Pickanjinnie North Road Upgrade Project

IPWEA Q WESTERN ROADS SYMPOSIUM
6-7 SEPTEMBER 2017, LONGREACH

Evan Woods and Simon McIntosh
Session Overview

- Maranoa Region and road utilisation (resource sector traffic)
- Road Upgrades within the Maranoa
- MoU - MRC: RoadTek
- Pickanjinnie North Road Project
- Pit selection & past gravel performance
- Pit logistics & issues
- Construction processes
- Benefit & risks
Maranoa Region

Overview of Maranoa Region

• 54,000km²
• 5,850km of Road Network
• 2,200km sealed 3,650km unsealed
• Workforce of 170 field employees

Impacts from Resource Sector Traffic

• GLNG, APLNG & QGC
• Road Infrastructure Agreements (RIAs)
  • Road Maintenance
  • Capital Upgrades
• 5 year rolling Capital Upgrade Program associated with the Santos GLNG RIA
Map of the Area

Maranoa Region (cont.)
Road Upgrades within the Maranoa

MRC invests on average $7M - $10M yearly into renewal and upgrade of the Rural Road Network regionally.

- Gravel Resheeting
- Pavement Rehabilitation
- Network Upgrades

Resource Sector network upgrades has increased this by an additional $10M to $14M per year on average since 2012.

Prior to 2015 this additional construction was delivered by Civil Contractors operating with the region.

Designs completed and Construction Contracts were managed by Regional Consultants.
Road Upgrade within the Maranoa (cont.)

Between 2011 and 2015 98km of the Maranoa Regional Road Network was upgraded to accommodate Resource Sector traffic demands.

A large percentage of these upgrades were completed using manufactured pavement materials (Type 3.2 and 3.3) produced within the region.

The use of manufactured gravels resulted in high material supply costs in terms of construction and haulage.

A number of the road upgrades are performing poorly under traffic conditions less than the design traffic volumes:

- Additional yearly maintenance costs above what would be expected.
- Concerns raised by the funding entity on the quality of the works.
In 2015 an alternate delivery model was proposed to Council whereby MRC internally oversees the design and delivers the construction of Resource Sector projects.

Challenges to overcome –

- A large Capital Works program
- Project management systems
- Project resourcing (Labour & Plant)
- Resource skills
- Financial risks during construction
- A rapid downturn in the local economic environment

The implementation of the MoU with RoadTek (Downs South West)
Memorandum of Understanding (MoU)

How the relationship came about -

- MRC faced with a competitive commercial market, potentially compromising construction quality
- Increased workload over a three year period
- MRC desire to building capacity, developing internal systems and skill sets
- RoadTek Downs South West (RTDSW) & Maranoa Regional Council (MRC) have had a working relationship for some years.
Memorandum of Understanding (MoU) (cont.)

MoU Purpose –

• Three year partnership agreement between Maranoa Regional Council (MRC) and Department of Transport and Main Roads – RoadTek Downs South West (RTDSW)

• To define, develop and deliver the program of works within the Maranoa Region, to meet commitments, funding requirements and client expectations, while providing the opportunity, training and support to assigned resources to upgrade their skills & capabilities.

• Key Components:
  • Provision of project management services and resourcing
  • Consideration of MRC’s and RTDSW’s Program of Works
  • Covering 2016, 2017 and 2018 calendar years

• Recognises the importance placed by both in the upskilling of road construction and maintenance capability within both parties to facilitate future safe, smart and sustainable operations.
Memorandum of Understanding (MoU) (cont.)

• The commitment by both organisations to cross utilise project management services, civil labour and plant resources over the duration of the MOU, in the first instance, to define, develop & deliver the program of work, in order to maximise utilisation of resources maintained within the region.

• Benefits to both parties
  • Provides ongoing program of works
  • Mitigates risk
  • Allows for upskilling from both parties
  • Transparent relationship
First major infrastructure upgrade project to be delivered by MRC (with the support of the MoU) was the **Pickanjinnie North Road Upgrade Project**

15.4km of sealed network located approx. 30km east of Roma

Provides a link for Santos GLNG to a network of gas wells that distribute to a processing hub located 15km west from the roadway.

It was identified in 2013 that substantial upgrades would be required to road to accommodate the projected project traffic.
Pickanjinnie Road Upgrade Project (cont.)

Existing Road Condition

- 4m wide bitumen seal / 6-7m formation
- Background traffic of 20vpd
- Substandard horizontal and vertical curves
- Encroaching vegetation
- Previous crash history

Road Upgrade Criteria

- Combined traffic volume of 120vpd deemed road “Not Fit For Use”
- MRC’s Road hierarchy: Rural Access – Primary A
- 20 year design life
- Make utilization of existing pavement and formation where possible
- Agreed funding package of $13M funded under the RIA
Limitation of design guidelines associated with low traffic impacts

- Standard Design Guidelines focus on higher Traffic Volume Roads
- Tendency to ‘distort’ design requirements due to very low volume
- Potential to ‘overdesign aspects’, in particular the pavement requirements
- Tend to increase construction costs (i.e. use of certified pavement materials)
Pickanjinnie Road Upgrade Project (cont.)

Design developed by a local Consultant with close input from MRC

8m wide bitumen seal / 8m granular pavement / 8m road formation

Pavement Design

- 120mm base course – Type 4.2 Material
- 150mm subbase course – Type 4.4 Material (incorporating suitable existing pavement)
- Subgrade Type A treatment
- Embankment widening as required
Agreed funding package of $13.1M under the RIA to complete the entire 15.4km upgrade

**Challenged project team to investigate regional material options as a potential substitute for manufactured gravel**

Project constraints relating to material supply –

- Production cost of manufactured materials
- Haulage costs associated with manufactured materials
- Durability or performance of non-standard local materials
- Consistency of non-standard local materials
Maranoa region material types (Local pits vs Roma Quarry)

- Sandstone – sedimentary material
- Basalt Seams
- Red Ridge Gravels

Performance of materials around the region in both sealed and unsealed pavements
Considered several material supply options –

- Commercial sources
  - Roma Quarry
  - Amby Quarries
  - Mt Saltbush Quarry

- Local sources
  - Well’s Pit
  - Combabula Pit
  - York’s Pit

Utilising a Local Material Source presented an opportunity of a $1,100,000 saving to the project

- Savings in material supply and production
- Savings in haulage to the job site
Pit Selection and Past Gravel Performance

Wells Pit

- Located approx. 14km from start of works
- White sedimentary sandstone (red loam over-burden)
- Varies in quality and strength
- Variability in the source rock
- Utilised on both sealed and unsealed roads in the area for past 25 years
### California Bearing Ratio

**Q113A - Standard Compaction - UNSOAKED**

<table>
<thead>
<tr>
<th>Initial Moisture Content (%)</th>
<th>11.9</th>
<th>13.2</th>
<th>15.0</th>
<th>10.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compacted Dry Density (t/m³)</td>
<td>1.770</td>
<td>1.806</td>
<td>1.755</td>
<td>1.734</td>
</tr>
<tr>
<td>CBR 2.5mm (%)</td>
<td>78</td>
<td>40</td>
<td>25</td>
<td>68</td>
</tr>
<tr>
<td>CBR 5.0mm (%)</td>
<td>84</td>
<td>54</td>
<td>42</td>
<td>70</td>
</tr>
<tr>
<td>Final Moisture Content (%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Sample Results

- **Compactive Effort:** Standard
- **Test Condition:** UNSOAKED
- **CBR MDD (tm-3):** 1.81
- **CBR OMC (%):** 13.2
- **CBR 2.5mm (%):** 40
- **CBR 5.0mm (%):** 54

**CBR Value (%):** 54

The CBR Results average between 48 and 60.
Pit Selection and Past Gravel Performance
Pit Selection and Past Gravel Performance

Typical Material Test Results

<table>
<thead>
<tr>
<th>Client</th>
<th>MARANGA REGIONAL COUNCIL</th>
<th>Client Job No.</th>
<th>SGS/16/007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>84301</td>
<td>Location</td>
<td>Pickanjinlie North Rd Reconstruction</td>
</tr>
<tr>
<td>Tested Date</td>
<td>19/02/2016</td>
<td>Sample No.</td>
<td>16-LT-311</td>
</tr>
<tr>
<td>SGS Job Number</td>
<td>16-55-82</td>
<td>Sample ID</td>
<td>Wells Pit Wallumbilla - SP #2, TMTRIA002</td>
</tr>
<tr>
<td>Lab</td>
<td>Lawnton</td>
<td></td>
<td></td>
</tr>
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**Atterberg Limits (5 Point Cone Penetrometer) with Linear Shrinkage**

Q104A, Q105, Q106

<table>
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<th>Property</th>
<th>Value</th>
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<tbody>
<tr>
<td>Liquid Limit (%) (Q104A)</td>
<td>29.8%</td>
</tr>
<tr>
<td>Plastic Limit (%) (Q105)</td>
<td>25.8%</td>
</tr>
<tr>
<td>Plasticity Index (%) (Q105)</td>
<td>4.0%</td>
</tr>
<tr>
<td>Linear Shrinkage (%) (Q106)</td>
<td>4.8%</td>
</tr>
<tr>
<td>Weighted Plasticity Index (%)</td>
<td>60</td>
</tr>
<tr>
<td>Weighted Linear Shrinkage (%)</td>
<td>69</td>
</tr>
</tbody>
</table>

**Shrinkage Details**

- Nature of Shrinkage: Curling
- Length of Mould (mm): 151
- History of Sample: Oven-Dried

**Method of Preparation:**

- Dry-Stewed

**Sampling Method and Clause:**

- 

**Date Sampled:** 16/02/16

Note: Sampled by SGS according to Q050 Random Locations and Q060 clause 8.1 Single layer S/Pile loader remove & mix
Pit Selection and Past Gravel Performance

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**Particle Size Distribution (Wet-Sieved)**

Crushed to a 40mm minus for workability.

Crushing to a maximum particle size less than 40mm tends to lead to construction issues with the material breaking down.
Pit Logistics and Issues

Material won using two D10 Dozers
  • Overburden stripped and retained for rehabilitation
  • Sandstone seam (3m face) won and stockpiled
  • Variable mudstone within source rock

Material crushed using an Impact Crusher

Product stockpiled in maximum 5000T lots prior to conformance testing
Lots of vary quality identified and incorporated into the works where suitable
Construction Process

Construction process:

• Clear the existing formation
• Nominal shoulder cutback into existing pavement
• Ground Surface Treatment, embankment and subgrade treatments
• Shoulder widening to new formation width and placement of a ‘corrector coarse’ over the existing formation
• Pulverisation to target 150mm depth – ensure incorporation of insitu-gravel
• Base overlay at nominal 120mm pavement thickness
Overall Benefit and Risks

Substantial cost saving (production and haulage)
Pavement that has a proven performance to withstand the low volume traffic
Pavement that can better tolerate moisture
Material can be trafficked for longer periods during construction without unravelling
Project team has a complete control over the supply and delivery of material
Overall Benefit and Risks

The project team needs to be resourced to manage the production of the material:

- Separate site located 14km from the construction site
- Quality control of processed material
- Additional resources and/or contractors

The variability of the source material needs to be closely monitored.

Legislative requirements to access and extract the materials

Stakeholder management (authorities, landholders, etc.)

Rehabilitation plan and works on completion
Questions?