CEO'S REPORT

BY GREG WHITE

CEO Greg White

Our community is dependent on a reliable and economical supply of construction aggregates. The majority of Australia's aggregates are sourced from hard rock quarries and gravel pits with an increasing proportion being supplied by recycled products, including slag, flyash, crushed concrete, recycled asphalt, recycled granular material and glass.

The suitability of an aggregate source – whether a gravel, hard rock or sand – is determined by its engineering properties and whether they comply to the relevant specification. Depending on the use of the aggregate, a specification is designed. As an example, aggregates used in spray seals are required to be strong to withstand the high wheel loads, but also give high skid resistance.

Aggregates used in lower levels of pavement construction do not require the strength properties of concrete or asphalt aggregates. The specifications for the various uses of the aggregates reflect their end use by defining their various engineering properties.

Australia, particularly near our large cities and towns, is experiencing increasing pressure to source good quality aggregates. This is due to the competition for land resources close to urban areas either from housing or industrial use.

It is ironic that this expansion puts even further pressure on the quarry industry as each residential house slab can use about 100 tonnes of aggregates and each 100 metres of two-lane road uses over 500 tonnes.

Although these quarry sources are essential to our continuing way of life, they are a relatively low value product with low costs of production per tonne. However, the cost of transportation often far exceeds the production costs and this is accelerating with increased fuel costs. As a result, the industry is keen to have sources as close as possible to their markets.

As quarries reach the end of their life the search for new sources is proving more and more difficult. The quarry industry is finding it increasingly difficult to gain approval to open new sources. Environmental aspects including visual and noise concerns, as well as dust generation, are all concerns of nearby residents. The use of high-load aggregate trucks can cause major damage to existing roads as well as causing traffic congestion.

This has resulted in many possible new quarries being refused development or being delayed for extended periods of time. The requirement for buffer zones has also reduced the access to available resources.

Often this has lead to the owners of quarries trying to extend the life of existing resource by using parts of the quarry which have poorer quality source rock. This material was previously not used or was sold at a greatly reduced price for fill, or a low quality aggregate use.

Recycling has been used successfully for many years, but is dependent on a sustainable supply. The recycling of concrete, asphalt and glass is usually reliant on a large urban or industrial centre and is not usually used in regional areas because of the high transport costs.

The use of flyash and slag is dependent on the available source. Flyash is obtained from suitable coal fired power stations. Slag is sourced from the steel or iron industry; as Australia's steel industry shrinks there is evermore reliance on the importation of slag from Asia where it is a high volume waste product.

It is with this background that Austroads is considering a project to research the increased use of low cost modified granular materials.

In the project proposal, the purpose is "to provide designers of new and rehabilitated pavements the tools to confidently make use of low cost modified materials. Laboratory processes to assess the likely field performance of modified materials and structural design concepts will be developed".

The proposal goes on to say: "to meet increasing road demands... scarcity of quality cost-effective road building materials is an increasing national challenge, particularly in the context of lack of funding for road maintenance and rehabilitation. In many instances, use of alternative approaches such as modified granular materials is becoming commonplace as reserves of high quality manufactured granular materials are exhausted or hauling such materials over long distance is cost prohibitive."

AustStab welcomes this initiative; as an industry we have been stressing the advantages of reusing existing pavements by modification using stabilisation. The definition of modification has long been controversial with many road agencies ignoring the existing Austroad's definitions of modification and targeting a slightly higher strength.

The long term concern has been that strengths higher than 1 MPa Unconfined Compressive Strength will result in cracked pavements. However, it has been proven by many road authorities that the use of slow setting binders with construction traffic results in fine cracking. Any possibility of propagation of these cracks to the surface is easily eradicated by the modern spray seal options available. These ensure that the surface is waterproof so keeping the pavement dry

Australia has many road pavements that have reached their serviceable life; it is a huge waste of our diminishing aggregate reserves for the existing pavement being excavated and disposed of to landfill. Rather, with just a small amount of binder, the total pavement can be restored using stabilisation, often giving this improved pavement material a design life far greater than the original.

This treated pavement also has the other advantage of improved permeability thus reducing the deleterious effect of water. This quality improvement has been shown repeatedly in Queensland with the flooding experienced over the last few years with the stabilised pavements showing far better performance than granular pavements, even under extreme flood inundation.

So the question for every road asset manager - why not use our road network as our primary road aggregate source and leave the quarry material for the concrete and asphalt industries?

PRESIDENT'S MESSAGE

BY HEATH CURNOW

The president's message in this edition is firstly to remind all those in wet or flood susceptible areas to consider the age old methods of drying, weather protecting and strengthening your site by in situ stabilisation, and secondly to provide notice of the upcoming events and current affairs of the stabilisation association.

If you're involved with earthworks or pavement construction in a part of the country that is entering the wetter winter months or coming out of the tropical wet season, now is a timely reminder of the benefits of lime and/or cement stabilisation on wet or soft unsuitable soils.

"All roads lead to Rome" as do the origins of this tried and tested process of improving the engineering properties of pavement materials. The most commonly utilised benefits of lime or cement stabilisation are:

- moisture conditioning – saturated material can be dried to optimum moisture content and compacted typically 4,000m2 per day;
- strengthening – increase the CBR of pavement material from <CBR 5% to >CBR 30%;
- reduce plasticity (PI), shrink swell and the expansive nature of clay - PI > 20 to PI<5%.

Alternatively you're in a drought effected part of the country where water is scarce; stabilisation can provide a more efficient use of what water is available for optimum compaction to benefit the pavement and help to "water proof" it for when the rain returns.

Using stabilisation to produce an effective working platform for your construction site can save weeks of lost time due to wet and unsuitable material in subgrades and in cyclic conditions.

The process has been effectively used on many major projects such as the winners of last year's Stabilisation Awards of Excellence 2013 at the South Australian Jockey Club Morphetteville Race Course Project – highlighted in this edition.

Point loading from the hoof of a horse can be extreme and crushed rock typically used in pavements can dislodge and cause bruising and other injuries to the hoof. The use of in situ lime and cement soil stabilisation, in this case, eliminated the need for crushed rock on the racetrack whilst satisfying a like-for-like pavement strength and design life.

Many of the 2013 Awards of Excellence winners and finalists highlighted in this edition of Roads and Civil Works highlighted this as one of the major advantages. The Roads and Maritime Services (NSW) Farlow Flat project was an excellent example of this, providing significant savings on repairs following major flood events.

The Awards of Excellence will again be awarded by AustStab at the annual conference. We are thankful to have the continued support of Caterpillar for the awards, which are an opportunity to showcase stabilisation as it is currently being applied throughout Australia.

"If you're involved with earthworks or pavement construction in a part of the country that is entering the wetter winter months or coming out of the tropical wet season, now is a timely reminder of the benefits of lime and/or cement stabilisation on wet or soft unsuitable soils."

Work health and safety, education and/or research, innovation and/or excellence in sustainability, and excellence in local government will be the awards nomination categories. The Crowne Plaza Hunter Valley will be location for the conference and Gala Dinner on 19 August 2014. They are a much anticipated highlight to the conference program.

The program and registration is now open for AustStab members, and I encourage you to register now for the popular event. The

President
Heath Curnow

conference provides us with an opportunity to reflect on our efforts from the previous 12-month period and, as importantly, to set the strategic direction for 2014- 015 and beyond.

In September 2012, AustStab announced the introduction of a scheme to review chemical binders available in the Australian market. We were recently approached by ARRB and advised of the Transport Infrastructure Product Evaluation Scheme (TIPES). This scheme will replace the scheme which was previously proposed by AustStab. More information about this scheme can be sourced from the ARRB Group.

Finally, I am pleased to report that one of the key objectives for AustStab for 2014 – recognition of the AustStab ARRB Accreditation scheme – is progressing well in the eastern states of Australia.

I have been heartened to hear from senior SRA members that they can see the benefits of the accreditation scheme in the quality of work being produced in the field. I look forward to reporting in more detail on this initiative in coming issues of the magazine. More information about the scheme is available on the AustStab website.

TOWNSVILLE CITY COUNCIL PROVIDES SUSTAINABLE PAVEMENT SOLUTIONS

The winner of Category for Local Government in the 2013 Awards of Excellence demonstrates the ongoing successful utilisation of stabilisation by a local government agency.

For the past 15 years, Townsville City Council (TCC) and Stabilised Pavements of Australia (SPA) have developed a strategic partnership that has successfully stabilised hundreds of damaged roads throughout the Townsville region. With the amalgamation of Thuringowa and Townsville City Councils, this sustainable process has withstood all challenges and is still the preferred method for construction.

To strengthen the partnership, SPA has shown great initiative by developing council staff and cadet engineers by including them in the design and delivery processes. SPA continues to work closely with council's design team involving them in workshops keeping them up to date with new treatments and processes. This includes working together on cost estimates and design for foamed bitumen works for future capital works projects.

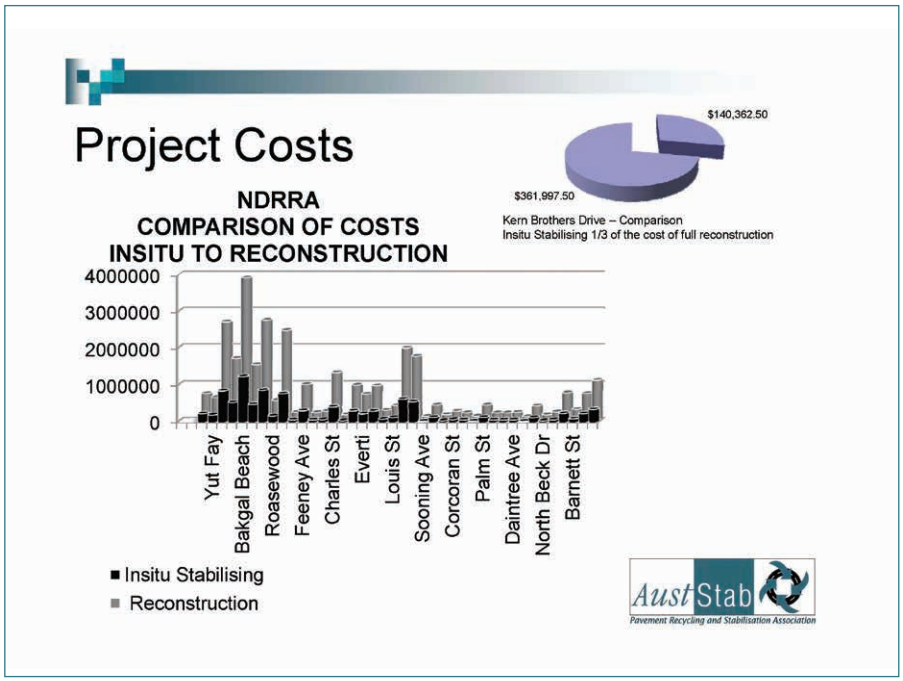
SPA has completed many major insitu stabilisation projects for council and for the past two years has been heavily involved in delivering the insitu component on the National Disaster Relief and Recovery (NDRRA) program for TCC.

These works involved over 91 streets and have been accessed by the NDRRA Compliance team to ensure the value for money criteria is met. Each street was evaluated on merit for repairs and council's design team and the rehabilitation process delivered value for money projects saving the government millions of dollars compared to using traditional remove and replace methods.

A number of initiatives including using an enclosed system in an urban environment which used lime on sub-grades, cement in sub-base and base course layers and foamed bitumen in low lying areas.

TCC's Design Manager has also explored the benefits of utilising lime stabilisation in future subdivisions. Lime stabilisation to subdivision sub-grades will now be adopted through council's development manual providing a cheaper and stronger infrastructure. They are examining cost savings to Council and the reduction of emissions to the environment.

An additional benefit of using the insitu recycling method is the significant reduction in carbon footprint. The use of recycling by stabilisation on council projects provides a cost effective road network with a 20-year design life, as well as significant reductions in CO2 levels for construction and congestion due to the timeframes saved on delivery.



Brendan Quabba – Executive Manager Construction and Maintenance, Townsville City Council – said the projects had consistently been of a very high quality and presented value for money to ratepayers. He further noted that best practice in the industry must continue to recognise the increasing importance of providing protection to the environment.

AUSTROADS RESEARCH REPORT - PAVEMENT DESIGN

Designers of pavements on lime stabilised sub-grades have often been confused on the procedure to take into account the untreated sub-grade under the stabilised layer. Often, a weighted average of the treated and untreated layers was used.

Austroads recently released a Research Report (AP-R435-13) titled *Proposed Procedures for the Design of Pavements on Selected Subgrade and Lime –stabilised Subgrade Materials.*

In the report, Austroads clearly described the design procedures with worked examples to detail those procedures. AustStab anticipates this draft will be used by practitioners and revised as necessary, and is hopeful of its inclusion in the next edition of the AustRoad's Guide.

Austroads cautions that acting on the research report and its findings is at the discretion of the user.

In the May edition last year, a brief outline of the procedure recommended in the report was given in this magazine. AustStab recommends all pavement designers download the full report and consider using the graphs and procedures to give very cost effective pavements.

For too long, many designers have not taken full advantage of the strength and water resistant capacity of lime stabilised pavements. If the findings of this report are adopted, it will often reduce the pavement thickness and give longer life due to the relative impervious lime treated layer.

The report can be found at https://www.onlinepublications.austroads.com.au/items/AP-R435-13

pink xx's need to be filled in

RMS PRODUCES A PROJECT WORTHY OF HIGH COMMENDATION

The Farlow's Flat foamed bitumen project was recognised with a highly commended award in Category 3 for Innovation in the 2013 AustStab Awards of Excellence.

The project is situated on the Pacific Highway 44 kilometres North of Grafton, New South Wales, south of Harwood Bridge to Farlows Flat. It was completed in late 2012.

The original scope of works was to raise a low section of the existing highway (1.5 kilometres long). In flood events this was the last section of the Pacific Highway to be reopened on the A1 National Highway between Grafton and Ballina. These flood events could last up to five days. The total project value was $8.5 million.

The work involved:

- Raising the highway south of the interchange by up to one metre to reduce closure time on the highway during flooding.
- Widening the road shoulders to improve safety.
- Changes to the layout of the interchange for motorists travelling to and from Maclean and Yamba.
- Longer acceleration and deceleration lanes to provide a smoother and safer highway connection for both local and highway users.

The project – developed as a trial – was delivered by a Roads and Maritime Services NSW (RMS) internal Alliance. The alliance included asset managers, designers and contractors. The foamed bitumen plant was subcontracted from RPQ. The design was completed by Queensland Transport and Main Roads (TMR). Alliance, Project and Asset Management were provided by RMS Northern Region.

The site was exposed to significant social and environmental challenges, carrying 1.3 x 106 Equivalent Standard Axels per day or 14 000 vehicles, including 15% heavy vehicles.

As part of the National Road Network the construction site was required to provide continuous vehicle access for traffic with one lane of traffic needing to remain open in each direction at all times. The site was adjacent to the Clarence River and within an area identified as a *State environmental planning policy no. 14 - Coastal wetlands* (SEPP 14) area. These areas provide significant ecosystem services and are valued by local communities.

Pavement investigation and design was critical to the success of the project, and was completed by RMS in conjunction with the TMR Pavement XX's Michael Janosevic, Senior Advisor (Seals and Granular Pavements). Site investigations included trench investigation, material testing and mechanistic designs.

As this is a new research area for RMS, the *Austroad's Guide to Pavement Technology* principles was applied to the project, which was designed as a continuously bound layer, with the expected modes of distress being rutting and/or shoving due to insufficient resistance to pavement deformation and cracking due to fatigue.

According to the Project Manager for RMS, Stephen Williamson, he expects the bitumen binder will enable increased resistance to fatigue.

The pavement was designed to overlay the existing pavement, including sprayed seal, with 250 millimetre foamed bitumen pavement with 1.5 per cent lime and three per cent bitumen. Approximately 50 000 tonnes of foamed bitumen material was manufactured and placed over a project duration of X weeks.

Alternatives were considered by the site, such as placement, shaping and compaction of locally available suitable dense-graded base materials. The production rates achieved using the foamed bitumen products, including placement, shaping and compaction of the base materials, were up to three times more effective than with other methods.

Production rates of up to 1600 tonnes of foamed bitumen materials being placed, compacted with final trim in a production day were achieved.

RPQ commissioned a new Wirtgen 350 plant on the project. The plant was located adjacent to the work site, which reduced the number of construction vehicle movements in conjunction with the works.

Quarry materials were provided by xx, which was xx kilometres from the production facility. Staging of the works was co-ordinated locally to minimise the disruption to the local and national highway network. The project was able to achieve optimum placement and production conditions.

An RMS work health and safety guideline, *Working Safely on Foot,* was also implemented on this site as a trial site. This has subsequently been adopted across NSW.

The project site was twice inundated with flood waters in early 2013 and performed well. The roads were reopened to traffic more quickly, with no visible surface pavement damaged observed.

Plant manufactured foamed bitumen stabilisation was able to achieve a tight construction schedule, with improved pavement qualities in an environmentally sensitive location in Northern NSW.

Steven Williamson indicated that RMS would strongly consider the use of foamed bitumen stabilisation in future RMS new work projects.

SANTOS PROJECT PROVIDES SUSTAINABLE SOLUTIONS AT DAWSON'S BEND ROAD

The Dawson's Bend Road project, which was recognised as a finalist in the 2013 AustStab Awards of Excellence, was an excellent example of a traditional use of improving poor quality materials locally available with a one per cent cement modification of sub-base materials.

As part of Santos Limited's $18.5 billion GLNG coal seam gas venture, a need was identified to improve the road systems in-and-around the Fairview Gas Fields near Injune in Queensland's Bowen Basin.

The Dawson's Bend Road site is a 17kilometre section of road running through the gas fields, and is the main thoroughfare for access to compressor stations, hubs and living quarters. Due to the critical nature of the road, there was a requirement to keep the pavement operational during the construction period.

The extent of the construction works required an upgrade to the pavement from an unsealed pavement to a sealed pavement capable of carrying the significantly increased traffic loading. It required improving the sub-grade, sub-base, base and wearing course.

The material specification provided by Fluor for the sub-base material required a minimum Californian Bearing Ration (CBR) of 35.

A number of potential quarries were identified for the project. A local quarry source, Burnt Gully, had lower CBR's (10-15) and lacked course granular material. A quarry, 70 kilometres from the site, had higher CBR's with poor fines available. An alternative proposal, suggested by the sub-contractor, FK Gardner, considered for the later material included re-crushing the rock and this was trialled on the project.

This quarry product was available from a quarry with a significantly greater haul distance than the Burnt Gully pit, which would have resulted in a longer construction time and a higher number of trucks allocated to the haul task, with the associated environmental and financial costs. These costs included additional heavy vehicle loading to longer sections of unrelated road networks.

The project solution was to modify, with cement, the poorer CBR material insitu with centrally mounted stabilisers achieving results of CBR's in excess of 45 being consistently achieved.

The contractor, FK Gardner, believes this provided a sustainable solution, resolving project issues and providing Santos Limited with value for money.

STABILISING PAVEMENTS FOR THE 'SPORT OF KINGS'

Stabilising of training tracks at Morphetteville Race Course, operated by the South Australian Jockey Club (SAJC), was an innovative example of lime and cement stabilisation in practice, and was the AustStab award winner for Category 3 in the Awards of Excellence in 2013.

The Australian Government publication *Racetrack Design and Performance (2004)* prepared a report detailing the latest database of knowledge in 2004. The aim of the research was to provide improved surfaces for maximum use, minimum maintenance and best horse performance and safety.

A detailed international literature review, site sampling and survey of jockeys allowed the authors to form conclusions relating to track design factors that influenced the safety of horses and jockeys.

The results of the studies found the water content of the surface reduced the risk of injury. Soil moisture and therefore hardness can be controlled through irrigation and drainage (Zebarth and Sheard, 1985).

Proper pavement construction with consistent materials is required, with a free-draining wearing course. The underlying pavement must allow the wearing surfaces to achieve these requirements.

The design selected for the training tracks was innovative in providing a sound surface to achieve these engineering specifications, within the economic, social and environmental constraints of the tracks.

The key innovation in the project was providing an engineering solution to ensure an all-weather training track. A track with strength to withstand the point loading by the training horses that ensured their fetlocks or tendons were not damaged during training due to pavement failures, and that the construction period for the track was to be reduced to an minimum.

Time considerations were a motivating factor for SAJC to consider construction methods that reduced the loss of pavement to a minimum during pavement rehabilitation. The training tracks are operational year-round. Training is completed daily by more than five stables housing nearly 100 yearlings, colts and geldings accessing the Morphettville training tracks.

The construction process allowed the treatment of the existing base material insitu with two per cent lime to assist in the drying of the existing base. The lime treatment was also used to waterproof the base material in flood-prone areas.

The base was treated with three per cent cement. The cement treatment of the base material provided a bound layer which reduced mitigation of the material migration from the base to the sand layer. This reduced potential damage to the hooves of the training horses.

The treatment of the base course material was completed within three days. The sand wearing course was reinstated at a depth of 150 millimetres.

Alternative options were considered by the stabilisation contractor – Stabli-lime. The options included the removal and disposal off-site of the existing base course material and replacement with a 20 millimetre fine crushed rock.

This construction time was estimated to take two weeks. A second alternative was to overlay the existing base course with new base course material, which would not have matched with the existing drainage structures, particularly the adjoining ProRide surface.

The preferred construction process reduced the requirement for virgin construction materials to be imported to site for the base materials, as well as the removal of waste to fill for the materials that would have been removed off-site.

This reduction in vehicle movements assisted in the continuous operations of the other training facilities with minimal interruption and disturbance to the horses still in training.

NAMBUCCA SHIRE COUNCIL SIDE CAST MATERIALS WITH GREAT RESULTS

Nambucca Shire Council was the highly commended award winner in the local government category of the 2013 AustStab Awards of Excellence for the Valla Road Project.

The North Coast of NSW is the start of the tropical regional in Australia. The road network is subject to extremely wet conditions. The Valla Road project could be classified as a low volume road, with pavements designed to carry low equivalent standard axels.

The pavement that was rehabilitated was constructed on a pavement with significant sub-grade failures, with unsuitable material removed from the site to a depth of 1.5metres in isolated locations. Much of the existing pavement materials, sub-grade and pavement materials were saturated at the design stage.

Investigations and preliminary designs included removing all unsuitable material and saturated pavement materials, and replacing them with virgin products. This was dismissed due to the inconvenience to the local residents of the full-depth pavement reconstruction using traditional cut and fill construction methodologies.

Over a pavement site of 1000 square metres, 200 millimetres of pavement materials were cut and side cast. This allowed sufficient time for the materials to dry to be later incorporated back into the pavement. A further 200 millimetres of pavement and sub-grade materials were cut to waste.

The 200 millimetres of side cast material was recycled into the sub-base layer of pavement with a 70/30 slag/lime blend. The blended binder assisted with the drying of the material, through both pozzolanic and exothermic reactions. A base layer of 200 millimetres was imported and compacted.

The site received a 14 millimetre seal.

This reuse of existing materials provided a significant reduction in heavy vehicle movements on the local network with associated environmental and social benefits.

It provided significant financial savings over incorporating virgin materials for the sub-base layer, as well as savings on tip fees associated with the disposal of waste from site. The contractor, Mid Coast Road Services, felt the site was safer to manage as a deep excavation was not left unattended overnight.

Granulated blast furnace iron slag (GBFS), commonly known as slag, is formed when high-pressure, high-volume water sprays hit the molten slag when leaving the blast furnace.

The combined heat energy contained in the molten slag and water causes the molten slag to explode instantly forming granulated particles. This is a by-product of iron production and is a recycled product. Slag is a slow-setting hydraulic cement; reacts exceptionally well with lime and is treated by AustStab as a pozzolanic material.

Category 3 in the Awards of Excellence in 2013.

The Australian Government publication Racetrack Design and Performance (2004) prepared a report detailing the latest database of knowledge in 2004. The aim of the research was to provide improved surfaces for maximum use, minimum maintenance and best horse performance and safety.

A detailed international literature review, site sampling and survey of jockeys allowed the authors to form conclusions relating to track design factors that influenced the safety of horses and jockeys.

The results of the studies found the water content of the surface reduced the risk of injury. Soil moisture and therefore hardness can be controlled through irrigation and drainage (Zebarth and Sheard, 1985).

Proper pavement construction with consistent materials is required, with a free-draining wearing course. The underlying pavement must allow the wearing surfaces to achieve these requirements.

The design selected for the training tracks was innovative in providing a sound surface to achieve these engineering specifications, within the economic, social and environmental constraints of the tracks.

The key innovation in the project was providing an engineering solution to ensure an all-weather training track. A track with strength to withstand the point loading by the training horses that ensured their fetlocks or tendons were not damaged during training due to pavement failures, and that the construction period for the track was to be reduced to an minimum.

Time considerations were a motivating factor for SAJC to consider construction methods that reduced the loss of pavement to a minimum during pavement rehabilitation. The training tracks are operational year-round. Training is completed daily by more than five stables housing nearly 100 yearlings, colts and geldings accessing the Morphettville training tracks.

The construction process allowed the treatment of the existing base material insitu with two per cent lime to assist in the drying of the existing base. The lime treatment was also used to waterproof the base material in flood-prone areas.

The base was treated with three per cent cement. The cement treatment of the base material provided a bound layer which reduced mitigation of the material migration from the base to the sand layer. This reduced potential damage to the hooves of the training horses.

The treatment of the base course material was completed within three days. The sand wearing course was reinstated at a depth of 150 millimetres.

Alternative options were considered by the stabilisation contractor – Stabli-lime. The options included the removal and disposal off-site of the existing base course material and replacement with a 20 millimetre fine crushed rock.

This construction time was estimated to take two weeks. A second alternative was to overlay the existing base course with new base course material, which would not have matched with the existing drainage structures, particularly the adjoining ProRide surface.

The preferred construction process reduced the requirement for virgin construction materials to be imported to site for the base materials, as well as the removal of waste to fill for the materials that would have been removed off-site.

This reduction in vehicle movements assisted in the continuous operations of the other training facilities with minimal interruption and disturbance to the horses still in training.