 Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

Whipple, John J., OSE

From: Whipple, John J., OSE

Sent: Fri 7/8/2005 9:18 AM

To: Dave Trueman

Cc:

Subject: RE: Variation of HD Spreadsheet

Attachments:  [Navset.hdsummary.070805.xls\(18KB\)](#)

Dave:

Attached is a summary indicating years and amounts of shortages for different combinations of storage, Upper Basin demand and release to Lee Ferry. The numbers were generated using the previous HD spreadsheet (in which CRSP reservoir evap would be included within the UB demand). This is the kind of summary sheet I was thinking of sharing with the other states. This type of summary differs, of course, from the philosophy of taking annual shortages (where the firm yield would then be the actual annual use) and does not consider taking shortages under low-storage conditions in anticipation of compact calls.

Do you have any thoughts or suggestions?

John Whipple

From: Dave Trueman [mailto:DTRUEMAN@uc.usbr.gov]

Sent: Thu 7/7/2005 12:38 PM

To: Whipple, John J., OSE

Subject: Variation of HD Spreadsheet

John,

Here is a variation of the HD spreadsheet that corrects how compact calls are handled, uses variable CRSP evap v. storage, allows supply shortages to be varied in extremely dry years, and allows a soft landing for compact calls. Note when you look at UB depletion levels that this doesn't include evap, which can be found in another column. Take a look and give me a call.

Regards - Dave T

David Trueman
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 Resources Management Division
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OSE-0333

<https://webmail.state.nm.us/exchange/john.whipple/Sent%20Items/RE:%20Variation%20of...> 7/8/2005

Annual Water Budget Analysis for Upper Basin
1906-2000 CRSS Natural Flow at Lee Ferry

<u>CRSP Storage</u>	<u>Powell Release</u>	<u>UB Demand</u>	<u>Year of Shortage</u>	<u>Amount of Shortage</u>	<u>CRSP Storage</u>	<u>Powell Release</u>	<u>UB Demand</u>	<u>Year of Shortage</u>	<u>Amount of Shortage</u>
Active	8.25 MAF	6.0 MAF	1964	2.8 MAF	Live	8.25 MAF	6.0 MAF	1964	none
			1967	0.5 MAF				1967	none
			1968	0.5 MAF				1968	0.4 MAF
			1977	4.5 MAF				1977	4.5 MAF
Active	8.25 MAF	6.1 MAF	1961	0.2 MAF	Live	8.25 MAF	6.1 MAF	1961	none
			1963	2.5 MAF				1963	none
			1964	3.5 MAF				1964	2.7 MAF
			1967	0.8 MAF				1967	0.8 MAF
			1968	0.6 MAF				1968	0.6 MAF
			1977	5.4 MAF				1977	5.4 MAF
Active	8.25 MAF	6.2 MAF	1961	3.3 MAF	Live	8.25 MAF	6.2 MAF	1961	none
			1963	2.7 MAF				1963	2.5 MAF
			1964	3.6 MAF				1964	3.6 MAF
			1967	1.1 MAF				1967	1.1 MAF
			1968	0.7 MAF				1968	0.7 MAF
			1977	6.3 MAF				1977	6.3 MAF
Active	8.10 MAF	6.1 MAF	1964	1.1 MAF	Live	8.10 MAF	6.1 MAF	1964	none
			1967	0.4 MAF				1967	none
			1968	0.5 MAF				1968	none
			1977	4.0 MAF				1977	2.5 MAF
Active	8.10 MAF	6.2 MAF	1963	1.1 MAF	Live	8.10 MAF	6.2 MAF	1963	none
			1964	3.4 MAF				1964	1.0 MAF
			1967	0.7 MAF				1967	0.7 MAF
			1968	0.6 MAF				1968	0.6 MAF
			1977	4.9 MAF				1977	4.9 MAF
Active	8.10 MAF	6.2 MAF/ 6.0 MAF	1964	1.1 MAF	Live	8.10 MAF	6.2 MAF/ 6.0 MAF	1964	none
			1967	0.3 MAF				1967	none
			1968	0.6 MAF				1968	none
			1977	4.3 MAF				1977	2.8 MAF
Active	8.00 MAF	6.2 MAF	1964	1.1 MAF	Live	8.00 MAF	6.2 MAF	1964	none
			1967	0.4 MAF				1967	none
			1968	0.5 MAF				1968	none
			1977	4.0 MAF				1977	2.5 MAF
Active	8.00 MAF	6.2 MAF/ 6.0 MAF	1977	2.5 MAF	Live	8.00 MAF	6.2 MAF/ 6.0 MAF	1977	none
Active	7.90 MAF	6.2 MAF	1977	2.8 MAF	Live	7.90 MAF	6.2 MAF	1977	none

Notes:

Active storage includes active storage at Powell, Flaming Gorge, Aspinall and Navajo (23.89 MAF).

Live storage includes live storage at Powell, Flaming Gorge and Aspinall, and active storage at Navajo (27.37 MAF).

Only Powell storage is reduced for sedimentation through 2060, and no bank storage is included.

6.2 MAF/6.0 MAF demand uses 6.2 MAF demand when natural flow exceeds 13.0 MAF and 6.0 MAF in other years.

NEW MEXICO INTERSTATE STREAM COMMISSION

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May 3, 2005

Mr. Rick Gold
Regional Director
Bureau of Reclamation
Upper Colorado Regional Office
125 South State Street, Room 6107
Salt Lake City, Utah 84138-1102

Dear Mr. Gold:

We are very pleased to announce that on April 19, 2005, the State of New Mexico and the Navajo Nation executed the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (the Agreement). We anticipate that New Mexico's Congressional delegation soon will be introducing legislation to approve the Agreement and to authorize the Navajo-Gallup Water Supply Project (NGWSP).

This letter asks the Secretary to complete, as expeditiously as possible, the hydrologic determination required by section 11(a) of the Act of June 13, 1962 (Public Law 87-483), of whether sufficient water is reasonably likely to be available for serving NGWSP uses in New Mexico. We appreciate Commissioner Keys' recent commitment regarding this issue, made during our discussion of the terms of the Settlement at our April meeting in D.C., and his recent direction that the determination be completed this year.

The existing Hydrologic Determination approved by the Secretary of the Interior on February 2, 1989 (1988 Determination) projects water availability to the year 2040. Because the NGWSP is not expected to be completed until almost 2020, a contract that would supply water for the proposed NGWSP to serve the project demands in New Mexico should be based on a determination that there is sufficient water likely to be available through 2060 from the apportionment made to the State of New Mexico by the Upper Colorado River Basin Compact. The Upper Colorado River Commission by Resolution dated June 17, 2003, copy enclosed, approved the use and accounting of Upper Basin water supplied to the Lower Basin in New Mexico by the proposed NGWSP. It is our view that the 1988 Determination can be extended to the year 2060.

Mr. Rick Gold
May 3, 2005
Page 2

In contemplation that such an extension can be prepared, we have reviewed in detail existing, anticipated and potential depletions in the Upper Colorado River Basin in New Mexico. We have made minor revisions to previous schedules of depletions in the Basin in New Mexico to reflect the Agreement and other information that has become available since Thomas Turney transmitted an updated depletion schedule to you via letter dated February 19, 2002. The revised depletion schedule is contained in a memorandum from John Whipple to Philip Mutz, dated April 22, 2005, copy enclosed for your information and use. Further discussion of the depletion schedule and of the availability of water within New Mexico's Upper Basin apportionment to service the NGWSP is provided in documents prepared in support of the Agreement that Mr. Whipple has made available to members of your staff.

This letter, with its attachments, is being forwarded to the Upper Colorado River Commissioners for the United States, Colorado, Utah and Wyoming for their information.

We appreciate the efforts of the Bureau of Reclamation in the planning and development of the proposed NGWSP and the Bureau's efforts to complete a hydrologic determination within the year. Mr. Whipple has scheduled a meeting with your staff in May to discuss preparation of an updated hydrologic determination. Please let us know if additional information would be useful and please call Mr. Whipple or me should you have any questions.

Sincerely,



John R. D'Antonio, Jr., P.E., State Engineer
and Secretary of the Interstate Stream Commission

Enclosures

Copy w/enc.: Richard Bratton
 Scott Balcomb
 Larry Anderson
 Patrick Tyrell
 Don Ostler
 Stanley Pollack

RESOLUTION OF THE
UPPER COLORADO RIVER COMMISSION

Regarding the Use and Accounting of Upper Basin Water Supplied to the Lower Basin in
New Mexico by the Proposed Navajo-Gallup Water Supply Project

WHEREAS, part of the State of New Mexico is within the Upper Basin and part is within the Lower Basin as defined in Article II of the Colorado River Compact (45 Stat. 1057); and

WHEREAS, New Mexico has proposed the Navajo-Gallup Water Supply Project to divert water from the Upper Basin to serve communities located within the Lower Basin in New Mexico; and

WHEREAS, New Mexico needs to provide a water supply for municipal, industrial, commercial and domestic purposes to Navajo and non-Indian communities located within the Lower Basin in New Mexico that do not have an adequate Lower Basin source of water; and

WHEREAS, Subsection 303(d) of Public Law 90-537, the Colorado River Basin Project Act, authorized a thermal generating plant to be located within the State of Arizona and provided that if the plant was served by water diverted from the drainage area of the Colorado River system above Lee Ferry such consumptive use of water would be a part of the consumptive use apportioned to the State of Arizona by Article III (a) of the Upper Colorado River Basin Compact (63 Stat. 31) regardless of whether the plant was located in the Upper Basin or the Lower Basin; and

WHEREAS, the states of Colorado, New Mexico, Utah and Wyoming all support the proposed Navajo-Gallup Water Supply Project; but the states are not in agreement as to whether, under the Law of the River, New Mexico may use a part of its Upper Basin apportionment to serve uses in the Lower Basin portion of New Mexico, without obtaining the consent of the other states. However, in the spirit of comity, and without prejudice to the position of any state regarding these unresolved issues, all the states support and to the extent necessary consent to the Navajo-Gallup Water Supply Project in New Mexico.

NOW, THEREFORE, BE IT RESOLVED by the Upper Colorado River Commission that the States of Colorado, New Mexico, Utah and Wyoming, support and to the extent necessary consent to the diversion of water from the Upper Basin for use in the Lower Basin solely within New Mexico via the proposed Navajo-Gallup Water Supply Project; provided, that any water so diverted by said project to the Lower Basin portion of New Mexico, being a depletion of water at Lee Ferry, shall be a part of the consumptive use apportionment made to the State of New Mexico by Article III (a) of the Upper Colorado River Basin Compact; and

BE IT FURTHER RESOLVED, that the use of any return flows which result from use of water through the Navajo-Gallup Water Supply Project within the Lower Basin shall be subject to applicable laws; and

BE IT FURTHER RESOLVED, that nothing resulting from the implementation of this Resolution shall limit the right or ability of any Upper Basin State to develop the full apportionment made to it under the Colorado River Compact and the Upper Colorado River Basin Compact; and,

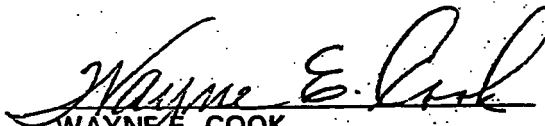
BE IT FURTHER RESOLVED, that the construction and operation of, and use of water through, the Navajo-Gallup Water Supply Project shall be subject to all other applicable provisions of law; and,

BE IT FURTHER RESOLVED, that the Upper Colorado River Commission supports such Congressional action as may be necessary to authorize the Navajo-Gallup Water Supply Project.

CERTIFICATE

I, WAYNE E. COOK, Executive Director and Secretary of the Upper Colorado River Commission, do hereby certify that the above Resolution was adopted by the Upper Colorado River Commission at its Meeting held at the Half Moon Lake Resort near Pinedale, Wyoming on June 17, 2003.

WITNESS my hand this 19th day of June, 2003.


WAYNE E. COOK
Executive Director and Secretary

MEMORANDUM
April 22, 2005

To: Philip Mutz, Upper Colorado River Commissioner for New Mexico
From: John Whipple, ISC staff and Engineering Committee member for New Mexico
Subject: Revised Upper Colorado River Basin Depletion Schedule for New Mexico

The State of New Mexico and the Navajo Nation on April 19, 2005, signed the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement. For Congress to approve the Settlement Contract between the United States and the Navajo Nation that is described in subparagraph 6.2 of the Settlement Agreement, the Secretary of the Interior pursuant to Public Law 87-483 will need to make a determination that sufficient water is reasonably likely to be available under the apportionments made by the Upper Colorado River Basin Compact for the Navajo Nation's uses in New Mexico under the Navajo-Gallup Water Supply Project. New Mexico State Engineer Thomas Turney via letter to Rick Gold dated February 19, 2002, transmitted to the Bureau of Reclamation a schedule of anticipated depletions in the San Juan River Basin in New Mexico, dated February 2002, that indicated that sufficient water would be available through the year 2060 to service the existing and authorized uses in New Mexico and the Navajo-Gallup Water Supply Project. The New Mexico Interstate Stream Commission staff prepared the revised depletion schedule attached hereto to incorporate minor adjustments to the February 2002 schedule to reflect the Settlement Agreement and data updates. The revised depletion schedule indicates that under the Settlement Agreement, sufficient water would be available to service the Settlement Contract. The revised depletion schedule is to be provided to the Bureau of Reclamation for the Secretary's consideration pursuant to subparagraph 6.1 of the Settlement Agreement, and would be subject to further minor adjustments as may be appropriate.

The depletion schedule shows anticipated average annual depletions over time for use for planning purposes only. The schedule is not a tabulation or determination of water rights and is not

binding on any party with respect to how a party may use its water rights. The anticipated depletions are based on reasonable assumptions of use within the water rights for Navajo Nation and non-Navajo uses in the Basin. For example, it is anticipated that, on average, about 5 percent of the acreage within large irrigation projects such as the Navajo Indian Irrigation Project and the Hogback-Cudei Irrigation Project will be fallow. Similarly, it is anticipated that the non-Indian irrigators will not irrigate every water right acre each year and will not deplete water in excess of the historic irrigation use. To use the full water right acreage to determine average annual depletions would guarantee that some of New Mexico's Upper Basin apportionment would remain unused by New Mexico. In some instances, most notably in the Animas River valley, current irrigation use is significantly less than the historic irrigation use. With the exception of the Bureau of Reclamation's Hammond Irrigation Project, the non-Indian irrigation depletions shown in the depletion schedule are based on the historic peak of the amount of acreage irrigated in a year within the specified areas or projects, which peak generally occurred about 1965. No attempt is made in the depletion schedule to reflect transfers of water rights from irrigation to municipal and industrial uses from 1965 to the present or into the future because to do so would not change the total anticipated depletion in the Upper Basin in New Mexico, and no attempt is made to speculate as to how much water rights may be determined in the San Juan River Adjudication to be forfeited or abandoned for non-use. Also, while over 70 years of hydrologic data indicate that the San Juan-Chama Project over the long-term physically will be able to divert an average of about 105,200 acre-feet per year, the Project during any given ten-year period may divert up to 135,000 acre-feet per year under the Project authorization in Public Law 87-483 depending upon availability of water. For these reasons, the total amount of water rights in the San Juan River Basin in New Mexico exceeds the total amount of anticipated average annual depletions shown in the depletion schedule. Also, the actual depletions in the Basin in 1990 and 2000 were less than the nominal current depletions shown in the schedule.

Under the Settlement Agreement, the reserved rights for Navajo Nation uses on the Navajo Indian Irrigation Project would be supplied under New Mexico State Engineer File No. 2849 and the rights for Navajo Nation uses on the Navajo-Gallup Water Supply Project would be supplied under State Engineer File Nos. 2849 and 3215. The Navajo Nation would share in shortages in the Navajo Reservoir water supply with the San Juan-Chama Project, the Jicarilla Apache Nation, the Hammond Irrigation Project and other contractors. The reserved rights for Navajo Nation uses on the Animas-La Plata Project would be supplied under New Mexico State Engineer File No. 2883, and the Navajo Nation would share in shortages in the Project water supply with the San Juan Water Commission and other Project contractors. Senior direct flow water rights in the San Juan River Basin, including irrigation rights for Navajo and non-Navajo ditches on the San Juan River and its tributaries, would retain their rights in a priority administration of the river system and not share shortages. However, pursuant to subparagraph 9.2 of the Settlement Agreement, the Navajo Nation would not call for a priority administration of the river system to supply the Hogback-Cudei and Fruitland-Cambridge irrigation projects; rather, when the available direct flow is insufficient to satisfy senior direct flow water rights in the Basin, the Nation would provide an alternate water supply for the two projects from the water delivery rights for the Navajo Indian Irrigation Project under the Settlement Contract. The anticipated depletion amounts for the Hogback-Cudei and Fruitland-Cambridge irrigation projects include depletions that would be accounted against the Navajo Indian Irrigation Project rights as a result of the alternate water source provisions of subparagraph 9.2 of the Settlement Agreement. Although there are limits to the amount of water to be supplied under subparagraph 9.2 of the Settlement Agreement, the anticipated depletions for both Navajo and non-Navajo irrigation uses, and for other uses, on the San Juan River and on the Animas River do not include reductions for shortages that may still occur during times of administration of direct flow priorities.

The depletion schedules for the Upper Basin States have been developed only to project future uses to facilitate planning for future development of the water resources available to the Upper Basin States. The depletion schedules do not provide a definitive accounting of use under the Upper Colorado River Basin Compact apportionments. In the Hydrologic Determination approved by the Secretary of the Interior on February 2, 1989, the Bureau of Reclamation determined that the yield available to the Upper Basin States under the apportionment of water to the Upper Basin by Article III of the Colorado River Compact is at least 6.0 million acre-feet of water annually based on a minimum objective release of 8.23 million acre-feet per year from Glen Canyon Dam. The Upper Colorado River Commission disagrees with the assumption of a minimum release of 8.23 million acre-feet per year from Glen Canyon Dam, but the Commission does not object to the determination. The depletion schedule shows the State of New Mexico's share of 6.0 million acre-feet minimum yield available to the Upper Basin to be about 669,400 acre-feet of consumptive use annually. If in the future it is determined that the yield available to the Upper Basin States exceeds 6.0 million acre-feet of water annually and an additional allocation of water can be made available for use within the State of New Mexico's Upper Colorado River Basin Compact apportionment, then additional Navajo and non-Navajo uses can be projected or scheduled consistent with subparagraph 8.2 of the Settlement Agreement. On the other hand, if in the future it is determined that actual uses in New Mexico exceed its Upper Basin apportionment, the New Mexico State Engineer is vested with the authority to determine curtailments of junior water uses in New Mexico as necessary to comply with the Colorado River and Upper Colorado River Basin compacts.

The depletion schedule does not reflect salvage by use. The apportionments made by the Upper Colorado River Basin Compact to the Upper Basin States are of the flow available to the Upper Basin at Lee Ferry under Article III of the Colorado River Compact. When a use of water is made in the Upper

Basin, the depletion of the flow at Lee Ferry is less than the depletion of the flow at the place of use because a portion of the streamflow used would have been lost to evaporation or evapotranspiration had the water remained in the stream channels. The savings in river channel loss above Lee Ferry resulting from putting the water to use in the Upper Basin constitutes salvage by use. In particular, uses of water in intermittent tributary drainages, such as in the Chaco River drainage in New Mexico, do not result in an equivalent reduction in flow of the San Juan River. Further, uses of ground water from non-tributary aquifers, and uses of tributary ground water at locations that are far removed from perennial streams in the San Juan River Basin, do not deplete stream flow of the San Juan River by the amount of use. The Upper Colorado River Commission has not made determinations of salvage by use, and has not made determinations as to methodologies for accounting certain consumptive uses such as irrigation depletions or ground water uses. No such determinations have been considered because the Upper Basin States have not approached full development of the Upper Basin apportionment. Nevertheless, the effects of salvaged channel losses on man-made depletions of the flow at Lee Ferry by Upper Basin States were presented in the November 29, 1948, Final Report of the Engineering Advisory Committee to the Upper Colorado River Compact Commission, and Tipton and Kalmbach in 1965 prepared a report for the Upper Colorado River Commission on water supplies available for use by the Upper Division States that included the Department of the Interior's July 1965 projections of depletions at Lee Ferry that were reduced for salvage estimated to be 4 percent of at-site depletions by projects in the Upper Basin. The Bureau of Reclamation in the preparation of long-range operating criteria for the Colorado River pursuant to Section 602 of Public Law 90-537 in July 1969 also considered salvage by use estimated to be about 4 percent of at-site depletions in its projections of depletions of the flow at Lee Ferry by uses in the Upper Basin. Only depletion of the flow at Lee Ferry is chargeable against a state's apportionment of the yield available to the Upper Basin under Article III of the Colorado River Compact.

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ing by
used in
URC
studies*

Considering uncertainties in future uses and determinations, the revised depletion schedule is a reasonable projection of future development and use of the State of New Mexico's Upper Basin apportionment, and it indicates that sufficient water is reasonably likely to be available under the apportionment for the Navajo Nation's uses in New Mexico under the Settlement Contract.

STATE OF NEW MEXICO SCHEDULE OF ANTICIPATED UPPER BASIN DEPLETIONS
(Units: 1000 acre-feet per year)

Year	1990	2000	2010	2020	2030	2040	2050	2060
CURRENT DEPLETIONS (1)								
Agricultural - Irrigation & Stock Use:								
Navajo Irrigation:								
Navajo Indian Irrigation Project (NIIP)	149.4	149.4	149.4	149.4	149.4	149.4	149.4	149.4
Fruitland-Cambridge Irrig. Project	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
Hogback-Cudei Irrigation Project	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Chaco River drainage irrigation	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Crystal area irrigation	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Navajo Irrigation Subtotal	173.4	173.4	173.4	173.4	173.4	173.4	173.4	173.4
Non-Indian Irrigation:								
Above Navajo Dam (inc. Jicarilla)	1.3	1.3	1.3	1.3	1.7	1.7	1.7	1.7
Upper San Juan (exc. Hammond)	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
Hammond Irrigation Project	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2
Animas River ditches	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7
La Plata River ditches	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
Farmers Mutual Ditch	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Jewett Valley Ditch	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Chaco River drainage irrigation	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Non-Indian Irrigation Subtotal	67.8	67.8	67.8	67.8	68.2	68.2	68.2	68.2
Stockpond Evaporation and Stock Use	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Agricultural - Irrigation & Stock Total	245.5	245.5	245.5	245.5	245.9	245.9	245.9	245.9
Municipal and Domestic Uses:								
Municipal and Industrial (2)	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
Scattered Rural Domestic (inc. Jicarilla)	1.0	1.0	1.0	1.0	1.1	1.1	1.2	1.2
Municipal and Domestic Total	10.7	10.7	10.7	10.7	10.8	10.8	10.9	10.9
Power and Industrial Uses:								
PNM - Navajo Reservoir contract (3)	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2
BHP Billiton (4)	37.0	37.0	37.0	38.0	39.0	39.0	39.0	39.0
Bloomfield Industrial	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Power and Industrial Total	55.7	55.7	55.7	56.7	57.7	57.7	57.7	57.7
Export - San Juan-Chama Project (5)	105.2	105.2	105.2	105.2	105.2	105.2	105.2	105.2
Reservoir Evaporation:								
Navajo Reservoir Evaporation (6)	28.3	28.3	28.0	27.7	27.7	27.7	27.7	27.7
Small Reservoir Evaporation	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Reservoir Evaporation Total	29.5	29.5	29.2	28.9	28.9	28.9	28.9	28.9
TOTAL CURRENT DEPLETIONS	446.6	446.6	446.3	447.0	448.5	448.5	448.6	448.6
ANTICIPATED DEPLETIONS								
Agricultural - Irrigation & Stock Uses:								
NIIP Completion (7)	0.0	0.0	65.0	100.0	107.1	107.1	107.1	107.1
Fruitland/Hogback Rehabilitation	0.0	0.0	0.0	7.2	7.2	7.2	7.2	7.2
Agricultural - Irrigation & Stock Total	0.0	0.0	65.0	107.2	114.3	114.3	114.3	114.3
Municipal and Domestic Uses:								
Animas-La Plata Project:								
San Juan Water Commission (8)	0.0	1.0	10.4	10.4	10.4	10.4	10.4	10.4
Navajo Nation	0.0	0.0	1.0	2.0	2.3	2.3	2.3	2.3
La Plata Conservancy District	0.0	0.0	0.0	0.8	0.8	0.8	0.8	0.8
Ridges Basin Res. Evap. - NM share	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Animas-La Plata Project Subtotal	0.0	1.0	11.4	13.3	13.6	13.6	13.6	13.6
Jicarilla Apache Nation	0.0	0.0	0.0	0.0	0.4	0.6	0.6	0.6
Municipal and Domestic Total	0.0	1.0	11.4	13.3	14.0	14.2	14.2	14.2
Power/Industrial Uses - Navajo Nation (9)	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3
TOTAL ANTICIPATED DEPLETIONS	0.0	1.3	76.7	120.8	128.6	128.8	128.8	128.8


*Assumes no
use by Bk
of Nat. Res.
area rights
acquired*

*U.S. Nav. Res.
w. rights acquired*


Year	1990	2000	2010	2020	2030	2040	2050	2060
POTENTIAL DEPLETIONS								
Municipal and Domestic Uses:								
Navajo-Gallup Water Supply Project:								
Navajo Nation	0.0	0.0	0.0	7.9	10.2	12.5	12.5	12.5
Jicarilla Apache Nation	0.0	0.0	0.0	0.8	1.0	1.2	1.2	1.2
Navajo-Gallup Project Subtotal	0.0	0.0	0.0	8.7	11.2	13.7	13.7	13.7
Navajo Nation	0.0	0.0	0.0	1.0	1.0	2.0	2.0	2.0
Municipal and Domestic Total	0.0	0.0	0.0	9.7	12.2	15.7	15.7	15.7
Power and Industrial Uses:								
Navajo-Gallup Project - NAPI (10)	0.0	0.0	0.0	0.7	0.7	0.7	0.7	0.7
Small Navajo Res. Contracts	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Power and Industrial Total	0.0	0.0	0.1	0.8	0.8	0.8	0.8	0.8
Export - Navajo-Gallup Project:								
Navajo Nation in New Mexico (11)	0.0	0.0	0.0	4.0	5.8	7.6	7.6	7.6
City of Gallup (12)	0.0	0.0	0.0	4.7	6.1	7.5	7.5	7.5
Export Total	0.0	0.0	0.0	8.7	11.9	15.1	15.1	15.1
TOTAL POTENTIAL DEPLETIONS	0.0	0.0	0.1	19.2	24.9	31.6	31.6	31.6
TOTAL NEW MEXICO DEPLETIONS (13)	446.6	447.9	523.1	587.0	602.0	608.9	609.0	609.0
Evaporation - CRSP Storage Units (14)	58.0	58.0	58.0	58.0	58.0	58.0	58.0	58.0
TOTAL DEPLETIONS	504.6	505.9	581.1	645.0	660.0	666.9	667.0	667.0
State Share of 6.0 MAF (15)	669.4	669.4	669.4	669.4	669.4	669.4	669.4	669.4
Remaining Available (15,16)	164.8	163.5	88.3	24.4	9.4	2.5	2.4	2.4
Percent of State Share Remaining	24.6%	24.4%	13.2%	3.6%	1.4%	0.4%	0.4%	0.4%

NOTES:

- (1) Does not reflect post-1965 transfers from irrigation to municipal and industrial uses. 800 acre-feet of current non-Indian depletions are supplied through short-term leases from the Jicarilla Apache Nation as of 2003.
- (2) Based on 1990 uses and 30% return flow from full diversion of Farmington's municipal water supply rights under the Echo Ditch Decree and License 2995. Otherwise excludes transfers of irrigation rights to municipal uses, and excludes the Animas-La Plata and Navajo-Gallup projects.
- (3) Public Service Company of New Mexico (PNM) contract with the Secretary expires 2005; PNM subcontract with Jicarilla Apache Nation effective 2006-2027, with commitment to negotiate in 2022 for a subcontract extension.
- (4) Includes uses under New Mexico State Engineer File No. 2838 at the Four Corners Power Plant, the San Juan Generating Station, and related mines.
- (5) Based on hydrologic record updated through 2000.
- (6) Based on September 2004 Biological Assessment for the Navajo-Gallup Water Supply Project. A small amount of Navajo Reservoir evaporation may be charged to Arizona's Upper Basin apportionment to the extent that reservoir storage is used to supply Navajo-Gallup Project uses in Arizona.
- (7) Total Navajo Indian Irrigation Project (NIIP) depletion by 2030 is 256,500 acre-feet, assuming 5% average fallow acreage. This amount does not include the depletions on the Hogback-Cudei and Fruitland-Cambridge irrigation projects that would be accounted against the NIIP depletion right pursuant to the alternate water source provisions of subparagraph 9.2 of the Settlement Agreement.
- (8) San Juan Water Commission member entities in 2000 used 1,000 acre-feet from the Animas River under Animas La-Plata Project permits.
- (9) Industrial uses near Shiprock (diversion of about 300 acre-feet per year assumed fully depleted).
- (10) 700 acre-feet of water from the Navajo-Gallup Water Supply Project would be used by the Navajo Agricultural Products Industry for food processing. This is an agricultural/industrial use.
- (11) This depletion schedule includes uses in New Mexico only and excludes exports by the Navajo-Gallup Project for Navajo Nation uses in Arizona.
- (12) The exports by the Navajo-Gallup Project to the City of Gallup are anticipated to be supplied through a subcontract with the Jicarilla Apache Nation. To the extent that Gallup's actual demand is less than 7,500 acre-feet, the Jicarilla Apache Nation could use its water for irrigation or other uses.
- (13) This is a schedule of anticipated depletions for planning purposes only. It is not a tabulation or determination of water rights or actual uses.
- (14) "Evaporation - CRSP Storage Units" refers to the total and individual States' portions of evaporation from the major reservoirs constructed under the Colorado River Storage Project Act that are used principally to regulate compact deliveries at Lee Ferry. These include Flaming Gorge, Curecanti and Glen Canyon, but exclude Navajo which is used principally for storing water for use in New Mexico. 58,000 acre-feet is New Mexico's portion.
- (15) This depletion schedule does not attempt to interpret the Colorado River Compact, the Upper Colorado River Basin Compact, or any other element of the "Law of the River." This schedule should not be construed as an acceptance of any assumption that limits the Upper Colorado River Basin's depletion. In this schedule, for planning purposes only, the total Upper Colorado River Basin Allocation is 6.0 million acre-feet, of which 50,000 acre-feet is the Upper Basin allocation to Arizona. This estimate does not constitute an endorsement of the Bureau of Reclamation's 1988 Hydrologic Determination that was approved by the Secretary of the Interior on February 2, 1989. This estimate also does not include salvage by use.
- (16) Reserved.

 Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

Whipple, John J., OSE

From: Dave Trueman [DTRUEMAN@uc.usbr.gov] **Sent:** Mon 7/18/2005 2:17 PM
To: Whipple, John J., OSE
Cc:
Subject: Updated Hydro Determination Spreadsheet
Attachments:  [HD Test.xls\(308KB\)](#)

John,

I've included bank storage per our discussion. In our CRSS model we include 4% for Lake Powell. I've assumed 4% for on all CRSP storage. Also note that the new version of the HD does not include any annual fallowing assumptions. I've imposed shortages only in very extreme droughts like 2002. I've also modeled CRSP reservoir evap as a function of reservoir storage (separate from Upper Basin Demands) as this helps get us through droughts (lower evap during low reservoir conditions). I've also broken out the reservoir storage, sedimentation rate, banks storage assumptions and resulting 2060 storage value so that folks can follow our math a bit more easily.

From this analysis, we could get to 6.0maf/yr of real use... no fallowing assumptions or what we were terming "shortage" in earlier versions of the spreadsheet.

David Trueman
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Resources Management Division
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OSE-0347

1952	20,805,422	18,107,385	8,250,000	5,507,000	558,727	0	24,597,080	0	24,597,080	0
1953	11,165,419	24,597,080	8,250,000	5,507,000	736,019	0	21,269,480	0	21,269,480	0
1954	8,496,102	21,269,480	8,250,000	5,507,000	645,113	550,700	15,914,169	0	15,914,169	0
1955	9,413,908	15,914,169	8,250,000	5,507,000	498,811	550,700	11,622,968	0	11,622,968	0
1956	11,426,874	11,622,968	8,250,000	5,507,000	381,579	0	8,911,261	0	8,911,261	0
1957	21,500,963	8,911,261	8,250,000	5,507,000	307,498	0	16,347,726	0	16,347,726	0
1958	15,862,511	16,347,726	8,250,000	5,507,000	510,655	550,700	17,942,582	0	17,942,582	0
1959	9,598,169	17,942,582	8,250,000	5,507,000	554,225	0	13,780,226	0	13,780,226	0
1960	11,524,160	13,780,226	8,250,000	5,507,000	440,514	0	11,106,872	0	11,106,872	0
1961	10,010,259	11,106,872	8,250,000	5,507,000	367,480	0	6,992,651	0	6,992,651	0
1962	17,377,609	6,992,651	8,250,000	5,507,000	255,084	550,700	10,358,176	0	10,358,176	0
1963	8,840,900	10,358,176	8,250,000	5,507,000	347,027	0	5,645,749	0	5,645,749	0
1964	10,863,586	5,645,749	8,250,000	5,507,000	218,288	0	2,534,047	0	2,534,047	0
1965	19,875,027	2,534,047	8,250,000	5,507,000	133,279	0	8,518,795	0	8,518,795	0
1966	10,679,844	8,518,795	8,250,000	5,507,000	296,777	0	5,144,863	0	5,144,863	0
1967	11,670,830	5,144,863	8,250,000	5,507,000	142,022	0	2,854,089	0	2,854,089	0
1968	13,739,932	2,854,089	8,250,000	5,507,000	137,676	0	2,694,998	0	2,694,998	0
1969	15,272,159	2,694,998	8,250,000	5,507,000	175,308	0	4,072,481	0	4,072,481	0
1970	15,344,136	4,072,481	8,250,000	5,507,000	213,877	0	5,484,309	0	5,484,309	0
1971	15,290,433	5,484,309	8,250,000	5,507,000	249,926	0	5,756,589	0	5,756,589	0
1972	12,959,652	6,803,864	8,250,000	5,507,000	221,316	0	10,176,090	0	10,176,090	0
1973	18,397,816	5,756,589	8,250,000	5,507,000	342,052	0	9,166,080	0	9,166,080	0
1974	13,089,042	10,176,090	8,250,000	5,507,000	314,480	0	11,920,616	0	11,920,616	0
1975	16,825,996	9,166,080	8,250,000	5,507,000	389,711	0	8,914,217	0	8,914,217	0
1976	11,140,311	11,920,616	8,250,000	5,507,000	307,579	550,700	839,234	0	839,234	0
1977	5,436,897	8,914,217	8,250,000	5,507,000	86,979	0	2,178,977	0	2,178,977	0
1978	15,183,722	839,234	8,250,000	5,507,000	123,579	0	5,970,267	0	5,970,267	0
1979	17,671,870	2,178,977	8,250,000	5,507,000	227,153	0	9,751,297	0	9,751,297	0
1980	17,765,183	5,970,267	8,250,000	5,507,000	330,447	550,700	5,229,750	0	5,229,750	0
1981	9,015,200	9,751,297	8,250,000	5,507,000	206,923	0	8,755,226	0	8,755,226	0
1982	17,489,400	5,229,750	8,250,000	5,507,000	303,236	0	19,056,980	0	19,056,980	0
1983	24,361,989	8,755,226	8,250,000	5,507,000	584,689	0	30,074,687	4,409,348	25,665,339	0
1984	25,359,376	19,056,980	8,250,000	5,507,000	765,203	0	32,389,245	6,723,906	25,665,339	0
1985	21,246,109	25,665,339	8,250,000	5,507,000	765,203	0	34,156,582	8,491,243	25,665,339	0
1986	23,013,446	25,665,339	8,250,000	5,507,000	765,203	0	26,783,614	1,118,275	25,665,339	0
1987	15,640,478	25,665,339	8,250,000	5,507,000	765,203	0	22,599,493	0	22,599,493	0
1988	11,456,357	25,665,339	8,250,000	5,507,000	681,447	550,700	18,633,592	0	18,633,592	0
1989	9,921,847	22,599,493	8,250,000	5,507,000	573,103	550,700	14,493,992	0	14,493,992	0
1990	9,639,803	18,633,592	8,250,000	5,507,000	460,013	0	12,447,000	0	12,447,000	0
1991	12,170,021	14,493,992	8,250,000	5,507,000	404,091	0	9,181,489	0	9,181,489	0
1992	10,895,580	12,447,000	8,250,000	5,507,000	314,881	0	13,269,726	0	13,269,726	0
1993	16,160,118	9,181,489	8,250,000	5,507,000	426,567	0	10,211,661	0	10,211,661	0
1994	11,125,503	13,269,726	8,250,000	5,507,000	343,024	0	16,158,803	0	16,158,803	0
1995	20,047,166	10,211,661	8,250,000	5,507,000	505,494	0	16,398,602	0	16,398,602	0
1996	14,502,293	16,158,803	8,250,000	5,507,000	512,045	0	23,751,995	0	23,751,995	0
1997	21,622,438	16,398,602	8,250,000	5,507,000	712,932	0	26,080,441	415,102	25,665,339	0
1998	16,795,376	23,751,995	8,250,000	5,507,000	765,203	0	27,077,346	1,412,007	25,665,339	0
1999	15,934,210	25,665,339	8,250,000	5,507,000	765,203	0	21,789,662	0	21,789,662	0
2000	10,646,526	25,665,339	8,250,000	5,507,000	765,203	0	0	0	0	0

*(surplus in wet years?
Contracted it)*

1952	20,805,422	18,522,105	8,250,000	5,630,000	504,761	0	24,942,766	0	24,942,766	0	24,942,766
1953	11,165,419	24,942,766	8,250,000	5,630,000	680,167	0	21,548,018	0	21,548,018	0	21,548,018
1954	8,498,102	21,548,018	8,250,000	5,630,000	587,426	563,000	16,139,695	0	16,139,695	0	16,139,695
1955	9,413,908	16,139,695	8,250,000	5,630,000	439,676	563,000	11,796,927	0	11,796,927	0	11,796,927
1956	11,426,874	11,796,927	8,250,000	5,630,000	321,036	0	9,022,765	0	9,022,765	0	9,022,765
1957	21,500,963	9,022,765	8,250,000	5,630,000	245,248	0	16,398,480	0	16,398,480	0	16,398,480
1958	15,862,511	16,398,480	8,250,000	5,630,000	446,746	0	17,934,245	0	17,934,245	0	17,934,245
1959	9,598,169	17,934,245	8,250,000	5,630,000	488,701	563,000	13,726,713	0	13,726,713	0	13,726,713
1960	11,524,160	13,726,713	8,250,000	5,630,000	373,756	0	10,997,118	0	10,997,118	0	10,997,118
1961	10,010,259	10,997,118	8,250,000	5,630,000	299,186	0	6,828,191	0	6,828,191	0	6,828,191
1962	17,377,609	6,828,191	8,250,000	5,630,000	185,295	0	10,140,505	0	10,140,505	0	10,140,505
1963	8,840,900	10,140,505	8,250,000	5,630,000	275,784	563,000	5,388,621	0	5,388,621	0	5,388,621
1964	10,863,588	5,388,621	8,250,000	5,630,000	145,967	0	2,226,240	0	2,226,240	0	2,226,240
1965	19,875,027	2,226,240	8,250,000	5,630,000	59,574	0	8,161,693	0	8,161,693	0	8,161,693
1966	10,679,844	8,161,693	8,250,000	5,630,000	221,725	0	4,739,812	0	4,739,812	0	4,739,812
1967	11,670,830	4,739,812	8,250,000	5,630,000	128,242	0	2,402,400	0	2,402,400	0	2,402,400
1968	13,739,932	2,402,400	8,250,000	5,630,000	64,387	0	2,197,945	0	2,197,945	0	2,197,945
1969	15,272,159	2,197,945	8,250,000	5,630,000	58,801	0	3,531,303	0	3,531,303	0	3,531,303
1970	15,344,136	3,531,303	8,250,000	5,630,000	95,227	0	4,900,212	0	4,900,212	0	4,900,212
1971	15,290,433	4,900,212	8,250,000	5,630,000	132,624	0	6,178,020	0	6,178,020	0	6,178,020
1972	12,959,652	6,178,020	8,250,000	5,630,000	167,533	0	5,090,139	0	5,090,139	0	5,090,139
1973	18,397,816	5,090,139	8,250,000	5,630,000	137,813	0	9,470,142	0	9,470,142	0	9,470,142
1974	13,089,042	9,470,142	8,250,000	5,630,000	257,470	0	8,421,715	0	8,421,715	0	8,421,715
1975	16,825,996	8,421,715	8,250,000	5,630,000	228,828	0	11,138,882	0	11,138,882	0	11,138,882
1976	11,140,311	11,138,882	8,250,000	5,630,000	303,059	0	8,096,135	0	8,096,135	0	8,096,135
1977	5,438,897	8,096,135	8,250,000	5,630,000	219,994	563,000	-1,902	0	-1,902	1,902	0
1978	15,183,722	0	8,250,000	5,630,000	-1,245	0	1,304,966	0	1,304,966	0	1,304,966
1979	17,671,870	1,304,966	8,250,000	5,630,000	34,406	0	5,062,430	0	5,062,430	0	5,062,430
1980	17,765,183	5,062,430	8,250,000	5,630,000	137,056	0	8,810,557	0	8,810,557	0	8,810,557
1981	9,015,200	8,810,557	8,250,000	5,630,000	239,451	563,000	4,269,306	0	4,269,306	0	4,269,306
1982	17,489,400	4,269,306	8,250,000	5,630,000	115,399	0	7,763,317	0	7,763,317	0	7,763,317
1983	24,361,989	7,763,317	8,250,000	5,630,000	210,841	0	18,034,465	0	18,034,465	0	18,034,465
1984	25,359,376	18,034,465	8,250,000	5,630,000	491,439	0	29,022,402	966,925	28,055,477	0	28,055,477
1985	21,246,109	28,055,477	8,250,000	5,630,000	765,203	0	34,656,382	6,600,908	28,055,477	0	28,055,477
1986	23,013,446	28,055,477	8,250,000	5,630,000	765,203	0	36,423,720	8,368,243	28,055,477	0	28,055,477
1987	15,640,478	28,055,477	8,250,000	5,630,000	765,203	0	29,050,752	995,275	28,055,477	0	28,055,477
1988	11,456,357	28,055,477	8,250,000	5,630,000	678,087	563,000	20,793,390	0	20,793,390	0	20,793,390
1989	9,921,847	24,866,630	8,250,000	5,630,000	566,810	563,000	16,549,383	0	16,549,383	0	16,549,383
1990	9,639,803	20,793,390	8,250,000	5,630,000	450,868	0	14,388,536	0	14,388,536	0	14,388,536
1991	12,170,021	16,549,383	8,250,000	5,630,000	391,836	0	11,012,280	0	11,012,280	0	11,012,280
1992	10,895,580	14,388,536	8,250,000	5,630,000	299,600	0	14,992,798	0	14,992,798	0	14,992,798
1993	18,160,118	11,012,280	8,250,000	5,630,000	408,344	0	11,829,957	0	11,829,957	0	11,829,957
1994	11,125,503	14,992,798	8,250,000	5,630,000	321,938	0	17,675,185	0	17,675,185	0	17,675,185
1995	20,047,166	11,829,957	8,250,000	5,630,000	481,924	0	17,815,854	0	17,815,854	0	17,815,854
1996	14,502,283	17,675,185	8,250,000	5,630,000	486,467	0	25,072,825	0	25,072,825	0	25,072,825
1997	21,622,488	17,815,854	8,250,000	5,630,000	683,720	0	27,307,483	0	27,307,483	0	27,307,483
1998	16,798,378	25,072,825	8,250,000	5,630,000	744,769	0	28,616,925	561,448	28,055,477	0	28,055,477
1999	15,934,210	27,307,483	8,250,000	5,630,000	765,203	0	24,056,800	0	24,056,800	0	24,056,800
2000	10,646,526	28,055,477	8,250,000	5,630,000	765,203	0	24,056,800	0	24,056,800	0	24,056,800

Trueman Craft

6/14/2005 4:40 PM

DRAFT
HYDROLOGIC DETERMINATION
2005

Water Availability
from Navajo Reservoir and the Upper Colorado River Basin
for Use in New Mexico

Date

Secretary of the Interior

OSE-0352

Perpetual uses -	Div.	Dep.
Jicarilla	33.5	25.5
Hammond	23.0	—
Navajo { NHP NRP	—	—
Atkins Gas 58	—	—

Executive Summary

Determination as to the availability of water under long-term service contracts for municipal and industrial (M&I) uses from Navajo Reservoir involves a projection into the future of estimated water uses and water supplies. On the basis of this hydrologic investigation, water depletions for the Upper Basin of the Colorado River can be reasonably allowed to rise to 6.0 million acre-feet (MAF) annually. This determination certifies the availability of 94,000 acre-feet of water annually for marketing from Navajo Reservoir. Of this amount, 3,000 acre-feet annually has been reserved for use in perpetuity for the Jicarilla Apache Tribe, 69,000 acre-feet per year is available for marketing through the year 2039, and an additional 22,500 acre-feet per year is available for marketing from Navajo Reservoir in perpetuity. This depletion level can be achieved under the same shortage criteria upon which the allowable annual depletion level of the 1988 hydrologic investigation, without significant increase in the level of risk.

While the Colorado River Compact requires the Upper Basin deliver 75 MAF of water every 10 years at Lee Ferry, plus up to 750,000 acre-feet per year toward any deficiencies shared with the Lower Basin in meeting the Mexican Treaty delivery requirement of 1.5 MAF per year, some simplifying assumptions were made to avoid a critical compact interpretation surrounding the deficiency obligation. It was assumed for the purposes of this study that the Upper Basin will deliver an average annual water delivery at Lee Ferry of 8.25 MAF (7.5 MAF plus 750,000 AF). This leads to a conservative hydrologic determination. If the deficiency obligation is reduced, then the Upper Basin water supply would be expected to increase by a like amount.

It should be noted that the Upper Colorado River Commission, comprised of representatives of the Upper Basin States, does not agree with the presumption of a fixed delivery requirement of 750,000 acre-feet per year toward the Mexican Treaty obligation. Use of the assumptions contained in this report are for planning purposes only and should not be considered to prejudice the position of either the upper or lower basin interests with respect to required deliveries at Lee Ferry pursuant to the Colorado River Compact.

The change in allocations for the Upper Basin States for a change from 6.0 to 6.1 maf yield under the assumptions of a 6-percent annual shortage, 8.25 maf Upper Basin delivery, and use of CRSP active storage as a result of this investigation are as follows:

State	Compact Allocation	1988 Investigation	2005 Investigation
Arizona	Fixed	50,000	50,000
Colorado	51.75%	3,079,500	3,130,875
New Mexico	11.25%	669,500	680,625
Utah	23.00%	1,368,000	1,391,500
Wyoming	14.00%	833,000	847,000
total		6,000,000	6,100,000

present like in 188 AD - ie yield w/ 4% power pool & w/ 4% Treaty oblig.

25.5 to JAN in perpetuity leaves 69.0 to market for term thru 2039 - 1060 cont. new for marketing for limited term v. perpetual? Compact long!

not cause the flow at Lee Ferry to drop below and to deliver when reservoir is half full water supply

Contracting - Diversion Cons. use

Introduction

The Act of June 13, 1962 (76 Stat. 96, Public Law 87-483), authorizing the Navajo Indian Irrigation Project and the San Juan-Chama Project, provides in Section 11 that the Secretary of the Interior (Secretary) shall not enter into long-term contracts for the delivery of water from Navajo Reservoir until the Secretary has made certain hydrologic determinations as to water availability, has submitted such determinations to the Congress, and the Congress has approved such contracts. The act also authorized the Secretary to market water from Navajo Reservoir for other municipal and industrial uses in New Mexico if the Secretary determines on the basis of hydrologic investigation that such water is reasonably likely to be available.

(a) "... No long-term contract... shall be entered into for the delivery of water stored in Navajo Reservoir... until the Secretary has determined by hydrologic investigation that sufficient water to fulfill said contract is reasonably likely to be available for use in the State of New Mexico during the term thereof under the allocations made in articles III and XIV of the Upper Colorado River Basin compact, and has submitted such determination to the Congress of the United States and the Congress has approved such contracts..."

(b) "If contracts are entered into for delivery from storage in Navajo Reservoir of water not covered by subsection (a) of this section, such contracts shall be subject to the same provision for sharing of available water supply in the event of shortages in the case of contracts required to be made pursuant to subparagraph (a) of this section."

By November 1967, the first determination which made 100,000 acre-feet of water available for marketing was submitted to the Congress, and on March 22, 1968, Senate Joint Resolution 123 (Public Law 90-272) was adopted, approving three long-term contracts with a total estimated annual depletion of 51,550 acre-feet. However, by the early 1980's it became impractical to sell water to meet long-term demands from Navajo Reservoir supply under the Secretary's 1963 determination. Under that determination, any contracts must terminate in the year 2005, which did not allow enough time for potential contractors to develop a project and recover their investments.

In December 1984, the Secretary signed the second hydrologic determination for the Upper Colorado River Basin by the Bureau of Reclamation (Reclamation). A principal conclusion of the 1984 Hydrologic Determination was the estimation that there was enough runoff in the Upper Basin to support a depletion level of at least 5.8 million acre-feet (MAF). This determination also certified the availability of 69,000 acre-feet per year of water for marketing from Navajo Reservoir through the year 2039. Although there was some indication, dependent upon assumptions and study conditions, that utilization of the Colorado River Simulation System (CRSS) might have resulted in somewhat greater yield estimations for the Upper Basin, consensus on the appropriate procedure for employing the CRSS model limited further investigation into this possibility at that time.

In February 1989, the Secretary signed the third hydrologic determination for the Upper Colorado River Basin by Reclamation. The 1988 Hydrologic Determination revised the estimation that there was enough runoff in the Upper Basin to support a depletion level of at least 6.0 million acre-feet (MAF). This determination also certified the availability of 94,000 acre-feet of water annually for marketing from Navajo Reservoir. Of this amount, 3,000 acre-feet annually was reserved for use in perpetuity for the Jicarilla Apache Tribe, 69,000 acre-feet per year was available for marketing through the year 2039, and an additional 22,500 acre-feet per year available for marketing from Navajo Reservoir in perpetuity. It was found that this depletion level could be achieved under the same shortage criteria upon which the allowable annual depletion level of 1984 hydrologic investigations, without significant increase in the level of risk.

~~Insert Recent Need for an update~~

- Navajo settlement, NGWSP (NN share)

Hydrologic Investigation

The Department of the Interior's past position on water availability assumed that up to 6.0 MAF per year of water could be safely depleted in the Upper Basin (1988 Hydrologic Determination). This 2005 hydrologic investigation seeks to confirm its methods by first reproducing the results of the 1984 and 1988 determinations and then looking at how the assumptions contained in those determinations might affect the results of the 2005 determination.

The yield for the Upper Basin (water availability) at full basin development is a function of the natural (undepleted) water supply and assumptions made for several other variables: ^{*Upper Basin*} Lower Basin deliveries, ^{*To the LB, UB deliveries to meet its obligations to assist in*} Mexican Treaty deliveries, Upper Basin storage capacity, and shortages. Each of these variables was evaluated as to their affect on yield. It should be noted that the Upper Basin States have previously stated disagreement with some of the assumptions in the 1984 Hydrologic Investigation. Therefore, it should be stated that the results from this 2005 hydrologic investigation are for Reclamation planning purposes only.

Annual Natural Flow Data (1906-2000) - The combined Upper Basin natural flow at Lee Ferry (compact point) for 1906-1999 was obtained from Reclamation's current CRSS model. This data was augmented with more recent provisional data covering the period from 1996-2000 (dated 4/22/05). While it is expected that the provisional data will be modified in the future, modeling shows that this timeframe would not be within the critical period of record for the analysis.

Equalization Releases - No equalization releases would be required under section 602(a) of the Colorado River Basin Project Act at full Upper Basin development. Releases above the minimum objective release would only occur for flood control or from inadvertent spills.

Lower Basin Deliveries - The Compact requires a minimum delivery of 75 MAF over 10 years. It is assumed for the purposes of this analysis that at full basin development,

that the UB not cause the flow at LF to drop below

602(a) equalization would not occur as the full use of Lake Powell storage capacity would be required for the Upper Basin States to meet its compact delivery requirements. *75 MAF/10 yrs.*
A delivery rate of 7.5 maf/yr was used in the analysis.

Mexican Treaty Deliveries – To avoid a critical compact interpretation, it was assumed that the Upper Basin will be obligated to deliver up to one half the Mexican Treaty obligation (up to 750,000 acre-feet per year). A range from 0 acre-feet to 750,000 acre-feet was used in the sensitivity analysis. It must be noted that the Upper Colorado River Commission and the Upper Basin States do not agree with the delivery requirement of 750,000 acre-feet per year toward the Mexican Treaty.

Reservoir Starting Conditions – Both full reservoir and empty reservoir starting conditions were tested and the results were found to be completely insensitive to this variable. This is due to the unusually wet conditions at the start of the hydrologic record. Reservoirs are completely filled in even the worst case (empty reservoirs).

Upper Basin Storage Capacity – The 1988 study used active storage in the yield determination, but it also investigated the effect of using live storage which adds capacity. Several increasing levels of storage were investigated in this study. Active storage includes storage which would protect all project purposes including NIIP, Navajo Powerplant, and Page diversions made directly from CRSP reservoirs and power production. Live storage includes all storage capacity available for release. For example the use of live storage in Lake Powell adds about 4 maf in capacity. The study also evaluates the effects of including both active and live storage from other CRSP and non-CRSP facilities in the Upper Basin. Bank storage was not considered in this study.

Active CRSP or only Powell?

for NIIP & Dam safety - inactive at Navajo not avail.

Loss in '88. why not now?

Lake Powell Sedimentation Rate – The 1986 Lake Powell Survey dated December 1988 by the Bureau of Reclamation found the rate of loss of live reservoir storage averaged 36,946 acre-feet per year. Of this amount 34.25 percent of the sediment was deposited below the minimum power pool elevation of 3490 feet (interpolation of Table 4 on page 26). The adjusted sedimentation rate for the active pool would be 24,292 af/yr (36,946 af/yr x 65.75%). Active capacity in 1986 between elevations 3490 to 3700 was 20,309,919 acre-feet by interpolation from Table 4. Live capacity was 24,322,000 af.

*25,000
- 1,750,000
- 2,270,000 - Act. Live*

Projected Capacities in 2060?

Shortages – The 1988 Hydrologic Determination (pages 6-7) found through a mass balance equation that the firm yield of for the Upper Basin varied from 5.55 maf without any shortage to 6.03 maf with an assumed 8 percent shortage. The equation simply divides the firm yield by 1 minus the percent shortage (5.55 maf/(1.00-0.08) = 6.03 maf).

$$\text{Yield} = \text{Firm Yield} / (1.00 - \text{Shortage})$$

This upward adjustment increases the yield directly by what is typically perceived as the difference between a water right and the actual (realized) consumptive use. Several factors contribute to this difference and may include fallowing, late season shortages from inadequate storage, unusual weather (temperature and precipitation), effects of ESA on storage, and other factors. Thus the concept in the 1988 determination was that a

than Dep-Sched. would have to be water rights to compare to yield.

water right based allocation of 6.0 maf is likely to achieve only 5.55 maf of actual consumptive use.

suggests Dep. Sched. of Proj. Dept. should be based on UB yield of 5.6.

Other Considerations – Changes in Assumptions

To obtain a wider range of yield analysis results, various changes in the basic assumptions were made and the corresponding results arrayed with the previous work. In particular, the use of inactive storage pools and a change in the minimum delivery requirement to the Lower Basin were examined in regards to the Upper Basin yield. In the CRSP Active Storage analysis active storage was 23.9 maf. There remains an inactive storage and minimum power pools within CRSP which could increase storage capacity to 28.0 maf (live storage). Utilizing CRSP live capacity along with a minimum release of 8.23 maf/yr from Glen Canyon Dam produces a firm yield (no shortages) of 5.9 maf or a yield of 6.4 maf with 8 percent shortages.

less Navajo inactive

Additional analyses were made at the request of the Upper Colorado River Commission with minimum releases set at 7.5 maf/yr. The difference between the releases can be translated directly into increased yield to the Upper Basin. Mass balance analyses using both active and inactive CRSP storage levels and both 0-percent and 8-percent shortage levels are presented in the table.

*25%
24%
23%
x 20
x 10*

TABLE 1 - Summary Results

Study	Storage	C.U. Water Right		
		0% Shortage 8.25 Delivery	6% Shortage 8.25 Delivery	6% Shortage 7.5 Delivery
1984 Active Storage ¹	26,232,000	5,450,000	5,800,000	na
1988 Active Storage	20,197,000	5,550,000	6,000,000	6,770,000
1988 Live Storage	23,141,000	5,670,000	6,090,000	6,880,000
2005 CRSP Active ²	23,892,000	5,738,000	6,104,000	6,902,000
2005 CRSP Live ³	28,030,000	5,903,000	6,280,000	7,078,000

why 2005 storage so much storage?

Note: The shortage adjustment directly increases annual yield by the amount of shortage.

Use of CRSP active storage (without shortages) results in a firm yield of 5.7 maf through the critical period of record which was found to be the 1953-1977 hydrology. Applying risk and shortage criteria similar to those used in the previous determinations results in a reasonable yield of 6.1 maf. This has been discussed with the Basin States and the magnitude and consequences of such risk and shortages are understood. Therefore, it is recommended that the Secretary certify that 6.1 maf is reasonably available in the Upper Basin. This figure takes into account the above risk and shortage criteria as well as provides for a conservative minimum delivery from the Upper Basin of 8.25 maf/yr.

¹ The 1984 study evaluated the effects of sedimentation and estimated that it might reduce yield by 2 percent; however the study did not consider this impact in its yield determination.

² Active storage is reduced by estimated sedimentation in Lake Powell through 2060.

³ Live storage is reduced by estimated sedimentation in Lake Powell through 2060.

Current Water Service at Navajo Reservoir

Additional Requests for Water from Navajo Reservoir

Determination

Recognizing the status of water use in the Upper Colorado River Basin, the physical availability, and institutional constraints, it is determined through hydrologic investigation that sufficient water is reasonably likely to be available under the provision of Section 11(a) of Public Law 87-483, to fulfill contracts that involve additional Navajo Reservoir water uses up to ~~94,500 acre-feet annually~~. Of this amount, 3,000 acre-feet annually has been reserved for use in perpetuity for the Jicarilla Apache Tribe, 69,000 acre-feet per year is available for marketing through the year 2039, and an additional 22,500 acre-feet per year is available for marketing from Navajo Reservoir in perpetuity. This depletion level can be achieved under the same shortage criteria upon which the allowable annual depletion level of the 1988 hydrologic investigation, without significant increase in the level of risk.

Extensive hydrologic data analysis, present Colorado River Storage Project operating policies, and required and projected Upper Basin water deliveries, support the Upper Basin limit of 6.1 maf. This 6.1 maf yield from the Upper Colorado Basin is recognized by the Bureau of Reclamation and the Department of the Interior as an estimate which takes into account risk and shortage criteria as well as providing minimum deliveries from the Upper Basin of 8.25 maf/yr. The 6.1 maf figure is an estimate to be used for planning purposes only and is not intended to be an interpretation of the Upper Basin entitlement according to the provisions of the Colorado River compacts and other laws of the river.

Therefore, we conclude that the projection of water uses now envisioned in the Upper Basin by year 2060 can reach a 6.1 maf level without impairment of the Upper Basin's ability to meet its water delivery obligation to the Lower Basin and the Republic of Mexico.

*Shortage in any yr.
≠ shortage to
NN NGWSP us*