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Mr. Terry Stroh
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Re: Request for input concerning Paradox Valley Salinity Control Unit: Evaluation of brine disposal alternatives in Montrose County, Colorado.

Dear Mr. Stroh,

In light of the extended scoping comment period for the Paradox Valley Salinity Control Unit's proposed brine disposal alternatives, Living Rivers, Colorado Riverkeeper, Sheep Mountain Alliance, Canyonlands Watershed Council, Center for Biological Diversity, and Grand Canyon Trust offer the following supplemental comments to our support for the Sheep Mountain Alliance comments of January 30, 2012.

INTRODUCTION

The Colorado River salinity control program is the result of flawed river and water management policies longtime led by Reclamation and its partnerships with select stakeholders in the basin. Nature has been discharging brine into the Colorado River for millennia, and will continue to do so well beyond any efforts Reclamation engineers may pursue to contain it. The Dolores and Colorado River ecosystems evolved quite well under these conditions, helping to spawn a vibrant desert ecosystem below Paradox Valley. Only in the past 40 years, due to Reclamation's direct and indirect interventions into Colorado River management have issues of salinity required attention, principally to meet water quality treaty obligations with Mexico.

In the past 25-years salinity management programs have continuously trended upward, removing nearly 1.2 million tons of salt in 2010. Despite this ongoing increase and major unaddressed drivers that will further elevate salinity levels, Reclamation offers no long-

term plan for how the proposed action will contribute to sustainability with regard to resolving the mounting salinity challenges in the basin. Moreover, the proposed action merely represents a piecemeal response aimed at the replacement of infrastructure that became fully operational just 16-years ago.

Most tragic, the proposed action represents a continuation of engineering approaches to manage natural sources of salinity that have historically never been a problem for the ecosystem. More then 50 percent of the salts now flowing into the Colorado River are the result of anthropogenic drivers, principally irrigated agriculture with Reclamation-delivered water. It's these sources which have tipped the balance, representing 37% of the 8.2 million tons of salt entering the Colorado River system annually. That's roughly 3.2 million tons of salt, nearly 30 times the amount slated for removal by Reclamation via this proposed action. It's far more appropriate that Reclamation look at opportunities to reduce this human-generated salinity, to begin addressing the problem at its source (farming and irrigation practices), as opposed to the continuous intervention into natural processes that cannot be entirely controlled.

Prior to pursuing this proposed action, Reclamation must first develop a more holistic, long-term management plan for Colorado River water resources that extends well beyond the Paradox Valley project and the salinity control program as a whole. It must also include new approaches to water storage and delivery management strategies that minimize evaporation and maximize in-stream flows to help reduce salt concentrations. Absent this, projects like the proposed action and the others identified in Interim Report No.1 (Reclamation's supply and demand study release of June 2011), will continue to be put forward that offer only incremental, short-term technological salves that consume vast amounts of capital, all the while never addressing the source of the problem. It's premature to even consider scoping for this proposed action until a more comprehensive evaluation is undertaken that tackles the human-induced causes of increased salinity and abandons attempts at placing technical shackles on natural processes that will continuously succeed in breaking them.

IDENTIFYING THE PROBLEM

The Reclamation Act of 1902 and Colorado River Compact of 1922 have transformed the Colorado River basin: securing energy, agriculture, metropolises, and industry upon a landscape that early explorers described as valueless due to its debilitating aridity during the growing season and for poor soils requiring amendments to be productive.

What this Congressional act and interstate compact have not succeeded in accomplishing is establishing a system of water delivery that is as resilient as the deserts these policies attempt to hydrate. Beyond the corrosive processes eating away at the Paradox Valley's nascent salinity control infrastructure, and the ever expanding salinity problem it fails to address, lies a whole host of challenges impeding any hope of sustainable fresh water management in the basin, not the least of which is sediment.

The continued propping up of a massive reservoir system that all the while is filing with material from the natural erosion of the Colorado Plateau's marine and terrestrial rock

layers will also degrade water quality, not to mention interrupt water delivery. Since the 1960s, the US Geological Survey and Reclamation both have acknowledged the unsustainable nature of Reclamation's approach due to this accumulating storage of sediment in reservoirs, referring to it as "the day of reckoning." Similar warnings have longtime been advanced with regard to water allocation exceeding natural supplies, now all the more worrisome due to flow reductions resulting from climate change, and inappropriate irrigation practices eating away at the soil quality, public coffers and yes, the water quality that precipitated the proposed action.

The salinity problem in the basin lies with faulty management decisions prior to, and following the Reclamation Act of 1902. For example, trans-basin diversions from the Colorado River basin to the Mississippi River basin was the first mistake, because taking abundant flows of nearly pristine water near the headwaters meant the Colorado River would be less capable of diluting the natural salinity downstream that emanates from the marine-based rocks of the Colorado Plateau. The second mistake was to permit farming on the saline soils of the Colorado Plateau, such as the Mancos Shale. The third mistake was to allow farming in the Basin and Range, where poor soil drainage creates a situation of salinization on agricultural fields, exemplified by the insidious Wellton-Mohawk Project near Yuma, AZ—with its hugely expensive brine extraction project, the MODE Canal, and the Yuma Desalting Plant.

In Paradox Valley specifically, the first mistake was to build McPhee Reservoir. The annual average yield of the Dolores River (817,000 acre-feet) was significant to abate the impacts of natural salt inflows through dilution. Making matters worse for the Dolores basin is that water diverted from McPhee Reservoir is applied to soils high in salinity in the San Juan River basin.

So far, this Reclamation-created salinity and sediment challenge is being addressed in a piecemeal fashion through the Salinity Control Act, and by various dredging operations below Davis Dam. Under Reclamation's artificial metrics, the program is labeled as successful as it complies with Reclamations established threshold numbers at Hoover Dam, Parker Dam and Imperial Dam (see Table 1, 2 and 3 below). However, success in meeting these benchmarks may have as much to do with nature's whims as those of Reclamation.

Table 1: Threshold criteria established for compliance of salinity control

Locations below	Salinity in mg/L
Hoover Dam	723
Parker Dam	747
Imperial Dam	879

Table 2: Actual salinity values in 1970 before Congressional intervention

Locations below	Salinity in mg/L
Hoover Dam	743
Parker Dam	760
Imperial Dam	896

Table 3: Actual salinity values as of 2008

Locations below	Salinity in mg/L
Hoover Dam	622
Parker Dam	646
Imperial Dam	717

The natural processes that provided voluminous spring freshets from 1983-1986, 1995, and 1997 all contributed greatly to Reclamation realizing its thresholds. Table 4, for example, illustrates how drops in salinity levels following annual flows into Lake Powell in excess of 15 million acre-feet. With the exception of the 2011 snowmelt, freshets of this magnitude have not occurred since 1997. Consequently, an increase in the basin's salinity levels is easily observed. Also of note is that the high salinity values observed in 1970 were partly the result of the "critical drought period" that occurred from 1954 to 1965 during which the average annual flow was only 12.8 million acre-feet.

Table 4: 40-years of observed flow-weighted average salinity

Calendar Year (Numeric Criteria)	Below Hoover Dam (723 mg/L)	Below Parker Dam (747 mg/L)	At Imperial Dam (879 mg/L)
1970	743	760	896
1971	748	758	892
1972	724	734	861
1973	675	709	843
1974	681	702	834
1975	680	702	829
1976	674	690	822
1977	665	687	819
1978	678	688	812
1979	688	701	802
1980	691	712	760
1981	681	716	821
1982	679	713	827
1983	659	678	727
1984	598	611	675
1985	556	561	615
1986	517	535	577
1987	519	538	612
1988	529	540	648
1989	564	559	683
1990	587	600	702
1991	629	624	749
1992	657	651	767
1993	665	631	785
1994	667	673	796
1995	654	671	803
1996	618	648	768
1997	585	612	710
1998	559	559	655
1999	549	550	670
2000	539	549	661
2001	550	549	680
2002	561	572	689
2003	584	592	695
2004	625	644	729
2005	643	668	710
2006	646	671	720
2007	632	657	715
2008	622	646	717
2009 provisional	602	623	717

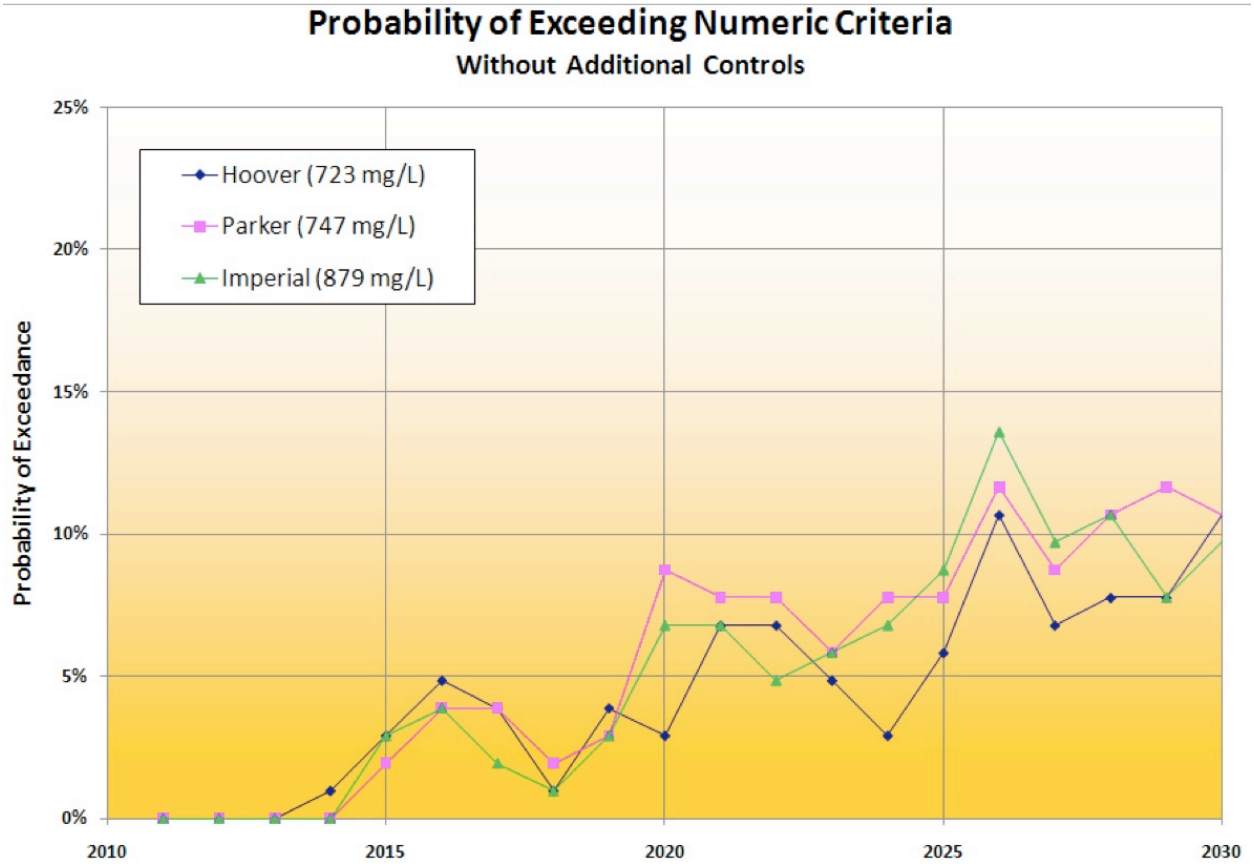
UNDERSTAND THE FUTURE

The Salinity Control Forum emphasizes that if agency mitigation plans do not progress with more programming and adequate funding, exceeding the numeric criteria is more likely to occur (Table 5). The Forum's long-term analyses is flimsy at best, employing

six-year old data and scenario on river flows that have long since been criticized as flawed due to their lack of sufficient attention to climate change impacts. Reclamation has presented in its Interim Report No.1 of June 2011, that the basin can expect a 1.5 million acre-feet reduction in annual supply by mid-century as a consequence of increased evaporation and sublimation of the snowpack. But climate scientists and hydrologists have warned that such reductions could near 4.5 million acre-feet by mid-century (Barnett and Pierce in Proceedings of the National Academy of Sciences, 2009). At a minimum Reclamation needs to note these and similar findings and offer a suite of scenarios that reflect the full range of likely futures facing the basin's hydrology.

Furthermore, the water columns within deep reservoirs such as Lakes Powell and Mead contain a dense layer of saline water below the level of their active storage pools. Once active storage is consumed, this inactive storage will have to be bypassed through the river outlet works and the salinity rates will skyrocket until the columns are once again submerged. Salinity, however will not be the only problem resulting from these inactive storage pools. These water columns also include corrosive hydrogen sulfide, and perilous low oxygen levels that will further threaten aquatic ecosystem within the reservoirs and downstream.

Table 5: created by the Salinity Control Forum



Additionally, Upper Basin water users' plan to divert more and more water from the system, further degrading dilution capabilities also needs to be taken into consideration. So too must impacts to water quality surrounding the 2005 Energy Policy Act. Because the Colorado Plateau has untapped energy resources such as oil shale (kerogen) and tar sands (bitumen), the quest to bring these marginal resources to market is the death knell to the water resources that initiated fundamental prosperity to the watershed. It is illusional to tease corporations and the public to even consider that these resources could actually be proffered out of the ground successfully without altering the regional water cycle forever. The basin hasn't even finished reclaiming the legacy of messy energy extraction projects that threaten water resources from previous decades, let alone the projects that will soon be added to the inventory.

For more than two decades investment in salinity control has risen steadily, as has the number of tons of salt removed from the system. There's nothing happening presently that will cause this trend to reverse, and as noted, future conditions in this era of climate change will likely render the problem much, much worse.

The Paradox Valley proposed action, and others like it, are not being presented within a context of a clear understanding of the real challenges ahead, so any and all actions pertaining to them should be curtailed until such an analysis is completed. And in so doing, an equally comprehensive evaluation of appropriate salinity control alternatives must be explored well beyond the current basket of technical controls that do very little to address the underlying causes of the increased salinity experienced over the past century. Not until a clear picture is presented of hydrologic extremes that may lie ahead, addressing periods of severe and sustained drought, and a probable maximum flood, can a proposed action like the Paradox Valley project be evaluated.

GETTING SALINITY UNDER CONTROL

Decreases in salinity must be achieved through reversing those vectors responsible for the problem including: salinity pollution from agriculture, evaporation from inefficient water storage, and loss of in-stream flows and habitat preservation due to excessive diversion. Each of these must be addressed in devising a comprehensive solution to not only resolve salinity problems in the basin, but working toward a more sustainable human-ecological balance in the Colorado River basin generally.

First and foremost Reclamation must compel farmers to begin shifting their irrigation practices and cropping strategies away from those that exacerbate the basin's salinity levels. For example, fallow or transform unproductive and cost-inefficient agricultural lands that contribute to the salinity problem overall. Unless farmers themselves are willing to finance the associated salinity control, projects like the Wellton-Mohawk must be decommissioned. Establish incentive systems that reward those reducing their pollution and penalize those who do not must be developed and implemented. Salinity is an external cost to their production that can no longer be ignored or tolerated, thus must be internalized into their operations.

Reducing water consumption in both basins to match the new hydrologic norm should be evaluated. Much stricter rules and regulations must be put on all consumers of Colorado River water received via federal infrastructure. The Salinity Control Forum must staunchly advocate for conservation measures that will: 1) assure sufficient in-stream flows to maintain critical habitat and restore damaged ecosystem; 2) allow for increased flows to be used by Mexico for Colorado River delta restoration; and 3) assure that total consumption, including environmental flows, no longer exceed annual inflows.

Evaporation from above-ground reservoirs not only loses valuable water, but also contributes to increased salinity levels. Storing this water underground is an alternative to reduce overall evaporation losses from surface reservoirs by replenishing human-depleted aquifers. This is already occurring in confined aquifers within Arizona and California. There is sufficient capacity in the Basin and Range Province, for example, to store the combined storage contents of Lakes Mead and Powell.

In pursuing an expanded ground-water storage strategy, the decommissioning of redundant dams and reservoirs can be pursued. This will afford a head start on addressing the salinity problems inherent in managing the sediment backing up behind all of the basins reservoirs. Moreover, such decommissioning would afford unmatched habitat restoration potential for many areas that had previously been devastated or are currently threatened by dam and reservoir operations.

None of these options involve new infrastructure to manage natural brine inflows. They all work to collectively reverse the human-induced salinity as well as provide greater water supply resilience for Colorado River water users and improved habitat conditions for the basin's unique ecosystems.

ABANDON THE PROPOSED ALTERNATIVE

No modifications should be undertaken that affect the Dolores River's stream bed as it passes through the Paradox Valley. This includes channelization, linings, check dams, siphons or tunnels. Recent studies of extreme flooding conducted on the Dolores River by Dr. Michael L. Cline (*Extreme flooding in the Dolores River Basin, Colorado and Utah: Insights from paleofloods, geochronology and hydroclimatic analysis,* 2010) indicate that engineered modifications in Paradox Valley, where the river would not be constrained between walls of bedrock, would fail over time. The meanders of the Dolores River through Paradox Valley indicate that the river channel has migrated over this broad floodplain throughout historic and prehistoric times. It is possible that floods in the future would damage any infrastructure Reclamation may choose to site here.

Moreover, prehistoric slack water deposits along the Dolores River indicate that the magnitude of floods in the Dolores River basin are significantly higher than the spillway capacity of McPhee Dam, thus rendering the Dam useless and ineffective at best in preventing flood damage in the Paradox Valley, and more likely much worse should it catastrophically fail during such an event.

Reclamation should also avoid constructing brine evaporation ponds. The loss of vegetation cover would impair the enjoyment of scenic vistas, impair wildlife habitat, pose a contamination problem for migratory birds, and create a potential waste disposal problem with exorbitant costs and cumulative impacts. It would also be expensive to build, maintain, decommission and reclaim these evaporation ponds. Like the 16-year history of what now is clearly an injection well experiment, the long-term viability of such an approach it too uncertain and potentially environmentally costly.

The other places where deep well injection of brines into the Paradox Formation that some have argued are feasible include areas in eastern Utah. For example, Castle Valley, Spanish Valley and Lisbon Valley. However, the costs associated with such an alternative are quite significant considering the cost of the infrastructure, consumption of electrical energy and other numerous cumulative impacts.

Strategies that might offer relief include planting native phreatophyte plants to consume surplus groundwater flowing over salt domes via evapotranspiration would be an appropriate mitigation strategy for the Paradox Valley. Such a strategy would be an enhancement for wildlife habitat, and a pilot study for this kind of mitigation to control salinity may indeed be feasible and appropriate for Reclamation to try.

Additionally, the pilot program from "dewvaporation" technology may offer an alternative to evaporation ponds, especially if the quantity of hydrogen sulfide gas that is separated from the brine is sufficient enough to heat atmospheric air required for this innovative technology. Perhaps the heat from the electric pumps can also be utilized as a possible heat transfer mechanism for dewvaporation technology, in conjunction with applications of passive solar gain (Desalination and Water Purification Research and Development Report No. 120 by Reclamation, 2008).

However, such controls at the source should only be pursued for localized habitat restoration relating to Reclamation's activities that disrupt natural conditions. Moreover, instead of relying on any single mitigation strategy to solve the salinity challenges in the Paradox Valley, such as constructing evaporation ponds or just injecting brine, a more appropriate strategy would be to include numerous applications simultaneously, especially if they can significantly reduce cumulative impacts to the natural environment.

DECOMMISSIONING MCPHEE DAM

In addition to seeking out more efficient water storage mechanisms such as ground-water recharge, Reclamation should pursue the restoration of natural flows in the Dolores River basin by decommissioning McPhee Dam. The return of free-flowing water would assure healthy habitat conditions for the river corridor, return sufficient dilution capacity for the natural salt inputs from Paradox Valley, and reduce salinity by the application of irrigation water from the Dolores River on to the saline soils of southwestern Colorado. This would simultaneously improve the water quality of the San Juan River as well. Additionally, it should be noted that the San Juan River watershed contributes more sediment into Lake Powell than the Colorado and Green rivers combined (1986 Lake Powell Survey by Reclamation; REC-ERC-88-5).

Water currently under contract from McPhee reservoir is primarily used by the City of Cortez, the Dolores Water Conservancy District, the Montezuma Valley Irrigation District, and the Mountain Ute Tribe. The electricity that is generated at the dam is used to aid in the total cost of lifting the water from the Dolores River basin to the San Juan River basin.

None of this water is critical, because the original farmers established a successful dry-farming practice in the region before McPhee Dam was completed in 1984. The high cost of water from the Dolores Project has been a controversy since 1987, when the delivery canals were finally completed. Additionally, the USGS has identified the Dolores Project as a major contributor of salinity and selenium in the San Juan River basin (USGS Water-Resources Investigations Report 97-4008).

McPhee reservoir was built to augment an existing agricultural community in the San Juan River basin on soils that are naturally saline and high in selenium. Like all reservoirs in the Colorado River basin, McPhee Reservoir will be rendered useless by sediment fill, and in the interim time-period the dam may fail or be severely damaged by a probable maximum flood. Such a flood occurred in the watershed of the San Juan Mountains in October of 1911, and the estimated total volume of the week-long cloudburst was greater than the spillway capacity of the reservoirs that were authorized in this area in1956 and 1968. For example, the peak discharge of the San Juan River at Bluff was estimated to be 150,000 cubic feet per second (USGS Open File Report 01-314 by Robert H. Webb et al., 2001).

The Dolores Water Conservancy District has recently decided to invest in the possible construction of a pumpback storage facility to produce more electricity from the water stored in McPhee Reservoir. This project will increase salinity due to incidental evaporation and seepage from two new reservoirs, and increase vulnerability when shortages are declared for downstream users or for increased flows to protect endangered fish. This project further demonstrates how water users in the basin are resistant to developing system resilient strategies.

Additional benefits of decommissioning McPhee Dam will include increasing the range of critical habitat for endangered and threatened native fish, seasonal non-motorized river recreation on the Dolores River, and decreased evaporation and seepage from McPhee Reservoir.

CONCLUSION

For some time Living Rivers and a host of other stakeholders have requested that the Department of Interior pursue a basin-wide Programmatic Environmental Impact Statement to address water quantity, water quality and critical habitat for the Colorado River basin. Such a proposal has in fact been on the table for nearly four decades, but Reclamation and Interior continue to push back. The growing salinity problem that has precipitated this proposed action is yet another example as to the urgent need for such an undertaking. EIS processes for such a marginal activity that does not address any of the root problems affecting Colorado River water quality, storage and consumption, is a

tremendous waste of the public's time and resources. The Colorado River water storage and delivery system is broken, and this proposed action by Reclamation, along with the other agency partners in salinity control (Bureau of Land Management, Department of Agriculture, and the Salinity Control Forum) will provide no long-term remedy. It's critical that the partnering agencies and Reclamation take a step back and begin to reevaluate this approach. Otherwise resolutions to resolve these mounting problems will only come via crisis management and court battles that themselves will only add further piecemeal impediments to the long-term viability of sustainable water resources management in the Colorado River Basin.

Sincerely yours,

/s/ John Weisheit

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