

Three Kings Quarry Air Quality Investigation of Triggers



Air Quality Monitoring at Three Kings Quarry consists of:

- Hi-vol TSP air quality samplers located on the quarry office and the northern boundary;
- A FH62 Beta Attenuation Monitor (BAM) located on the quarry office (adjacent to the quarry office Hi-vol TSP sampler);
- A meteorological monitoring station located on the quarry office that records wind speed, wind direction and rainfall on a continuous basis;
- Video cameras that monitor the site from the north and south.
- Visual inspections of air quality carried out by site staff;
- Recording dust suppression equipment use and any malfunctions.

Sept-Dec 2009 Air Quality Monitoring Triggers

Date	Hi-vol TSP Quarry Office	BAM Quarry Office 24hr average	Hi-vol TSP Northern Boundary	Daily Rain	Daily average wind speed	Daily average wind direction	Watercart volume	Sprinklers	Video Monitoring
	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	mm	m/sec.	degrees	m^3	On/Off	On/Off
25/9/09	-	136.7	-	5.4	3.368	249	0	On	Off
29/10/09	96.0	44.1	67.9	1.4	6.003	227	Nil	On	Off
25/11/09	112.6	35.8	61.3	0	4.756	219	48	On	On*
21/12/09	84.8	27.9	59.8	0	4.410	223	48	On	On
31/12/09	86.1	32.2	47.5	0	5.065	219	Nil	On	On

* Video monitoring was operating on this day however the video archive had expired by the time the trigger result had been received.

25/9/09 Trigger – 136.7 $\mu\text{g}/\text{m}^3$ – BAM Continuous Monitor

- Peak dust reading of 377 $\mu\text{g}/\text{m}^3$ was recorded between midnight and 6am.
- 24 hours average was 136.7 $\mu\text{g}/\text{m}^3$ which compares with measurements recorded in other Air Quality Monitors throughout the Auckland Region.
- Not recorded in the TSP monitors as it was outside the 1 in 3 and 1 in 6 sampling interval of these monitors.
- The dust trigger was a result of the dust cloud that drifted over New Zealand from the Australian dust storms.
- Elevated dust levels from the Australian dust storms were also recorded by the BAM dust monitor on the 28/29 September.

Dust($\mu\text{g}/\text{m}^3$) Periodic Report Winstone 2
23/09/2009 24:00 - 25/09/2009 24:00 Interval 5 Min



29/10/09 Trigger - $96\mu\text{g}/\text{m}^3$ - Office Hi-vol TSP Monitor

- On this day the new camera monitoring system was being installed on site.
- This required a trench to be dug across the site road to lay some cables. The trench was located directly adjacent to the dust monitors on the site office.
- The ground was dampened before digging but as new ground was exposed this has emitted some localised dust which due to the close proximity to the dust monitor may have resulted in the trigger.
- This was a one-off project that is not likely to be required again in the near future.
- Should any task similar to this occur again then precautions will be taken to ensure that localised dust emissions are controlled.
- The BAM Continuous Dust Monitor located immediately adjacent to the Hi-vol Sampler recorded $44.1\mu\text{g}/\text{m}^3$.

25/11/09 Trigger – 112.6µg/m³ - Office Hi-vol TSP Monitor

- On this day there were 4 loads (48m³) of water applied to the roads to dampen them and the sprinkler system was working normally. This would indicate that it is unlikely that the trigger was caused by dust emitted from the site roads.
- The crushing plant was operating on this day and was located on the quarry bench below the office. No dust emissions have been recorded as significant from the crushing plant however due to the wind speed and direction any small amount of dust emitted would have been carried in the direction of the dust monitors.
- Unfortunately due to no camera images the exact dust source can not be identified. There were no camera images due to an unforeseen issue with the length of the new camera system archives. This has now been extended to prevent it being an issue in the future.
- The BAM recorded 35.4µg/m³.

21/12/09 Trigger – 84.8 $\mu\text{g}/\text{m}^3$ - Office Hi-vol TSP Monitor

- On this day there were 4 loads (48m³) of water applied to the site roads and the sprinkler system was working normally.
- The crushing plant was not operating on this day. There was only sales loadout activity.
- The camera footage on this day for the site showed one significant dust emission from a truck that used a wrong site road that had not been watered. This was a very short emission is unlikely to have been the main reason for the trigger. Road management practices have been improved to ensure that only roads that have been watered are accessible to traffic.
- There was no visual dust on the office view camera that includes the office Hi-vol TSP monitor and the BAM Continuous Dust Monitor.
- Relatively strong wind from the south-west of the site may have contributed to the trigger.
- The BAM recorded 27.9 $\mu\text{g}/\text{m}^3$.

Video Monitoring – 21st December 2009



- Picture on left shows only significant dust emission for the day.
- Picture on right shows office view with monitors. There was no visual dust seen in this view all day.

31/12/09 Trigger – 86.1 $\mu\text{g}/\text{m}^3$ - Office Hi-vol TSP Monitor

- On this day there was no activity as the site was closed for the Christmas/New Year period.
- The site sprinklers were operating normally.
- The camera footage for this day show no signs of visual dust being present on the site.
- Relatively strong south-west wind may have contributed to the trigger.
- The BAM recorded 32.2 $\mu\text{g}/\text{m}^3$ for the 24 hour period.

Video Monitoring – 31st December 2009



- Both views from near office show no sign of any visual dust emission all day.

Summary of Actions from the Investigation of Air Quality

Monitoring Triggers:

- Ensure that one-off and unusual tasks undertaken in the future have sufficient measures taken to make sure there is no dust emission while the task is being undertaken.
- Camera archive has been expanded to ensure the video history is available when air monitoring results are received.
- Road management has been improved to ensure that roads not required for use and that have possibly have not been dampened are blocked off and not accessible to traffic.
- Reinforced with site staff the need for extra focus on dust suppression particularly in dry, high wind weather conditions.

The BAM Continuous Dust Monitor is located directly adjacent to the Office Hi-vol TSP dust monitor. The BAM is the more modern technology and considered to be more accurate than the Hi-vol monitor.