

MEMORANDUM

TO: CLARK FILE 25-14070; SHEPPARD FILE 25-278

FROM: Douglas Jones 

DATE: 8/6/2006

RE: HUBBLE ANALYSIS

In response to their objections to recommended flow rates for the rights the claimants obtained a preliminary reclassification of soils on their farms from NRCS. The data from NRCS is based on field investigation and although it is preliminary in nature, subject to change, it is better information than the published soil survey data. The data indicates that the soil is more pervious and with somewhat lower water holding capacity.

Staff in the Eastern Regional office of IDWR requested a Hubble reanalysis based on the new information. This was conducted and the results are presented below.

Field dimension parameters used in the initial analysis by Scott King were used in this analysis as well. Cropping was analyzed using spring grains, pasture and alfalfa hay as single, farm-wide crop in an attempt to find a worse case scenario.

Historically, and currently, graded border-type irrigation practices have been used on the Clark and Sheppard farms. However, this type of practice is not conducive to reasonable administration of water resources. In the Report Regarding Evaluation of Irrigation Diversion Rates submitted to the SRBA Court in 1999 IDWR Director Dreher and then Bureau Chief Dave Tuthill state that "for allocation purposes the diversion rate required for irrigation must be based on the amount of water required on a continuous basis...." The report directs analysis of border systems assuming continuous flow conditions to determine application efficiencies that are then used to determine appropriate flow rates per acre.

Based on the reclassification of the soils I assigned a higher intake family value than previously used. This accounts for the coarser gravelly loam to sand and gravel surface soils. Figure 1 is the Soil Characteristics spreadsheet showing the intake family used and the Management Applied Deficit values for the crops based on the NRCS determined Available Water Capacity. These values are used in the Furrow Irrigation Program that yields an application efficiency that is then entered into Field Irrigation Requirement spreadsheets (Figures 2A, 2B and 2C).

Analysis of the each crop for field irrigation requirement indicates that a worst case scenario is present in the case a grain. Figure 2B shows that a continuous diversion rate of 0.033 cfs/acre is required.

Conveyance losses for getting the water from the Annis Slough to the fields were then analyzed. A worst-case scenario for Clark was determined from the mapping and found to result in a loss of 1.49 cfs (Figure 3A). Clark's conditions include 1260 feet of 30 ft wide channel from the Annis Slough to his rediversion point and 2000 feet of 4.7 ft wide field ditch. Sheppard's worst-case scenario of 1590 ft of 4.7 ft wide field ditch results in a conveyance loss of 0.24 cfs (Figure 3B).

From these analyses I conclude that a flow rate of 4.25 cfs can be recommended for 25-14070 with the provision that the rate includes a conveyance loss of 1.49 cfs and that 3.06 cfs can be rediverted from the main channel onto the farm. A flow rate of 1.45 cfs can be recommended to Sheppard's 25-278 with the provision that the rate includes a conveyance loss of 0.24 cfs.

SOIL CHARACTERISTICS initials: dj date: 12june 06

Soil Type = Lobenzo
Source of Soils Data =

Printout From the Idaho Falls NRCS Office

soil depth (inches)		AWC (in/in)		PH		organic (%)		soil depth (ft)		AWC (inches)		<u>intake family</u>	
lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	flood	furrow
0	13	0.11	0.13	7.4	8.4	1	3	1	1.44	4	0.85		
13	34	0.16	0.21					2	3.60				
34	60	0.04	0.06					3	5.55				
								4	6.15			alternate	
								5	6.74			method	

#N/A #N/A

Management Allowed Deficit (MAD)

crop	root depth (ft)	stress point	<u>MAD (inches)</u>	
alfalfa (hay or seed)	5	0.5	3.37	
corn (field or silage)	4	0.5	3.07	
grain (winter or spring)	4	0.5	3.07	
pasture (or grass hay)	3	0.5	2.77	
other (enter below)				

Figure 1

FIELD IRRIGATION REQUIREMENT

initials: DJ Claimant = Clark & Sheppard
 date: 08/03/06 Weather Station = Idaho Falls FAA

crop	acres	irrig. system	eff. (%)	Monthly ET (mm/day)					oct	AVE IR season (mm/yr)	net irrig. app. (in)	ET ratio	irrig. freq. (days)
				mar	apr	may	jun	jul	aug	sep			
alfh1100	46.7	corr	52.2	1.77	4.8	6.52	7.84	8.22	6.58	5.08	3.37	1.08	9.6
alfh650	13.4	corr	59.6	1.77	4.8	6.52	7.84	8.22	6.58	5.08	3.37	1.08	9.6
alfh500	15.7	corr	62.8	1.77	4.8	6.52	7.84	8.22	6.58	5.08	3.37	1.08	9.6
alfh800	33.1	corr	56.8	1.77	4.8	6.52	7.84	8.22	6.58	5.08	3.37	1.08	9.6
alfh950	9.2	corr	54.2	1.77	4.8	6.52	7.84	8.22	6.58	5.08	3.37	1.08	9.6
alfh1400	10.6	corr	48.8	1.77	4.8	6.52	7.84	8.22	6.58	5.08	3.37	1.08	9.6

Summary 128.7

Peak Gross Irrigation Application (mm/day) = 16.14
 On-Farm Irrigation Requirement (cfs/acre) = 0.027
 Total On-Farm Irrigation Requirement (cfs) = 3.43
 Irrigation Diversion Volume (ft/yr) = 4.72
 Total Irrigation Diversion Volume (ac-ft/yr) = 607.82

Figure 2A

FIELD IRRIGATION REQUIREMENT

initials: DJ Claimant = Clark & Sheppard
 date: 08/03/06 Weather Station = Idaho Falls FAA

crop	acres	irrig. system	eff. (%)	Monthly ET (mm/day)	may	jun	jul	aug	sep	oct	AVE IR season (mm/yr)	net irrig. app. (in)	ET ratio	irrig. freq. (days)
grain1100	46.7	corr	42.5		1.44	3.09	7.53	8.13	2.97		604	3.07	1.09	8.8
grain650	13.4	corr	48.5		1.44	3.09	7.53	8.13	2.97		604	3.07	1.09	8.8
grain500	15.7	corr	51		1.44	3.09	7.53	8.13	2.97		604	3.07	1.09	8.8
grain800	33.1	corr	46.2		1.44	3.09	7.53	8.13	2.97		604	3.07	1.09	8.8
grain950	9.2	corr	43.8		1.44	3.09	7.53	8.13	2.97		604	3.07	1.09	8.8
grain1400	10.6	corr	39.8		1.44	3.09	7.53	8.13	2.97		604	3.07	1.09	8.8

Summary 128.7

Peak Gross Irrigation Application (mm/day) = 19.80
 On-Farm Irrigation Requirement (cfs/acre) = 0.033
 Total On-Farm Irrigation Requirement (cfs) = 4.21
 Irrigation Diversion Volume (ft/yr) = 4.43
 Total Irrigation Diversion Volume (ac-ft/yr) = 569.87

Figure 2B

FIELD IRRIGATION REQUIREMENT

initials: DJ Claimant = Clark & Sheppard
 date: 08/03/06 Weather Station = Idaho Falls FAA

crop	acres	irrig. system	eff. (%)	Monthly ET (mm/day)					oct	AVE IR season (mm/yr)	net irrig. app. (in)	ET ratio	irrig. freq. (days)
				mar	apr	may	jun	jul	aug	sep			
past1100	46.7	corr	37.7	2.52	5.01	6.03	6.33	5.06	3.91	2.56	801	1.09	10.2
past650	13.4	corr	41	2.52	5.01	6.03	6.33	5.06	3.91	2.56	801	1.09	10.2
past500	15.7	corr	45	2.52	5.01	6.03	6.33	5.06	3.91	2.56	801	1.09	10.2
past800	33.1	corr	41	2.52	5.01	6.03	6.33	5.06	3.91	2.56	801	1.09	10.2
past950	9.2	corr	39.3	2.52	5.01	6.03	6.33	5.06	3.91	2.56	801	1.09	10.2
past1400	10.6	corr	35	2.52	5.01	6.03	6.33	5.06	3.91	2.56	801	1.09	10.2

Summary 128.7

Peak Gross Irrigation Application (mm/day) = 17.47
 On-Farm Irrigation Requirement (cfs/acre) = 0.029
 Total On-Farm Irrigation Requirement (cfs) = 3.72
 Irrigation Diversion Volume (ft/yr) = 6.65
 Total Irrigation Diversion Volume (ac-ft/yr) = 856.38

Figure 2C

CONVEYANCE LOSS - WORSTELL

NAME OF DITCH: CLARK DITCH

BY: dj

DATE: 8/7/06

REACH	LENGTH (FT)	AVE WIDTH (FT)	SEEPAGE (FT/DAY)	WORSTELL LOSS (CFS)	DELIVERY (CFS)	DELIVERY LEFT (CFS)	LOSS FACTOR	DELIVERY LOSS (CFS)	FLOW (CFS)
1	1260	30.0	2.50	1.19		0.00	0.0000	0.00	1.49
2	2000	4.7	2.50	0.30		0.00	0.0000	0.00	0.30
3				0.00		0.00	0.0000	0.00	0.00
4				0.00		0.00	0.0000	0.00	0.00
5				0.00		0.00	0.0000	0.00	0.00
6				0.00		0.00	0.0000	0.00	0.00
7				0.00		0.00	0.0000	0.00	0.00
8				0.00		0.00	0.0000	0.00	0.00
9				0.00		0.00	0.0000	0.00	0.00
10				0.00		0.00	0.0000	0.00	0.00
11				0.00		0.00	0.0000	0.00	0.00
12				0.00		0.00	0.0000	0.00	0.00
13				0.00		0.00	0.0000	0.00	0.00
14				0.00		0.00	0.0000	0.00	0.00
15				0.00		0.00	0.0000	0.00	0.00
16				0.00		0.00	0.0000	0.00	0.00
17				0.00		0.00	0.0000	0.00	0.00
18				0.00		0.00	0.0000	0.00	0.00
19				0.00		0.00	0.0000	0.00	0.00
20				0.00		0.00	0.0000	0.00	0.00
TOTALS	3260			1.49	0.00			0.00	

REACH = SECTION OF CHANNEL

LENGTH = LENGTH OF REACH, THE CHANNEL CAN BE DIVIDED INTO EQUAL LENGTH REACHES

OR ACTUAL LENGTHS BETWEEN DELIVERY POINTS

AVE WIDTH = AVERAGE TOP WIDTH OF WATER SURFACE IN REACH

SEEPAGE = SOIL SEEPAGE RATE OF REACH

WORSTELL LOSS = CONVEYANCE LOSS IN REACH BASED ON WORSTELL METHOD

DELIVERY = TOTAL DELIVERIES IN REACH

DELIVERY LEFT = SUM(DELIVERIES OF CURRENT AND REMAINING REACHES)

LOSS FACTOR = WORSTELL LOSS/DELIVERY LEFT

DELIVERY LOSS = SUM(LOSS FACTORS OF CURRENT AND PREVIOUS REACHES) X DELIVERY;

REPRESENTS THE LOSSES ASSIGNED TO THE DELIVERIES IN THE REACH;

IF MULTIPLE RIGHTS WITHIN REACH, DELIVERY LOSSES SHOULD BE

PRORATED BASED ON SIZE OF DELIVERY FOR EACH RIGHT WITHIN REACH

FLOW = TOTAL FLOW AT BEGINNING OF EACH REACH

Figure 3A.

CONVEYANCE LOSS - WORSTELL

NAME OF DITCH: SHEPPARD DITCH

BY: dj

DATE: 8/7/06

REACH	LENGTH (FT)	AVE WIDTH (FT)	SEEPAGE (FT/DAY)	WORSTELL LOSS (CFS)	DELIVERY (CFS)	DELIVERY LEFT (CFS)	LOSS FACTOR	DELIVERY LOSS (CFS)	FLOW (CFS)
1	1590	4.7	2.50	0.24		0.00	0.0000	0.00	0.24
2				0.00		0.00	0.0000	0.00	0.00
3				0.00		0.00	0.0000	0.00	0.00
4				0.00		0.00	0.0000	0.00	0.00
5				0.00		0.00	0.0000	0.00	0.00
6				0.00		0.00	0.0000	0.00	0.00
7				0.00		0.00	0.0000	0.00	0.00
8				0.00		0.00	0.0000	0.00	0.00
9				0.00		0.00	0.0000	0.00	0.00
10				0.00		0.00	0.0000	0.00	0.00
11				0.00		0.00	0.0000	0.00	0.00
12				0.00		0.00	0.0000	0.00	0.00
13				0.00		0.00	0.0000	0.00	0.00
14				0.00		0.00	0.0000	0.00	0.00
15				0.00		0.00	0.0000	0.00	0.00
16				0.00		0.00	0.0000	0.00	0.00
17				0.00		0.00	0.0000	0.00	0.00
18				0.00		0.00	0.0000	0.00	0.00
19				0.00		0.00	0.0000	0.00	0.00
20				0.00		0.00	0.0000	0.00	0.00
TOTALS	1590			0.24	0.00			0.00	

REACH = SECTION OF CHANNEL

LENGTH = LENGTH OF REACH, THE CHANNEL CAN BE DIVIDED INTO EQUAL LENGTH REACHES
OR ACTUAL LENGTHS BETWEEN DELIVERY POINTS

AVE WIDTH = AVERAGE TOP WIDTH OF WATER SURFACE IN REACH

SEEPAGE = SOIL SEEPAGE RATE OF REACH

WORSTELL LOSS = CONVEYANCE LOSS IN REACH BASED ON WORSTELL METHOD

DELIVERY = TOTAL DELIVERIES IN REACH

DELIVERY LEFT = SUM(DELIVERIES OF CURRENT AND REMAINING REACHES)

LOSS FACTOR = WORSTELL LOSS/DELIVERY LEFT

DELIVERY LOSS = SUM(LOSS FACTORS OF CURRENT AND PREVIOUS REACHES) X DELIVERY;
REPRESENTS THE LOSSES ASSIGNED TO THE DELIVERIES IN THE REACH;
IF MULTIPLE RIGHTS WITHIN REACH, DELIVERY LOSSES SHOULD BE
PRORATED BASED ON SIZE OF DELIVERY FOR EACH RIGHT WITHIN REACH

FLOW = TOTAL FLOW AT BEGINNING OF EACH REACH

Figure 3B