IM Mine Exhaust Moisture: Potential Hazard, Aesthetics, and Air Quality Impacts Background
CEA Foundation

Key points:

- The headframe is within the airport restricted area.
- The 200,000 cfm volume of air will exit 24/7 at 7.7 ft/sec, possibly causing turbulence for air traffic.
- Under some weather conditions, a persistent cloud plume or fog may form.
- Exit elevation of the headframe is roughly the height of the surrounding residential hills.
- A SW breeze will move this towards the airport, which is less than a mile away.

The Water Supply Assessment states that the Idaho-Maryland Mine will lose about 40,000 gal per day (gpd) of water due to saturated air venting out of the headframe at the Brunswick site.[1] The exhaust fan in the headframe at 165' above ground will emit 200,000 cfm. It will exit from a 23.52 ft diameter stack with a velocity of 7.7ft/sec. The temperature of the exiting air will be 293.15K, or 20C (68 degrees F).[2]

This large volume of saturated 68F degree air exhaust will potentially form a fog or a moisture cloud plume. Depending upon the rate of mixing, this would occur when weather is cool and the relative humidity is high because the temperature of the exiting saturated air will drop and be unable to carry the excess moisture. This will be much worse in cold weather when the humidity is high. For example, when the relative humidity is 80% and the temperature is 41F, the exhaust plume will need to continuously mix with over 12 times its volume to dissipate. If the temperature drops to 35F, the exhaust will need to be continuously mixing with over 40 times its volume.

A SW breeze will move this towards the airport, which is less than a mile away. Under some conditions, the cloud may persist. In addition, the exiting air column will also have an upward velocity which may impact air traffic due to turbulence.

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[1] *"Ventilation air flow through the mine working would become saturated with water vapor, consuming approximately 40,000 gpd (assuming 200,000 CFM airflow, 100 percent saturation of air at 68 degrees F).", DEIR "Appendix N_Water Supply Assessment.pdf", pg 10.*

[2] DEIR "Appendix E.1_AQ-GHG Report.pdf", (p371 of 1938)

"Base Elevation: 2,741.99 ft"
"Release Height: 50.30 m"
"Emission Rate: 1 g/s"
"Gas Exit Temperature: 293.15 K"
"Stack Inside Diameter: 23.52 ft"
"Gas Exit Velocity: 2.34 m/s"
"Gas Exit Flow Rate: 200,000.00 ft3/min [cfm]"
"Variable Emissions Scenario: None"

[3] DEIR "Project Description.pdf", p3-5. Map showing Brunswick Shaft location.

[conversions: 293.15 K = 68 F = 20 C, 2.34 m/s = 7.7 ft/sec, 200,000cfm = 5660 m3/min, 0.264gal/kg of water]
[Given 100% rel humidity, 20C, 760mm Hg, absolute humidity is 0.0173kg/m3.
Total moisture is 5660 * 0.0173 = 97.9kg/min. 97.9kg/min*0.264gal/kg = 25.85 gal/min.
25.85 * 60*24 = 37,224 gal/day exhausted. = ~ 40,000 OK.]

RS, 2/1/22