Jeff Shafer (Do we want to discuss this at the work session on Aug. 21, 2003 in Holdrege? Ask Roger Patterson (Doubtful)

From: Roger Andrews [randrews@gp.usbr.gov]
Sent: Wednesday, July 23, 2003 11:54 AM
To: ableed@dnr.state.ne.us; jshafer@dnr.state.ne.us
Cc: Michael Kube
Subject: Conf. Call on Lower Rep. Appraisal Study Progress

Dear Ann and Jeff:
We are planning a conference call on the progress of the Lower Republican Appraisal Study for Tuesday, July 29 at 10:00 a.m. CDT. Is this date and time still satisfactory? Ann, we understand you will be on vacation but in your e-mail message you indicated Jeff would be taking over and he is available for the call. The toll free call in number is 877-686-3190 and the Participant Passcode is 363511. We expect Dave Barfield to join us in the call. Reclamation people besides Mike Kube and myself should include Dennis Allacher and Marv Swanda from McCook, Bob McCaig, Joe Lyons, and Rob Davis from Denver, and Mark Phillips and Rick DeVore from Billings.

By tomorrow I will forward to you Hydrology Summary sheets from Mark Phillips and Rick DeVore, an analysis sheet from Dennis Allacher, and a brief statement from Rob Davis on his approach for doing the economics. Included in the Summary sheets are the analysis of the Baseline and 9 different alternative runs. I will also include an anticipated Agenda for the call.

Ann, if you have some time, we would appreciate it if you could look at forwarded material and let Jeff or us know your thoughts. Thanks.

Roger

Do they really need only a KS right? Can they call from NE below Guide Rock.

has not ever been called

Barfield- MDS - 1984 right, Milford is 1974 right - being administered this year - State of KS has the water right for Muni + Ind,

Barfield - could feasibility study include a look at Beaver Creek Storage if Lovewell can store enough

- Pick a value at Concordia & if exceeded then the needs of Senior* appropriators would not be met & therefore KS would put a call on the River, thus limiting the ability to store more at Lovewell

- Burca - could look at Concordia & Clay Center monthly values (compare to MDS values)

ST extra storage

* Bostwick has a senior right, but the new KS water right would be junior to other appropriators. It's an "off season" MDS tables for communities

Average End-of-May Available Water Supply in Reservoirs: (Kaf)

	Baseline	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G	Alt H	Alt I
Harlan	75.6	71.7	78.2	72.7	78.5	73.3	78.7	73.7	76.0	72.2
Lovewell	19.8	21.0	21.5	21.5	32.5	32.6	42.9	43.5	29.0	29.2

Harlan supply calculated as May EOM minus June 1 shutoff content determined by concensus criteria.
Lovewell supply calculated as May EOM minus top of dead pool.

Average Annual Shortages to Bostwick Districts: (Kaf)

	Baseline	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G	Alt H	Alt I
Total Shortage	69.6	67.9	64.1	62.8	54.1	53.6	46.8	47.1	60.9	60.7

Total for shortages to Franklin, Franklin Pump, Naponee, Superior, Ne & Ks Courtland, and Courtland Unit

Average Discharge from Courtland Canal into Lovewell: (Kaf)

	Baseline	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G	Alt H	Alt I
Annual	25.5	33.6	30.5	36.1	36.5	41.3	41.3	45.6	30.6	34.9
Non-Irrig Seas	11.2	13.6	15.6	14.7	21.5	20.0	25.8	23.9	15.9	14.8
Irrigation Seas	14.3	20.0	15.0	21.4	15.0	21.3	15.5	21.7	14.7	20.2
Dec-Feb	0.0	4.8	5.4	5.1	7.2	6.8	7.5	7.2	0.0	0.0

Data from model node 'Courtland Canal above Lovewell'

Average Total Outflow from Harlan County Reservoir: (Kaf)

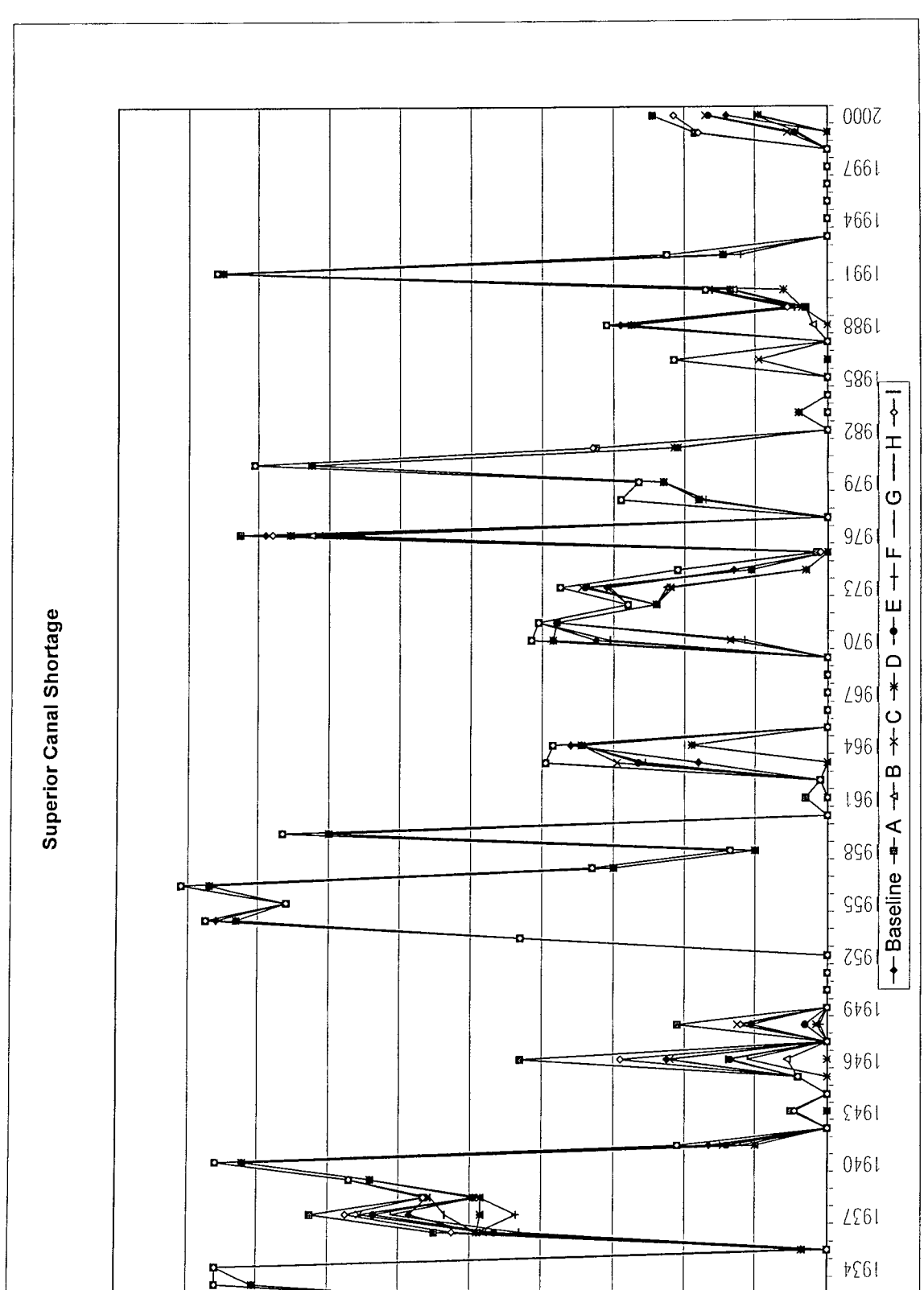
	Baseline	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G	Alt H	Alt I
Annual	100.1	100.8	99.7	100.5	99.6	100.4	99.5	100.4	100.1	100.7
Non-Irrig Seas	10.7	9.0	11.4	9.6	11.3	9.6	11.3	9.6	10.6	9.0
Irrigation Seas	89.5	91.8	88.3	90.9	88.3	90.9	88.2	90.8	89.5	91.7

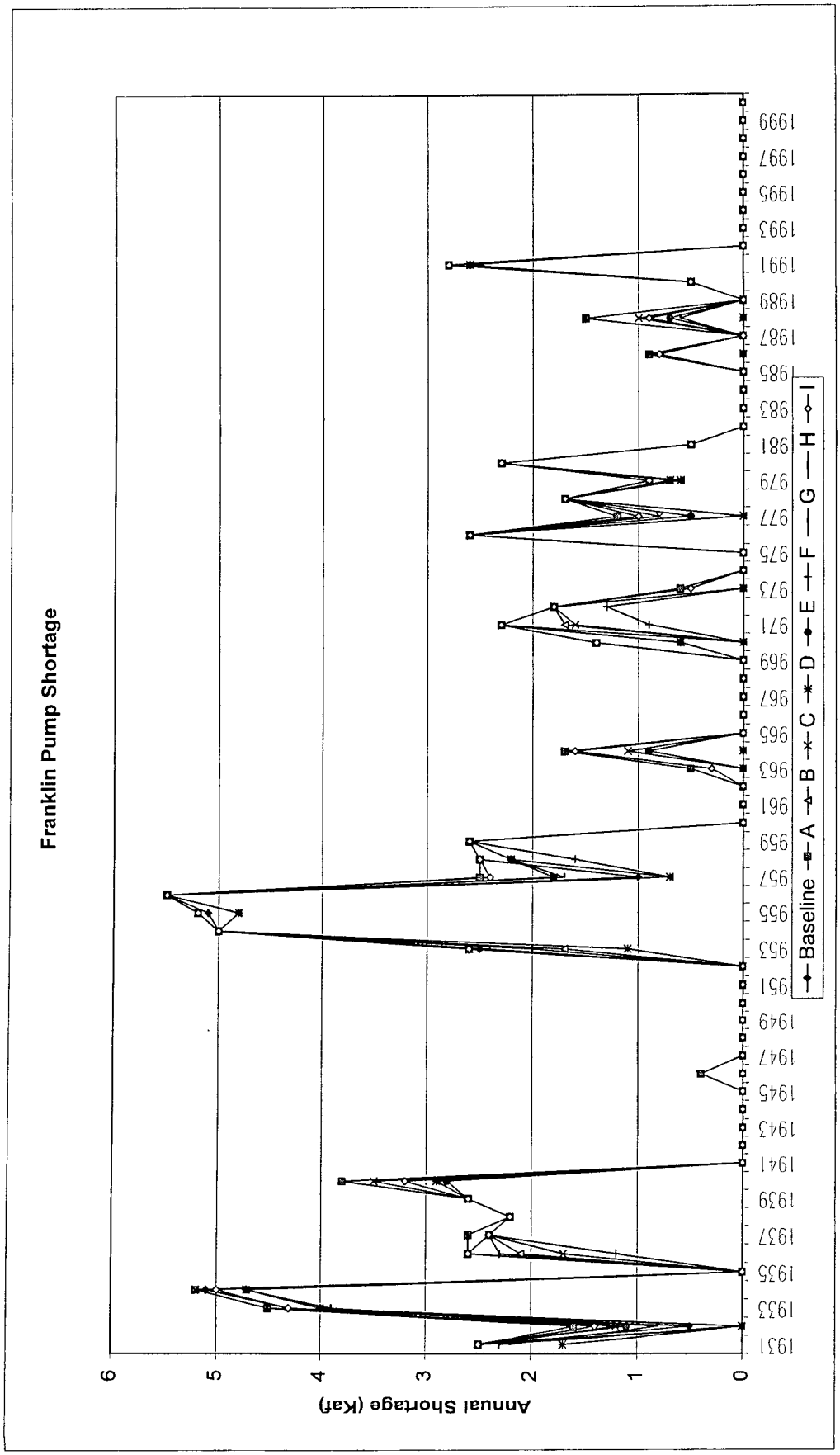
Data from model node 'Harlan Co. Res. Outflow'...includes releases, spills, and seepage.

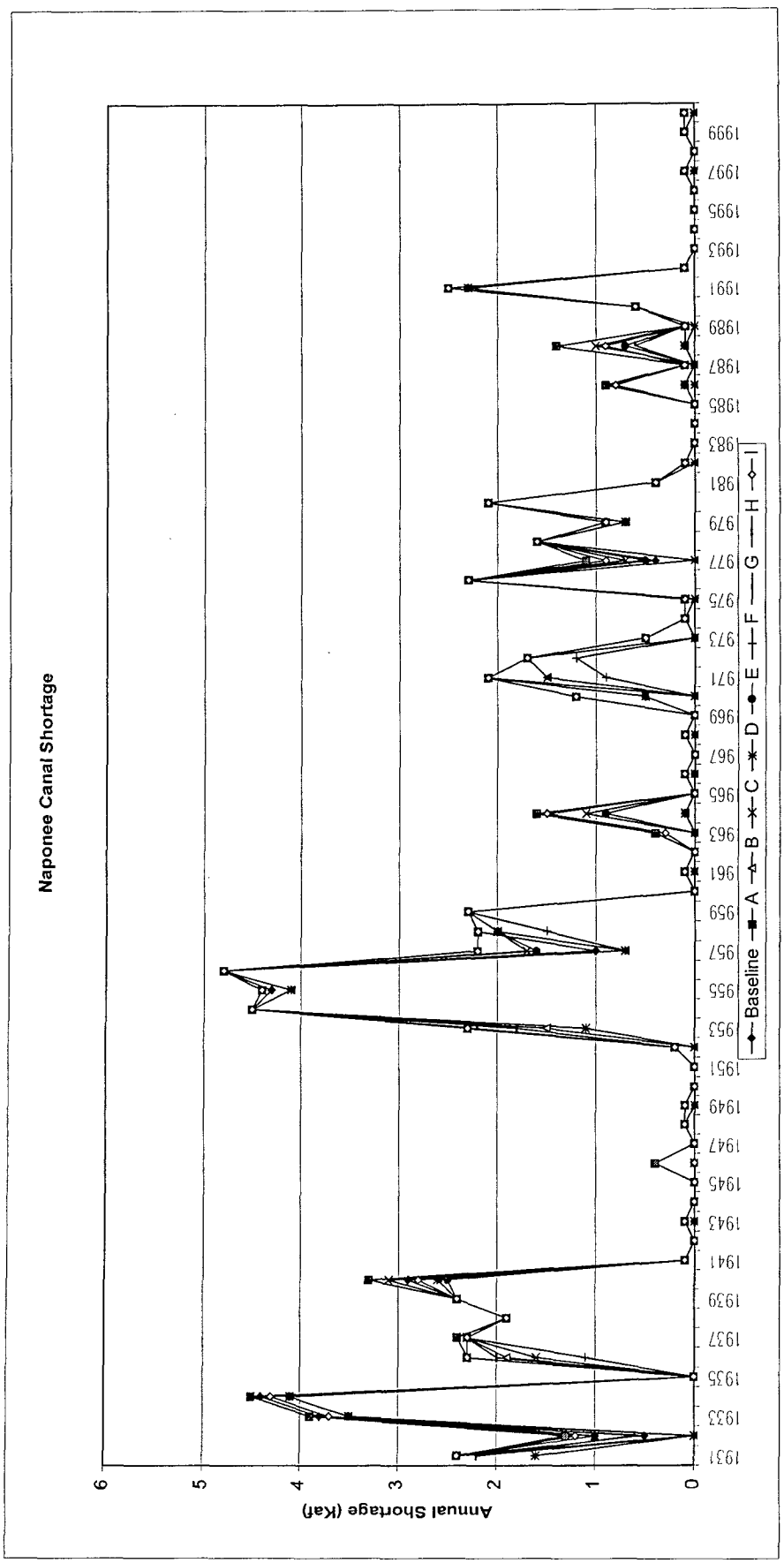
Average Annual Discharge for Republican River at Hardy: (Kaf)

	Baseline	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G	Alt H	Alt I
Annual	124.4	118.1	111.9	111.7	103.6	104.0	97.7	98.4	118.0	118.0

Data from model node 'Republican R. at Hardy'


Superior Canal Shortage
Annual Shortage (Kaf)
0
2
4
6
8
10
12
14
16
18
20
1931
1934
1937
1940
1943
1946
1949
952
955
958
961
964
967
970
973
976
979
982
985
1988
1991
1994
1997
2000
Baseline
A
B
C
D
E
F
G
H
I


Franklin Pump Shortage
Annual Shortage (Kaf)
0
1
2
3
4
5
6
1931
1933
1935
1937
1939
1941
1943
1945
1947
1949
951
953
955
957
959
961
963
965
967
969
971
973
975
977
979
981
983
985
987
989
991
993
995
997
1999
Baseline
A
B
C
D
E
F
G
H
I


Naponee Canal Shortage
Annual Shortage (Kaf)
0
1
2
3
4
5
6
1931
1933
1935
1937
1939
1941
1943
1945
1947
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
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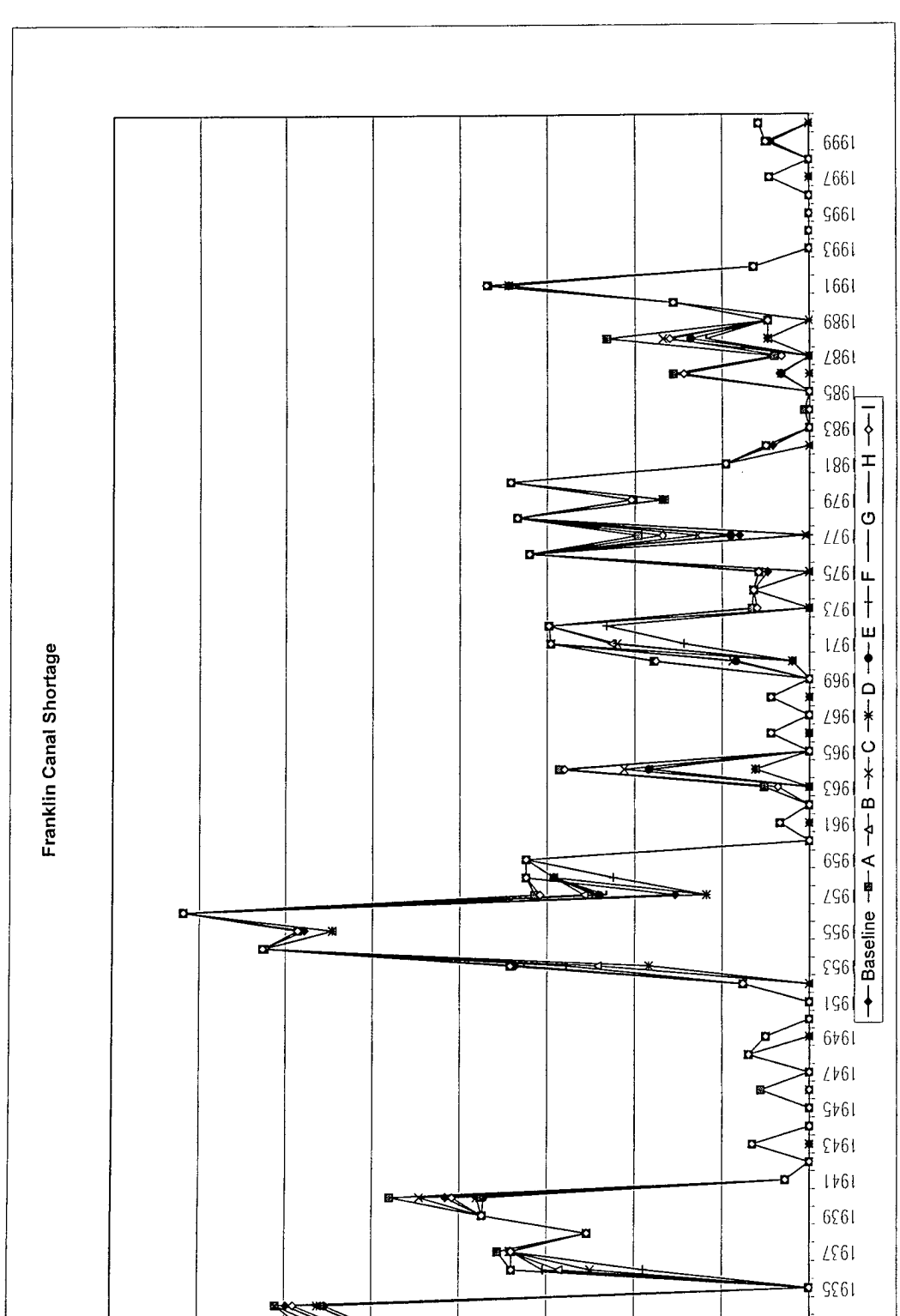
1997
1999
Baseline
A
B
C
D
E
F
G
H
I


Franklin Canal Shortage
Annual Shortage (Kaf)
0
5
10
15
20
25
30
35
40
1931
1933
1935
1937
1939
1941
1943
1945
1947
1949
951
953
955
957
959
961
963
965
967
969
971
973
975
977
979
981
983
985
987
989
991
993
995
997
999
Baseline
A
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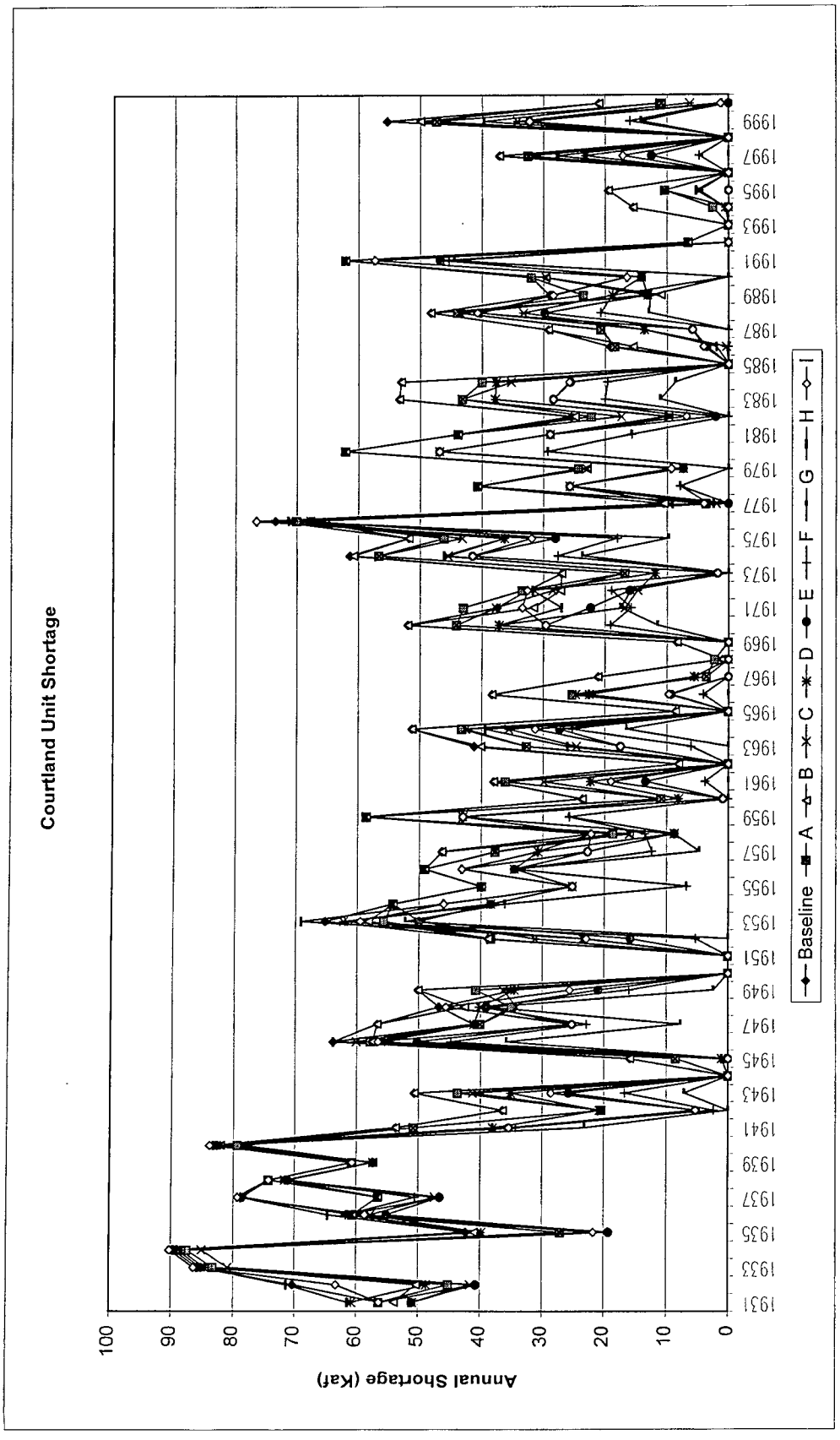
Courtland Unit Shortage
Annual Shortage (Kaf)
100
90
80
70
60
50
40
30
20
10
0
1931
1933
1935
1937
1939
1941
1943
1945
1947
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
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1993
1995
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Baseline
A
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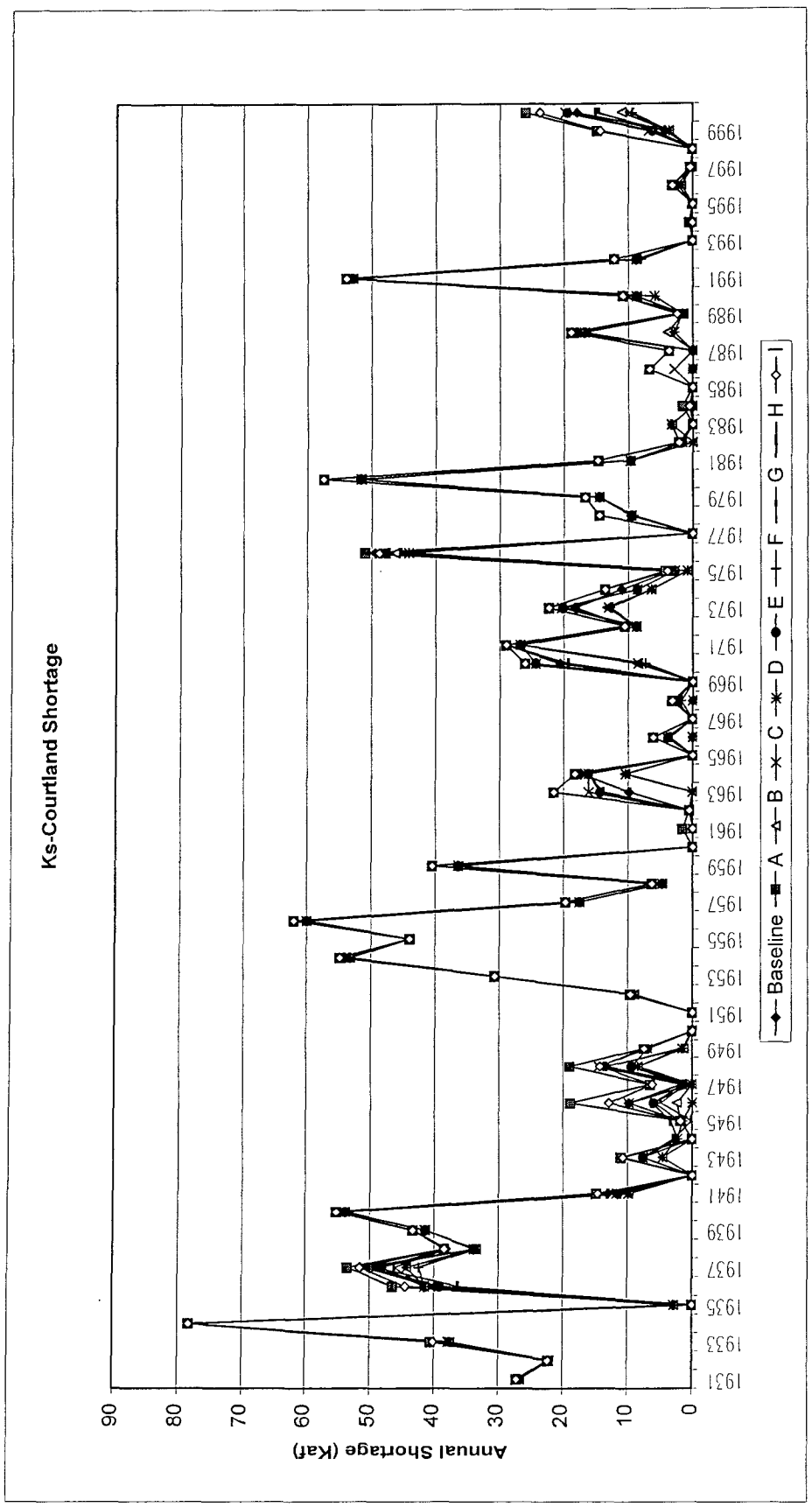
Ks-Courtland Shortage
Annual Shortage (Kaf)
0
10
20
30
40
50
60
70
80
90
1931
1933
1935
1937
1939
1941
1943
1945
1947
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
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Baseline
A
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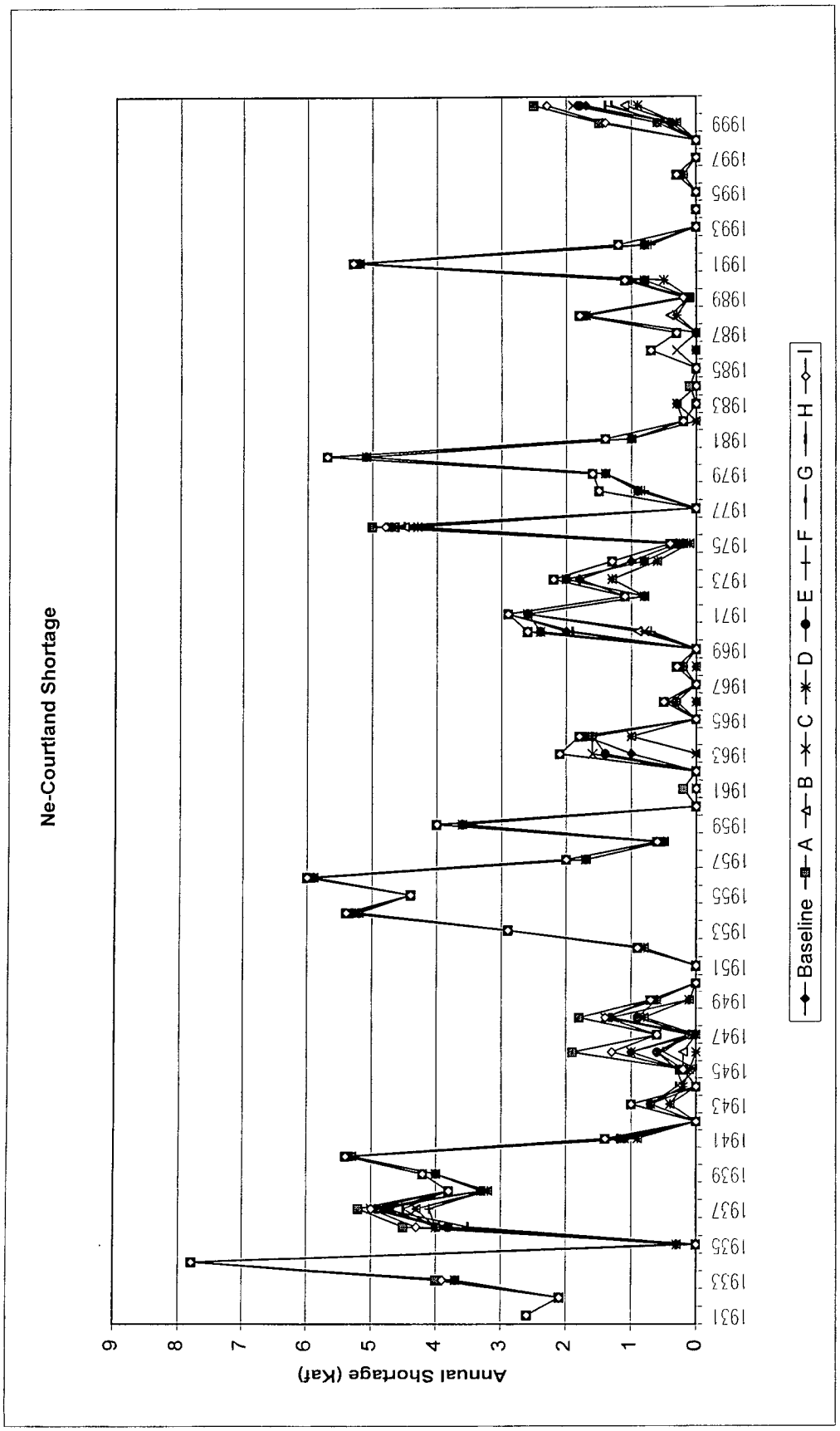
Ne-Courtland Shortage
Annual Shortage (Kaf)
0
1
2
3
4
5
6
7
8
9
1931
1933
1935
1937
1939
1941
1943
1945
1947
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
Baseline
A
B
C
D
E
F
G
H
I

Dennis A.

Lower Republican Appraisal Study
Model Runs

Additional end of May 1.2KAF 1.6 Alternatives — Biggest Benefits — 9.2

Component	Baseline	A	B	C	D	E	F	G	H	I
Courtland Canal Capacity at Diversion Dam	580 cfs (35.0 kaf/mo)	751 cfs (45.3 kaf/mo)	580 cfs (35.0 kaf/mo)	751 cfs (45.3 kaf/mo)	580 cfs (35.0 kaf/mo)	751 cfs (45.3 kaf/mo)	580 cfs (35.0 kaf/mo)	751 cfs (45.3 kaf/mo)	580 cfs (35.0 kaf/mo)	751 cfs (45.3 kaf/mo)
Courtland Canal Capacity above Lovewell	500 cfs (30.2 kaf/mo)	681 cfs (41.1 kaf/mo)	500 cfs (30.2 kaf/mo)	681 cfs (41.1 kaf/mo)	500 cfs (30.2 kaf/mo)	681 cfs (41.1 kaf/mo)	500 cfs (30.2 kaf/mo)	681 cfs (41.1 kaf/mo)	500 cfs (30.2 kaf/mo)	681 cfs (41.1 kaf/mo)
Bypass at Div. Dam										
Irrigation Season	40 cfs (2.4 kaf/mo)	40 cfs (2.4 kaf/mo)	0 cfs	0 cfs	0 cfs	0 cfs	0 cfs	0 cfs	40 cfs (2.4 kaf/mo)	40 cfs (2.4 kaf/mo)
Rest of Year	10 cfs (0.6 kaf/mo)	10 cfs (0.6 kaf/mo)	0 cfs	0 cfs	0 cfs	0 cfs	0 cfs	0 cfs	10 cfs (0.6 kaf/mo)	10 cfs (0.6 kaf/mo)
Lovewell TOC (1000 AF)	35.7	35.7	35.7	35.7	51.7	51.7	70.7	70.7	51.7	51.7
Lovewell BOC (1000 AF)	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6
Winter Diversions (Ice)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Increased Storage Use	NA	NA	NA	NA	Irrigation	Irrigation	Irrigation	Irrigation	Irrigation	Irrigation

A. Courtland Canal to Design Capacity — 3rd choice
B. Automate, Winterize — 2nd choice
C. Automate, Winterize, Courtland Canal to Design Capacity
D. Automate, Winterize, Raise Lovewell 16,000 acre-feet — Barfield's 1st choice
E. Automate, Winterize, Raise Lovewell 16,000 acre-feet, Courtland Canal to Design Capacity
F. Automate, Winterize, Raise Lovewell 35,000 acre-feet
G. Automate, Winterize, Raise Lovewell 35,000 acre-feet, Courtland Canal to Design Capacity
H. Raise Lovewell 16,000 acre-feet
I. Raise Lovewell 16,000 acre-feet, Courtland Canal to Design capacity

Dennis - true as long as the model is correctly spreading the water around the Kansas Bostwick

Dennis - need to account for the above Lovewell taking 5 inches + below setting Lovewell storage so a total of say 10 inches. Right now it is assumed the KS Bostwick gets the same inches over all

Jeff Shafer

From: Mark A. Phillips [MPHILLIPS@gp.usbr.gov]
Sent: Wednesday, July 23, 2003 10:14 AM
To: Roger Andrews
Cc: Dennis Allacher; Richard DeVore
Subject: modified alternative results worksheet

owerRepub_Alts_Eval3.xls

Roger, attached is modified worksheet containing just total shortages for Bostwick. Let me know if you need additional changes.

Jeff Shafer

From: Roger Andrews [randrews@gp.usbr.gov]
Sent: Wednesday, July 23, 2003 12:25 PM
To: ableed@dnr.state.ne.us; jshafer@dnr.state.ne.us; DBARFIELD@KDA.STATE.KS.US
Cc: Michael Kube
Subject: Fwd: modified alternative results worksheet

odified alternative
results w...

Dear Ann, Dave, and Jeff,
Attached to this forwarded message are the Hydrology Summary Sheets for Lower Republican Appraisal Study Baseline and 9 Alternative runs. If you have any questions please contact me. I will send to you the other information when it becomes available. Thanks.

Roger

Lower Republican Appraisal Study
Model Runs

7/29/2003

Component	Baseline	Alternatives A	B	C	D	E	F	G	H	I
Courtland Canal Capacity	580 cfs	751 cfs	580 cfs	751 cfs	580 cfs	751 cfs	580 cfs	751 cfs	580 cfs	751 cfs
Bypass at Div. Dam										
Irrigation Season	40 cfs	40 cfs	0 cfs	0 cfs	0 cfs	0 cfs	0 cfs	0 cfs	40 cfs	40 cfs
Rest of Year	10 cfs	10 cfs	0 cfs	0 cfs	0 cfs	0 cfs	0 cfs	0 cfs	10 cfs	10 cfs
Lovewell TOC (1000 AF)	35.7	35.7	35.7	35.7	51.7	51.7	70.7	70.7	51.7	51.7
Lovewell BOC (1000 AF)	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6
Winter Diversions (Ice)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Increased Storage Use	NA	NA	NA	NA	Irrigation	Irrigation	Irrigation	Irrigation	Irrigation	Irrigation
Results (70 year study)										
HCL Water Supply	75.6	71.7	78.2	72.7	78.5	73.3	78.7	73.7	76	72.2
Lovewell Water Supply	19.8	21	21.5	21.5	32.5	32.6	42.9	43.5	29	29.2
Inches(Farm delivery)	9.55	9.38	9.95	9.52	11.25	10.85	12.47	12.15	10.65	10.37
Change from Baseline	--	-0.17	0.40	-0.03	1.70	1.30	2.92	2.60	1.10	0.82
# Lovewell Fills (End of May)	49	53	54	54	42	42	31	33	34	36

A. Courtland Canal to Design Capacity
B. Automate, Winterize
C. Automate, Winterize, Courtland Canal to Design Capacity
D. Automate, Winterize, Raise Lovewell 16,000 acre-feet
E. Automate, Winterize, Raise Lovewell 16,000 acre-feet, Courtland Canal to Design Capacity
F. Automate, Winterize, Raise Lovewell 35,000 acre-feet
G. Automate, Winterize, Raise Lovewell 35,000 acre-feet, Courtland Canal to Design Capacity
H. Raise Lovewell 16,000 acre-feet
I. Raise Lovewell 16,000 acre-feet, Courtland Canal to Design capacity

C:\Documents and Settings\JShafer\Local Settings\Temporary Internet Files\OLK10B\[Lower Republican Alternatives-Results.xls]Sheet1

Jeff Shafer

From: Dennis Allacher [DALLACHER@gp.usbr.gov]
Sent: Wednesday, July 23, 2003 10:57 AM
To: Roger Andrews
Cc: Michael Kube; Mark A. Phillips; Marvin Swanda; Richard DeVore
Subject: Lower Republican Spreadsheet

Lower Republican Alternatives-...

Roger:

Attached is the spreadsheet that we discussed on the conference call. A date has been added.

Dennis

Jeff Shafer

From: Roger Andrews [randrews@gp.usbr.gov]
Sent: Wednesday, July 23, 2003 12:28 PM
To: ableed@dnr.state.ne.us; jshafer@dnr.state.ne.us; DBARFIELD@KDA.STATE.KS.US
Cc: Michael Kube
Subject: Fwd: Lower Republican Spreadsheet

Lower Republican Spreadsheet (...

Dear Ann, Dave, and Jeff,
Attached to this forwarded message is the analysis of the Hydrology runs that was prepared by Dennis Allacher. If you have any questions please contact me or Dennis. Thanks.

Roger

The discount rate used is the current-year interest rate used by Reclamation for benefits analyses.

References are obviously missing. These will be included.

One of the assumptions is that the changes in yield are due solely to more water being applied and that fertilizer applications, etc do not change. This may or may not be realistic and is one area that will be explored with the UNL professors.

Gross revenues from the analysis ranged from a low of $323.80 per acre to $363.11 per acre. Net revenues per acre, after subtracting out all costs of production, ranged from $131.46 to $168.68. When the net revenues obtained from each alternative were compared to the net revenues obtained under the Baseline, two of the Alternatives had lower net revenues (Alternatives A and C) and the rest had higher net revenues. Alternatives F and G had the largest changes in net revenue.

After finding the net revenues, or benefits, per acre, the total net benefits are computed by multiplying the per-acre benefit by the total number of acres. At this point, these benefits are still annual benefits. The last step is to take the annual benefits into the future 50 years, discount them back to a present value, and find the incremental benefits under each of the Alternatives. Table 4 shows the incremental net present value of irrigation benefits for each Alternative.

Table 4. Incremental Irrigation Benefits for Each Alternative.

Alternative	Incremental Net Present Value Relative to Baseline Alternative
Baseline	
Alt A	$0.00
Alt B	$5,371,715.59
Alt C	$0.00
Alt D	$22,092,463.00
Alt E	$17,068,423.18
Alt F $16 million cost	$36,744,685.13
Alt G $6.1 million	$32,999,891.30
Alt H	$14,516,006.81
Alt I	$10,897,561.49

Two of the Alternatives (Alt A and Alt C) had decreased water supplies and, thus, no irrigation benefits relative to the Baseline Alternative. Alternative F had the greatest water supply increase and the greatest benefits, followed by Alternative G.

ENDNOTES AND NEAR-FUTURE ENHANCEMENTS

This example only used one crop. However, corn is not the only crop produced in the Lower Republican. Therefore, this example probably shows an inflated value of benefits. More crops, including alfalfa and soybeans can be incorporated into the analysis.

The default coefficients in the yield estimation model were accepted and not modified. By working with UNL economists, the model can be calibrated and modified to better fit the local conditions. This will result in a better estimate of net irrigation benefits.

The historical yield data came from the period 1991-95. This will be updated.

The cost of production data also came from the 1991-95 period. This will be updated.

Draft

KS+NE Bartlett Yield 1991-1995 econ. values were used, need to use 2006 price info.
5.875% Intrest Rate → USBR planning rate for this year
could look at 30 year T-Bills etc

Table 3. Calculation of Gross and Net Revenues.

	ALTERNATIVES									
	Baseline	A	B	C	D	E	F	G	H	I
Yield	144.9	143.9	147.4	144.8	154.8	152.6	161.4	159.7	151.4	149.8
Normalized Price	$2.25	$2.25	$2.25	$2.25	$2.25	$2.25	$2.25	$2.25	$2.25	$2.25
Gross Revenues	$326.13	$323.80	$331.54	$325.72	$348.37	$343.31	$363.11	$359.34	$340.74	$337.10
Variable Op Costs										
Custom Work	$23.81	$23.81	$23.81	$23.81	$23.81	$23.81	$23.81	$23.81	$23.81	$23.81
Seed	$29.40	$29.40	$29.40	$29.40	$29.40	$29.40	$29.40	$29.40	$29.40	$29.40
Fertilizer	$41.00	$41.00	$41.00	$41.00	$41.00	$41.00	$41.00	$41.00	$41.00	$41.00
Chemical	$58.86	$58.86	$58.86	$58.86	$58.86	$58.86	$58.86	$58.86	$58.86	$58.86
Misc. Costs	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00
Harvest Costs										
Combine	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00
Trucking	$17.39	$17.27	$17.68	$17.37	$18.58	$18.31	$19.37	$19.16	$18.17	$17.98
Net Income	$133.67	$131.46	$138.79	$133.28	$154.72	$149.93	$168.68	$165.11	$147.50	$144.05
Change in Net Revenue From Baseline		($2.21)	$5.12	($0.39)	$21.05	$16.26	$35.01	$31.44	$13.83	$10.38

Barfield is wanting to look at this + input files to compare to NDS water administration

yield is used as a check value for the starting yield obtained from the yield estimation model. The average irrigated yield is important in that this is the yield being obtained by farmers given the current water supply. For this example, a maximum possible yield is assumed to be 200 bushels per acre.

The maximum possible irrigated yield are inputs to the yield estimation model. Other inputs to the yield estimation model include ET. The average crop water use (ET) parameter for southcentral Nebraska (24.4 inches of water) was obtained from NebGuide G98-1354-A and was not modified. Effective rainfall coefficients and crop irrigation requirements for Sandy Loam soils in Central Nebraska were also obtained from the NebGuide and were not modified for this example.

Once the yield estimation model was modified to account for the range of water supplies estimated by the hydrology models, the yield estimation model gave a range of corresponding yields. This is shown in Table 2.

Table 2. Estimated Yields for the Selected Water Supply Range.

Alternative Name	Inches of Water Applied	Corn Yield
Baseline	9.55	144.9
A	9.38	143.9
B	9.95	147.4
C	9.52	144.8
D	11.25	154.8
E	10.85	152.6
F	12.47	161.4
G	12.15	159.7
H	10.65	151.4
I	10.37	149.8

The estimated yield for the Baseline Alternative came to 144.9 bushels of corn. This is 0.6 bushels higher than the reported average for the two districts. Overall, water supplies ranged from a low of 9.38 acre-inches to a high of 12.47 acre-inches. Estimated yields ranged from a low of 143.9 bushels per acre to a high of 161.4 bushels.

Once the yields had been estimated, gross revenues under each Alternative could be calculated. The ERS normalized price of $2.25 was used. The unchanging variable costs of production (custom work, seed, fertilizer, chemicals) came to $155.10 per acre. Harvest costs were assumed to come from a custom combining charge of $20 per acre and a transportation charge of $0.12 per bushel. After subtracting all the costs of production, the net revenue for corn production under each Alternative could be computed. This is shown in Table 3.

(ERS) were used to determine the change in gross revenues. Gross revenues are calculated by multiplying yield by price.

Variable costs of production were taken from whole-farm budgets prepared by Reclamation. Harvesting costs were included. However, as small changes in yield occur, harvesting costs will also change. Other production costs are assumed to not change. For example, the same amount of fertilizer will be applied to corn that produces 140 bushels as will be applied to 144-bushel corn. The only change is the amount of irrigation water that has been applied. This same assumption applies to the cultural practices such as plowing, disking, and cultivating and the management skills of the farmer.

After deriving the gross revenues for each alternative, the unchanging variable costs of production and the changing costs of harvesting are subtracted to find net revenues. Fixed costs have been excluded. Net revenues are, for this report, the estimation of incremental, annual irrigation benefits.

The annual irrigation benefits are transformed into a present worth value by taking the annual benefit into the future 50 years and then discounting it back to the present. An interest rate of 5.875 percent is used as the discount rate.

IRRIGATION BENEFITS OF CORN PRODUCTION

The first step in determining the irrigation benefits was to calculate the changes in yields. To identify an appropriate range in yields, data was obtained from previously completed economic studies and from the Nebraska Agricultural Statistics. Average district-level irrigated yields and county-average dryland yields for 1991-95 are shown in Table 1. The years 1991-95 were chosen simply because the data had already been collected. The yield information will be updated to current levels.

Table 1. Average Irrigated and Dryland Yields, 1991-95.

		Irrigated Corn Yields					
	UNIT	1991	1992	1993	1994	1995	AVG
Kansas Bostwick	Bushel	166.0	92.0	153.4	135.8	163.9	142.2
Nebraska Bostwick	Bushel	156.21	123.61	156.16	133.26	162.5	146.3
Average							144.3
		County-Average Dryland Corn Yields					
Franklin, NE	Bushel	72.00	116.00	101.00	115.00	79.00	96.6
Webster, NE	Bushel	55.00	112.00	96.00	100.00	74.00	87.4
Nuckolls, NE	Bushel	37.00	125.00	105.00	107.00	84.00	91.6
Jewell, KS	Bushel		96.20	71.90	79.00	65.00	78.0
Republic, KS	Bushel		101.20	88.20	99.00	75.00	90.9
Average		54.67	110.08	92.42	100.00	75.40	86.5

A simple average of dryland yields for three Nebraska counties and two Kansas counties was computed. This overall, simple average came to 86.5 bushels. The simple average of irrigated yields for the two irrigation districts came to 144.3 bushels. The dryland

Draft

LOWER REPUBLICAN IRRIGATION BENEFIT ESTIMATION

INTRODUCTION

Operational changes have been proposed for the Lower Republican River. These operational changes include modifying the timing of flows, bypass flows, and increasing the storage capacity of Lovewell Reservoir. The economic portion of the appraisal study estimates the economic benefits accruing from the changes to operations. This preliminary report provides a methodology for measuring irrigation benefits.

For purposes of this example, only the most dominant crop for the area, corn, has been modeled. The numbers used in the example are representative, but will be refined as the study progresses. Further enhancements to the study will be discussed at the end of this example.

METHODOLOGY

One method for estimating irrigation benefits is to isolate the incremental benefits from small changes in the irrigation water supply. For small changes in the water supply, the best indicator of benefits comes from predicted changes in yields. Agricultural economists with the University of Nebraska in Lincoln (UNL) have published articles and provided spreadsheet models which estimate yields for varying water supply levels, several crops, and some of the more prominent soil types in Nebraska. Included in the UNL publications are model coefficients for different regions of the state and the ability to modify the models to a particular range of water supplies.

The spreadsheet model incorporates plant growth dynamics with respect to soil and water. Thus, the model can predict yield changes assuming all other plant requirements such as fertilizer, etc are met. The model includes factors for the type of irrigation system used (e.g., furrow or sprinkler), the maximum yield that could be obtained and evapotranspiration (ET) rates. Input factors also include the ET and yield for dryland crops. The model then estimates incremental yields starting from the dryland yield average and up to the suggested maximum yield.

For this example, published average values for southcentral Nebraska were used in the crop yield model. These values include average irrigated corn yields from two irrigation districts, county-average dryland corn yields from the Nebraska Agricultural Statistics Service, irrigation efficiency rates, effective precipitation, and crop irrigation requirements.

Benefit Estimation

The benefit analysis has to conform to National Economic Development (NED) standards. Therefore, normalized prices published by the Economic Research Service

Jeff Shafer

From: Rob Davis [RMDAVIS@do.usbr.gov]
Sent: Wednesday, July 23, 2003 10:21 PM
To: Joseph Lyons; Robert McCaig; Dennis Allacher; Michael Kube; Mark A. Phillips; Marvin Swanda; Roger Andrews; Richard DeVore
Subject: Re: Agenda Items for Tues., July 22 Conf. Call

Lower Repub Irrig Benefits.doc...

All,

Here is an example of how the irrigation benefits will be calculated given the changes in water supply per acre. I took the changes in water supply that Dennis calculated and input them into a yield response model that I obtained from Ray Supalla with the University of Nebraska. The main point of this exercise is to point out how sensitive ag benefits are to a relatively small change in yield. In my mind, the magnitude of the water supply changes would not warrant a major change within the existing cropping patterns.

For those of you who have read previous ag benefit studies done by the econ group (top-notch entertainment for sure) such as safety of dams studies, this one departs from using our standard whole-farm budgeting process. For the stated purpose, however, it provides an adequate level of detail and may actually do a better job with less muss and fuss. I say that because, to date, it has been hard for the econ group to handle small, incremental changes in water supply and the resultant yield. We all know that small changes in water supply will, in reality, be expressed as small changes in yield. This is the first time that I have been able to trace out a crop growth curve with respect to water supply. Before, I always had to just assume a change in yield given anecdotal data. Not that that was all bad, but I only had one data point instead of a range.

Bear in mind, this is still an example at this point, so don't set the numbers in concrete just yet. This example is for corn production only, which may or may not be acceptable for the appraisal study. I will get Bob Hamilton's recommendations. I also want to send this to Ray Supalla and get his recommendations.

However, it should provide at least a general idea of what I am trying to do when we have the conference call next week with the state folks.

I would welcome any comments.

Rob

Jeff Shafer

From: Roger Andrews [randrews@gp.usbr.gov]
Sent: Thursday, July 24, 2003 4:03 PM
To: ableed@dnr.state.ne.us; jshafer@dnr.state.ne.us; DBARFIELD@KDA.STATE.KS.US
Cc: Rob Davis; Michael Kube
Subject: Fwd: Re: Agenda Items for Tues., July 22 Conf. Call

Agenda Items for Tues., July ...

Dear Ann, Dave, and Jeff,

Included in this forwarded message and attached is a discussion from Rob Davis from Reclamation's Technical Services Center in Denver regarding the approach for looking at Benefits for the Lower Republican Appraisal Study. Please understand this is still preliminary and Rob is going to seek comments from Bob Hamilton, his supervisor, and Ray Supulla with the University of Nebraska. Your comments are also welcome.

I will be sending you an e-mail with a brief outline of agenda items for our conference call Tuesday.

Roger

Jeff Shafer

From: Roger Andrews [randrews@gp.usbr.gov]
Sent: Friday, July 25, 2003 3:09 PM
To: ableed@dnr.state.ne.us; jshafer@dnr.state.ne.us; DBARFIELD@KDA.STATE.KS.US
Cc: Joseph Lyons; Robert McCaig; Rob Davis; Dennis Allacher; Michael Kube; Mark A. Phillips; Marvin Swanda; Richard DeVore
Subject: Agenda for Tues., July 29 Conference Call

Dear Ann, Dave, and Jeff,
The following is a generalized agenda for our conference call Tuesday morning at !0:00 a.m. CDT.

- Introductions
- Review Hydrology Studies
- Review Economics
- Review Designs and Estimates
- Discuss POS and Schedule to complete Study — POS = "Plan of Study" — end of 2003 for all but Dam Safety
- Seek input from States if there are any concerns over approach and what is being done
- Determine if another Progress Report conference call is desirable and if so, when → Before August 21 ?
- Conclude call

Dam Safety ★ risk assesment is a significant consideration that has not been resolved yet. ↓ won't begin until Oct.

Mark and Rick's Hydrology Summary Sheets, Dennis's Analysis of the Hydrology Runs, and Rob's discussion on the Economics Approach have been forwarded to you. If you have any questions please contact me or one of these individuals.

The call in toll free number is 877-686-3190 and the Participant Passcode is 363511. We have the call scheduled for 10:00 a.m. CDT, 9:00 a.m. MDT, Tuesday, July 29. If you have a problem with this date or time please let me know. Thanks.

Roger

Hydrology Study by Dennis A. – Modified OP Study & updated to 2000
– Harlan Consensus operations
– Lower Courtland + Lovwell Damands + off season ops.
– Utilize only natural flow below Harlan
– Monthly Model
– Dave B. asks about summary page.... 1931–2000 (70 year avg.) Answer →
End of May available water supply
– Barfield is concerned about taking extra water in Cand may deprive
– Higher demand years you take more from Harlan, since you have used less in lower demand years
– Lovewell would get an increase in storage, but Harlan would not.
Barfield worries about "0"'s below Guide Rock – what is he worried about? Complains about the smoothing over 70 years w/ floodings yrs.
– Right now Lovewell only has a 20 day supply.

over →

Economics

Rob Andrews

- Could get hydrology separately KS + NE Bostwick + KS Bostwick into above + below Lovewell irrigation
- Need to add proper crop distribution (right now only corn was calculated).
- Do we really want 50 years or 100 years projection or "what is the projected life of the project."

- Est cost vs Est Benefits

  Benefits − cost = > 0 Then it's a success.

- Cost of ① Canal enhancement
  ② Raise storage 16,000 / 35,000
  ③ Modify Recreation facilities (Boat Ramp) ← small cost

  } To be done?

- More work should be able to erase the negative impact of raising storage in Lovewell — may not end up being a significant amount (Barfield)
- The Feds need to I.D. at least one promising scenario to justify a Feasibility Study. That is the only way the Feds. can pursue this course of action. So far it looks promising.
- Barfield - can the Dam store more & can it be safely enlarged. If so. how much will it cost?