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By Electronic Mail Only

RE: Comments: Proposed Administrative Changes to Kaibab National Forest Plan Chapter 5

Dear Supervisor Provencio and Ms. Leonard:

Thank you for the opportunity to provide comments on the proposed changes to the monitoring chapter of the Kaibab National Forest Plan. We commend the Forest Service for its work to bring the Forest Plan into compliance with the 2012 Planning Rule and appreciate the consideration that the Grand Canyon Trust has been given in this process. As discussed further below, the Trust's comments on the Monitoring Plan Transition to the 2012 Forest Planning Rule are focused on a single issue - improving groundwater monitoring in the vicinity of uranium mines on the Kaibab National Forest.

There is currently no long-term groundwater monitoring required near uranium mines despite the serious threat that uranium mining poses to groundwater quality - a scarce and precious resource in the Grand Canyon region. To address this, we propose a monitoring solution in the form of an existing "Best Management Practice" (BMP) that was crafted by a multiple-agency team in 2012. This BMP is specifically designed to institute long-term groundwater monitoring near breccia pipe uranium mines. Instituting this BMP would both safeguard groundwater resources from contamination and provide needed information about little-understood groundwater flow in the Grand Canyon region. Moreover, and as discussed in depth below, the Kaibab Forest Plan's monitoring provisions, the 2012 Mineral Withdrawal, and the 2012 Planning Rule itself all support the inclusion of the Best Management Practice for long-term groundwater monitoring in the vicinity of uranium mines. We appreciate your time and attention to this issue.

I. Identity of Commenting Party

The Grand Canyon Trust is a non-profit corporation with offices in Flagstaff, Arizona, Castle Valley, Utah, and Denver and Durango, Colorado. The mission of the Trust is to protect and restore the Colorado Plateau – its spectacular landscapes, flowing rivers, clean air, diversity of plants and animals, and areas of beauty and solitude. The Colorado Plateau stretches from the Grand Canyon to northern Utah and into western Colorado and New Mexico. The Trust has long worked to secure responsible operation and timely reclamation of uranium mines and mills, and ensure that the Plateau and Grand Canyon are safeguarded from toxic and radioactive contamination. The Trust employs a professional staff of 26, has 25 committed Trustees, a national membership of more than 4,000, and an active seasonal volunteer workforce of more than 450 people who engage in conservation projects across the Colorado Plateau.

II. Background on Uranium Mining in the Grand Canyon Region

The Grand Canyon and its surrounding areas contain significant quantities of uranium. Although the first deposits in northern Arizona were discovered in the 1940s and 1950s, it was not until the 1970s, when the price of uranium rose, that mining companies began to explore the area in earnest. By the late 1980s and early 1990s, nearly a thousand exploration holes had been drilled and seven mines had begun operations. Six of those mines produced nearly 1.5 million tons of uranium ore during that period.¹

As this early history suggests, the number of uranium mines that are opened and the extent to which they are developed depends largely on the market price of uranium.² Thus, when the price of uranium dropped in the late 1980s and early 1990s, interest waned and many operators put their mines into non-operation.³ In 2004, uranium prices surged again, and “mining-related activities increased on BLM and USFS managed lands.”⁴ Operators located thousands of new mining claims on federal lands surrounding Grand Canyon National Park (10,000 as of 2009).⁵ Although a recent drop in the price of uranium has once again cooled interest,⁶ that dip is, almost inevitably, temporary.⁷ America remains the eighth-largest producer of uranium, behind countries such as Canada and Australia.⁸ Moreover, the lands surrounding the Grand Canyon “have a high potential for uranium with a high level of

¹ BLM, Record of Decision – Northern Arizona Withdrawal, Mohave and Coconino Counties, Arizona (Jan. 9, 2012), at 2-3, 5-6, *available at* http://www.blm.gov/pgdata/etc/medialib/blm/az/pdfs/withdraw/feis.Par.88586.File.dat/NorthernArizona-ROD-v20-1%2011%202012_wsignederrata.pdf (hereinafter “2012 Withdrawal ROD”).

² *Id.* at 3.

³ *Id.* at 2.

⁴ *Id.* at 3. As of 2012, there were an estimated 221 uranium mining operations on federal lands, with 202 on BLM-managed lands, three on National Forest System lands, and 16 on Department of Energy lease tracts. Only seven of the 221 operations were actively extracting uranium as of 2012. *See* U.S. Government Accountability Office, *GAO-12-544 – Uranium Mining: Opportunity Exist to Improve Oversight of Financial Assurances; Report to the Ranking Member, Committee on Natural Resources, House of Representatives*, at 20 (May 2012), *available at* <http://www.gao.gov/assets/600/590929.pdf> (hereinafter “GAO-12-544”).

⁵ 2012 Withdrawal ROD at 3.

⁶ *See, e.g., id.* at 3; Rhiannon Hoyle, “Prices Pull Plug on Uranium’s Power Play,” *The Wall Street Journal* (Sept. 10, 2013) (“Uranium prices are at their lowest level in nearly eight years.”).

⁷ *See, e.g.,* Kate Galbraith, *The New York Times*, “Growth Prospects for Uranium Stir Concerns” (Apr. 14, 2012) (explaining that uranium “companies see a potential hike in demand for their product”), *available at* <http://www.nytimes.com/2012/04/15/us/global-growth-prospects-for-uranium-stir-concerns.html>.

⁸ World Nuclear Association, “World Uranium Mining Production” (July 2013), *available at* <http://www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Mining-of-Uranium/World-Uranium-Mining-Production/>.

certainty,” and the uranium deposits found there are “of higher grade than approximately 85% of the world’s known uranium deposits.”⁹ Uranium mining therefore will continue and likely increase in the future on lands where it is permitted.

This constant cycle of boom and bust has brought to the surface an underlying public concern: “that uranium mining could adversely affect natural, cultural, and social resources in the Grand Canyon watershed, which includes resources in Kaibab National Forest and Grand Canyon National Park.”¹⁰ To guard against these adverse effects,¹¹ in 2008 legislation was introduced in Congress that would have permanently withdrawn over one million acres in the Grand Canyon watershed from mineral entry and location and other uses.¹² Congress did not pass the bill, but it did direct the Secretary of the Interior to consider whether to exercise his administrative authority to protect the area. Accordingly, in 2009 the Secretary of the Interior proposed, and in 2012 adopted, a 20-year administrative withdrawal (“2012 Withdrawal”) “to protect the iconic Grand Canyon and its vital watershed from the potential adverse effects of additional uranium and other hardrock mining on over 1 million acres of federal land for the next 20 years.”¹³ As the basis for his decision, the Secretary reasoned that much more data needed to be gathered about “subsurface water movement, radionuclide migration, and biological toxicological pathways”; that while the probability of certain impacts might be “low,” they would be “significant”; that “the potential impacts to tribal resources could not be mitigated”; and that “the set of circumstances and the unique resources located in this area support a cautious and careful approach.”¹⁴

As much as the 2012 Withdrawal protects these precious resources, it does not stop uranium mining. Among other things, the 2012 Withdrawal made the prohibition against mineral entry and location subject to “valid existing rights,” which the Department of the Interior interprets to mean any and all mining claims that pre-date the 2012 Withdrawal decision.¹⁵ As of December 2011, 3,156 uranium mining claims fit this definition, and the

⁹ BLM, Northern Arizona Proposed Withdrawal Final Environmental Impact Statement, ES-8 (Oct. 2011), available at http://www.blm.gov/az/st/en/info/nepa/environmental_library/eis/naz-withdraw.html (hereinafter “2011 Withdrawal FEIS”).

¹⁰ 2012 Withdrawal ROD at 3.

¹¹ See Section 4.2 (discussing adverse effects).

¹² Grand Canyon Watersheds Protection Act of 2008, H.R. 5583 (110th Cong., Mar. 11, 2008) (Rep. R. Grijalva, D-AZ); see also 2012 Withdrawal ROD at 3.

¹³ U.S. Department of the Interior, Press Release, “Secretary Salazar Announces Decision to Withdraw Public Lands near Grand Canyon from New Mining Claims” (Jan. 9, 2012), available at <http://www.doi.gov/news/pressreleases/Secretary-Salazar-Announces-Decision-to-Withdraw-Public-Lands-near-Grand-Canyon-from-New-Mining-Claims.cfm>; see also Public Land Order No. 7787 (Jan. 21, 2012), available at http://www.blm.gov/az/st/en/info/nepa/environmental_library/eis/naz-withdraw.html; *Yount v. Salazar*, 933 F. Supp. 2d 1215 (D. Ariz. 2013) (upholding withdrawal against mining industry challenge). Administratively withdrawn lands are areas “with[held] . . . from settlement, sale, location, or entry, under some or all of the general land laws, for the purpose of limiting activities under those laws in order to maintain other public values in the area or reserving the area for a particular public purpose or program; or transferring jurisdiction over an area . . . from one [government entity] to another.” 43 U.S.C. § 1702(j).

¹⁴ 2012 Withdrawal ROD at 11.

¹⁵ The Secretary of the Interior’s withdrawal authority derives from Section 204 of the Federal Land Policy Management Act (“FLPMA”), 43 U.S.C. § 1714. When it was passed in 1976, FLPMA provided that “[n]othing in this Act . . . shall be construed as terminating any valid lease, permit, patent, right-of-way, or other land use right or authorization existing on the date of approval of this Act,” and that “[a]ll actions by the Secretary concerned under this Act shall be subject to valid existing rights.” Pub. L. No. 94-579 (1976), § 701(a) & (h), 90 Stat. 2743, 2786-87, reprinted in 43 U.S.C.A. § 1701 historical note. That savings clause arguably was intended to protect property rights that existed at the time FLPMA was enacted in 1976, not rights that came into being after 1976 but before some subsequent administrative decision. See, e.g., *Western Watersheds Project v. Matejko*,

Department of the Interior conservatively estimates that 11 of them could be fully developed during the 20 years the 2012 Withdrawal is in effect.¹⁶ The Canyon Mine, currently being drilled on the Kaibab National Forest, is one of these mines.

III. Uranium Mining Threatens Contamination of Scarce Groundwater Resources

In the Final Environmental Impact Statement (EIS) for the 2012 Withdrawal, the Department of the Interior studied the use and contamination of surface waters and groundwater by uranium mining in the Colorado Plateau. In fact, the possibility of such contamination was one reason the Secretary of the Interior issued the 2012 Withdrawal.¹⁷ Impacts to surface waters affect quality and function, while impacts to groundwater (both perched and deep aquifers) primarily affect quality and quantity. However, both waters are “part of a single resource,” and “changes in the quantity and quality of one will affect the same parameters in the other.”¹⁸

Both active and inactive uranium mining operations can directly pollute surface and ground waters with uranium, uranium decay products, chemicals, and metals.¹⁹ Uranium mining “alter[s] conditions underground that could allow uranium and other minerals to be mobilized.”²⁰ The result is that concentrations of uranium, its decay products, metals, and other contaminants are elevated in deep groundwater aquifers.²¹ For example, historic and new data suggest that water seeping into the abandoned Orphan uranium mine, located near the south rim of the Grand Canyon, is generating “elevated concentrations of uranium in water that has moved vertically downward” into an underlying aquifer.²² Samples from Horn Springs Creek, which originates from that aquifer less than a mile from the Orphan Mine and flows into the Colorado River, and nearby Salt Creek show concentrations of dissolved uranium that are at or

468 F.3d 1099, 1104 (9th Cir. 2006); *Cnty. of Okanogan v. Nat'l Marine Fisheries Serv.*, 347 F.3d 1081, 1085 (9th Cir. 2003); *Colo. Envtl. Coal. v. BLM*, 932 F. Supp. 1247, 1249 (D. Colo. 1996) (“Section 701 of FLPMA preserved ‘valid existing rights’ to permit activity on mineral leases issued before the enactment of FLPMA in 1976.”). In fact, BLM took that position shortly after FLPMA’s passage. See BLM, Interim Management Policy and Guidelines for Land Under Wilderness Review, 44 Fed. Reg. 72,014, 72,017 (1979) (“The ‘valid existing rights’ provision of FLPMA (Section 701(h)) clearly applies only to valid rights outstanding on October 21, 1976.”). Nonetheless, the Department of the Interior interpreted “valid existing rights” in the 2012 Withdrawal broadly, *i.e.*, as including any mining claim that existed at the time of the Withdrawal. See 2012 Withdrawal ROD at 6-7 (“As of December 11, 2011, the withdrawal area contains 3,156 mining claims that predate the publication of the Notice of Proposed Withdrawal on July 21, 2009. Withdrawals under section 204 of FLPMA must be made subject to valid existing rights, which means that new mineral exploration and development could still be authorized under the withdrawal on valid existing mining claims.”).

¹⁶ 2012 Withdrawal ROD at 6. These 11 mines include the Pinenut, Kanab, Canyon, and Arizona 1 Mines. *Id.* See Section 3.1.3.1. for a discussion of the legal requirements applicable to valid existing mines in withdrawn areas.

¹⁷ See 2012 Withdrawal ROD at 9-10. Other types of hardrock mining adversely impact surface water and groundwater, but we focus on uranium mining in part because of its unique potential for radioactive contamination.

¹⁸ National Research Council, *Uranium Mining in Virginia: Scientific, Technical, Environmental, Human Health and Safety, and Regulatory Aspects of Uranium Mining and Processing in Virginia*, 180 (2012), available at http://nap.edu/catalog.php?record_id=13266 (hereinafter “National Research Council, *Uranium Mining in Virginia*”).

¹⁹ National Research Council, *Uranium Mining in Virginia*, at 180; 2012 Withdrawal FEIS at 4-62.

²⁰ 2012 Withdrawal FEIS. at 3-7.

²¹ *Id.*; see also *id.* at 3-6, 4-51, 4-58, 4-88.

²² *Id.* at 3-96.

above the maximum contaminant levels set by the U.S. Environmental Protection Agency (“EPA”).²³

Uranium mining operations drain perched aquifers and/or draw water from deep aquifers, affecting the amount of water available for seeps, springs and other water resources. These resources are exceedingly rare in desert environments like the Colorado Plateau, and are critical for a variety of water-dependent species.²⁴ In the early 1980s, exploration boreholes in the vicinity of the Canyon Mine encountered groundwater at depths between 140 feet and 2300 feet and depleted groundwater resources located beneath the mine site, eliminating an estimated 1.3 million gallons per year from the region’s springs that are fed by groundwater.²⁵ In the recent drilling for the Canyon Mine, the company has pierced two perched aquifers at 200 and 300 feet in the early stages of drilling.²⁶ Notably, the fact that the company found groundwater at early stages and at shallow depths contradicts the Final Environmental Impact Statement for the Canyon Mine, which claimed “[g]round water flows, if they exist, are likely to be at least 1,000 feet below the lower extremities of the mine. This, plus the low potential for encountering groundwater in the mine, effectively eliminates the possibility of contaminating the Redwall-Muav aquifer.”²⁷ The current reality of the Canyon Mine piercing perched aquifers at shallow depths casts serious doubt on this conclusion.

Regional history illustrates the real threat uranium mining poses to groundwater. Regional aquifer groundwater wells near the Pinenut and Hermit uranium mines in Northern Arizona – both of which have been or were non-operational for long periods of time – contain dissolved uranium concentrations in excess of EPA drinking water standards.²⁸ Drainage from the un-reclaimed Orphan Mine on the south rim of the Grand Canyon has yielded concentrations of dissolved uranium up to 400 parts per billion in the underlying deep aquifer, “after operations had ceased.”²⁹ (The EPA drinking water limit is 30 parts per billion.³⁰) And the New Mexico Environment Department advises people with private wells in the San Mateo Creek Basin, in northwestern New Mexico, that their water may be contaminated with uranium

²³ *Id.* at 3-96; Donald Bills, et al., Historical and 2009 Water Chemistry of Wells, Perennial and Intermittent Streams, and Springs in Northern Arizona, 156 (Chapter C of U.S. Department of the Interior & USGS, *Scientific Investigations Report No. 2010-5025: Hydrological, Geological, and Biological Site Characterization of Breccia Pipe Uranium Deposits in Northern Arizona* (2010)), available at <http://pubs.usgs.gov/sir/2010/5025/pdf/sir2010-5025.pdf>. The National Park Service warns visitors not to drink water from Horn Creek “unless death by thirst is the only other option.” NPS, Grand Canyon Tonto Trail Description, available at http://www.nps.gov/grca/planyourvisit/upload/Tonto-Bright_Angel_to_Hermit.pdf. NPS is currently cleaning up the Orphan Mine under Superfund at an estimated cost of \$15 million for just the surface area; subsurface and water remediation costs are unknown. *Sidebar: The Story of Orphan Uranium Mine, The Washington Independent* (July 22, 2008), <http://washingtonindependent.com/481/sidebar-the-story-of-orphan-uranium-mine>.

²⁴ 2012 Withdrawal FEIS at 3-6, 3-129, 4-51 to 4-61, 4-136 to 4-137.

²⁵ David Kreamer, Professional Hydrologist and Hydrology Professor, *Uranium Mining in the Grand Canyon: Biting My Tongue In Front of Congress*, 22 *Boatmen’s Quarterly Review* 4, (2009-2010) at 8-12., available at http://www.gcr.org/docs/gtslib/uranium_mining_in_gc.pdf; U.S. Forest Service, Final Environmental Impact Statement Canyon Uranium Mine (August 1986), at 3.36.

²⁶ Personal Communication with Don Bills, U.S. Geological Survey, in Flagstaff, Arizona, (June 23, 2016).

²⁷ U.S. Forest Service, Final Environmental Impact Statement Canyon Uranium Mine (August 1986), at vii.

²⁸ Bills, *et al.*, at 158, 160-61; NPS, Grand Canyon National Park, Division of Science and Resource Management, Comments and Concerns Regarding the Proposed Wate Mine and Potentials for Expanded Arizona State Land Breccia Pipe Uranium Mining, 5 (May 9, 2013), available at http://www.grandcanyontrust.org/documents/gc_uranium_grcaCommentsProposedWateMine.pdf.

²⁹ 2012 Withdrawal FEIS at 4-63.

³⁰ *Id.* at 4-64.

from former uranium mining and processing operations, with concentrations above federal and state limits for drinking water.³¹

IV. Immediate Need for Groundwater Monitoring Near Uranium Mines

Robust groundwater monitoring near active uranium mines during the 2012 Withdrawal period of 2012 to 2032 is critical. Monitoring is the only way to achieve the 2012 Withdrawal's goal of gathering data to determine the risk of uranium mining in the greater Grand Canyon region, including on the Kaibab National Forest. For this reason, the U.S. Geological Survey (USGS) is involved in a research program that studies both baseline conditions and the impact of uranium mining on lands within the withdrawn area. Additionally, there is short-term monitoring occurring during all uranium mines' operation terms pursuant to the Arizona Department of Environmental Quality Aquifer Protection Permit requirements.

However, there is no long-term monitoring of groundwater in the vicinity of the uranium mines, including on the Kaibab National Forest. While the Forest Service's hardrock mining regulations do not require operators to engage in long-term monitoring of groundwater quality, a separate regulatory mechanism provides a potential solution. In 2012, drawing from the Final EIS for the 2012 Withdrawal, "Best Management Practices and Compliance Measures for Breccia Pipe Uranium Mining Activities in Northern Arizona" were developed. Among the BMPs is a long-term groundwater monitoring protocol:

"Monitoring/observation wells will be installed into the R-aquifer in the vicinity of each mine, downgradient of the mine site, in order to conduct long-term water monitoring. Protocols for well installation and documentation will be in accordance with the *U.S. Geological Survey Report No. 95 – 398 ("Ground-Water Data-Collection Protocols and Procedures for the National Water-Quality Assessment Program: Selection, Installation, and Documentation of Wells, and Collection of Related Data")*. It would be most desirable to install at least 3 wells since water gradients are not always known."³²

To date, this BMP has not been required either on the state or federal level. If agencies fail to institute long-term groundwater monitoring, the insufficient understanding of uranium mining's impact to groundwater resources will continue. Given the importance of seeps, springs, and groundwater resources in the Grand Canyon region and on the Kaibab National Forest, we urge the Forest Service to address this problem.

V. The Forest Service Should Incorporate the BMP for Groundwater Monitoring in the Vicinity of Uranium Mines into the Forest Plan

We applaud the Forest Service for its work to bring the Forest Plan into compliance with the 2012 Planning Rule, including incorporating a climate change approach, integrating broader landscape-scale strategies, and leveraging a collaborative process. We also appreciate the consideration that the Trust has been given in the process, both as a livestock grazing permittee and as a partner in conservation. With respect to monitoring recommendations, we commend the Forest Service for emphasizing many approaches that "should provide the Kaibab NF with

³¹ New Mexico Environment Department, Advisory Release (Jan. 8, 2009), *available at* <http://www.nmenv.state.nm.us/OOTS/documents/PR-SanMateo-1-8-08--Final2.pdf>.

³² Best management practices and compliance measures for breccia pipe uranium mining activities in northern Arizona, (2012) at 14-15, *available at*, http://www.grandcanyontrust.org/sites/default/files/gc_breccia_uranium.pdf, attached as Exhibit 1.

the best chance for achieving long-term sustainability of its natural resources, as well as the natural resources of the greater landscape.”³³ However, we are concerned that the Forest Service has failed to apply its sound monitoring approach to the specific issue of groundwater threatened by uranium mining.

In the current proposal, there is no incorporation of long-term groundwater monitoring in the vicinity of uranium mines on the Kaibab National Forest. We see this as a significant omission, but there is a clear solution. For the reasons discussed below, we urge the Forest Service to adjust its Plan by incorporating the above-referenced BMP for long-term groundwater monitoring near uranium mines.

First, this incorporation would be consistent with the Forest Plan. As the Forest Plan states, “[d]ue to the limited information available, Kaibab NF efforts and emphasis are placed on improving knowledge on the distribution of water resources and aquatic or wetland biota, resource protection, and rehabilitation of springs, including groundwater flow and geochemical analyses.”³⁴ Incorporating the long-term groundwater monitoring BMP would further the Forest’s goal of improving knowledge of groundwater flow and geochemistry by providing years of data on the impact of uranium mining on downgradient water resources, and enhancing knowledge of groundwater flow. The Forest Plan also provides the goal that “[m]ineral and mining activities meet the legal mandates to facilitate the development of minerals on the Kaibab NF *in a manner that minimizes adverse impacts to surface and groundwater resources.*”³⁵ Having a long-term groundwater monitoring well in place would allow contamination to be detected at an earlier stage, which would allow corrective action that minimized harm to groundwater resources. Finally, the Forest Plan directs that “[t]he impacts of management activities on springs, streams, and wetlands should be evaluated and minimized.”³⁶ Absent long-term monitoring, there is no way to determine and therefore minimize adverse impacts of uranium mining on springs with a hydrologic connection to the areas impacted by the mine shaft or mining activities. Having the BMP in place would allow the Forest Service to “evaluate and minimize” adverse impacts; without monitoring, this is otherwise impossible.

Second, the incorporation of the long-term groundwater monitoring BMP into the Forest Plan would be consistent with the 2012 Planning Rule. The 2012 Planning Rule provides that “monitoring is to be developed using the best available scientific information.”³⁷ As the Forest Plan states, there is currently a dearth of groundwater data available; this is particularly true with regard to uranium mining’s impact on groundwater in the Forest,³⁸ making compliance with this requirement practicably impossible absent additional monitoring. For this reason alone, incorporation of the long-term groundwater monitoring BMP is important to meet the goals of the monitoring rule. Additionally, the 2012 Planning Rule directs that monitoring should inform forest management of the status of resources in the plan area “...including by testing relevant assumptions, tracking relevant changes, and measuring management effectiveness and progress toward achieving or maintaining the plan’s desired conditions or

³³ U.S. Forest Service, Land and Resource Management Plan for the Kaibab National Forest; Coconino, Yavapai, and Mojave Counties, Arizona (February 2014), at 123.

³⁴ *Id.* at 47.

³⁵ *Id.* at 82 (emphasis added)

³⁶ *Id.* at 47.

³⁷ 36 C.F.R. § 219.3

³⁸ Dave Kreamer, *Claims that Uranium Mining Near The Grand Canyon Is Safe Don’t Hold Water*, The Guardian, (August 25, 2015), available at <https://www.theguardian.com/commentisfree/2015/aug/25/uranium-mining-grand-canyon-groundwater-contamination>.

objectives.”³⁹ Here, the relevant assumption is that uranium mining will not impact groundwater resources – an assumption already challenged by the fact that the Canyon Mine’s drilling has pierced perched aquifers. Long-term groundwater monitoring would provide invaluable information that can be used to inform future decisions on uranium mining in the Grand Canyon region, and allow the Forest Service to determine whether its desired conditions for mining – specifically, minimizing adverse effects on groundwater – are being achieved.

Finally, incorporation of the long-term groundwater monitoring BMP would facilitate the overarching goal of the 2012 Withdrawal by providing information about uranium mining’s impact on groundwater resources. In enacting the Withdrawal, the Department of Interior found that “[a] twenty-year withdrawal will allow for additional data to be gathered and more thorough investigation of groundwater flow paths, travel times, and radionuclide contributions from mining...”⁴⁰ Moreover, Interior noted that “obtaining additional data to address the uncertainty regarding impacts on water quantity and quality...on a site-specific basis as mines are developed, will nevertheless be helpful for future decision-making in the area.”⁴¹ The Canyon Mine presents the precise opportunity considered by Interior when it enacted the Withdrawal; a way to obtain additional data. If Canyon Mine begins operations without any long-term groundwater monitoring in place, a significant opportunity will be lost and future decision-making will be compromised. Conversely, the addition of the BMP for long-term groundwater monitoring into the Forest Plan will meet the goals of the Withdrawal and provide multiple agencies with a wealth of otherwise un-obtainable information.

VI. Conclusion

We urge the Forest Service to add the BMP into the Forest Plan, and to modify the monitoring requirements in the Canyon Mine operating permit accordingly. While we recognize that these changes would ask the Forest Service to do some more work, most of the burden of enabling data to be gathered and of disclosing the information would fall on operators. This proposed change would build upon concepts and authority already present in the Agency’s regulations and impose little additional burden on regulated entities, all with an eye towards more responsibly managing our public lands and scarce groundwater resources. We appreciate your consideration of our request, and look forward to your timely response.

/s/ Ethan Aumack

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³⁹ 36 CFR § 219.12(a)(2)).

⁴⁰ 2012 Withdrawal ROD at 9.

⁴¹ *Id.* at 10 ft. 1

Exhibit 1

BEST MANAGEMENT PRACTICES AND COMPLIANCE MEASURES FOR BRECCIA PIPE URANIUM MINING ACTIVITIES IN NORTHERN ARIZONA

Following is a list of best management practices (BMPs) and compliance measures that could be applied to individual uranium mining operations on both Bureau of Land Management (BLM) and National Forest System Lands in Northern Arizona. These BMPs were developed from Chapter 4 of the Northern Arizona Proposed Withdrawal Final Environmental Impact Statement (EIS) (October 2011) and from existing stipulations. They will be applied as appropriate through the site-specific National Environmental Policy Act (NEPA) review and permitting process for each new mine, and voluntarily by mine operators for previously approved activities. They are not intended to apply in totality to any individual mining operation, nor are they intended to limit any additional measures that could be developed and applied through the site-specific NEPA analysis and permitting process. What follows is intended to serve as a reference guide to be considered and applied as appropriate to each individual mine. They are arranged by resource, although it should be noted that some BMPs are recommended for more than one resource; rather than duplicate the BMP in each section, it will be listed once and referenced in the other applicable section(s).

For operations on BLM-managed lands, BLM's regulations require operators to implement appropriate design features and comply with all applicable state and federal laws to prevent unnecessary or undue degradation. For operations on National Forest System lands, regulations require that all operations, where feasible, shall be conducted to minimize all adverse environmental impacts on surface resources. Operators shall comply with all applicable federal and state laws and regulations. Operators shall obtain all permits required by the State of Arizona and the County and provide copies to the agency authorized officer. Compliance with permit requirements is mandatory. Active mine sites are routinely inspected for compliance with their approved plans of operation and other permits.

Air Quality and Climate

Compliance measures for exploration activities, mine development, mine operations, and mine closure/reclamation will be required and applied in a manner consistent with federal, state, and local air quality regulations. These compliance measures will be based on the individual activity and for the air pollutant to be controlled.

The following actions are in accordance with applicable requirements of Arizona Administrative Code Article 6 of R18-2 pertaining to roadways/streets, emission requirements for material handling and storage piles, opacity requirements for point and non-point sources, and standards of performance for storage vessels for petroleum liquids. These actions are to be used as needed to control project-related fugitive dust emissions, with emphasis on actions not requiring use of water.

- To minimize generation of dust and other particulate emissions, speed of haul trucks (and other large trucks) will be limited to 25 mph on unpaved roads, and dust suppression, typically light water spraying, will be used to control fugitive dust. These requirements are typically established through an Arizona Department of Environmental Quality (ADEQ) Air Quality Control permit.
- Employees will be provided transportation to and from the mine site by a company van or bus in order to minimize generation of dust and other particulate emissions. Driving of individual vehicles to the mine will be discouraged.

- Apply gravel (9 to 16-inch road base) to silty pockets and/or use magnesium chloride or a similar soil stabilizer on dust problem areas along the haul road.
- If additional data determines that increased mitigation is necessary, the operator shall be required to provide additional dust abatement by using gravel, water, wetting agent or other adequate substance such as "Bitumate" or "Cohorex" for the control of fugitive dust.
- Ore stockpiles will be managed at all times to eliminate the potential for wind dispersed radioactive dust. This may require management of the stockpiled ore by wetting or chemical treatment, or other appropriate measures.
- On the last day of active operations prior to a weekend or holiday, apply chemical stabilizer or water to maintain a stabilized surface of ore stockpiles.
- Cover excavated soil piles with temporary coverings or water them hourly.
- Moisten excavated soil prior to loading haul trucks.
- Cover all loads of dirt leaving the site. Apply water to ground surfaces prior to and during earth-moving activity.
- Apply chemical stabilizers, per manufacturer's directions, and/or water as necessary prior to expected high wind events. During periods of high winds, work activities will cease temporarily.
- Should periods of prolonged drought ensue, the operator shall implement, during the dry period, a short term dust abatement program within the mine yard as approved by the agency authorized officer.
- Should dust from the mine yard exceed environmental thresholds, the operator shall initiate a dust abatement program as required by the agency authorized officer.

American Indian Resources

The American Indian Religious Freedom Act requires that federal agencies consider American Indian beliefs and practices in the formulation of policy and approval of actions. The intent of the Act is to ensure for traditional native religions the same rights of free exercise enjoyed by other religions. However, it does not afford Indian religions a more favored status than other religions, but only ensures equal treatment. The Act does not mandate protection of Tribal religious practices to the exclusion of all other courses of action. It does require that federal actions be evaluated for their impacts on Indian religious beliefs and practices.

Since damage to traditional cultural and sacred places is irreversible, the preferred mitigation measure is avoidance. The BLM and Forest Service are required to consult with interested tribes on a government-to-government basis and attempt to address their concerns. The consultation process consists of informative letters, phone calls, emails, and formal meetings with tribal elected officials. Meetings are held either near or on the various reservations and allow for tribal members to ask questions and offer their opinions about proposed drilling and mining projects. Draft versions of relevant documents such as archaeological and ethnographic studies and draft environmental review documents (environmental assessments and EISs) are provided for review by tribal members. Concerns expressed by tribal members are then incorporated into the final versions of these documents, as long as those concerns are not deemed confidential by tribal members. Confidential issues are addressed without releasing information to the public, to the extent that information is protected by laws including the National Historic Preservation Act, Archaeological Resources Protection Act, and Freedom of Information Act. If a conflict arises, mine operators will, if possible, attempt to relocate drill or mining locations that are particularly sensitive to the interested tribes as mitigation of potential adverse impacts; however, it may not be possible to mitigate all impacts to American Indian religious beliefs by moving locations. If relocation is not possible, other

mitigation measures will be agreed upon by the BLM or Forest Service, the interested tribes, and the mine operator(s).

Cultural Resources

To comply with federal and state laws and regulations, all surface disturbing proposals on federal land (which includes all mining activities and associated infrastructure such as access roads and powerlines) require cultural resource review. This review normally consists of: cultural resource literature review; field inventory if needed; evaluation of any sites found for National Register Eligibility or covered under the Omnibus Public Lands Act of 2009 in relationship to paleontological resources, or other significance; recommendations for treatment (either as avoidance, mitigation, placing stipulations on the action, or rejecting the proposed action). These review items may be preceded by American Indian, State Historic Preservation Office, and other public consultation if considered relevant to the proposed action. Other cultural resource actions may be necessary depending on the proposal.

The implementation of mitigation measures according to current mining regulations would reduce adverse impacts to cultural resources. The primary mitigation measure is avoidance. Areas proposed for mine development (including associated infrastructure) will be intensively surveyed to identify and evaluate cultural resources that could be affected. Impacts to cultural resources will be considered and addressed through the NEPA and Section 106 processes, with efforts made to identify, avoid, mitigate, or otherwise resolve any adverse effects.

Mitigation of adverse effects on specific sites will be based on the sites' National Register of Historic Places eligibility criteria. For example, sites eligible under Criterion D, the potential to provide significant information about the past, can often be mitigated through data recovery. Data recovery procedures could include excavation, mapping, collection of artifacts and other archaeological materials, archival research, or oral histories. Final reports will be required to document the results of analysis, with collections and data preserved for long-term research in a museum or other federally approved repository. American Indian tribes will be consulted in developing related research designs, plans, and procedures. The agencies will comply with the provisions of the Native American Graves Protection and Repatriation Act to address any discoveries of materials protected under that law.

Other potential mitigation measures include:

- avoidance of impacts through the design or relocation of activities or facilities;
- required education of workers to ensure that they understand and comply with cultural resource protection measures; and
- implementation of discovery plans to address any unexpected finds during exploration, construction, or operation.

Mitigation measures near access roads can include implementation of site monitoring plans to detect violations and support enforcement of the Archaeological Resources Protection Act.

Visual intrusions can be mitigated through measures designed to reduce visual impacts by lowering the contrast of mining-related facilities with the surrounding terrain and viewshed. Auditory intrusions could be mitigated through scheduling of mining activities to avoid sensitive times of the year. Reclamation can restore aspects of the setting after mining activities conclude. However, it may not be possible to reduce all such adverse effects in the long term, especially impacts to the character, association, and feeling of the setting.

Additional stipulations/mitigation measures are:

- Any surface, or sub-surface archaeological, historical, or paleontological remains discovered during planning, construction, maintenance, or use shall be left intact; all work in the area shall stop immediately and the agency authorized officer shall be notified. Monitoring and/or mitigation to prevent adverse impacts to significant cultural resources may be required before on the ground work can take place or continue. Commencement of work shall be allowed upon clearance by the authorized officer in consultation with the agency archaeologist.
- If in connection with this work any human remains, funerary objects, sacred objects or objects of cultural patrimony as defined in the Native American Graves Protection and Repatriation Act (P.L. 101-601; 104 Stat. 3048; 25 U.S.Code. 3001) are discovered, the proponent shall stop operations in the immediate area of the discovery, protect the remains and objects, and immediately notify the authorized officer. The proponent shall continue to protect the immediate area of the discovery until notified by the agency authorized officer that operations may resume.

Fish and Wildlife

Measures will be implemented to minimize impacts to fish and wildlife. These measures could include the following:

- Equipment fluids and waste fluids will be contained at all times and disposed of at approved off-site disposal facilities.
- All drill cuttings will be confined to a mud pit, and radioactive drill cuttings will be encapsulated in sealable metal containers and re-deposited in the drill hole after drilling operations have been completed, or removed for appropriate disposal.
- Trenches shall include escape ramps, constructed at least every 100 feet, to prevent wildlife from getting trapped. Escape ramps can be short lateral trenches sloping to the surface or wooden planks extending to the surface. The slope should be less than 45 degrees (100%).
- Fluid/mud pits will be fenced and covered to exclude and protect wildlife.
- All ponds will be covered with a material that prevents animals (including birds) from accessing the water, but still allows water evaporation. In addition, escape ramps will be put in place to prevent smaller wildlife from becoming inadvertently trapped.
- Berms will be constructed around mine sites to prevent in-flows and out-flows of water (see “Water” section below).
- The operator shall report to the BLM or Forest Service any big game wildlife accidents associated with their mining activities (i.e., vehicle collisions, fence entanglements, pond entrapments, etc.).
- If road kills of big game animals are demonstrated to be a problem, the agency authorized officer may require limitations on travel in order to avoid the most active times of day of big game animals (i.e., dawn and dusk).
- If mining activities are deemed to affect wildlife use of key wildlife waters, additional wildlife waters will be developed at other appropriate locations to mitigate these impacts. All new waters will be constructed and fenced in accordance with Arizona Game and Fish Department standards.
- Access roads to mine sites located in key elk calving areas or within bighorn sheep habitat areas may be closed to all traffic during calving/lambing season.
- Wildlife shall not be harassed.

Public Health and Safety

Mine safety and health is regulated by the Federal Mine Safety and Health Administration and the Arizona State Mine Inspector. The Mine Safety and Health Administration imposes substantive standards for mine construction and operation, in 30 Code of Federal Regulations [CFR] § 57, “Safety and Health Standards—Metal and Non-Metal Underground Mines,” and retains authority for inspection of mines and enforcement of its standards.

Measures will be implemented to protect the health and safety of the public. These measures could include the following:

- A 6-foot chainlink security fence with lockable gates will be constructed on the outside edge of the area of operations. All gates will be locked during periods of inactivity at the mine. The operator will maintain the integrity of this fencing, as well as monitor other aspects of the safety and security program. Federal safety inspection requirements, administered by the State Mine Inspector through the Mine Safety and Health Administration, will ensure that a safe working environment is maintained.
- Signs shall be installed at the entrance of the mine yard and at the intersection of the mine access road and State/County roads to inform visitors and other land users that uranium operations are in progress. “No trespassing” and “Uranium Mine” signs shall be placed on the mine yard gate and posted on all sides of the fenced perimeter.
- Traffic control will be required for ore trucks entering State Highway 64 from Forest Road 305, when highway haul options are used.
- Unless otherwise excepted, newly constructed shafts and tunnels shall be covered or blocked to prevent unauthorized or accidental entry.
- All sites shall be kept in a safe, clean, and environmentally stable condition.
- The operator shall ensure that the uranium ore stockpiles shall not exceed the size of the ore pads.
- All fuels and solvents shall be stored in an area which is bermed to prevent accidental release of contaminants.
- The operator shall submit to the BLM or Forest Service for review and approval their Best Management Practice Plan for radiological and environmental clean-up in the event of accidental discharge or release, prior to any production of ore.
- In the event that any liquid from within the mine yard is released (whether on or off site), the operator shall take immediate actions for clean-up, including a final radiogenic assessment of the impacted area and a report that shall be submitted to the BLM or Forest Service. If additional reports are required by the State of Arizona (best management practices plan or best available technology plan), they shall be forwarded to the BLM or Forest Service.
- Any unauthorized release, discharge or spill of any hazardous material or petroleum product must be immediately cleaned up to appropriate standards and requirements of the law, and promptly reported to the BLM or Forest Service and ADEQ, as appropriate. All spills of federally or state listed hazardous materials which exceed the reportable quantities shall be promptly reported to the appropriate state agency and BLM or Forest Service authorized officer.
- All ore trucks will be covered with a tarpaulin to prevent loss of material in transit. The tarpaulin will be lapped over the sides of the truck bed approximately one foot and secured.

- In the event that a uranium ore spill occurs, the operator shall take immediate aggressive action to: 1) contact the BLM or Forest Service and provide them with the applicable reports on the incident; 2) notify Arizona or Utah Departments of Public Safety and Transportation; 3) notify appropriate tribal councils and the Bureau of Indian Affairs, if the ore spill occurs on tribal lands; and 4) clean up any spilled material. All uranium ore will be removed from the spill site within two working days of the time of the spill, unless the appropriate federal and state agencies deem that such action is prevented by conditions beyond the control of the operator. In any event, all state and federal cleanup standards relating to spillage of the ore will be strictly adhered to. If a haulage accident occurs, a radiological report will be prepared. The report will contain such information as the amount of material spilled, the extent of area affected, measures taken to provide an adequate cleanup, results of the final radiological survey, and estimates of any possible non-occupational exposures.
- The BLM or Forest Service shall be notified of any hazardous or toxic material generated, used, transported or stored and this material shall be kept in approved safe containers.
- All hazardous or toxic material shall be disposed of in accordance with applicable federal and state laws.

Radiological Impacts

All operations shall comply with all pertinent federal and state laws associated with radiological impacts, including but not limited to:

- Arizona Revised Statute-27-31, concentration of radon gas shall not exceed such amount as may be set by the inspector. Current settling is 1 working level.
- Arizona Revised Statute -27-372, in all uranium operations the operator shall test regularly for radon daughter concentrations and submit records of testing as may be required by the State Mine Inspector.
- R11-1-473, smoking is prohibited where uranium is mined.
- R11-1-472, when radon daughter concentrations above 0.1 working levels are found in an active working area, measurements representative of the worker breathing zone shall be determined. Sample date, locations and results shall be recorded and retained at the mine office for at least two years.

Soil Resources

Measures will be implemented to minimize land disturbances and conserve soil resources. These measures could include the following:

- Areas of disturbance will be as small as is practicable, with surface facilities, stockpile, and disposal areas clustered together.
- Excavation of the cut and fill slopes is normally guided by information on the slope stakes. Fills should be compacted to minimize the chance of slope failure. If excess cut material exists after fill areas have been brought to grade, the excess material should be stockpiled at approved locations.
- All surface-disturbing activities on slopes greater than 15% shall include measures to stabilize soils and control surface water runoff.

- Erosion from all access and haul roads and the area of operations that are disturbed during construction activities will be controlled by revegetating these areas immediately after construction (see “Vegetation Resources” section below). The outside slopes of the dikes that surround the mine yard will be riprapped with barren rock fragments taken from the mine during shaft construction. These fragments should not exceed six inches on any one face.
- Natural drainage features will be maintained to the extent possible, and grading is designed to maintain natural drainage as much as is practicable. Facilitate drainage in existing channels near the mine site by removing obstructions to increase channel capacity. Access roads will be graded to follow existing topography.
- Should the perimeter berm at the mine site fail following a storm event, the flooded area downstream from the mine site will be radiometrically surveyed. Any soil showing radiation levels above baseline measurements will be removed and returned to the mine site.
- Procedures for recovery and cleanup of materials spilled during transport will be established in emergency response plans, which may be required under the aquifer protection permit or may be included in plans of operation. (See “Public Health and Safety” section above.)
- Engineered ore pads will be constructed to contain stockpiled waste rock and ore and prevent leaching of excavated material to native surface soil during rainfall events. Waste rock/ore stockpiles are regulated by ADEQ aquifer protection permit requirements, which include Best Available Demonstrated Control Technology. Dust suppression procedures are used to control fugitive dust from stockpiles (see “Air Quality and Climate” section above).
- Install a track-out device (i.e., grizzly, gravel pad, and/or wash down pad) adjacent to the entrance of an area accessible to the public to control carryout of contaminants.

Topsoil measures:

- During construction and excavation, existing vegetation will be left in place to the extent practicable, and native soils will be stockpiled for later use in site reclamation.
- Topsoil stockpiles will be of a depth and width to maintain soil biotic community health.
- Topsoil will be segregated and stored separately from subsurface materials or overburden stockpiles to avoid mixing during construction, storage, and interim reclamation. Topsoil stockpiles will be clearly identified. Subsurface materials should never be placed on top of topsoil material at any point in the operation.
- All stockpiled soils will be located and protected so that wind and water erosion are minimized and reclamation potential is maximized.
- If protection of the topsoil stockpile becomes warranted, the operator shall use tackifiers¹, asphalt emulsion, rip rap, water, etc., to prevent wind or water erosion as approved by the agency authorized officer.
- Roads and road crossings shall be monitored for signs of erosion. If any erosional damage is detected, it will be repaired by rip rap or other erosion control measures.

¹ A tackifier is a binding and lubricating agent that can provide a short-term, economical dust control solution. A tackifier can also be used with hydroseeding and hydromulching operations – it acts as a glue to hold loose straw mulches in place on the ground and over the seed bed until the seed has germinated.

At the conclusion of mining activities, areas of operation must be fully reclaimed to state and federal requirements (see “Reclamation” section on pages 20-22).

Soundscapes

The following measures could be implemented to ensure compliance with environmental regulations and permitting requirements.

- Where possible, exploration and development activities will be limited to daytime hours (10-hour shifts and a 5-day work week), thus limiting noise on nights and weekends.
- All equipment will be carefully maintained to achieve the lowest practical noise levels (e.g., required to have manufacturer recommended mufflers, tightening loose parts, etc.).
- To the extent feasible, configure the construction site in a manner that keeps noisier equipment and activities as far as possible from noise sensitive areas.
- To the extent feasible, mining equipment producing the most noise shall be located in areas where the topography provides a natural buffer (i.e., locate noisier components in depressions and off of hill crests).
- For mining activities proposed in close proximity to National Park Service (NPS) lands, the BLM/Forest Service will work with NPS to develop additional stipulations that would reduce impacts on noise sensitive areas.

Special Status Species

Habitat management areas for threatened, endangered, or sensitive plant or animal species will be identified that are consistent with the conservation strategy and the recovery plan established for the species. These areas will be identified through on-the-ground surveys or record searches.

Threatened, Endangered, Proposed, and Candidate Species

- All surface-disturbing activities within special status species habitat may be restricted seasonally to a period outside the reproductive period, or when the species is not active. This recommendation will be made by a BLM or Forest Service wildlife biologist in coordination with the U.S. Fish and Wildlife Service (USFWS).
- Special status species habitat surveys will be required whenever surface disturbances will occur within an area of known or suspected occupancy by special status species. Field surveys will be conducted during the appropriate time of year when detection of the species is most likely to occur. Based on the results of surveys, appropriate buffer zones where protective measures will be applied will be identified (see species-specific conservation measures).
- All surface disturbing activities will be restricted to remain 0.25 mile away from seeps, springs, and other riparian areas. This distance may be modified when specifically approved in writing by the BLM or Forest Service.
- All surface-disturbing activities will include conservation to reduce impacts to special status species and their habitat. Appropriate conservation measures developed for each listed, proposed, or candidate species will be applied to any proposed project within the habitat of that species.

- If any threatened, endangered, proposed, or candidate species is encountered during exploration activities, the operator shall immediately suspend operations and report the encounter to the agency authorized officer.

California Condor

- Prior to the start of mine construction or development activities, the BLM or Forest Service will contact personnel monitoring condor locations and movements to determine the locations and status of condors in or near the project area.
- All workers at the mine will be advised of the possibility of the occurrence of California condors in the project area.
- All workers at the mine will be instructed to avoid interaction with condors and to immediately contact the appropriate BLM/Forest Service or Peregrine Fund personnel if and when condor(s) occur at the project area. To avoid injury both to condors and personnel, mine personnel will not haze condors.
- If a condor occurs at the project site, permitted personnel will employ appropriate techniques to cause the condor to leave the site. "Permitted" means those with the necessary federal and state permits.
- Any project activity that may cause imminent harm to condors will temporarily cease until permitted personnel can assess the situation and determine the appropriate course of action.
- The project area will be kept clean (e.g., trash disposed of, scrap materials picked up) in order to minimize the possibility of condors accessing inappropriate materials. The BLM or Forest Service will complete a site visit to ensure clean-up measures are adequate.
- To prevent water contamination and potential condor poisoning, a hazardous material (including vehicle fluids) leakage and spill plan will be developed and implemented. The plan will include provisions for immediate clean-up of any hazardous substance, and will outline how each hazardous substance will be treated in case of leakage or spill. The plan will be reviewed by the BLM or Forest Service to ensure protection for condors.
- Any pesticide use at the project area will follow the guidelines for California condor in the April 2007 *Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service*.
- Mine site ponds containing water or radioactive material will be made inaccessible to condors in order to prevent use by condors.
- If condors consistently occur at the project area, additional conservation measures may be necessary. The BLM or Forest Service will report consistent condor occurrence at the mine area to USFWS in a timely manner, and will facilitate any necessary consideration of additional measures by the mine operator, BLM/Forest Service, and USFWS.
- If condor nesting activity occurs within 0.5 mile of the mine area, additional conservation measures may be necessary. The BLM or Forest Service will report such occurrences to USFWS in a timely manner, and will facilitate any necessary consideration of additional measures by the mine operator, the BLM/Forest Service, and USFWS.

Mexican Spotted Owl

- Prior to the start of mine construction or development activities, surveys of all potential spotted owl habitats (as defined in the current Recovery Plan), within the impact area (plus habitat within 0.5 mile of the perimeter of the proposed mine area) will be conducted to accepted standards.

Plants

- Prior to the start of mine construction or development activities, the BLM or Forest Service will survey the impact area (including locations of proposed roads and utility lines), plus a 0.5 mile buffer beyond the boundary of the area, in order to locate suitable habitat and/or populations of rare plants.
- Buffer areas will be delineated around plant populations prior to the start of mine construction or development activities.
- No surface disturbing activities will be permitted within 100 meters (330 feet) of identified individuals or populations of special status plant species. Off-road vehicles will not be allowed within this buffer area. If avoidance is not possible, compensation will be required that will lead to improved adjacent/nearby habitat/populations and/or measures towards successful transplanting or restocking.
- On National Forest System lands, purchased seed or mulch will not be used within populations of listed plant species, in order to prevent the introduction of invasive species and to prevent attracting wild ungulates to the area.

Sensitive Species (both BLM and Forest Service)

Plants

- Prior to the start of mine construction or development activities, the BLM or Forest Service will survey the impact area (including locations of proposed roads and utility lines), plus a 0.5 mile buffer beyond the boundary of the area, in order to locate suitable habitat and/or populations of sensitive plants.
- If populations of any rare plant species are found before or during mine construction or development activities, the operator will coordinate with the BLM/Forest Service in order to minimize adverse impacts. Individual rare plants will be marked and avoided during mine activities, or site-specific reclamation measures will be developed to reduce adverse impacts.
- On National Forest System lands, purchased seed or mulch will not be used within populations of sensitive plants, in order to prevent the introduction of invasive species and to prevent attracting wild ungulates to the area.

Goshawk

- Recommendations from Forest Service General Technical Report RM-217, titled “*Management Recommendations for the Northern Goshawk in the Southwestern United States*” will be incorporated into all mining plans within goshawk habitat.

Vegetation Resources

Measures will be implemented to minimize land disturbances and conserve vegetation resources. These measures could include the following:

- To prevent fire, all equipment, including small gas engines for generators and water pumps, will have spark arrestors. All equipment on-site and going to and from the site will have chemical fire extinguishers, which are to be readily accessible during drilling operations. Drill rigs and water pumps will have hoses with nozzles with pressure suitable for use in the event of a fire. On-site smoking will be subject to agency rules and guidelines, and no smoking materials, such as cigarette butts, will be discarded on the ground.
- Reclamation of all surface disturbances must be initiated immediately upon completion of activities, unless otherwise approved by the authorized officer. Reclamation of disturbed areas shall, to the extent practicable, include contouring disturbances to blend with the surrounding terrain, replacing topsoil, smoothing and blending the original surface colors to minimize impacts to visual resources, and seeding the disturbed areas with a mix specified by the authorized officer, using certified, weed-free seed.
- Revegetation efforts must establish a stable biological groundcover equal to that which occurred prior to disturbance. Mulching may be appropriate for conserving moisture, holding seed on-site, and ensuring stability of freshly topsoiled slopes during revegetation, thus improving the chances for successful establishment. Site-specific requirements including species, density, and cover will be developed by the BLM or Forest Service (in coordination with Arizona Game and Fish Department, USFWS, and other cooperating agencies), and monitoring to determine whether the requirements have been met will be conducted prior to releasing any bond.
- Roads shall be reclaimed immediately upon termination of the project. Recontouring all cut slopes to approximately the original contour shall be required. Reclaimed roads shall be barricaded or signed to protect them until reclamation is achieved. All existing roads that require upgrading shall be reclaimed to their original dimensions upon completion of the project. Exceptions must be approved in writing by the authorized officer.

Noxious Weeds

- Vehicles will stay on designated driving routes to avoid excessive soil and vegetation disturbance to minimize the introduction and spread of noxious weeds, unless specifically allowed by the plan of operations.
- There is potential for the spread of noxious and invasive weeds from equipment contaminated with weed seed and/or biomass. To reduce this potential, the following measures must be taken:
 - a) All equipment will be thoroughly power washed to remove all vegetative material and soil before transporting equipment to the work site to help minimize the threat of spreading noxious and invasive species. This includes trucks, trailers, and all other machinery.
 - b) The operator is responsible for the eradication of noxious weeds within the mine site and other disturbed areas connected with mining activities (such as associated powerline rights-of-way) during operations and until reclamation is complete.
 - c) Reclaimed sites will be monitored on a regular basis after mine closure to ensure that noxious weed species have not spread to the site.
 - d) The operator is responsible for consultation with the authorized officer and local authorities for implementing acceptable weed treatment methods. Any use of chemical treatments on

BLM lands will be made using only chemicals approved in the *Final Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement*, by a state certified applicator who will abide by all safety and application guidelines as listed on the product label and Material Safety Data Sheet. For National Forest System lands, noxious weed management will follow the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab and Prescott National Forests within Coconino, Gila, Mohave and Yavapai Counties, Arizona*.

Visual Resources

All new surface disturbing projects or activities, regardless of size or potential impact, shall incorporate visual design considerations during project design as a reasonable attempt to meet the visual resource management class objectives for the area and minimize the visual impacts of the proposal.

- Paint above ground production facilities (including buildings and head frames) colors that allow the facility to blend into the background. All new equipment brought onto the site will be painted the same color(s).
- Vegetation colors will be preferred, rather than soil colors.
- To minimize contrast, lighter colors (such as desert tan or brown, white doors or roofs, galvanized silver electrical boxes and guardrails, signs with white backgrounds, etc.) will be avoided. The following considerations will be used when selecting a color and shade: 1) semi-gloss paints will stain and fade less than flat paints; 2) the background is typically a vegetated background and seldom a solid soil background; 3) the selected color should be one or two shades darker than the background; and 4) consider the predominant season of public use, but never paint an object to match snow.
- Impacts of noticeable night lights shall be hooded and directed to throw light within the area of operations.

Additional measures to reduce visual impacts (including on dark skies) will be considered:

“Shielding”:

- All light apparatus will, at a minimum, be fully shielded to provide full cutoff. A fully shielded light is defined as one which allows no light from either the lamp or fixture to be projected above the horizontal.
- The light pattern from fixtures shall be further restricted (to the extent practical) so that light is directed onto only those areas that require illumination.
- Signs and displays should be lit from above with fully shielded lighting.
- Light sources which do not meet the above requirements may be prohibited (such as floodlights).

“Illumination”:

- Follow the minimum recommended illumination levels of the Illuminating Engineering Society of America.
- The overall illumination for any mine site should not exceed 25,000 lumens per acre averaged over the entire area.

Exceptions

- The operator may need to paint certain portions of facilities that are subject to Mine Safety and Health Administration safety requirements a red, yellow, or orange color.
- The operator should not be required to paint wooden, distribution power poles; and electrical lines. However, non-reflective materials will be used wherever possible.

Water Resources

Water quality is regulated by the Environmental Protection Agency (EPA) and the State of Arizona. Mine operators apply for a National Pollutant Discharge Elimination System (NPDES) permit under Section 402 of the Clean Water Act to regulate any discharge from the mine site. EPA and the State share responsibility to ensure compliance with that permit. Before the permit is granted, the State of Arizona must certify that the discharge from the mine site, if any, will comply with Arizona water quality standards. The permittee has an affirmative duty under the permit to notify EPA of any incident of noncompliance which may endanger health or environment. EPA retains authority to inspect the mine site or company records to ensure compliance with the permit.

An NPDES permit for the discharge of mine drainage from a uranium mine must contain effluent limitations established under national EPA guidelines for the Ore Mining and Dressing Point Source Category at 40 CFR Part 440, Subpart C. These guidelines contain limitations on carbonaceous oxygen demand, zinc, dissolved radium 226, total radium 226, uranium, pH, and total suspended solids. In addition, all NPDES permits must contain many more stringent limitations necessary for achieving compliance with State water quality standards.

Under NPDES permits, operators of facilities are required to sample their discharges and report pollutant concentrations to EPA and the Arizona Department of Health Services. Such reports are public information. Permitted facilities are inspected regularly for compliance with the Clean Water Act. NPDES permits give EPA and Arizona Department of Health Services personnel right of entry for inspection and sampling.

Detailed, site-specific environmental analysis will be required for any new uranium mines, and the data necessary to assess the potential impacts on a case by case basis will be obtained and evaluated at that time. Decisions about reclamation requirements (including whether the supply well should be plugged and abandoned, or kept operational for future water monitoring) are made on a case-by-case basis as part of the approval of the plan of operations.

Measures to limit and control soil resource impacts are discussed in the “Soil Resources” section above; these measures are also generally applicable to protection of surface water resources and will not be repeated here. Stipulations or required mitigation measures in approved plans of operations include the following:

- Nearby surface water features will be identified to address any concerns regarding potential impacts that might occur to the features.
- Lined below-grade evaporation ponds will be used to contain on-site runoff and mine drainage pumped from the collection sump at the bottom of the mine. These ponds are regulated by ADEQ’s aquifer protection permit, which generally requires Best Available Demonstrated Control Technology to minimize leakage potential by way of a double liner and automated leak detection systems. Aquifer protection permits include requirements to maintain proper fluid levels in the pond at all times and a contingency to ensure that this occurs. The evaporation pond

is sized to accommodate the maximum amount of run-off expected from a 500- year 24 hour event as well as being able to accommodate water produced from the mine. Off-site discharges of mine drainage or stormwater are not permitted under the aquifer protection permit program. The ponds must be lined with plastic or impervious material to prevent percolation into the substrate.

- All ponds will be covered with a material that prevents animals (including birds) from accessing the water, but still allows water evaporation. In addition, escape ramps will be put in place to prevent smaller wildlife from becoming inadvertently trapped.
- Perimeter berms and diversion channels shall be completed prior to any storage of uranium ore on the surface, and will be engineered and constructed to withstand a 500-year, 24-hour flood event outside the mine site perimeter. These structures are required pursuant to plans of operation and aquifer protection permits. The perimeter berm is intended to contain mining-generated materials and soil within the site by preventing run-on from entering the site and run-off from leaving the site. Engineering designs for these berms are based on site-specific hydrologic models. Although failure or overtopping of the berms is not reasonably foreseeable, ADEQ requires remedial action under the aquifer protection permit in the unlikely event that waste rock, ore, and/or material from the evaporation pond are released from the site.
- Diversion channels and berms shall be maintained before and after all major rain storm events. Downstream impact due to diversion of any channel-sizing around the mine yard will be immediately mitigated as approved by the agency authorized officer.
- The evaporation pond, dike and diversion ditches shall be routinely maintained to ensure their integrity at all times during operation of the mine, with appropriate modifications during reclamation.
- Control of mine drainage will be accomplished through the following aquifer protection permit requirements: total mine shaft depth is limited; the mine shaft(s) and sump(s) are required to be continuously dewatered; and the bottom of the sumps must pass permeability requirements and not have visible fractures or other secondary porosity features or must be sealed with bentonite.
- Monitoring requirements pursuant to the aquifer protection permit will be as follows: the main mine shaft sump must be monitored monthly for the first year and annually thereafter; and the evaporation pond leak detection system monitoring data must be reported on a quarterly basis.
- Where a water supply well is drilled at a mine site, the well will be constructed and tested prior to the intersection of ore by mining operations. If groundwater is yielded, the well will be completed with blank and steel casing, and a standard 5-day single borehole pumping test, followed by a 5-day recovery period, will be conducted to determine aquifer permeability and to obtain groundwater samples for laboratory chemical analyses. Water samples for chemical analyses will be obtained at 3-month intervals during the first year of the sampling program. After results for the first year are analyzed, the frequency of sample collection may be modified. The water samples will be analyzed for routine constituents, trace elements, gross alpha and beta radiation, uranium and radium 226.
- If ground water is not yielded from the mine site, the test bore hole will be plugged and abandoned in accordance with requirements for the Arizona Department of Water Resources.
- Monitoring/observation wells will be installed into the R-aquifer in the vicinity of each mine, downgradient of the mine site, in order to conduct long-term water monitoring. Protocols for well installation and documentation will be in accordance with the U.S. Geological Survey Report No. 95—398 (*“Ground-Water Data-Collection Protocols and Procedures for the National Water-Quality Assessment Program: Selection, Installation, and Documentation of Wells, and*

Collection of Related Data”). It would be most desirable to install at least 3 wells since water gradients are not always known. However, costs or other considerations may dictate the actual number installed.

- In the event that groundwater becomes contaminated during mining operations, continuous pumping will be maintained until critical constituents are reduced to drinking water standards or to within ten percent of ambient concentrations, or to some comparable standard approved by the BLM or Forest Service. The pumped water will be stored in the mine yard ponds and discharged only when it meets NPDES standards. With the drawdown that occurs as a result of pumping, no contaminants should leave the area in the groundwater since all flow would be directed toward the well.
- Decisions about reclamation requirements (including whether the supply well should be plugged and abandoned, or kept operational for future water monitoring) are made on a case-by-case basis as part of the approval of the plan of operations.
- Water from stock-water reservoirs, springs, and wells shall not be used for operations unless prior approval has been granted by the individual or agency possessing the water rights of the source.
- During upgrading, realignments and construction of access roads, no activities will be allowed that would have a potential to impact “in wash flow” or that would adversely affect downstream reservoirs, etc.

Interim Management

Each mine operator is required to submit an interim management plan for approval with the site plan of operations. These plans establish actions required during periods of temporary or seasonal closure to avoid causing unnecessary or undue degradation. The items that must be covered by the interim management plan are:

- **Stabilize Excavations and Workings** – If the project has any open excavations or drill holes, the interim management plan must describe how such openings will be closed during the period(s) of non-operation. Temporary closure is usually accomplished by temporary measures: adits may be gated, trenches may be partially filled or fenced, temporary plugs or surface plugs can be placed in drill holes, and soil stockpiles, roadcuts, or slopes can be seeded with cover crops to limit erosion. If the period of non-operation is only a few days and the proposal is to leave excavations open, the proposal must also be clearly described as part of the interim management plan.
- **Isolate or Control Toxic or Deleterious Materials** – The interim management plan must describe measures the operator proposes to prevent impacts from a variety of materials and conditions during the period of non-operation. Interim fluid management plans are required in order to maintain leaching solution volumes at low levels to avoid overtopping or spills during the period of non-operation. For example, if there is a particularly reactive stockpile of sulfide waste rock that should be covered, or a cyanide process pond that needs to be detoxified prior to the period of non-operation, the interim management plan must clearly describe the measures the operator will take to avoid causing unnecessary and undue degradation.
- **Storage or Removal of Equipment, Supplies, and Structures** – The interim management plan must provide for the storage or removal of equipment and supplies during the period of non-operation. If equipment and supplies are to be stored onsite, the plan must describe where they are proposed to be stored and how they will be secured, both for liability reasons and to ensure environmental protection.

- **Maintain the Project Area in a Safe and Clean Condition** – The interim management plan must address how the operator proposes to keep the project area in a clean and safe condition during the period of non-operation. A simple commitment to remove trash and unneeded equipment may address the “clean” requirement. To address safety, the interim management plans must include measures to remove public safety hazards during periods of non-operation, such as measures to secure mine openings, fuel, and processing reagents. The operator must also commit to maintaining any necessary permits during the period of non-operation.
- **Monitoring During Non-Operation** – The interim management plan must address the monitoring that will be conducted during the period of non-operation. This could vary from no monitoring during the seasonal shutdown of an exploration or small mining operation, to continued implementation of the approved Monitoring Plan for large mines. The amount and type of monitoring needed during a period of non-operation depends upon a variety of factors including the type of operation, risk of environmental impacts, and duration of the non-operational period.

The interim management plan provides the BLM or Forest Service with a basis for determining when an operation might be considered abandoned. The regulations also require the operator to maintain an adequate financial guarantee and include provisions for agency review of the interim management status of a project that has been inactive for 5 years to determine whether the project should terminate its plan of operations and begin final closure and reclamation.

FACILITY DESIGN STANDARDS

Roads

- All roads shall be designed and constructed to the appropriate standard, no higher (or wider) than necessary to adequately accommodate their intended functions.
- Design, construction, and maintenance activities shall be consistent with national policies for safety and resource protection.
- Design of roads shall consider the anticipated average daily traffic, vehicle loads, anticipated vehicle speeds, potential for use by the public, soil types, time of year use will occur, topography, etc. Where practical, roads shall follow the contours of the land to minimize cuts and fills and visually obtrusive lines in the landscape. Appropriate drainage will be incorporated into road design.
- Roads shall be located to reduce or eliminate impacts to cultural, scenic, biological, and other environmental resources.
- Two-track (i.e., primitive) roads and routes must be used and maintained in a safe and environmentally responsible manner and are not intended for use as all-weather access roads. Resource damage must be repaired as soon as possible.
- Overland travel or two-track (i.e., primitive) roads may be appropriate for exploratory drilling or drilling where year-round access needs have been reduced due to the use of other BMPs. However, the number of cross-country trips shall be limited to the minimum number required to conduct necessary work.
- Construction with saturated or frozen soils results in unstable roads and should be avoided.
- Wet roads shall not be used when ruts of two inches or deeper will result from road use.

- Vehicular travel under wet conditions can produce significant rutting of unsurfaced roads resulting in soil loss and safety concerns. If road use is anticipated during saturated soil conditions, road surfacing may be required to provide safe vehicle access, ensure uninterrupted operations, and reduce road damage and soil compaction/soil loss.
- Drainage must be maintained, where appropriate, to avoid erosion or the creation of a muddy, braided road.
- Operators will maintain all roads to assure adequate drainage and to minimize or, where practicable, eliminate damage to soil, water, and other resource values. The operator shall be primarily responsible for the haul roads (with the exception of regular County maintenance activities). This includes but is not limited to proper grading, graveling, dust abatement (as necessary) and signing where necessary for public safety.
- Key road maintenance considerations shall include regular inspections; reduction of ruts and holes; maintenance of crowns and out slopes to keep water off the road; replacement of surfacing materials; clearing of sediment blocking ditches and culverts; maintenance of interim reclamation; and noxious weed control.
- Inspections shall be conducted following snowmelt or heavy or prolonged rainfall to look for drainage, erosion, or siltation problems.
- Roads shall be bladed only when necessary and avoid blading established grass and forb vegetation in ditches and adjacent to the road, unless deemed necessary for proper drainage.
- Maintenance operators shall have proper training and understand the surface management agency's road maintenance objectives.
- All road upgrading, realignments and construction shall be submitted to the BLM or Forest Service as a mining plan amendment to ensure the appropriate clearances and NEPA compliances and at least conform to agency standards.
- All realignments will be kept minor, and shall only be allowed where approved by the authorized officer.
- Road designs and standards must be submitted to the BLM or Forest Service for engineering review prior to any construction activity.
- Doublewide cattleguards shall be placed where fences are intersected by upgraded or new haul roads.

Surface Drainage

- Surface drainage provides for the interception, collection, and removal of water from the surface of roads and slope areas. The design shall allow for debris passage, and water heavily laden with silt, sand, and gravel.
- Culverts shall be designed in accordance with applicable practices adopted by state and federal water quality regulators under authority of the Federal Clean Water Act. Culverts must be sized according to the expected maximum drainage flow – at a minimum, culverts shall accommodate a 10-year, 24-hour flood without development of a static inlet head and avoid serious velocity damage from a 25-year, 24-hour flood. Culverts shall be installed according to BLM or Forest Service standards.

Subsurface Road Drainage

- Subsurface drainage shall be provided to intercept, collect, and remove groundwater that may flow into the base course and subgrade; to lower high water tables; or to drain locally saturated deposits or soils.
- Proper road location and design can provide economical and efficient drainage in many cases. However, structural measures will be used as required to ensure proper and adequate drainage. Some of the most common structures are drainage dips, ditches, road crowning, culverts, and bridges.

Drainage Dips

- The primary purpose of a drainage dip is to intercept and remove surface water from the travel way and shoulders before the combination of water volume and velocity begins to erode the surface materials. Drainage dips shall not be confused with water bars, which are normally used for drainage and erosion protection of closed or blocked roads.
- Spacing of drainage dips depends upon local conditions such as soil material, grade, and topography. The surface management agency shall be consulted for spacing instructions.

Ditches

- The geometric design of ditches shall consider the resource objectives for soil, water, and visual quality; maintenance capabilities and associated costs; and construction costs.
- Ditch grades shall be no less than 0.5 percent to provide positive drainage and to avoid siltation.

Road Crowning

- Roads that use crowning and ditching are common and can be used with all road classes, except non-constructed roads. This design provides good drainage of water from the surface of the road. Drainage of the inside ditch and sidehill runoff is essential if the travelway is to be kept dry and passable during wet weather.

Exceptions

- Overland or primitive two-track roads may not be suitable for use in certain soil types or during saturated soil conditions. The impacts caused by the construction of a wide, crowned and ditched road versus the chance that a primitive road may have a few muddy spots will be considered.

Powerlines

- Powerlines shall be constructed to as close as is possible to existing access roads to reduce surface disturbance.
- Prior to the approval of any surface disturbing activities relating to powerlines, a visual analysis shall be completed in accordance with BLM or Forest Service procedures. Every possible attempt shall be made to reduce visual impacts and contrasts.
- Surface disturbance shall be kept to an absolute minimum; blading of pole pads will be allowed where absolutely necessary and only where approved by the agency authorized office.
- Powerlines shall be constructed using non-reflective wire and other materials. Powerlines will not be high-lined unless no other reasonable location exists.

- Overhead powerlines shall have a 60-inch minimum separation of wires to prevent raptor electrocution. All powerlines will be constructed in accordance with standards outlined in “*Suggested Practices for Avian Protection on Power Lines*” by the Edison Electric Institute, Avian Power Line Interaction Committee, and the California Energy Commission, Washington, DC and Sacramento, CA in order to prevent raptor electrocution.
- Off road travel shall be minimized during powerline construction. All clearances, staking and final alignments will be kept to existing roads or be non-motorized.
- Safety globes must be placed on the powerlines where required by the agency authorized officer.
- The powerline shall be dismantled when operation ceases, at the request of the agency authorized officer. All surface disturbance shall be reclaimed in accordance with the reclamation procedures submitted by the operator (see “Reclamation” section below).

Drilling (Exploration)

- Vegetation shall be mowed, instead of scraped, when possible.
- Drilling locations shall be kept as small as possible to safely accommodate drilling operations.
- Existing road access shall be used whenever possible. Roads created for exploration will be reclaimed when the route is no longer needed.
- Access shall be planned for the minimum width needed for exploration activities, and shall not exceed 14 feet in width.
- Large vegetation such as pinyon and juniper trees shall be avoided whenever possible.
- The area of the drilling pad where the drilling rig substructure is located shall be level and capable of supporting the rig.
- The drill rig, tanks, and heavy equipment shall not be placed on uncompacted fill material. The area used for mud tanks, generators, mud storage, and fuel tanks shall be at a slight slope, where possible, or a suitable alternative, such as ditching, shall be used to provide surface drainage from the work area to the pit.
- To reduce erosion and soil loss, it may be appropriate to divert storm water away from the drilling location with ditches, berms, or waterbars above the cut slopes and to trap drilling location runoff and sediments on or near the location through the use of sediment fences or water retention ponds.
- To aid in reclamation and to prevent potential adverse impacts, water and/or drilling fluid that circulates from boreholes shall be confined, as much as practical, to fenced and covered fluid pits, to be later backfilled and reclaimed when drilling operations are completed.
- The operator shall take all practicable measures to maintain and protect wildlife and wildlife habitat that may be affected by the operations. Fluid/mud pits will be fenced and covered as required to protect wildlife.
- The site shall be maintained in a sanitary condition at all times.
- Animal proof trash receptacles shall be used and food shall not be left out to avoid attracting animals.
- All garbage, refuse or waste shall be removed from the affected land and disposed of in an authorized/approved land fill.

- "Waste" is defined as all discarded matter including, but not limited to, human waste, trash, garbage, refuse, pipe, oil, oil drums, grease, petroleum products, construction materials, and equipment.
- In the event that fuel or waste fluids are spilled, the affected soil shall be removed for disposal off-site and the appropriate agency shall be notified.
- Portable tanks shall be used in place of fluid pits in areas with highly erodible soils.
- All holes drilled for the purpose of mineral exploration shall be plugged in accordance with the Arizona Department of Water Resources' Well Abandonment Handbook.
- Drill holes are properly abandoned when: 1) all aquifers are adequately cemented or otherwise isolated to prevent the migration of liquids or gases; 2) the surface hole is properly plugged to prevent injury to the public, livestock and wildlife; and 3) the surface is properly cleaned up and reclaimed according to the approved reclamation plan.

Construction Activities

- In order to minimize surface disturbance, construction equipment appropriately sized to the scope and scale of the proposed operation shall be used.
- Snow and frozen soil material shall not to be used in construction of fill areas and dikes or berms.
- To reduce areas of soil disturbance, the surface management agency may allow mowing or brush beating of vegetation for parts of the drilling location or access road where excavation is not necessary.

Survey Monuments and Markers

- To the extent practicable, all operators shall protect U.S. Government survey markers, bench marks, witness corners, reference monuments, bearing trees, etc., against destruction, obliteration or damage.
- Current mining claim markers shall be protected.
- When mining or exploration activities are concluded, the operator shall remove all operation survey markers, stakes, flagging, etc., which are not needed for ongoing activities.

FINAL RECLAMATION

Reclamation takes place upon completion of mining. General reclamation requirements are described in Appendix B of the Northern Arizona Proposed Withdrawal EIS. The plan of operations for individual mines includes a reclamation plan, and the agency having jurisdiction monitors reclamation activities for compliance prior to release of the reclamation bond. Reclamation activities are designed to allow post-mining land uses that are consistent with the surface managing agency's applicable land use plan to return lands to a level of productivity consistent with pre-mining levels.

Reclaimed sites will be monitored on a regular basis after mine closure to evaluate the effectiveness of the reclamation actions and to maintain the designed features against erosion. Reclamation includes the restoration of the surface topography, vegetation, and drainage. Reclamation of mines includes removal of surface stockpiles, removal of all equipment and structures, sealing of the mine shaft, regrading of the site and access roads, respreading stockpiled topsoil, and revegetation with a seed mixture approved by

the authorized officer. Reclamation may also include restoration of the subsurface groundwater flow regime, prevention of surface or groundwater from entering the closed mine, and prevention of drainage from the mine to groundwater aquifers. Decisions about reclamation requirements (including whether the supply well should be plugged and abandoned, or kept operational for future water monitoring) are made on a case-by-case basis as part of the approval of the plan of operations. Specific measures that may be included in a mine reclamation plan are:

- Mud pits will be covered with topsoil such that radioactivity levels on the surface are returned to pre-drilling levels.
- Sediments accumulated in evaporation ponds will be excavated and removed from the site or buried in the mine shaft (upon reclamation) if concentrations of metals, radon, and uranium are detected at levels above background.
- Areas of operation will be re-graded to the approximate original topographic contours, and native soil or natural sediments will be placed to a uniform thickness. Disturbed areas will be seeded with an approved seed mixture, and the disturbed soils will be ripped or disked to reduce compaction impacts.
- Areas prone to erosion will be armored with erosion-resistant aggregate.
- Diversion channels will remain in place to divert surface run-off around re-seeded areas and re-contoured after vegetation has been adequately established.
- Access roads will be fully reclaimed unless agencies request they be left in place as part of the regional road system. Roads having no further use will be re-contoured to pre-disturbance topography, ripped to a depth of 18 to 24 inches to loosen compacted material, and seeded.
- Reclamation efforts will include an extensive radiometric survey of the areas of influence of the mine. Any material encountered that exceeds acceptable radiation standard for long-term exposure (10 mrem/yr) will be removed from the site or buried in the mine workings before the area is graded and covered with soil. At closure, soils are required to meet ADEQ soil remediation levels (Background Remediation Standards).
- All surface plant equipment, buildings, materials, supplies, and mobile equipment will be removed.
- All disturbed areas, including access roads and associated road shoulders, shall be re-contoured to the original contour or a contour that blends with the surrounding landform.
- Topsoil shall be re-spread to a uniform depth across all re-contoured areas to better ensure successful revegetation of the site. Leave a slightly rough surface if broadcast seeding onto the surface or a smoother surface if broadcast seeding into dozer track marks or if drill seeding.
- Disturbed areas shall be revegetated after the site has been satisfactorily re-contoured and topsoil has been re-spread. Site preparation for re-seeding may include ripping, tilling, disking on contour, and dozer track-imprinting.
- Reclaimed mine sites shall be temporarily fenced to exclude livestock grazing in order to improve the likelihood of successful reclamation.
- Erosion control blankets shall be installed on slopes exceeding 3:1 and in swales and other areas of concentrated runoff.
- The operator shall usually be advised of the revegetation methods, objectives, and seasons to plant (this information may be included in the Plan of Operations reclamation plan). Species to be included in the seed mix will be specified by the BLM or Forest Service.

- Seeding shall be planned to take advantage of optimal seasonal moisture, and shall be accomplished by drilling on the contour whenever practical or by other approved methods such as dozer track-walking followed by broadcast seeding, , then chain dragging the seed to cover it. Seeding or planting shall be repeated until revegetation is successful, as determined by the BLM or Forest Service.
- The operator shall be responsible for monitoring the site, taking the necessary steps to ensure reclamation success, and notifying the BLM or Forest Service when success is achieved.
- Supplemental guidelines and methods may be available that reflect local site and geographic conditions and should be requested from the BLM or Forest Service.
- In re-contouring areas that have been surfaced with gravel or similar materials, the material should be removed from the site or buried deep in recontoured cuts.
- The operator shall dispose of all concrete pads at least 24 inches below surface, or backfill them into the shaft.
- After removal of all equipment, the mine entrance and ventilation shafts will be sealed in a manner approved by the appropriate regulatory agencies.

AIRCRAFT USE

- The operator shall not utilize Kanab Creek or Hack Canyon as a flight path.
- The operator shall only be allowed to use their helicopter for necessary and due operations.
- The operator shall not land in Grand Canyon National Park to gather water samples unless previous approval by the Park has been granted.
- The operator shall not be allowed to land within the Kanab Creek Wilderness and must abide by the existing Interagency Agreement between BLM and the Federal Aviation Administration - Navigable Airspace Over Wilderness Areas (Instruction Memorandum 86-94). The operator must maintain the established 2,000 foot minimum altitude over designated wilderness.
- Helicopter landing approaches shall be from the west to west/southwest to reduce potential adverse impacts from Hack Canyon, head of Water Canyon, the Kanab Creek Wilderness, Grand Canyon National Park, and the Grand Canyon Game Preserve.

FIRE PROTECTION

A water storage tank of 12,000 gallon capacity and fire extinguishers, as required by the Occupational Safety and Health Administration, will be maintained on-site in case of structural or wildland fires. Project personnel will be instructed in appropriate fire suppression techniques.

RADIOLOGICAL MONITORING

The radiological monitoring program involves collection of appropriate data before the mine is operational. Additional measurements will be made as needed during mine operation and in the event of an accidental release of radioactivity to the downstream wash. A final survey will be conducted at the time the mine is closed to assess the impact of the mine, if any, on the project area.

Pre-operational Baseline Information

The pre-operational baseline data collection program will last one year prior to ore production and will involve background measurements of direct gamma radiation, radon gas and progeny concentrations, and radioactivity concentrations in air, soil and water.

Direct gamma radiation measurements will be obtained by duplicate independent monitoring devices at locations determined by the BLM or Forest Service, in consultation with the appropriate regulatory agency and/or the U.S. Geological Survey. Dosimeters will be exchanged quarterly and provide cumulative dose information. Readings from a pressurized ion chamber and a scintillometer will be recorded whenever the dosimeters are exchanged.

Radon measurements have been and will be performed quarterly using an instrument which obtains independent measurements of radon gas concentrations and the daughter product “working level” exposure. Measurements will be made at the mine site and other locations as deemed necessary.

Water samples will be collected from washes and springs (locations to be determined by the BLM or Forest Service, in consultation with U.S. Geological Survey) semiannually, based on availability of water.

Operational Measurements

After the mine is in operation, the quarterly dosimetry measurements, pressurized ion chamber, and scintillometer measurements will continue at the established sites. Additional sites may be established along the haulage route.

Based on time and need, radon measurements will occur at the ore and waste piles, in the mine office, and atop the exhaust vent. The objective will be to collect sufficient radon information to determine whether any measurable increases occur.

Soil and water samples will be collected until such time as sufficient data is available to delineate possible radionuclide increases from accidental releases and to ensure that ground water, if present, will not be adversely impacted. Thereafter, except for water from the mine well and soil from the survey location immediately downwash from the mine yard, routine soil and water sampling should not be needed unless some extraordinary event dictates additional samples be taken.

Acronyms and Abbreviations

| | |
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| ADEQ | Arizona Department of Environmental Quality |
| BLM | Bureau of Land Management |
| BMP | Best Management Practice |
| CFR | Code of Federal Regulations |
| EIS | Environmental Impact Statement |
| EPA | Environmental Protection Agency |
| ESA | Endangered Species Act |
| NEPA | National Environmental Policy Act |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | National Park Service |
| USFWS | U.S. Fish and Wildlife Service |