This objection is to permit #M2021046 - Zephyr Dawson Gold Mine

It is being filed by the Dawson Ranch Homeowners Association (HOA) on behalf of 500+ property owners in the subdivision.

Dawson Ranch is between 1.3 and 3 miles east of Zephyr's proposed "affected area".

Our objection is based on a survey conducted in April 2020 in which 86% of 268 respondents were strongly opposed to any mining activity in the area. The HOA Board (all volunteers and property owners) considered this a mandate to do whatever possible to block the mining permit from being approved.

The bottom line: There have been a significant number of disasters from mining activities in Colorado. This fact cannot be refuted. Approving Zephyr Minerals permit application could or is likely to add to the list of unintended disasters. The four fundamental flaws in the application documented below and risks that endanger this pristine area require that DRMS deny this permit without any consideration of potential revisions.

The four fundamental flaws found in the application:

EXPERT ANALYSIS

Dr. Steven Emerman (Hydrologist) analyzed the permit application. Dr. Emerman has a B.S. in Mathematics from The Ohio State University, M.A. in Geophysics from Princeton University, and Ph.D. in Geophysics from Cornell University. Dr. Emerman has 31 years of experience teaching hydrology and geophysics, including teaching as a Fulbright Professor in Ecuador and Nepal, and has 70 peer-reviewed publications in these areas.

He reports: "The application for the Dawson gold mine includes three fundamental flaws that require rethinking of the project from the very beginning. The first fundamental flaw is the underestimation of the water consumption of the gold mine by an order of magnitude. In summary, at the present time, there is certainly no assurance that mine dewatering could supply the probably necessary 100 gallons of water per minute. The predicted water consumption is 18.4% and 6.6% of the average for the gold mining industry, based on ore production and gold production respectively, even after adjusting industry averages for the reduction in water consumption resulting from filtered tailings technology. This is what is meant by a fundamental flaw that requires rethinking from the ground up. If there is no adequate source of water, then there is no way to construct a gold mine at the proposed location. It would be completely unacceptable for a regulatory authority to allow a mining project to go forward that was going to consume ten times as much water as it claimed that it was going to consume."

"The second fundamental flaw is the assumption that water could be endlessly recycled through the mining operation with no chemical water treatment and no adverse effects. These adverse effects arising from a build-up of the dissolved solids content of the process water could include precipitation of salts onto all contact surfaces, clogging of pipes, clogging of the filter presses, and most importantly, the potential inability of the process water to function for the extraction of the gold concentrate. Finally, there is the problem of what to do with all of the saline process water when the mine is closed and the recycling of water ceases. The introduction of chemical water treatment into the mining circuit is not a minor matter and requires rethinking from the ground up."

"The third fundamental flaw is the failure to acknowledge that the structural zone of the filtered tailings storage facility would constitute a dam and should conform to dam safety standards. This is not simply a matter of, say, the mining company agreeing to add a layer of rockfill as armor on the outer embankment of the structural zone. Thus far, there has not even been any consideration of state, national or international guidelines for dam safety. On that basis, at the present time, there is no way to know whether it is even possible to construct a safe tailings storage facility at this particular location. As with the other fundamental flaws, the means for safe permanent tailings management needs to be rethought from the ground up."

--- end of Dr. Emerman's findings ---

We see a fourth fundamental flaw. Because the Dawson tailings sample size was limited to two samples, this results in a lack of knowledge of the acid-generating potential of the tailings. The source for this conclusion is from the GEM Services study appendix B dated June 2021 where it states: "Short term metal release was assessed using the shake flask extraction procedure (MEND, 2009) for the development rock and analyzing the filtrate from the two tailings samples by ICP-MS." How can Zephyr satisfy any of the many state requirements regarding prevention of acid mine drainage if they don't even know whether the tailings are potentially acid-generating?

In addition to fundamental flaws, we see the following key risks associated with mining operation:

WILD FIRE RISKS:

More than 800 homes lie within 1.5-4 miles east of the planned gold mine location, downwind (winds are normally westerly). Downtown Cañon City, a town of 17,141, is 4 miles away.

The planned gold mine area is a semi-arid region with abundant amounts of fuel for a wildfire. A single spark can ignite and destroy acres of forest, homes, businesses, and wildlife country.

The application doesn't adequately address fire risks.

- The application states, "Bottom portion of the filtered water tank will be dedicated to storing sufficient volume of water for firefighting". (2.4.3.4.2) Sufficient? The amount of water stored and dedicated strictly for firefighting should be specified.

- The application states that a fire prevention plan will be submitted. However, there is no fire prevention plan currently included.

How can government entities approve the application without an assurance of being able to mitigate a fire before it becomes a wildfire? An application should provide absolute assurance of the ability to mitigate a fire before it becomes a wildfire. The mine location is in a semi-arid juniper forest, on rugged terrain which is essentially a tinder box. With 13,000 pounds of explosives (replenished per week) and 8,400 gallons of diesel fuel onsite, and with no established fire protection plan, a fire could quickly explode into an inferno that destroys an entire region. Given the catastrophic possibility of fire, promising a fire prevention plan will be included is unacceptable.

WATER DEPLETION RISKS:

The 2017 Technical Report (which can be provided) states: "the plant will require 135 gpm of process water to operate while over 90% recycle rate will minimize fresh water usage. It is estimated that the

mine will supply 3.6 gpm of water in the form of ROM moisture and mine water, and 6.2 gpm of fresh water will be required for cooling, reagent mixing, process make-up, and potable water purposes throughout the plant. Drinking water will be hauled in from the nearby town." The relevant point is that 3,258,720 gallons of fresh water will be consumed annually (6.2 gallons * 60 minutes * 24 hours *365 days) from underground sources.

Dr. Emerman's relevant conclusions:

#2 The predicted water consumption of 9.8 gallons per minute is 18.4% and 6.6% of the average for the gold mining industry, based on ore production and gold production, respectively, even after adjusting industry averages for the reduction in water consumption resulting from filtered tailings technology. A more reasonable water consumption would be 100 gallons per minute, which would need to be supplied from groundwater.

#3 The predicted regional drawdown from dewatering the underground mine did not take into account the additional groundwater that would be pumped from a supply well. The dewatering calculation also did not consider the long-term impacts of dewatering or the time required to restore the equilibrium of the groundwater system.

#5 There is no mention of the possibility of water treatment for the water that is recycled through the mining operation and no analysis of the increase in the dissolved solids content of the process water that could occur due to recycling without treatment. In fact, saturation of the process water could result in precipitation of salts on all contact surfaces and in the tailings filter presses, which would render the filter presses non-functional. In addition, there is no discussion as to how the process water could still function to extract the gold concentrate with a high dissolved solids content.

--- end of Dr. Emerman's findings ---

A local geologist has stated that the underground water sources today supply some undetermined amount of water to Grape Creek and the Arkansas River. This helps maintain water levels and temperatures of the creek and river. He believes it is possible that the mine's consumption of water could reverse that flow: i.e. to fill an underground void, water could be drawn from the creek and/or river, further depleting water resources.

The above analysis is acknowledged in the permit application. The following text is from section 2.7.1 of the application; "The mine is expected to intercept some ground water within that material and will be dewatered to allow for mining. Accordingly, the mine does have the potential to impact ground water systems in the vicinity of the proposed mine as a result of the mine dewatering in the form of water level changes in the aquifers. The ground water level changes have the potential to indirectly impact surface water systems in the form of stream depletions."

Conclusions and objections:

Zephyr has not accurately stated its water consumption from underground sources, has an insufficient method of monitoring water depletion, and it does not know how water depletion will be impacted.

WATER POLLUTION:

U.S. Gold Mines: Spills & Failures Report surveys federal and state data and news reports to compile operating records of 27 operating U.S. gold mines accounting for 93% of national gold production. The study shows:

- Gold mines always spill - Gold mines responsible for 93% of U.S. gold production have accidentally spilled cyanide, mine waste, diesel, or other hazardous materials.

- Gold mines almost always pollute water - 74% of operating gold mines polluted surface and/or groundwater, including drinking water.

- When gold mines don't pollute water, it's almost always because there's no water nearby - of the mines that didn't pollute water, only one had a perennial stream in the project area.

Source (2017): New Study: 74% of U.S. gold mines pollute water - Earthworks

Dr. Emerman's relevant conclusions:

#4 There is no plan for the treatment of mine water before it is released into the environment.

#6 The application never uses the word "dam" and does not recognize that the structural zone of the filtered tailings facility would constitute a dam that should conform to dam safety standards.

#7 The structural zone/dam would be constructed using the upstream method in which the dam is built on top of the lightly-compacted tailings that it is confining. In the event of the liquefaction of the tailings, the dam will collapse into the underlying tailings. For that reason, the method of upstream construction is illegal in Brazil, Chile, Ecuador and Peru.

#8 There is no consideration of the susceptibility to liquefaction of the lightly compacted tailings confined by the structural zone or the circumstances under which liquefaction could occur.

#9 The documents from Zephyr Minerals Ltd include no consideration of the consequences of failure of the filtered tailings facility. According to a statistical model of past tailings dam failures, following failure of the tailings dam at the Dawson mine, under the most-likely scenario (loss of 35% of the stored tailings after 5 years of operation), the tailings will travel 11,905 feet during the initial runout. Under the worst-case scenario (loss of 100% of the stored tailings after 5 years of operation), the tailings will travel 37,098 feet (over 7 miles) to Grape Creek and then to the Arkansas River and through the center of Cañon City during the initial runout. Subsequent normal fluvial processes will transport the tailings indefinitely down the Arkansas River

#10 Based on Colorado, as well as most national and international dam safety standards, and the potential for loss of human life and habitat destruction following dam failure, the filtered tailings facility should be designed to withstand at least 90% of the Probable Maximum Precipitation (PMP).

#11 Although the static stability analysis of the filtered tailings facility indicated an acceptable factor of safety, all geotechnical input parameters were assumed without justification. The tailings densities were based on measurements on tailings samples from a different ore deposit (Windy Gulch), an assumed ability to compact the tailings to 95% of the maximum density within the structural zone, and an apparent confusion between dry and moist unit weights. There was no mention of the assumed height of the water table or any discussion of the water table height that would result in dam instability or the circumstances under which such a water table height would occur.

#12 The diversion channels for the filtered tailings facility would be designed to accommodate a 24-hour storm with a return period of 10 years during mine operation. On that basis, the probability of rewetting the tailings by runoff would be 10% in any given year of mine operation and 41% over the five years of mine operation. Following mine closure, the diversion channels would be reconstructed to accommodate a 24-hour storm with a return period of 100 years, so that the probability of rewetting the tailings by runoff would be 1% in any given year of the indefinite period of mine closure. There is no analysis of the consequences of rewetting either in terms of dam stability or increasing the susceptibility of the tailings to liquefaction.

The design of the channels to accommodate a 24-hour storm with a return period of 100 years after mine closure means that, in any given year of the indefinite time period following mine closure, the probability of overtopping of the channels will be 1%. On that basis, the probability that overtopping of the channels will occur at least once during, say, the next 60 years (two human generations), is 45%, so that overtopping of the channels will essentially be an expected event for the grandchildren of the current residents of Cañon City.

As before, the available documents include no discussion of the consequences of overtopping of the diversion channels, including possible impacts on the stability of the filtered tailings facility or the possibility of liquefaction of the lightly compacted tailings. In summary, the proposed water management infrastructure for the filtered tailings facility is entirely inadequate.

...the method of upstream construction is the most dangerous because, if the underlying tailings undergo liquefaction, the dam will simply fall backwards and downwards into the liquefied tailings, even if the dam itself does not liquefy. (P42)

The filtered tailings facility crest would be 6495 feet, 6523 feet, and 6541 feet after one, three, and five years of operation, respectively (see Figs. 11-12). Based on a minimum elevation of 6420 feet for the filtered tailings facility ..., the tailings dam heights would be 75 feet, 103 feet, 121 feet, and 153 feet for the one-year, three-year, five-year, and ultimate configurations, respectively ....

Although the water balance diagram ... shows a “Water Treatment Plant” before “Treated Water to Discharge,” the available documents do not include any plan for a water treatment plant, including no discussion of the contaminants that would need to be removed or how they would be removed. (P37)

In other words, the main body of the application (Environmental Alternatives, 2021a) states categorically that no water treatment will be needed, while the appendices (Environmental Alternatives, 2021b) see the need for water treatment as a later decision to be decided based upon the results of water quality monitoring. (P38)

---end of Dr, Emerman's comments ---

Our water pollution summary and conclusion:

Zephyr plans to use a very high-risk method of upstream construction for the filtered tailings. Heavy rains (similar to July 23, 2018) could cause liquefaction of the tailings stack and release chemically treated tailings into Grape Creek and then the Arkansas River. Where is the water treatment plant? Since tailings densities were based on measurements on tailings samples from a different ore deposit (Windy Gulch), the application’s conclusions are not valid.

It makes no sense that any government agency would be OK with this risk given the need for consumable water and the absence of any need for gold.

RECREATION:

Fremont County prides itself on its efforts to change the area's reputation from "mining and prisons" to a tourism and recreation center. Over the past 10+ years, the County, City, and other entities (e.g. Fremont Adventure Recreation [FAR], Bureau of Land Management [BLM]) have worked very hard and invested funds toward this goal.

The potential mining operation puts our recreation opportunities along the Grape Creek and Arkansas River corridors at risk. The Grape Creek area is a favorite spot for outdoor activity, including hiking, cycling, and equestrian trails, as well as fishing. Local people and others who travel a considerable distance cherish the quiet, scenic, natural landscape and the pristine features of the area. It is not uncommon to meet people who have traveled to Ecology Park from Boulder (a solid three hour drive), Denver, Colorado Springs, Pueblo and even the western slope just to be here. The hiking and bicycling trails in the area are beginning to receive national recognition.

Grape Creek is well known for providing local anglers and tourists with opportunities to catch healthy rainbow and brown trout. The wilderness character brings return tourism and long-term economic stability for outfitters and businesses. Mining operation noise would severely affect the joy of fishing in the Grape Creek area and would have a negative economic impact.

Any water pollution and any water depletion in Grape Creek will affect the fishing habitat and population. We already face statistically hotter summers than in the recent past, something we have no control over. We do, however, have control over approval of a gold mine that risks damage to this world-class fishing area.

Mining activity will create unavoidable disturbances and heavy truck traffic which will result in lower quality fishing, decreased recreational use, and less local spending.

WILDLIFE:

We are blessed with beautiful geologic surroundings, clean air, and a silence that only nature can provide. The planned gold mine area is in terrain filled with mule deer, mountain lion, black bear, bighorn sheep, wild turkey, raptors, resident and migratory trout, and other wildlife. In recent years the BLM and the City have worked on improving the Grape Creek riparian habitat.

No environmental impact analysis has been done and is not required because Zephyr's permit application is limited to land they own or control. As written, the permit application provides no assurances that the mining operation will not significantly impact the animal habitat and environment in our generation or future generations.

We want long-term protection for our regional wild lands and abundant wildlife.

RECLAMATON:

Only $261,813 has been set aside for reclamation of the 'affected area'. These funds are expected to cover 82 acres. This allocation is highly underestimated and isn't adjusted for inflation.

The application does not address how reclamation will ensure that the 121 feet of tailings piles will not collapse under heavy rain, impacting future generations.

There is no allocation of funds to address unexpected depletion of surface or underground water, pollution of surface or underground water, fire, explosion, power outage, or other potential disasters. There is no safety net for the community.

CONCLUSIONS:

The proposed gold mine lies immediately adjacent to 800+ homes and a heavily used recreational and environmentally sensitive area. Our local recreational opportunities add substantial and sustainable value to the local economy by attracting tourists from around the world and providing local residents with world-class outdoor activities. This area of land is worthy of preservation for our community, for future generations, and for the wildlife.

There needs to be a sizable reserve for unexpected mitigation. It shouldn't be left to the City, or the County, or the citizens to clean up a disaster not of our making.

The gold mining operation would have a devastating impact on the fragile natural environment in our community. It's an extractive industry with no sustainable benefits to the local community and economy. It would result in damage to the natural habitat as a result of soil and water contamination to Grape Creek, increased fire risks, and additional vehicular traffic creating a host of problems.

There have been a significant number of disasters from mining activities in Colorado. This fact cannot be refuted. Approving Zephyr Minerals permit application could or is likely to add to the list of unintended disasters. The four fundamental flaws in the application documented above and risks that endanger this pristine area **require that DRMS deny this permit without any consideration of potential revisions**.

Respectfully,

The Dawson Ranch HOA Board