Centennial Coal

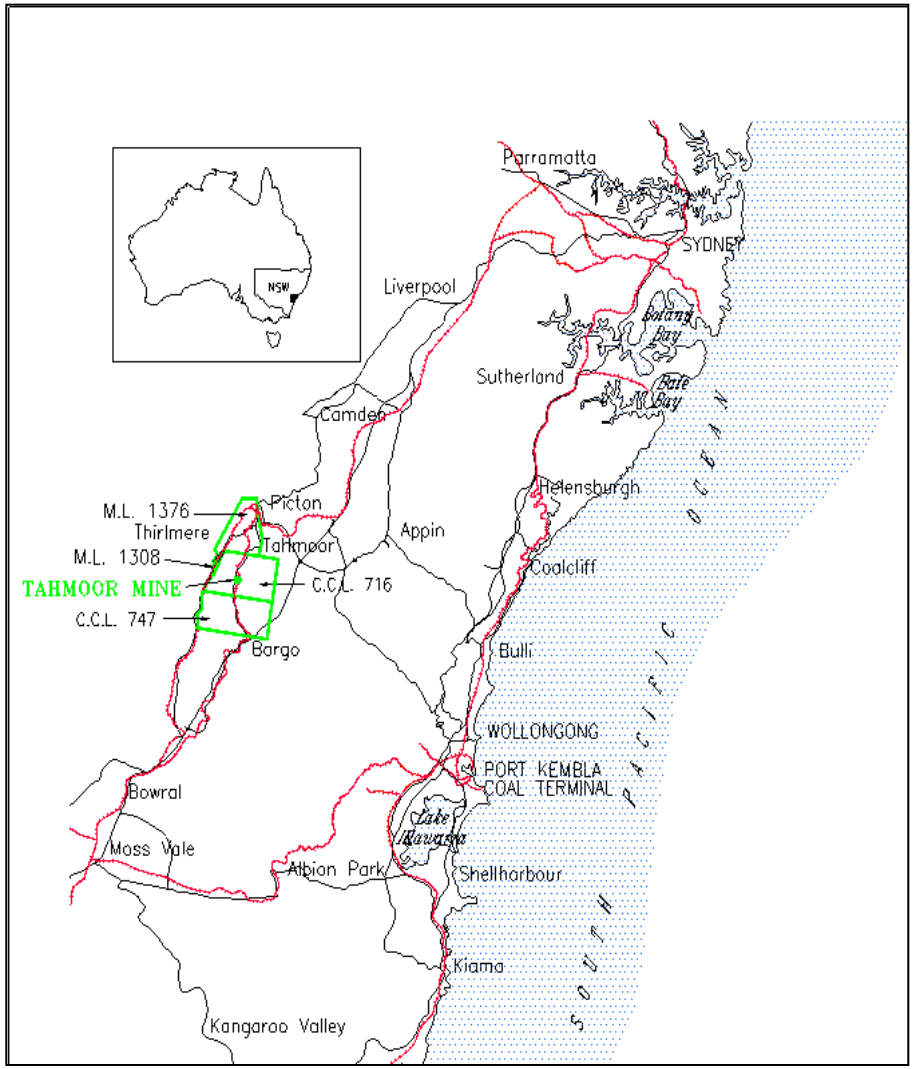
CENTENNIAL COAL

Handling Gas Problems at Tahmoor Colliery

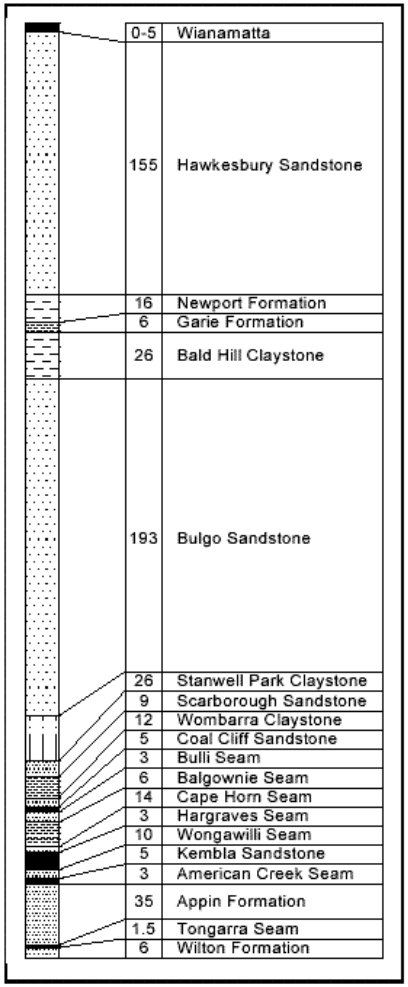
Bob Newman, Ventilation Officer

Tahmoor Colliery

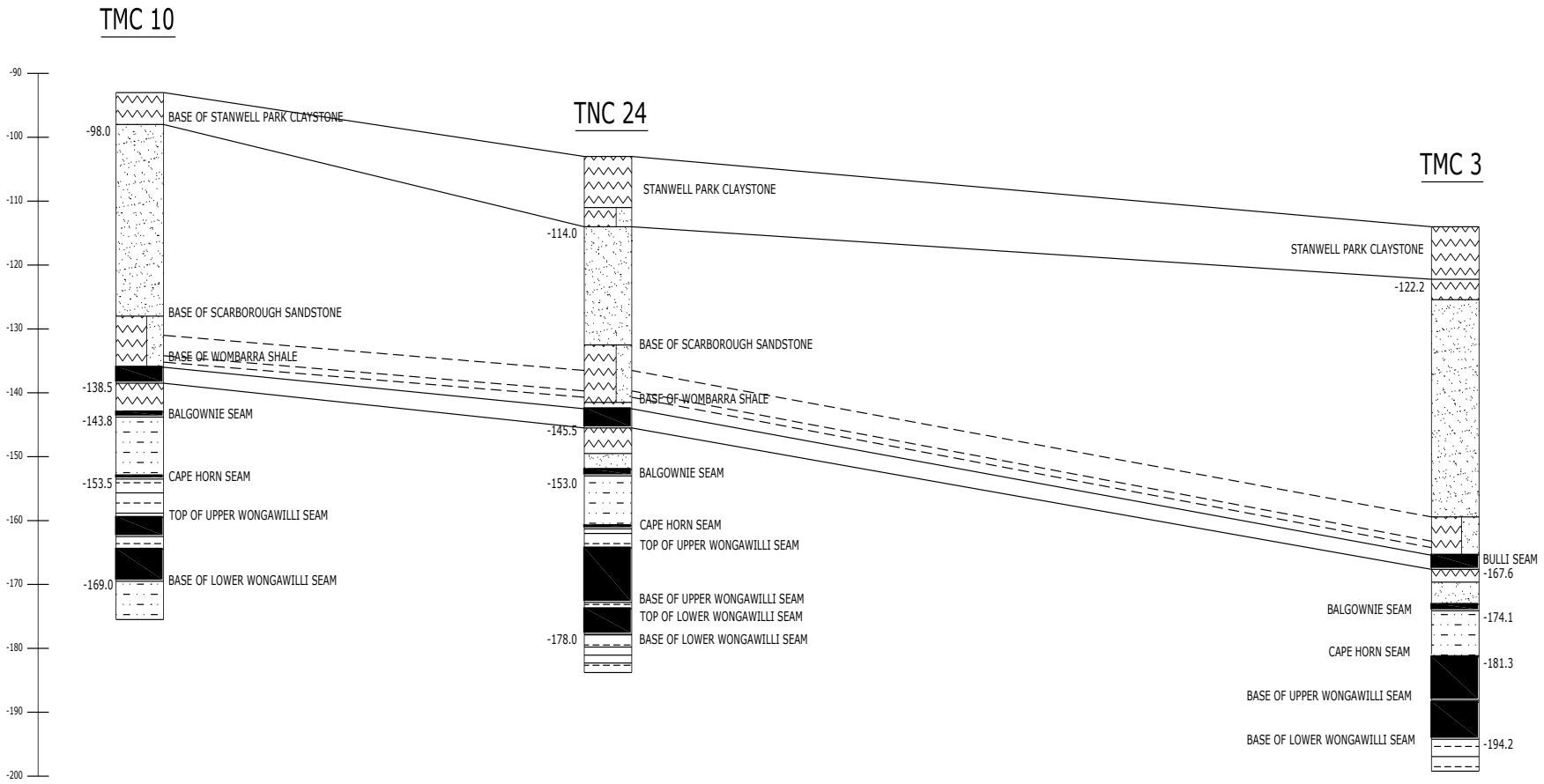
- Located approx. 70km SW of Sydney
- Underground Coal Mine
- Depth of cover 380 – 500 m
- Commissioned in 1979
- Longwall introduced in 1986
- Rail transport to Port Kembla Coal Loader
- Reserves for more than 25 years production within 3 leases



General Geology



Geological Sections



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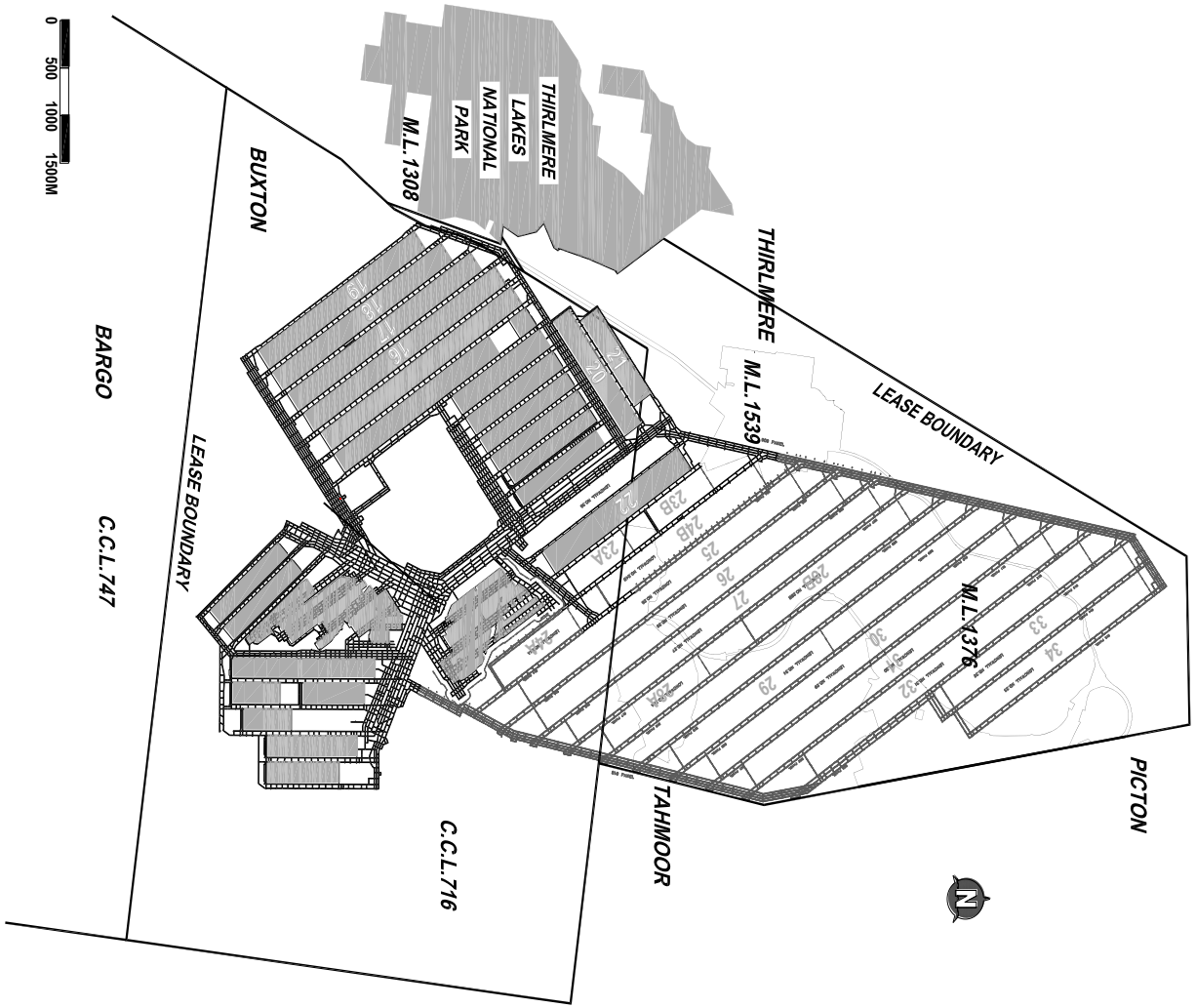
Tahmoor Colliery Workings



Tahmoor Colliery – Early days

- **Mine development commenced 1978**
- **Designed as Continuous miner operation**
  - **Extraction using Wongawilli system**
  - **5 units set-up – 4 prod, 1 spare**
  - **No 1 shaft return, No 2 & drift intake**

Tahmoor Colliery – Upgrade

- Longwall introduced 1986/87
- No 3 shaft sunk as new return
- Gas drainage introduced to pre drain L/W blocks & post drain L/W goaf
- Surface vacuum plant – 1x 4000 m3/hr & 1x 2000 m3/hr Siemens pumps (provision to increase to 4x 4000 m3/hr). Designed to operate at 40-50 kPa. Plan for dual system never used
- 2x Schmidt-Kranz drill rigs (modified) for in-seam holes – all rotary drilling

Early methods of dealing with outburst problem

- Outburst problem recognized quite early in mine life – progressed from "slumps, pressure bumps……."
- All "big" outbursts on structures – dykes or faults
- Mining under "bomb squad" conditions – c/m driver had O_2 bottle & mesh screen; all other personnel retreated o/bye c/t
- Inadequate – fatality in 200 area

Improved methods of dealing with outburst problem

- Outburst miner developed – fully enclosed cab; 2 air supply systems; remote operation of s/c flights; breathing suits for bolting. Worked well but very slow.
- Remote mining with full face miner (ABM 20's) – remote cabin with radio control & CCTV – worked well but also very slow
- Grunching (remote mining) – current system when necessary; effective & practical; still slow but faster than previous methods; introduces other risks associated with explosives; problems with supply of P5 powder

Outburst prevention

- Work by many people (Alan Hargraves, Ripu Lama, Ray Williams, John Hanes, et al) led to development of pre-drainage to remove outburst risk

- Development of directional drilling a great benefit

- Current state is that drilling for prevention of outbursts is the main driver and degassing coal for L/W prod is a by-product (for in-seam drilling at least)

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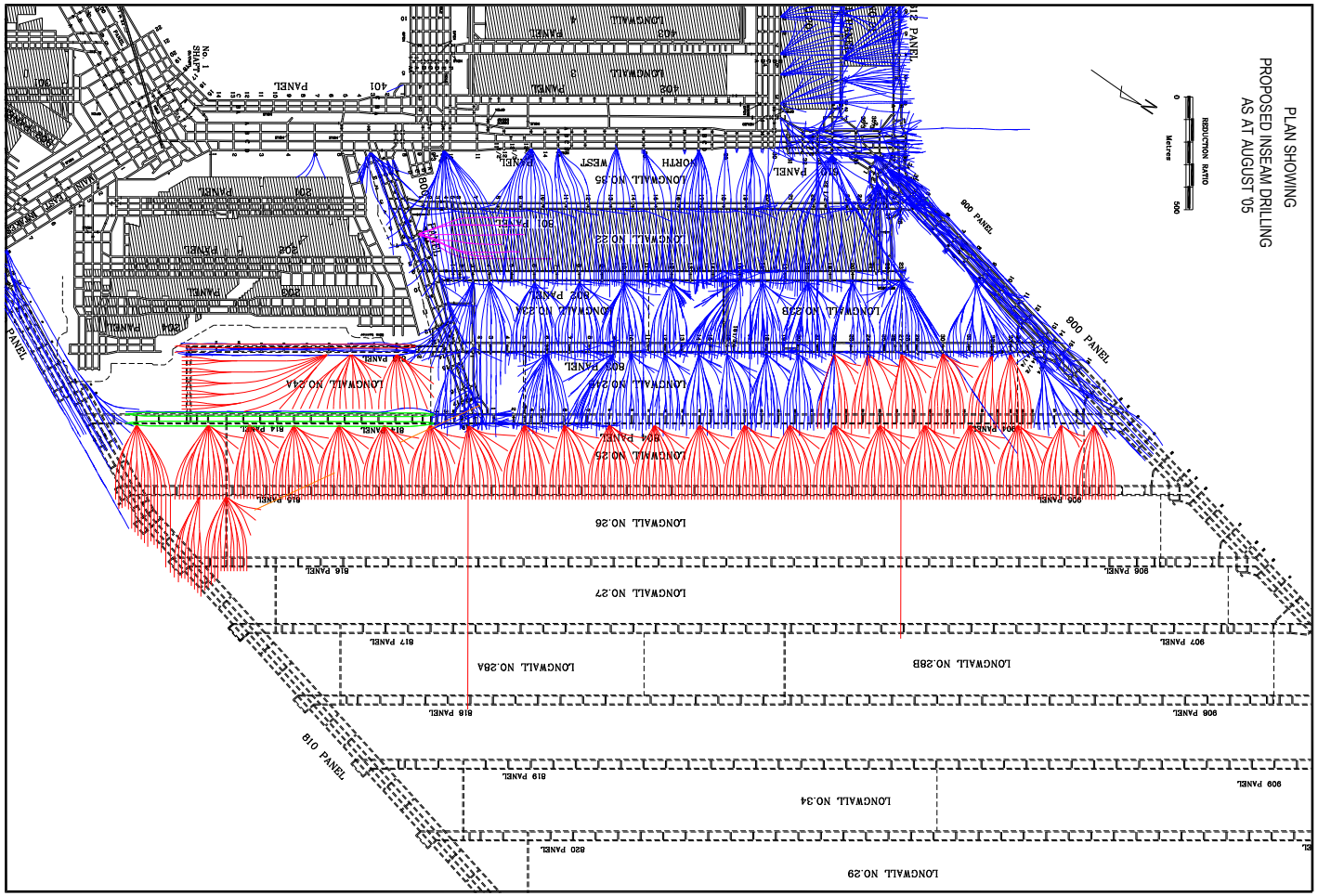
DRILLING PLAN



Tahmoor drilling equipment

- 1 x Longyear LM55 (drill to 400m)
- 2 x Kempe (1 drill to 800m 1 to 1100m)
- 1 x Ramtrack (for cross-measure drilling)
- 2 x “Propets” (for coring & scout holes)
- 1 x VLD rig for longer holes & exploration
- 1.5 x acoustic tools
- 3 x Mecca (2 in storage in next l/w block)
- 1 x DGS (+1 on order)

Drill patterns

In seam:

- Mostly cross-hole where possible; where not possible try & drill long holes parallel to hdgs, avoiding line of hdg
- Usually drill on fan pattern from 10m stubs off gate roads
- Try & limit branches to 1 (ie 2 holes per standpipe)
- Work on approx 15m spacing as standard
- 96mm holes from 100mm standpipes (copper)

Drill patterns (contd)

Cross measure:

- Work on approx 20m spacing, avoiding c/t's
- Drill at 90 degrees to hdg on approx 17 degrees dip
- 65mm holes with 50mm standpipes (steel)

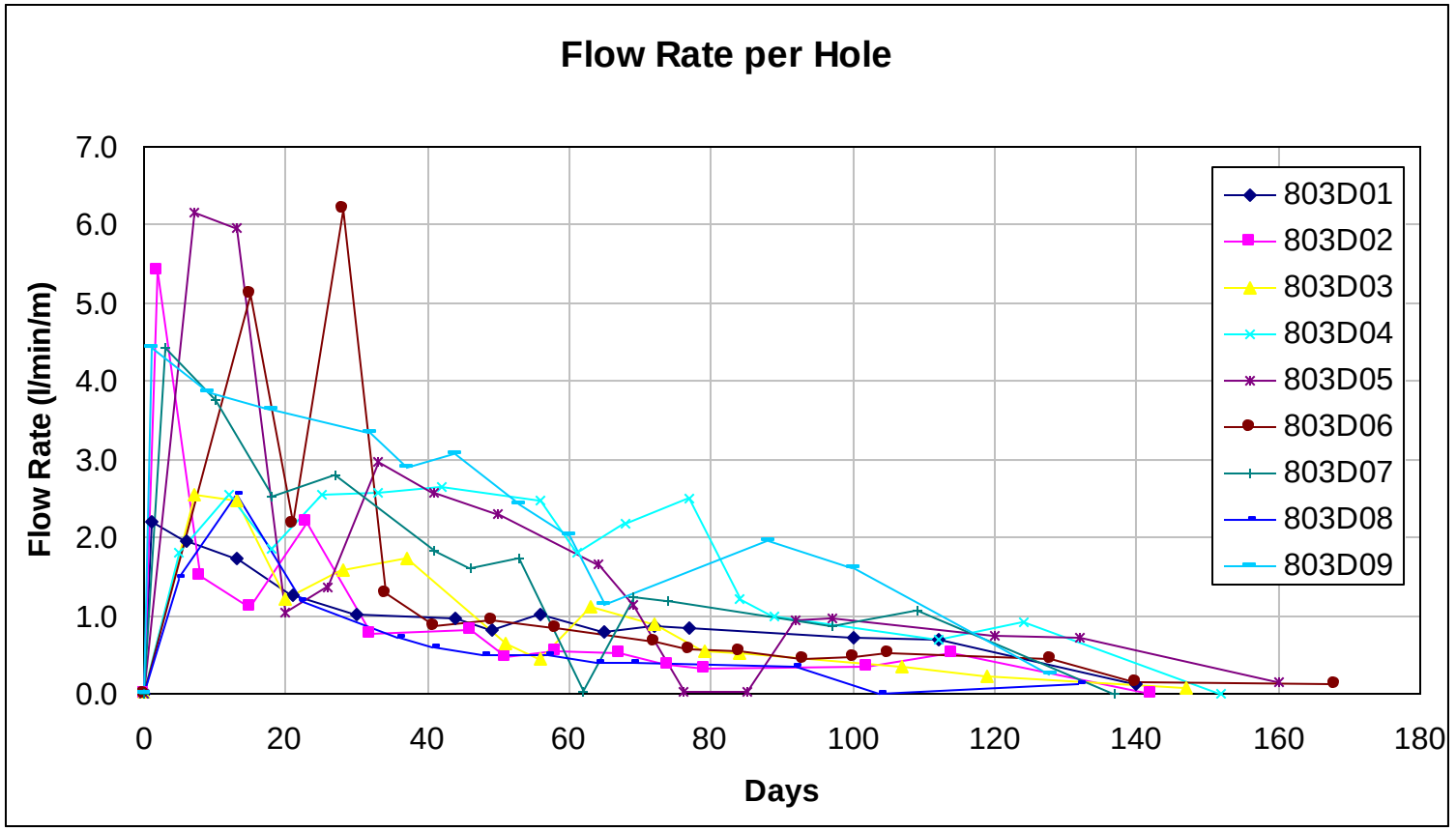
Plumbing

- All holes fitted with measuring sets
- In seam holes connected to gas mains via 100mm suction hoses, usually connected to a 150mm manifold – valve at standpipe & at manifold
- Cross measure holes usually direct onto mains via 50mm suction hoses
- Gas mains are 350mm in panels & 450mm in main roads – oversize to allow for water/silt. Ideally valves at every branch & approx every 800m or so
- Water traps (manual) at potential collection points

Hole monitoring

- Purpose – to check hole is working (blocked or “hard to drain” area), estimate drainage effectiveness & identify air leakage sources
- Contractor on approx 3 days/week
- Readings on each hole weekly initially then decreasing frequency (also affected by access)
- Bag samples as often as practical

803 6 C/T


Flow Rate per Hole
Flow Rate (l/min/m)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
20
40
60
80
100
120
140
160
180
Days
803D01
803D02
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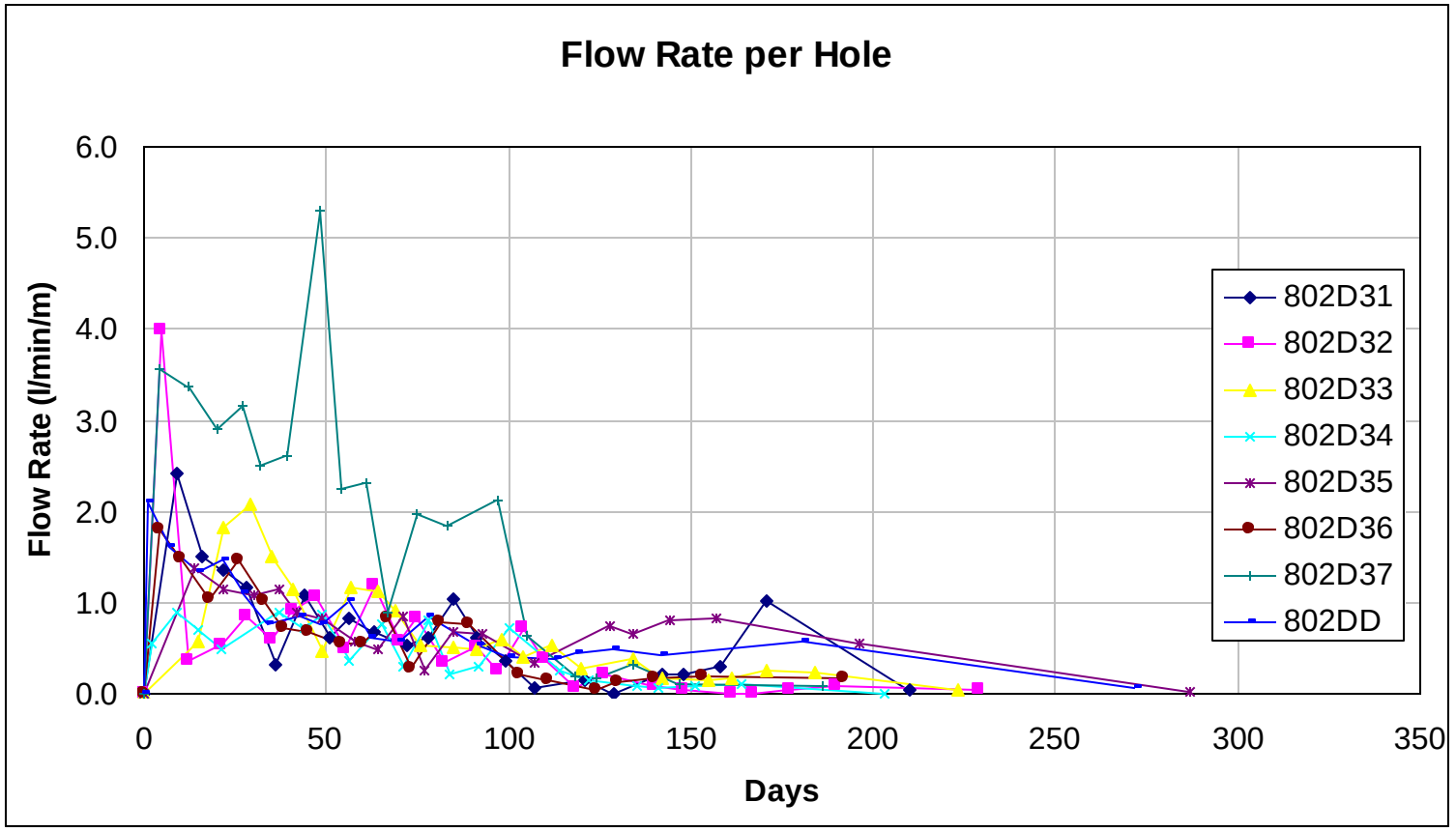
803 10 C/T


Flow Rate per Hole
Flow Rate (l/min/m)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
50
100
150
200
250
300
350
Days
802D31
802D32
802D33
802D34
802D35
802D36
802D37
802DD

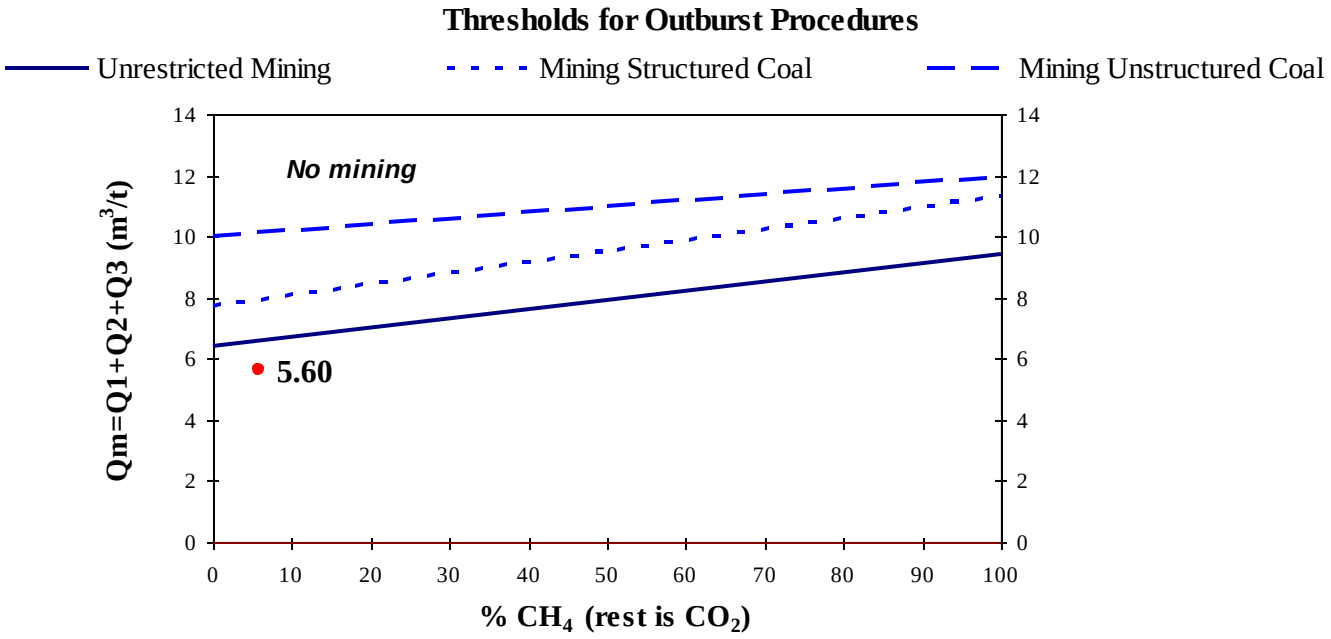
Outburst TLV's

- Originally the standard of approx 6.5 m3/t for 100% CO2 to 9.5% m3/t for 100%CH4

- All "life threatening" outbursts at Tahmoor have occurred on structures which would be readily identified by drilling (dykes & large faults)

- Based on the above & Ripu Lama's work now have 3 TLV's allowing normal mining or mining at reduced rates (structured & non structured)

Tahmoor TLV's



Borehole maintenance

- Not a lot
- Monitoring contractor will identify obvious problems at hole collar/ plumbing area
- Monitoring results may indicate a possible blockage
- Sealing or hosing over after intersection a major leakage problem

“Hard to drain”areas

- Only apparent from 513 panel, possibly because of longer drainage times before then
- Occur in zones, but not consistently within those zones
- No readily apparent difference in coal in hard to drain areas (often, but not always, harder & stronger)
- Plainly areas of low permeability, but not sure of cause
- Work done on relating filling of micro fractures by foreign material to these areas (ongoing)

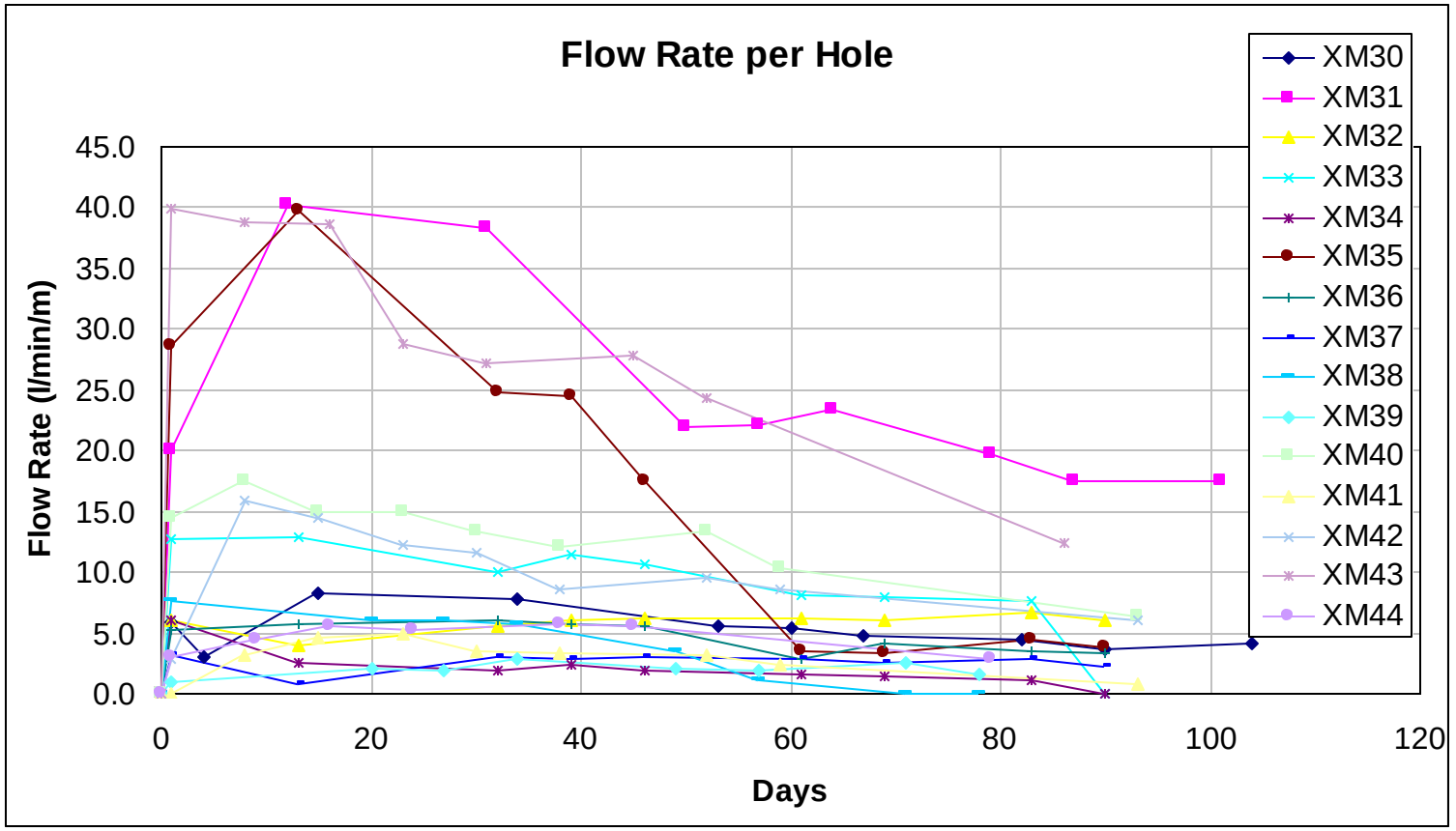
Overcoming “hard to drain” problem

- Have not yet succeeded
- When/if cause identified need to extend this to locating these zones & then to fixing them
- Hole slotting using high pressure water cutting – some indications of success
- Hydrofraccing – some indications of success
- Systems not easy to include in normal operations (time, resources, space, power supply, etc)

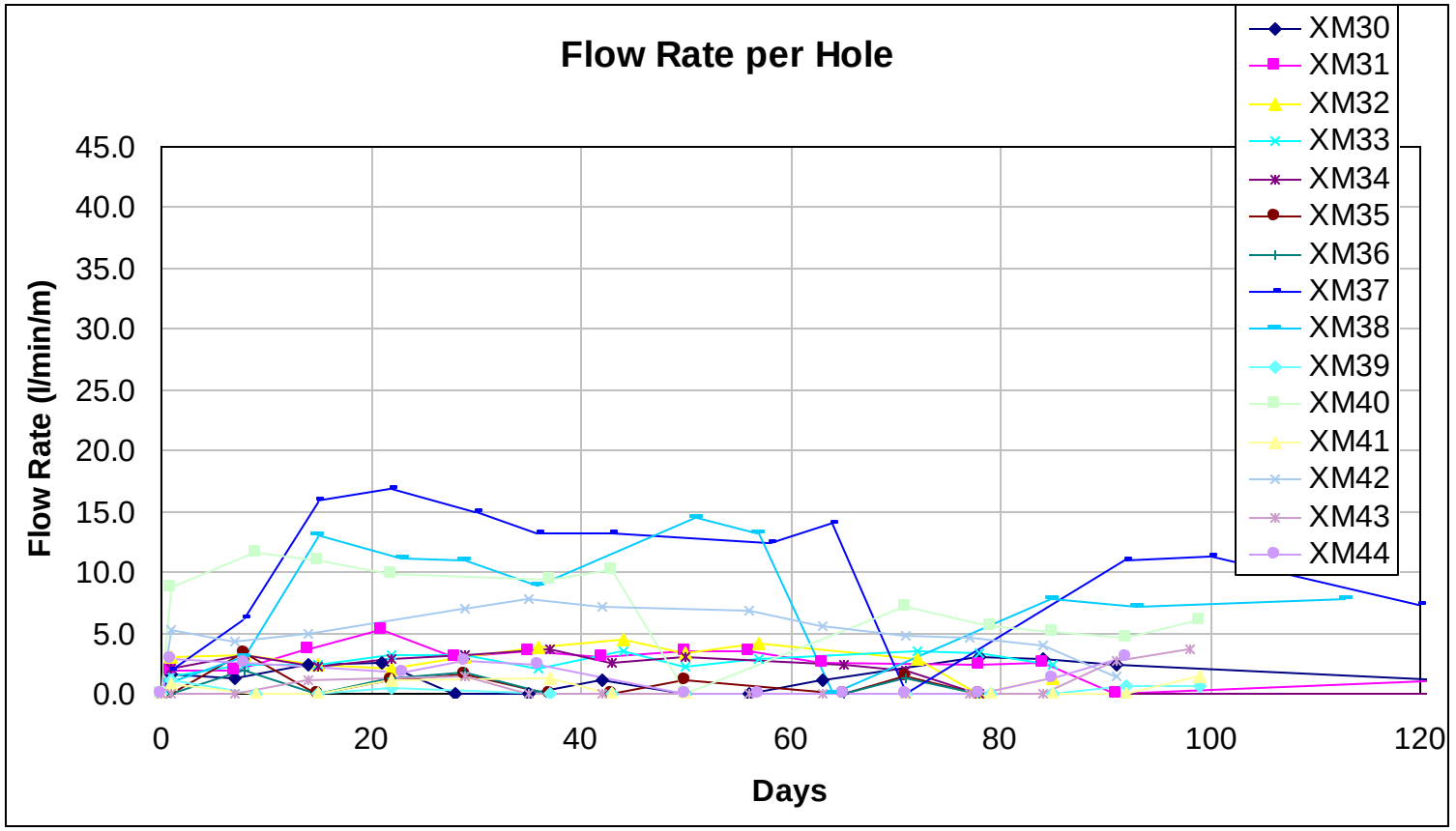
Post drainage

- Effectiveness not really known, but not game to find out
- Tried various patterns but parallel holes works best
- Not all holes produce large flows & no pattern evident
- Need gas from these holes to “dilute” air in the gas ranges or greatly improve hole sealing

801 post drain holes 30-44



802 post drain holes 30-44



Airway gas problem

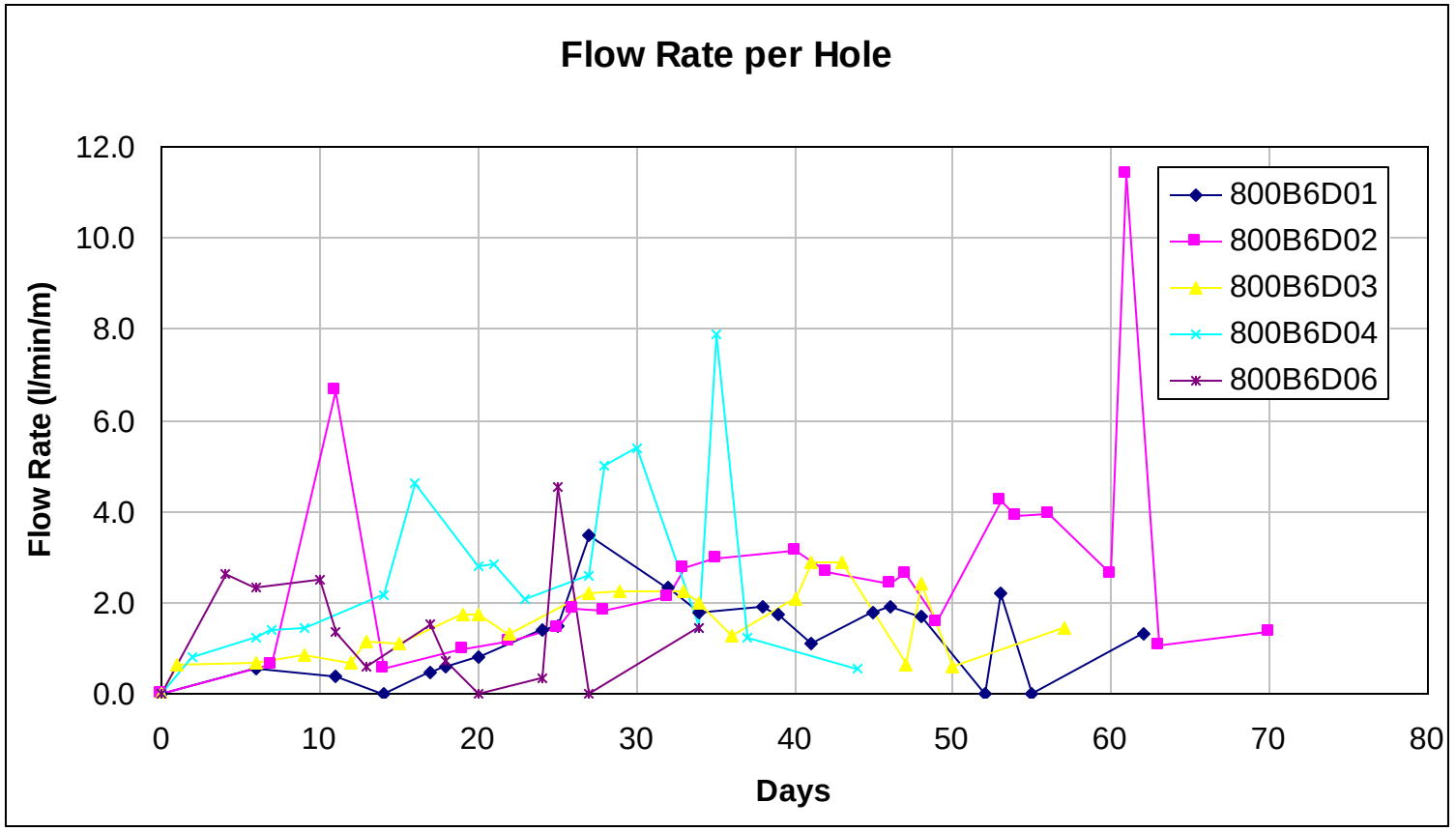
- Problem maintaining statutory limits on l/wall face & in returns – working with exemptions at present, 2% on face & 3% in returns
- Largely a vent problem & plans in place for new fans with much higher pressures (+4.5kPa vs 2.7kPa)
- Problem worse on L/W 22 even though vent much the same as previous walls

Airway gas problem (contd)

- Source of bulk of gas not clear – do not believe it comes from roof, but source must be close to seam – Balgownie seam suspected. Bulli seam remaining gas content low

- Tried holes drilled into Balgownie seam which produced reasonable flows but no clear benefit on face

Holes in Balgownie seam



Plans to overcome airway gas problem

- New fans with upgrade of vent control devices necessary
- Possibly continue trials of holes in Balgownie seam but not as easy as for L/W 22
- Possibly improve goaf seals behind wall & apply suction to back of goaf

What developments would we like to see?

- Any improvements in drilling always welcome – faster, cheaper or whatever
- Quick, cheap & effective method of sealing intersected holes
- Good automatic system for draining dirty water from gas lines
- Method to readily identify “hard to drain” coal
- Method to improve permeability
- Method to identify outburst prone areas other than gas content

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