Sand Propped Hydraulic Fracture Stimulation at Illawarra Coal Operations

Update – February 2006

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Introduction

Sand propped hydraulic fracturing has been shown to increase gas drainage rates over a full longwall panel by 5-6 times in normal coal and 22-180 times in low permeability coal

First stage is to overcome the borehole completion challenges on South Coast

Second stage is to introduce sand propped hydraulic fracturing to Illawarra Coal underground mining operations

Overview of Presentation

- Project Outline
- Concept of implementation based on experience
- Challenges to be overcome
- Implementation strategy

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Project Outline

- Completion of overstressed holes
  - Douglas pit bottom – high stresses
  - Slotting trials
- Manufacture of production fraccing system
- Trial in Bulli Seam
- Production in Bulli Seam
- Cross Measure trial (requires drilling development)
- Production in Cross Measure

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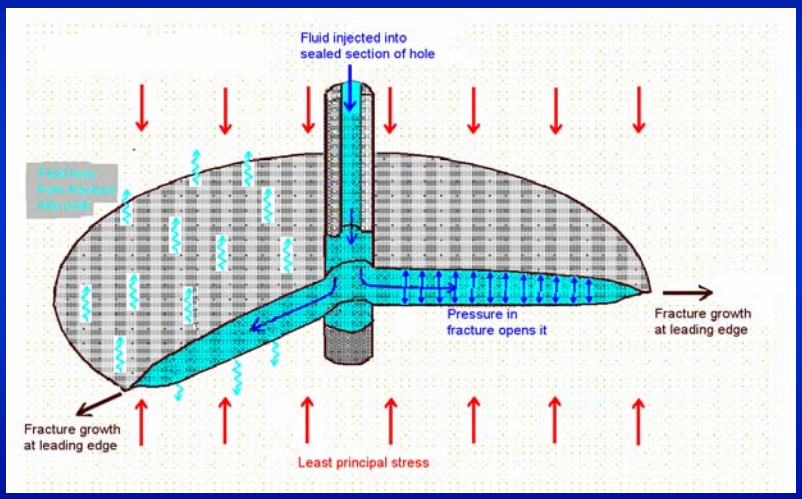
Hydraulic Fracture



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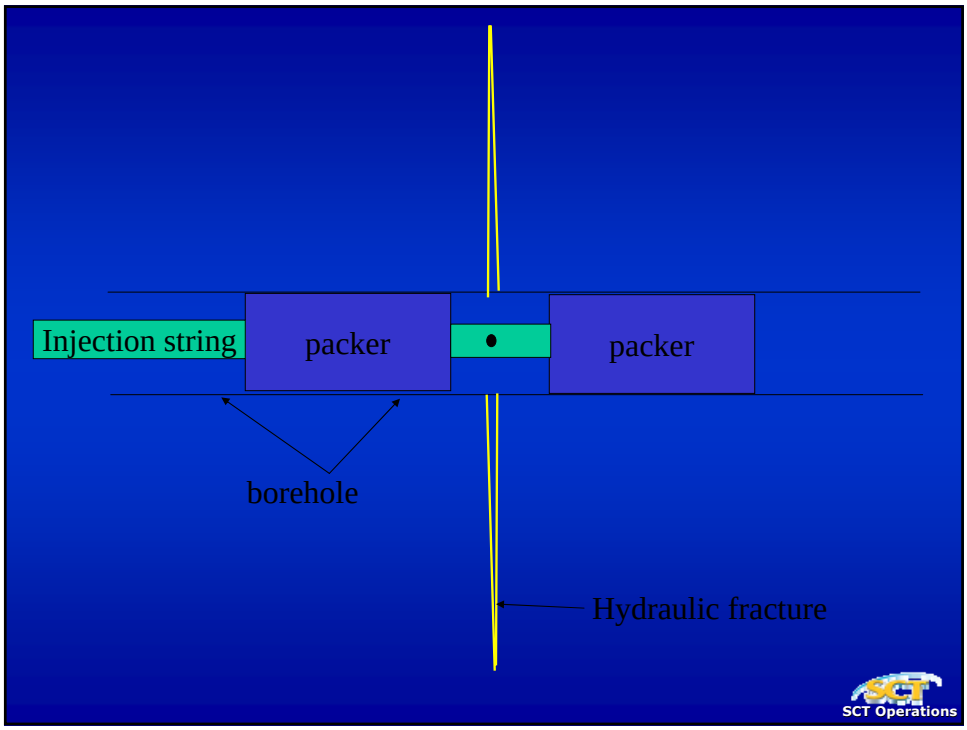

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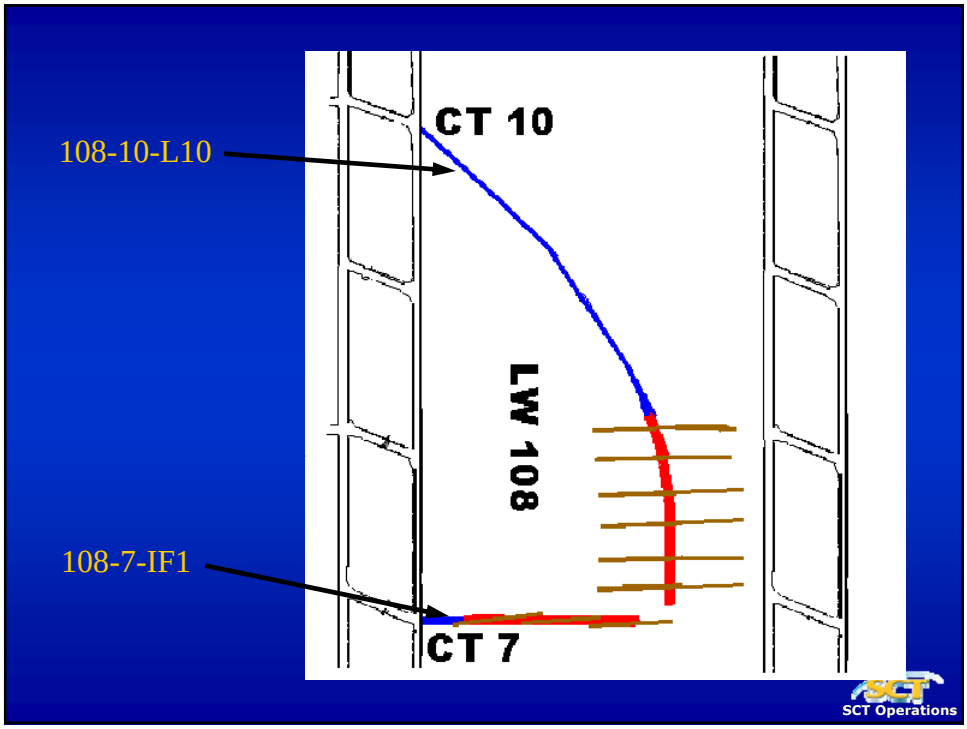

Challenges for Implementation of Sand Propped Hydraulic Fracturing in Southern Coalfield

- Maintaining borehole stability and / or installing casing
- Perforating / notching casing
- Optimising sand placement

- Drilling and casing long holes in Bulli Seam

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Project Update

Staged Implementation Strategy

- Confirm borehole integrity
- Confirm borehole completion and slotting
  - Off site work – Melbourne
  - Trial at Douglas Pit Bottom
- Trial sand-propped hydraulic fracturing
  - Douglas pit bottom – trial of gear
  - Bulli Seam working area – 100 to 400m holes
- Optimise equipment
- Routine implementation

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Strategies to Overcome Borehole Instability

- Case and cement holes, slot casing, conduct treatments using packer system
- Drill out of seam and frac through roof into coal
- Drill out of seam with branches into seam
- For cross measure holes case and cement holes and then extend for treatment

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Staged Work Program

1. Evaluate potential completion methodologies in laboratory setting in steel pipes (off site in Melbourne) – well advanced
2. Trial and evaluate completion methodologies at a field site where borehole breakout is expected
   - Measure development of breakout
   - Trial different casing systems
   - Test slotting system
   - Test packer setting and fraccing system
3. Trial and evaluate completion methodologies at production site in 100m and 400m holes where normal gas production is expected
4. Design and construct purpose built system that BHPB IC personnel can use
5. Provide training, design and ongoing support

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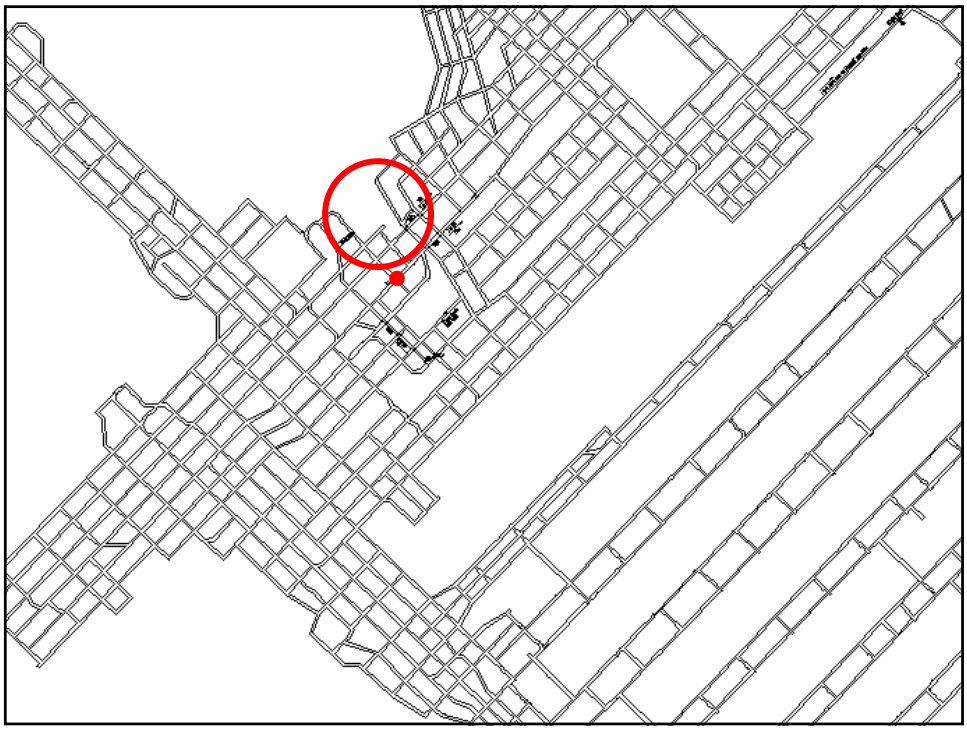
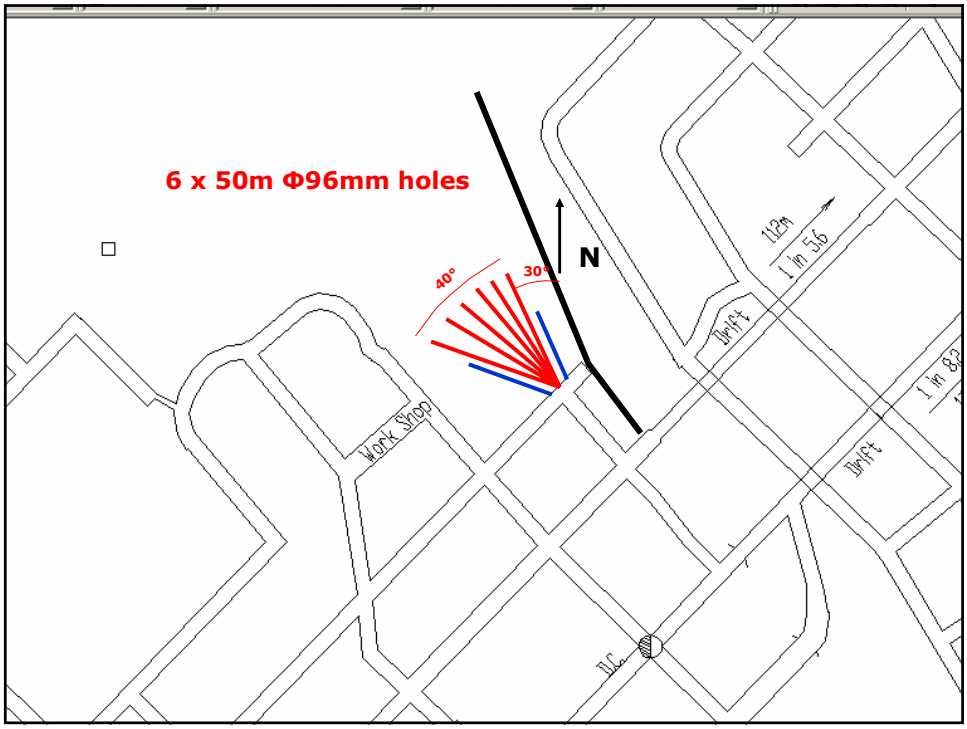
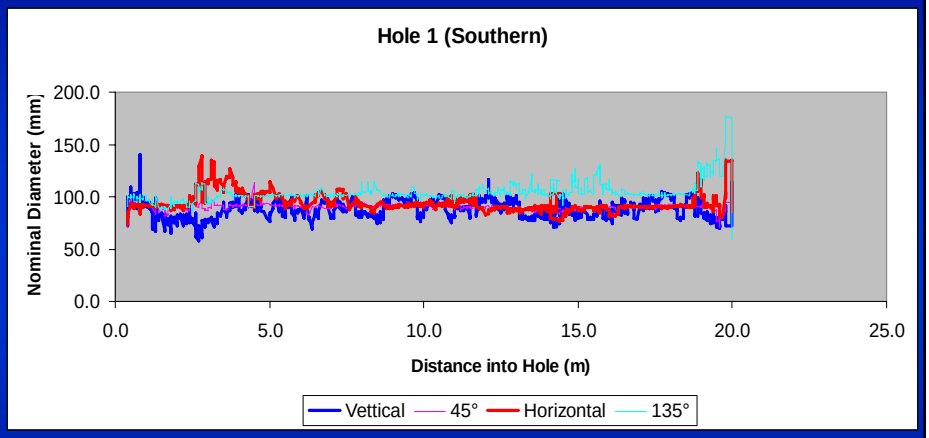




Measured Borehole Diameters – Douglas



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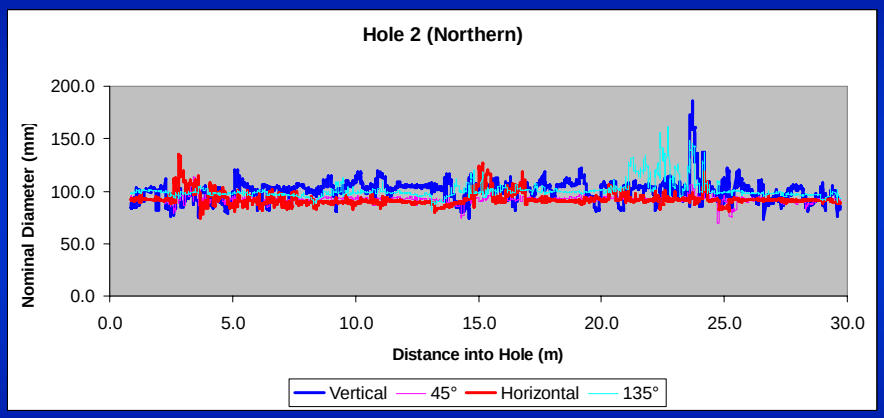
Measured Borehole Diameters – Douglas



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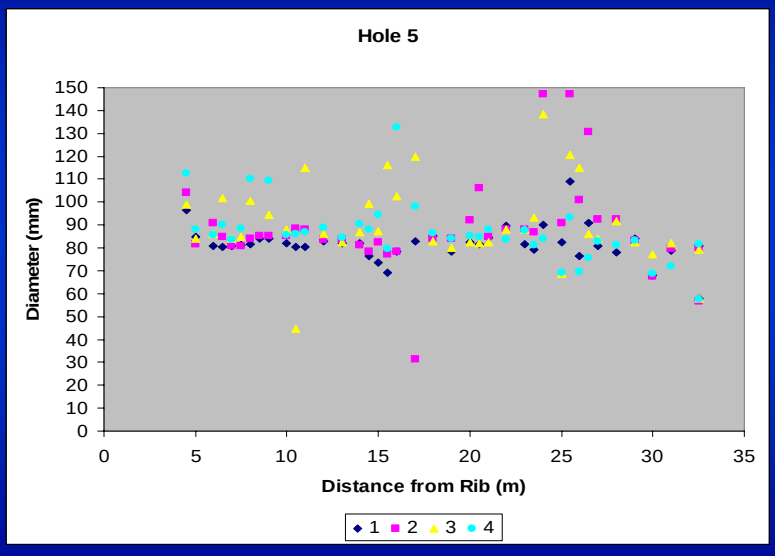
Measured Borehole Diameters – West Cliff



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Conclusion

Holes are not suitable for packers without some form of completion

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Workshop Trials of Casing

Steel Tube

Casing Options

- Steel
- Fibreglass
- PVC

Slotting Trials

Equipment Prep

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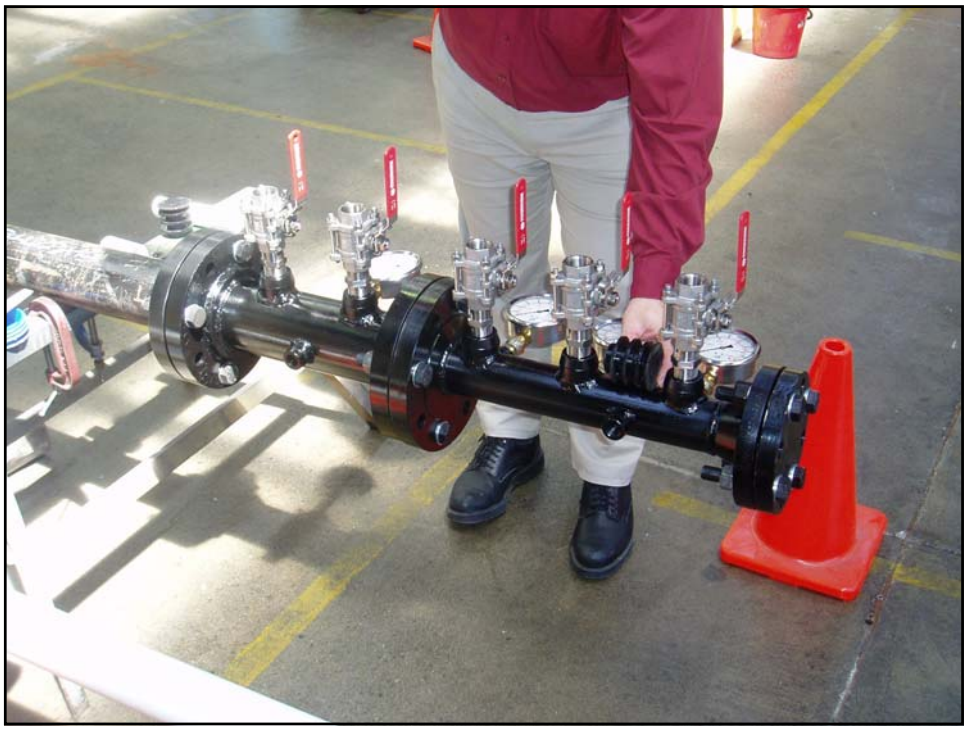


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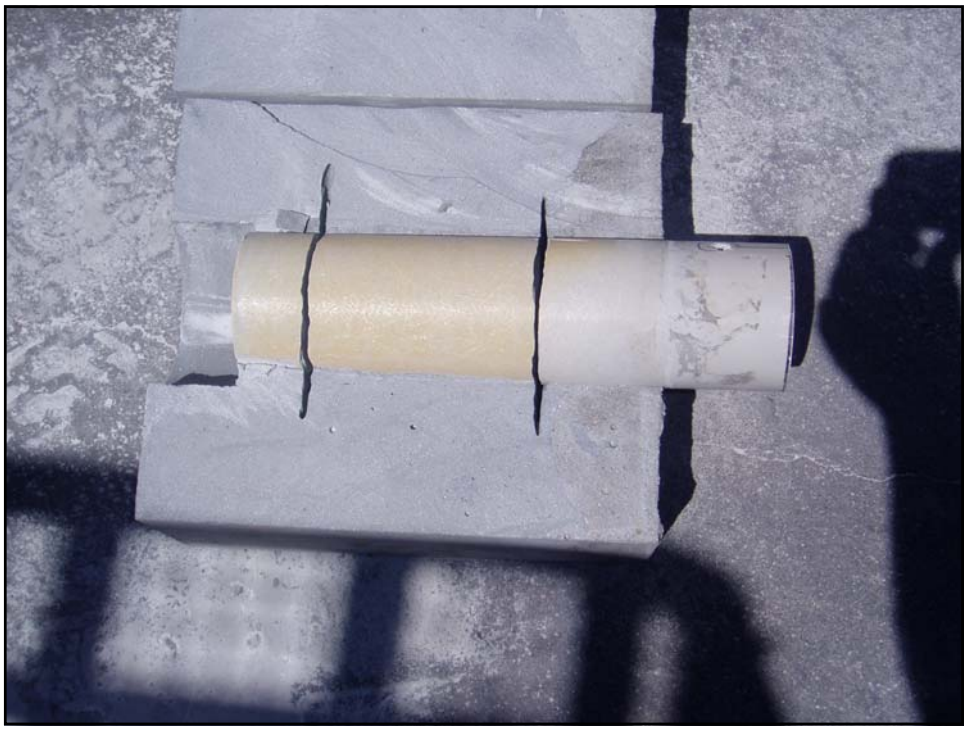
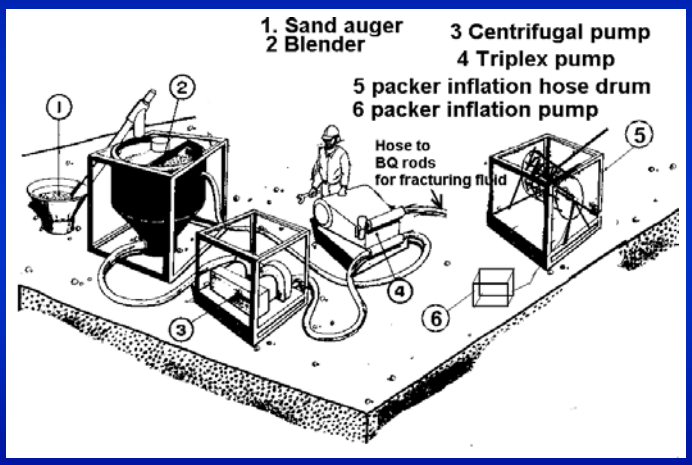


Equipment System Used to Place Sand Propped Fractures



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Progress

- Caliper Measurement – Ongoing
- Workshop Testing - Melbourne
  - Slotting – completed
  - Cementing – completed
    Equipment Prep – February
- Douglas
  - Drill Rig U/G – 18 Jan
  - Gear On Site – Now
  - Trial – Next fortnight

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