the untreated and Polycom treated being below 10mm.
- Inside wheelpath rutting in all cases is occurring and is below 10mm, which the exception of Polycom section.
- Outer windrow height is above 25mm for Heinrich material and 20mm for the grader mixed lime. All others are below 10mm.
- Inside Windrow height is below 10mm in all cases with the exception of Polycom where no windrow has been observed.
- Loose material of over 1.5kg was measured for Drew’s Pit treated lime, Heinrich and Drew Pit machine placed with Lime. Untreated Drew’s pit is less then 1 kg and Polycom no material was retrieved.
The findings after 22 months of operation is as follows:

- There is an obvious trend of higher dust reading over the summer period and during that time Henrich pit and Drews pit treated with Polycom showed lower dust observations.
- Corrugations are not visually noticeable when driving through.
- Potholes are only just appearing in the Polycom and march placed lime section after 22 months, however only marginal.
- Loose material was more prominent in all treatments in the summer period and no clear differentiation between treatments.
- Outside wheel rutting peaked over summer and was rectified by grading. Henrich and Polycom section showed lower rutting readings.
- Inside wheel rutting in all cases is occurring and is below 10mm.
- Outer windrow height peaked in the summer around 20mm, with the exception of Polycom treatment remained constant below 10mm.
- Inside Windrow height is below 10mm in all cases.
- Loose material peaked in the first summer with over 2 kg recorded however in all cases was less then 1.5kg in the second summer. Henrich had the highest reading of loose material, where as untreated and machine treated lime had the lowest. Polycom also had a low reading of loose material.

A summary of the visual drive through rating and the site measurements are presented in the tables below:
Visual Assessment – Low = 1, Medium = 2, High = 3.

Outside Rut depth (mm)

Inside Rut Depth (mm)

Outer Windrow Height (mm)
The use of Polycom appears to be providing some benefit in lowering the loose material and windrow generation which is an indicator that there may be a possible slowdown in deterioration. The use of Hiernich material is a more expensive material and is showing a higher rate of loose material and windrow development indicating it is not going to be beneficial for the higher cost (note: as a commercial source it is probable that the material being produced is attempting to comply with basecourse/subbase material associated with sealed roads). The use of lime does not appear to assist with this type of material because of the low plasticity and WPI.

Council should continue the monitoring, and attempt not to grade the road to get a longer term comparison between untreated and the Polycom section to evaluate any associated cost/benefit.
3 Adelaide Hills – Mawson Road

3.1 Detail of Trial

The road is very steep and runs down a ridge line in a wet area of the district. Characteristics include bends and a poor road base material. This material is nearly exhausted and ravelled. The issues with this road are poor material quality, loose material and prone to corrugations.

The trial was established over a kilometre of the road to compare the performance of the two different materials (Monarto PM2/20QG) and Boral Lobethal (Dolomite) PM3. Each material was placed in 500m lengths, with 250m sections being treated with Polycom on each material. The remainder of the road sections were untreated.

The trial sections are as follows:

Section 1 – CH 0-250 Dolomite

Section 2 – CH 250-500 Dolomite with Polycom
Section 3 – Ch 500-750 Monarto (Polycom)

Section 4 – Ch 750-1000 Monarto
3.1.1 Testing

Monarto and Dolomite

<table>
<thead>
<tr>
<th></th>
<th>Upper Limit</th>
<th>Lower Limit</th>
<th>Monarto PM2/20QG</th>
<th>Comment</th>
<th>Boral Dolomite (PM3)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grading Coeff</td>
<td>34</td>
<td>16</td>
<td>30</td>
<td></td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Shrinkage Product</td>
<td>365</td>
<td>100</td>
<td>11-48(ave 29)</td>
<td>42</td>
<td>Prone to ravelling</td>
<td></td>
</tr>
<tr>
<td>37.5mm</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19mm</td>
<td>100</td>
<td>100</td>
<td>97</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5mm</td>
<td>90</td>
<td>60</td>
<td>67.5</td>
<td>61.5</td>
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<tr>
<td>4.75mm</td>
<td>75</td>
<td>40</td>
<td>48.5</td>
<td>42</td>
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</tr>
<tr>
<td>2.36mm</td>
<td>65</td>
<td>25</td>
<td>37.5</td>
<td>30.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.425mm</td>
<td>45</td>
<td>10</td>
<td>23</td>
<td>18.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.075mm</td>
<td>30</td>
<td>5</td>
<td>9</td>
<td>13.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
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<td>1</td>
<td>23.5</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic Index</td>
<td>18</td>
<td>8</td>
<td>1-6(ave 3.5)</td>
<td>Low Pl</td>
<td>7.4</td>
<td>Low Pl</td>
</tr>
<tr>
<td>WPI</td>
<td>400</td>
<td>200</td>
<td>60 - 130</td>
<td>125</td>
<td>Low cohesion</td>
<td></td>
</tr>
</tbody>
</table>

With both materials being sourced from commercial quarries, the products are most likely being manufactured to meet basecourse/subbase requirements associated with sealed roads and as such have unsuitable unsealed wearing surface characteristics.

3.1.2 Monitoring

3.1.3 Inspections

The construction work occurred in June 2009 and the site has been inspected 2 times:

15/12/2009 – First Readings taken after construction (hot/dry conditions)

23/3/2010 – 9 months after construction

26/6/2010 – 12 months after construction
6/10/2010 – 16 months after construction
21/1/2011 – 19 months after construction

3.1.4 Traffic

Traffic Counters were placed by Council from 7 October 2009 to 6 May 2010

It is not clear whether the results are one way or 2 way flows, however it is assumed they are 2 way.

The results indicate the following:

![Vehicles per day chart]

![% Commercial chart]
3.1.5 Preliminary Findings

The preliminary findings after 9 months of operation is as follows:

- Dust generated from the dolomite material is more than for the Monarto Material
- Potholes, corrugations, are not visually noticeable when driving through
- Outside wheel rutting was only detected at 2 locations, one on a Monarto section and the other on one Dolomite section (both treated with Polycom).
- Inside wheel rutting was only observed a 2 sites, both Dolomite (one treated and one untreated).
- Outer windrow height is more significant for the Dolomite material (30mm) than the Monarto material (0-30mm). Monarto untreated ranged 20-30mm and Monarto treated with Polycom (0-10mm)
- Inside Windrow height was only detected in the Dolomite section at 2 locations (one treated and one untreated)
- Loose material for Dolomite ranges from 2.5-4kg. For Monarto the treated section ranges 0.2-0.8kg and untreated section 0.5-1.5kg.

The findings after 19 months of operation is as follows:

- Dust generated from the dolomite material is more than for the Monarto material with no noticeable difference between treated and untreated
- Potholes, corrugations, are not visually noticeable when driving through and loose material in more noticeable in dolomite with no difference between treated and untreated
- Outside wheel rutting did not show a consistent trend however less rutting was observed on the treated sections of both Monarto and dolomite. A high reading of 50mm was recorded on Section 7 untreated Monarto with most others either no recording or less then 15mm.
- Inside wheel rutting was recorded at each location, however only in one site in each location. No trend is detectable form these results.
- Outside windrow heights up to 40mm were detected on un treated sections of both dolomite and Monarto, however no window height was detected on Monarto treated with Polycom and the dolomite treated with Polycom had a lower windrow height then untreated sections
- Inside Windrow height was also detected in each of the 4 treatment areas, however only one is each sections, which is also unusual.
- Monarto has less loose material and less again when treated with Polycom. Inconsistent readings occurred on the dolomite, inconclusive if there is a difference between treated and untreated.
A summary of the visual drive through rating and the site measurement are presented in the table below:
Loose Material

Visual Assessment – Low = 1, Medium = 2, High = 3.

Outside Rut depth (mm)
Inside Windrow Height (mm)

Loose Material (kg)

Other measurements taken did not register.
3.1.6 Conclusion

The Monarto material being a slightly finer grading indicates a better performance and is likely to give a longer serviceable life than the dolomite material. The additive made improvements to both the rutting and windrow development in both materials, however had a significant improvement on the Monarto material with no windrow development recorded. The loose material was less for Monarto and less again with Polycom treatment.

While the Monarto material is more expensive and the added cost of using Polycom increases the upfront cost, there appears to be a case for continuing to monitor and possibly reviewing the use of material and additives to reduce the whole of life cost of maintaining and renewing roads.

3.2 Barossa Council

No trial was conducted in the Barossa.