

Three Kings Quarry

27 February 2017 – Site Liaison Group Meeting

Site Monitoring Report



February 2017 Site Monitoring Report

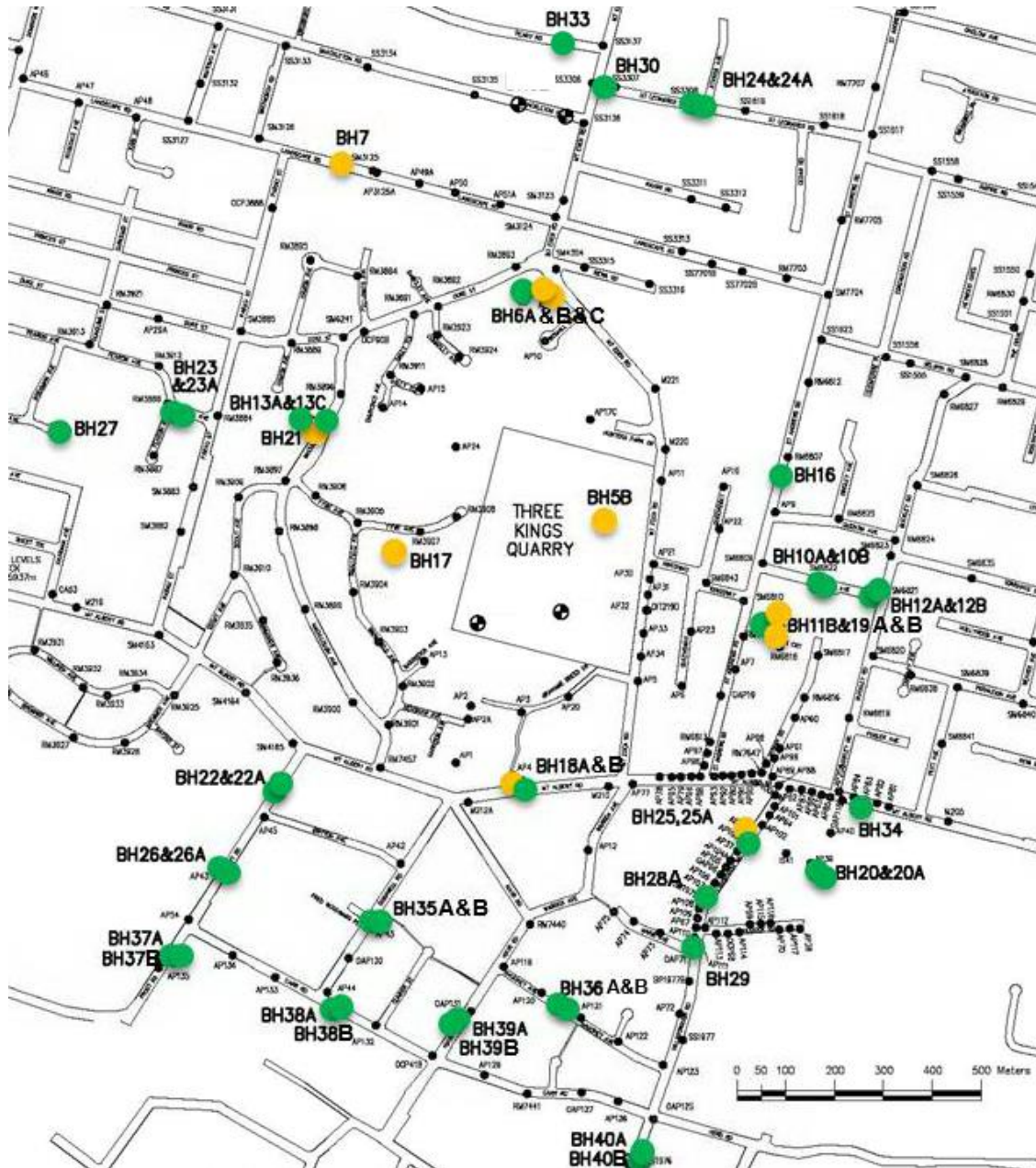
This Site Monitoring Report is a summary of environmental monitoring data collected since the last Site Liaison Group meeting and includes:

- Groundwater Level Monitoring Results
- Groundwater Chemistry Monitoring
- Air Quality Monitoring Results
- Noise Monitoring Results

Groundwater Level Monitoring

- Dewatering of Three Kings Quarry commenced in March 1999
- Groundwater levels within Three Kings Quarry have been held above RL34m since October 2002
- Groundwater levels are currently being measured monthly in 51 boreholes and piezometers located in and around Three Kings Quarry
- Groundwater levels are generally following seasonal trends

Borehole Location Plan with Jan 2017 Groundwater Levels Included



LEGEND

- 34 – 36 RL m
- 36 – 45 RL m
- >45 RL m

Groundwater Chemistry Monitoring

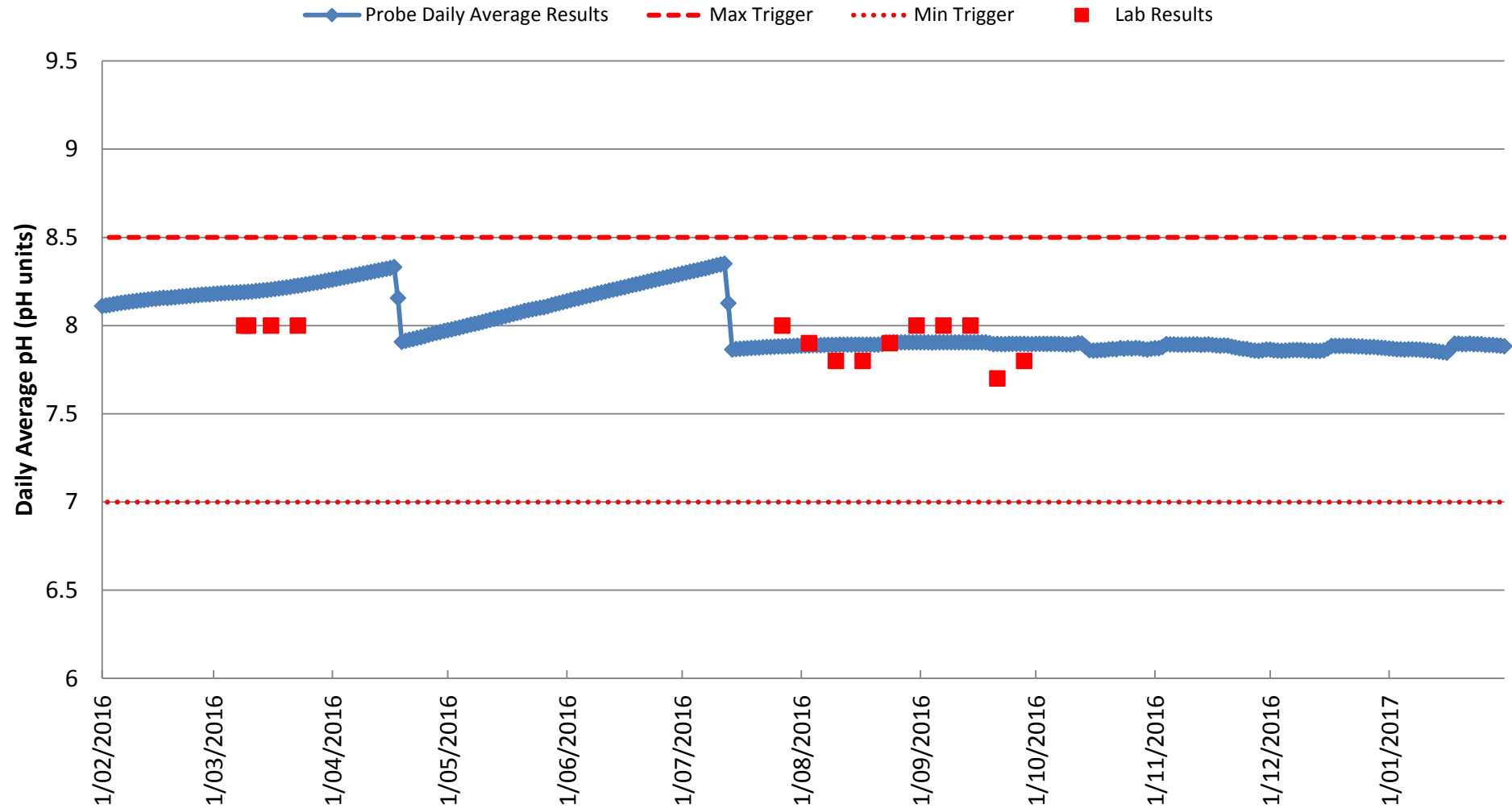
- Monitoring of Groundwater Chemistry commenced in December 2011 following the granting of Resource Consents to fill Three Kings Quarry
- Samples were taken at three monthly intervals from the Pumping Bore within Three Kings Quarry and from BH 7 on Landscape Road for analysis of a suite of chemical parameters for the first 2 years of monitoring.
- Following 2 years of monitoring, samples for chemical analysis are required to be taken at 6 monthly intervals from the Pumping Bore within Three Kings Quarry and from BH 7 on Landscape Road (March and September).
- The next round of groundwater chemistry sampling is scheduled for March 2017.

Continuous Groundwater Quality Monitoring

- Continuous monitoring of electrical conductivity and pH is required to be undertaken in the Three Kings Quarry pumping bore.
- Historically, the pH probe in particular showed an undesirable downward trend following calibration, therefore a weekly water sample was taken and sent to Hill Laboratories Ltd for analysis of pH & EC
- New pH & EC probes were installed at the Three Kings Quarry pumping bore in the August 2015.
- An upward drift in pH was recorded from January 2016 to July 2016. The electrode was replaced in July 2016 and is showing much more consistent results.
- The downward spike in the EC record in October 2016 was investigated and found to be a result of too high a flow in the sampling vessel.

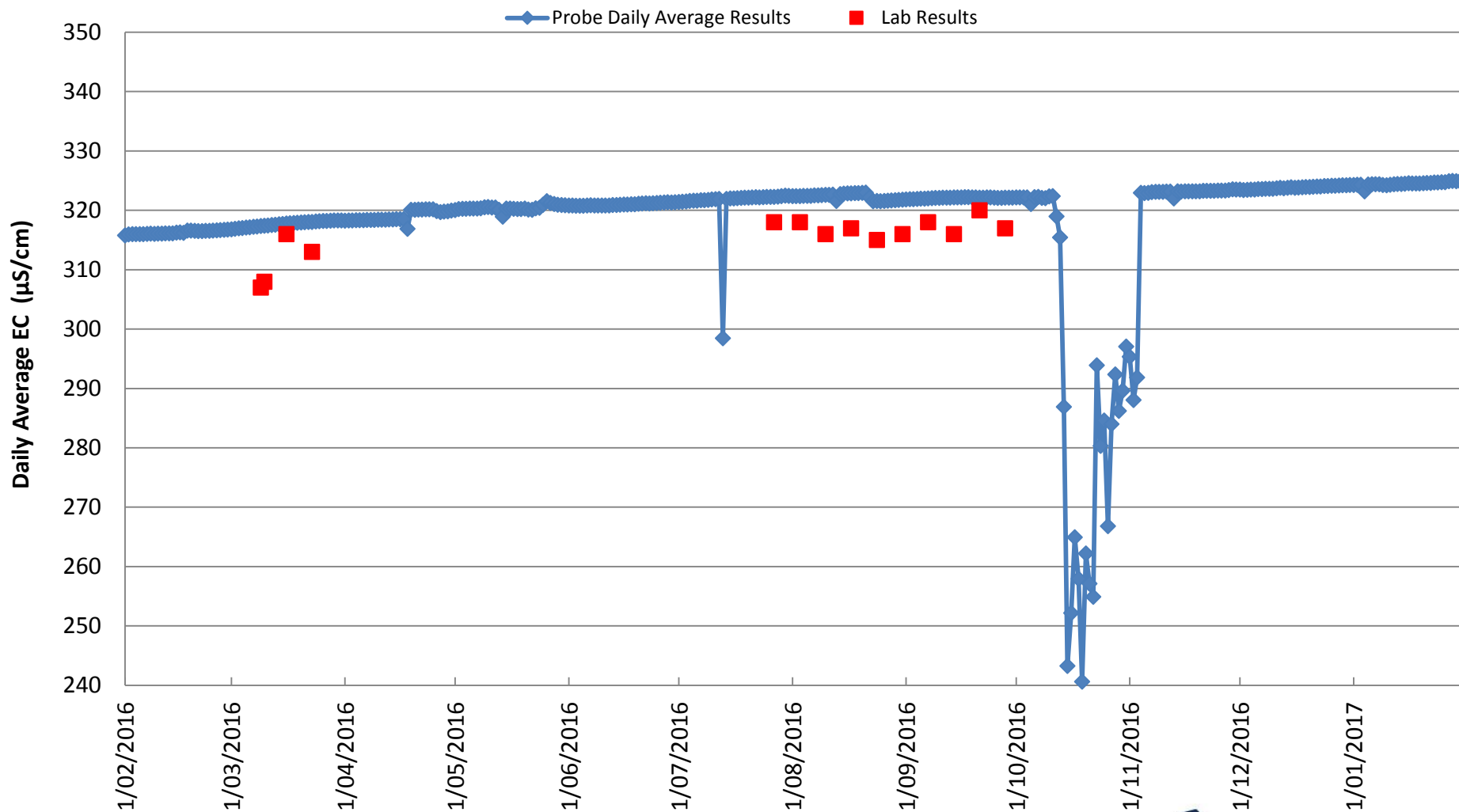
Continuous Groundwater Quality Monitoring

Average Daily pH Graph



Continuous Groundwater Quality Monitoring

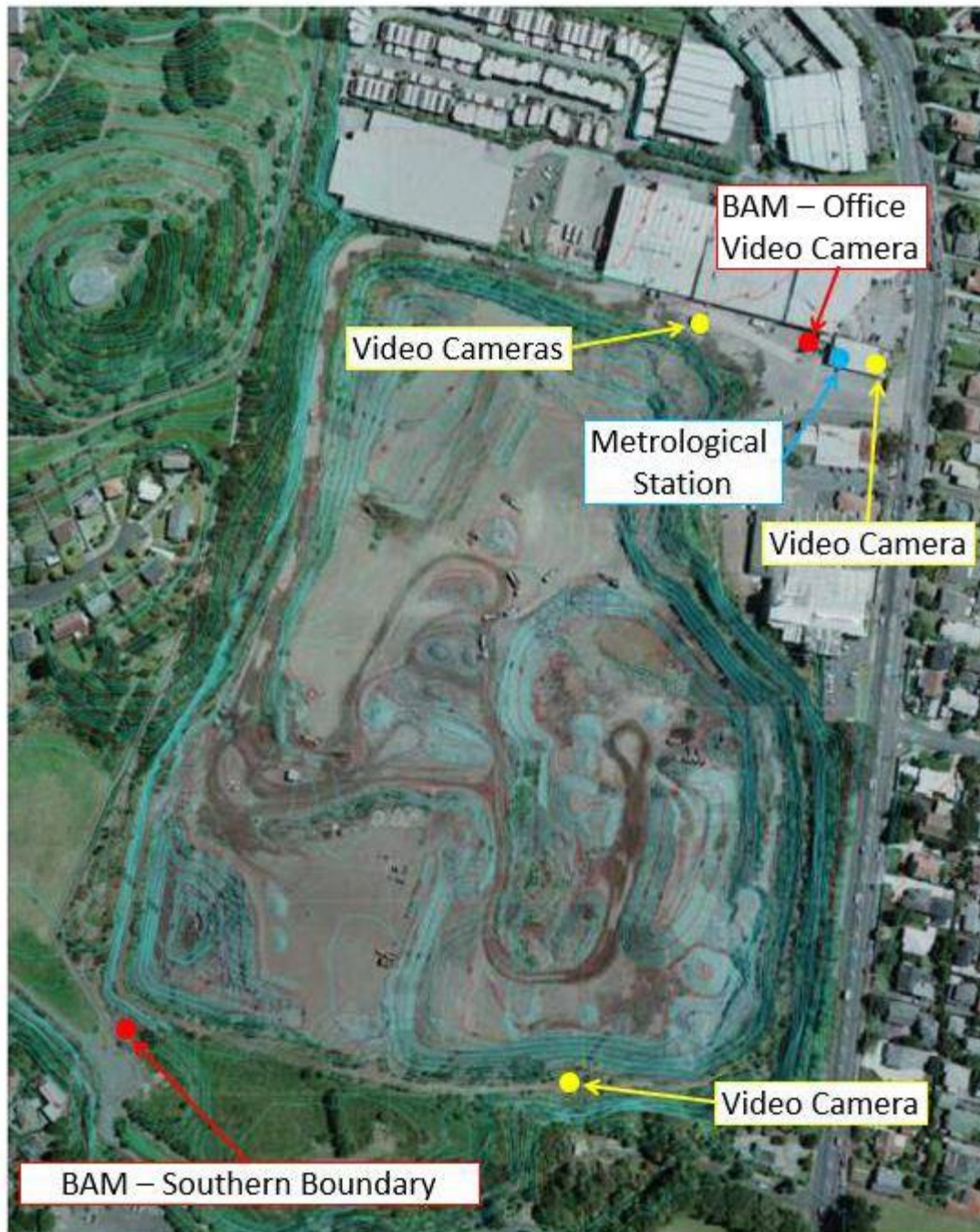
Average Daily EC Graph



Air Quality Monitoring

- Air Quality Monitoring equipment at Three Kings Quarry consists of two Continuous Real Time Beta Attenuation Monitors (BAM), time lapse video cameras and a metrological station
- The BAM monitor located on the roof of the site office has been operating since April 2008. A second BAM monitor was commissioned in April 2012 in the south-western corner of Three Kings Quarry
- The Air Discharge Consent for Three Kings Quarry was renewed in February 2015.
- The air quality trigger was changed from 80 micrograms per cubic metre as a 24hour average (all results) to 60 micrograms per cubic metre as a 24hour average as measured by the BAM units.

Air Quality Monitoring Equipment



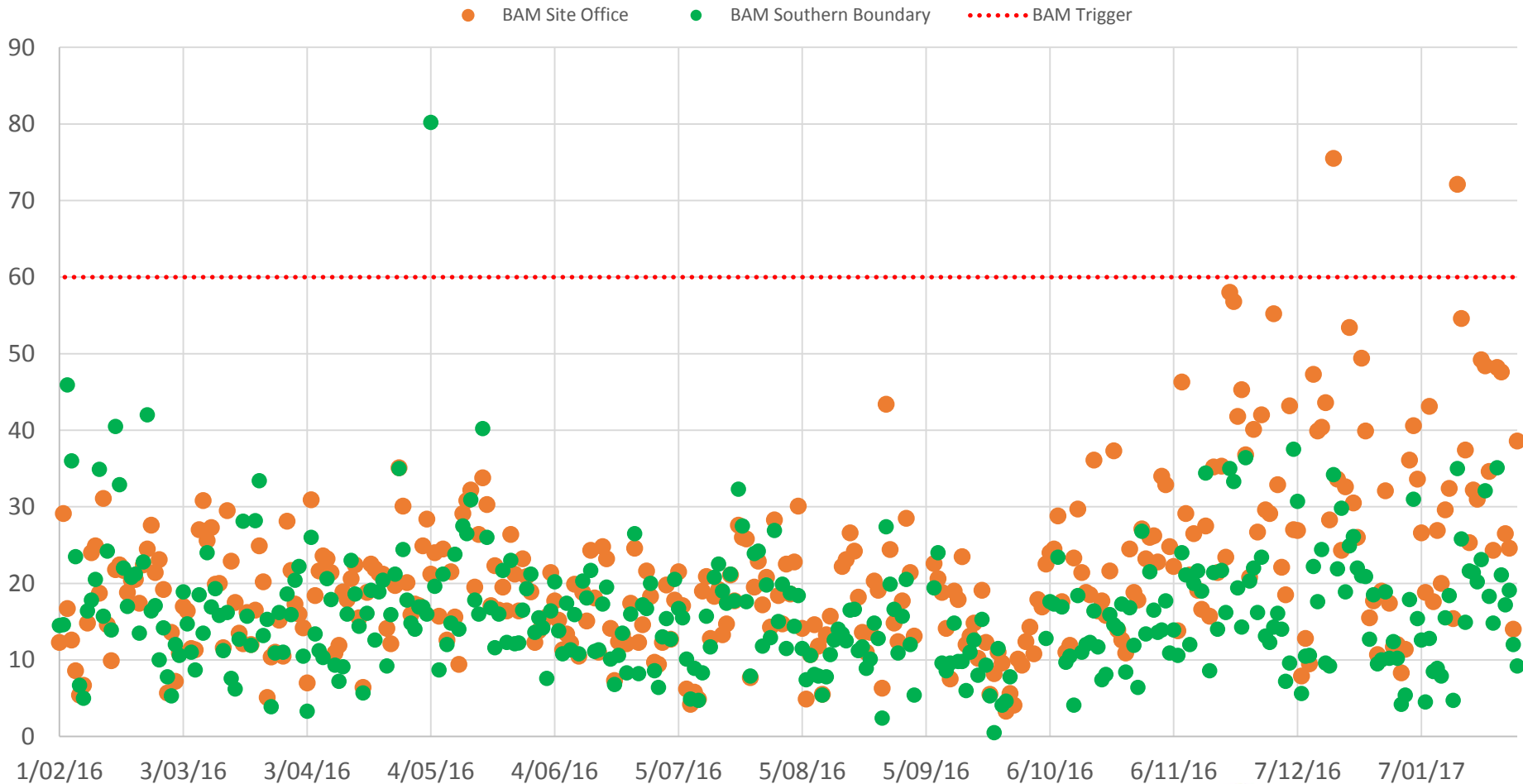
Air Quality Monitoring Results

- Continuous air quality monitoring results recorded since the last SLG meeting have generally been less than 60 micrograms per cubic meter as a 24 hour average
- On the 16th December 2016 and the 16th January 2017 the Office BAM unit recorded air quality triggers of 75.5 and 72.1 micrograms per cubic meter as a 24 hour average, respectively. On both days there were strong prevailing Southwest winds, no rainfall and works at the adjacent SHA site in close proximity to the BAM unit which are believed to be contributing factors for the trigger exceedances.
- Reports of investigations into these triggers were forwarded to the Auckland Council.

Air Quality Monitoring Results

The following figure shows air monitoring results from 1st February 2016 to 31st January 2017.

All results are in $\mu\text{g}/\text{m}^3$.



Noise Monitoring

- To ensure that the noise performance standards set in the District Plan and consents authorising filling are met, monitoring on two representative occasions per year is undertaken.
- The District Plan requires that the noise from the quarry and fill operations shall not exceed $L_{A10} 55\text{dBA}$ at or within the boundary of any residential property
- Noise monitoring was undertaken on the 14th November 2016 by Marshall Day Acoustics Ltd. The cumulative acoustic emission from fill operations resulted in sound levels which complied with the relevant noise rules for quarry operations at the Fyvie Avenue measurement position and exceeded by 3 decibels at the Grahame Breed Drive position.
- In response to the measured exceedance at the Grahame Breed Drive location, GBCWinstone implemented a review of the operation and moved specific large/noisy plant to the North end of the site and repositioned internal vehicle routes where the noise may impact surrounding neighbours.
- On the 20th December 2016 a follow-up survey was carried out at the two measurement positions. The cumulative acoustic emission from fill operations resulted in sound levels which complied with the relevant noise rules for quarry operations on the site.

Soakage Infrastructure ASCNMP

- As part of our filling operation, we will be undertaking soakage infrastructure works in the area indicated in red. The works involve the handling, sorting and stockpiling of rock and concrete to fill the quarry and to construct a soakage hole, enabling stormwater discharge to ground.
- In order to avoid, remedy and mitigate any adverse noise effects from the project, an Activity Specific Construction Noise Management Plan (ASCNMP) has been implemented
- Expected duration of this activity is October 2016 to June 2017.
During daytime hours 8:00am – 4:00pm, Mon-Sat.
- The relevant noise limits for construction occurring during these hours is 70dB L_{Aeq} and 85dB L_{amax}
- You can find a copy on our website: www.threekingsquarry.co.nz under the “Management Plans & Regulatory Structure” tab.
- Alternatively, please contact Angela Klein on 027 504 3624 or angela.klein@gbcwinstone.co.nz.



**Thank you - that concludes the
February 2017 Monitoring Report**