UNITED STATES

NUCLEAR REGULATORY COMMISSION

REGION IV

URANIUM RECOVERY FIELD OFFICE
BOX 25325
DENVER, COLORADO 80225

Docket No. 40-3453

JAN 03 1993

Atlas Corporation
ATTN: Mr. Richard Blubaugh
Vice President of Environmental
and Government Affairs
370 Seventeenth Street, Suite 3150
Denver, Colorado 80202

Dear Mr. Blubaugh:

In further reviewing the surface water hydrology and erosion protection aspects of your reclamation plan, we have identified areas in which additional information and analyses are required. As indicated in our letter to you dated November 29, 1993, we expected that such additional comments would be developed as our review progressed.

Following our recent geomorphic review and our preliminary determination that the Colorado River may not be stable and may have the potential to migrate, we performed a detailed review of the basic physical and hydraulic data used in your water surface profile analyses submitted in your reclamation report dated June 1992. Previously, the staff had no basis to question these data. Independent verification using your data had indicated that the river channel and overbank areas would be subject to very low flood velocities. It appeared that such low velocities resulted primarily from a backwater effect produced by downstream constrictions and by a relatively flat river slope.

Following a detailed review of the profiles, and site visits to the mill and river area, it appears that the cross-sections used may not reflect actual river geometry and that several assumptions used in the water surface profile analyses may not be appropriate. The staff's concerns in these areas are enclosed.

If you have any questions concerning this letter please call me at (303) 231-5800. Technical questions on the enclosure should be directed to Ted Johnson at (301) 504-3440. We would be pleased to discuss these comments and questions with you at the January, 1994, meeting.

Sincerely,

Ramon E. Hall
Director

Enclosure:
As stated

cc:
W. Sinclair, RCPD, UT

bcc:
Docket No. 40-3453
PDR/DCS
URFO r/f
DDChamberlain, RIV
LLUR Branch, LLWM
TLJohnson, 5 E4
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ENCLOSURE

ADDITIONAL QUESTIONS AND COMMENTS
SURFACE WATER HYDROLOGY AND EROSION PROTECTION

It appears that the cross-sections and other estimated hydraulic parameters used in your water surface profile analyses to assess flooding on the Colorado River may not be appropriate. Preliminary review of your data and analyses indicates that the computations presented may not reflect actual conditions, as indicated by direct staff observations of the Colorado River. We have questions and concerns in the following areas: (1) topographic and Colorado River cross-section data; (2) underprediction of flow velocities in the river channel; (3) changes to river channel cross sections during flood events; and (4) use of Manning's 'n' values.

It appears that the topographic and cross-section data provided for determining water surface elevations and velocities are not adequate for assessing flow velocities in the river channel. Based on an examination of the topographic and cross-section information provided, more-detailed and correct cross-sections are required to correctly analyze the flows in the Colorado River, particularly with regard to determining flood velocities. For example, the cross-section data provided with the HEC-2 analyses (Appendix F) do not agree with topographic data provided in Drawing 88-067-E64 (Sheet 2 of 10). Specifically, cross-section 800 in the immediate site vicinity, does not reflect the elevations or channel widths indicated on the drawing. Further, direct observations and approximate staff measurements of the river depth indicate that the depths from the top of the bank to the channel bottom are greater than indicated in the HEC-2 data at cross-section 800 and at other cross-sections. These apparent errors could significantly affect the flow profiles computed using HEC-2, particularly if the channel bottom elevations and bottom slope are not well-defined. The calculations take on added significance if the river channel is assumed to migrate toward the pile (See previous questions on geomorphology, dated November 29, 1993.) Additional evidence to substantiate that the cross-section data are not correct is provided by direct observations of the flow velocities in the river, which indicate that the maximum predicted PMF channel velocity of about 2-3 feet per second has apparently been underestimated. The staff observed surface velocities of 2-3 feet per second in November 1993, during a low-flow period in the river. Channel velocities are likely to increase significantly as the discharge increases during flood events.

In addition, based on map studies, this reach of the river is known to change geometry during and after major flood events, since erosion and deposition occur in various places. Therefore, the flood analyses should assume that changes will occur to the river geometry during a flood event. These changes would include erosion of channel bars and deepening of the channel during a large flood event. This assumption could be extremely important at cross-sections near the "portal" area, for example, where it appears that significant constriction of flows occur and backwater effects are produced by constricted cross-sections. These sections may not be as significantly constricted during the course of a flood event. In particular, cross-section 200 indicates the presence of a sandbar which constricts flows, but could be eroded by high velocities during a major flood event. In addition, it becomes

very important to define stable channel bottom elevations in these constricted sections, since the bottom elevations and bottom slope can have a great effect on velocities and depths of flow.

Also, the Manning 'n' values should be more conservative than those assumed. For example, the channel and overbank 'n' values are assumed to be 0.03. It is likely, particularly during large floods, that channel 'n' values would be less than this. It is also likely, based on the presence of significant amounts of vegetation, that overbank 'n' values would be greater than 0.03. The overall net effect of using lower channel 'n' values would likely be to increase channel velocities and possibly lower water surface elevations. This is significant if the riprap on the pile side slopes needs to be designed for river channel velocities, if the river is assumed to migrate toward the pile (See staff questions on geomorphology). If the river is not assumed to migrate, use of overbank 'n' values of 0.03 is likely to be acceptable, but should be checked and verified using appropriate equations for estimating 'n' values.

During our field visit to the area in November, the National Park Service pointed out high-water marks at the Highway 191 bridge for floods which occurred in the early 1930s. You should attempt to duplicate these historic profiles by adjusting Manning 'n' values, expansion and contraction losses, river geometry, etc. for the flows which occurred. These high-water marks should be surveyed and provided in the analyses as justification for the HEC-2 input parameters selected.

Accordingly, please provide revised and accurate cross-sections to properly model flood flows in the Colorado River. The new data should include surveyed cross-sections which accurately portray river geometry. Also, submit revised HEC-2 analyses using these new data to substantiate the adequacy of the proposed erosion protection on the pile side slopes.

Alternately, it may be possible to conservatively estimate the river depth and velocities to be used for the design of erosion protection using a minimal amount of data. Such estimates could be developed for (1) overbank velocities for the case where the river channel is assumed to be stable and does not migrate toward the pile or (2) channel velocities for the case where the channel is assumed to migrate toward the pile. In preparing these "bounding" calculations, however, a certain amount of new information will need to be developed. While some river channel widths and bank elevations could possibly be estimated from topographic maps already available, the slope and elevation of the river bottom will need to be accurately determined by surveys. It may be possible to use such measured river slopes and overbank/channel geometry taken from maps in a worst-case analysis to estimate velocities in the vicinity of the pile using simple slope-area methods and conservative estimates of Manning 'n' values for the channel and overbank. This type of worst-case calculation could possibly be acceptable, if adequately justified as being appropriate and/or conservative, using sensitivity analyses, for example. This analysis should also attempt to duplicate historic profiles and high water marks.