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Via email only

3 April 2022

Attn: Mayra Martinez
Bureau of Land Management
1661 S 4th Street
El Centro, CA 92243
mymartinez@blm.gov

RE: Southern Empire Resources Corporation's Proposal for Gold Exploration at the Oro Cruz Pit Area, Cargo Muchacho Mountains, Imperial County, CA (DOI-BLM-CA-D070-2022-0012-EA)

Dear Ms. Martinez,

The Desert Tortoise Council (Council) is a non-profit organization comprised of hundreds of professionals and laypersons who share a common concern for wild desert tortoises and a commitment to advancing the public's understanding of desert tortoise species. Established in 1975 to promote conservation of tortoises in the deserts of the southwestern United States and Mexico, the Council routinely provides information and other forms of assistance to individuals, organizations, and regulatory agencies on matters potentially affecting desert tortoises within their geographic ranges.

We appreciate this opportunity to provide comments on the above-referenced project. Given the location of the proposed project in habitats likely occupied by Mojave desert tortoise (*Gopherus agassizii*) (synonymous with Agassiz's desert tortoise), our comments pertain to enhancing protection of this species during activities authorized by the Bureau of Land Management (BLM) and Imperial County, and we assume they will be added to the Administrative/Decision Record. Please accept, carefully review, and include in the relevant project file the Council's following comments and attachments for the proposed project.

Mojave desert tortoise is now on the list of the world's most endangered tortoises and freshwater turtles. It is in the top 50 species. The International Union for Conservation of Nature's (IUCN) Species Survival Commission, Tortoise and Freshwater Turtle Specialist Group, now considers Mojave desert tortoise to be Critically Endangered (Berry et al. 2021). "species that possess an extremely high risk of extinction as a result of rapid population declines of 80 to more than 90 percent over the previous 10 years (or three generations), a current population size of fewer than 50 individuals, or other factors." It is one of three turtle and tortoise species in the United States to be critically endangered.

<u>Description of Proposed Project</u>:
Southern Empire Resources Gold Corporation (Proponent) proposes to conduct mineral exploration activities at the former Oro Cruz Mine Area (Project). Much of this Project area has been disturbed by previous mining activities.

The Proponent's proposed activities include:

- 2.0 miles of road improvements
- 6.2 miles of new 12-foot-wide temporary access road construction
- 1.8 miles of new 15-foot-wide permanent access road construction
- Eight temporary helicopter landing pads
- 65 drill pads in seven Drill Areas
- 2.8-acre staging area for underground exploration

To access the southern part of the Project site, it appears from the Public Exploration Plan, dated October 2021, that vehicles and equipment would travel along an existing road in American Girl Wash in the Cargo Muchacho Mountains. When the wash narrows, the access route turns north on a new road to the southern drill areas. To access the northern part of the Project site, vehicles and equipment would travel on an existing road in Tumco Wash, then travel north or south to the northern drill areas. Four drill areas are on the north facing slope of Tumco Wash, two are on the south facing slope, and two are on the north facing slope of American Girl Wash.

An estimated 2,000 gallons of water would be required per day. Water would be delivered via water trucks. A 2,000-gallon portable water storage tank would be kept on site for drilling, dust suppression, and fire-fighting assistance.

The Project would be completed within 12 to 24 months and reclamation would be completed within five years

The total proposed new surface disturbance would be 20.54 acres.

The proposed Project is located at elevations from about 400 to 900 feet (Google Earth) in the Cargo Muchacho Mountains of Imperial County in southeastern California, approximately 15 miles northwest of Winterhaven, California, 50 miles east of El Centro, California, and 23 miles northwest of Yuma, Arizona by road travel. The Project is located in the southwestern part of the Picacho Area of Critical Environmental Concern (ACEC).

The Project Proponent would implement the following mitigation measures to reduce impacts to the Mojave desert tortoise and its habitat:

- To the extent possible, the Project would be completed outside the desert tortoise active season, March 15-November 1.
- Pre-construction tortoise surveys would be conducted within 24 hours of surface disturbance activities between March 15 and November 1. Burrows will be flagged.
- A BLM-Qualified Biologist will be onsite during the initial activities or mobilization between March 15 and November 1.
- All surface disturbing activity shall be limited to the land area essential for the Project. Work area boundaries would be appropriately marked, and workers would strictly limit their activities and vehicles to the areas marked.
- Training for all personnel onsite would include the distribution, general behavior and ecology of desert tortoise, and protections, penalties, and reporting procedures. A designated field contact representative would be responsible for compliance.
- Vehicle tracks would be reclaimed, barriers would be installed, and signs posted to prevent unauthorized access.
- Speed limits of 20 miles per hour would be implemented throughout the project area. Parked vehicles would be checked for tortoises before moving.
- Trash and food would be contained and removed to prevent attraction of predators. Feeding wildlife would be prohibited.
- Domestic pets would be prohibited onsite.

To reduce impacts to tortoise habitat:

- Reclamation would be concurrent and would be completed within five years.
- Solids and desiccated drilling muds would be treated by evaporation; sumps would be backfilled.
- Drill sites, mud pits, and outer berms would be returned to a natural grade.
- Water bars and erosion control features would be repaired or constructed, as necessary.
- All equipment and supporting structures would be removed from BLM land.
- Drill holes would be sealed and abandoned (backfilling, sealing with bentonite clay, and covering with a mound of on-site material).
- Disturbed surfaces would be ripped and/or covered and reseeded.
- Roads would be scarified by ripping, berms and water bars would be placed to prevent access and erosion, and corridors would be reseeded.

General Comments

Alternatives to the Proposed Project

BLM and Imperial County should develop and analyze alternatives to the proposed Project. While the anticipated location of the minerals cannot be changed, the access routes, timing, etc. of these activities can be changed. We request that BLM develop alternatives to the proposed Project that would keep vehicles and equipment out of washes whenever possible, as these are corridors frequented by the tortoise in the Colorado Desert for foraging and shelter. These alternatives should be analyzed in the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) documents that BLM and Imperial County are preparing.

<u>Occurrence of the Mojave Desert Tortoise in the Project Area</u>

According to the BLM, the Picacho ACEC was established with an overarching goal "to maintain desert tortoise habitat connectivity between the Chuckwalla Desert Wildlife Management/Area of Critical Environmental Concern/ Critical Habitat Units and high value climate refugia for wildlife" (BLM 2016). The AECs' significant ecological values include critical habitat for the tortoise (in the northern part of the ACEC), connectivity essential for the tortoise and other wildlife, and providing an important climate refugia (slow/minimized climate changes) for wildlife species (BLM 2016).

To fully assess the effects and identify potentially significant impacts, the following literature searches and surveys should be performed to determine the extent of rare plant and animal populations occurring within the Project area and nearby. Results of the search and surveys will determine appropriate permits from CDFW and USFWS and associated minimization and mitigation measures.

- Prior to conducting surveys, a knowledgeable biologist should perform a records search of the California Natural Diversity Data Base (CNDDB; CDFW 2022) for rare plant and animal species reported from the region. The results of the CNDDB review would be reported in the NEPA and CEQA documents with an indication of suitable and occupied habitats for all rare species reported from the region based on performing species specific surveys described below.

- Formal protocol surveys for Mojave desert tortoise (USFWS 2019) should be conducted by biologists at the proper times of year. The results of these surveys should be reported in the NEPA and CEQA documents. We strongly recommend that the BLM and Imperial County require that only experienced biologists perform protocol surveys, which may mean that CDFW and USFWS biologists review their credentials prior to the surveys.

- To determine the full extent of impacts to tortoises and to facilitate compliance with the Federal Endangered Species Act (FESA), qualified biologist(s) should consult with the Palm Springs office of the USFWS to determine the action area for this project. The USFWS defines "action area" in 50 Code of Federal Regulations 402.2 and their Desert Tortoise Field Manual (USFWS 2009) as "all areas to be affected directly or indirectly by proposed development and not merely the immediate area involved in the action (50 CFR §402.02)."

- A jurisdictional waters analysis should be performed for all potential impacts to washes, streams, and drainages. This analysis should be reviewed by the CDFW as part of the permitting process and a Streambed Alteration Agreement acquired, if deemed necessary by CDFW.

Indirect Impacts

Common ravens and other predators: The common raven (*Corvus corax*) is a predator of the Mojave desert tortoise, primarily of juvenile desert tortoises (Berry et al. 2006), but also adults. Historically, common ravens were migratory, and are on the USFWS's list of migratory birds. They were not common in the Mojave Desert (Johnson et al. 1948). During the last few decades of the 20^{th} century, the number of common ravens in the Mojave Desert increased substantially [e.g., west Mojave Desert increased about 700 percent (Boarman and Kristan 2006)] with population increases noted at other locations in the Mojave Desert. Unintentional human subsidies of food, water, and nest sites (Knight et al. 1993, Boarman 1993, Boarman and Berry 1995) have allowed ravens to become residents of the Mojave Desert and increase their numbers substantially. Their year-round residency means that ravens are present in the Mojave Desert during the tortoise's entire active season, and their increased numbers means more predation pressure on tortoises.

An example of a human subsidy for the common raven is the use of water trucks at the Project site to control dust. Water trucks can overwater and form puddles that attract common ravens and other tortoise predators to the Project site. This increases the likelihood of predation on tortoises in the area. Other examples include food brought to the Project site by construction workers. If not promptly and properly disposed of, this organic waste and trash attracts ravens and coyotes to the Project site and increases the likelihood of predation on tortoises in the area.

The NEPA and CEQA documents should analyze whether construction, operation, and/or maintenance of the proposed Project would result in an increase of common ravens and other predators of the desert tortoise nearby and in the region. Future operations should include provisions for monitoring and managing raven predation on tortoises as a result of the proposed Project. A monitoring and management plan should be prepared and include implementing actions that will reduce human subsidies for food, water, and sites for nesting, roosting, and perching. These actions would address the local impacts but not regional and cumulative impacts from the proposed Project. To mitigate the regional and cumulative impacts, the project Proponent should contact the USFWS to determine how to contribute to the National Fish and Wildlife Foundation's Raven Management Fund for regional and cumulative impacts.

Proliferation of non-native plant species: One serious effect of climate change is the invasion of non-native annual grasses. Non-native plant species, including *Bromus rubens*, *Bromus madritensis*, *Bromus tectorum*, *Schismus arabicus*, and *Schismus barbatus*, are some of the invasive species in many areas of the Mojave Desert. Project sites with surface disturbance (e.g., construction activities, grading, etc.) and vehicles travelling along roadways provide a conduit for the transport and establishment of these non-native species (Brooks and Matchett 2006). Once established, they outcompete native forbs resulting in a substantial reduction in the number/densities of native plants that the tortoise needs for adequate nutritional quality and quantity. This is due in part to their fast seed germination times in areas with disturbed soil surfaces/soil crusts. Further, they are assisted from the enhanced nitrogen deposition in soils from the exhaust from internal combustion engines (e.g., along roadways) (Allen et al. 2009). Once established, expanses of dried plants provide an enhanced fuel source to carry fires that degrade/destroy native desert vegetation that is not adapted to fire. As the impacts of climate change increase, one impact is an increase in the occurrence, numbers, and densities of these fires fueled by non-native invasive plant.

We request that the NEPA and CEQA documents include an analysis of how the proposed Project would contribute to the spread and proliferation of non-native invasive plant species; how this spread/proliferation would affect the Mojave desert tortoise and its habitats (including its nutrition and the frequency and size of human-caused fires); how the proposed Project may affect the likelihood of human-caused fires); and how the proposed Project may affect the frequency, intensity, and size of human-caused and naturally occurring fires. We strongly urge BLM and Imperial County to require the project Proponent to develop and implement a management and monitoring plan using this analysis and other relevant data that would reduce the transport to and spread of non-native seeds and other plant propagules within the Project area and eliminate/reduce the likelihood of human-caused fires.

Roads: The proposed Project would improve dirt roads and create new roadways for vehicle access to the Project site. It would also increase the number and types of vehicles using these roads during the implementation of the proposed Project and potentially allow the public to use some of these roads.

Linear projects such as roads have greater impacts on wildlife species and their habitats than other types of projects (LaRue and Dougherty 1998). Road establishment and road use are often followed by various indirect effects such as increased human access causing disturbance of species' behavior, increase predation, spread of invasive plant species, and vandalism and/or collection. Field studies (LaRue 1992, Nafus et al. 2013, von Seckendorff Hoff and Marlow 2002) have shown that impact zones from road use eliminate or substantially reduce tortoise numbers up to 0.25 mile from roadways. These impacts are attributed to road kill with roads acting as population sinks for tortoises. Nafus et al. (2013) state that the ecologically-affected areas along roads, otherwise known as ''road-effect zones," are those in which a change in wildlife abundance, demography, or behavior is observed. Von Seckendorff Hoff and Marlow (2002) reported that they detected reductions in tortoise numbers and sign from infrequent use of roadways to major highways with heavy use. There was a linear relationship between traffic level and reduction. Nafus et al. (2013) reported that roads may decrease tortoise populations via several possible mechanisms, including cumulative mortality from vehicle collisions and reduced population growth rates from the loss of larger reproductive animals. Other documented impacts from road construction, use, and maintenance include increases in roadkill of wildlife species as well as tortoises, creating or increasing food subsidies for common ravens, and contributing to increases in raven numbers and predation pressure on the desert tortoise.

Please include in the NEPA and CEQA documents the analyses of the five major categories of primary road effects to the tortoise: (1) wildlife mortality from collisions with vehicles; (2) hindrance/barrier to animal movements thereby reducing access to resources and mates; (3) degradation of habitat quality; (4) habitat loss caused by disturbance effects in the wider environment and from the physical occupation of land by the road; and (5) subdividing animal populations into smaller and more vulnerable fractions (Jaeger 2005, Jaeger et al. 2005, Roedenbeck et al. 2007). Also, for your use and analysis, please see the list of footnoted references for impacts associated with roads[1].

[1] https://www.dropbox.com/s/tvbfpvr8ush6c17/%23Road%20Impacts%20Bibliography.pdf?dl=0

<u>Heavy Metals Associated with Gold Mining Operations</u>: Although the proposed Project is exploratory in purpose, the drilling wastes and dust generated from past and proposed operations have the potential to unearth heavy metals (e.g., arsenic and lead, etc.) that sometimes occur with gold deposits and release them into the environment, These heavy metals are then transported in the environment through wind and water movements, sometimes several miles (Chaffee and Berry 2006). Wind-transported heavy metals can be inhaled or ingested directly by tortoises because of their geophageous behavior, or ingested indirectly as windborne dust containing heavy metals is deposited on plants (Chaffee and Berry 2006) eaten by tortoises. Water-transported heavy metals can be transported several miles down washes (Kim and others (2012). Tortoises with elevated arsenic levels became ill (Seltzer and Berry (2005). The Proponent should test the dust and wastes generated during the proposed Project to determine their contents, and if they contain heavy metals, implement measures to prevent wind and water transport from the drill sites.

<u>Cumulative Impacts</u>

In the cumulative effects analysis of the NEPA document, please ensure that the CEQs "Considering Cumulative Effects under the National Environmental Policy Act" (1997) is followed, including the eight principles, when analyzing cumulative effects of the proposed action to the tortoise and its habitats. CEQ states, "Determining the cumulative environmental consequences of an action requires delineating the cause-and-effect relationships between the multiple actions and the resources, ecosystems, and human communities of concern. The range of actions that must be considered includes not only the project proposal but all connected and similar actions that could contribute to cumulative effects." The analysis "must describe the response of the resource to this environmental change." Cumulative impact analysis should "address the sustainability of resources, ecosystems, and human communities."

CEQs guidance on how to analyze cumulative environmental consequences, which contains eight principles listed below:

1. Cumulative effects are caused by the aggregate of past, present, and reasonable future actions.

The effects of a proposed action on a given resource, ecosystem, and human community, include the present and future effects added to the effects that have taken place in the past. Such cumulative effects must also be added to the effects (past, present, and future) caused by all other actions that affect the same resource.

2. Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who (federal, non-federal, or private) has taken the actions.

Individual effects from disparate activities may add up or interact to cause additional effects not apparent when looking at the individual effect at one time. The additional effects contributed by actions unrelated to the proposed action must be included in the analysis of cumulative effects.

3. Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.

Environmental effects are often evaluated from the perspective of the proposed action. Analyzing cumulative effects requires focusing on the resources, ecosystem, and human community that may be affected and developing an adequate understanding of how the resources are susceptible to effects.

4. It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful.
For cumulative effects analysis to help the decision maker and inform interested parties, it must be limited through scoping to effects that can be evaluated meaningfully. The boundaries for evaluating cumulative effects should be expanded to the point at which the resource is no longer affected significantly or the effects are no longer of interest to the affected parties.

5. Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
Resources are typically demarcated according to agency responsibilities, county lines, grazing allotments, or other administrative boundaries. Because natural and sociocultural resources are not usually so aligned, each political entity actually manages only a piece of the affected resource or ecosystem. Cumulative effects analysis on natural systems must use natural ecological boundaries and analysis of human communities must use actual sociocultural boundaries to ensure including all effects.

6. Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.
Repeated actions may cause effects to build up through simple addition (more and more of the same type of effect), and the same or different actions may produce effects that interact to produce cumulative effects greater than the sum of the effects.

7. Cumulative effects may last for many years beyond the life of the action that caused the effects.
Some actions cause damage lasting far longer than the life of the action itself (e.g., acid mine damage, radioactive waste contamination, species extinctions). Cumulative effects analysis need to apply the best science and forecasting techniques to assess potential catastrophic consequences in the future.

8. Each affected resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.
Analysts tend to think in terms of how the resource, ecosystem, and human community will be modified given the action's development needs. The most effective cumulative effects analysis focuses on what is needed to ensure long-term productivity or sustainability of the resource.

Principles 5 through 8 are especially relevant to the Mojave desert tortoise.

We offer data on the status of the Mojave desert tortoise (please see Attachment A). These data show that from 2004 to 2014 the tortoise in the Colorado Desert Recovery Unit overall have declining population numbers and densities that are below the viable level, that is below a level of self-sustaining. The proposed Project is located in the Western Mojave Recovery Unit and near the Chuckwalla Tortoise Conservation Area. Consequently, any proposed project that would contribute further to the decline of the tortoise in the Colorado Desert Recovery Unit would cause the population of tortoises to drop further below the self-sustaining levels without appropriate mitigation. Please included these data in the NEPA and CEQA document s and use it when analyzing cumulative impacts to the tortoise and developing effective mitigation (see **Mitigation and Monitoring**) to reverse this decline.

In addition, BLM should include a cumulative impacts analysis of the proposed Project on climate change. Vegetation sequesters carbon. Studies around the world have shown that desert ecosystems can act as important sinks to sequester carbon. For example, the California deserts account for nearly 10 percent of the state's carbon sequestration; below ground in soil and root systems and as calcium carbonate (caliche) (Allen and McHughen 2011), and above ground in biomass. Protecting this biome can contribute to securing carbon stores in the state (MDLT 2021). However, when plants die, they release carbon from their roots, stems, and leaves into the atmosphere and contribute to climate change. Given the current climate change conditions, there is an increasing need for carbon sequestration, not carbon release, therefore, an increasing need to, as a minimum, maintain native plants.

The proposed project would likely result in the loss/degradation of plants and their ability to sequester carbon for decades or longer. Although the proposed Project has a small footprint, the cumulative impacts of it when combined with the numerous actions that BLM authorizes, has authorized, and the unauthorized activities occurring on BLM land that destroy vegetation means it would be contributing to climate change. Consequently, BM should conduct a cumulative impacts analysis of the proposed Project with respect to climate change . Analyzing alternatives and implementing ones that avoid or minimize the reduction/loss of native vegetation is important to combat climate change; it is imperative that proposed Project not result in the net loss of native vegetation. Finally, because BLM's ongoing discretionary actions and those in the foreseeable future are likely contributing to climate change, these impacts should be addressed with respect to their effects on the Mojave desert tortoise at the population level, recovery unit, and range-wide.

Mitigation and Monitoring

The NEPA and CEQA documents should describe the mitigation that would be implemented to offset the direct, indirect, and cumulative impacts of the proposed Project for the tortoise. The mitigation plans should be completed and provided in the NEPA and CEQA documents so the public and the decisionmaker can review them and determine the effectiveness of the proposed mitigation. Stating that a mitigation plan will be developed using the best available science is not adequate or appropriate, as the preparers are not always experts on the best available science for that specific subject. When mitigation plans are included in the public review process, this provides the project proponent and approving agency/decisionmaker with the opportunity for the public to provide comments based on their diverse knowledge and experience to the approving agency regarding the adequacy and soundness of the proposed mitigation plans This review process increases the likelihood of their effectiveness, when implemented.

For example, for indirect impacts to the tortoise, mitigation would include development and implementation of the following plans – a predator management plan; weed (non-native plants) management plan; compensation plan for the degradation and loss of tortoise habitat that includes protection of the acquired, improved, and restored habitat in perpetuity for the tortoise from future development and human use; a road mitigation plan; and a containment of heavy metals plan; and if there are no subsequent mining activities, a habitat restoration plan (see Abella and Berry 2016[2]). A reclamation plan results in a net loss/degradation of tortoise habitat and net loss of carbon sequestration for decades or longer (Allen and McHughen 2011). These plans should include a commitment to implement the mitigation commensurate with impacts to the tortoise and its habitats.

[2] https://www.dropbox.com/s/nx1b5m2b5ehya12/%23Abella%20and%20Berry%202016.pdf?dl=0

The mitigation plans should be completed and provided in the environmental document so the public and the decisionmaker can review them and determine the effectiveness of the proposed mitigation. Stating that a mitigation plan will be developed using the best available science is not adequate or appropriate, as the preparers work for the project proponent and are not always experts on the best available science for that specific subject. When mitigation plans are included in the public review process, this provides the project proponent and approving agency/decision maker with the opportunity for the public to provide comments based on their diverse knowledge and experience to the approving agency regarding the adequacy and soundness of the proposed mitigation plans and this review process increases the likelihood of their effectiveness, when implemented.

All proposed mitigation plans for the desert tortoise and other species of special concern should be provided in the NEPA and CEQA documents so the public and the decisionmaker can determine their adequacy (i.e., whether they are scientifically rigorous and would be effective in mitigating these impacts), their monitoring requirements to measure effectiveness, and requirements for implementing adaptive management if monitoring shows the mitigation is not working. If these plans are not provided, it is not possible for BLM or Imperial County to analyze the environmental consequences of the proposed Project to the tortoise. Please included the completed mitigation and monitoring plans in the NEPA and CEQA documents for the proposed Project.

Specific Comments

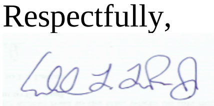
We have a few specific comments on the mitigation measures proposed by the Proponent. We will state the Proponent's mitigation measure in italics and follow it with our comments.

- *A BLM-Qualified Biologist will be onsite [for the tortoise] during the initial activities or mobilization between March 15 and November 1.* A USFWS- and CDFW-qualified biologist should be onsite rather than a BLM-qualified biologist. Tortoises, especially juveniles, can be active at any time of the year depending on temperature and rainfall events. Consequently. the biologist should be onsite anytime weather conditions occur where tortoises may be active. In addition, we found no measures to construct a tortoise exclusion fence around the work areas. Tortoises may enter the work areas during initial activities, mobilization, or after this. Mitigation should include measures to prevent tortoises from entering the work areas where they may become trapped, injured, or killed (e.g., drilling muds, mud pits, sumps, drill holes, trenches, etc.).
- *Drill holes would be sealed and abandoned (backfilling, sealing with bentonite clay, and covering with a mound of on-site material).* The covering should not be onsite material that may be contaminated with heavy metals and drilling muds from drilling. Rather it should be surface soils that contain native seedbanks.
- *Disturbed surfaces would be ripped and/or covered and reseeded*. There is no provision to revegetate or restore the areas that would be temporarily impacted by the proposed Project. Revegetation using native plants and success criteria should be required of the Proponent.
- *Roads would be scarified by ripping, berms and water bars would be placed to prevent access and erosion, and corridors would be reseeded*. Temporary roads should be treated with vertical mulching in addition to reseeding with native plant species to prevent future use by the public.

- *Training for all personnel onsite would include the distribution, general behavior and ecology of desert tortoise, and protections, penalties, and reporting procedures. A designated field contact representative would be responsible for compliance*. We recommend the BLM and Imperial County require the Proponent to develop and implement a program that rewards personnel for reporting to the authorized/qualified biologist any tortoises seen on/near the Project site. This program would ensure that mortality or injury to the tortoise from use of vehicles and equipment is substantially reduced or eliminated during implementation of the proposed Project.
- *Speed limits of 20 miles per hour would be implemented throughout the project area. Parked vehicles would be checked before moving*. Please include that the qualified biologist would be called and would move the tortoise before the vehicle or equipment could be used.
- *Domestic pets would be prohibited onsite*. Firearms should also be prohibited.

We appreciate this opportunity to provide comments on this project and trust they will help protect tortoises during any resulting authorized activities. Herein, we note that a third party, not the BLM, contacted the Council about this project. So, we reiterate[3] that the Desert Tortoise Council wants to be identified as an Affected Interest for this and all other projects funded, authorized, or carried out by the BLM that may affect species of desert tortoises, and that any subsequent environmental documentation for this project is provided to us at the contact information listed above. Additionally, we ask that you respond in an email that you have received this comment letter so we can be sure our concerns have been registered with the appropriate personnel and office for this project.

Respectfully,



Edward L. LaRue, Jr., M.S.
Desert Tortoise Council, Ecosystems Advisory Committee, Chairperson

cc: California State Clearinghouse, state.clearinghouse@opr.ca.gov
Planning & Development Services Director, Imperial County Planning and Development, Jim.Minnick@co.imperial.ca.us
Regional Manager, California Department of Fish and Wildlife, Richard.Burg@wildlife.ca.gov or Rich.Burg@wildlife.ca.gov

Literature Cited

Abella S.R. and K.H. Berry. 2016. Enhancing and restoring habitat for the desert tortoise (*Gopherus agassizii*). Journal of Fish and Wildlife Management 7(1):xx–xx; e1944-687X. doi: 10.3996/052015-JFWM-046.

[3] https://www.dropbox.com/s/mlwe60a9lcxhy56/BLM%20CDCA%20District%20Manager%20DTC%20as%20an%20Affected%20Interest.11-7-2019.pdf?dl=0

Allen, E.B., L.E. Rao, R.J. Steers, A. Bytnerowicz, and M.E. Fenn. 2009. Impacts of atmospheric nitrogen deposition on vegetation and soils at Joshua Tree National Pages, *in* Webb, R.H., Fenstermaker, L.F., Heaton, J.S., Hughson, D.L., McDonald, E.V., and Miller, D.M. (eds.), The Mojave Desert: ecosystem processes and sustainability: Reno, University of Nevada Press, .p. 78–100.

Allen, M.F., and A. McHughen. 2011. Solar Power in the Desert: Are the current large-scale solar developments really improving California's environment? UC Riverside, Desert Development Issues https://escholarship.org/uc/item/2ff17896

Berry, K.H., A.P. Woodman, and C. Knowles. 1989. "Ten years of monitoring data from the Desert Tortoise natural Area interior, Chuckwalla Bench Area of Critical Environmental Concern, and Chemehuevi Valley." Desert Tortoise Council Proceedings of the 1987–1991 Symposia.

Berry, K.H., L.J. Allison, A.M. McLuckie, M. Vaughn, and R.W. Murphy. 2021. *Gopherus agassizii*. The IUCN Red List of Threatened Species 2021: e.T97246272A3150871. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T97246272A3150871.en

[BLM] Bureau of Land Management. 2016. Desert Renewable Energy Conservation Plan Land Use Plan Amendment to the California Desert Conservation Area Plan, Bishop Resource Management Plan, and Bakersfield Resource Management Plan. BLM/CA/PL-2016/03+1793+8321. Appendix B ACECs and Special Management Areas. BLM California Desert District, Moreno Valley CA.

Boarman, W.I. 1993. "When a native predator becomes a pest: a case study." In Conservation and Resource Management. Pgs. 191–206. (S.K. Majumdar, E.W. Miller, D.E. Baker, E.K. Brown, J.R. Pratt, and R.F. Schmalz, eds.). Penn. Acad. Sci., Easton, PA.

Boarman, W.I., and K.H. Berry. 1995. "Common Ravens in the Southwestern United States, 1968 –92." Pp. 73–75 In Our Living Resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems (E.T. Laroe, ed.). U.S. Dept. of the Interior, National Biological Service, Washington, D.C.

Boarman, W.I., and W. B. Kristan, III. 2006. Trends in common raven populations in the Mojave and Sonoran deserts: 1968–2004. Conservation Science Research and Consulting and Department of Biological Sciences, California State University, San Marcos. Report to U.S. Fish and Wildlife Service, Ventura, CA. Contract No. 814405M055. 36 pages.

Brooks, M.L. and J.R. Matchett. 2006. Spatial and temporal patterns of wildfires in the Mojave Desert, 1980–2004. Journal of Arid Environments 67 (2006) 148–164.

[CDFW] California Department of Fish and Wildlife. 2022. California Natural Diversity Database. Maps and Data. https://wildlife.ca.gov/Data/CNDDB/Maps-and-Data.

Chaffee, M.A., and Berry, K.H, 2006. Abundance and distribution of selected elements in soils, stream sediments, and selected forage plants from desert tortoise habitats in the Mojave and Colorado Deserts, USA: Journal of Arid Environments v. 67, p. 35–87.

[CEQ] Council on Environmental Quality. 1997. Considering Cumulative Effects under the National Environmental Policy Act.

Jaeger, J. 2005. Does the configuration of road networks influence the degree to which roads affect wildlife populations? International Conference on Ecology and Transportation 2005 Proceedings, Chapter 5 - Integrating Transportation and Resource Conservation Planning - Landscapes and Road Networks, pages 151-163. August 29, 2005.

Jaeger, J., J. Bowman, J. Brennan, L. Fahrig, D. Bert, J. Bouchard, N. Charbonneau, K. Frank, B. Gruber, and K. Tluk von Toschanowitz. 2005. Predicting when animal populations are at risk from roads: an interactive model of road avoidance behavior. Ecological Modelling 185 (2005) 329–348.

Johnson, D.H., M.D. Bryant, and A.H. Miller. 1948. "Vertebrate animals of the Providence Mountains area of California." University of California Publications in Zoology 48:221–376.

Kim, C.S., D.H. Stack, and J.J. Rytuba. 2012. Fluvial transport and surface enrichment of arsenic in semiarid mining regions—Examples from the Mojave Desert, California: Journal of Environmental Monitoring v. 14, p. 1,798–1,813.

Knight, R.L., H.L. Knight, and R.J. Camp. 1993. "Raven populations and land use patterns in the Mojave desert, California." Wildlife Society Bulletin 21:469–471.

LaRue, E. 1992. Distribution of desert tortoise sign adjacent to Highway 395, San Bernardino County, California. Proceedings of the 1992 Symposium of the Desert Tortoise Council.

LaRue, E. and S. Dougherty. 1998. Federal Biological Opinion analysis for the proposed Eagle Mountain Landfill project. Proceedings of the 1997-1998 Symposia of the Desert Tortoise Council.

[MDLT] Mojave Desert Land Trust. 2021. Climate change. https://www.mdlt.org/climate-change/.

Nafus, M.G., T.D. Tuberville, K.A. Buhlmann, and B.D. Todd. 2013. Relative abundance and demographic structure of Agassiz's desert tortoise (*Gopherus agassizii*) along roads of varying size and traffic volume. Biological Conservation 162:100–106.

Roedenbeck, I., L. Fahrig, C. Findlay, J. Houlahan, J. Jaeger, N. Klar, S. Kramer-Schadt, and E.van der Grift. 2007. The Rauischholzhausen Agenda for Road Ecology. Ecology and Society 12(1): 11. [online] URL: http://www.ecologyandsociety.org/vol12/iss1/art11/

Seltzer, M.D., and K.H. Berry. 2005, Laser ablation ICP-MS profiling and semiquantitative determination of trace element concentrations in desert tortoise shells—Documenting the uptake of elemental toxicants. Science of the Total Environment, v. 339, p. 253–265.

[USFWS] U.S. Fish and Wildlife Service. 2009. Desert Tortoise (Mojave Population) Field Manual: (*Gopherus agassizii*). Region 8, Sacramento, California.

[USFWS] U.S. Fish and Wildlife Service. 2019. Preparing for any action that may occur within the range of the Mojave desert tortoise (*Gopherus agassizii*). USFWS Desert Tortoise Recovery Office. Dated 21 August 2017. Reno, NV.

von Seckendorff Hoff, K., and R. Marlow. 2002. Impacts of vehicle road traffic on desert tortoise populations with consideration of conservation of tortoise habitat in southern Nevada. Chelonian Conservation and Biology 4:449–456.

Attachment A: Status of the Mojave Desert Tortoise (*Gopherus agassizii*)

To assist the Agencies with their analysis of the direct, indirect, and cumulative impacts of the Proposed Project on the Mojave desert tortoise, we provide the following information on its status and trend.

The Desert Tortoise Council (Council) has serious concerns about direct, indirect, and cumulative sources of human mortality for the Mojave desert tortoise given the status and trend of the species range-wide, within each of the five recovery units, and within the Tortoise Conservation Areas (TCAs) that comprise each recovery unit.

<u>Densities of Adult Mojave Desert Tortoises</u>: A few years after listing the Mojave desert tortoise under the Federal Endangered Species Act (FESA), the U.S. Fish and Wildlife Service (USFWS) published a Recovery Plan for the Mojave desert tortoise (USFWS 1994a). It contained a detailed population viability analysis. In this analysis, the minimum viable density of a Mojave desert tortoise population is 10 adult tortoises per $mile^2$ (3.9 adult tortoises per km^2). This assumed a male-female ratio of 1:1 (USFWS 1994a, page C25) and certain areas of habitat with most of these areas geographically linked by adjacent borders or corridors of suitable tortoise habitat. Populations of Mojave desert tortoises with densities below this density are in danger of extinction (USFWS 1994a, page 32). The revised recovery plan (USFWS 2011) designated five recovery units for the Mojave desert tortoise that are intended to conserve the genetic, behavioral, and morphological diversity necessary for the recovery of the entire listed species (Allison and McLuckie 2018).

Range-wide, densities of adult Mojave desert tortoises declined more than 32% between 2004 and 2014 (Table 1) (USFWS 2015). At the recovery unit level, between 2004 and 2014, densities of adult desert tortoises declined, on average, in every recovery unit except the Northeastern Mojave (Table 1). Adult densities in the Northeastern Mojave Recovery Unit increased 3.1% per year (SE = 4.3%), while the other four recovery units declined at different annual rates: Colorado Desert (–4.5%, SE = 2.8%), Upper Virgin River (–3.2%, SE = 2.0%), Eastern Mojave (–11.2%, SE = 5.0%), and Western Mojave (–7.1%, SE = 3.3%)(Allison and McLuckie 2018). However, the small area and low starting density of the tortoises in the Northeastern Mojave Recovery Unit (lowest density of all Recovery Units) resulted in a small overall increase in the number of adult tortoises by 2014 (Allison and McLuckie 2018). In contrast, the much larger areas of the Eastern Mojave, Western Mojave, and Colorado Desert recovery units, plus the higher estimated initial densities in these areas, explained much of the estimated total loss of adult tortoises since 2004 (Allison and McLuckie 2018).

At the population level, represented by tortoises in the TCAs, densities of 10 of 17 monitored populations of the Mojave desert tortoise declined from 26% to 64% and 11 have a density that is less than 3.9 adult tortoises per km^2 (USFWS 2015). The Fremont-Kramer TCA population is near the Proposed Project and has a population below the minimum viable density, and an 11-year declining trend (–50.6%)(USFWS 2015).

Population Data on Mojave Desert Tortoise: The Mojave desert tortoise was listed as threatened under the FESA in 1990. The listing was warranted because of ongoing population declines throughout the range of the tortoise from multiple human-caused activities. Since the listing, the status of the species has changed. Population numbers (abundance) and densities continue to decline substantially (please see Tables 1 and 2).

Table 1. Summary of 10-year trend data for 5 Recovery Units and 17 Critical Habitat Units (CHU)/Tortoise Conservation Areas (TCA) for the Mojave desert tortoise, *Gopherus agassizii* (=Agassiz's desert tortoise). The table includes the area of each Recovery Unit and Critical Habitat Unit (CHU)/Tortoise Conservation Area (TCA), percent of total habitat for each Recovery Unit and Critical Habitat Unit/Tortoise Conservation Areas, density (number of breeding adults/km^2 and standard errors = SE), and the percent change in population density between 2004-2014. Populations below the viable level of 3.9 adults/km^2 (10 adults per mi^2) (assumes a 1:1 sex ratio) and showing a decline from 2004 to 2014 are in red (Allison and McLuckie 2018, USFWS 2015).

Recovery Unit Designated Critical Habitat Unit/Tortoise Conservation Area	Surveyed area (km^2)	% of total habitat area in Recovery Unit & CHU/TCA	2014 density/km^2 (SE)	% 10-year change (2004–2014)
Western Mojave, CA	**6,294**	**24.51**	**2.8 (1.0)**	**–50.7 decline**
Fremont-Kramer	2,347	9.14	2.6 (1.0)	–50.6 decline
Ord-Rodman	852	3.32	3.6 (1.4)	–56.5 decline
Superior-Cronese	3,094	12.05	2.4 (0.9)	–61.5 decline
Colorado Desert, CA	**11,663**	**45.42**	**4.0 (1.4)**	**–36.25 decline**
Chocolate Mtn AGR, CA	713	2.78	7.2 (2.8)	–29.77 decline
Chuckwalla, CA	2,818	10.97	3.3 (1.3)	–37.43 decline
Chemehuevi, CA	3,763	14.65	2.8 (1.1)	–64.70 decline
Fenner, CA	1,782	6.94	4.8 (1.9)	–52.86 decline
Joshua Tree, CA	1,152	4.49	3.7 (1.5)	+178.62 increase
Pinto Mtn, CA	508	1.98	2.4 (1.0)	–60.30 decline
Piute Valley, NV	927	3.61	5.3 (2.1)	+162.36 increase
Northeastern Mojave	**4,160**	**16.2**	**4.5 (1.9)**	**+325.62 increase**
Beaver Dam Slope, NV, UT, AZ	750	2.92	6.2 (2.4)	+370.33 increase
Coyote Spring, NV	960	3.74	4.0 (1.6)	+ 265.06 increase
Gold Butte, NV & AZ	1,607	6.26	2.7 (1.0)	+ 384.37 increase
Mormon Mesa, NV	844	3.29	6.4 (2.5)	+ 217.80 increase
Eastern Mojave, NV & CA	**3,446**	**13.42**	**1.9 (0.7)**	**–67.26 decline**
El Dorado Valley, NV	999	3.89	1.5 (0.6)	–61.14 decline
Ivanpah, CA	2,447	9.53	2.3 (0.9)	–56.05 decline
Upper Virgin River	**115**	**0.45**	**15.3 (6.0)**	**–26.57 decline**
Red Cliffs Desert	115	0.45	15.3 (6.0)	–26.57 decline
Total amount of land	**25,678**	**100.00**		**–32.18 decline**

Density of Juvenile Mojave Desert Tortoises: Survey results indicate that the proportion of juvenile desert tortoises has been decreasing in all five recovery units since 2007 (Allison and McLuckie 2018). The probability of encountering a juvenile tortoise was consistently lowest in the Western Mojave Recovery Unit. Allison and McLuckie (2018) provided reasons for the decline in juvenile desert tortoises in all recovery units. These included decreased food availability for adult female tortoises resulting in reduced clutch size, decreased food availability resulting in increased mortality of juvenile tortoises, prey switching by coyotes from mammals to tortoises, and increased abundance of common ravens that typically prey on smaller desert tortoises.

Declining adult tortoise densities through 2014 have left the Colorado Desert Recovery Unit at a 36% decline from their 2004 levels (Allison and McLuckie 2018, USFWS 2015) and an even greater decline since listing in 1990. Such steep declines in the density of adults are only sustainable if there are suitably large improvements in reproduction and juvenile growth and survival. However, the proportion of juveniles has not increased anywhere in the range of the Mojave desert tortoise since 2007, and in the Western Mojave Recovery Unit the proportion of juveniles in 2014 declined to 91% (a 9 % decline) of their representation since 2004 (Allison and McLuckie 2018).

The USFWS and Utah Division of Wildlife Resources have continued to collect density data on the Mojave desert tortoise since 2014. The results are provided in Table 2 along with the analysis USFWS (2015) conducted for tortoise density data from 2004 through 2014. These data show that adult tortoise densities in most Recovery Units continued to decline in density since the data collection methodology was initiated in 2004. In addition, in the Northeastern Mojave Recovery Unit that had shown an overall increase in tortoise density between 2004 and 2014, subsequent data indicate a decline in density since 2014 (Table 2) (USFWS 2016, 2018, 2019, 2020, 2022a, 2022b).

Specifically, in the Colorado Desert Recovery Unit, which is where the proposed Project is located, there are eight TCAs – Chocolate Mountains Aerial Gunnery Range (AGR), Chuckwalla, Chemehuevi, Fenner, Joshua Tree, Pinto Mountain, and Piute Valley. Between 2004 and 2014, densities for adult tortoises declined in six of the eight TCAs. From 2015 to 2021, densities declined further in two TCAs (Chocolate Mountains AGR and Piute Valley) that previously had shown increases. More concerning is that the density of adult tortoise in six of the eight TCAs is at or below the density of 3.9 per km^2 needed to support a minimum viable population. The remaining two TCAs that are above the minimum viable threshold are Chemehuevi at 4.0 per km^2, which is barely above the threshold, and Fenner at 5.3 per km^2. In addition, the closest TCA to the proposed Project is the Chuckwalla TCA. Tortoise densities in this TCA declined to 3.3 tortoises per km^2 from 2004 to 2014, a decline of 37.4 percent, and declined further from 2014 to 2021 to 2.6 tortoise per km^2. This current density of adult tortoises is 33 percent below the density needed for a minimum viable population in the Chuckwalla TCA.

Table 2. Summary of trend data for Agassiz's desert tortoise, *Gopherus agassizii* (=Mojave desert tortoise).from 2004 to present for 5 Recovery Units and 17 Critical Habitat Units (CHU)/Tortoise Conservation Areas (TCA). The table includes the area of each Recovery Unit and CHU/TCA, percent of total habitat for each Recovery Unit and CHU/TCA, density (number of breeding adults/km^2 and standard errors = SE), and percent change in population density between 2004-2014 (USFWS 2015). Populations below the viable level of 3.9 breeding individuals/km^2 (10 breeding individuals per mi^2) (assumes a 1:1 sex ratio) (USFWS 1994a, 2015) or showing a decline from 2004 to 2014 are in **red.**

Recovery Unit: Designated CHU/TCA &	% of total habitat area in Recovery Unit & CHU/TCA	2004 density/ km^2	2014 density/ km^2 (SE)	% 10-year change (2004–2014)	2015 density/ km^2	2016 density/ km^2	2017 density/ km^2	2018 density/ km^2	2019 density/ km^2	2020 density/ km^2	2021 density/ km^2
Western Mojave, CA	**24.51**		**2.8 (1.0)**	**–50.7 decline**							
Fremont-Kramer	9.14		2.6 (1.0)	–50.6 decline	4.5	No data	4.1	No data	2.7	1.7	No data
Ord-Rodman	3.32		3.6 (1.4)	–56.5 decline	No data	No data	3.9	2.5/3.4*	2.1/2.5*	No data	1.9/2.5*
Superior-Cronese	12.05		2.4 (0.9)	–61.5 decline	2.6	3.6	1.7	No data	1.9	No data	No data
Colorado Desert, CA	**45.42**		**4.0 (1.4)**	**–36.25 decline**							
Chocolate Mtn AGR, CA	2.78		7.2 (2.8)	–29.77 decline	10.3	8.5	9.4	7.6	7.0	7.1	3.9
Chuckwalla, CA	10.97		3.3 (1.3)	–37.43 decline	No data	No data	4.3	No data	1.8	4.6	2.6
Chemehuevi, CA	14.65		2.8 (1.1)	–64.70 decline	No data	1.7	No data	2.9	No data	4.0	No data
Fenner, CA	6.94		4.8 (1.9)	–52.86 decline	No data	5.5	No data	6.0	2.8	No data	5.3
Joshua Tree, CA	4.49		3.7 (1.5)	+178.62 increase	No data	2.6	3.6	No data	3.1	3.9	No data

Recovery Unit: Designated CHU/TCA	% of total habitat area in Recovery Unit & CHU/TCA	2004 density/ km^2	2014 density/km^2 (SE)	% 10-year change (2004–2014)	2015	2016	2017	2018	2019	2020	2021
Pinto Mtn, CA	1.98		2.4 (1.0)	–60.30 decline	No data	2.1	2.3	No data	1.7	2.9	No data
Piute Valley, NV	3.61		5.3 (2.1)	+162.36 increase	No data	4.0	5.9	No data	No data	No data	3.9
Northeastern Mojave AZ, NV, & UT	**16.2**		**4.5 (1.9)**	**+325.62 increase**							
Beaver Dam Slope, NV, UT, & AZ	2.92		6.2 (2.4)	+370.33 increase	No data	5.6	1.3	5.1	2.0	No data	No data
Coyote Spring, NV	3.74		4.0 (1.6)	+ 265.06 increase	No data	4.2	No data	No data	3.2	No data	No data
Gold Butte, NV & AZ	6.26		2.7 (1.0)	+ 384.37 increase	No data	No data	1.9	2.3	No data	No data	2.4
Mormon Mesa, NV	3.29		6.4 (2.5)	+ 217.80 increase	No data	2.1	No data	3.6	No data	5.2	5.2
Eastern Mojave, NV & CA	**13.42**		**1.9 (0.7)**	**–67.26 decline**							
El Dorado Valley, NV	3.89		1.5 (0.6)	–61.14 decline	No data	2.7	5.6	No data	2.3	No data	No data
Ivanpah Valley, CA	9.53		2.3 (0.9)	–56.05 decline	1.9	No data	No data	3.7	2.6	No data	1.8
Recovery Unit: Designated CHU/TCA	**% of total habitat area in Recovery**	**2004 density/ km^2**	**2014 density/km^2 (SE)**	**% 10-year change (2004–2014)**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**

	Unit & CHU/TCA										
Upper Virgin River, UT & AZ	**0.45**		**15.3 (6.0)**	**–26.57 decline**							
Red Cliffs Desert**	0.45	29.1 (21.4-39.6)**	15.3 (6.0)	–26.57 decline	15.0	No data	19.1	No data	17.2	No data	
Range-wide Area of CHUs - TCAs/Range-wide Change in Population Status	**100.00**			**–32.18 decline**							

*This density includes the adult tortoises translocated from the expansion of the MCAGCC, that is resident adult tortoises and translocated adult tortoises.

**Methodology for collecting density data initiated in 1999.

Abundance of Mojave Desert Tortoises: Allison and McLuckie (2018) noted that because the area available to tortoises (i.e., tortoise habitat and linkage areas between habitats) is decreasing, trends in tortoise density no longer capture the magnitude of decreases in abundance. Hence, they reported on the change in abundance or numbers of the Mojave desert tortoise in each recovery unit (Table 2). They noted that these estimates in abundance are likely higher than actual numbers of tortoises, and the changes in abundance (i.e., decrease in numbers) are likely lower than actual numbers because of their habitat calculation method. They used area estimates that removed only impervious surfaces created by development as cities in the desert expanded. They did not consider degradation and loss of habitat from other sources, such as the recent expansion of military operations (753.4 km^2 so far on Fort Irwin and the Marine Corps Air Ground Combat Center), intense or large scale fires (e.g., 576.2 km^2 of critical habitat that burned in 2005), development of utility-scale solar facilities (as of 2015, 194 km^2 have been permitted) (USFWS 2016), or other sources of degradation or loss of habitat (e.g., recreation, mining, grazing, infrastructure, etc.). Thus, the declines in abundance of Mojave desert tortoise are likely greater than those reported in Table 3.

Habitat Availability: Data on population density or abundance does not indicate population viability. The area of protected habitat or reserves for the subject species is a crucial part of the viability analysis along with data on density, abundance, and other population parameters. In the Desert Tortoise (Mojave Population) Recovery Plan (USFWS 1994a), the analysis of population viability included population density and size of reserves (i.e., areas managed for the desert tortoise) and population numbers (abundance) and size of reserves. The USFWS Recovery Plan reported that as population densities for the Mojave desert tortoise decline, reserve sizes must increase, and as population numbers (abundance) for the Mojave desert tortoise decline, reserve sizes must increase (USFWS 1994a). In 1994, reserve design (USFWS 1994a) and designation of critical habitat (USFWS 1994b) were based on the population viability analysis from numbers (abundance) and densities of populations of the Mojave desert tortoise in the early 1990s. Inherent in this analysis is that the lands be managed with reserve level protection (USFWS 1994a, page 36) or ecosystem protection as described in section 2(b) of the FESA, and that sources of mortality be reduced so recruitment exceeds mortality (that is, lambda > 1)(USFWS 1994a, page C46).

Table 3. Estimated change in abundance of adult Mojave desert tortoises in each recovery unit between 2004 and 2014 (Allison and McLuckie 2018). Decreases in abundance are in red.

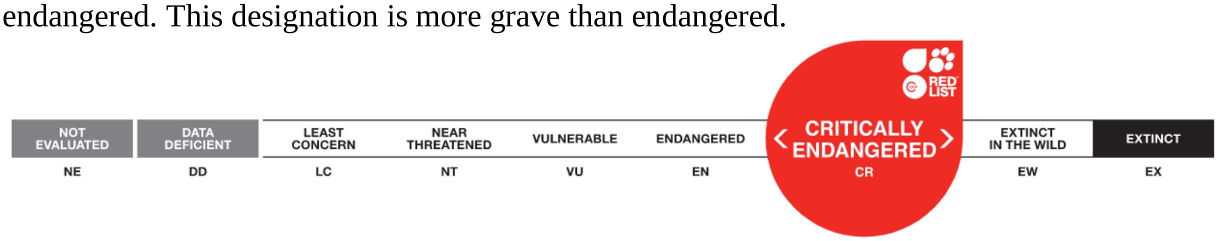
Recovery Unit	Modeled Habitat (km^2)	2004 Abundance	2014 Abundance	Change in Abundance	Percent Change in Abundance
Western Mojave	23,139	131,540	64,871	-66,668	-51%
Colorado Desert	18,024	103,675	66,097	-37,578	-36%
Northeastern Mojave	10,664	12,610	46,701	34,091	270%
Eastern Mojave	16,061	75,342	24,664	-50,679	-67%
Upper Virgin River	613	13,226	10,010	-3,216	-24%
Total	**68,501**	**336,393**	**212,343**	**-124,050**	**-37%**

Habitat loss would also disrupt the prevailing population structure of this widely distributed species with geographically limited dispersal (isolation by resistance Dutcher et al. 2020). Allison and McLuckie (2018) anticipate an additional impact of this habitat loss/degradation is decreasing resilience of local tortoise populations by reducing demographic connections to neighboring populations (Fahrig 2007). Military and commercial operations and infrastructure projects that reduce tortoise habitat in the desert are anticipated to continue (Allison and McLuckie 2018) as are other sources of habitat loss/degradation.

Allison and McLuckie (2018) reported that the life history of the Mojave desert tortoise puts it at greater risk from even slightly elevated adult mortality (Congdon et al. 1993; Doak et al. 1994), and recovery from population declines will require more than enhancing adult survivorship (Spencer et al. 2017). The negative population trends in most of the TCAs for the Mojave desert tortoise indicate that this species is on the path to extinction under current conditions (Allison and McLuckie 2018). They state that their results are a call to action to remove ongoing threats to tortoises from TCAs, and possibly to contemplate the role of human activities outside TCAs and their impact on tortoise populations inside them.

Densities, numbers, and habitat for the Mojave desert tortoise declined between 2004 and 2014 and densities continue to decline in most Recovery Units since 2014. As reported in the population viability analysis, to improve the status of the Mojave desert tortoise, reserves (area of protected habitat) must be established and managed. When densities of tortoises decline, the area of protected habitat must increase. When the abundance of tortoises declines, the area of protected habitat must increase. We note that the Desert Tortoise (Mojave Population) Recovery Plan was released in 1994 and its report on population viability and reserve design was reiterated in the 2011 Revised Recovery Plan as needing to be updated with current population data (USFWS 2011, p. 83). With lower population densities and abundance, a revised population viability analysis would show the need for greater areas of habitat to receive reserve level of management for the Mojave desert tortoise. In addition, we note that none of the recovery actions that are fundamental tenets of conservation biology has been implemented throughout most or all of the range of the Mojave desert tortoise.

IUCN Species Survival Commission: The Mojave desert tortoise is now on the list of the world's most endangered tortoises and freshwater turtles. It is in the top 50 species. The International Union for Conservation of Nature's (IUCN) Species Survival Commission, Tortoise and Freshwater Turtle Specialist Group, now considers Mojave desert tortoise to be Critically Endangered (Berry et al. 2021). As such, it is a "species that possess an extremely high risk of extinction as a result of rapid population declines of 80 to more than 90 percent over the previous 10 years (or three generations), a current population size of fewer than 50 individuals, or other factors." It is one of three turtle and tortoise species in the United States to be critically endangered. This designation is more grave than endangered.



Literature Cited Status of the Mojave Desert Tortoise

Allison, L.J. and A.M. McLuckie. 2018. Population trends in Mojave desert tortoises (*Gopherus agassizii*). Herpetological Conservation and Biology 13(2):433–452.

Berry, K.H., L.J. Allison, A.M. McLuckie, M. Vaughn, and R.W. Murphy. 2021. *Gopherus agassizii*. The IUCN Red List of Threatened Species 2021: e.T97246272A3150871. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T97246272A3150871.en

Congdon, J.D., A.E. Dunham, and R.C. van Loeben Sels. 1993. Delayed sexual maturity and demographics of Blanding's Turtles (*Emydoidea blandingii*): implications for conservation and management of long-lived organisms. Conservation Biology 7:826–833.

Doak, D., P. Karieva, and B. Klepetka.1994. Modeling population viability for the Desert Tortoise in the Western Mojave. Ecological Applications 4:446–460.

Dutcher, K.E., A.G. Vandergast, T.C Esque, A. Mitelberg, M.D. Matocq, J.S. Heaton, and K.E. Nussear. 2020. Genes in space: what Mojave desert tortoise genetics can tell us about landscape connectivity. Conservation Genetics 21:289–303(2020).

Fahrig, L. 2007. Non-optimal animal movement in human-altered landscapes. Functional Ecology 21:1003–1015.

Murphy, R.W., K.H. Berry, T. Edwards, and A.M. McLuckie. 2007. A genetic assessment of the recovery units for the Mojave population of the Desert Tortoise, *Gopherus agassizii*. Chelonian Conservation and Biology 6:229–251.

Murphy, R.W., K.H. Berry, T. Edwards, A.E. Leviton, A. Lathrop, and J. D. Riedle. 2011. The dazed and confused identity of Agassiz's land tortoise, *Gopherus agassizii* (Testudines, Testudinidae) with the description of a new species, and its consequences for conservation. ZooKeys 113: 39–71. doi: 10.3897/zookeys.113.1353.

Spencer, R.-J., J.U. Van Dyke, and M.B. Thompson. 2017. Critically evaluating best management practices for preventing freshwater turtle extinctions. Conservation Biology 31:1340–1349.

Turtle Conservation Coalition. 2018. Turtles in Trouble: The World's 25+ Most Endangered Tortoises and Freshwater Turtles. www.iucn-tftsg.org/trouble.

[USFWS] U.S. Fish and Wildlife Service. 1994a. Desert tortoise (Mojave population) Recovery Plan. U.S. Fish and Wildlife Service, Region 1, Portland, Oregon. 73 pages plus appendices.

[USFWS] U.S. Fish and Wildlife Service. 1994b. Endangered and threatened wildlife and plants; determination of critical habitat for the Mojave population of the desert tortoise. Federal Register 55(26):5820-5866. Washington, D.C.

[USFWS] U.S. Fish and Wildlife Service. 2011. Revised Recovery Plan for the Mojave Population of the Desert Tortoise (*Gopherus agassizii*). U.S. Fish and Wildlife Service, California and Nevada Region, Sacramento, California.

[USFWS] U.S. Fish and Wildlife Service. 2015. Range-wide Monitoring of the Mojave Desert Tortoise (*Gopherus agassizii*): 2013 and 2014 Annual Reports. Report by the Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Reno, Nevada.

[USFWS] U.S. Fish and Wildlife Service. 2016. Range-wide Monitoring of the Mojave Desert Tortoise (*Gopherus agassizii*): 2015 and 2016 Annual Reporting. Report by the Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Reno, Nevada.

[SFWS] U.S. Fish and Wildlife Service. 2018. Range-wide Monitoring of the Mojave Desert Tortoise (*Gopherus agassizii*): 2017 Annual Reporting. Report by the Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Reno, Nevada.

[USFWS] U.S. Fish and Wildlife Service. 2019. Range-wide Monitoring of the Mojave Desert Tortoise (*Gopherus agassizii*): 2018 Annual Reporting DRAFT. Report by the Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Reno, Nevada.

[USFWS] U.S. Fish and Wildlife Service. 2020. Range-wide Monitoring of the Mojave Desert Tortoise (*Gopherus agassizii*): 2019 Annual Reporting DRAFT. Report by the Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Reno, Nevada. 42 pages.

[USFWS] U.S. Fish and Wildlife Service. 2022a. Range-wide Monitoring of the Mojave Desert Tortoise (Gopherus agassizii): 2020 Annual Reporting DRAFT. Report by the Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Reno, Nevada.

[USFWS] U.S. Fish and Wildlife Service. 2022b. Range-wide Monitoring of the Mojave Desert Tortoise (*Gopherus agassizii*): 2021 Annual Reporting DRAFT. Report by the Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Reno, Nevada.