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Leading the Way with Directional Noise Monitoring

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 **GOLDCORP**

Outline

- Background
 - Porcupine Gold Mines (PGM)
 - Hollinger Open Pit
 - Hollinger Monitoring Network
- Conventional Noise Monitoring
- BarnOwl
 - Applications and Benefits
 - Approvals



Background

Porcupine Gold Mines



Background

Hollinger Open Pit

- Reclamation project to remove historical mining hazards and return usable land to the City of Timmins
- Located in downtown Timmins
- Close proximity to industrial, commercial and residential receptors
- Environmental Compliance Approval (ECA)
 - **Noise, Dust, Vibration**



Background

Hollinger Monitoring Network



Conventional Noise Monitoring

- Single microphone system measuring noise levels
 - External Microphone
 - Hand-held Analyzer (2250)
 - Communications
- Noise Sentinel
 - Real-time alerting
 - Audio clip generation for review
 - Archived historical data
 - Report generation





Issues with Conventional Noise Monitoring

- Noise limits are defined at property boundaries
 - **Noise levels impacted from offsite activities**
- Difficult to identify the source of the noise
 - **Audio clips help but not always**
- Difficult to determine the impact of site activities versus offsite activities
 - **What source caused the exceeded noise level?**
- Wind noise
 - **Alerts are generated from winds over the microphone**



What is BarnOwn?

- Upgrade or add-on to Noise Sentinel
- Directional Noise Monitoring System
- Allows for the identification of noise sources both on and off site
- Can identify individual noise sources and levels
- Provides real time alerts, levels and audio clips

BarnOwl

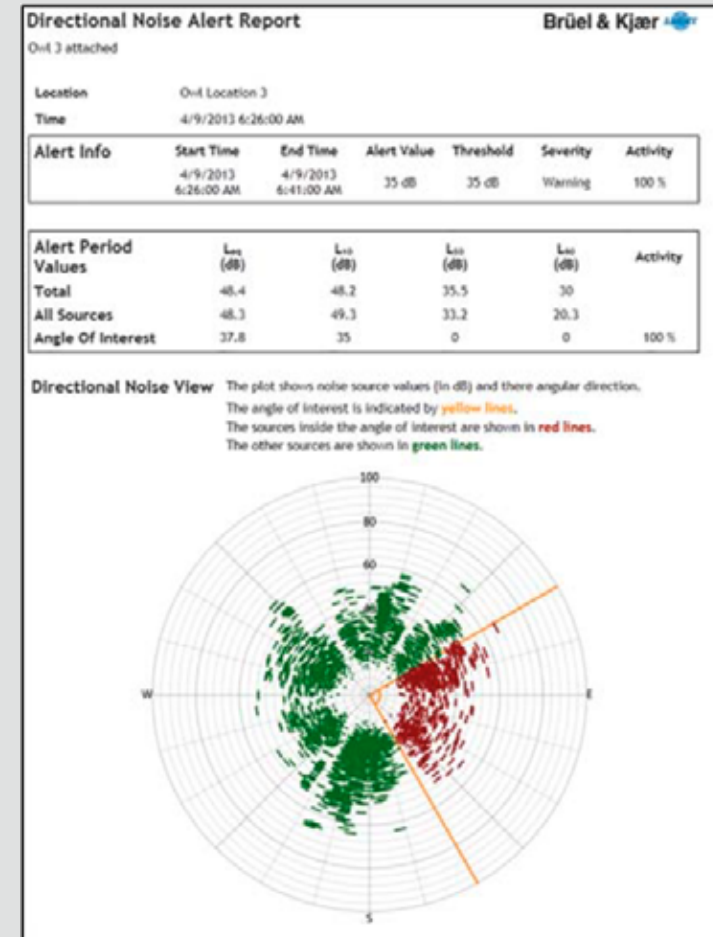
System components

- Triangulated microphone array
- Three channel processing unit
- Computer and display screen
- Power supply and communications

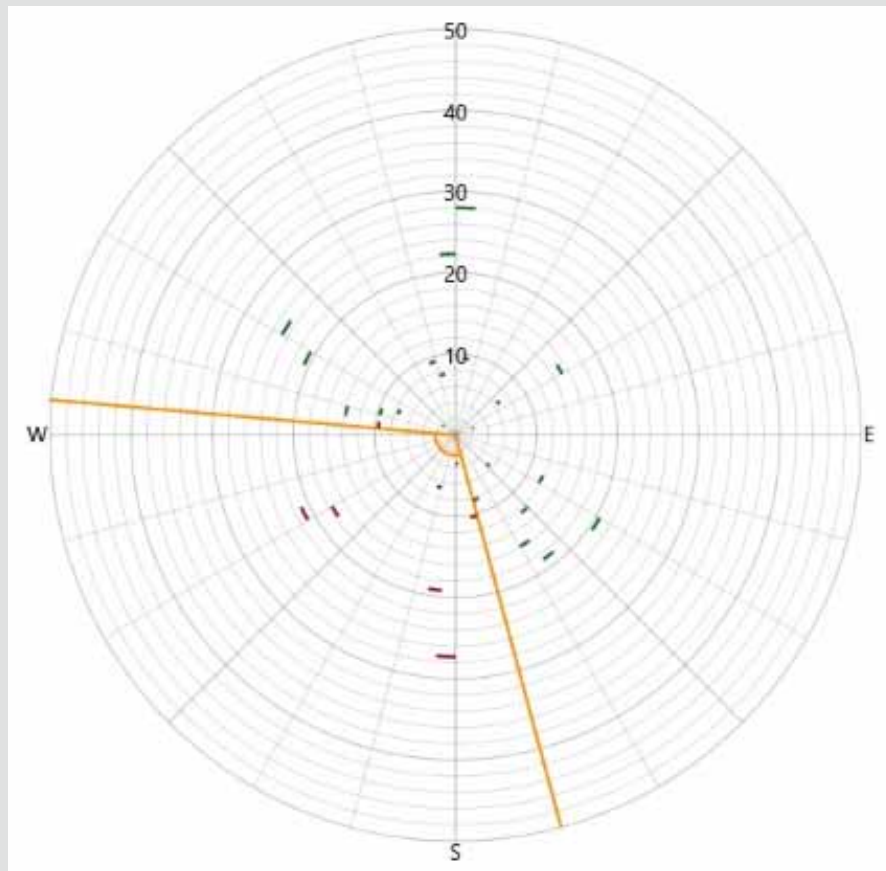


Direction Noise Monitoring

- BarnOwl
 - Detects sounds from many identifiable directions
 - Collects data from 71 five-degree segments
 - Generates a radar plot of the directional pattern of noise



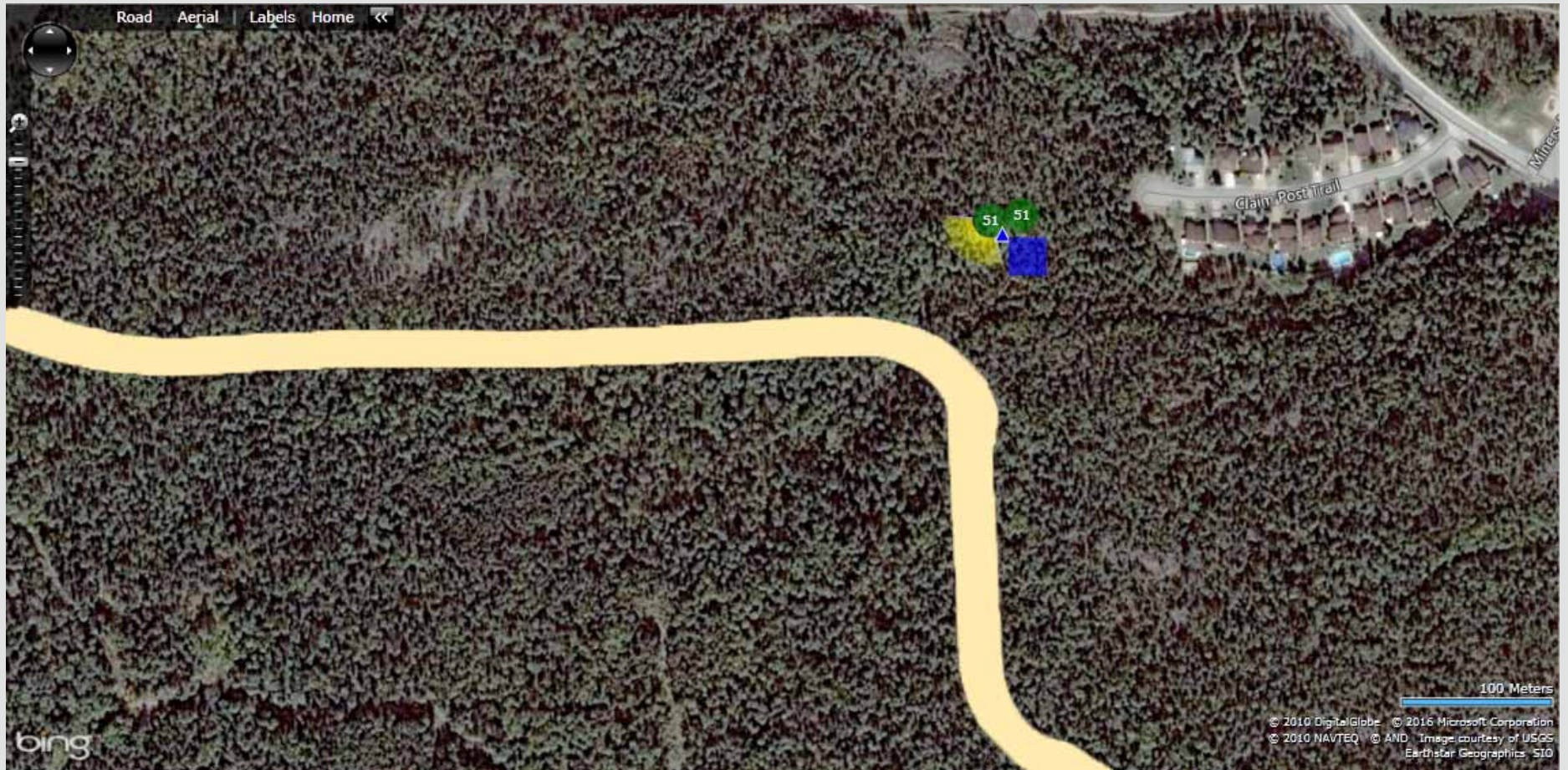
Radar Plot



- The radar plot displays the level of noise arriving from different directions over a five minute period.
- The contours represents the noise level in decibels and the angle is the direction of the source relative to the monitor.
- Angle of Interest (Yellow)
- Sound source of interest (Red)
- Outside sound sources (Green)

BarnOwl

Results



Results

Start Time	End Time	Total L_{eq} (dB)	All Sources L_{eq} (dB)	Angle of Interest L_{eq} (dB)	Activity
9/18 11:00 PM	9/19 12:00 AM	45.5	29.2	17.8	100%
9/19 12:00 AM	9/19 1:00 AM	44.3	29.7	11.0	100%
9/19 1:00 AM	9/19 2:00 AM	45.6	29.5	11.5	100%
9/19 2:00 AM	9/19 3:00 AM	44.6	29.7	12.4	100%
9/19 3:00 AM	9/19 4:00 AM	47.3	30.0	22.6	100%
9/19 4:00 AM	9/19 5:00 AM	46.6	30.3	21.0	100%
9/19 5:00 AM	9/19 6:00 AM	49.9	31.8	27.9	100%
9/19 6:00 AM	9/19 7:00 AM	47.9	31.2	23.8	100%
9/20 11:00 PM	9/21 12:00 AM	50.9	34.8	33.3	100%
9/21 12:00 AM	9/21 1:00 AM	47.8	30.4	29.5	100%
9/21 1:00 AM	9/21 2:00 AM	50.6	33.3	32.8	100%
9/21 2:00 AM	9/21 3:00 AM	50.7	33.5	32.7	100%
9/21 3:00 AM	9/21 4:00 AM	50.1	34.5	33.1	100%
9/21 4:00 AM	9/21 5:00 AM	48.1	33.4	31.0	100%
9/21 5:00 AM	9/21 6:00 AM	50.7	36.1	34.6	100%
9/21 6:00 AM	9/21 7:00 AM	49.6	31.4	29.1	100%

Results

- Some noises may not be assigned to a source in a specific direction:
 - **Wind-on microphone noise**
 - **Source more than ± 15 degrees from the horizontal plane**
 - **Distributed noise source with no definable direction**

A graphic element in the top-left corner consisting of a dark grey triangle and a yellow diagonal line with three horizontal steps, resembling a stylized owl's wing or ear.

BarnOwl

Noise Alerts

- BarnOwl like the traditional noise monitoring equipment is capable of generating noise alerts
- Alerts have the benefit of reporting directionality
- All directions are monitored
- Direction of the exceedance event can be determined
- Alerts can be generated
- Triggers for the alerts can be based on specified angle of interested or from all sources



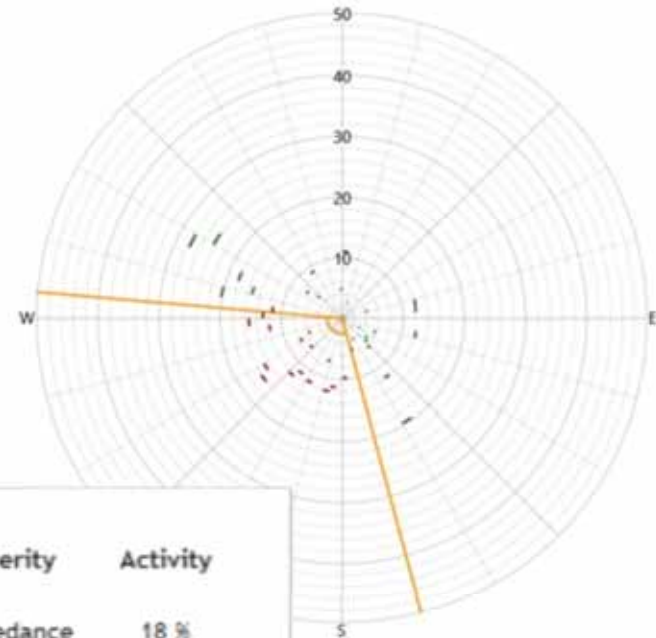
BarnOwl

Noise Alerts

- Any noise alert that is triggered produces a report
- Reports generated display
 - overall levels
 - level in the angle of interest
 - radar plot visually displaying the directional noise level data.

Noise Alerts

Directional Noise View The plot shows noise source values (in dB) and their angular direction. The angle of interest is indicated by **yellow lines**. The sources inside the angle of interest are shown in **red lines**. The other sources are shown in **green lines**.



Alert Info	Start Time	End Time	Alert Value	Threshold	Severity	Activity
	9/25/2016 8:00:00 PM	9/25/2016 9:00:00 PM	50 dB	45 dB	Exceedance	18 %

Alert Values	L _{0q} (dB)	L ₁₀ (dB)	L ₅₀ (dB)	L ₉₀ (dB)	Activity
Total	49.2	52.3	47.7	44.2	
All Sources	31.8	37.2	0	0	
Angle Of Interest	24.1	0	0	0	100 %



BarnOwl

Applications

- Currently BarnOwl is being used in parallel with our standard noise monitoring system at areas of concern
- Used for investigations
 - Both BarnOwl units are set-up in portable trailers
 - Deployed as required for any length of time

The logo graphic for BarnOwl, featuring a stylized yellow owl silhouette on a dark grey background.

BarnOwl

Benefits

- Ensures that the noise you are monitoring is actually yours
 - **More accurate determination of compliance**
- Improved assessment of noise impact
- Reduces false alerts



Approvals

- Currently BarnOwl is not approved for compliance monitoring in Ontario
- All components of the system meet the required standards for noise monitoring

Approvals

Leading the way

- Currently PGM is the first industry in North America to use the BarnOwl system
- PGM is leading the way to get the BarnOwl system approved in Ontario for compliance applications



Leading the way

- Presented the system to:
 - Local and District offices of the MOECC
 - Approvals Branch of the MOECC
 - Standards Development Branch of the MOECC
- Continue discussions with all parties
- Continue to use BarnOwl
 - Gathering data on the system
 - Demonstrate the systems capabilities and benefits
 - Investigate noise alerts from our conventional system used for compliance

Questions

