

Ranges West

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FAX TRANSMISSION

To: *Sandy Hemingway* Date: *4/29/09*
Fax #: *208-387-6708* Pages: *23*, including this cover sheet.
From: *Wayne Burkhardt*
Subject: *Regarding water right 67-7878*

COMMENTS:

Sandy
We are faxing at your request the following

- 1. 12 pages of my irrigation records*
- 2. 7 pages of weir data for outlet Canal*
- 3. 3 pages of Ben Ross Reservoir storage capacity*
There are 2 different storage charts.

Hope this ^{serves} ~~serves~~ your purpose and call
if you have any questions. Wayne B

Water Right 67-7878

Little Water Irrigation Dist

12 pgs

The following are field records of water levels and other information related to the operation of the Irrigation District. These records span the time that I have been on the Board of Directors (2000).

Reservoir water level reading that occur when water level is below boat ramp staff gauge are estimated as follows:

Approximately 6' of run on boat ramp slope equals 1' of elevation change in reservoir water level.

Attention Sandy Hemingway
Water Right 67-7878

Pg 1

2000 - Reservoir empty 9-1 Spillway level 55 ft
Opened inlet canal Oct 15 Closed 12-5

2001

Started inlet canal 2-16

Reservoir full to spillway (54.6) 4-30

Copper Dam in 5-11

Reopened inlet canal 5-11

→ Reservoir filled to 57 ft 5-22

Spillway level 55 ft Copper Dam 57 ft

Opened outlet for Corvair + Yantis 5-20 (2" opening)

Maintain full Reservoir 5-22 to (inlet canal 2" opening)

→ 6-19 Shut inlet canal off

2001 Apr Snow Pack @ 42%

May 11 - started irrigating - Richardson Ditch

Sept 1 - Reservoir empty

Sept 10 - Restricted adjudicated river water to 600 cfs

Nov 2 - Opened inlet canal

Dec 12 - Canal + headgate icing - closed headgate to 2"

2002

Feb 16 - Started deicing canal - major ice dams @
Shaner Bridge and at County Road Crossing

Feb 22 - Opened headgates to full head (24" opening)

Apr 18 - Closed headgate to 2". Reservoir at 49'
Much snow to get come off Anderson Draw watershed

Mar 18 - Apr 25 Snow melt from local reservoir watershed raises reservoir level from 49 - 52 1/2

Apr 25 Opened headgate to 10" Reservoir level 52 1/2

Apr SNOW PACK @ ~~124~~ 124 (Oct thru Apr.)

Apr 29 Opened headgate to 12" Reservoir level 53'

May 8 PM filled to spillway level Reservoir level 55'
10 days to fill 2'

May 30 Boards in spillway, Reservoir 55'
opened inlet headgate 15"

June 8 Reservoir Filled Reservoir 56.8
Inlet headgate close to 8"

June 11 Reservoir full Reservoir 54.8
8" inlet headgate opening adequate to offset spillway leakage & outlet discharge during rainy cool windy weather

July 1 Began using reservoir water

July 13 Closed inlet canal

July 15 Reservoir level at 55'

Removed spillway boards

Sept 1 Reservoir empty

Nov 1 Opened inlet canal headgate

JAN 14/03 Monsoon. Canal at full capacity

Water level @ over flow lip of safety spillway immediately below inlet headgate. Also 5 limbs submerged of chain gauge at foot bridge going from house to barn.
6" free in canal banks at junction between Upper & Lower Reservoir

Note 2

This is the work
Paint along the inlet
canal. Approx 100' on
either side of gate between
Shaffer & Burkhardt

Pg 3

Best Spring Water Location

6' on slope equal 1' of water level

2003 1/24/03

Reservoir level 51.5' (54' in blt gill)
 1/24/03 1/24/03
 1/24/03 1/24/03 1/24/03
 1/24/03 1/24/03 1/24/03

Headgate 1/24/03

1/24/03 1/24/03 1/24/03

1/24/03 1/24/03 1/24/03

1/24/03 1/24/03 1/24/03

2003

- 1-28-03 Outlet Headgate closed to 4"
- 2-8-03 Reservoir level @ 49'
- 2-22 " " @ 48'
- 3-15 Opened Outlet Headgate 15"
- 3-25 Reservoir level @ 51.5'
- 4-3 Reservoir level @ 53'
- 4-3 Closed inlet headgate to 4"
- 4-26 Closed headgate to 2" - Reservoir level 55'
- * ~~4-27~~ Opened Richardson Ditch - started irrigating ~~the~~
- 5-30 Closed spillway Coffey Dam - water level in Reservoir 53'

Pg 4
2003 Cont'd

- 6-5-03 Started irrigating
- 6-8-03 Reservoir Full. Closed inlet to 4" to maintain
- 7-5-03 Opened Reservoir - 2 more turns each headgate
- 10-20-03 Reservoir Empty

2004

2004

- Nov 30/03 Inlet headgate setting 4" for the winter period.
- 2/17/04 Deiced inlet canal headgate 6"
- 3/11/04 Opened headgate 15"
Reservoir level 42' (some snow cover yet to melt, Hills surrounding Lake)
- 3/26/04 Reservoir level 47'
- 4/10/04 Reservoir level 52 1/2'
- 4/14 " " 53 1/2'
- 4/14 Closed inlet gate to 8"
- 4/24 Closed inlet gate to 4" Reservoir level @ 55'
- * 4-30 Open Richardson Ditch - Started Irrigating
- 5-3 Open reservoir headgate 5 turns (Yantis, Shuman, Corriell)
(4 turns of slack + 1 turn opening)
Splitter of 1 1/2" water divided both ways
- * 5-20-04 Put flashboards in spillway - do not open inlet headgate. Reservoir level 55.2'
- 5-25-04 Opened inlet headgate to 6"
- 6-18-04 Opened inlet headgate to 16" Reservoir level 56.5'
- * 6-22-04 Closed headgate to 8" Reservoir Full 57'
- 7-10-18-04 Opened Reservoir incrementally
- 7-26-04 Board out of spillway
- 10-15-04 Closed dam headgates - Reservoir storage lasted all season
- 11-1-04 Closed inlet headgate to 3" in 3" in 3"

Pg 5
Ben Co. Irrigation Record

8/22/04 Heavy rain - river up
Opened Inlet Canal ~~wide~~ 20"
Started closing Reservoir headgates & Splitter

8/29/4 Reservoir West Headgate closed 9 turns (2 of 6 slack)
East Headgate " 9 turns (2 of 9 slack)

Splitter closed 6 turns (prior to 8/22 open 14 turns)

River Weir Reading

7/31 $5\frac{1}{2}$ "
8/10 $4\frac{1}{4}$ "
8/22 $4\frac{1}{2}$ "
8/24 $4\frac{7}{16}$ "
8/27 $5\frac{1}{2}$ "
8/29 $4\frac{1}{2}$ or 15 cfs or 450"

8/31/04 Rayce asked for more water
Closed Inlet Canal to 2"
Reservoir West Headgate opened 4 turns (2 of 4 slack)
East Headgate " 4 turns (2 of 4 slack)
Splitter opened 2 turns
Reservoir water level at 41.5'

9/1/04 Grays Creek Ditch weir @ 10 inches
Joe Holmes ask for more water
Opened east headgate $\frac{1}{2}$ turn
Reservoir water level @ 41'

R/b

Donart weir at 5"
9/7/04 Water spilling at Donart Diversion
Roger called said Isaac indicated too much H₂O
Reserv level @ 37'
Reserv west headgate closed 3 turns (293 stroke)
Splitter closed 1 turn

9/9/04 Joe Holmes called - too much H₂O in Grays Co.
Reserv East headgate closed 3 turns (293 stroke)
Splitter opened 1 turn

River Weir 3" = 8.39 cfs @ 419.5"

9/12/04 Rain 1/2 inch early AM

Reserv headgates - East + West Close 1 turn ea

9/15/04 Still raining
Closed E + W reserv headgates 1 turn each
Reserv level 33.5'

10/3/04 Dry weather since 9/20 (Isaac called for more water)
Opened west reserv headgate 1 turn stroke - 3 turns open
Reserv water level @ 28 feet

10/7/04 Roger closed Reserv W headgate 4 turns

Pg 7

11-25-04 Set inlet headgate at 4" for winter

2005

2-15-05 Opened inlet headgate to flush canal ice

3-11-05 Reservoir level @ 45' & 12" headgate opening

4-9-05 { " " @ 52 1/4"
Closed inlet headgate to 6"

4-21-05 Reservoir level @ 53.5'

Leakage from catchment apron normal ~ 20gpm

Closed inlet headgate to 2"

5/14/05 Put flash dam boards in reservoir spillway
Did Not open inlet canal - reservoir level 54'

* 5/30/05 Opened Inlet headgate to 12" - Reservoir level 55.5'
Seepage drain pipe below dam @ ~ 30gpm

* 6/7/05 Reservoir full to 57' - Closed inlet headgate to 6"
6/10/05 Opened West out headgate 1 1/2 turns

* 6/10/05 Started irrigating on Richardson Ditch

* 7/6/05 Opened Ben Ross headgate

2006 Pg 8

Nazir Wallace

- 4/2/06 Inlet Headgate Closed Note
Reservoir Level @ 53.5' Reservoir nearly
4/10/06 Reservoir Level @ 54.5 filled with low
5/6 5/16/06 Put boards in spillway flash dam Country runoff
5/4/06 Reservoir seepage pipe less than 30 gpm
6/15/06 Reservoir seepage 2" in bottom of 6 in pipe -
Reservoir level 56'
7/8/06 Reservoir at 57' (Full)
7/8/06 River Weir flow @ 12" = 60 cfs
* 7/8/06 Reservoir headgates opened
7/19/06 Lowered inlet headgate to 4" Res. Level 54
7/20 Shut inlet headgate off
8/4 Reservoir level @ 50'
8/31 Reservoir level @ 37'
River weir @
9/9 Reservoir level @ 30'
* 9/27 Reservoir Empty
9/30 Opened Inlet Headgate 4" Needed to
divert river water to allow reconstruction
of Grays Creek headgate
12/1 Closed to 2" for winter

2007

- 2/1/07 Started opening inlet headgate
2/15/07 Opened to 8"
3/30/07 Opened headgate to 10" River @ 49'
4/9/07 Reservoir level @ 51 1/2'
4/14/07 Reservoir level @ 52 1/4' ~~Reservoir level @ 52 1/4'~~

Pg 9
2007 Cont'd

4/24/07 Reservoir Level $53\frac{1}{4}'$
4/27 " " $54'$ Red water in Reservoir Ditch
Opened Inlet headgate to 15"

5/1 Reservoir Level $54\frac{1}{2}'$

5/2 ~~Reservoir Level $54\frac{1}{2}'$~~

5/11 Reservoir @ $56\frac{1}{2}"$ ~~Drain pipe $2\frac{1}{2}"$ of drain water~~

5-14 Reservoir Full @ $57'$ started closing Inlet 4"

5-22 Drain pipe flow constant @ $< 2"$ of water

6-10 " " " " " "

6-17 " " " " " "

6-21 Opened Dam Outlet

8-3 Reservoir Level @ $43'$ estimated

8-16 Reservoir Level Measured

From 50' level down 96' on ramp

$96/6' = 16'$ drop below 50' mark

Reservoir level at $\approx 34'$

8/25 Reservoir Level Measured

From 50' level down 138' on ramp to water level

$138/6' = 23'$ ft below 50' mark

Reservoir level at $27'$

* 9/9 Reservoir Empty - River flow @ weir $2\frac{1}{2}"$

10/2 Opened Inlet Canal

10/16 Water level in Reservoir above outlet grates

Pg 10
2008

- 3/1/08 Opened Inlet Headgate 8"
- 4/19/08 Reser level @ 45'
- 4/22/08 Opened Inlet Headgate to 12"
- 4/1/08 Reservoir level @ 46' Opened Inlet to 15"
- 4/23 Reservoir level @ 48 1/2'
- 4/28 " " @ 50'
- 5/1 Reservoir level @ 50 1/2'
- 5/6 " " 52
- 5/10 Started irrigating in Richardson Ditch
- 5/10 Opened west reservoir headgate 2" completely full pipe headgate at spill
lacked 2-3 of overflowing concrete spill
- 5/10 Dam drainage pipe flow about 1" in 5 inch pipe - clear
- 5/16 Full head of water in Richardson Ditch
- 5/18 Reservoir level at 53 1/2". Drain pipe same as previous
- 5/20 Boards in Flash Dam - Reser level 54 - Drain pipe 1" & clear
- 5/28 Reser level @ 55' Drain pipe < 1" clear water
- 5/31 " " @ 56 " " " "
- 6/2 " " @ 56 Drain pipe 1" " " "
- 6/12 " " @ 56.4 Closed inlet headgate to 4"
- 6/17 " " @ 56.5 " " " "
- 6/20 " " @ 56.6 " " " "
- 6/23 " " @ 56.6 " " " "
- 7/4 Reservoir Full @ 57' " " " "
- 7/12 Opened Reservoir Outlet
- 10/15 Reservoir still has water - level at 30'
- 10/15 Started putting river water in reservoir
Irrigation season over

2009 Pg 11

2/15/09 Opened Inlet Canal
4/10 Reservoir Level @ 49.5'
4/11 Open inlet headgate to 15"
4/22 Reservoir Level @ 52'
4/27 Reservoir Level @ 53 1/2', Seepage drain 1" water
4/27 Started irrigating N pasture
4/29 Reservoir level @ 54'

4/17/87

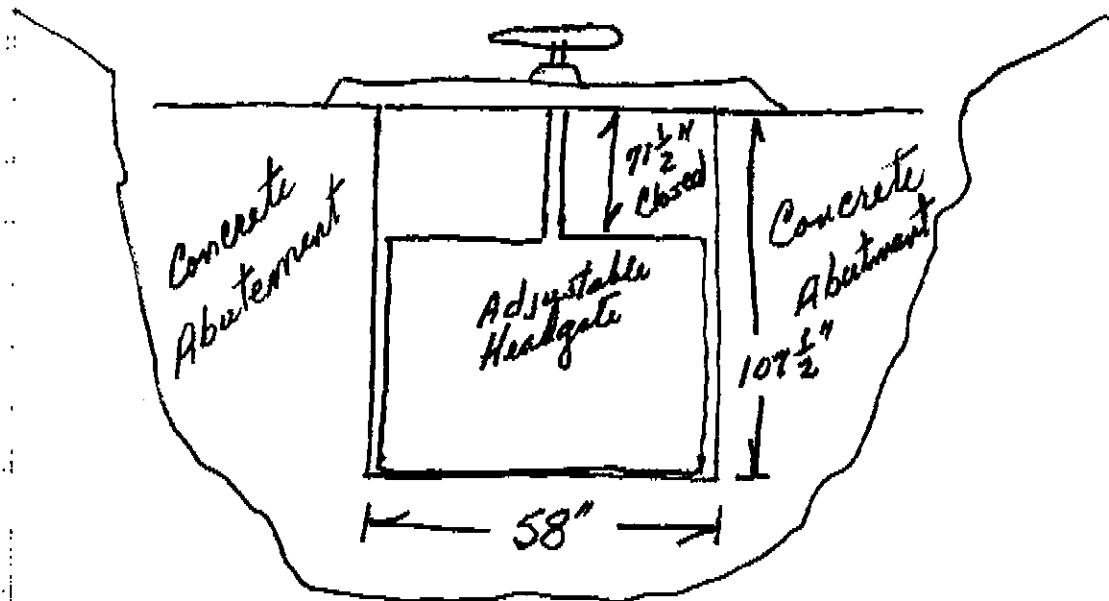
Ben Ross - Inlet Canal Headgate

1 page

Attached is the formula and charts for reading water flow through the Inlet Canal Headgate at the Little Sioux River.

John Weston of IDWR supplied this information for reading water flow through a "submerged orifice weir".

Dimensions for the inlet headgate are shown below



Submerged Orifice Formula

-See attached sheets for water level height difference less than ½ ft.

-For height difference greater than ½ ft use formula below:

$$\text{Flow rate (cfs)} = .7 A \sqrt{(64.4 \text{ ft/sec } \Delta H)}$$

A = orifice cross area (ft)

ΔH = height difference upstream minus downstream (ft)

Given:

Gate: Width = 58 inches

Height = 12 inches

Δ Height difference = 1 ft.

Orifice Area = 58 inches X 12 inches / 144 sq. inches per sq. ft
= 4.83 sq. ft.

$$\text{Flow Rate} = .7 (4.83 \text{ sq ft}) \sqrt{(64.4 \text{ ft/sec} \times 1 \text{ ft.})}$$

H	Flow rate
1 ft	27.1 cfs
2 ft	38.4 cfs
3 ft	47.0 cfs
4 ft	54.3 cfs

$$\text{Flow Rate} = (0.7)^x (\text{sf area of orifice})^x \sqrt{(64.4 \text{ ft/sec} \times \text{head})}$$

A-37

from the formula $Q = 0.70A(2g \Delta h)^{0.5}$

Head $\Delta h, ft$	35	40	42	44	46	48	50	55	60	65	70	75	80	85	90
0.04	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18
0.05	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19
0.06	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20
0.07	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21
0.08	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22
0.09	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23
0.10	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24
0.11	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25
0.12	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26
0.13	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27
0.14	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28
0.15	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29
0.16	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30
0.17	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31
0.18	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32
0.19	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33
0.20	0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34
0.21	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35
0.22	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36
0.23	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37
0.24	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38
0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39
0.26	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40
0.27	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41
0.28	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42
0.29	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43
0.30	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44
0.31	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.45
0.32	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46
0.33	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47
0.34	0.34	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48
0.35	0.35	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49
0.36	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50
0.37	0.37	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51
0.38	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52
0.39	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53
0.40	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54
0.41	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55
0.42	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56
0.43	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57
0.44	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58
0.45	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59
0.46	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60
0.47	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61
0.48	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
0.49	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62	0.63
0.50	0.50	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62	0.63	0.64
0.51	0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62	0.63	0.64	0.65
0.52	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62	0.63	0.64	0.65	0.66
0.53	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62	0.63	0.64	0.65	0.66	0.67

A-36

A-39

Discharge ft ³ /sec	Gate opening in feet		Discharge ft ³ /sec	Gate opening in feet		Discharge ft ³ /sec	Gate opening in feet	
	2 gates	1 gate		2 gates	1 gate		2 gates	1 gate
10.25	0.81		0.25	0.02	0.04	10.25	0.81	
10.50	.83		.50	.04	.05	10.50	.83	
10.75	.85		.75	.06	.12	10.75	.85	
11.00	.87		1.00	.08	.18	11.00	.87	
11.25	.89		1.25	.10	.20	11.25	.89	
11.50	.91		1.50	.12	.24	11.50	.91	
11.75	.93		1.75	.14	.26	11.75	.93	
12.00	.95		2.00	.16	.32	12.00	.95	
12.25	.97		2.25	.18	.36	12.25	.97	
12.50	.99		2.50	.20	.40	12.50	.99	
12.75	1.01		2.75	.22	.44	12.75	1.01	
13.00	1.03		3.00	.24	.48	13.00	1.03	
13.25			3.25	.26	.52	13.25		
13.50	1.05		3.50	.28	.56	13.50	1.05	
13.75	1.07		3.75	.30	.60	13.75	1.07	
14.00	1.09		4.00	.32	.64	14.00	1.09	
14.25	1.12		4.25	.34	.68	14.25	1.12	
14.50	1.14		4.50	.36	.72	14.50	1.14	
14.75	1.16		4.75	.38	.75	14.75	1.16	
15.00	1.18		5.00	.40	.79	15.00	1.18	
15.25	1.20		5.25	.42	.83	15.25	1.20	
15.50	1.22		5.50	.44	.87	15.50	1.22	
15.75	1.24		5.75	.46	.91	15.75	1.24	
16.00	1.26		6.00	.48	.95	16.00	1.26	
16.25	1.28		6.25	.50	.99	16.25	1.28	
16.50	1.30		6.50	.52	1.03	16.50	1.30	
16.75	1.32		6.75	.54	1.06	16.75	1.32	
17.00	1.34		7.00	.56	1.10	17.00	1.34	
17.25	1.36		7.25	.58	1.14	17.25	1.36	
17.50	1.37		7.50	.60	1.18	17.50	1.37	
17.75	1.39		7.75	.62	1.22	17.75	1.39	
18.00	1.41		8.00	.64	1.26	18.00	1.41	
18.25	1.43		8.25	.66	1.30	18.25	1.43	
18.50	1.45		8.50	.68	1.34	18.50	1.45	
18.75	1.47		8.75	.70	1.37	18.75	1.47	
19.00	1.49		9.00	.72	1.41	19.00	1.49	
19.25	1.51		9.25	.74	1.45	19.25	1.51	
19.50	1.53		9.50	.76	1.49	19.50	1.53	
19.75	1.54		9.75	.77	1.52	19.75	1.54	
20.00	1.56		10.00	.80	1.56	20.00	1.56	

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from the formula $W = U \cdot \sqrt{A} \cdot (2g \cdot H)^{1/2}$

Head ft.	95	100	105	110	115	120	125
0.04	107	112	116	124	129	135	140
.05	119	126	132	138	144	151	157
.06	131	138	144	151	158	165	172
.07	141	149	156	163	171	178	186
.08	151	159	167	175	183	191	199
.09	161	169	177	185	194	202	211
.10	169	178	187	195	204	213	222
.11	177	186	195	205	214	224	233
.12	185	195	204	214	224	234	243
.13	192	203	213	223	233	243	253
.14	200	210	221	231	242	252	263
.15	207	218	228	238	250	261	272
.16	213	225	236	247	258	270	281
.17	220	232	243	255	266	278	290
.18	226	238	250	262	274	286	298
.19	232	245	257	269	282	294	306
.20	238	251	264	278	290	301	314
.21	245	257	270	283	296	309	322
.22	250	263	277	290	303	316	329
.23	255	269	283	296	310	323	337
.24	261	275	289	303	316	330	344
.25	267	281	295	308	323	337	351
.26	272	286	301	315	328	344	358
.27	277	292	306	321	336	350	365
.28	282	297	312	327	342	357	372
.29	287	303	318	333	348	363	378
.30	292	308	323	338	354	369	385
.31	297	313	328	344	360	375	391
.32	302	318	334	350	365	381	397
.33	307	323	339	355	371	387	403
.34	311	328	344	360	377	393	408
.35	316	332	349	366	382	399	415
.36	320	337	354	371	388	404	421
.37	325	342	359	376	393	410	427
.38	329	346	364	381	398	416	433
.39	333	351	368	386	403	421	438
.40	338	355	373	391	408	426	444
.41	342	359	378	396	414	432	450
.42	346	364	382	400	419	437	455
.43	350	368	387	405	424	442	460
.44	354	373	391	410	429	447	465
.45	358	377	396	415	433	452	471
.46	362	381	400	419	438	457	476
.47	366	385	404	424	443	462	481
.48	370	389	408	428	448	467	486
.49	374	393	413	433	452	472	492
.50	377	397	417	437	457	477	497
.51	381	401	421	441	461	481	501
.52	385	405	425	445	465	485	505
.53	389	409	429	449	469	489	509

STORAGE CAPACITY
C. BEN ROSS RESERVOIR
REVISED 1960

Elevation U.S.G.S. data	Dam Data	Acres Covered	Total Acre Ft.
3105*	12 feet **	35	210
3110	17 "	48	420
3115	22 "	65	700
3120	27	98	1100
3125	32	144	1725
3130	37	198	2580
3135	42	258	3725
3140	47	301	5120
3145	52	338	6720
3148	53	354	7760
3150	57 Approx DATA	360 approx	8580 approx

* Elevation tied to U.S. Bench Mark at old Hillsdale School

** Dam Data used in construction and indicated on gauges at Dam

Compiled by E. B. Snow, March 1960

San Ross Reservoir

HELEN WERRE

Elev		AcFt		Storage Capacity				Elev		AcFt				
12.0	--	210		17.0	--	420		22	--	700		27	--	1100
0.1		214		0.1		425		0.1		707		0.1		1110
0.2		217		0.2		431		0.2		713		0.2		1120
0.3		221		0.3		436		0.3		720		0.3		1130
0.4		224		0.4		441		0.4		726		0.4		1140
0.5		228		0.5		447		0.5		733		0.5		1151
0.6		231		0.6		452		0.6		739		0.6		1162
0.7		235		0.7		457		0.7		746		0.7		1173
0.8		238		0.8		462		0.8		752		0.8		1184
0.9		242		0.9		468		0.9		759		0.9		1195
13.0	--	245		18.0	--	470		23.0	--	765		28.0	--	1204
0.1		249		0.1		476		0.1		772		0.1		1215
0.2		253		0.2		481		0.2		779		0.2		1226
0.3		257		0.3		487		0.3		786		0.3		1237
0.4		261		0.4		492		0.4		793		0.4		1248
0.5		265		0.5		498		0.5		800		0.5		1259
0.6		268		0.6		504		0.6		808		0.6		1270
0.7		272		0.7		509		0.7		815		0.7		1281
0.8		276		0.8		515		0.8		823		0.8		1292
0.9		280		0.9		520		0.9		831		0.9		1304
14.0	--	284		19.0	--	523		24.0	--	838		29.0	--	1316
0.1		288		0.1		529		0.1		845		0.1		1328
0.2		293		0.2		534		0.2		853		0.2		1340
0.3		297		0.3		540		0.3		860		0.3		1352
0.4		301		0.4		545		0.4		868		0.4		1364
0.5		305		0.5		551		0.5		876		0.5		1376
0.6		309		0.6		557		0.6		885		0.6		1388
0.7		314		0.7		562		0.7		894		0.7		1400
0.8		318		0.8		568		0.8		903		0.8		1412
0.9		322		0.9		573		0.9		911		0.9		1425
15.0	--	326		20.0	--	579		25.0	--	918		30.0	--	1438
0.1		331		0.1		585		0.1		926		0.1		1451
0.2		335		0.2		590		0.2		934		0.2		1464
0.3		340		0.3		596		0.3		943		0.3		1477
0.4		344		0.4		602		0.4		951		0.4		1490
0.5		349		0.5		608		0.5		960		0.5		1503
0.6		353		0.6		613		0.6		969		0.6		1516
0.7		358		0.7		619		0.7		978		0.7		1529
0.8		362		0.8		625		0.8		987		0.8		1543
0.9		367		0.9		630		0.9		996		0.9		1557
16.0	--	371		21.0	--	638		26.0	--	1004		31.0	--	1581
0.1		376		0.1		644		0.1		1013		0.1		1595
0.2		381		0.2		650		0.2		1022		0.2		1609
0.3		386		0.3		655		0.3		1031		0.3		1623
0.4		391		0.4		661		0.4		1040		0.4		1637
0.5		396		0.5		667		0.5		1050		0.5		1651
0.6		401		0.6		673		0.6		1060		0.6		1665
0.7		406		0.7		680		0.7		1070		0.7		1680
0.8		410		0.8		687		0.8		1080		0.8		1695
0.9		415		0.9		694		0.9		1090		0.9		1710
17.0	--	420		22.0	--	700		27.0	--	1100		32.0	--	1725

*Note! 12' is the remaining pool
level at the bottom of outlet headgate*

Elev		Acft		Ben Ross Reservoir			
32 --	1725	37 --	2580	42 --	3725	47	5120
0.1	1740	0.1	2600	0.1	3751	0.1	5150
0.2	1755	0.2	2621	0.2	3777	0.2	5180
0.3	1770	0.3	2642	0.3	3803	0.3	5210
0.4	1785	0.4	2663	0.4	3829	0.4	5240
0.5	1800	0.5	2684	0.5	3855	0.5	5270
0.6	1815	0.6	2705	0.6	3881	0.6	5300
0.7	1830	0.7	2726	0.7	3907	0.7	5330
0.8	1845	0.8	2747	0.8	3934	0.8	5361
0.9	1860	0.9	2768	0.9	3961	0.9	5392
33.0 --	1876	38.0 --	2788	43.0 --	3987	48.0 --	5423
0.1	1892	0.1	2809	0.1	4014	0.1	5454
0.2	1908	0.2	2831	0.2	4041	0.2	5485
0.3	1924	0.3	2853	0.3	4068	0.3	5516
0.4	1940	0.4	2875	0.4	4095	0.4	5547
0.5	1956	0.5	2897	0.5	4122	0.5	5578
0.6	1972	0.6	2919	0.6	4149	0.6	5609
0.7	1988	0.7	2941	0.7	4176	0.7	5640
0.8	2004	0.8	2963	0.8	4203	0.8	5671
0.9	2020	0.9	2985	0.9	4230	0.9	5702
34.0 --	2035	39.0 --	3009	44.0 --	4257	49.0 --	5733
0.1	2052	0.1	3032	0.1	4285	0.1	5765
0.2	2069	0.2	3055	0.2	4313	0.2	5797
0.3	2086	0.3	3078	0.3	4341	0.3	5829
0.4	2103	0.4	3101	0.4	4369	0.4	5861
0.5	2120	0.5	3124	0.5	4397	0.5	5893
0.6	2137	0.6	3147	0.6	4425	0.6	5925
0.7	2154	0.7	3170	0.7	4453	0.7	5957
0.8	2171	0.8	3193	0.8	4481	0.8	5989
0.9	2188	0.9	3216	0.9	4509	0.9	6021
35.0 --	2206	40.0 --	3237	45.0 --	4537	50.0 --	6054
0.1	2224	0.1	3261	0.1	4565	0.1	6086
0.2	2242	0.2	3285	0.2	4593	0.2	6118
0.3	2260	0.3	3309	0.3	4621	0.3	6151
0.4	2278	0.4	3333	0.4	4649	0.4	6184
0.5	2296	0.5	3357	0.5	4678	0.5	6217
0.6	2314	0.6	3381	0.6	4707	0.6	6250
0.7	2332	0.7	3405	0.7	4736	0.7	6283
0.8	2350	0.8	3429	0.8	4765	0.8	6316
0.9	2368	0.9	3453	0.9	4794	0.9	6349
36.0 --	2387	41.0 --	3475	46.0 --	4823	51.0 --	6382
0.1	2406	0.1	3500	0.1	4852	0.1	6415
0.2	2425	0.2	3525	0.2	4881	0.2	6449
0.3	2444	0.3	3550	0.3	4911	0.3	6483
0.4	2463	0.4	3575	0.4	4941	0.4	6517
0.5	2482	0.5	3600	0.5	4971	0.5	6551
0.6	2501	0.6	3625	0.6	5001	0.6	6585
0.7	2521	0.7	3650	0.7	5031	0.7	6619
0.8	2541	0.8	3675	0.8	5061	0.8	6653
0.9	2561	0.9	3700	0.9	5091	0.9	6687
37.0 --	2580	42.0 --	3725	47.0 --	5120	52.0 --	6720
							57 --8475

Surface area
determined with
Arc Map Shapefile of
Reservoir
352.6 acres X 57' =
20098.2 AF.
maximum capacity

Ranges West

Range and Ranch Consulting

P.O. Box 74
Indian Valley, ID 83432
Phone/Fax: (208) 288-4437

FAX TRANSMISSION

To: *Sandy Hemingway* Date: *4/29/09*
Fax #: *208-387-6708* Pages: *23*, including this cover sheet.
From: *Wayne Buephardt*
Subject: *Regarding water right 67-7878*

COMMENTS:

Sandy
we are faxing at your request the following
to 13 pages of my irrigation records
2 7 pages of weir data for Cental Canal
3. 3 pages of Ben Ross Reservoir storage capacity
There are 2 different storage charts.

Hope this ^{serves} ~~serves~~ your purpose and call
if you have any questions. Wayne B

Water Right 67-7878

STORAGE CAPACITY
C. BEN ROSS RESERVOIR
REVISED 1960

Elevation U.S.G.S. data	Dam Data	Acres Covered	Total Acre Ft.
3105*	12 feet **	35	210
3110	17 "	48	420
3115	22 "	65	700
3120	27	98	1100
3125	32	144	1725
3130	37	198	2580
3135	42	258	3725
3140	47	301	5120
3145	52	338	6720
3148	55	354	7760
3150	57 Approx Cofferdam	360 Approx	8500 Approx

* Elevation tied to U.S. Bench Mark at old Hillsdale School

** Dam Data used in construction and indicated on gauges at Dam

Compiled by E. B. Snow, March 1960

The Student Edition of Lotus 1-2-3

HELEN WERRE

Ben Ross Reservoir
Storage Capacity

<i>Elev</i>	<i>Ac Ft</i>		<i>Elev</i>	<i>Ac Ft</i>			
12.0 --	210	17.0 --	420	22 --	700	27 --	1100
0.1	214	0.1	425	0.1	707	0.1	1110
0.2	217	0.2	431	0.2	713	0.2	1120
0.3	221	0.3	436	0.3	720	0.3	1130
0.4	224	0.4	441	0.4	726	0.4	1140
0.5	228	0.5	447	0.5	733	0.5	1151
0.6	231	0.6	452	0.6	739	0.6	1162
0.7	235	0.7	457	0.7	746	0.7	1173
0.8	238	0.8	462	0.8	752	0.8	1184
0.9	242	0.9	468	0.9	759	0.9	1195
13.0 --	245	18.0 --	470	23.0 --	765	28.0 --	1204
0.1	249	0.1	476	0.1	772	0.1	1215
0.2	253	0.2	481	0.2	779	0.2	1226
0.3	257	0.3	487	0.3	786	0.3	1237
0.4	261	0.4	492	0.4	793	0.4	1248
0.5	265	0.5	498	0.5	800	0.5	1259
0.6	268	0.6	504	0.6	808	0.6	1270
0.7	272	0.7	509	0.7	815	0.7	1281
0.8	276	0.8	515	0.8	823	0.8	1292
0.9	280	0.9	520	0.9	831	0.9	1304
14.0 --	284	19.0 --	523	24.0 --	838	29.0 --	1316
0.1	288	0.1	529	0.1	845	0.1	1328
0.2	293	0.2	534	0.2	853	0.2	1340
0.3	297	0.3	540	0.3	860	0.3	1352
0.4	301	0.4	545	0.4	868	0.4	1364
0.5	305	0.5	551	0.5	876	0.5	1376
0.6	309	0.6	557	0.6	885	0.6	1388
0.7	314	0.7	562	0.7	894	0.7	1400
0.8	318	0.8	568	0.8	903	0.8	1412
0.9	322	0.9	573	0.9	911	0.9	1425
15.0 --	326	20.0 --	579	25.0 --	918	30.0 --	1438
0.1	331	0.1	585	0.1	926	0.1	1451
0.2	335	0.2	590	0.2	934	0.2	1464
0.3	340	0.3	596	0.3	943	0.3	1477
0.4	344	0.4	602	0.4	951	0.4	1490
0.5	349	0.5	608	0.5	960	0.5	1503
0.6	353	0.6	613	0.6	969	0.6	1516
0.7	358	0.7	619	0.7	978	0.7	1529
0.8	362	0.8	625	0.8	987	0.8	1543
0.9	367	0.9	630	0.9	996	0.9	1557
16.0 --	371	21.0 --	638	26.0 --	1004	31.0 --	1581
0.1	376	0.1	644	0.1	1013	0.1	1595
0.2	381	0.2	650	0.2	1022	0.2	1609
0.3	386	0.3	655	0.3	1031	0.3	1623
0.4	391	0.4	661	0.4	1040	0.4	1637
0.5	396	0.5	667	0.5	1050	0.5	1651
0.6	401	0.6	673	0.6	1060	0.6	1665
0.7	406	0.7	680	0.7	1070	0.7	1680
0.8	410	0.8	687	0.8	1080	0.8	1695
0.9	415	0.9	694	0.9	1090	0.9	1710
17.0 --	420	22.0 --	700	27.0 --	1100	32.0 --	1725

*Note! 12' is the remaining pool
level at the bottom of outlet headgate*

The Student Edition of Lotus 1-2-3

HELEN WERRE

Student Edition of Lotus 1-2-3				HELEN WERR			
Elev Acft				Ben Ross Reservoir			
32 -- 1725	37 --2580	42 -- 3725	47 5120	52 --6720			
0.1 1740	0.1 2600	0.1 3751	0.1 5150	0.1 6754			
0.2 1755	0.2 2621	0.2 3777	0.2 5180	0.2 6788			
0.3 1770	0.3 2642	0.3 3803	0.3 5210	0.3 6822			
0.4 1785	0.4 2663	0.4 3829	0.4 5240	0.4 6856			
0.5 1800	0.5 2684	0.5 3855	0.5 5270	0.5 6890			
0.6 1815	0.6 2705	0.6 3881	0.6 5300	0.6 6924			
0.7 1830	0.7 2726	0.7 3907	0.7 5330	0.7 6958			
0.8 1845	0.8 2747	0.8 3934	0.8 5361	0.8 6993			
0.9 1860	0.9 2768	0.9 3961	0.9 5392	0.9 7028			
33.0 -- 1876	38.0 --2788	43.0 -- 3987	48.0 -- 5423	53 --7062			
0.1 1892	0.1 2809	0.1 4014	0.1 5454	0.1 7096			
0.2 1908	0.2 2831	0.2 4041	0.2 5485	0.2 7130			
0.3 1924	0.3 2853	0.3 4068	0.3 5516	0.3 7164			
0.4 1940	0.4 2875	0.4 4095	0.4 5547	0.4 7198			
0.5 1956	0.5 2897	0.5 4122	0.5 5578	0.5 7233			
0.6 1972	0.6 2919	0.6 4149	0.6 5609	0.6 7268			
0.7 1988	0.7 2941	0.7 4176	0.7 5640	0.7 7303			
0.8 2004	0.8 2963	0.8 4203	0.8 5671	0.8 7338			
0.9 2020	0.9 2985	0.9 4230	0.9 5702	0.9 7373			
34.0 -- 2035	39.0 --3009	44.0 -- 4257	49.0 -- 5733	54 --7408			
0.1 2052	0.1 3032	0.1 4285	0.1 5765	0.1 7443			
0.2 2069	0.2 3055	0.2 4313	0.2 5797	0.2 7478			
0.3 2086	0.3 3078	0.3 4341	0.3 5829	0.3 7513			
0.4 2103	0.4 3101	0.4 4369	0.4 5861	0.4 7548			
0.5 2120	0.5 3124	0.5 4397	0.5 5893	0.5 7583			
0.6 2137	0.6 3147	0.6 4425	0.6 5925	0.6 7618			
0.7 2154	0.7 3170	0.7 4453	0.7 5957	0.7 7653			
0.8 2171	0.8 3193	0.8 4481	0.8 5989	0.8 7689			
0.9 2188	0.9 3216	0.9 4509	0.9 6021	0.9 7725			
35.0 -- 2206	40.0 --3237	45.0 -- 4537	50.0 -- 6054	55 --7760			
0.1 2224	0.1 3261	0.1 4565	0.1 6086	0.1 7795			
0.2 2242	0.2 3285	0.2 4593	0.2 6118	0.2 7830			
0.3 2260	0.3 3309	0.3 4621	0.3 6151	0.3 7865			
0.4 2278	0.4 3333	0.4 4649	0.4 6184	0.4 7900			
0.5 2296	0.5 3357	0.5 4678	0.5 6217	0.5 7936			
0.6 2314	0.6 3381	0.6 4707	0.6 6250	0.6 7972			
0.7 2332	0.7 3405	0.7 4736	0.7 6283	0.7 8008			
0.8 2350	0.8 3429	0.8 4765	0.8 6316	0.8 8044			
0.9 2368	0.9 3453	0.9 4794	0.9 6349	0.9 8080			
36.0 -- 2387	41.0 --3475	46.0 -- 4823	51.0 -- 6382	56 --8116			
0.1 2406	0.1 3500	0.1 4852	0.1 6415	0.1 8152			
0.2 2425	0.2 3525	0.2 4881	0.2 6449	0.2 8188			
0.3 2444	0.3 3550	0.3 4911	0.3 6483	0.3 8224			
0.4 2463	0.4 3575	0.4 4941	0.4 6517	0.4 8260			
0.5 2482	0.5 3600	0.5 4971	0.5 6551	0.5 8296			
0.6 2501	0.6 3625	0.6 5001	0.6 6585	0.6 8332			
0.7 2521	0.7 3650	0.7 5031	0.7 6619	0.7 8368			
0.8 2541	0.8 3675	0.8 5061	0.8 6653	0.8 8404			
0.9 2561	0.9 3700	0.9 5091	0.9 6687	0.9 8440			
37.0 -- 2580	42.0 --3725	47.0 -- 5120	52.0 -- 6720	57 --8475			

Arc Map calculated
352.6 acres x 57' =
20098.2 ac

5/5/09
S. Hemenway