



November
2018

BLACK SOIL TRIALS
NARRABRI SHIRE COUNCIL - RIVER ROAD

Black Soil Trials. Narrabri Shire Council. River Road. November 2018.

1. Scope

Black soil trials were constructed at River Rd at Narrabri on November 1st and 2nd. These trials are a joint initiative between Narrabri Shire Council, IPWEA (NSW, Roads and Transport Directorate) and AustStab. They follow previous black soil trials which were constructed at Goondiwindi in October 2016.

The purpose of these trials are to develop procedures and methods for stabilising unsealed black soil roads with low traffic volumes to provide and an all weather surface with reduced maintenance requirements.

AustStab and Council's responsibility for this trial were shared as follows:

AustStab Contractors Responsibility:

- Establishment
- Supply and spreading of Quicklime as above
- Slaking
- Stabilising as above (2 passes)
- Construction testing (spread rate, depth of mixing, field moisture)
- Post Construction testing (relative compaction, UCS, CBR, 2 of each per section)
- Project Management

Council Responsibility:

- Traffic control
- Water cart
- Rollers/compaction
- Grader/trimming of final surface profile

2. Location

The trial was carried out on River Rd which is located approximately 35km west of Narrabri. The actual site of the works is on River Rd, 2km south of the Kamiloroi Highway. The site is approximately halfway between Narrabri and Wee Waa.

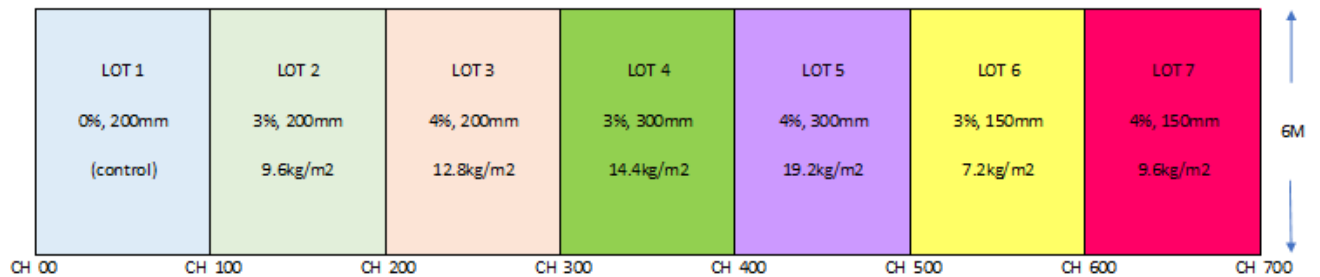
This road is an access road for a low number of properties and it is estimated to carry less than 50 vehicles per day. The section of this road selected for the trial has been formed from the highly plastic black soil located on site with no imported local gravel overlay.

3. Trial Description

The following site sketch provides details of the trial sections including depth of stabilisation and quicklime percentages. Lot 1 has no lime but has been included as a control section. This lot was simply just mixed and compacted with added moisture to assist compaction.

Trial Layout Sketch

RIVER ROAD NARRABRI SHIRE COUNCIL
BLACK SOILS LIME STAB. TRIALS



Note: Lime percentages are for Quicklime.

The trial details were developed after a site investigation and laboratory testing including lime demand testing, Atterberg Limits, UCS and CBR's. This testing is summarized in Table 1.

N16022 River Road SR286 Material Assessment								
Sample No	CBR Report	UCS Report	PI Report	Sample Location/Material and or Blend	Additive, %	CBR, %	UCS, MPa	PI
N538/N637	N637-CBR	N637-UCS	N538-PI	TP1/Natural Field Condition	0	2.5	0	44
N539/N641	N641-CBR	N641-UCS	N539-PI	TP2/Natural Field Condition	0	2.5	0.1	36
N540/N645	N645-CBR	N645-UCS	N540-PI	TP9/Natural Field Condition	0	3.0	0.1	40
N663	N663-CBR	N663-UCS	N663-PI	TP1/2% Hydrated Lime * Blend	2	30	0.8	13
N662	N662-CBR	N662-UCS	N662-PI	TP1/4% Hydrated Lime Blend	4	35	0.5	13
N665	N665-CBR	N665-UCS	N665-PI	TP1/2% 50:50 Slag/Lime* Blend	2	7	0.1	23
N664	N664-CBR	N664-UCS	N664-PI	TP1/4% 50:50 Slag/Lime Blend	4	19	0.5	16
N666	N666-CBR	N666-UCS	N666-PI	TP2/2% Hydrated Lime * Blend	2	14	0.1	17
N667	N667-CBR	N667-UCS	N667-PI	TP2/4% Hydrated Lime Blend	4	60	0.6	11
N669	N669-CBR	N669-UCS	N669-PI	TP2/2% 50:50 Slag/Lime* Blend	2	7	0.1	21
N668	N668-CBR	N668-UCS	N668-PI	TP2/4% 50:50 Slag/Lime Blend	4	25	0.6	17
N670	N670-CBR	N670-UCS	N670-PI	TP9/2% Hydrated Lime * Blend	2	11	0.2	12
N671	N671-CBR	N671-UCS	N671-PI	TP9/4% Hydrated Lime Blend	4	60	0.8	11
N672	N672-CBR	N672-UCS	N672-PI	TP9/2% 50:50 Slag/Lime* Blend	2	8	0.1	28
N673	N673-CBR	N673-UCS	N673-PI	TP9/4% 50:50 Slag/Lime Blend	4	25	0.6	18

* Hydrated Lime supplied by Boral Cement 07/09/2016.

* 50:50 Slag/Lime blend (CBBLK102) supplied by Boral Cement 07/09/2016.

Table 1.

The investigation testing was carried out with both hydrated lime and a 50/50 blend of slag and lime. The hydrated lime was found to be the most effective binder a summary of the results is as below:

- The average lime demand for the full soil sample is 3.4%
- Average CBR (10 day soak) for 2% hydrated lime is 18%
- Average CBR (10 day soak) for 4% hydrated lime is 52%

The natural material was found to have a CBR of 2.5% with a plasticity index range of 36 to 44.

Construction Testing

Construction testing was carried out by South Qld Soils Pty Ltd and results are summarized in Table 2.

NARRABRI BLACK SOILS TRIAL.CONSTRUCTION TEST RESULTS.														
	Lot 1 CH 3167m	Lot 1 CH3120m	Lot 2 CH3280m	Lot 2 CH3225m	Lot 3 CH3345m	Lot 3 CH3330m	Lot 4 CH3430m	Lot 4 CH3480m	Lot 5 CH3517m	Lot 5 CH3581m	Lot 6 CH3616m	Lot 6 CH3690m	Lot 7 CH3714m	Lot 7 CH3780m
CBR (10 day soak)	3.0	4.0	140.0	130.0	150.0	140.0	70.0	40.0	70.0	80.0	110.0	70.0	110.0	45.0
Field Relative Compaction % (standard compaction)	90.0	87.5	94.0	96.0	97.0	93.5	99.5	92.0	97.5	92.5	98.0	100.5	97.5	100.0
UCS (MPa) 7 day acc							1.1	0.4	1.1	1.2				
UCS (MPa) 28 day ambient.			0.7	0.8	1.2	1.0	1.3	0.4	0.6	0.5	0.9	0.8	1.1	0.3

Table 2.

As with the initial investigation, testing CBR results for the unstabilised control section are low at 3% and 4%. Variable CBR's were achieved for both the 3% and 4% binder sections with results in the range of 45% to 140%. These results are generally much higher than those achieved for the initial site investigation laboratory test program with no discernable difference between the results for the 3% binder compared to 4%.

The range of UCS results for both 7 day accelerated and 28 day ambient tests are similar and range from 0.3MPa to 1.2MPa.

4. Future Monitoring

To assess the performance of these trials over time a regular monitoring of the trials will be carried out. This will be predominantly visual monitoring initially at 6 monthly intervals for the first year and then at 12 monthly intervals. Any maintenance activities will also be documented to provide long term performance data on the effectiveness of the lime stabilisation.

5. Site Photos



Location shot



Lime Spreading



Mixing, first run.



Slaking of lime



Mixing and moisture conditioning.

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18/1/19