# Fugitive Dust Management at Elkview Operations: Challenges, Learnings and What's Next

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# Agenda

### Overview and Approach

- Elkview Operations
- Fugitive Dust

### Challenges

### Learnings

- Monitoring and Mitigation Measures
- Pilot Projects

What's Next



# **Overview and Approach**





# **Elkview Operations**

- Produce steelmaking coal
- Open pit mining since the late 1960s
- Located next to Sparwood, B.C., within Ktunaxa ?amak?is, homeland of the Ktunaxa Nation people
- Capacity to produce 9 million tonnes of clean coal per year
- Product sent to port via rail and then overseas primarily to Asian Pacific markets



# **Fugitive Dust**

### **Fugitive Dust**

 Incidental, or unintended emissions of dust not emitted from a definable point source, such as industrial smoke stacks or vehicle exhaust. Sources of fugitive dust include roads and storage piles of soil or rock.

### Particulate Matter (PM)

- Inhalable PM is  $\leq 10 \ \mu m \ (PM_{10})$
- Fine inhalable PM is  $\leq 2.5 \ \mu m \ (PM_{2.5})$
- Total Suspended Particulate (TSP)



# **Fugitive Dust Management Plan**

- Meets guidance found in BC's *Developing a Fugitive Dust Management Plan for Industrial Projects (EMLI and ENV,* 2018)
- Presents an integrated approach to managing fugitive dust at the operation
- Identifies all known fugitive dust sources and mitigation measures
- Provides the necessary tools to adaptively manage fugitive dust and comply with applicable acts and regulations
- Recently updated to address feedback received from ENV, Ktunaxa Nation Council and community representatives
- Audited annually by a third-party qualified professional and updated regularly



# **Our Approach**

# AIR QUALITY AND **DUST MANAGEMENT**

Managing air quality is critical to people, communities and the environment. Teck understands that dust generated from our operations is visible from communities in the Elk Valley. We are deploying known effective dust mitigations, and looking at other innovative mitigations and monitoring systems to drive continued improvement at our operations. We are gaining ground, but recognize that more work is needed. We value your input and have included your feedback into our practices.



# Challenges





# Managing Fugitive Dust

Multiple sources of fugitive dust on site, which require different mitigation strategies:

- Vehicle travel on unpaved roads
- Wind erosion:
  - Tailings storage facilities, stockpiles, mine rock spoils
- Material handling of raw coal and mine rock
- Drilling
- Blasting
- Material crushing
- Rail cars

Mitigation measures are also applied at different scales.



Photo: Waste rock spoil 18 months after heli-seeding

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# **Key Challenges**

Mining near communities

- Highly visible
- At the closest point, residents live immediately adjacent to the No Unauthorized Entry boundary
- Recreational area approximately 15 km north of Elkview (Grave Lake)

Monitoring program

- Separating mining impacts from other fugitive dust source impacts when analyzing and interpreting data
- Quantitatively evaluating effectiveness of mitigation measures
- Creating a real-time monitoring plan with proactive triggers

# **Key Challenges**

### Mitigation

- Some fugitive dust sources have large surface areas and are hard to reach/cover with conventional mitigation measures
- Water supply for dust control
- Dust control in sub-zero temperatures
- Use of dust control products come with tradeoffs – continuing to search for most sustainable solutions



Photo: Dust control product being applied to loaded rail cars

# Learnings – monitoring, mitigations, management





### Monitoring Learnings Off-site

Conduct ambient air quality monitoring off-site:

- Five continuous ambient air quality / meteorological monitoring stations in surrounding areas
- One background monitoring station
- Added ozone monitoring to downtown Sparwood station; now registered with the BC Air Quality Database
- Still and live video cameras
- Targeted dustfall monitoring

Data completeness has improved, distinguishing between mine or other sources at various times of the year (e.g., summer forest fires) still a challenge.





### Monitoring Learnings On-site

EnviroSuite is a real-time air quality and meteorological monitoring system.

- Multiple monitors set up in mining and processing plant areas – currently 20 on site
- Backtrack modelling for incident investigations
- Predictive modelling to anticipate adverse conditions

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Working on data quality improvements. Good flexibility to deploy monitors to different areas. Power supply.





Photo: EnviroSuite monitoring station

### Mitigation Learnings Routine mitigations

Need a variety of routine mitigation measures – based on experience and best management practices.

- Tailored to specific sources
- Applied at different scales

Assess efficacy of routine mitigations and layer on trials to improve effectiveness where needed.

Monitor to allow real-time response – inform frequency of applications and deploying mitigation to specific areas.

| Fugitive Dust<br>Source   | Responsible Person  | Normal  |  | Level 1 Alert   |   | Level 2 Alert   |  |
|---|---|---|--|---|---|---|--|
|   |   | Trigger   | Action/Response  | Trigger   | Action/Response   | Trigger   | Action/Response  |
| General stockpiling<br>of materials<br>(including soil<br>salvage and<br>sediment pond<br>cleanout materials) | Project Supervisor  | Localized dust<br>during normal<br>operations   | Minimize material drop<br>heights<br>Proactive application of<br>water, hydroseed or other<br>dust suppressant / erosion<br>control as needed (e.g., if<br>dry conditions are expected<br>or if storing long-term)   | Wind blowing towards<br>Sparwood resulting in<br>fugitive dust migrating<br>outside of stockpile<br>footprint | Limit stockpiling<br>activities<br>Dependent on the<br>material being<br>stockpiled, apply<br>water, tackifier,<br>hydroseed or other<br>erosion control<br>(e.g., erosion<br>control blankets) | Wind blowing<br>towards Sparwood<br>resulting in fugitive<br>dust migrating<br>toward or beyond<br>the permitted mine<br>boundary | Limit or suspend<br>stockpiling activities if<br>contributing to fugitive<br>dust<br>Apply erosion control   |
| In-pit heavy haul<br>roads (including<br>road maintenance<br>and construction)                                | General Supervisor Operations                                   | Localized dust<br>(i.e., not leaving<br>the road<br>boundary) during<br>normal operations | Proactive dust suppressant<br>application (e.g., water,<br>snow, gravel) to limit dust<br>and to maintain safe<br>visibility<br>Trucks may need to be<br>reassigned to priority areas<br>In-vehicle monitoring<br>system to limit equipment<br>and vehicle speeds<br>Priority maintenance of<br>water trucks during dust<br>season | Wind blowing towards<br>Sparwood resulting in<br>fugitive dust migrating<br>outside of pit boundary           | Reassign water<br>trucks to priority<br>areas<br>Increase dust<br>suppressant<br>application<br>coverage and/or<br>frequency  | Wind blowing<br>towards Sparwood<br>resulting in fugitive<br>dust migrating<br>toward or beyond<br>the permitted mine<br>boundary | Reassign water trucks to<br>priority areas<br>Increase dust suppressant<br>application coverage and/or<br>frequency<br>Limit or re-route activities if<br>additional mitigation<br>measures are not successful       |
| Ex-pit heavy haul<br>roads (incl. CCR<br>haul road)   | General Supervisor Operations                                   | Localized dust<br>during normal<br>operations (i.e.,<br>not leaving road<br>boundary)     | Proactive dust suppressant<br>application (e.g., water,<br>snow, gravel) as needed<br>In-vehicle monitoring<br>system to limit equipment<br>and vehicle speeds<br>Priority maintenance of<br>water trucks during dust<br>season  | Wind blowing towards<br>Sparwood resulting in<br>fugitive dust migrating<br>outside road boundary             | Reassign water<br>trucks to priority<br>areas<br>Increase dust<br>suppressant<br>application<br>coverage and/or<br>frequency  | Wind blowing<br>towards Sparwood<br>resulting in fugitive<br>dust migrating<br>toward or beyond<br>the permitted mine<br>boundary | Reassign water trucks to<br>priority areas<br>Increase dust<br>suppressant application<br>coverage and/or<br>frequency<br>Limit or re-route activities<br>if additional mitigation<br>measures are not<br>successful |
| Light vehicle roads   | General Supervisor Operations                                   | Localized dust<br>during normal<br>operations (i.e.,<br>not leaving the<br>road boundary) | Proactive dust suppressant<br>application (e.g., water,<br>snow, gravel) as needed<br>In-vehicle monitoring<br>system to limit equipment<br>and vehicle speeds<br>Priority maintenance of<br>water trucks during dust<br>season  | Wind blowing towards<br>Sparwood resulting in<br>fugitive dust migrating<br>outside road boundary             | Reassign water<br>trucks to priority<br>areas<br>Increase dust<br>suppressant<br>application<br>coverage and/or<br>frequency  | Wind blowing<br>towards Sparwood<br>resulting in fugitive<br>dust migrating<br>toward or beyond<br>the permitted mine<br>boundary | Reassign water trucks to<br>priority areas<br>Increase dust<br>suppressant coverage<br>and/or application<br>frequency<br>Limit or re-route activities<br>if additional mitigation<br>measures are not<br>successful |
| Light vehicles –<br>leaving site  | All employees and contractors<br>General Supervisor Maintenance | Light duty vehicle<br>is dirty  | Wash vehicle prior to<br>leaving site or at local car<br>wash if site facility not<br>operational<br>Routine maintenance of<br>vehicle wash  | Dirty light vehicle leaving<br>EVO via main gate  | Gatehouse LPO<br>will instruct driver<br>to wash vehicle if<br>observed (not<br>applicable when<br>gatehouse is<br>unoccupied)  | Dirty vehicle<br>observed in a<br>community or<br>reported via Teck's<br>Feedback<br>Mechanism                                    | Attempt to contact vehicle<br>operator/supervisor to<br>have the vehicle and<br>parking area cleaned<br>immediately and share<br>reminder of clean vehicle<br>policy   |

Image: Trigger Action Response Plan excerpt from FDMP

### Mitigation Learnings Routine mitigations - roads

Water and mister trucks operating during dust season (April to October).

- Water truck maintenance is prioritized to maximize availability
- Additives are used to lower water usage and increase effectiveness

Trialed product called Nalco Haulage DC in 2020 and implemented site-wide in 2021. The product helps water quickly penetrate road surfaces to minimize evaporation and runoff.



Photo: Water truck in action

### Mitigation Learnings Drilling & Blasting

- Water injection dust suppression system on production drills
- Developed a Trigger/Action/Response Plan (TARP) for blasts
  - Blasts are delayed until wind direction is favourable (i.e., blowing away from town)
- Electronic detonators and strategic spacing of drill holes lowers fugitive dust from blasting
  - Contains energy in the blast and able to direct blast debris

Watering blast patterns prior to detonation has had very limited success.



Image: Blasting Trigger Action Response Plan

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### Mitigation Learnings Pilot projects – road wax product

A paraffin wax road treatment, Novamen DCPOB, was trialed on several road surfaces in 2021.

- Successful pilot effective, limited to no reapplication needed, reduced water use.
- In 2022 targeted high-use light vehicle roads.

Similar success seen in 2022, however new challenges identified including difficulty washing material off of light vehicles, and slippery areas in certain conditions. Informing planned use in 2023.



Photo: Paraffin wax haul road treatment

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### Mitigation Learnings Pilot projects – high expansion foam

High-expansion foam trials completed in August and September 2022.

- Four low-toxicity foaming products tested on a high wall and a spoil
- Good results with surfaces remaining wet for 2-3 days, in some cases longer
- Larger scale testing of two foaming products planned for summer 2023
- Studying potential effects for longterm use



Photos: Foam trial in progress on an in-pit spoil (left) and pit highwall (right)

### Mitigation Learnings Pilot projects – high expansion foam



### Mitigation Learnings Pilots and trials

As trials prove successful, we incorporate new mitigations into routine management actions. Conversely, drop pilots that are not proving beneficial. Don't get stuck in pilot mode.

### **Discontinued pilots:**

- MicroPulse LiDAR
  - Software limited, not user friendly
  - Limited ability to detect dust movement
- Mobile monitoring partnership with MIT
  - Successfully identified "PM" hot spots
  - Challenges separating mine impacts from other dust sources and dust generated by the truck



Photo: LiDAR unit on Elkview's Coarse Coal Refuse Spoil



Photo: Mobile PM monitor

# **Management Learnings**

Benefits of consistent resourcing – people and budget.

Dedicated dust management team; added a position in 2022

Maintain focus through continual internal engagement.

- Monthly dust meetings with senior staff
- Discuss opportunities for improvement
- Knowledge sharing and brainstorming solutions

Regular external communications to share progress.



# What's Next





### What's Next Continual Improvement

### Monitoring pilot projects

- Expanding EnviroSuite uses
  - Developing location-based early action triggers to alert operators when fugitive dust risks are elevated, based on weather conditions and current particulate matter concentrations
- Investigating ability to develop a meaningful visual air quality index
  - Creating a baseline photo library and collecting nephelometry data (distribution of particles suspended in air)



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### What's Next Continuous Improvement

### **Mitigation pilot projects**

- Investigating feasibility of wind fencing around clean coal stockpiles
  - Modelling results indicate benefit for reducing wind speed and scour area; currently assessing wildlife risks
- Investigating mitigating measures for other sources, such as shovel dig faces
- Scale-up high expansion foam trial with purpose-built equipment and optimal product blends



Photo: Foam trial concept

### What's Next Ongoing engagement

Continue to engage with local communities on fugitive dust management

- Elkview meets quarterly with the District of Sparwood and community representatives (SCEEAC)
- Fugitive dust management is a standing agenda item
- Project updates are provided and quarterly monitoring data are shared



Photo: Community engagement at a local farmer's market

# Fugitive Dust Management at EVO

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# **Questions?**

# References

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