

Written Testimony of James Wells, PhD, Environmental Geologist
L. Everett & Associates, Environmental Consultants
Testimony before House Natural Resources Subcommittee on
Indigenous Peoples of the United States
Hearing on “The Irreparable Environmental and Cultural Impacts
of the Proposed Resolution Copper Mining Operation”
March 12, 2020

I would like to thank Chairman Grijalva, Chairman Gallego, and members of the House Subcommittee for Indigenous Peoples of the United States for inviting me to testify at this hearing about the proposed Resolution Copper Mine. I am a Registered Geologist and I have been a practicing environmental geologist for nearly 30 years. My Bachelor’s Degree is from Dartmouth College and my Masters’ and PhD degrees are from the University of Washington in Seattle, all in Geological Sciences. For the last seven years, I have advised the San Carlos Apache Tribe on environmental and water resource matters related to the proposed Resolution Copper Mine, as well as other matters.

At the invitation of the US Forest Service, I served on the Groundwater Modeling Workgroup which advised Tonto National Forest on its preparation of the Draft Environmental Impact Statement (EIS), using complex groundwater modeling methods to predict water and ecosystem impacts from the proposed mine. The working group consisted of Forest Service and Resolution Copper personnel, as well as professionals from stakeholder agencies such as US EPA, US Geological Survey, Arizona Game and Fish, and Arizona Department of Environmental Quality. Also, at the invitation of Tonto National Forest, I am currently a member of the Resolution Copper Mine Water Resources Working Group which is advising the Forest Service on its efforts to respond to public comments on the Draft EIS. For context, of roughly 30,000 comments submitted to the Forest Service on the Draft EIS during the public comment period, approximately 20% of the substantive comments related to water resources or water quality, demonstrating the public’s deep concern about this issue.

The Draft EIS prepared by Tonto National Forest identifies a number of profound environmental impacts from this project that cannot be mitigated. The scale of this project is hard to fathom and unfortunately the Forest Service fell short of its obligation under CEQA rules to take a hard look and ensure scientific integrity in its evaluation of these environmental impacts.

Inadequate Evaluation of Cumulative Impacts on Water Resources in a Region Already Experiencing Shortages

Once mining commences, the formation of a subsidence crater becomes inevitable and unstoppable. Even Resolution Copper cannot stop this process once it has begun. Further, once the 1.8-mile wide subsidence crater forms, the Apache Leap Tuff Aquifer will be altered forever,

irreversibly and permanently altering the region's water resources. This is the very definition of an irreparable harm. As stated in the Draft EIS, "The deep groundwater system is being and would continue to be actively dewatered, and once block-caving begins the Apache Leap Tuff would begin to dewater as well."¹

The Draft EIS analysis of past, present and reasonably foreseeable future regional water impacts is inadequate, even though the Forest Service acknowledges that "groundwater demand is substantial and growing" and "total demand on the groundwater resources in the East Salt River Valley is substantial and could be greater than the estimated amount of physically available groundwater" (DEIS, p. 342). The DEIS does not take a realistic look at the consequences of Resolution's plan to pump 550,000 acre feet of water (as cited in DEIS Table 2.2-1) from the aquifer in the East Salt River Valley.

There is disagreement about the accuracy of Resolution's water use predictions, but even if we take Resolution at its word, it will use about 775,000 acre feet of water over the life of the mine, of which 70% will be pumped from a large network of new extraction wells in the East Salt River Valley. 775,000 acre feet equals 250 billion gallons of water. The mine will consume enough water to supply a city of 140,000 people every year for 50 years. This is a vast new water demand for an area of the southwest that is already experiencing water shortages.

The East Salt River Valley is part of the Phoenix Active Management Area. There are already lots of straws drawing water out of this basin. Phoenix, Scottsdale, Tempe, Mesa, Gilbert, Chandler, Apache Junction and other towns rely on groundwater from the very same basin that Resolution will be pumping from. In its latest study, the Arizona Department of Water Resources predicted demand to exceed supply into the foreseeable future for this basin and also predicted irreversible loss of aquifer capacity due to overpumping.² In an October 2019 study of the adjacent Pinal Active Management Area, Arizona DWR finds a future unmet demand of 8.1 million acre-feet.³ There is simply not enough water to go around. By green-lighting this mine, we are embarking on an uncontrolled experiment on social priorities pitting Arizona's agricultural, municipal and tribal interests against those of a multinational mining company and the mining company is winning.

¹ Draft EIS, pp. 296-299.

² Arizona Department of Water Resources, 2010, Modeling Report #22, A Salt River Valley Groundwater Flow Model Application. 100-Year Predictive Scenarios Used for the Determination of Physical Availability in the Phoenix Active Management Area.

³ Arizona Department of Water Resources, 2019 Pinal Model and 100-Year Assured Water Supply Projection Technical Memorandum.

Tens of thousands of people in Pinal County rely on groundwater for their water supply and already, private wells are drying up.⁴ As shown on Figure 1, the Forest Service’s own research shows that Arizona has experienced moisture deficits even when averaged over the last 100 years.

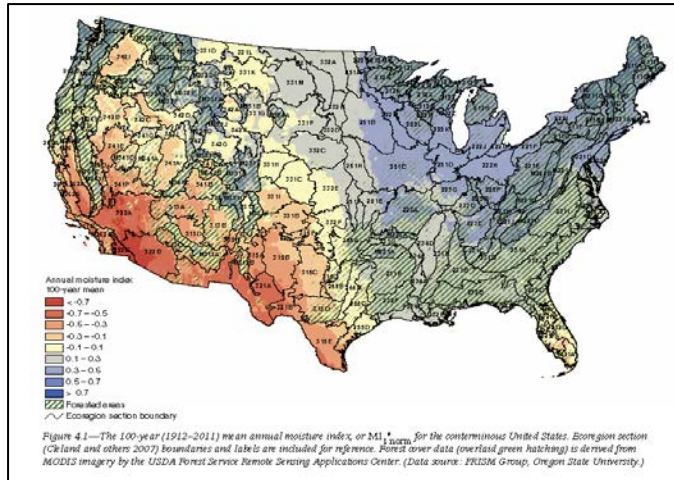


Figure 1. USDA 100-year moisture index, showing much of Arizona has a moisture deficit, even when averaged over 100 years. Source, USDA, 2012, *Forest Health Monitoring: National Status, Trends and Analysis*.

the effects of climate change suggest that “a transition to a more arid average climate in the American West” may be under way. Likely consequences of climate change include higher temperatures in the West, higher evapotranspiration, reduced precipitation, and decreased spring runoff.⁵

The DEIS fails to evaluate “reasonably foreseeable future” Colorado River shortages and cuts, as well as the events that will be triggered under the Drought Contingency Plan once shortages occur. It also fails to look at the project’s impact on regional water resources when combined with these shortages.

Cumulative Impacts

Resolution Copper Mine will obviously require a vast amount of water in a region of the country that is already experiencing water shortages. Arizona water law grants exceptional leeway to mines, which are essentially unregulated water users. As such, Resolution Copper may be entitled to develop a virtually unlimited number of wells and pump an unlimited amount of water

Colorado and other parts of the desert Southwest remain in an almost perpetual drought. Figure 2 is the Interagency Drought Monitor map showing long-term and short-term drought conditions in and around the project area and across much of the Colorado River Basin. A 2017 Report to Congress noted that the Colorado River (source of critical water supplies to Arizona via the Central Arizona Project or “CAP”) has experienced lower-than-normal flows for the past 16 years, with some of the lowest annual flows in 900 years. The Report to Congress also noted that recent studies on

⁴ ABC15 News, Private Wells Running Dry in Pinal County, Oct. 24, 2019; <https://www.abc15.com/news/region-central-southern-az/private-wells-running-dry-in-pinal-county>.

⁵ Congressional Research Office, November 9, 2017, *Drought in the United States: Causes and Current Understanding*, pp. 14-15.

from the East Salt River Valley. The Forest Service seems to have (incorrectly) concluded that because of this water right, it is relieved of considering impacts that would arise from the exercising of this right. This approach is not sufficient under NEPA and does not satisfy the requirement under NEPA to take a “hard look” at environmental impacts.

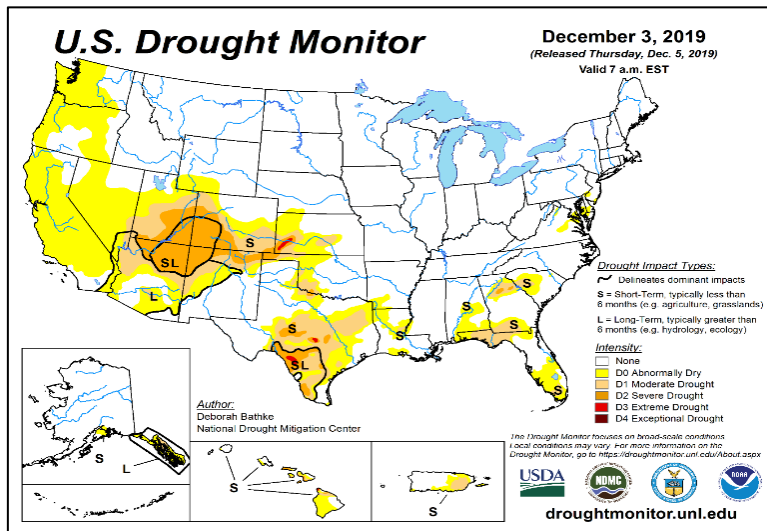


Figure 2. US Drought Monitor Map, accessed on 12/6/2019.

Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions.”⁶ One of the greatest contributions the Forest Service *could have made* to this process—but did not—would have been to conduct a thorough analysis on cumulative impacts of

Resolution’s plan to pump 180 billion gallons of water from the aquifer in the East Salt River Valley.

Inadequacy and Unreliability of Groundwater Models

40 CFR §1502.24 requires that agencies ensure scientific integrity of analyses in environmental impact statements. This means that scientific analyses must be reliable. As noted in the Draft EIS,

“The Groundwater Modeling Workgroup recognized that a fundamental limitation of the model—of any model—is *the unreliability of predictions far in the future*, and the workgroup was tasked with determining a time frame that would be reasonable to assess.”⁷

The Forest Service subsequently “determined that results could be reasonably assessed up to 200 years into the future.”⁸ This is a problem because some hydrogeological impacts not only persist, but actually get worse in timeframes far beyond 200 years.

⁶ 40 CFR §1508.7.

⁷ Draft EIS, p. 300, emphasis added.

⁸ Draft EIS, p. 300.

The groundwater model was actually run for 1,000 years into the future (DEIS, p. 296) although only the first 200 years are reported quantitatively in the DEIS. This long-term analysis documented that in some areas around the mine, groundwater levels will continue to decline for many hundreds of years, thus potential impacts to Groundwater-Dependent Ecosystems (GDEs) will only increase beyond the 200-year cut-off for analysis. For example, the 1,000-year hydrograph produced by Resolution's modeling consultant for Hidden Spring predicts a continuing decline in groundwater levels for almost 800 years.⁹ That impacts continue (and worsen) over such vast timeframes is a testament to how large and disruptive this project truly is and how environmental impacts from this project should be measured on a geologic time scale. By limiting the period of analysis, the Forest Service discounted (and did not disclose) the worst impacts that are predicted to occur decades and even centuries later.

The Forest Service also acknowledges (see quotation above) that the best scientific tool available (three-dimensional groundwater modeling) is not up to the task of analyzing such impacts. The Forest Service did not meet its obligation under 40 CFR §1502.24 because it did not maintain scientific integrity in analyzing hydrogeological impacts beyond 200 years, even though such impacts are certain and significant.

The limitations and unreliability of the groundwater model are simply the most recent chapter in a long saga of Resolution falsely claiming that it understands the hydrogeology of the project area well enough to assess impacts due to mining. I acknowledge that Resolution has conducted substantial investigations into the hydrogeology of the project area. However, the Forest Service failed to recognize that the knowledge base was still inadequate for the purposes of the DEIS.

The hydrogeology of the project area is extremely complex, with multiple aquifers, multiple faults and variable rock types. When combined with a proposed project of such immense scale, it is a significant challenge to conduct a groundwater impact analysis and the Forest Service has not met this challenge. Starting at least as early as 2016, Resolution's consultants assured the Forest Service scientists and others that the West Boundary Fault, Concentrator Fault and other faults would limit the western aerial extent of groundwater drawdown (under Superior and farther west) from mine dewatering at Shafts 9 and 10. Resolution's own computer model later contradicted this conclusion, instead showing nearly 10 feet of drawdown as far west as the Boyce Thompson Arboretum (see Figure 4 showing substantial drawdown beyond the boundary faults surrounding the mine site). In addition, Resolution's hydrogeological studies failed to predict the inflow of 600 gallons per minute of hydrothermal groundwater (170° F) that was encountered when sinking Shaft 10.

⁹ Groundwater Working Group Meeting Notes, Meeting #8 held on May 15, 2018.

Resolution's own assessment acknowledges that groundwater will be depleted by at least 10 feet (and in some places, more than 1,000 feet) over an area covering about 300 square miles. As shown on this map, this is a consequence of dewatering at the mine site as well as massive amounts of pumping that will occur in the East Salt River Valley, about 15 miles west of the mine. No one knows how long it will take for the aquifers to recover after the mine closes, but Resolution once estimated that it would take about 1,000 years.

Inadequate Analysis of Impacts on Groundwater-Dependent Ecosystems

In evaluating this project, the Forest Service has violated its own groundwater policy for Tonto National Forest. The Draft EIS acknowledges that "Between 14 and 16 GDEs, mostly sacred springs, would be anticipated to be impacted by dewatering." Use of groundwater that impacts springs and streams is contrary to Tonto National Forest's groundwater policy:

"Groundwater shall be managed for the long-term protection and enhancement of the Forest's streams, springs and seeps, and associated riparian and aquatic ecosystems. Development and use of groundwater for consumptive purposes shall be permitted only if it can be demonstrated that such proposals will adequately protect Forest resources."¹⁰

One of the most important expectations of the groundwater modeling effort was to assist the Forest Service in evaluating future impacts to springs and perennial streams that support

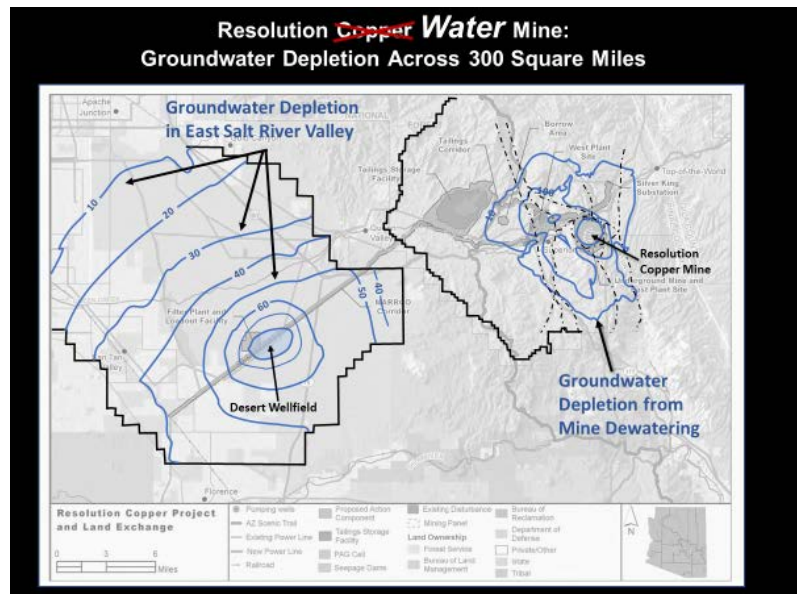


Figure 3. Map showing predicted groundwater drawdown from mine dewatering and from the Desert Wellfield. Sources: Base Map: DEIS, Figure ES-2; Desert Wellfield drawdown contours redrawn from DEIS, Figure 3.7.1-2 (Desert Wellfield modeling analysis area and maximum modeled pumping impacts); Mine model contours redrawn from WSP, October 31, 2018, Memo: Resolution Copper Groundwater Flow Model – Predictive Results, Figure 5 (Regional Groundwater Model Predicted Drawdown-Proposed Action Post Closure (Year 200)); Faults are redrawn from WSP, February 2019, Resolution Copper Groundwater Flow Report, Figure 2.1 (Regional Geology Map).

¹⁰ Martin and Loomis, Keeping Our Streams Flowing: Tonto National Forest Groundwater Policy, in: Furniss, Clifton and Ronnenberg, eds., 2007, Advancing the Fundamental Sciences: Proceedings of the Forest Service National Earth Science Conference, October 2004, PNW-GTR-689, USDA, Forest Service, Northwest Research Station.

groundwater-dependent ecosystems (GDEs).¹¹ The computer model used to evaluate this issue does not quantitatively simulate groundwater-surface water interactions: “Changes in stream flow cannot be evaluated based on the groundwater model.”¹² Instead, it was decided that a finding of hydrogeological “impact” would only be identified if the model predicted at least a 10-foot drop in the groundwater elevation in the immediate vicinity of a GDE. As stated in the Draft EIS,

“... the Groundwater Modeling Workgroup determined that to properly reflect the level of uncertainty inherent in the modeling effort, results less than 10 feet should not be disclosed or relied upon, as these results are beyond the ability of the model to predict.”¹³

In short, the Forest Service has acknowledged that its scientific methodology (groundwater modeling) has a limit of precision of plus or minus 10 feet. The Working Group concluded that drawdowns of less than 10 feet could still have an impact on GDEs:

“The Groundwater Modeling Workgroup recognized that while the model may not be reliable for results less than 10 feet in magnitude, changes in aquifer water level much less than 10 feet still could have meaningful effects on GDEs, even leading to complete drying.”¹⁴

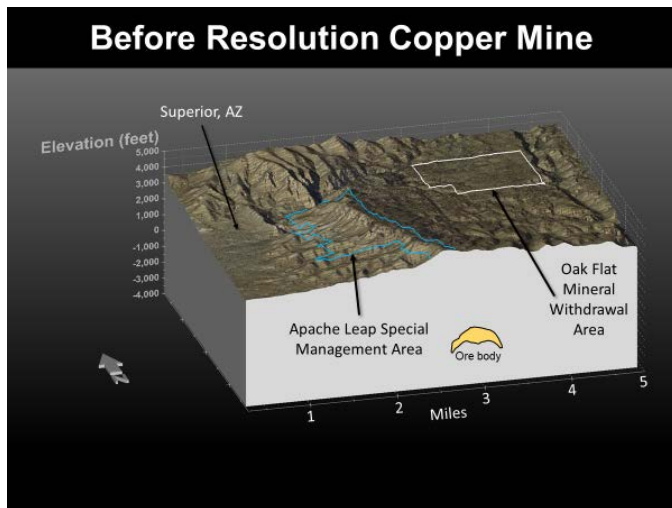
However, due to the limitation of the model, in places where the model predicts drawdown greater than zero but less than 10 feet, the Forest Service assumed (without proof) that there are no impacts: “to properly reflect the level of uncertainty inherent in the modeling effort, results less than 10 feet should not be disclosed or relied upon” (Draft EIS, p. 301). The Forest Service did not scientifically conclude that 10 feet or more of groundwater drawdown is needed to cause an impact on GDEs, this was just an arbitrary number based on limitations of the method of analysis, not some scientific principle.

¹¹ BGC Environmental, November 2018, Review of Numerical Groundwater Model Construction and Approach, Section 1.1, “Issues to be Addressed by the Groundwater Model”.

¹² BGC Environmental, November 2018, Review of Numerical Groundwater Model Construction and Approach, Section 4.9.2.

¹³ Draft EIS, p. 301.

¹⁴ Draft EIS, p. 301.



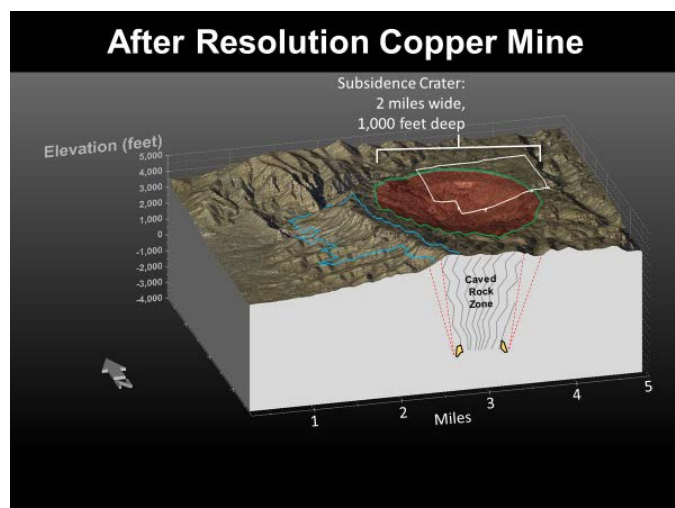
In conclusion, the Forest Service chose a methodology that is incapable of thoroughly analyzing impacts of mine dewatering and the collapse crater on GDEs. In this instance, the Forest Service is not meeting its obligation under 40 CFR §1502.24, because it is relying on a scientific method (groundwater modeling) that is not capable of predicting significant hydrogeological impacts for this complex project.

Inadequate Consideration of Alternatives to Block Cave Mining as a Way to Avoid Permanent Water Resource Impacts

Once the 1.8-mile-wide subsidence crater forms, the Apache Leap Tuff Aquifer will be altered forever. As stated in the Draft EIS, “The deep groundwater system is being and would continue to be actively dewatered, and once block-caving begins the Apache Leap Tuff would begin to dewater as well.”¹⁵ The Apache Leap Tuff Aquifer is a critical source of water for springs and creeks, many of them sacred. This permanent impact would not occur if alternative underground mining methods were employed, but the Forest Service did not conduct an adequate analysis of alternative mining methods (as discussed elsewhere in these comments) largely because the Forest Service accepted Resolution’s assertion that any method other than block cave mining would be too expensive. The Draft EIS disclosed a number of profound impacts due to the collapse crater that cannot be mitigated, including to water resources. By failing to conduct an acceptable and competent evaluation of project alternatives that could avoid the impacts caused by the collapse zone, the Forest Service is allowing one factor (cost of mining: i.e., Resolution’s profitability) to outweigh all environmental and social factors combined.

Mitigation of Impacts to Groundwater Dependent Ecosystems

The Draft EIS concludes that the Resolution Copper Mine project will or is likely to deplete water supplies and



¹⁵ Draft EIS pp. 296-299.

harm or destroy the streams, springs, seeps and other water features in Oak Flat, Ga'an Canyon (Devil's Canyon), Mineral Creek and Queen Creek: "Between 14 and 16 GDEs, mostly sacred springs, would be anticipated to be impacted by dewatering. Although mitigation would replace water, impacts would remain to the natural setting of these places."¹⁶ The proposed mitigation for GDEs is inadequate. Mitigation plans are outlined in an April 2019 report.¹⁷ This report calls for replacing water flows in springs and creeks by pumping water from nearby wells (i.e., tapping groundwater from deeper in the aquifer), storing water in tanks and piping the water to the creek or stream or by constructing various water-collecting devices such as so-called "guzzlers," surface water capture systems or even trucking water in from alternative sources. Replacing a natural system with a manufactured facsimile of the system is not the intention of mitigation under NEPA. Just as it would not be permissible to replace the real Half Dome with a very large photograph of Half Dome, it is not permissible to replace lost GDEs with artful but artificial copies of natural systems. It was not the intention of NEPA to replace nature with Disney-like imitations of nature.

The monitoring plan for GDEs is also inadequate because its discussion of triggers (i.e., occurrences or observations that would trigger mitigation activities) is vague and incomplete. The Montgomery Report¹⁸ reveals that Resolution has built in (and the Forest Service has bought into) any number of ways to avoid actually implementing mitigation measures for GDEs. In particular, the Plan explains that Resolution will somehow differentiate the impacts from its dewatering from other variables such as "changes in weather and/or climate, impacts to the regional and/or local groundwater system from other human causes, landscape changes such as landslides and fires, natural succession of the GDE into a new presentation such as an increase in phreatophytic plants coincident with a reduction in spring flow rates, or other reasons not included in this document." Other than noting that Resolution will employ "multiple lines of evidence" there is no quantitative or qualitative discussion of how Resolution will accomplish this difficult task. Considering that all of the GDEs covered by the monitoring plan have already been identified as likely to be severely impacted by mine dewatering, this is a problematic situation and is inadequate under NEPA.

Appendix J of the Draft EIS specifies that the monitoring and mitigation plan is not intended to address water sources associated with perched shallow groundwater in alluvium or fractures. Including shallow fracture flow in this statement incorrectly excludes important and probably

¹⁶ Draft EIS p. 123.

¹⁷ Montgomery & Associates, 2019, "Monitoring and Mitigation Plan for Groundwater Dependent Ecosystems and Water Wells."

¹⁸ Montgomery & Associates, 2019, "Monitoring and Mitigation Plan for Groundwater Dependent Ecosystems and Water Wells."

inevitable impacts directly related to mining. Fracture flow¹⁹ is likely the dominant groundwater flow mechanism in the Apache Leap Tuff and this groundwater unit is the source of water discharges that support riparian zones in Ga'an Canyon (Devil's Canyon), Mineral Creek and possibly Queen Creek. The groundwater system in the Apache Leap Tuff will be profoundly and irrevocably altered by the formation of the collapse crater. The Draft EIS is incorrect in excluding shallow fracture flow from monitoring and mitigation requirements.

Water Quality Impacts-Acid Rock Drainage

As noted in the Draft EIS, "The deposit is associated with hydrothermal alteration and includes a strong pyrite "halo" in the upper areas of the deposit, containing up to 14 percent pyrite. This mineralization has ramifications for water quality, as sulfide-bearing minerals such as pyrite have the potential to interact with oxygen and cause water quality problems (acid rock drainage)".²⁰ Much of the mineralized halo (i.e., rocks with abundant sulfide minerals but a lower grade of copper) will not be mined out, rather it will become a permanent part of the collapse zone.

The Draft EIS makes the unsupported assumption that the mineralized, fractured rock in the collapse zone will not be in contact with oxygen, thus will not form acid rock drainage. This is a highly optimistic conclusion that defies common sense. As the collapse zone forms, the rock will become fractured (thus increasing its hydraulic conductivity many orders of magnitude) and largely dewatered. For the purposes of groundwater modeling, Resolution assumes that the hydraulic conductivity²¹ of rock in the cave zone will increase by as much as a factor of a million: "Maximum hydraulic conductivity values were altered by a multiplier of 1E+6 or to a hydraulic conductivity of 100 ft/day, whichever occurs first...The maximum hydraulic conductivity value of 100 ft/day was selected because it is much higher than the natural, unaltered bedrock, but higher values caused the model to become unstable."²² This statement highlights another deficiency of the groundwater model: hydraulic conductivity of rock in the

¹⁹ Groundwater flow is generally thought of as flow through porous media, that is, through the pore spaces between the grains that make up sediments and sedimentary rocks. This is considered "primary porosity." Fractures are a form of secondary porosity, created due to tectonic forces or other stresses on the rock. Large fractures can increase rates of groundwater flow very substantially compared to the generally slow flow through porous media, thus can be very important in mountainous regions with significant fracturing.

²⁰ Draft EIS p. 140.

²¹ Hydraulic conductivity is a measure of the ease by which groundwater flows through an aquifer. This, in turn, affects the groundwater velocity through the aquifer. Solid rock has a very low hydraulic conductivity; sandstone has a higher hydraulic conductivity and very coarse grained sediments like gravels have even higher hydraulic conductivity.

²² WSP, February 2019, Resolution Copper Groundwater Flow Report, pp. 37-38.

collapse zone was arbitrarily limited to 100 ft/day because the model would crash if higher (i.e., more realistic) values were used.

Atmospheric air will easily penetrate the fracture zone, supplying oxygen into a subsurface environment that has probably been devoid of oxygen for thousands if not millions of years. This assumption (no oxygen thus no acid-generating reactions in to collapse zone) is likely incorrect and likely greatly understates the impacts from acid rock drainage within the mine and in ore stockpiles.

Water Quality Impacts-Tailings Facility

The scale of this project is hard to grasp, but the volume of tailings produced by Resolution Copper would fill the Rose Bowl to its brim, not once but nearly 1,800 times. This vast volume of waste material will permanently disturb 16,000 acres of land of which nearly 8,000 acres is Arizona State Land. The principal accomplishment of the Draft EIS seems to be to propose a new location for the mine's 1.37 billion tons of tailings, but the Draft EIS is inadequate in its assessment of impacts at this new location to surface water and groundwater quality due to seepage from the preferred tailings storage facility. Water quality impacts from the tailings is one of the most profound and concerning environmental issues for a mine of this size, yet there is virtually no defensible scientific analysis of this issue in the Draft EIS. Indeed, except for the Near West site, there is no true, data-supported, site-specific analysis of potential impacts to surface water and groundwater quality at any of the alternative tailings sites.

Impacts to Apache Leap Special Management Area

Resolution chose to employ block cave mining (thus ensuring creation of a 1.8-mile wide subsidence crater) because that's the cheapest way to mine this deep ore body. A consequence of this mining method is that reclamation or restoration is simply impossible: maybe a sturdy fence and maybe some "no trespassing" signs.

There is a high degree of uncertainty in Resolution's subsidence predictions but we've been assured that the subsidence crater will not extend into the Apache Leap Special Management Area. True or not, we do know it will creep up the eastern slope of Apache Leap and profoundly degrade the quality of this theoretically protected place. In 75 years, if we could stand together

on the crest of Apache Leap, instead of the world-class view across Oak Flat, we would see a massive pit of collapsed rock, just a couple hundred meters away, devoid of life & gradually filling with toxic mine water. Imagine standing on the stairs of the US Capitol and seeing nothing but a 1,000-foot deep rocky pit, starting at the Capitol reflecting pool, swallowing not only the Smithsonian Museums and the Washington Monument, but extending all the way to the Lincoln Memorial. That's how immense this subsidence crater will be.



Conclusions

This mining project has long-term consequences to the groundwater resources in Arizona as a whole and the Phoenix Active Management Area, in particular: in some cases, permanent consequences. Once mining commences, the formation of a subsidence crater becomes inevitable and unstoppable. The Draft EIS acknowledges that total demand for water in the East Salt River Valley is growing and could be greater than the available supply.²³ And yet, the Draft EIS does not take a realistic look at the consequences of Resolution's plan to pump 180 billion gallons of groundwater from the Desert Wellfield: a network of new extraction wells proposed for the East Salt River Valley.

Considering the effects of ongoing drought conditions and likely reductions in deliveries of Colorado River water to Arizona via the CAP, it is nearly certain that the new demand from Resolution's pumping of groundwater from the East Salt River Valley will lead to water shortages among the many users of this groundwater basin. Even more certain is the irreversibility of Resolution Copper's impacts to the Apache Leap Tuff Aquifer which will be altered forever: permanently altering the region's water resources and threatening permanent and unmitigable impacts to local streams and springs, many of which are sacred to Arizona Tribes.

²³ Draft EIS, p. 342.