

MEMORANDUM

Board	'S EXHIBITS 1069
DATE: 11-1-2013	

DATE: October 28, 2013

TO: Jim Shaw, Federal Water Master
U.S BOARD OF WATER COMMISSIONERS, WALKER RIVER

FROM: Robert O. Anderson, P.E., W.R.S., CFM *ROA*
R.O. ANDERSON ENGINEERING, INC.

SUBJECT: National Fish and Wildlife Foundation, Application to Change 80700: Review of Lower Walker River Conveyance Protocols, dated September 18, 2013

Jim:

Thank you, again, for your confidence. We appreciate the opportunity to assist you evaluate and better understand the basis and function of the subject protocols if implemented as now proposed. The meeting we had earlier this week to review these protocols together with Ms. Peterson was very helpful for me to better understand the operational constraints that you deal with as you administer the distribution of irrigation waters for the lower Walker River. In addition, the opportunity to meet with and discuss these protocols with Kip Allander, the USGS Hydrologist who provided technical assistance during the development of the protocols, was also informative and quite helpful.

From our review of the draft protocols and the information we gleaned from the above referenced meetings, we have made several findings that I believe are pertinent to and may affect the means and methods now used to administer water rights in the lower portion of the river should these protocols be adopted and incorporated into the proposed permit terms. Our findings and technical observations are as follows:

1. The equations developed to "model" flows through the lower Walker River system are based on the Conservation of Mass equation. This is sometimes referred to as "water balance".
2. From our meeting with Mr. Allander, it seems that he has done extensive back testing of the proposed protocols using historic gage data that is available. The available gage data, at least in some locations, is either relatively new or known to be biased or unreliable (e.g. Cow Camp Gage). We were informed that Mr. Allander shares your concern for the reliability of the Cow Camp Gage and that he disregarded that data. According to his comments, on an annual or gross basis the back testing done to date confirms that the draft protocols seem to function as anticipated. He acknowledged, though, that the protocols may or may not function well (due to uncertainties and potential bias) to account for day-to-day flow variations, which is how the Water Master must administer and distribute waters.
3. There are several significant assumptions embedded in the proposed protocols. They are:

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- a. a daily time step is sufficient to account for the "unsteadiness" or high variability of river flows in the system;
 - b. the differences between the average daily discharge at adjacent streamgages is useful for estimating "transmission losses";
 - c. a simple equation, which is based solely on maximum daily temperature, is used to account for reservoir evaporation;
 - d. transmission losses can be apportioned between Program Water and other waters in the river system using a simple ratio or linear proportion; and
 - e. the Program Water and other remaining waters are allocated commencing immediately downstream of the Wabuska Gage.
4. To our knowledge a streamgage network analysis has not been performed to determine the magnitude of errors or the extent of bias that may be present in the streamgage measurements that are now, and have historically been present within this portion of the river. Such an analysis would help determine the level of uncertainty in streamgage data. Results from this analysis could be applied to historic data and adjusted as necessary and appropriate to improve the terms of the protocol. This extent of streamgage analysis has been unnecessary to administer and distribute water in accordance with historic practices and the terms of the Decree. However, as permits are issued with allowed discharge rates in fractions of cubic feet per second, and protocols implemented based on the historic streamgage data, a network analysis of the streamgages becomes increasingly important to minimize uncertainty in the background information.

Uncertainty in streamgage discharge estimates is not specifically addressed in the proposed protocol. Therefore, there is uncertainty in the allocations represented by the protocol. Neither is bias directly addressed in the protocol. If the streamgage discharge data are biased (quite possible), then there will be bias in the protocol. Only the parties attendant to the protocol can assess whether the uncertainty and bias is important to their relative rights, but those quantities are present and seem unaddressed by the draft protocol. It is understood that there will always be uncertainty in discharge estimates. However, as proposed, the protocol ignores or effectively hides those uncertainties and potential bias. Unfortunately, if these protocols are adopted and implemented without addressing the extent of uncertainty and bias, the Water Master will be responsible to administer the relative rights of the users using relationships based on uncertain and potentially biased data.

5. Surface evaporation from lakes and reservoirs is more complicated than the single term expression used in the protocol. At a minimum, reservoir evaporation is a function of vapor pressure (near water-surface temperature), atmospheric vapor deficit (relative humidity), and advection (wind speed over the water surface). These variables are not quantified in the protocol. The simple relation used in the suggested protocol might have both uncertainty and bias.

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During our conversation with Mr. Allander, he indicated that the format and function of proposed protocols were sufficient to properly account for evaporation based on the anticipated operating parameters of the reservoir. Specifically, he indicated that the Applicant (NFWF) anticipates that their water will be present in the reservoir for a very short period of time, typically less than two days. In his estimation, this operational assumption serves to minimize the significance that reservoir evaporation plays in the function of the protocol and justifies the simplicity of this term. As a result, under the draft protocol, Program Water is not assessed evaporative losses or is, effectively, passed through the reservoir without discount.

6. The protocol uses a relatively simple, linear proportion for allocation of "losses" to Program Water and other waters in the river based on the defined water balance, which has been derived from data between the Wabuska Gage and the outlet of Weber Reservoir. As I understand the terms of the Decree, the Water Master is required to and has historically administered the decreed rights now proposed to be changed from the Yerington Weir, not the Wabuska Gage. As such, there is no means for the Water Master to guarantee delivery of water to the Wabuska Gage.

The proposed protocol as currently drafted also does not account for losses in the system between the Yerington Weir and the Wabuska Gage and is, therefore, ineffective for the Water Master's purpose of administering the relative rights on the system.

7. As we discussed at some length, the terms of the Decree require the Water Master to serve the Walker River Paiute Tribe of Indians 26.25 CFS for 180 days. As I understand it, the Tribe is the most senior appropriator on the river. Due to the lack of available storage or a means of regulating flows in the lower portions of the Walker River system, on a daily basis the Water Master must estimate and project what flows may be available at the Yerington Weir for the purpose of ensuring an adequate supply of water to serve the Tribe's claim. Because of lag time in the river, the historic practice of the Water Master has been to make these calculations on a two- to three-day-forward basis. In theory, water in excess of 26.25 CFS above the Yerington weir should be available to serve junior appropriators. Furthermore, according to the terms of Permit 25792/Certificate 10860 (State of Nevada, Department of Wildlife), flows in excess of 26.25 CFS, up to 795.2 CFS, below the Wabuska Gage are already appropriated for fish, game and recreation purposes. That is, during the 180 day irrigation season allocated to the Tribe, the first 26.25 CFS is appropriated; the next 795.2 CFS are appropriated by permit to the State of Nevada. Therefore, in this segment (below the Wabuska Gage), it seems inappropriate and perhaps erroneous to implement a protocol based on a linear proportion of relative rights. This concern may possibly be mitigated if additional regulation storage was available upstream of the Yerington Weir; however, such storage capacity is, obviously, not available at this time.

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I hope this summary is helpful as you continue to weigh and consider the subject application and the proposed administrative protocol. Please do not hesitate to call to discuss any questions or clarifications you might require to the above information.

Best professional regards.

cc. Karen Peterson, Esq.