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**From: Blaine Dwyer and Matt Brown (AECOM)**

**Subject: CRWAS Phase I | Task 2.1 | Pertinent Document List**

**Date: January 8, 2010**

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**Introduction**

This Technical Memorandum presents information per Task 2 of the Colorado River Water Availability Study (CRWAS or Study). The objective of Task 2 is to *identify, review, and summarize relevant and readily available previous studies and investigations pertinent to the execution of primary Study tasks*, limited to 20 documents.

This Task 2.1 memorandum lists high priority, readily-available, previous studies pertinent to the execution of primary Study tasks. Following is the approach used in identifying pertinent documents followed by a recommendation for 20 documents to be summarized in the upcoming Task 2.2 memo.

**Approach**

As part of 2008 CRWAS Phase I contract negotiations, CWCB, IBCC, and BRTs identified relevant and readily available previous studies and investigations as follows:

- Statewide Water Supply Initiative (SWSI) documents,
- CDSS Documentation of StateMod subbasin models,
- Alternate Hydrology Methods using tree ring based hydrology (including Prairie, J.R., 2006),
- CWCB Investigations of Colorado River Compact (including CWCB, 1995),
- Tipton and Kalmbach Studies,
- SCS Basin Studies,
- USBR Basinwide Planning Reports,
- Upper Colorado River Commission Colorado River Compact Analyses,
- Eric Kuhn Analysis of Compact Obligations,
- Colorado River and Upper Colorado River Compacts and Mexican Treaty,
- Coordinated Long-Range Operating Criteria, Interim Surplus Guidelines, and potentially Lower Basin Shortage Guidelines and Coordinated Operations of Lake Powell and Mead,
- Hydrologic determinations of 1988 and 2007, and
- CWRRRI Completion Report No. 208: "Impact of Streamflow Variability on the Colorado River System Operation".

From October 2008 to December 2009, the CRWAS consulting team completed technical memoranda for Tasks 4.1, 6.1, 7.2, 7.3, 7.5, 8.1, and 8.2 that included reviews of pertinent documents listed within each technical memorandum and included those listed above (see <http://cwcb.state.co.us/WaterInfo/CRWAS/CDSSSupportingDocumentation/>). The Recommendation section below presents a list of documents, organized by the Technical Memorandum (TM) in which the documents are referenced, that are considered, per our CRWAS contract, to be high priority, readily available, previous studies pertinent to execution of the Study. The references listed below have been compiled from the direct reference section of the technical memoranda and from the principal references contained in the TM appendices.

### Recommendation

The documents listed on the previous page and those listed below were prioritized according to level of pertinence to the Study, resulting in a list of 20 documents (**numbered in bold text below**), recommended as the Pertinent Document List, to be summarized in the Task 2.2 TM.

#### CRWAS TM 4.1 – CDSS Model Briefs

- Colorado Water Conservation Board and Colorado Division of Water Resources, Colorado's Decision Support System, Water Supply Model (StateMod) Documentation, November 2008
- Colorado Water Conservation Board and Colorado Division of Water Resources, Colorado's Decision Support System, StateCU Documentation, September 2008
- Colorado Water Conservation Board and Colorado Division of Water Resources, Gunnison River Basin Water Resources Planning Model User's Manual, July 2004
- Colorado Water Conservation Board and Colorado Division of Water Resources, Gunnison River Basin Information Report, July 2004
- Colorado Water Conservation Board and Colorado Division of Water Resources, San Juan / Dolores River Basin Water Resources Planning Model User's Manual, November 2005
- Colorado Water Conservation Board and Colorado Division of Water Resources, San Juan / Dolores River Basin Information Report, November 2005
- Colorado Water Conservation Board and Colorado Division of Water Resources, Upper Colorado River Basin Water Resources Planning Model User's Manual, January 2007
- Colorado Water Conservation Board and Colorado Division of Water Resources, Upper Colorado River Basin Information Report, January 2007
- Colorado Water Conservation Board and Colorado Division of Water Resources, White River Basin Water Resources Planning Model User's Manual, October 2009
- Colorado Water Conservation Board and Colorado Division of Water Resources, White River Basin Information Report, October 2009
- Colorado Water Conservation Board and Colorado Division of Water Resources, Yampa River Basin Water Resources Planning Model User's Manual, October 2009
- Colorado Water Conservation Board and Colorado Division of Water Resources, Yampa River Basin Information Report, October 2009

CRWAS TM 6.1 – Alternate Historical Hydrology Literature Review and Method Evaluation

1. Meko, D.M., C.A. Woodhouse, C.A. Baisan, T. Knight, J.J. Lukas, M.K. Hughs, and M.W. Salzer. “Medieval drought in the Upper Colorado River Basin.” *Geophysical Research Letters* 2007 34(5), L10705, doi: 10.1029/2007GL029988.
2. Prairie J., B. Rajagopalan, U. Lall, T. Fulp. “A stochastic nonparametric technique for space-time disaggregation of streamflows.” *Water Resources Research* 2007 Volume 43, W03432, doi: 10.1029/2005WR004721.
3. Prairie, J., K. Nowak, B. Rajagopalan, U. Lall, and T. Fulp. “A stochastic nonparametric approach for streamflow generation combining observational and paleoreconstructed data.” *Water Resources Research* 2008 Volume 44, W06423, doi: 10.1029/2007WR006684.
4. Woodhouse, C. A., S. Gray, and D. Meko. “Updated streamflow reconstructions for the upper Colorado River Basin.” *Water Resources Research* 2006 42(5), W05415, doi: 10.1029/2005WR004455.

CRWAS TM 7.2 – Climate Change Literature Review and Methods Evaluation

5. Bureau of Reclamation. “Appendix U: Climate Technical Work Group Report. Final Environmental Impact Statement: Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead”. October 2007.
6. Christensen, N. S., A. W. Wood, N. Voisin, D. Lettenmaier. *The Effects of Climate Change on the Hydrology and Water Resources of the Colorado River basin*. *Climate Change* 62: 337-363. 2004.
7. Christensen, N. and D.P. Lettenmaier. “A Multimodel Ensemble Approach to Assessment of Climate Change Impacts on the Hydrology and Water Resources of the Colorado River Basin.” *Hydrology and Earth System Sciences Discussion*. 9 July 2007: 1417-1434.
8. IPCC (2007), Summary for policy makers in: *climate change 2007: the physical science basis*. Contribution of Working Group I to the Fourth Assessment Report for the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, NY USA
9. Maurer, E.P., A.W. Wood, J.C. Adam, D.P. Lettenmaier, and B. Nijssen. “A long term Hydrologically-based Data Set of Land Surface Fluxes and States for the Conterminous United States.” *Journal of Climate*. 15 Nov. 2002: 3237-3251.
10. Ray, A. J., et al. “Climate change in Colorado; a synthesis to support water resources management and adaptation.” A report by the Western Water Assessment for the Colorado Water Conservation Board. 2008.
11. Seager, R., M. Ting, I. Held, Y. Kushnir, J. Lu, G. Vecchi, H. Huang, N. Harnik, A. Leetmaa, N. Lau, C. Li, J. Velez, and N. Naik. “Model Projections of an Imminent Transition to a More Arid Climate in Southwestern North America.” *Science*. 25 May 2007: 1181-1184.

WCRP CMIP3 Statistically Downscaled Climate Projections. January 15, 2008. LLNL-Reclamation-SCU downscaled climate projections derived from the World Climate Research Programme's (WCRP's) Coupled Model Intercomparison Project phase 3 (CMIP3) multi-model dataset. December 15, 2008.

CRWAS TM 7.3 – Forest Change Literature Review and Suggested Methods

12. Bethlahmy, N. 1974. More streamflow after bark beetle epidemic. *Journal of Hydrology* 23:185-189
  13. Graham, Russell T., Technical Editor. 2003. "Hayman Fire Case Study." Gen. Tech. Rep.MRS-GTR-114. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 396 p. Accessed March 3, 2009.
  14. MacDonald, Lee H. and Stednick, John D. "Forests and Water: A State of the Art Review for Colorado." CWRRI Completion Report No. 196. Colorado Water Resources Research Institute. 2003.
  15. Romme, W.H. et al. "Recent Forest Insect Outbreaks and Fire Risk in Colorado Forests: A Brief Synthesis of Relevant Research," Colorado State University. Accessed February 27, 2009.
- Stednick, John, undated Power Point presentation. "Effects of pine beetle infestations on water yield and water quality at the watershed scale in Northern Colorado," Posted on the Colorado Water Congress web page links. Accessed March 3, 2009.
16. Whitaker, Younes, and Decker. "Evaluating peak flow sensitivity to clear-cutting in different elevation bands of a snowmelt-dominated mountainous catchment." *Water Resources Research*, Vol. 38, No.9, 1172, doi: 10.1029/2001WR000514, 2002.

CRWAS TM 7.5 – Climate Change Approach

- Liang, S., D. P. Lettenmaier, E.F. Wood, and S.J. Burges. "A Simply Hydrologically Based Model of Land Surface Water and Energy Fluxes for General Circulation Models." *Journal of Geophysical Research*. 99. D7 (1994): 14415-14428.
- Variable Infiltration Capacity (VIC) Macroscale Hydrologic Model. January, 2002. Land Surface Hydrology Research Group, University of Washington. November 21, 2008. <http://www.hydro.washington.edu/Lettenmaier/Models/VIC/VIChome.html>
- Wood, E.F., D.P. Lettenmaier, and V.G. Zartarian. "A Land-Surface Hydrology Parameterization with Subgrid Variability for General Circulation Models." *Journal of Geophysical Research*. 97. D3 (1992): 2717-2728.

CRWAS TM 8.1 and 8.2 – Colorado River Compact Summary of Key Issues and Approach

- Bureau of Reclamation. Colorado River Basin Natural Flow and Salt Data. Sept. 2008.
17. Bureau of Reclamation. **Law of the River (focus on 1922 Colorado River Compact, 1944 Treaty between the United States of America and Mexico; 1948 Upper Colorado River Compact).**
  18. Bureau of Reclamation. **Hydrologic Determination 2007, Water Availability from Navajo Reservoir and the Upper Colorado River Basin for Use in New Mexico. Washington D.C., April 2007.**
  19. Bureau of Reclamation. **Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead: "Final Environmental Impact Statement", November 2007; "Record of Decision", December 2007.**
  20. Colorado Water Conservation Board, **Colorado River Compact Water Development Projection. Endangered Fish Flow and Colorado River Compact Water Development Workgroup. CO, 1995.**