

Job #2: MP of storage capacity, C.V. streams

Correct all figures for BR proposals by deducting dead storage reported in Central Valley Basin, p. 120, Table 3.

Stream

Kern	Isabella 525±	Buena Vista 205			
Tule	Success 105±				
Kaweah	Terminus 140±				
Kings	Pine Flat 1 m	Wishon (under const.) 128 less dead			
San Joaquin	Millerton L. 390± Florence L. 65 l.d.	Shaver L 135 less dead Huntington L. 90 l.d.	Big G. #1 35 less dead	Crane V. 45 less dead	Edison 125 less dead
Fresno	Hidden 80±				
Chowchille	Buchanan 60±	Merced Falls 197±	Canal G 60±	Burns-Black Rascal 169±	
Merced	L. McClure 279± 289 less dead, '57 sheet	Snelling 241± (BR)	Va. Pt 900±	Brigby, New Exch, & Snelling 1.6 m - above zero	
Tuolumne	Don Pedro 290± - CVB, p. 89 (less dead) 262± - WNN, 4-50 290± - Mod. Rec, p. 7	New Don Pedro 925± (BR) 1.8 m Rec, p. 7	L. Eleanor 28±	Hetch Hetchy 340± CVB, p. 89 360± less dead, '57 sheet	
Tuolumne (cont.)	Upper Cooperstown 609± Owen - 49 l.d.	Lower Cooperstown 146±	Cherry Valley (L. Lloyd) 268 less dead, '57 sheet 274± - Mod. Rec, p. 7	La Grange Owen Davis 35±	

Stream

Stanislaus	Melones	New Melones	Tri-dam	Tulloch (one of Tri)
	112±	1.0m	230±	50± (BR)
Calaveras R. Σ	Hogam	New Hogam	Woodward	Stramberg
	76±	320±	36±	18
				Relief
				16
Mokelumne	Pardee	Tone	Salt Spa	
	210± l.d.	960± But this is for)	140 less dead all	
	210 less dead, '57 sheet	am. R w t		
Cosumnes	Nashville	Buckeye	Jenkinson L.	
	506±	429±	41	
American	Folsom	Coloma	Small Projects, 8 dams	Hy Pk
	902±	714±	216±	41±
<del> </del>				
Bear	Waldo	Rollins	Garden Bar	Lwr Bear
	197±	43±	170±	48 less dead
Tuba 5	old 4, 328 ld. See '58 Opns sheet			
	New Bullard's Bar	Narrows (new)	L. Spaulding	Englebright
	591±	427± old, 70ld	74 less dead	70 less dead
	Old Bullard's Bar, 31 less dead - 11 less dead, by '58 Opns Rpt. Bowman L., 69ld.			
Feather	Oroville	Greenville	Big Bend	Bidwell Bar
	3,500	753±	906±	1,060±
	Bucks 102 ld	Butt V., 50ld		
Sacramento	Shasta	Table Mt.		L. Almanor
	4,000±	5.1m		650 BR Rpt of Opns, 2-58
				1308 less dead, '57 sheet

Stream

Cache Cr.	Clear Lake 300t - Lambert 420t - '57 sheet, less dead?	Indian Valley 244t	Wilson V. 200t
Putah Cr.	Monticello 2,115t (1944 CV Basin) Not built 1,600 less dead (1957 sheet) & '58 Opns Rpt.		
Russian R.	Coyote		
Alameda Cr.	San Antonio (SF)	Calaveras	
Coyote River (Sta. Clara Co)	Anderson 75 less dead		
Trinity R.	Fairview 1,025t (CV Basin, '49)	Trinity 2500 less dead (1957 sheet)	
Stony Cr.	Black Butte 145t	East Park 51 ld	Stony Gorge 50 l.d.
Littlejohn Cr.	Farmington 192t		
Truckee R.	L. Tahoe 732t less dead?		
Nacimiento	Nacimiento 350 less dead, '57 sheet		

Stream

Sta. Ynez

Cachuma

210 less dead

San Luis Rey

Henshaw

204 less dead

Owens R

Long Valley

183 less dead

Calaveras Creek
(Alameda Co)

Calaveras

100 less dead

Piru Cr
(Ventura Co)

Sta. Felicia

100 less dead

Los Gatos Cr.

Lexington

25 less dead

El R.

L. Pillsbury

Klamath R.

Clean L

513 ld

Gerber

94 ld

Upper Klamath L.

525 ld.

Cal WRBd Bull 3, Rept on Cal W Plan. May '56, prelim.

Vol. 3, p. 10-27. "Est. mean seasonal natural runoff."

Sf R above Friant Dam	1,816,000 a-f
Fresno R. above Daulton	103, —
Chowchilla R. above Buchanan site	91, —
Merced R. ab. Exchequer	1,027 —
Tuolumne R. ab. La Grange	1,900, —
Stanislaus ab. Knight's Ferry	1,210 —
Minor streams, Sfr - Stan R	180 —
	6,327 —

Calaveras R ab. Jenny Lind	199 —
Mokelumne R ab. Clements	780 —
Cosumnes R ab. Mich. Bar	374 —
	1,538 —

7,865 —

Prelim Bull 3, p. 2

Reservoirs & capac.

Stanislaus:

Small P&E upstream resers. Also some foothills, minor cmts. Some w. is

Melones

112 —

dimuted from S. Fork to

Tri-Dam (under const.)

Tuolumne Wtrshd. - from Lyons Res.
to Phoenix Pwr Hse.

Donnell's Res.

Beardsley Res.

Tulloch Res.

Tuolumne:

Hetch-Hetchy

360 —

Cherry Valley

268 —

L. Eleanor

28 —

Don Pedro

289 —

Merced:

McClure Res. (Exch.)

289 —

Chowchilla:

Very irregular; no storage

Fresno:

"

"

P&E power. Natl. resers, on Willow Ck.

SF:

Power plants, S.C. Edison

Millerton L.

520 —

Take: Job 2.

1. Note present storage capacity built on various streams - I will tabulate this.

2. Consult "Storage Curves", in Bull. 5, Plates CL and ff.

Note there are 2 curves, one solid, one dashed, on each plate.

For each stream, make 2 determinations (as outlined below), one for the solid and one for the dash line.

3. From the storage curves, determine the marginal productivity of additional storage in terms of additional ~~water~~ steady annual water supply:

Δ steady annual supply
Δ storage (A) This is just at one point, the point

~~and~~ corresponding to the amount of storage ~~was~~ actually built.

(The object is to discover how fully developed the different streams are, relative to each other) On the curves, storage is given in % of mean annual runoff; but mean annual runoff is also given, so

you can readily make the transformation.

(B). Make the determination with a straight-edge. Both scales are in same units, so read off vertical & horizontal components from scales, and give answer as a ratio. Note that on vertical scale you must subtract scale reading from 100 % each time.

Use great care in reading off the graphs, as a little carelessness may make a large error.

Jake: Job 2, p. 2

4. Now read off average productivity at same points: steady annual supply
storage.

This will be easier, and perhaps should be done first for that reason.

5. Now compute & of course tabulate ratio of marginal productivity
over average productivity. (This lets us know if we are in stage
of increasing or decreasing returns, and how far in).

Job 2.

Major missing data are Δ cost/ Δ storage over much range. Must extrapolate from 1 or 2 pts, & genl info.

So grab & hold any data or statements helping with this; & make final ests by judgement, after all data are in.

A second problem is change of costs over time. Get relevant cost-index, adjust each one from time of building or estimate.

Job 2. Sources on storage costs.

1. Bull 3: p. 90, Kuk: p 144, Tule.

(Where site acqu & relocat'g hwy is big cost, maybe decreasing cost, since much is nec. just to build any dam.
(Also, watch overstatement such costs, forgetting new road better than old)

2. File on Costs, data.

Trinity

Antum (on Am.)

Capacities, all major dams. (Also on p. 120, BR CV Basin)

Shy Park

San Luis site cost

Nacimientos

Stam. Tri dam. \$5-2m

Success, Terminus --- p. A-2, Banks

New Melones. D.P. --- p. A-4 " (New D.P. very cheap - make

strong case for underdeveloped Tual.)

BR CV Basin, pp 136-1, est. cap. costs, most years.

Also p. 43, 60, maybe others.

3. File on CV-wide.

Much data, in front of file. After Harold is broken in, he may be able to tabulate that data ok

4. After tabulate these, search other files for what's missing.

Job 2 - Sources.

1. Storage curves, Bull 5. Plate CL ff.

2. Cumulative runoff curves, Bull 5, back flap.

3. Present storage capacities -- ? Bull 21, T-1
CV Basin, BR, '49.
Files. etc

4. Probable cost of Δ storage — at time of bldg, & now.
Bull 3, p. 90, Kwh.
p 144, Tule

5. Value of wta.

6. Relevant index of construction costs.

Procedure: (Don't try every stream. Conc. on ones you have data for)

a. Tabulate present storage capacity. ~~at~~ at, & as % mean annual flow.
for stream (use solid ones - evap losses can be stopped more now)

b. From storage curves, determine $\frac{\Delta \text{ steady annual supply}}{\Delta \text{ storage}}$

c. " " " " $\frac{\text{steady an. supply}}{\text{storage}}$

d. Cf. b & c. Tabulate $\frac{b}{c}$, to see if reached pt. of max. AP —
or how far below it have fallen, which hv probly done.

e. Tabulate whatever cost - of - storage data you have. Column for date;
another for source. Present storage; proposed storage.

f. " est. value wta, per af.

g. Capitalize.

h. Cf. Δ value vs Δ cost.

i. allow for higher MP, bcs. needn't limit selves to steady annual service -
can flex between areas, & adapt crops to supplies on hand.
also, can sink underground in winter
 Δ - increase

Funds budgeted: \$11,883,000.

- ITEM Construction of railroad tunnels Nos. 2 and 3 and grading on the Western
388.1 Pacific relocation around Oroville Reservoir.

Funds budgeted: \$8,694,000.

Contract awarded in July to Gordon H. Ball, Gordon H. Ball, Inc., Ball and Simpson, and Gates and Fox, Berkeley.

Contract amount \$5,720,320. Started work August 13, 1959.

- ITEM Construction of Frenchman Dam and Reservoir on Little Last Chance Creek
387 (one of five dams comprising the Upper Feather River Projects).

Funds budgeted: \$2,060,000.

- ITEM Construction of South Bay Aqueduct between Delta-Mendota Canal and
384 Livermore Valley.

Funds budgeted: \$7,320,000.

The first contract for construction of the South Bay Aqueduct between the Delta-Mendota Canal and Livermore Valley will include the intake structure at the Canal, an interim intake canal, substructure on the intake pumping plant and excavation for the main pumping plant, and a forebay dam which will eventually be part of the main aqueduct. The interim intake canal will provide 150 second-feet and will be an unlined canal.

STATISTICS

PROPOSED OROVILLE DAM AND RESERVOIR

OROVILLE DAM AND RESERVOIR

Type of dam.....	Earth and Rock Fill
Maximum Height.....	735 feet
Crest Length.....	6,700 feet
Volume of fill material.....	80,000,000 cubic yards
Reservoir Capacity.....	3,500,000 acre feet
Length of shoreline.....	167 miles
Surface area of reservoir.....	15,500 acres
Maximum water surface elevation.....	900 feet
Maximum drawdown.....	400 feet
Power generating capacity.....	600,000 KW
Estimated cost.....	\$456,630,000.00

FEATHER RIVER

Watershed area.....	3,610 square miles
Maximum seasonal runoff.....	9,300,000 acre feet
Mean seasonal runoff.....	4,207,000 acre feet
Minimum seasonal runoff.....	1,200,000 acre feet
Maximum discharge of record.....	204,000 cfs, Dec. 1955

12-59

Jake: ~~240~~ This completes the list of streams and storage capacities.

M. G.

Reservoir Capacities to analyze

Computations only ↓

Stream

✓ Bear R.	~~240~~	48	245	288	458
✓ Yuba		328	685	888	1245
✓ Feather		152	905	1058	1212
"		1811	2871	3652	
"		152	802	1555	1708 1862
"		2461	3521	~~4302~~	~~2358~~
✓ Sacramento		4,000	5,100	9,100	
✓ Cache Crk.		300	420	620	864
✓ Putah Crk.		1600	2115		
Russian R.		Just find reservoir capacity of maximum A.P.			
Alameda Crk		"	"	"	"
✓ Coyote R. (Sta. Clara Co.)		75			
✓ Trinity R.		1025	2500		
✓ Stony Crk.		50	101	246	
✓ Littlejohn Crk		92			
✓ Truckee R.		732			
✓ Nacimiento		350			
✓ Sta. Inez		210			
✓ San Luis Rey		204			
✓ Owens		183			
✓ Calaveras Crk. (Alameda Co.)		100			
✓ Pinn Crk.		100			
✓ Los Gatos Crk		25			
Eel R.		Find max. A.P.			
✓ Klamath R.		525	619	1132	

152	~~43~~	48	328	328
753	~~181~~	197	560	357
905	~~280~~	245	888	685
906	152	43	357	560
1811	906	288	1245	1245
1060	1058	170	152	
2871	152	458	650	
	1060		802	
	1212			

where is this ?

where is this ?

" "

Determination of MP and AP in terms of the annual supply of water to the Littlejohn Creek near Knights' Ferry. Source: Bull 5.

assume y-intercept at zero.

STORAGE CAPACITY	X-SEASON	Point of	STORAGE CAPACITY	MP	STORAGE CAPACITY	AP	MP/AP
ooo	Runoff	TANGENCY	Runoff	%	Runoff	%	
92	8.15	11.3					

Determination of MP and AP in terms of the annual supply of water to the Klamath River at Regina. Source: Bull 5

assume y-intercept at zero.	STORAGE	X-SEASON/point of		STORAGE	MP	STORAGE		AP	MP AP
	Capacity	Runoff	TANGENT	Runoff		Runoff	Capacity		
	000	000		%		%	%		
	525	3,410.7	.15				100		
	619	"	.18				100		
	1,132	"	.33	84	114	.74	100	80	1.25 .59

Determination of MP and AP in terms of the annual supply of water to the Feather River at Oroville.
Source: Bull 5.

Assume y-intercept at zero.	Storage Capacity 000	$\bar{x}$ -SEASON Runoff 000	Point of TANGENCY %	Storage Capacity %	MP	Storage Capacity %	Runoff %	AP	MP/AP
	152	5,283.5	.03				100		
	802	"	.15				100		
	905	"	.17				100		
	1,058	"	.20				100		
	1,212	"	.23	91	92	.99	100	72	1.39
	1,555	"	.29	81	107	.81	100	76	1.32
	1,708	"	.32				100		
	1,811	"	.34				100		
	1,862	"	.35	83	120	.69	100	86	1.16
	2,461	"	.46	80	126	.63	100	93	1.08
	2,871	"	.54	75	142	.53	100	102	.98
	3,521	"	.67	70	155	.45	100	112	.89
	3,652	"	.69	68	164	.41	100	114	.88
	4,302	"	.81	65	172	.38	100	123	.81

Determination of MP and AP
supply of water for the
clements. Source: Bul 5

in terms of the annual
Mekelumne River near

Assume y-intercept at zero.	STORAGE CAPACITY 000	Y. SEASON Runoff 000	Point of TANGENCY Runoff %	STORAGE CAPACITY %	MP	Runoff %	STORAGE CAPACITY %	AP	MP/AP
	140	898.1	.16			100			
	210	"	*.23	72	206	100	60	1.67	.21
	350	"	.39	87	87	100	66	1.52	.66
y-intercept at 20 %	210	"	.23	72	206	80	132	.61	.57
	350		.39	87	87	80	110	.73	1.37

* Not very precise, since the
curve had to be arbitrarily
extended in order to find this point.

Determination of MP and AP in terms of the annual supply of water for the Yuba River near Smartsville.
Source: Bull. 5

Assume y-intercept at zero.

Storage capacity	X-season Runoff	Point of Tangency	Runoff %	Storage capacity %	MP	Runoff %	Storage capacity %	AP	MP/AP
000	000		%	%		%	%		
328	2,652.6	.12	71	105		100			
685	"	.26	91	105	.87	100	85	1.18	.74
888	"	.33	87	114	.76	100	87	1.15	.66
1,245	"	.47	81	133	.61	100	102	.98	.62

STORAGE CAPACITY	X-SEASON Runoff	Point of TANGENCY	STORAGE CAPACITY	Runoff	MP	STORAGE CAPACITY	Runoff	AP	MP / AP
000	000	%	%	%		%	%		
50	555	.09					100		
101	"	.18					100		
246	"	.44	84	154	.55		100	103	.97

Determination of MP and AP in terms of the annual supply of water for the Bear River near Van Trent.
Source: Bull. 5

Assume	STORAGE CAPACITY	$\bar{x}$ -SEASON Runoff	POINT OF TANGENCY	STORAGE CAPACITY	MP	STORAGE CAPACITY	Runoff	AP	MP AP	
y-intercept at zero	000	000	%	%		%	%			
	48	412.5	.12							
	245	"	.59	85	161	.53	100	127	.79	.67
	288	"	.70	79	182	.43	100	134	.75	.57
	458	"	1.11	67	222	.30	100	165	.61	.49

I couldn't find any data
for these rivers in the
U.S. G.S. publication. However
I have noticed that Bull. 5
also have minimum flows.
Although the data are for
for different years, they
could serve as well for
bench mark purposes.

Jake

See U.S. Water Supply Papers
pp. 4-5 for comments on
accuracy of data.

Determination of MP and AP in terms of the annual supply of water for the American River near Yair Oaks.
 Source: Bul. 5

Assume y-intercept at zero	STORAGE CAPACITY 000	X-Season Runoff 000	Point of TANGENCY	Runoff %	STORAGE CAPACITY %	MP	Runoff %	STORAGE CAPACITY %	AP	MP/ AP
	276	3,181.9	.09				100			
	902	"	.28	92	89	1.03	100	77	1.30	.79
	1,178	"	.37	90	94	.96	100	82	1.22	.79
	1,616	"	.51	78	116	.67	100	88	1.14	.59
	1,892	"	.59	71	130	.55	100	99	1.01	.54

Determination of MP and AP in terms of the annual supply of water for the Calaveras River at Jenny Lind. Source: Bul. 5

Assume y-intercept at zero.	STORAGE CAPACITY 000	X-SEASON Runoff 000	Point of TANGENCY	Runoff %	STORAGE CAPACITY %	MP	Runoff %	STORAGE CAPACITY %	AP	MP/AP
	76	316.5	.24				100			
	320	"	1.01	85	2.44	.35	100	202	.49	.71

Determination of MP and AP in terms of the annual supply of water for the Fresno River near Madera.
 Source: Bul. 5.

Assume	STORAGE CAPACITY	$\bar{X}$ SEASON Runoff	POINT OF TANGENCY	Runoff	STORAGE CAPACITY	MP	Runoff	STORAGE CAPACITY	AP	MP/ AP
y-intercept	000	000		%	%		%	%		
at zero.	80	68.3	1.17	60	223	.27	100	164	.61	.44

Determination of MP and AP in terms of the annual supply of water for the Chowchilla River near Chowchilla. Source: Bul. 5

Assume	Storage	X season Point of		Storage		MP		Runoff	Storage	AP	MP/AP
	CAPACITY	Runoff	TANGENCY	Runoff	CAPACITY				CAPACITY		
y-intercept	ooo	ooo		%	%			%	%		
at zero	60	67.7	.89	81	177	.46		100	151	.66	.69

Determination of MP and AP in terms of the annual supply of water for the Merced River near Merced Falls. Source: Bul 5

Assume y-intercept at zero	STORAGE CAPACITY 000	X SEASON RUNOFF 000	POINT OF TANGENCY	RUNOFF %	STORAGE CAPACITY %	MP	RUNOFF %	STORAGE CAPACITY %	AP	MP/ AP
	279	1,133.5	.25	91	92	.99	100	71	1.41	.70
	520	"	.46	80	122	.66	100	91	1.10	.60
	1,180	"	1.04	61	172	.35	100	137	.73	.48
	1,600	"	1.41	41	213	.19	100	165	.61	.31

Determination of MP and AP in terms of the annual supply of water to the San Luis Rey River near Pala.
 Source: Bull 5.

assume y-intercept at zero.	$\bar{x}$ -SEASON		Point of		STORAGE		MP	STORAGE		AP	$\frac{MP}{AP}$
	STORAGE CAPACITY	Runoff	TANGENCY	Runoff	CAPACITY			Runoff	CAPACITY		
	000	000		%	%			%	%		
	204	59.4	3.43	50	580	.09		100	436	.23	.39

determination of MP and AP in terms of the
 annual supply of water to Santa Ynez
 River near Lompoc. Source: Bill S.

Assume y-intercept at zero.	STORAGE	X-SEASON Point of		STORAGE	MP	STORAGE	AP		MP/AP	
	CAPACITY	Runoff	TANGENCY	Runoff		Runoff	CAPACITY			
	000	000		%	%	%	%			
	210	205.5	1.02	87	428	.20	100	308	.32	.62

Determination of MP and AP in terms of the annual supply of water to the Truckee River at state line. Source: Bull 5.

Assume y-intercept at zero.	STORAGE X-SEASON POINT of			STORAGE		MP	STORAGE		AP	MP AP
	CAPACITY	Runoff	Tangency	Runoff	CAPACITY		Runoff	CAPACITY		
	000	000		%	%		%	%		
	732	506	1.45	51	233	.22	100	180	.56	.39

Determination of MP and AP in terms of the annual supply of water to the Trinity River at Mouth, Source: Bull 5.

Assume y-intercept at zero.

STORAGE CAPACITY	X-SEASON RUNOFF	POINT OF TANGENCY	STORAGE CAPACITY	MP	STORAGE CAPACITY	AP	MP/AP
000	000	%	%		%	%	
1,025	4,447.7	.23	90	1.05	100	70	1.43
2,500	"	.56	71	.49	100	100	1.00

Determination of MP and AP in terms of the annual supply of water to the Coyote River near San Jose. Source: Bull. 5

assume y-intercept at zero.	Storage capacity	X-SEASON Runoff	Point of TANGENCY	Runoff	Storage Capacity	MP	Runoff	Storage Capacity	AP	MP/AP
	000	000		%	%		%	%		
	75	80.1	.94	97	258	.38	100	255	.39	.97

Determination of MP and AP in terms of the annual supply of water to the Pintah Creek at Winters.
 Source: Bull 5

Assume y-intercept at zero.	Storage capacity 000	$\bar{x}$ -Season Runoff	Point of Tangency Runoff	Storage capacity %	MP	Runoff %	Storage capacity %	AP	$\frac{MP}{AP}$
	1,600	421.8	3.79	37	.054	100	455	.22	.245
	2,115	"	5.01	31	.040	100	567	.176	.227

Determination of MP and AP in terms of the annual supply of water to the Cache Creek at Azula

Assume y-intercept at zero	Storage capacity	$\bar{x}$ -Season Runoff	Point of TANGENCY	Storage capacity	MP	Runoff %	Storage capacity	AP	MP/ AP
	000	000		%	%	%	%		
	300	586	.51	60	175	.34	100	90	1.11
	420	"	.72	54	215	.25	100	116	.86
	620	"	1.06	47	298	.16	100	154	.65
	864	"	1.47	42	363	.12	100	202	.49

Determination of MP and AP in terms of the annual supply of water to the Sacramento River near Red Bluff.
 source: Bull 5.

assume yr intercept at zero	STORAGE X-SEASON Point of				STORAGE		STORAGE				MP/AP
	CAPACITY	Runoff	Tangency	Runoff	CAPACITY	MP	Runoff	CAPACITY	AP		
	000	000		%	%		%	%			
	4,000	9,929	.40	69	121	.57	100	75	1.33	.43	
	5,100	"	.51	64	138	.46	100	85	1.18	.39	
	9,100	"	.92	46	230	.20	100	127	.79	.25	

determination of MP and AP in terms of the annual supply of water to the Los Gatos Creek at base of Gout hills. Source: Bull 5

Assume y-intercept at zero.	STORAGE	$\bar{x}$ SEASON	POINT OF	STORAGE	MP	STORAGE	AP	$\frac{MP}{AP}$		
	CAPACITY	Runoff	TANGENCY	Runoff		CAPACITY			Runoff	
	0.00	0.00		%	%	%	%			
	25	9.75	2.56	56	438	.13	100	336	.30	.43

Determination of MP and AP in terms of the annual supply of water for the Stanislaus River at Knight's Ferry. Source: Bul. 5.

Assume y-intercept at zero.	STORAGE CAPACITY 000	SEASON Runoff 000	Point of Tangency *	Runoff %	STORAGE CAPACITY %	MP	Runoff %	STORAGE CAPACITY %	AP	MP/AP
	112	1,376	.08	84	176	.48	100	43	2.33	.21
	182	"	.13	85	70	1.21	100	46	2.17	.56
	412	"	.30	80	88	.91	100	70	1.43	.64
	1,000	"	.73	50	191	.26	100	110	.91	.29

Assume y-intercept at 18%.	STORAGE CAPACITY	SEASON Runoff	Point of Tangency	Runoff %	STORAGE CAPACITY	MP	Runoff %	STORAGE CAPACITY	AP	MP/AP
	412	"	.30	80	88	.91	82	92	.89	1.02
	1,000	"	.73	50	191	.26	82	120	.68	.38

* storage development curve was arbitrarily extended to find this point.

Determination of MP and AP in terms of the annual supply of water for the Kern River near Bakersfield. Source: Bul. 5

assume	STORAGE CAPACITY	$\bar{X}$ SEASON RUN OFF	POINT OF TANGENCY	RUNOFF %	STORAGE CAPACITY	MP	RUNOFF %	STORAGE CAPACITY	AP	MP/AP
y-intercept	000	000		%	%		%	%		
at zero	525	760.4	.69	58	191	.30	100	113	.880	.34
	730	760.4	.96	53	216	.25	100	136	.735	.34

* y-intercept	525	760.4	.69	58	191	.30	75	140	.546	.56
at point	730	760.4	.96	53	216	.25	75	159	.47	.53
.25% above origin										

* Based on minimum data (1923-24) in U.S. Water Supply Papers.

Formula: $X \cdot 12 \cdot 30 \cdot 2 = 720X$

o It seems to me that a change in the y-intercept will not affect the MP

Determination of MP and AP in terms of the annual supply of water for Kanawha River near Three Rivers.
Source: Bul. 5

assume	STORAGE CAPACITY	X SEASON Runoff	Point of TANGENCY	STORAGE Runoff	Capacity	MP	Runoff	STORAGE Capacity	AP	MP/AP
y-intercept of zero	000	000		%	%		%	%		
	140	407.9	.34	98	92	1.06	100	90	1.11	.95
y-intercept at a point 25% above the origin	140	407.9	.34	98	92	1.06	75	190	.39	2.72

Determination of MP and AP in terms of the annual supply of water of Kingo River near Sanger.
Source: Bul. 5

Assume	STORAGE CAPACITY	X Season Point of Runoff	Point of Tangency	Runoff %	STORAGE CAPACITY	MP	Runoff %	STORAGE CAPACITY	AP	MP/AP
y-intercept at zero.	000	000		%	%		%	%		
	1,000	1,925.1	.52	75	111	.67	100	85	1.18	.57
	1,128	1,925.1	.59	74	113	.65	100	93	1.08	.60
y-intercept at 20% above point of origin.	1,000	"	.52	75	111	.67	80	104	.77	.87
	1,128	"	.59	74	113	.65	80	107	.75	.87

Determination of MP and AP in terms of the annual supply of water for the Tuolumne River near La Grange.
Source: Bul 5.

Assume y-intercept at zero.

STORAGE CAPACITY	$\bar{x}$ -season RUNOFF	Point of TANGENCY	RUNOFF	STORAGE CAPACITY	MP	RUNOFF	STORAGE CAPACITY	AP	MP/AP
000	000		%	%		%	%		
262	2,055.8	.13	90	53	1.70	100	38	2.63	.65
311	"	.15	82	62	1.32	100	40	2.50	.53
651	"	.32	69	105	.66	100	61	1.64	.40
919	"	.45	65	116	.56	100	75	1.33	.42
1,673	"	.81	53	146	.36	100	107	.93	.39
2,408	"	1.17	44	192	.23	100	136	.74	.31

y-intercept at 36%

919	"	.45	65	116	.56	64	123	.52	1.08
1,673	"	.81	53	146	.36	64	131	.49	.73
2,408	"	1.17	44	192	.23	64	151	.42	.55

Determination of MP and AP in terms of the annual supply of water for Tule River near Postersville.
Source: Bul. 5

Assume	STORAGE CAPACITY	X SEASON Runoff	POINT of TANGENCY	Runoff %	STORAGE CAPACITY	MP	Runoff %	STORAGE CAPACITY	AP	MP/AP
y-intercept at zero	000	000		%	%		%	%		
	105	141.5	.74	64	190	.337	100	123	.813	.41 ³³⁷ ₈₁₃
y-intercept at 13% above origin.	105	141.5	.74	64	190	.337	87	136	.64	.53

Determination of MP and AP in terms of the annual supply of water for the Cosumnes River near Michigan Bar.
 source: Bul. 5

Assume y-intercept at zero.	STORAGE CAPACITY 000	7-SEASON Runoff 000	Point of Tangency	Runoff %	STORAGE CAPACITY %	MP	Runoff %	STORAGE CAPACITY %	AP	MP AP
	41	482	.08				100			
	470	"	.91	71	233	.30	100	1.73	.58	.52
	976	"	2.02	44	375	.12	100	254	.39	.31
y-intercept at 08%	470	"	.91	71	233	.30	92	186	.49	.61
	976		2.02	44	375	.12	92	259	.36	.33

Determination of MP and AP in terms of the annual supply of water for the San Joaquin River near Friant. Source: Bul 5.

Assume	STORAGE CAPACITY	X Season Runoff	Point of Tangency	STORAGE CAPACITY	MP	Runoff %	STORAGE CAPACITY	AP	MP/AP
y-intercept at zero	000	000		%	%	%	%		
	390	2,056.9	.19	82	84	.976	100	53	1.887
	525	2,056.9	.25	81	84	.964	100	58	1.724
	560	2,056.9	.27	83	90	.922	100	65	1.54
	290	2,056.9	.14	85	83	1.02	100	56	1.78
	415	2,056.9	.20	84	85	.99	100	58	1.72
	805	2,056.9	.39	79	94	.84	100	76	1.32
y-intercept at a point 24% above origin	390	"	.19	82	84	.976	76	123	62
	525	"	.25	81	84	.964	76	103	74
	560	"	.27	83	90	.92	76	112	68
	290	"	.14	85	83	1.02	76	219	35
	415	"	.20	84	85	.99	76	128	59
	805	"	.39	79	94	.84	76	101	75

Task: Determine graphically MP and AP of storage, in terms of firm annual supply, for fl. streams and storage capacities

Price figures for electricity

Stream

Kern ✓	~~550~~	525	730					
Tule ✓	~~115~~	105						
Kaweah ✓	~~145~~	140						
King ✓	1,000	1128						
San Joaquin ✓	~~520~~	390	525	560	290	415	805	
Fresno ✓	~~40~~	80						
Chowchilla ✓	~~70~~	60						
Merced	280	521	1180	1600				
Tuolumne	262	290	630	904	1440	2225	2414	2500
Stanislaus	112	230	1100					
Calaveras	76	325						
Mokelumne	210	1140	1350					
Cosumnes	437	550	987					
American	276	800	1000	1216	1800	2076		
Bear	202	402	462					
Yuba	500	675	1175					
Feather								

Stream

San Joaquin ✓	290	415	390	805			
Fresno ✓	80						
Chowchilla ✓	60						
Merced ✓	279	520	1180	1600			
Tuolumne ✓	262	311	651	919	1673	2408	
Stanislaus ✓	112	182	412	1000			
Calaveras River ✓	76	320					
Mokelumne ✓	140	210	350				
Cosumnes ✓	41	470	976				
American ✓	276	902	1178	1616	1892		
Bear							