

To: Site Futures Committee

Norm Boyd, Krissie Braun, Sabrina Henry, Saxon Sharpe, Rock Smith, and Russ von Koch

From: Living Rivers & Uranium Watch

John Weisheit and Sarah Fields

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Dear sub-committee members:

During the federal National Environmental Policy Act (NEPA) process for the remediation of the Atlas Tailings Pile, a group of citizens obtained a grant from the Citizens' Monitoring and Technical Assessment Fund to include paleoflood data for the administrative record and to demonstrate scientifically that it was in the public's interest to move the tailings pile out of the Colorado River floodplain.

We submitted our final report about the same time that the US Geological Survey (USGS) submitted their findings (circa 2006). The citizens' distributed their report liberally to all interested parties via US Mail and it is posted permanently on the World Wide Web.

2005 USGS Report: http://pubs.usgs.gov/sir/2005/5022/pdf/SIR2005_5022.pdf

2006 Citizens' Report: www.livingrivers.org/pdfs/LRlibrary/MoabMillProject/MoabMillProject.pdf

2007 Citizens' Addendum: www.riversimulator.org/Resources/Hydrology/PaleofloodsColoradoHECRASmagnitudesOctober2006.pdf

The USGS calculated the peak discharge, using the Probable Maximum Precipitation - Probable Maximum Flood (PMP-PMF) model, to be about 300,000 cubic feet per second (cfs). The results of the citizens' paleoflood study shows that at least 2 floods with similar magnitudes did occur during the late history of the Colorado River. Such magnitudes are nearly five times greater than the magnitude of the floods of 1983 and 1984.

To visualize just how large a flood of 300,000 cfs in the Moab Valley would be, Highway 191 would be underwater from where the Grand County Credit Union building is to the junction of the Potash Highway 279. In the city limits of Moab, the river would encroach and parallel 100 West (Swanny City Park). Along our study reach (Highway 128 at Milepost 10.3), such a flood would be more than 15 meters (49 feet) above present winter water levels.

The two studies were different in determining the magnitude and frequency of the largest expected floods. The USGS did two types of analyses: (1) statistical analysis of the measured data and (2) Iteration of the PMP-PMF model. Whereas the citizens' group did a detailed paleoflood study under the supervision of Dr. Victor Baker from the University of Arizona and Dr. Noam Greenbaum from the University of Haifa (Israel).

The USGS's statistical analysis estimated the frequency of the probable maximum flood (PMF) at about 10,000-years. The citizens' paleoflood study revealed that the frequency of floods with magnitude the size of the PMF occurs in much higher frequency. For example, the citizens' report has found geological evidence of at least two floods with a PMF magnitude greater than 300,000 cfs that have occurred in the last 2,100-years, suggesting an average frequency of about 1,000-years to these floods.

We already understand that the Colorado River breaches the river right (north) bank at levels approaching 70,000 cfs. For example, there is a photo of the 1917 flood inundating the land between the Colorado River Bridge and Courthouse Wash Bridge. www.riversimulator.org/Resources/Photos/Moab/1917FloodMoab.jpg

There is a photo from 1957 that shows the Colorado River encroaching upon the site operations of the original uranium mill. www.riversimulator.org/Resources/Photos/Moab/ColoradoRiverFlood1957MoabMill.jpg

We also understand that the flood of 1884 peaked at 125,000 cfs above the mouth of the Dolores River and that this level has been confirmed by other proxies, such as the driftwood lines that still exist along the margins of the Colorado River from this flood. One of these driftwood lines exists at our paleoflood study site above the BLM "take-out" (Milepost 10.3) on the Colorado River "Daily."

Our paleoflood study has not been concluded. Since 2005, we have increased our level of understanding thanks to additional grant money from the Bureau of Reclamation to study paleofloods on the Green River in Canyonlands National Park and to model the flood history of the Upper Colorado River Basin. Dr. Tess Harden (Bureau of Reclamation) provided assistance for this modeling. The model is called FLDFRQ3. The following information will be shortly submitted to publication in a leading journal of hydrology.

The USGS report (Kenney, 2005) has determined the following probabilities for flood magnitudes at Moab, Utah as follows:

- 1) A 100-year flood – peak discharge of 97,645 cfs.
- 2) A 500-year flood – peak discharge of 120,070 cfs.
- 3) The PMF peak discharge – 300,175 cfs.
- 4) Estimated frequency of the PMF – 10,000-years.

The citizens' report (Greenbaum et al., 2007) determined the following flood frequencies in the last 2,140-years (+/- 220-years):

- 1) 34 to 40 floods have exceeded the magnitude of the USGS 100-year flood determination.
- 2) 20 to 25 floods have exceeded the magnitude of the USGS 500-year flood determination.
- 3) 5 floods have exceeded a peak discharge of 282,000 cfs.
- 4) The two largest floods exceeds peak discharge of 349,000 cfs.
- 5) The frequency of these floods is about 1,000-years. This value was also assigned to the USGS PMF.

FLDFRQ3 modeling suggests that flood recurrence intervals would have the following values:

- 1) The 100-year flood would have a peak discharge ranging from 156,440 to 179,050 cfs.
- 2) The 500-year flood would have a peak discharge ranging from 224,780 to 265,570 cfs.
- 3) A 1000-year flood would have a peak discharge ranging from 256,740 to 310,770 cfs.

INTERPRETATION

This data (USGS and Citizens') is more severe than the human instrument record reveals. The instrument record began when the railroad lines entered Grand County in 1883. In 1884 the Loma, Colorado, river gage measured a flood of 125,000 cfs. The second most severe flood happened in 1917, with a peak volume of 76,800 cfs.

According to the USGS statistical data, Grand County hasn't experienced a 100-year flood event since 1884 (129-years ago). According to the FLDFRQ3 modeling, Grand County hasn't experienced a 100-year flood in the chronology of its human history.

The take-home message is: According to our knowledge from the measured data, floods greater than what occurred in 1884 are indeed possible, and the frequency of these floods occur in much shorter intervals. Such floods can severely affect the tailings pile, and, therefore, it is critically important to continue to move the contaminated waste materials from the floodplain as quickly as possible.

The ultimate concerns are: 1) A 100-year flood is overdue, 2) When will the 500-year flood event arrive?, and 3) When will the 1,000-year flood arrive?

We cannot make a prediction regarding these three possible events, but we clearly know that such floods have already occurred in the late history of the Colorado River (twice in the last 2,000-years). Therefore, a prediction is not really vital information for planners. The best planning policy for the moment is to assume that such a flood will arrive someday and the community should be prepared for such an event. The community should adopt a development plan that is compatible with the reality of the Colorado River's flood history.

SUGGESTIONS FOR DEVELOPMENT, OR NOT

1) We suggest strongly that no permanent structures for human occupation be built in the floodplain. Analysis of drill records (DOE Borehole #453) at the mill site indicate significant reworking of driftwood, sediment and gravels during floods. Thus, structures and their foundations would very likely be compromised during major flood events.

2) We also suggest that non-human occupation facilities, such as power generation structures, not be constructed in the floodplain.

3) We strongly suggest that the best use of this land is to respect it for what it truly is—a floodplain buffer. Consider its true value as a free ecological service to lessen the impacts of flooding in the Moab Valley.

Sincerely yours,

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