3.4 Ventilation

The Ventilation & Gas System at Grosvenor is designed to ensure the management of the general body methane levels in the tailgate remains below 2.0%.

The source of ventilation for the LW104 face is the maingate 103 End of Panel Shaft (MG103 EP Shaft) and the intake air from the maingate 104 travel road coming into the panel. Intake air from MG103 EP Shaft travels around the LW103 bleeder road and down the travel road to combined with the intake air from outbye, then splits for a homotropal retum and onto the face, Two bulk air coolers are available on the MG103 EP Shaft and can supply approximately 25-50m3/s of cool air combined.

*Over the seven days prior to the ignition event. the quantity of ventilation across the longwall face ranged from 58.2-71.5m3/s* which is in accordance with Frictional Ignition controls and the Permit to Mine.

**THAT IS LARGE VENTILATION CHANGES. (P=RQ2)**

**THEY STATE LATER ON IN REPORT THAT THEY LOWER AIR TO FACE NOT INCREASE**

Ventilation Control Devices (VCDs) in LW104 included setup of a brattice wing at the maingate to reduce oxygen ingress into the goaf and manage ventilation at the tailgate. This setup is as per GRO—750—TARP— General Body Contaminant, GRO-10563-TARP-LW Return Methane General Body Contaminants and GRO4801 -STD-Longwall Area Management System.

***A Sherwood curtain had also been installed on the longwall on Thursday 23/04/2020 and 30/04/2020 as a trial to assist ventilation around the tailgate drive and tailgate roof support area. This was a recommendation from the gas IMT held on 22nd April 2020 following two methane exceedances in the 24 hours prior.***

***Venturis are installed at around #80, #90 and #146 roof supports, to aid in ventilating the rear walkway and dilute any accumulation of methane. Larger venturis had been installed at the tailgate end of the face to assist with increased ventilation around the rear of the tailgate roof supports (Figure 3), particularly during times of strata deterioration at the tailgate end. (Pg 10)***

***No pre-drainage of the GM Lower (GML) seam was conducted for LW104****.* ***As outlined in the second workings risk assessment and SOP, the GML seam was expected to release gas to the working section in the GL seam between chainage 4000m and chainage 2000m in LW104 (MG104 20-36c/t) due to the reservoir combined with the thickness of the interburden (between the GML and GM seams) as experienced in prior longwall panels and gateroad development. (pg 11)***

*Additional goaf drainage boreholes were drilled at the start Of the block to reduce the risks associated with gas make during the initial goaf formation. These borehole locations are listed below.*

GR04V001 5m below P Seam

GR04V002A 10m above GM Seam (connect to P seam lateral)

GR04L001 10m Above GM seam

GR04L002 15m Above GM seam

GR04V003 15m Above GM seam

GR04V004.5 20m Above GM seam

Events in LW103 brought about the trial of goaf drainage holes being installed at 25m spacing in LW103 between chainage 4344m and chainage 3900m. An improvement in methane quantities in the longwall tailgate roadway was noticeable and areas were targeted effectively. As a result, the post drainage strategy for LWI 04 has included 25m spacing of goaf holes for a portion of the panel. Figure 5 illustrates the goaf drainage holes drilled up to the 6th May 2020 when the gas ignition event occurred. *For the duration of LW104, other than Lateral 3 (which was a surface to seam directionally steered hole targeting around the P seam), all goaf drainage holes had come online as expected based on the longwall face position. (pg 12)*

In March 2020 in the early stages of goaf formation there were challenges experienced with some goaf holes and contamination of flame arrestors requiring some holes to be temporarily taken offline so the flame arrestors could be cleaned. This resulted in several tailgate roadway methane exceedances as detailed in the timeline, however the majority of the remaining goaf holes have performed as expected. (pg 13)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Time of  Exceedance | s243(a) Sensor ("149 Sensor") | Tailgate Sensor — 400m outbye  ("Inbye Sensor") | Tailgate Sensor — 3-4 c/t  ("Outbye Sensor") |
| 18/03/2020 | 21:33 | 0.97% | 2.56% | 2.3% |
| 19/03/2020 | 06:50 | 0.94% | 3.01% |  |
| 20/03/2020 | 02:30 | 0.81% | 2.84% | 2.57% |
| 20/03/2020 | 03:30 | 0.85% | 2.55% | 2.1% |
| 20/03/2020 | 14:36 | 0.99% | 3.55% | 3.1% |
| 22/03/2020 | 22:22 | 1.08% | 2.54% | 2.54% |
| 23/03/2020 | 06:28 | 0.8% | 1.99% | 2.55% |
| 04/04/2020 | 02:22 | 2.97% | 1.34% | 1.87% |
| 06/04/2020 | 23:31 | 1.36% | 2.12% | 2Æ6% |
| 07/04/2020 | 14:21 | 1.1% | 2.04% | 2.52% |
| 21/04/2020 | 00:58 | 3.08% | 1.48% | 1.49% |
| 21/04/2020 | 01:54 | 2.55% | 1.66% | 1.49% |
| 21/04/2020 | 13:06 | 2.66% | 1.6% | 1.42% |
| 21/04/2020 | 23:06 | 5.04% | 1.47% | 1.38% |

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**TWO DISTINCT TYPES OF EVENTS.**

**THOSE IN YELLOW COMING FROM FACE or FLOOR. S243 Sensor in the Tailgate does not change**

**THOSE IN BLUE COMING AT TAILGATE END OF ROADWAY FROM GAS MIGRATION FROM GOAF. The 400m and Outbye Sensor quantities at no stage go near 2%.**

**21/04/2020. 5% Explosive**

|  |  |
| --- | --- |
| Maingate Drive (A) | I audible and visual alarm  2.0% power trip to the face and back to the transformers |
| Maingate Drive (B) | I audible and visual alarm  2.0% power trip to the face and back to the transformers |
| Tailgate Drive (A) | I audible and visual alarm  2.0% power trip to the face and back to the transformer |
| Tailgate Drive (B) | 1.0% audible and visual alarm  2.0% power trip to the face and back to the transformer |
| Shearer (A) | I audible and visual alarm  I .25% shearer heads trip power  2.0% trips power to the Distribution Control Box (DCB) |
| Shearer (B) | 1.0% audible and visual alarm  I .25% shearer heads trip power  2.0% trips power to the Distribution Control Box (DCB) |
| s243(a) Sensor - Roof Support  149  ("149 Sensor") | >1.0% audible and visual alarm Trip AFC and shearer outlet reset |
| Tailgate Sensor — 400m outbye ("Inbye Sensor") | >I .6% haulage speed reduced to 6m/min  >I .8% haulage speed reduction to 4m/min  >1.9% shearer halt in MG>TG direction  >2.0% Trip AFC and shearer outlet |
| Tailgate Sensor — 34 c/t ("Outbye Sensor") | shearer trips power |

Additional 'spikes' of methane > 2.5% have also occurred during the operation of LW104, however where these have occurred for less than 30 seconds, they have been recorded as per s344(2) Of the CMSHR, being a sudden, temporary increase in the general body of methane to more than 2.5% and the ventilation system Is capable of quickly reducing the methane to not more than 2.5%.

**METHANE ACTION PLANS and INSPECTORATE**

1. 19/03/2020 12:00 Gas IMT formed following 2 x CH4 exceedances in last 24 hours. Action plan developed
2. 19/03/2020 Underground Inspection conducted by Malcom Brownett (DNRME Inspector of Mines) which included an inspection of LW104.

MRE Inspection Report for the visit received 24m March 2020. Nil recommendations or directives issued.

**COMPANY WILL MAKE A BIG DEAL THAT INSPECTORS DO NOTHING**

1. 20/03/2020 10:00 Gas IMT formed following 2 x CH4 exceedances in last 24 hours, Action plan developed.
2. 21/03/2020 10:00 Gas IMT formed following 1 x CH4 exceedance in last 24 hours. Action plan developed.
3. 23/03/2020 9:00 Gas IMT formed following 2 x CH4 exceedance in last 24 hours. Action plan developed.
4. 09/04/2020 10:00 Email directive from Stephen Smith (Inspector of Mines) to suspend Longwall operations due to the methane monitoring system in the Longwall return roadway not complying with section 243A of the Coal Mining Safety and Health Regulations 2017.

Gas IMT formed following issue of above directive from DNRME. Action plan developed.

Email response from SSE regarding the directive, advising that IMT had been formed to amend the gas monitoring configuration on the Longwall 104 face.

Email response from Stephen Smith (Inspector of Mines) acknowledging receipt from the SSE and the satisfaction of the Directive.

**WOULD PROBABLY BE THE SAME DIRECTIVE THAT SMITH WAS CROSS EXAMINED ON STAND ABOUT WITH GRASSTREE**

[**https://coalminesinquiry.qld.gov.au/wp-content/uploads/2020/08/Smith-S-Statutory-Declaration.pdf**](https://coalminesinquiry.qld.gov.au/wp-content/uploads/2020/08/Smith-S-Statutory-Declaration.pdf) **(starting page 15)**

[**https://coalminesinquiry.qld.gov.au/wp-content/uploads/2020/08/Transcript-Day-2-5-August-2020.pdf**](https://coalminesinquiry.qld.gov.au/wp-content/uploads/2020/08/Transcript-Day-2-5-August-2020.pdf) **(starting page 55)**

1. 14/04/2020 Queensland DNRME Resources Safety and Health Newsflash — Frictional Ignition Events. Reviewed by Underground Mine Manager, with action assigned to communicate to all statutory officials (completed 14/04/2020).

**IS NOT PUBLICLY AVAILABLE ON WEBSITE**

1. 14/04/2020 LFI Investigation Report for 7x CH4 exceedance events from 18th — 23rd March signed off by SSE. Action plan developed.

**WHAT WAS IN THIS INVESTIGATION AND PLAN?**

1. 15/04/2020 Underground inspection with an electrical focus conducted by Mark Lydon
2. (DNRME Inspector of Mines) and Neville Atkinson (DNRME Inspector of Mines). Included inspection of LW104.

MRE Inspection Report for the visit received 24th April 2020. Single recommendation from inspection relating to surface mine earth neutral connection point access. No recommendations or directives issued related to the longwall.

**AS PER PREVIOUS INSPECTION COMMENTS. COMPANY WILL MAKE A LOT OF NO ACTION**

1. 22/04/2020 15:00 Gas IMT formed following methane exceedances on 21 st April. Action plan developed.

One of these actions included the trial of the Sherwood curtain which was in place at the time of the ignition event on 6th May. The intent of the Sherwood curtain was to assist ventilation around the tailgate drive and the tailgate roof support area.

**FOUR EXCEEDANCES IN ONE DAY**

1. 28/04/2020 07:30 Gas IMT formed following continual stoppages and delays from periods of elevated methane in the tailgate, 220 minutes slow down and 172 minutes of stoppages last 24 hours. 9 new actions raised.

**6 DAYS LATER. OVER 6 HOURS GAS PROBLEMS**

**WHAT ARE 9 NEW ACTIONS?**

1. 01/05/2020 LFI Investigation Report for CH4 exceedance events on 6th and 7th April 2020 signed off by SSE. Action plan developed.

**WHAT IS IN THE ACTION PLAN?**

1. 01/05/2020 Vent change for the LW104 Pre-Driven Recovery Road. Changes included:

MG 103 1 c/t Dogleg changed from 38.6 to 40.5m3/s

104 X Drive Chute Road 2 changed from 28.5 to 35.6m3/s

Model shows 6m3/s drop to LW Return

**WHY WOULD TAKE 6M3/S OFF THE LONGWALL RETURN WHEN EXPERIENCING GAS PROBLEMS?**

**WHAT WAS THE REASON FOR THE VENTILATION CHANGE?**

**WHY DID THEY REQUIRE MORE VENTIALTION AT 104 X Drive CHUTE Road**

1. 02/05/2020 14:30 Gas 'MT formed following continual stoppages and delays from periods of elevated methane in the tailgate. 24 minutes slow down and 303 minutes of stoppages last 24 hours. 6 new actions raised.

**FIVE AND A HALF HOURS LOST.**

**6 NEW ACTIONS ON TOP OF THE PREVIOUS NINE AND WHAT WAS IN ACTION PLAN?**

1. 05/05/2020 LFI Investigation Report for CH4 exceedance event on 4th April 2020 signed off by SSE.
2. 05/05/2020 03:21 Multiple hard start attempts I Multiple bogged AFC start attempts.
3. 05/05/2020 05:44 Stripper plate suspected to be lifted in maingate. Unable to start chain. Longwall Coordinator notified by nightshift trades.
4. 06/05/2020 03:06 No further damage found on AFC Commenced production



1. 06/05/2020 14:57

Visible Sequence of Events over an approximate 20 second period (as seen on operational cameras underground):

1. Maingate brattice wing pushed into the goaf (as seen on MG camera boking inbye).
2. Increased dust at Shearer (as seen on Bretby Camera).
3. Maingate brattice wing being sucked back away from the goaf (as seen on MG camera looking inbye).
4. MG brattice wing pushed back into the goaf a second time (as seen on MG camera bokhg inbye).
5. Dust / pressure wave from TG to MG (as seen on MG camera looking inbye).
6. Flash near shearer (as seen on Bretby camera).
7. **Sequence of Events for Shaft 9 Collar pressure over an approximate 28 second period (as sourced from Citect):**

* **Shaft 9 Collar Pressure 498.1 Pa**
* **Shaft 9 Collar Pressure 77.4Pa Shaft 9 collar pressure 453.2Pa • Shaft 9 collar pressure -33.5Pa**
* **Shaft 9 collar pressure 666.5Pa**

1. **s243A sensor (#149 roof support) detects an increase in CH4 (4.31 %), tripping the AFC and shearer outlets.**
2. **Power trip to longwall face on 400m roadway TG CH4 sensor (in excess of 2% methane).**

The LFI has been listing events in chronological order, which needs examination without the video of the Face Ignition that Anglo Investigation Team has viewed.

They list the pressure changes in # 9 Shaft occurring after the events on the face, which would be correct.

The methane sensors both the 243 and the 400m sensor are recorded as reading excess methane and tripping power, **after the pressure changes at # 9 shaft**

This indicates power was still on up until this point.

This logically must be correct or power should have dropped off the face Cameras and there would not be a video of events.

Up until power is dropped off the face all the Electrical Components are powered and the AFC is running.

So up until power drops there is a potential electrical source of ignition as well as the AFC which had just gone through extensive repairs.

**CAMERAS**

**I note that there is no mention of the Tailgate camera during the visible events with the Ignition.**

1. **Was the tailgate camera installed and operational at the time of ignition?**
2. **If so, when did it stop recording/transmitting?**
3. **If the tailgate camera was operational and then stopped, was it either a potential; source of ignition**

**In 2017 Grosvenor Mine had an Electrical HPI on a longwall camera involving a cracked lens**

**DATE: 30/07/17 TIME:  13:30      LOCATION: MG101 Longwall MG corner**

**EQUIPMENT INVOLVED: Longwall AFC/BSL turnaround camera   DAMAGE: Camera lens cracked**

**During production in Longwall, Electrician found the flameproof turnaround camera had a cracked lens. Equipment was isolated and reported immediately.**

**. -           OTHER INFORMATION/DETAIL:**

**o            Equipment isolated at time of incident,**

**o            Incident reported to DNRM electrical inspector immediately,**

**o            Inspection carried out and photographs taken,**

* **ICAM to complete identifying root cause and actions for re-establishing AFC/BSL turnaround camera**

**Andrew Self in his testimony made this observation about flameproof devices and enclosures.**

**TRA.500.021.0056**

**Q. Are you content with those two propositions?**

**A. I think "content" is a bit strong. On the static electricity, I think "content" - in my own mind, I can never rule out electrical. That's not just based on prejudice against electricity. There are many reasons not to trust electrical systems in underground coal mines. I've done work in the past where the - do people understand the flameproof system?**

**Q. You explain it.**

**A. A flameproof system is, generally speaking, an enclosure where the electrical components are inside the enclosure. An explosible mixture cannot access the electrical components inside the enclosure. If there was an ignition inside an enclosure, then it would be contained within that enclosure. A lot of work I do - not a lot - a proportion of the work I do is to do with preventing explosions, and one of the first things in terms of ignition sources that you look at is electrical, because it has been the ignition source in so many cases in history.**

**The number of occurrences of a breach of flameproofing absolutely shocks me. In my operational career I always believed flameproofing was 100 per cent reliable, and I've discovered in the past 20 years or so that that's not the case. An engineer put it to me and said, "It's an engineering system; it will fail at some time." So I find it really difficult to rule out electrical 100 per cent.**

**Q. In the cases you've spoken about where flameproofing was found not to have worked, was there in fact evidence that showed where the ignition source had come from?**

**A. I believe not.**

**Q. So how was it determined that flameproofing had failed in those cases?**

**A. In the past where I've found these cases, people have identified it in routine inspections, that kind of thing, but I've seen cases where there's been a flameproof breach.**

**Obviously I'm not going to name any names, but the component was not a flameproof component at all, and yet the thing had been through the manufacturer's compliance testing, had been through the introduction to site, it had been through the introduction to underground, it had been through its codes periodically underground and not been detecting six months, and it horrifies me.**