APPENDIX F

Transect Cross Sectional Profiles and Model Calibration Details

Stream: Sultan R.
Site: Upper Reach 3

Date: 6/27/2007 **Transect:** TR6
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.40	102.40		100.00
HP1			4.62	97.78
HP2			4.26	98.14
TP				
HP2	4.48	102.62		98.14
HP1			4.84	97.78
BM			2.63	99.99

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWE	17		102.63	10.50	0.08	92.21	92.19	37.4
RWE	49.6			10.50	0.03	92.16		

Ave Q= 37.4

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	56		102.63	12.14	1.65	92.14
TR	0					92.19

Note:
WSE slope = 0.080%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/28/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.28	103.28		100.00
HP1			5.50	97.78
HP2			5.13	98.15
TP				
HP2	4.90	103.05		98.15
HP1			5.27	97.78
BM			3.05	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	18		103.05	10.06	0.00	92.99	92.95	161.7
LWS	19			10.07	0.00	92.98		
MWS	36			10.14	0.00	92.91		
RWS	47			10.15	0.00	92.90		

Ave Q= 161.7

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	56		103.05	10.00	0.00	93.05
TR	0					92.95

Note:
WSE slope = 0.19%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/29/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.91	103.91		100.00
HP1			6.13	97.78
HP2			5.76	98.15
TP				
HP2	5.71	103.86		98.15
HP1			6.08	97.78
BM			3.86	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	17		103.86	10.31	0.00	93.55	93.38	332.1
LWS	27			10.38	0.00	93.48		
RWS	47			10.55	0.00	93.31		
RWS	55			10.69	0.00	93.17		

Ave Q= 332.1

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	60		103.86	10.13	0.00	93.73
d/s	-40		103.86	10.69	0.00	93.38

Note:
WSE slope = 0.56%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A

Date: 10/19/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM				
HP1				
HP2				
TP				
HP2				
HP1				
BM				

Comment: No level loop shot

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS							93.53	
RWS	47		103.33	9.80	0.00	93.53		

Ave Q=

Note: Unable to cross river only LWS elevation was shot, measurement completed at ~11:00

Stream:	Sultan R.	
Site:	Upper Reach 3	
Transect:	6	
Habitat:	Riffle	

Survey Date	HI (ft)	Q (cfs)
6/27/2007	102.63	37.4
6/28/2007	103.05	161.7
6/29/2007	103.86	332.1

27-Jun-07

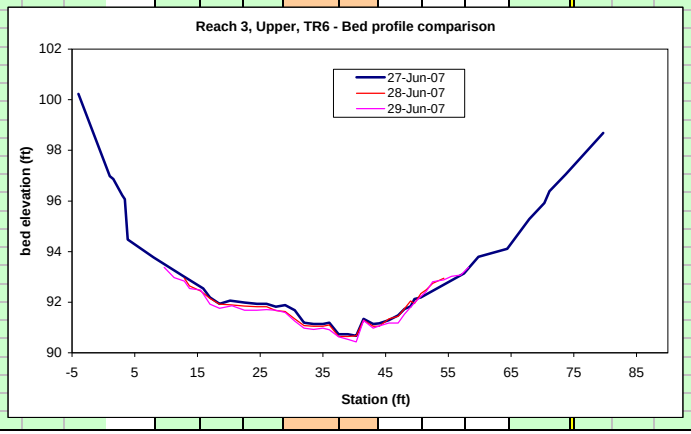
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-4.0	2.40	100.23									91.9
LWP	1.0	5.65	96.98									94.9
	1.6	5.76	96.87									94.9
	3.0	6.41	96.22									94.9
	3.4	6.56	96.07									94.7
	3.9	8.16	94.47									34.6
	8.0	8.86	93.77									34.6
	12.7	9.59	93.04									45.7
	15.9	10.09	92.54									67.6
LWE	17.0		92.19	0.00	0.00		0.00		0.00		0.00	85.6
	18.5		91.94	0.25	0.05		0.11		0.11		0.05	65.7
	20.2		92.07	0.12	0.03		0.07		0.07		0.02	65.6
	22.5		91.99	0.20	0.17		0.25		0.25	15.00	0.10	56.6
	24.5		91.94	0.25	0.60		0.67		0.67	30.00	0.26	65.6
	26.0		91.94	0.25	1.25		1.31		1.31	30.00	0.42	56.8
	27.5		91.82	0.37	1.14		1.19		1.19	15.00	0.64	56.7
	29.0		91.89	0.30	2.14		2.20		2.20	15.00	0.96	85.6
	30.5		91.69	0.50	2.00		2.07		2.07		1.55	65.6
	32.0		91.19	1.00	1.57		1.63		1.63		2.45	67.8
	33.5		91.14	1.05	1.15		1.20		1.20		1.90	65.6
	35.0		91.14	1.05	1.89		1.96		1.96		2.57	67.7
	36.0		91.19	1.00	1.35		1.41		1.41		1.76	67.7
	37.5		90.74	1.45	1.85		1.92		1.92		4.17	65.8
	39.0		90.74	1.45	2.12		2.18		2.18		4.43	65.7
	40.3		90.67	1.52	1.58		1.64		1.64		3.12	67.7
	41.5		91.34	0.85	2.10		2.16		2.16		2.48	67.6
	43.0		91.14	1.05	2.03		2.09		2.09		2.75	65.6
	44.0		91.17	1.02	2.33		2.39		2.39		3.04	65.6
	45.5		91.29	0.90	2.07		2.13		2.13		2.88	65.6
	47.0		91.49	0.70	1.60		1.66		1.66		1.46	65.7
	48.0		91.74	0.45	0.04		0.09		0.09		0.04	67.6
	49.0		91.84	0.35	1.07		1.12		1.12		0.31	67.7
	49.6		92.13	0.06	0.50		0.58		0.58		0.03	67.7
RWE	50.6		92.19	0.00	0.00		0.00		0.00		0.00	65.6
	57.5	9.50	93.13									27.9
	59.8	8.84	93.79									27.9
	64.4	8.52	94.11									27.8
	67.9	7.35	95.28									67.6
	70.3	6.71	95.92									65.6
	71.1	6.24	96.39									65.6
RWP	73.7	5.58	97.05									52.6
	79.7	3.94	98.69									25.8

28-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	12.9		92.95	0.00	0.00		0.00		0.00		0.00	45.7
	13.7		92.65	0.30	0.64		0.71		0.71		0.28	45.7
	15.5		92.45	0.50	1.30		1.36		1.36		1.12	67.6
	17.0		92.15	0.80	1.84		1.91		1.91		2.29	85.6
	18.5		91.93	1.02	1.28		1.34		1.34		2.18	65.7
	20.2		91.90	1.05	1.65		1.71		1.71		3.60	65.6
	22.5		91.85	1.10	1.94		2.01		2.01		4.74	56.6
	24.5		91.83	1.12	2.04		2.10		2.10		4.13	65.6
	26.0		91.83	1.12	2.00		2.07		2.07		3.47	56.8
	27.5		91.68	1.27	2.10		2.16		2.16		4.12	56.7
	29.0		91.63	1.32	2.10		2.16		2.16		4.28	85.6
	30.5		91.35	1.60	2.92		2.96		2.96		7.10	65.6
	32.0		91.08	1.87	2.71		2.76		2.76		7.73	67.8
	33.5		91.05	1.90	2.67		2.72		2.72		7.75	65.6
	35.0		91.05	1.90	3.63		3.67		3.67		8.71	67.7
	36.0		91.10	1.85	2.99		3.03		3.03		7.00	67.7
	37.5		90.65	2.30	3.95		3.99		3.99		13.76	65.8
	39.0		90.65	2.30	3.98		4.02		4.02		12.94	65.7
	40.3		90.68	2.27	3.83		3.87		3.87		10.98	67.7
	41.5		91.30	1.65	4.15		4.19		4.19		9.34	67.6
	43.0		91.05	1.90	4.36		4.40		4.40		10.46	65.6
	44.0		91.05	1.90	4.17		4.21		4.21		10.00	65.6
	45.5		91.35	1.60	4.01		4.05		4.05		9.72	65.6
	47.0		91.45	1.50	2.85		2.89		2.89		5.42	65.7
	48.0		91.75	1.20	2.27		2.33		2.33		2.80	67.6
	49.0		92.05	0.90	3.61		3.65		3.65		2.63	67.7
	49.6		91.95	1.00	3.54		3.58		3.58		2.86	67.7
	50.6		92.35	0.60	2.99		3.03		3.03		1.73	65.6
	51.5		92.50	0.45	0.94		0.99		0.99		0.42	65.6
	52.5		92.75	0.20	0.75		0.81		0.81	45.00	0.16	65.6
RWE	54.3		92.95	0.00	0.00		0.00		0.00		0.00	65.6

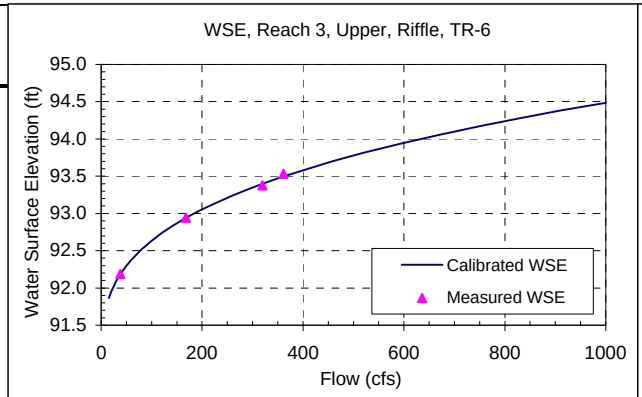
29-Jun-07

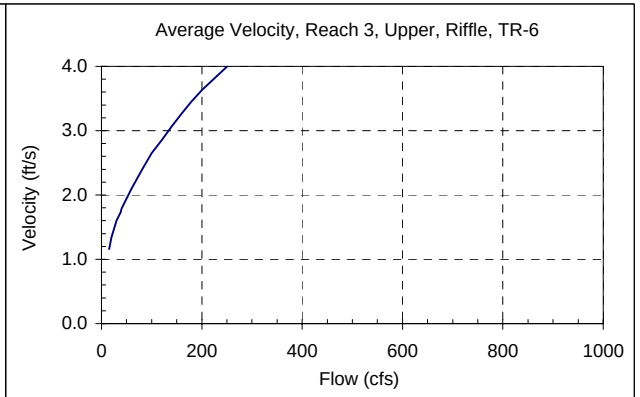
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	9.7		93.38	0.00	0.00		0.00		0.00		0.00	34.6
	11.3		92.98	0.40	0.71		0.76		0.76		0.49	45.7
	12.9		92.83	0.55	1.97		2.04		2.04		1.34	45.7
	13.7		92.55	0.83	2.54		2.60		2.60		2.81	45.7
	15.5		92.48	0.90	3.20		3.24		3.24		4.82	67.6
	17.0		91.93	1.45	3.09		3.14		3.14		6.82	85.6
	18.5		91.76	1.62	2.64		2.70		2.70		7.65	65.7
	20.5		91.86	1.52	2.96		3.01		3.01		9.16	65.6
	22.5		91.68	1.70	3.57		3.60		3.60		12.23	56.6
	24.5		91.68	1.70	3.70		3.72		3.72		11.07	65.6
	26.0		91.71	1.67	3.90		3.91		3.91		9.79	56.8
	27.5		91.68	1.70	4.16		4.16		4.16		10.61	56.7
	29.0		91.60	1.78	4.32		4.32		4.32		11.53	85.6
	30.5		91.26	2.12	4.58		4.58		4.58		14.56	65.6
	32.0		90.98	2.40	4.40		4.40		4.40		15.84	67.8
	33.5		90.93	2.45	4.95		4.95		4.95		18.19	65.6
	35.0		90.98	2.40	5.10		5.10		5.10		15.30	67.7
	36.0		90.91	2.47	4.90		4.90		4.90		15.13	67.7
	37.5		90.63	2.75	5.63	2.98	5.63	3.03	4.33		17.86	65.8
	39.0		90.53	2.85	5.88	4.57	5.88	4.57	5.23		20.85	65.7
	40.3		90.43	2.95	5.57	2.69	5.57	2.75	4.16		15.34	67.7
	41.5		91.28	2.10	5.77		5.77		5.77		16.36	67.6
	43.0		90.98	2.40	5.94		5.94		5.94		17.82	65.6
	44.0		91.06	2.32	5.87		5.87		5.87		17.02	65.6
	45.5		91.18	2.20	4.93		4.93		4.93		16.27	65.6
	47.0		91.18	2.20	4.53		4.53		4.53		12.46	65.7
	48.0		91.53	1.85	3.84		3.85		3.85		9.26	67.6
	49.6		91.98	1.40	4.99		4.99		4.99		9.08	67.7
	50.6		92.23	1.15	4.19		4.19		4.19		4.58	65.6
	51.5		92.43	0.95	3.24		3.28		3.28		2.96	65.6
	52.5		92.81	0.57	4.11		4.11		4.11		3.28	65.6
	54.3		92.88	0.50	1.00		1.05		1.05		0.79	27.9
	55.5		93.03	0.35	0.42		0.48		0.48		0.23	27.9
	57.0		93.08	0.30	1.42		1.48		1.48		0.60	27.9
RWE	58.2		93.38	0.00	0.00		0.00		0.00		0.00	27.9

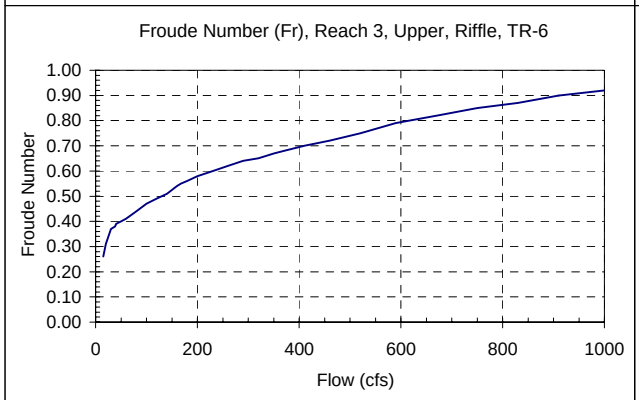


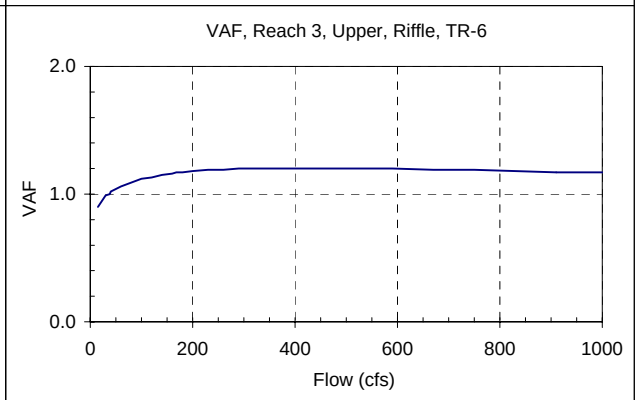
Stream: Sultan R.
Site: Upper Reach 3
Habitat: Riffle
Transect: 6

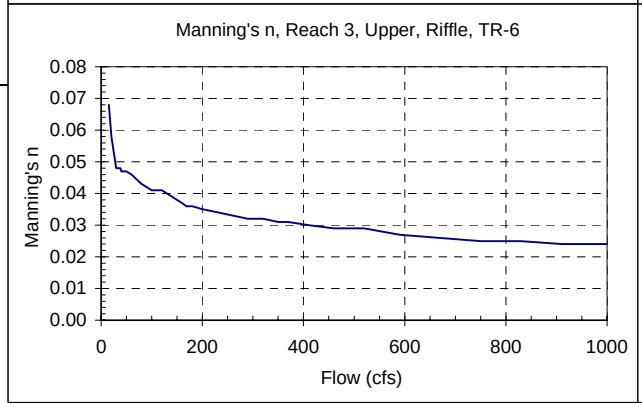
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
15	91.87	0.26	1.16	0.90	0.068	21.5
20	91.96	0.31	1.34	0.93	0.058	26.0
30	92.09	0.37	1.60	0.99	0.048	32.3
38.1	92.19	0.38	1.73	1.00	0.048	34.1
40	92.20	0.39	1.79	1.02	0.047	34.2
50	92.30	0.40	1.94	1.04	0.047	35.1
60	92.38	0.41	2.10	1.06	0.046	35.8
80	92.52	0.44	2.38	1.09	0.043	37.8
100	92.63	0.47	2.65	1.12	0.041	39.2
120	92.74	0.49	2.85	1.13	0.041	39.8
140	92.83	0.51	3.07	1.15	0.039	40.8
160	92.91	0.54	3.27	1.16	0.037	43.2
168.2	92.94	0.55	3.35	1.17	0.036	43.7
180	92.98	0.56	3.46	1.17	0.036	44.5
200	93.05	0.58	3.63	1.18	0.035	45.8
230	93.15	0.60	3.85	1.19	0.034	47.4
260	93.24	0.62	4.07	1.19	0.033	48.1
290	93.32	0.64	4.28	1.20	0.032	48.8
319.9	93.40	0.65	4.47	1.20	0.032	49.4
350	93.47	0.67	4.67	1.20	0.031	50.0
369.6	93.51	0.68	4.80	1.20	0.031	50.4
410	93.60	0.70	5.03	1.20	0.030	51.1
460	93.70	0.72	5.31	1.20	0.029	52.0
520	93.81	0.75	5.64	1.20	0.029	53.2
590	93.93	0.79	5.98	1.20	0.027	55.6
670	94.06	0.82	6.32	1.19	0.026	58.3
750	94.17	0.85	6.68	1.19	0.025	59.8
830	94.28	0.87	6.98	1.18	0.025	60.8
910	94.38	0.90	7.28	1.17	0.024	61.8
1000	94.49	0.92	7.60	1.17	0.024	62.7

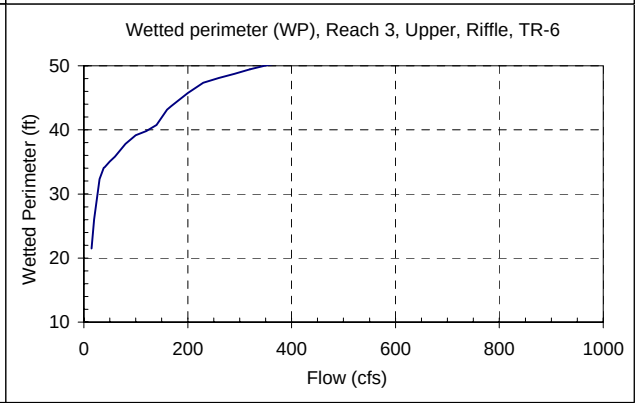


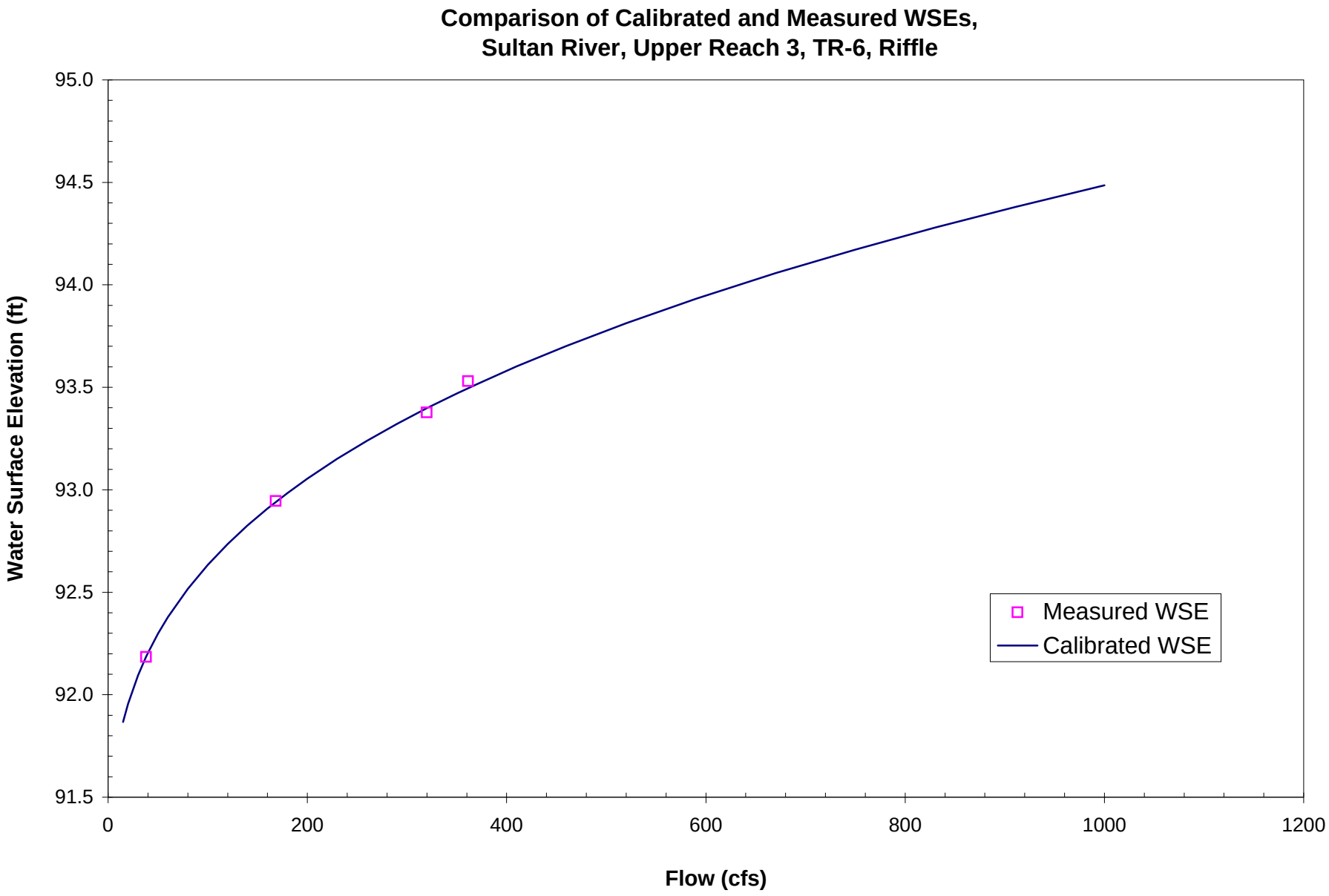











Comparison of Calibrated and Measured WSEs,
Sultan River, Upper Reach 3, TR-6, Riffle
Water Surface Elevation (ft)
95.0
94.5
94.0
93.5
93.0
92.5
92.0
91.5
0
200
400
600
800
1000
1200
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Upper Reach 3
Date: 6/27/2007 **Transect:** TR5
Habitat: Pool **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	8.63	108.63		100.00
HP1			8.79	99.84
HP2			8.01	100.62
HP3				
TP				
HP3				
HP2	7.73	108.35		100.62
HP1			8.49	99.86
BM			8.34	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	11		108.35	13.70		94.65	94.66	
RWS	40.4			13.69		94.66		

Ave Q=

Note: Dry cells only collected.
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/28/2007
Habitat: Pool **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	8.90	108.90		100.00
HP1			9.04	99.86
HP2			8.29	100.61
BM2			3.70	105.20
TP				
BM2			3.40	105.20
HP2	7.99	108.60		100.61
HP1			8.75	99.85
BM			8.60	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	10.6		108.60	13.25		95.35	95.35	172.0
RWS	40			13.25		95.35		

Ave Q= 172.0

Note: Wet Cells only collected
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/29/2007
Habitat: Pool **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	9.43	109.43		100.00
HP1			9.56	99.87
HP2			8.82	100.61
BM2			4.23	105.20
TP				
BM2			3.90	105.20
HP2	8.49	109.10		100.61
HP1			9.23	99.87
BM			9.08	100.02

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	11		109.10	13.34		95.76	95.77	
RWS	39			13.33		95.77		

Ave Q=

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 10/19/2007
Habitat: Pool **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM				100.00
HP1				0.00
HP2				0.00
BM2				0.00
TP				
BM2				0.00
HP2				0.00
HP1				0.00
BM				0.00

Comment: No level loop shot

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	11		109.50				95.88	
RWS	39			13.62		95.88		

Ave Q=

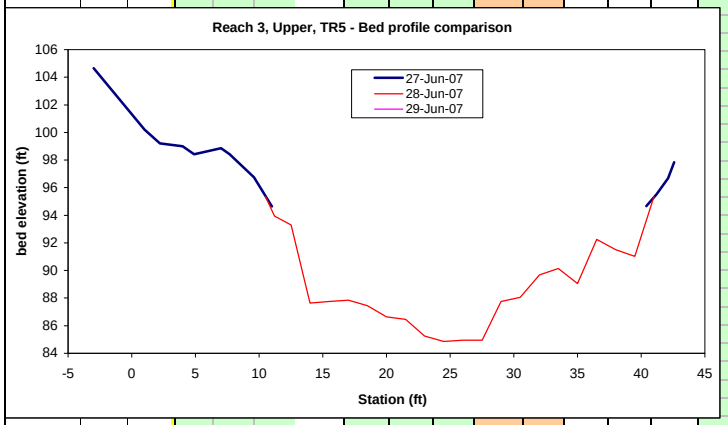
Note: Unable to cross river, only right WSE shot
WSE slope = NA

Stream:	Sultan R.	
Site:	Upper Reach 3	
Transect:	5	
Habitat:	Pool	

Survey Date	HI (ft)	Q (cfs)
6/27/2007	108.35	
6/28/2007	108.60	172.0
6/29/2007	109.10	

27-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-3.0	3.69	104.66									99.9
LWP	1.0	8.14	100.21									99.9
	2.2	9.14	99.21									99.9
	4.0	9.34	99.01									99.9
	4.9	9.92	98.43									99.9
	7.0	9.50	98.85									99.9
	7.7	9.93	98.42									99.9
	9.6	11.60	96.75									99.9
LWE	11.0	13.70	94.65									99.9
RWE	40.4	13.69	94.66									99.9
	41.2	12.82	95.53									99.9
	42.1	11.68	96.67									99.9
RWP	42.6	10.50	97.85									99.9



28-Jun-07

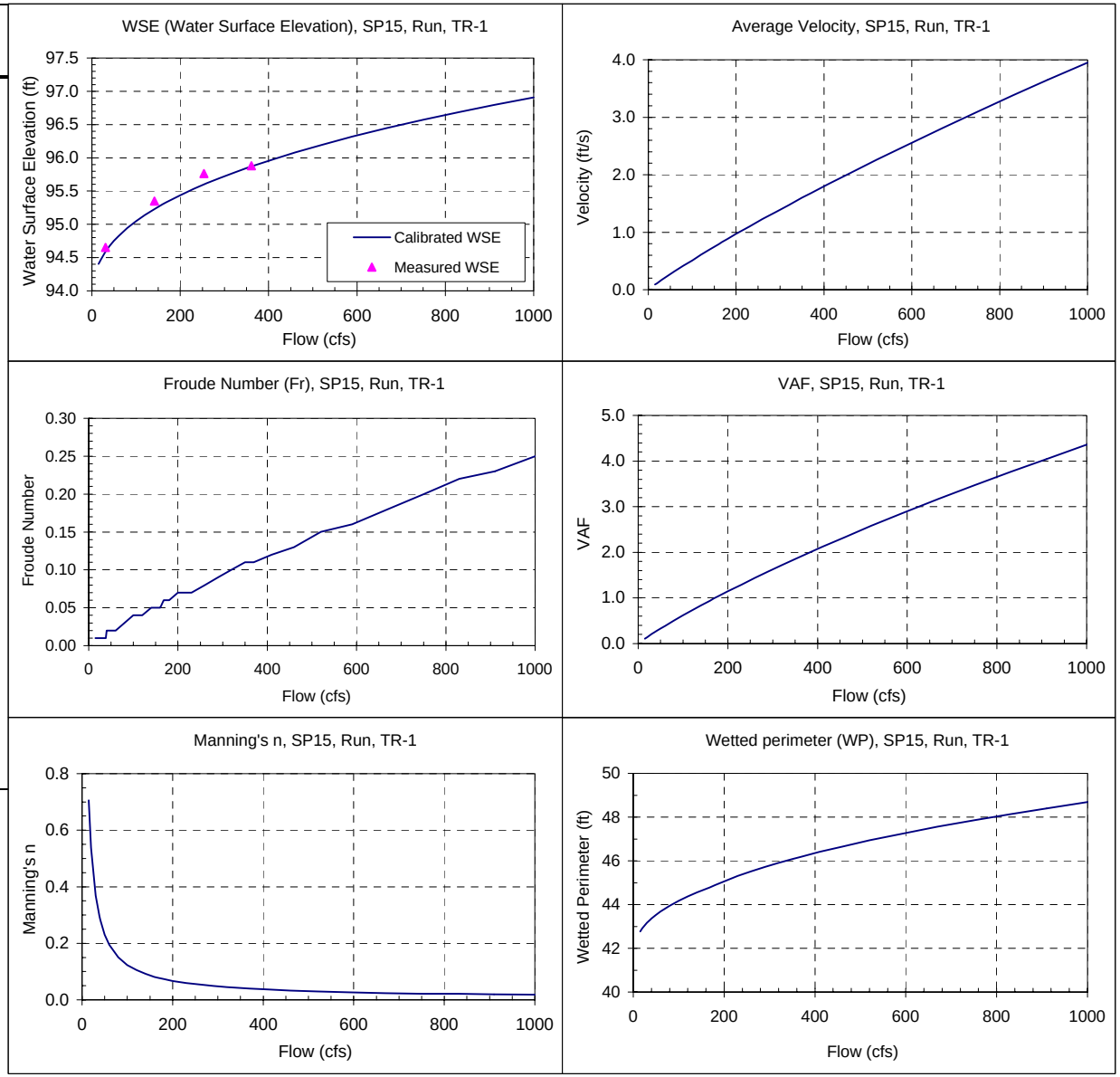
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	10.5		95.35	0.00	0.00		0.00		0.00		0.00	99.9
	11.2		93.95	1.40	0.07		0.16		0.16		0.22	99.9
	12.5		93.30	2.05	0.31		0.39		0.39		1.13	99.9
	14.0		87.65	7.70	0.38		0.47		0.47		5.38	91.8
	15.5		87.75	7.60	1.01		1.06		1.06		12.09	91.8
	17.0		87.85	7.50	1.04		1.09		1.09		12.28	91.8
	18.5		87.45	7.90	1.07		1.12		1.12		13.30	91.8
	20.0		86.65	8.70	1.02		1.07		1.07		13.97	91.8
	21.5		86.45	8.90	0.99		1.04		1.04		13.90	91.9
	23.0		85.25	10.10	1.15		1.20		1.20		18.24	99.9
	24.5		84.85	10.50	0.85		0.90		0.90		14.22	99.9
	26.0		84.95	10.40	1.11		1.16		1.16		18.14	99.9
	27.5		84.95	10.40	0.96		1.01		1.01		15.78	99.9
	29.0		87.75	7.60	0.88		0.93		0.93		10.63	99.9
	30.5		88.05	7.30	0.93		0.98		0.98		10.75	99.9
	32.0		89.67	5.68	0.67		0.74		0.74		6.27	99.9
	33.5		90.15	5.20	0.36		0.44		0.44		3.47	99.9
	35.0		89.05	6.30	0.15		0.23		0.23		2.21	91.9
	36.5		92.25	3.10	0.03		0.07		0.07		0.32	99.9
	38.0		91.50	3.85	0.01		0.02		0.02		0.13	99.9
	39.5		91.03	4.32	-0.03		-0.07		-0.07		-0.44	91.9
RWE	41.0		95.35	0.00	0.00		0.00		0.00		0.00	99.9

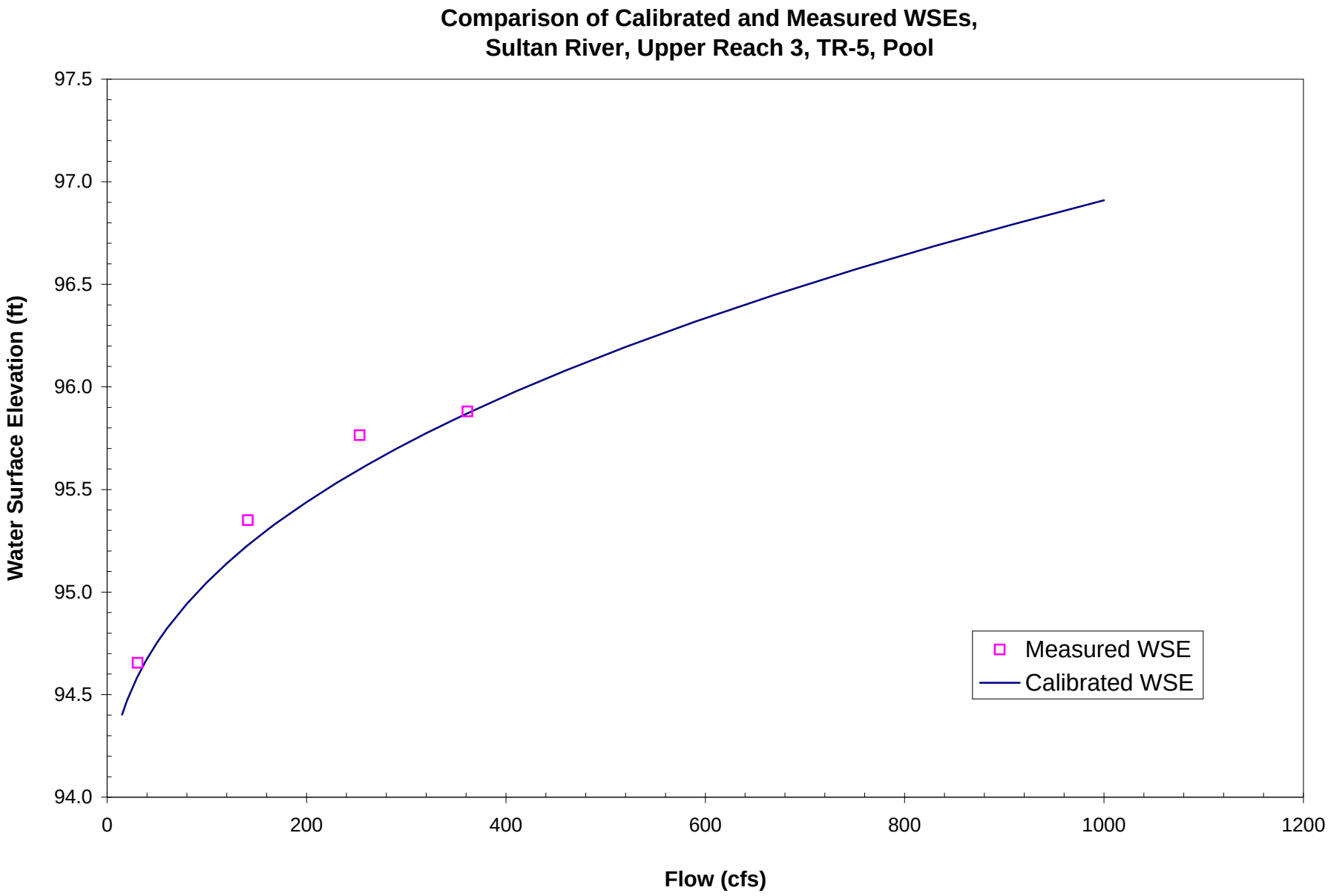
29-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate

Stream: Sultan R.
Site: Upper Reach 3
Habitat: Pool
Transect: 5
Flow: Mid

Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
15	94.40	0.01	0.09	0.11	0.706	42.8
20	94.47	0.01	0.11	0.14	0.538	42.9
30	94.58	0.01	0.17	0.21	0.369	43.2
38.1	94.66	0.01	0.21	0.26	0.296	43.3
40	94.67	0.02	0.22	0.27	0.283	43.4
50	94.75	0.02	0.27	0.33	0.230	43.5
60	94.82	0.02	0.32	0.39	0.195	43.7
80	94.94	0.03	0.42	0.51	0.151	43.9
100	95.05	0.04	0.51	0.62	0.123	44.2
120	95.14	0.04	0.61	0.73	0.105	44.4
140	95.22	0.05	0.70	0.84	0.092	44.6
160	95.30	0.05	0.79	0.94	0.081	44.7
168.2	95.33	0.06	0.83	0.99	0.078	44.8
180	95.37	0.06	0.88	1.05	0.074	44.9
200	95.44	0.07	0.97	1.15	0.067	45.1
230	95.53	0.07	1.10	1.29	0.059	45.3
260	95.62	0.08	1.23	1.44	0.054	45.5
290	95.70	0.09	1.35	1.58	0.049	45.7
319.9	95.77	0.10	1.47	1.72	0.045	45.9
350	95.85	0.11	1.60	1.85	0.042	46.1
369.6	95.89	0.11	1.68	1.94	0.040	46.2
410	95.98	0.12	1.84	2.12	0.037	46.4
460	96.08	0.13	2.03	2.33	0.033	46.7
520	96.19	0.15	2.26	2.58	0.030	46.9
590	96.32	0.16	2.52	2.86	0.027	47.2
670	96.45	0.18	2.81	3.17	0.024	47.6
750	96.57	0.20	3.10	3.47	0.022	47.9
830	96.69	0.22	3.38	3.76	0.021	48.1
910	96.79	0.23	3.65	4.04	0.019	48.4
1000	96.91	0.25	3.95	4.36	0.018	48.7




Comparison of Calibrated and Measured WSEs,
Sultan River, Upper Reach 3, TR-5, Pool
Water Surface Elevation (ft)
97.5
97.0
96.5
96.0
95.5
95.0
94.5
94.0
0
200
400
600
800
1000
1200
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Upper Reach 3/TR4
Date: 6/27/2007 **Transect:** TR4
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.93	104.93		100.00
HP1			5.43	99.50
HP2			0.38	104.55
HP3				
TP				
HP3				
HP2	0.55	105.10		104.55
HP1			5.60	99.50
BM			5.09	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	66.8		105.10	10.99	0.00	94.11	94.06	
MWS	103.0			11.02	0.00	94.08		32.6
RWS	-			11.09	0.00	94.01		
RWE	133.5			11.05	0.00	94.05		
							Ave Q=	32.6

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/28/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	5.80	105.80		100.00
HP1			6.30	99.50
HP2			1.27	104.53
BM3			1.19	104.61
TP				
BM3			0.99	104.61
HP2	1.07	105.60		104.53
HP1			6.10	99.50
BM			5.60	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	65		105.60	10.83	0.00	94.77	94.75	
MWS	104			10.84	0.00	94.76		176.8
RWS	131			10.88	0.00	94.72		
							Ave Q=	176.8

Note:
WSE slope = NA
No logitudinal WSE surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/29/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	5.18	105.18		100.00
HP1				
HP2			0.65	104.53
BM3			0.57	104.61
TP				
BM3			0.85	104.61
HP2	0.93	105.46		104.53
HP1				
BM			5.45	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	64		105.46	10.36	0.00	95.10	95.09	
MWS	101			10.35	0.00	95.11		327.5
RWS	127			10.39	0.00	95.07		
							Ave Q=	327.5

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A

Date: 10/19/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.18	104.18		100.00
HP1				
HP2				
BM3				
TP				
BM3				
HP2				
HP1				
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	64		104.18		0.00		95.17	
RWS	127			9.01	0.00	95.17		
							Ave Q=	

Note: Unable to cross river only LWS elevation was shot, measurement completed at ~11:30
WSE slope = NA

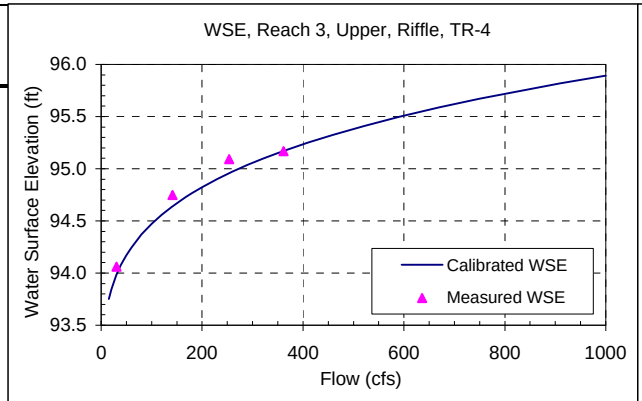
(3) Meter and propeller ID for Velocity Correction

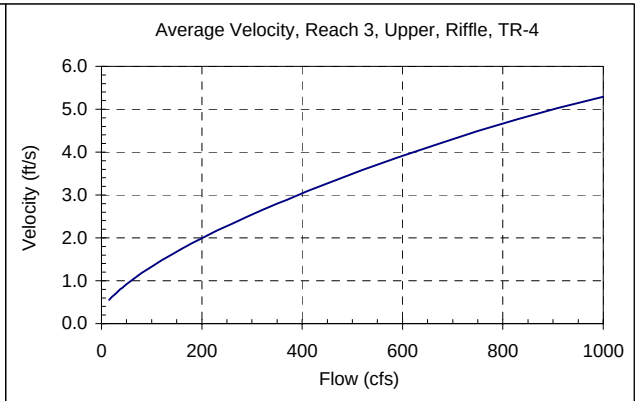
Meter ID: NA
Propeller ID: NA

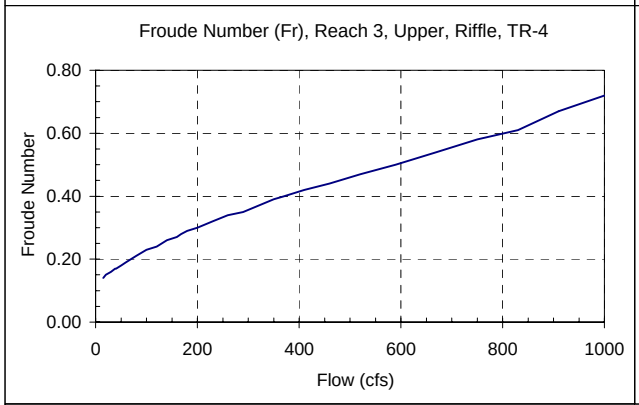
| Stream: | Sultan R. | | |

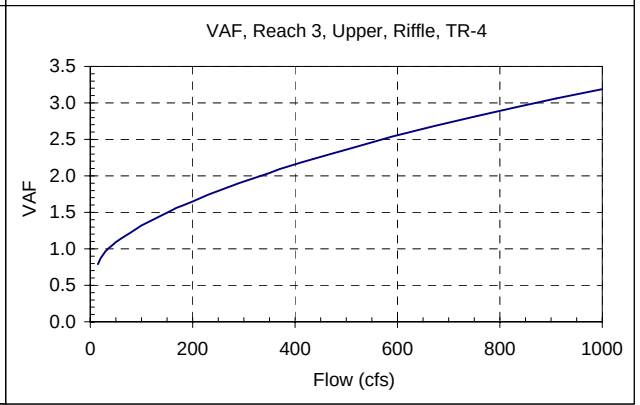
Stream: Sultan R.
Site: Upper Reach 3/TR4
Habitat: Riffle
Transect: 4

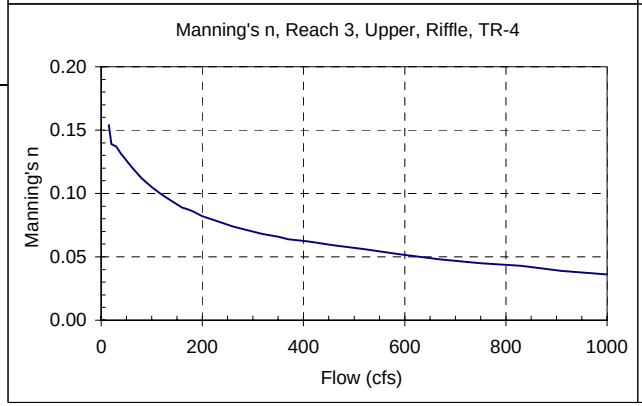
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
15	93.75	0.14	0.55	0.79	0.154	53.8
20	93.84	0.15	0.61	0.87	0.139	64.7
30	93.98	0.16	0.72	0.97	0.137	66.3
38.1	94.07	0.17	0.81	1.02	0.132	67.3
40	94.09	0.17	0.82	1.03	0.131	67.5
50	94.17	0.18	0.92	1.09	0.126	68.3
60	94.25	0.19	1.01	1.14	0.121	69.1
80	94.37	0.21	1.18	1.23	0.112	70.3
100	94.47	0.23	1.33	1.32	0.105	71.3
120	94.56	0.24	1.48	1.39	0.099	72.2
140	94.64	0.26	1.61	1.46	0.094	72.9
160	94.70	0.27	1.75	1.53	0.089	73.6
168.2	94.73	0.28	1.80	1.56	0.088	73.9
180	94.77	0.29	1.87	1.59	0.086	74.2
200	94.82	0.30	1.99	1.65	0.082	74.8
230	94.90	0.32	2.17	1.74	0.078	75.7
260	94.97	0.34	2.33	1.82	0.074	76.4
290	95.04	0.35	2.49	1.90	0.071	77.1
319.9	95.10	0.37	2.65	1.97	0.068	77.8
350	95.15	0.39	2.80	2.04	0.066	78.3
369.6	95.18	0.40	2.89	2.09	0.064	78.7
410	95.25	0.42	3.09	2.18	0.062	79.4
460	95.33	0.44	3.31	2.28	0.059	80.2
520	95.41	0.47	3.58	2.40	0.056	81.1
590	95.50	0.50	3.87	2.54	0.052	82.9
670	95.59	0.54	4.19	2.68	0.048	86.9
750	95.67	0.58	4.49	2.81	0.045	90.5
830	95.75	0.61	4.77	2.94	0.043	93.9
910	95.82	0.67	5.03	3.06	0.039	104.9
1000	95.89	0.72	5.29	3.19	0.036	114.2

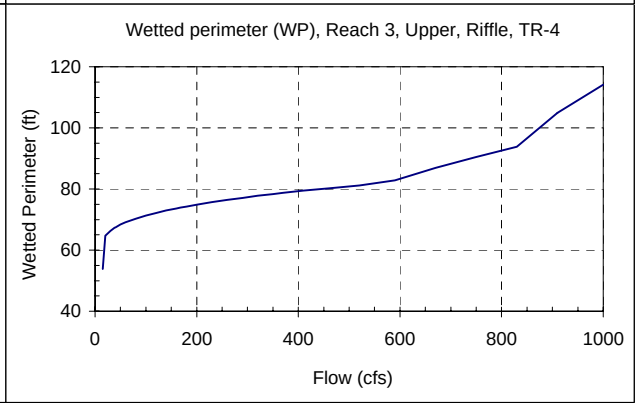


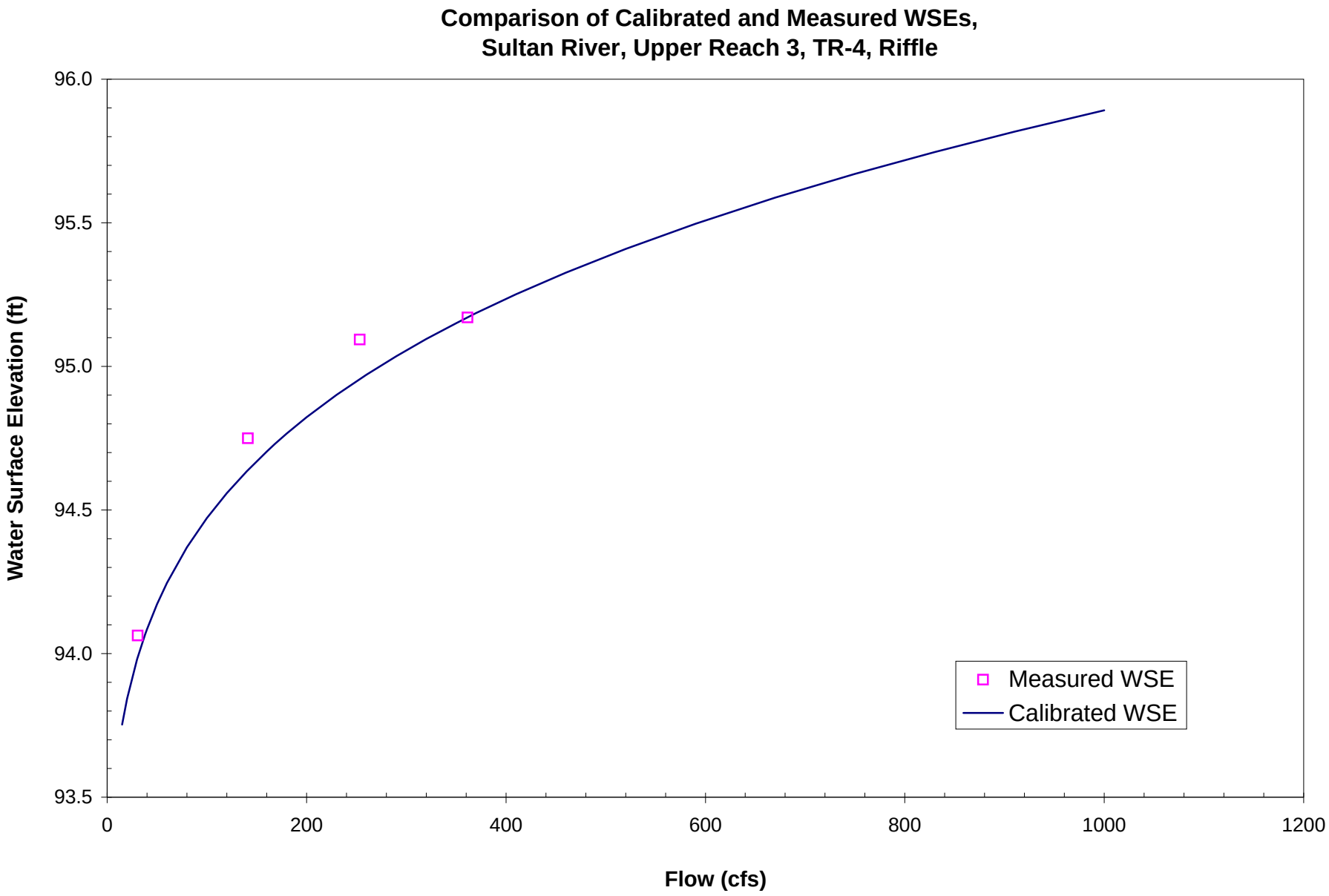











Comparison of Calibrated and Measured WSEs,
Sultan River, Upper Reach 3, TR-4, Riffle
Water Surface Elevation (ft)
96.0
95.5
95.0
94.5
94.0
93.5
0
200
400
600
800
1000
1200
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan River
Site: Upper Reach 3
Date: 6/27/2007 **Transect:** TR3
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.27	100.27		100.00
HP1			2.86	97.41
HP2			0.18	100.09
TP				
HP2	0.17	100.26		100.09
HP1			2.86	97.40
BM			0.27	99.99

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station L/R bank (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWE	45.2	58	100.26	9.21	0.00	91.05	91.04	37.4
RWE	70.2			9.24	0.00	91.02		

Ave Q= 37.4

Note:
WSE slope = N/A

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/28/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.30	100.32		100.00
HP1			2.89	97.43
HP2			0.21	100.11
TP				
HP2	0.22	100.33		100.11
HP1			2.90	97.43
BM			0.32	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station L/R bank (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	44.0		100.33	8.44	0.00	91.89	91.88	
MWS	56.0			8.45	0.00	91.88		
RWS	71.0			8.45	0.00	91.88		167.0
LWS	80.0			8.45	0.00	91.88		
RWS	96.0			8.44	0.00	91.89		

Ave Q= 167.0

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	60		100.33	8.33	0.00	92.00
d/s	-60		100.33	9.31	0.00	91.02

Note:
WSE slope = 0.817%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/29/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.43	100.43		100.00
HP1			3.02	97.41
HP2			0.35	100.08
TP				
HP2	0.33	100.41		100.08
HP1			3.00	97.41
BM			0.41	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station L/R bank (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	44.0		100.41	9.05	1.09	92.45	92.45	
MWS	77.0			8.88	0.97	92.50		293.5
RWS	95.0			10.11	2.14	92.44		

Ave Q= 293.5

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	60		100.41	10.91	3.09	92.59
d/s	-60		100.41	10.49	1.69	91.61

Note:
WSE slope = 0.817%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A

Date: 10/19/2007
Habitat: 0 **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM		100.00		100.00
HP1				
HP2				
TP				
HP2				
HP1				
BM				

Comment: No level loop was shot

(2) Water Surface Elevation (WSE) Survey

Location	TR Station L/R bank (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			100.92				92.55	
RWS				8.37		92.55		

Ave Q=

Note: Unable to cross river only RWS elevation was shot, measurement completed at ~11:40

Stream:	Sultan River	
Site:	Upper Reach 3	
Transect:	3	
Habitat:	Riffle	
Survey Date	HI (ft)	Q (cfs)
6/27/2007	100.26	37.4
6/28/2007	100.33	167.0
6/29/2007	100.41	293.5

27-Jun-07

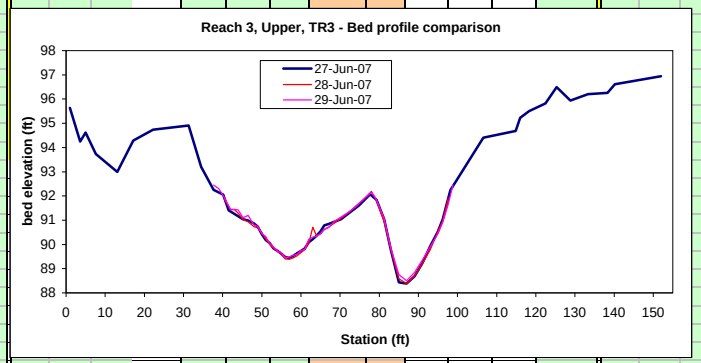
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWP	1.0	4.63	95.63									11.9
	3.6	6.01	94.25									23.6
	5.0	5.64	94.62									23.6
	7.6	6.53	93.73									23.6
	13.1	7.27	92.99									34.6
	17.2	5.97	94.29									34.6
	22.2	5.52	94.74									34.6
	31.3	5.35	94.91									34.6
	34.5	7.06	93.20									34.6
	37.7	8.01	92.25									34.6
	40.1	8.20	92.06									45.6
	41.5	8.85	91.41									45.6
LWE	45.2		91.04	0.00	0.00		0.00		0.00		0.00	65.6
	46.5		90.99	0.05	0.01		0.02		0.02		0.00	65.6
	48.0		90.87	0.17	1.08		1.13		1.13		0.24	56.6
	49.0		90.74	0.30	1.45		1.51		1.51		0.45	56.6
	50.0		90.42	0.62	1.53		1.59		1.59		0.99	56.6
	51.0		90.19	0.85	1.67		1.73		1.73		1.47	56.6
	52.0		90.07	0.97	1.52		1.58		1.58		1.53	65.6
	53.0		89.84	1.20	1.90		1.97		1.97		2.36	65.7
	54.0		89.74	1.30	2.04		2.10		2.10		2.74	65.7
	55.0		89.62	1.42	2.00		2.07		2.07		2.93	65.7
	56.0		89.49	1.55	2.05		2.11		2.11		3.28	65.6
	57.0		89.44	1.60	2.07		2.13		2.13		3.41	56.7
	58.0		89.52	1.52	2.06		2.12		2.12		3.23	56.8
	59.0		89.64	1.40	2.12		2.18		2.18		3.06	56.7
	60.0		89.74	1.30	2.00		2.07		2.07		2.68	54.6
	61.0		89.84	1.20	2.07		2.13		2.13		2.56	54.7
	62.0		90.09	0.95	1.94		2.01		2.01		1.91	54.6
	63.0		90.22	0.82	1.69		1.75		1.75		1.44	45.6
	64.0		90.37	0.67	1.98		2.05		2.05		1.37	45.6
	65.0		90.54	0.50	1.80		1.87		1.87		0.93	45.6
	66.0		90.79	0.25	1.70		1.76		1.76	15.00	0.43	45.6
	67.0		90.84	0.20	1.17		1.22		1.22		0.31	45.6
	68.5		90.94	0.10	0.63		0.70		0.70		0.11	46.7
RWE	70.2		91.04	0.00	0.00		0.00		0.00		0.00	54.6
	74.8	8.66	91.60									43.6
	77.7	8.19	92.07									43.6
	79.3	8.41	91.85									45.6
LWE	81.3		91.04	0.00	0.00		0.00		0.00		0.00	43.6
	83.0		89.77	1.27	0.00		0.00		0.00		0.00	43.6
	85.0		88.44	2.60	0.00		0.00		0.00		0.00	43.6
	87.0		88.39	2.65	0.00		0.00		0.00		0.00	43.6
	89.0		88.69	2.35	0.00		0.00		0.00		0.00	43.6
	91.0		89.22	1.82	0.00		0.00		0.00		0.00	43.6
	93.0		89.94	1.10	0.00		0.00		0.00		0.00	43.6
	95.0		90.54	0.50	0.00		0.00		0.00		0.00	43.6
RWE	96.2		91.04	0.00	0.00		0.00		0.00		0.00	43.6
	98.2	8.02	92.24									34.7
	106.6	5.85	94.41									34.7
	114.9	5.57	94.69									34.7
	116.0	5.03	95.23									34.7
	118.3	4.76	95.50									43.6
	122.5	4.44	95.82									43.6
	125.3	3.77	96.49									43.6
	128.8	4.32	95.94									43.6
	133.3	4.05	96.21									43.6
	138.3	4.00	96.26									43.6
	140.2	3.65	96.61									43.6
RWP	152.0	3.32	96.94									43.6

28-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	40.4		91.88	0.00	0.00		0.00		0.00		0.00	45.6
	42.0		91.43	0.45	0.70		0.76		0.76		0.45	45.6
	43.0		91.43	0.45	1.78		1.85		1.85		0.83	45.6
	44.0		91.28	0.60	1.97		2.04		2.04		1.34	65.6
	45.2		91.03	0.85	2.05		2.11		2.11		2.25	65.6
	46.5		90.93	0.95	2.57		2.62		2.62		3.49	65.6
	48.0		90.73	1.15	2.52		2.57		2.57		3.70	56.6
	49.0		90.68	1.20	2.72		2.77		2.77		3.32	56.6
	50.0		90.48	1.40	2.80		2.84		2.84		3.98	56.6
	51.0		90.23	1.65	2.89		2.93		2.93		4.84	56.6
	52.0		90.00	1.88	3.15		3.18		3.18		5.98	65.6
	53.0		89.83	2.05	3.25		3.28		3.28		6.73	65.7
	54.0		89.73	2.15	3.41		3.44		3.44		7.40	65.7
	55.0		89.58	2.30	3.42		3.45		3.45		7.94	65.7
	56.0		89.40	2.48	3.55		3.59		3.59		8.89	65.6
	57.0		89.38	2.50	3.72	3.40	3.76	3.43	3.60		8.99	56.7
	58.0		89.43	2.45	3.43		3.46		3.46		8.49	56.8
	59.0		89.53	2.35	2.68		2.73		2.73		6.41	56.7
	60.0		89.66	2.22	3.75		3.79		3.79		8.41	54.6
	61.0		89.78	2.10	3.78		3.82		3.82		8.02	54.7
	62.0		90.03	1.85	3.93		3.97		3.97		7.34	54.6
	63.0		90.71	1.17	3.88		3.92		3.92		4.58	45.6
	64.0		90.35	1.53	3.80		3.84		3.84		5.87	45.6
	65.0		90.43	1.45	3.85		3.89		3.89		5.64	45.6
	66.0		90.61	1.27	3.68		3.72		3.72		4.72	45.6
	67.0		90.71	1.17	3.81		3.85		3.85		5.63	45.6
	68.5		90.88	1.00	3.53		3.57		3.57		5.70	46.7
	70.2		91.08	0.80	3.47		3.50		3.50		4.91	54.6
	72.0		91.28	0.60	2.82		2.86		2.86		3.26	54.6
	74.0		91.58	0.30	2.67		2.72		2.72		1.71	43.6
RWE	76.2		91.88	0.00	0.00		0.00		0.00		0.00	43.6
	78.0		92.18	-0.30								45.6
LWE	79.1		91.88	0.00	0.00		0.00		0.00		0.00	45.6
	81.3		90.93	0.95	-0.10		-0.19		-0.19		-0.34	43.6
	83.0		89.78	2.10	0.05		0.11		0.11		0.44	43.6
	85.0		88.58	3.30	0.31	0.24	0.39	0.32	0.36		2.37	43.6
	87.0		88.38	3.50	0.71	0.84	0.77	0.89	0.83		5.83	43.6
	89.0		88.70	3.18	0.44	1.05	0.52	1.10	0.81		5.17	43.6
	91.0		89.18	2.70	0.08	0.58	0.16	0.66	0.41		2.21	43.6
	93.0		89.78	2.10	0.16		0.24		0.24		1.01	43.6
	95.0		90.53	1.35	-0.10		-0.19		-0.19		-0.40	43.6
	96.2		90.96	0.92	-0.05		-0.11		-0.11		-0.14	43.6
RWE	97.6		91.88	0.00	0.00		0.00		0.00		0.00	34.7

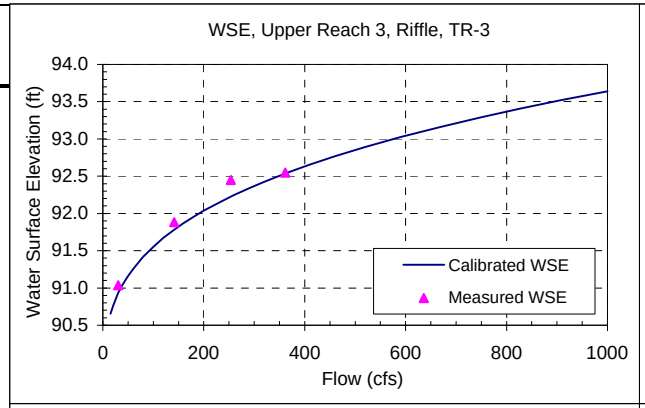
29-Jun-07

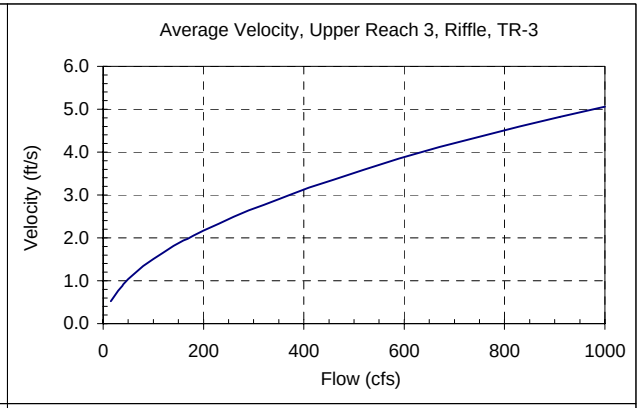
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	37.7		92.45	0.00	0.00		0.00		0.00		0.00	34.6
	39.0		92.30	0.15	0.09		0.25		0.25		0.05	45.6
	40.4		91.95	0.50	0.85		0.90		0.90		0.67	45.6
	42.0		91.45	1.00	2.44		2.50		2.50		3.25	45.6
	43.0		91.45	1.00	2.80		2.86		2.86		2.86	45.6
	44.0		91.42	1.03	3.00		3.05		3.05		3.46	65.6
	45.2		91.11	1.34	3.10		3.15		3.15		5.27	65.6
	46.5		91.20	1.25	2.54		2.60		2.60		4.55	65.6
	48.0		90.80	1.65	3.50		3.53		3.53		7.28	56.6
	49.0		90.75	1.70	3.48		3.51		3.51		5.97	56.6
	50.0		90.45	2.00	3.69		3.71		3.71		7.42	56.6
	51.0		90.33	2.12	3.80		3.81		3.81		8.09	56.6
	52.0		90.05	2.40	4.12		4.12		4.12		9.89	65.6
	53.0		89.90	2.55	4.55	3.01	4.55	3.06	3.81		9.70	65.7
	54.0		89.70	2.75	4.35	3.83	4.35	3.84	4.10		11.26	65.7
	55.0		89.67	2.78	4.73	3.92	4.73	3.93	4.33		12.03	65.7
	56.0		89.45	3.00	4.69	2.87	4.69	2.92	3.81		11.42	65.6
	57.0		89.48	2.97	4.33	3.21	4.33	3.25	3.79		11.26	56.7
	58.0		89.55	2.90	4.25	3.43	4.25	3.46	3.86		11.18	56.8
	59.0		89.60	2.85	4.31	3.26	4.31	3.30	3.81		10.85	56.7
	60.0		89.75	2.70	4.41	3.19	4.41	3.23	3.82		10.32	54.6
	61.0		89.80	2.65	4.72	3.37	4.72	3.41	4.06		10.77	54.7
	62.0		90.20	2.25	4.46		4.46		4.46		10.04	54.6
	63.0		90.30	2.15	4.47		4.47		4.47		9.61	45.6
	64.0		90.35	2.10	4.29		4.29		4.29		9.01	45.6
	65.0		90.45	2.00	4.61		4.61		4.61		9.22	45.6
	66.0		90.63	1.82	5.12		5.12		5.12		9.32	45.6
	67.0		90.70	1.75	5.16		5.16		5.16		11.29	45.6
	68.5		90.95	1.50	4.79		4.79		4.79		11.50	46.7
	70.2		91.13	1.32	4.37		4.37		4.37		10.09	54.6
	72.0		91.32	1.13	3.74		3.76		3.76		8.07	54.6
	74.0		91.55	0.90	3.45		3.48		3.48		6.58	43.6
	76.2		91.90	0.55	3.42		3.45		3.45		3.80	43.6
	78.0		92.15	0.30	3.32		3.36		3.36	15	1.41	43.6
	79.1		91.90	0.55	2.07		2.14		2.14	35	1.59	45.6
	81.3		91.07	1.38	0.52		0.58		0.58	35	1.27	43.6
	83.0		89.85	2.60	0.85	0.13	0.90	0.22	0.56	35	2.20	43.6
	85.0		88.75	3.70	0.40	0.25	0.46	0.31	0.39	20	2.70	43.6
	87.0		88.50	3.95	0.93	0.24	0.98	0.30	0.64	20	4.76	43.6
	89.0		88.85	3.60	0.99	0.57	1.04	0.63	0.83	20	5.63	43.6
	91.0		89.35	3.10	0.66	1.22	0.71	1.28	0.99	20	5.79	43.6
	93.0		89.90	2.55	0.98	1.70	1.03	1.76	1.40		7.12	43.6
	95.0		90.45	2.00	1.13		1.18		1.18		3.79	43.6
	96.2		90.90	1.55	0.40		0.46		0.46		0.93	43.6
	97.6		91.65	0.80	0.05		0.19		0.19		0.20	34.7
RWE	98.8		92.45	0.00	0.00		0.00		0.00		0.00	34.7

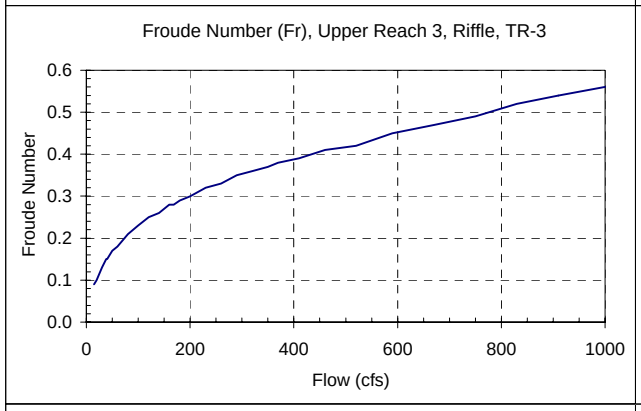


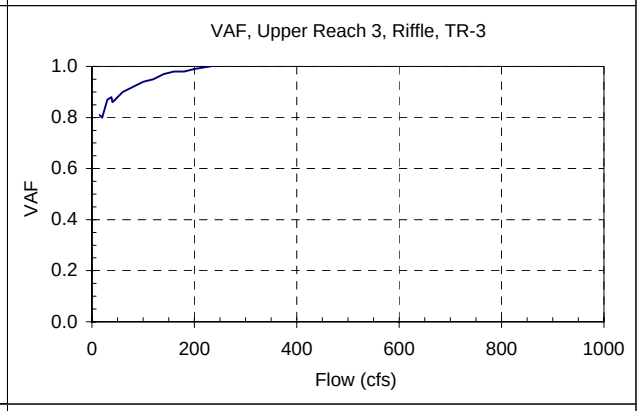
Stream: Sultan River
Site: Upper Reach 3
Habitat: Riffle
Transect: 3

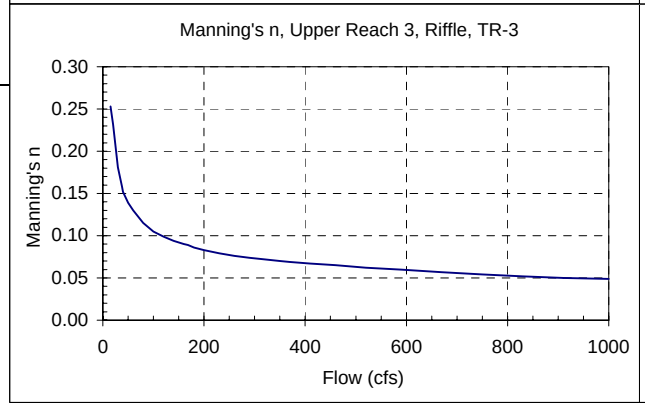
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted Perimeter (ft)
15	90.65	0.09	0.52	0.81	0.253	30.4
20	90.76	0.10	0.60	0.80	0.232	32.2
30	90.92	0.13	0.77	0.87	0.181	36.7
38.1	91.03	0.15	0.88	0.88	0.158	41.4
40	91.05	0.15	0.92	0.86	0.152	41.6
50	91.16	0.17	1.04	0.88	0.139	43.5
60	91.26	0.18	1.14	0.90	0.130	45.2
80	91.42	0.21	1.34	0.92	0.115	48.9
100	91.55	0.23	1.51	0.94	0.105	51.5
120	91.67	0.25	1.66	0.95	0.099	53.3
140	91.77	0.26	1.81	0.97	0.094	54.8
160	91.87	0.28	1.94	0.98	0.090	56.2
168.2	91.91	0.28	1.98	0.98	0.089	57.0
180	91.96	0.29	2.05	0.98	0.086	57.9
200	92.04	0.30	2.17	0.99	0.083	59.4
230	92.15	0.32	2.33	1.00	0.079	61.6
260	92.25	0.33	2.49	1.01	0.076	62.8
290	92.34	0.35	2.64	1.02	0.074	63.5
319.9	92.43	0.36	2.77	1.03	0.072	64.2
350	92.51	0.37	2.90	1.04	0.070	64.8
369.6	92.56	0.38	2.99	1.04	0.069	65.1
410	92.65	0.39	3.17	1.06	0.067	65.8
460	92.77	0.41	3.36	1.07	0.065	66.7
520	92.89	0.42	3.59	1.08	0.062	67.6
590	93.02	0.45	3.85	1.10	0.060	68.9
670	93.16	0.47	4.12	1.11	0.057	71.5
750	93.29	0.49	4.36	1.13	0.054	73.7
830	93.41	0.52	4.60	1.14	0.052	75.8
910	93.52	0.54	4.82	1.15	0.050	77.6
1000	93.64	0.56	5.06	1.16	0.049	79.7

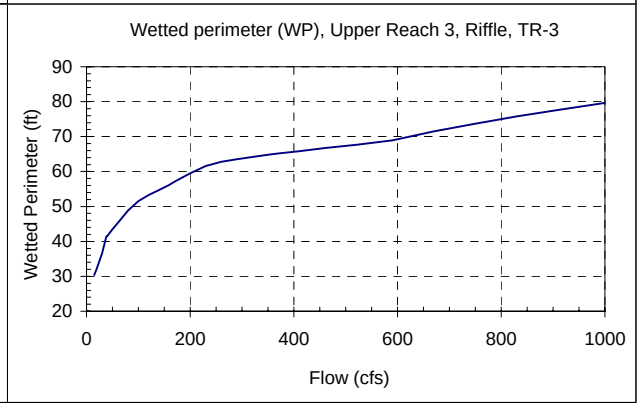


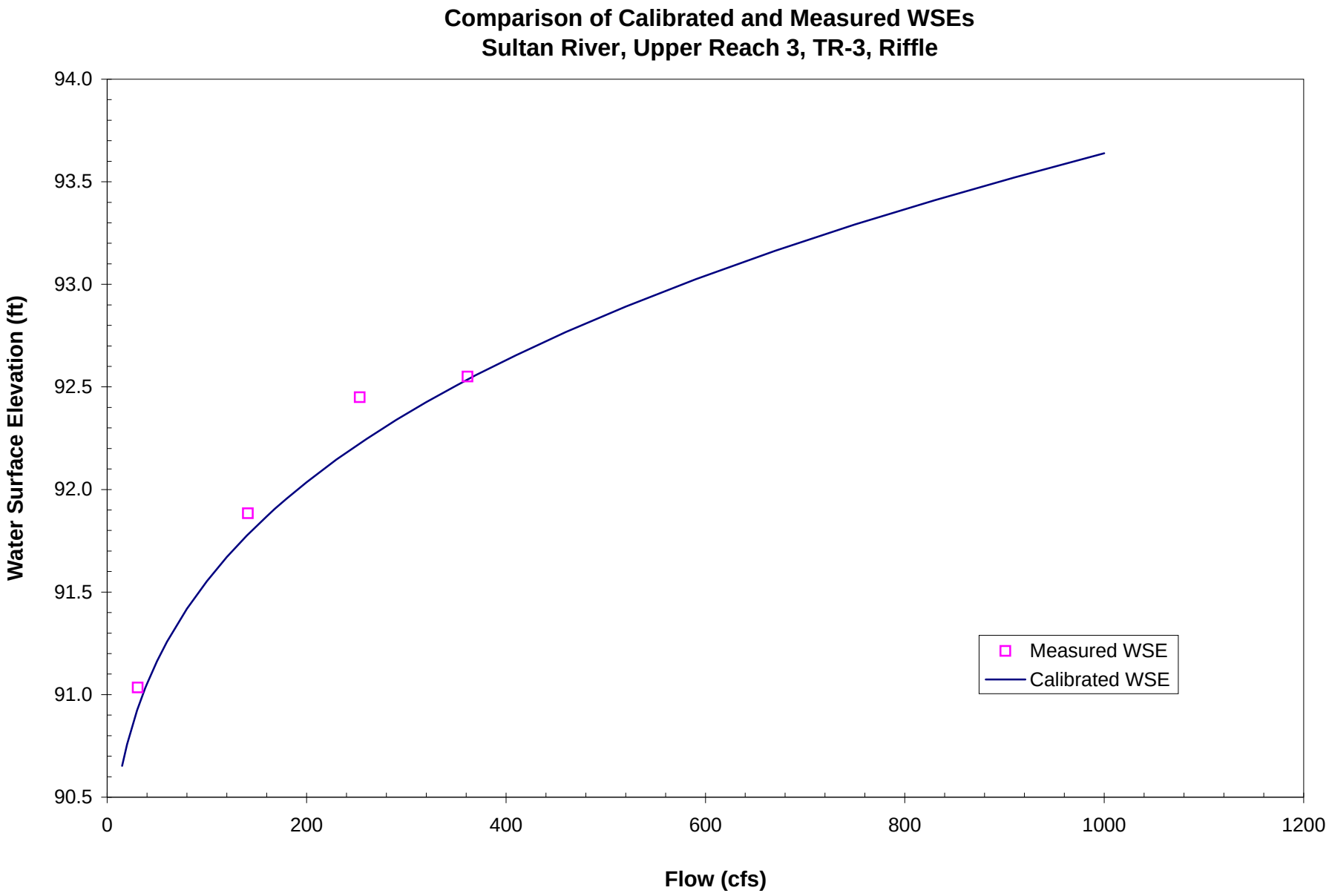











Comparison of Calibrated and Measured WSEs
Sultan River, Upper Reach 3, TR-3, Riffle
Water Surface Elevation (ft)
94.0
93.5
93.0
92.5
92.0
91.5
91.0
90.5
0
200
400
600
800
1000
1200
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Upper Reach 3
Date: 6/27/2007 **Transect:** TR2
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.31	103.31		100.00
HP1			0.50	102.81
HP2			3.15	100.16
TP				
HP2	3.06	103.22		100.16
HP1			0.41	102.81
BM			3.22	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWE	48.7		103.22	8.00	0.00	95.22	95.28	
								37.9
RWE	101.3			7.89	0.00	95.33		

Ave Q= 37.9

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	60		103.39	8.80	1.85	96.44
d/s	-60		103.39	9.45	1.20	95.14

WSE slope = NA
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/28/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.22	103.22		100.00
HP1			0.41	102.81
HP2			3.05	100.17
TP				
HP2	3.22	103.39		100.17
HP1			0.57	102.82
BM			3.39	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L	55		103.39	7.73	0.00	95.66	95.77	
-	61			9.22	1.54	95.71		
MWS	86			7.51	0.00	95.88		173.3
WSE	100.6			7.69	0.15	95.85		
RWE	125			7.64	0.00	95.75		

Ave Q= 173.3

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	60		103.39	8.80	1.85	96.44
d/s	-60		103.39	9.45	1.20	95.14

WSE slope = 1.083%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/29/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.23	103.23		100.00
HP1			0.41	102.82
HP2			3.06	100.17
TP				
HP2	2.99	103.16		100.17
HP1			0.33	102.83
BM			3.17	99.99

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	43		103.16	7.68	0.39	95.87	96.10	
LWS	56			7.90	0.69	95.95		
LWS	77			9.20	2.24	96.20		301.5
RWS	104			7.65	0.73	96.24		
RWS	127			8.55	1.65	96.26		

Ave Q= 301.5

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	60		103.16	7.69	1.33	96.80
d/s	-60		103.16	10.21	2.82	95.77

WSE slope = 0.858%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A

Date: 10/19/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.57	101.57		100.00
HP1				
HP2			1.40	100.17
TP				
HP2				
HP1				
BM				

Comment: 1/2 level loop shot

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	43		101.57	5.20	0.00	96.37	96.38	
LWS				5.19	0.00	96.38		

Ave Q= 361.4

Note: Unable to cross river only RWS elevation was shot, measurement completed at ~11:55

WSE slope = NA
Note:

Stream: Sultan R.
Site: Upper Reach 3
Transect: 2
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
6/27/2007	103.22	37.9
6/28/2007	103.39	173.3
6/29/2007	103.16	301.5

27-Jun-07

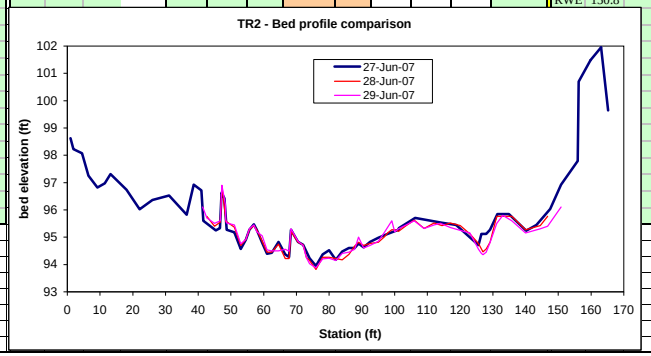
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWP	1.0	4.59	98.63									11.9
	1.9	4.99	98.23									11.9
	4.5	5.14	98.08									31.6
	6.5	5.97	97.25									31.6
	9.2	6.40	96.82									56.6
	11.4	6.25	96.97									56.6
	13.2	5.91	97.31									56.6
	18.1	6.48	96.74									45.6
	22.1	7.20	96.02									45.6
	26.0	6.86	96.36									45.6
	31.1	6.69	96.53									45.6
	36.5	7.40	95.82									89.7
	38.6	6.30	96.92									89.7
	41.0	6.50	96.72									88.7
	41.5	7.62	95.60									88.7
	45.4	7.97	95.25									88.7
	46.6	7.89	95.33									88.7
	47.1	6.59	96.63									88.8
	48.0	6.80	96.42									88.9
LWE	48.7		95.28	0.00	0.00		0.00		0.00		0.00	78.6
	51.0		95.18	0.10	0.05		0.11		0.11		0.02	87.7
	53.0		94.58	0.70	0.49		0.57		0.57		0.70	86.6
	54.5		94.91	0.37	0.44		0.52		0.52		0.25	23.8
	55.6		95.28	0.00	0.00		0.00		0.00		0.00	23.9
	57.0		95.48	-0.20								56.8
	57.9		95.28	0.00	0.00		0.00		0.00		0.00	23.9
	59.5		94.80	0.48	0.29		0.37		0.37	15	0.27	72.6
	61.0		94.40	0.88	0.47		0.55		0.55		0.73	78.6
	62.5		94.43	0.85	1.41		1.47		1.47		2.19	87.7
	64.5		94.83	0.45	1.61		1.67		1.67		1.54	87.7
	66.6		94.38	0.90	0.28		0.36		0.36		0.52	87.7
	67.7		94.28	1.00	0.17		0.25		0.25		0.21	82.8
	68.3		95.28	0.00	0.00		0.00		0.00		0.00	82.8
	70.5		94.83	0.45	0.01		0.02		0.02		0.02	87.6
	72.0		94.73	0.55	0.14		0.23		0.23		0.22	78.6
	74.0		94.23	1.05	1.51		1.57		1.57		3.30	86.6
	76.0		93.96	1.32	0.71		0.77		0.77		2.04	67.6
	78.0		94.38	0.90	2.00		2.07		2.07		3.72	67.6
	80.0		94.53	0.75	1.96		2.03		2.03		3.04	56.6
	82.0		94.18	1.10	2.17		2.23		2.23		4.91	65.6
	84.0		94.48	0.80	2.37		2.43		2.43		3.88	54.6
	86.0		94.61	0.67	2.59		2.64		2.64		3.36	54.7
	87.8		94.61	0.67	1.80		1.87		1.87		1.88	58.7
	89.0		94.78	0.50	0.21		0.29		0.29		0.20	82.6
	90.5		94.63	0.65	1.27		1.33		1.33		1.51	68.6
	92.5		94.83	0.45	1.88		1.95		1.95		1.97	67.8
	95.0		94.98	0.30	0.87		0.92		0.92		0.61	65.8
	96.9		95.08	0.20	0.37		0.46		0.46		0.19	65.7
	99.1		95.18	0.10	0.05		0.11		0.11		0.02	76.6
RWE	101.2		95.28	0.00	0.00		0.00		0.00		0.00	76.6
	101.3	7.89	95.33									54.6
	106.3	7.51	95.71									34.6
	114.4	7.69	95.53									34.7
	118.8	7.77	95.45									34.7
LWE	125.6	8.51	94.71	0.00	0.00		0.00		0.00		0.00	34.7
	126.5		95.13	0.15	1.30		1.36		1.36		0.14	54.7
	127.0		95.13	0.15	1.72		1.78		1.78		0.20	54.7
	128.0		95.13	0.15	1.31		1.37		1.37		0.22	54.7
RWE	129.1		95.28	0.00	0.00		0.00		0.00		0.00	54.7
	131.4	7.37	95.85									23.7
	134.9	7.37	95.85									22.9
	140.2	7.98	95.24									28.9
	143.3	7.77	95.45									28.9
	147.5	7.18	96.04									28.9
	150.8	6.29	96.93									28.9
	155.9	5.43	97.79									28.9
	156.2	2.52	100.70									68.9
	159.8	1.74	101.48									88.9
	163.1	1.27	101.95									88.9
RWP	165.2	3.58	99.64									

28-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	42.6		95.77	0.00	0.00		0.00		0.00		0.00	88.7
	45.0		95.40	0.37	0.08		0.16		0.16		0.12	88.7
	46.7		95.55	0.22	0.56		0.64		0.64		0.12	88.7
	47.2		96.87	-1.10								88.8
	48.3		95.77	0.00	0.00		0.00		0.00		0.00	88.9
	48.4		95.57	0.20	2.38		2.44		2.44		0.10	78.6
	48.7		95.57	0.20	2.54		2.59		2.59		0.67	78.6
	51.0		95.37	0.40	2.64		2.69		2.69		2.31	87.7
	53.0		94.70	1.07	2.18		2.24		2.24		4.20	86.6
	54.5		94.92	0.85	0.80		0.86		0.86		0.95	23.8
	55.6		95.27	0.50	0.29		0.37		0.37		0.23	23.9
	57.0		95.42	0.35	0.30		0.38		0.38		0.15	56.8
	57.9		95.27	0.50	0.19		0.27		0.27		0.17	23.9
	59.5		94.85	0.92	0.31		0.39		0.39		0.56	72.6
	61.0		94.45	1.32	1.13		1.18		1.18		2.34	78.6
	62.5		94.45	1.32	2.60		2.65		2.65	15	5.91	87.7
	64.5		94.75	1.02	3.66		3.70		3.70		7.73	87.7
	66.6		94.22	1.55	2.22		2.28		2.28		5.66	87.7
	67.7		94.22	1.55	0.61		0.68		0.68		0.90	82.8
	68.3		95.22	0.55	2.04		2.10		2.10		1.62	82.8
	70.5		94.82	0.95	0.43		0.51		0.51		0.90	87.6
	72.0		94.72	1.05	0.49		0.57		0.57		0.75	78.6
	73.0		94.27	1.50	0.80		0.86		0.86		1.28	78.6
	74.0		94.15	1.62	2.80		2.84		2.84		6.91	86.6
	76.0		93.82	1.95	2.57		2.62		2.62		10.22	67.6
	78.0		94.27	1.50	3.39		3.42		3.42	15	9.92	67.6
	80.0		94.27	1.50	3.28		3.31		3.31	15	9.60	56.6
	82.0		94.22	1.55	3.45		3.48		3.48	15	10.43	65.6
	84.0		94.17	1.60	4.32		4.36		4.36	15	13.49	54.6
	86.0		94.37	1.40	4.39		4.43		4.43	15	11.39	54.7
	87.8		94.67	1.10	4.41		4.45		4.45	15	7.10	58.7
	89.0		94.82	0.95	4.22		4.26		4.26	15	5.28	82.6
	90.5		94.70	1.07	2.90		2.94		2.94	15	5.32	68.6
	92.5		94.77	1.00	2.43		2.48		2.48	15	5.40	67.8
	95.0		94.82	0.95	2.50		2.55		2.55	15	5.15	65.8
	96.9		95.02	0.75	0.83		0.88		0.88	15	0.96	65.7
	98.0		95.17	0.60	4.33		4.37		4.37	15	2.79	65.7
	99.1		95.27	0.50	0.48		0.56		0.56	15	0.27	76.6
	100.0		95.27	0.50	3.14		3.17		3.17	15	1.61	76.6
	101.2		95.22	0.55	1.47		1.53		1.53	15	1.42	76.6
	103.5		95.42	0.35	2.77		2.81		2.81		2.36	53.7
	106.0		95.62	0.15	1.74		1.81		1.81		0.74	56.6
	109.0		95.32	0.45	2.13		2.19		2.19		2.96	54.6
	112.0		95.52	0.25	1.45		1.51		1.51		1.04	54.6
	114.5		95.42	0.35	1.81		1.88		1.88	20	1.54	54.6
	117.0		95.52	0.25	2.24		2.30		2.30	35	1.30	54.6
	120.0		95.42	0.35	2.18		2.24		2.24	35	1.93	54.6
	123.0		95.12	0.65	1.69		1.75		1.75		3.19	34.7
	125.6		94.77	1.00	2.32		2.38		2.38	15	4.02	34.7
	126.5		94.57	1.20	2.59		2.64		2.64	15	2.14	54.7
	127.0		94.47	1.30	2.23		2.29		2.29	15	2.16	54.7
	128.0		94.57	1.20	1.96		2.03		2.03	15	2.47	54.7
	129.1		94.82	0.95	2.25		2.31		2.31		3.51	54.7
RWE	131.2		95.77	0.00	0.00		0.00		0.00		0.00	23.7
LWE	135.8		95.77	0.00	0.00		0.00		0.00		0.00	23.8
	140.0		95.27	0.50	0.00		0.00		0.00		0.00	23.8
	144.5		95.42	0.35	0.00		0.00		0.00		0.00	23.8
RWE	146.7		95.77	0.00	0.00		0.00		0.00		0.00	23.8

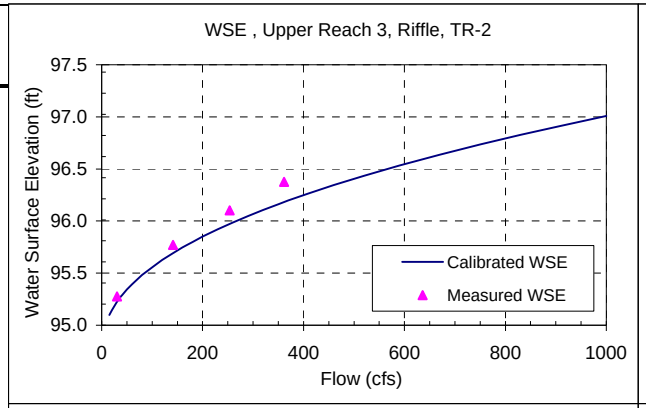
29-Jun-07

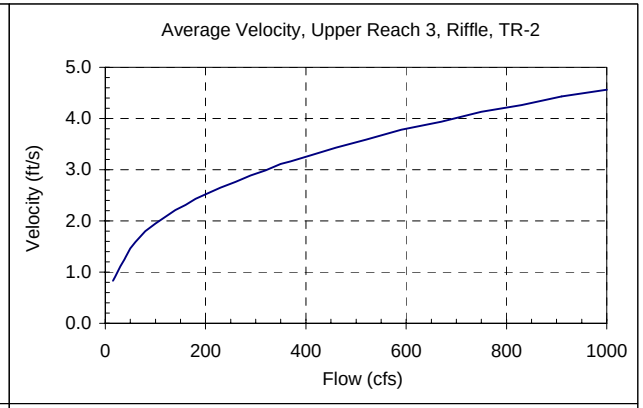
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	41.4		96.10	0.00	0.00		0.00		0.00		0.00	88.7
	42.6		95.70	0.40	0.03		0.12		0.12		0.09	88.7
	45.0		95.50	0.60	2.03		2.10		2.10		2.58	88.7
	46.7		95.60	0.50	1.17		1.22		1.22		0.52	88.7
	47.2		96.90	-0.80								88.8
	48.3		96.20	-0.10								88.9
	48.4		95.65	0.45	2.16		2.23		2.23		0.15	78.6
	48.7		95.52	0.58	2.80		2.86		2.86	25	1.95	78.6
	51.0		95.45	0.65	2.75		2.81		2.81	25	3.56	87.7
	53.0		94.75	1.35	2.22		2.29		2.29	25	4.89	86.6
	54.5		94.92	1.18	0.72		0.77		0.77		1.18	23.8
	55.6		95.30	0.80	-0.17		-0.23		-0.23		-0.23	23.9
	57.0		95.45	0.65	0.05		0.19		0.19		0.14	56.8
	57.9		95.20	0.90	-0.05		-0.19		-0.19		-0.22	23.9
	59.5		95.05	1.05	0.15		0.22		0.22		0.36	72.6
	61.0		94.53	1.57	1.28		1.34		1.34		3.15	78.6
	62.5		94.50	1.60	1.36		1.42		1.42		3.97	87.7
	64.5		94.50	1.60	3.53		3.56		3.56		11.67	87.7
	66.6		94.55	1.55	3.18		3.22		3.22		8.00	87.7
	67.7		94.48	1.62	1.36		1.42		1.42		1.95	82.8
	68.3		95.30	0.80	3.54		3.57		3.57		4.00	82.8
	70.5		94.85	1.25	1.89		1.96		1.96		4.52	87.6
	72.0		94.70	1.40	1.45		1.51		1.51		2.64	78.6
	73.0		94.25	1.85	1.85		1.92		1.92		3.54	78.6
	74.0		94.03	2.07	3.71		3.73		3.73		11.58	86.6
	76.0		93.88	2.22	3.44		3.47		3.47		15.42	67.6
	78.0		94.20	1.90	4.31		4.31		4.31		16.38	67.6
	80.0		94.23	1.87	3.17		3.21		3.21	20	11.30	56.6
	82.0		94.15	1.95	4.52		4.52		4.52	20	16.56	65.6
	84.0		94.40	1.70	4.11		4.11		4.11	20	13.13	54.6
	86.0		94.45	1.65	5.71		5.71		5.71	20	16.82	54.7
	87.8		94.55	1.55	4.62		4.62		4.62	20	10.09	58.7
	89.0		95.00	1.10	4.72		4.72		4.72	15	6.77	82.6
	90.5		94.60	1.50	5.70		5.70		5.70	15	14.45	68.6
	92.5		94.70	1.40	4.11		4.11		4.11	15	12.51	67.8
	95.0		94.85	1.25	3.73		3.75		3.75	15	9.96	65.8
	96.9		95.18	0.92	3.91		3.92		3.92	15	7.14	65.7
	99.1		95.60	0.50	5.07		5.07		5.07	15	3.80	76.6
	100.0		95.20	0.90	4.39		4.39		4.39	15	4.01	76.6
	101.2		95.30	0.80	3.1		3.15		3.15	15	4.26	76.6
	103.5		95.45	0.65	3.54		3.57		3.57		5.57	76.6
	106.0		95.60	0.50	2.9		2.95		2.95		4.06	34.6
	109.0		95.32	0.78	2.74		2.80		2.80		6.55	34.6
	112.0		95.45	0.65	2.86		2.91		2.91		4.74	34.7
	114.0		95.50	0.60	2.44		2.50		2.50		3.75	34.7
	117.0		95.35	0.75	3.59		3.62		3.62	15	7.86	34.7
	120.0		95.25	0.85	2.51		2.57		2.57	15	6.34	34.7
	123.0		95.15	0.95	3.75		3.77		3.77	15	9.68	34.7
	125.6		94.55	1.55	2.49		2.55		2.55	15	6.69	34.7
	126.5		94.40	1.70	2.45		2.51		2.51	15	2.89	54.7
	127.0		94.35	1.75	2.51		2.57		2.57	15	3.26	54.7
	128.0		94.45	1.65	2.23		2.30		2.30	15	3.84	54.7
	129.1		94.80	1.30	1.46		1.52		1.52		3.16	54.7
	131.2		95.50	0.60	0.40		0.46		0.46		0.54	23.7
	133.0		95.80	0.30	0.00		0.00		0.00		0.00	22.9
	135.8		95.60	0.50	0.00		0.00		0.00		0.00	22.9
	140.0		95.15	0.95	0.00		0.00		0.00		0.00	28.9
	144.5		95.30	0.80	0.00		0.00		0.00		0.00	28.9
	146.7		95.40	0.70	0.00		0.00		0.00		0.00	28.9
RWE	150.8		96.10	0.00	0.00		0.00		0.00		0.00	28.9

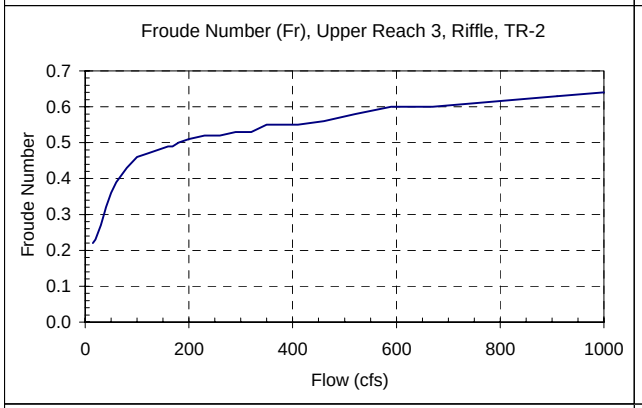


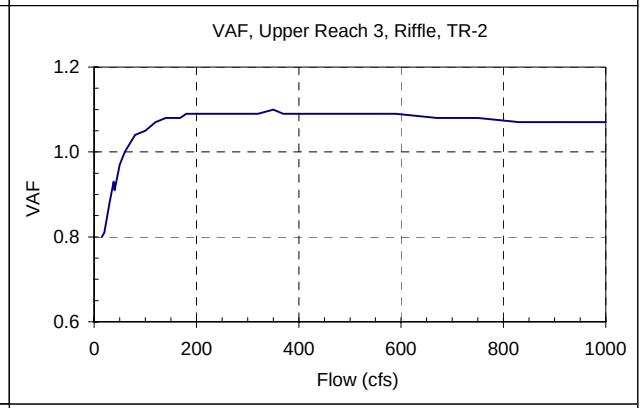
Stream: Sultan R.
Site: Upper Reach 3
Habitat: Riffle
Transect: 2

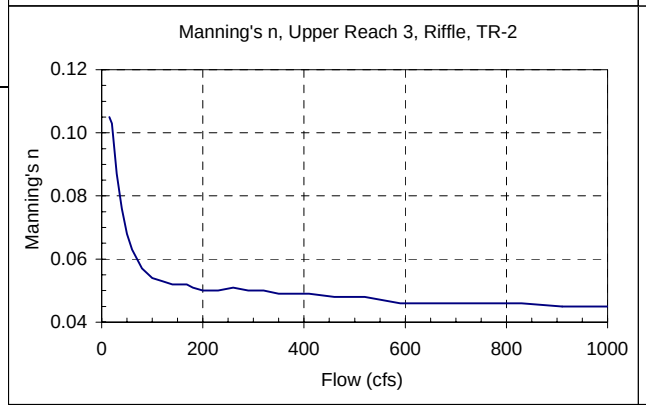
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted Perimeter (ft)
15	95.10	0.22	0.83	0.80	0.105	43.0
20	95.14	0.23	0.91	0.81	0.103	47.1
30	95.22	0.27	1.11	0.88	0.087	54.8
38.1	95.28	0.31	1.25	0.93	0.078	61.2
40	95.29	0.32	1.29	0.91	0.076	62.2
50	95.34	0.36	1.46	0.97	0.068	67.3
60	95.39	0.39	1.59	1.00	0.063	72.5
80	95.48	0.43	1.80	1.04	0.057	81.7
100	95.56	0.46	1.95	1.05	0.054	92.0
120	95.63	0.47	2.08	1.07	0.053	95.2
140	95.69	0.48	2.21	1.08	0.052	98.3
160	95.75	0.49	2.31	1.08	0.052	100.7
168.2	95.77	0.49	2.36	1.08	0.052	101.3
180	95.80	0.50	2.43	1.09	0.051	103.3
200	95.85	0.51	2.52	1.09	0.050	106.9
230	95.92	0.52	2.65	1.09	0.050	108.1
260	95.99	0.52	2.76	1.09	0.051	109.3
290	96.05	0.53	2.89	1.09	0.050	110.8
319.9	96.11	0.53	2.99	1.09	0.050	112.8
350	96.16	0.55	3.11	1.10	0.049	114.5
369.6	96.20	0.55	3.16	1.09	0.049	115.9
410	96.27	0.55	3.28	1.09	0.049	118.3
460	96.35	0.56	3.43	1.09	0.048	121.0
520	96.44	0.58	3.59	1.09	0.048	125.6
590	96.53	0.60	3.78	1.09	0.046	130.6
670	96.64	0.60	3.94	1.08	0.046	132.5
750	96.73	0.61	4.13	1.08	0.046	133.8
830	96.83	0.62	4.26	1.07	0.046	136.6
910	96.91	0.63	4.43	1.07	0.045	140.4
1000	97.01	0.64	4.56	1.07	0.045	143.7

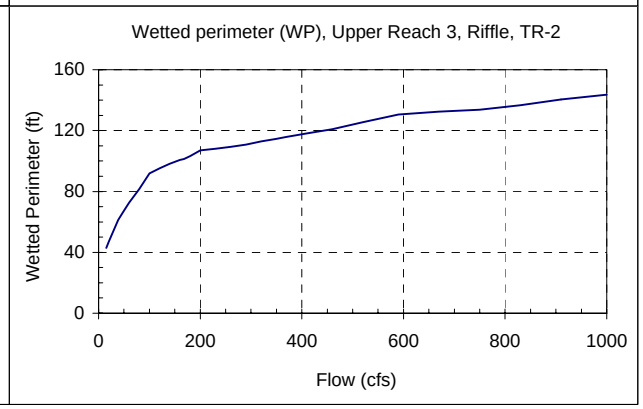


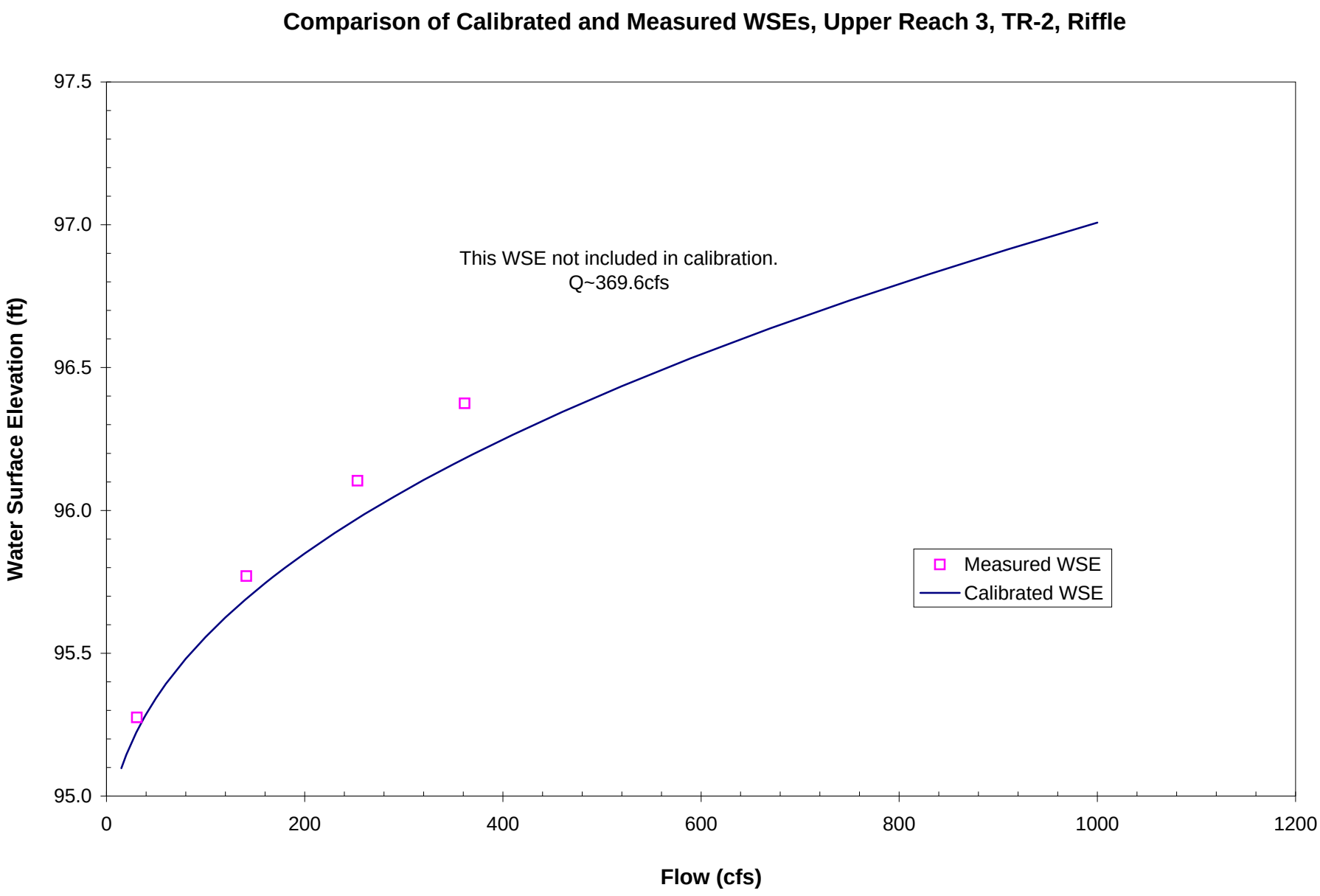











Comparison of Calibrated and Measured WSEs, Upper Reach 3, TR-2, Riffle
Water Surface Elevation (ft)
97.5
97.0
96.5
96.0
95.5
95.0
0
200
400
600
800
1000
1200
Flow (cfs)
This WSE not included in calibration.
Q~369.6cfs
Measured WSE
Calibrated WSE

Stream: Sultan River
Site: Upper Reach 3

Date: 6/27/2007 **Transect:** TR1
Habitat: Cascade **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.38	101.38		100.00
HP1			2.00	99.38
HP2			1.57	99.81
TP				
HP2	1.46	101.27		99.81
HP1			1.88	99.39
BM			1.27	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWE	17.6		101.27	7.39	0.00	93.88	93.81	
WSE	22.7			7.43	0.00	93.84		
WSE	25.5			7.71	0.00	93.56		45.2
WSE	39.0			7.38	0.00	93.89		
RWE				7.37	0.00	93.90		

Note: WSE at Sta=25.5 is too low, outlier Ave Q= 45.2

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s						
d/s						

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/28/2007
Habitat: Cascade **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.34	101.34		100.00
HP1			1.96	99.38
HP2			1.53	99.81
TP				
HP2	1.41	101.22		99.81
HP1			1.84	99.38
BM			1.22	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	19		101.22	6.89	0.00	94.33	94.68	
	34			6.92	0.00	94.30		
	43			6.45	0.00	94.77		158.4
	53			6.57	0.00	94.65		
RWS	80			6.49	0.00	94.73		
	87			5.93	0.00	95.29		

Ave Q= 158.4

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	60		101.22	4.63	0.00	96.59
d/s	-65		101.22	8.86	0.00	92.36

Note:
WSE slope = 3.4%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 6/29/2007
Habitat: Cascade **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.01	101.01		100.00
HP1			1.63	99.38
HP2			1.20	99.81
TP				
HP2	1.30	101.11	1.73	99.81
HP1			1.73	99.38
BM			1.11	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	19	43	101.11	7.39	1.23	94.95	95.10	
LWS	32			8.93	2.68	94.86		344.7
MWS	43			7.78	2.05	95.38		
RWS	78			7.59	1.68	95.20		

Ave Q= 344.7

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s						
d/s						

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A

Date: 10/19/2007
Habitat: Cascade **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM				100.00
HP1				0.00
HP2				0.00
TP				
HP2				0.00
HP1				0.00
BM				0.00

Comment: No level loop was shot

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			101.49	6.33	0.00	95.16	95.31	
MWS				6.04	0.00	95.45		

Ave Q= 361.4

Note: Unable to cross river only LWS elevation was shot, measurement completed at ~12:10

WSE slope = NA

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s						
d/s						

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:

Stream: Sultan River
Site: Upper Reach 3
Transect: 1
Habitat: Cascade

Survey Date	HI (ft)	Q (cfs)
6/27/2007	101.27	45.2
6/28/2007	101.22	158.4
6/29/2007	101.11	344.7

27-Jun-07

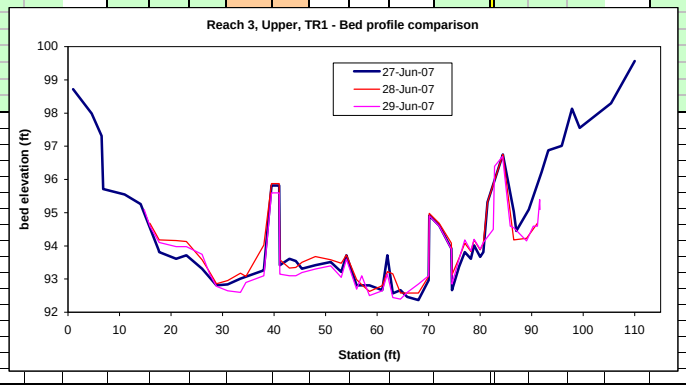
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWP	1.0	2.55	98.72									81.6
	4.6	3.28	97.99									81.6
	6.5	3.96	97.31									81.6
	6.8	5.56	95.71									81.6
	11.0	5.72	95.55									32.6
	14.1	6.01	95.26									43.6
	17.6	7.39	93.88									23.6
LWE	17.7		93.81	0.00	0.00		0.00		0.00		0.00	23.6
	21.0		93.61	0.20	0.01		0.02		0.02		0.01	54.7
	23.0		93.71	0.10	0.02		0.05		0.05	75	0.00	54.7
	26.0		93.31	0.50	0.26		0.34		0.34		0.50	43.7
	28.8		92.81	1.00	0.58		0.66		0.66		1.64	72.6
	31.0		92.83	0.98	0.13		0.22		0.22		0.50	23.9
	33.5		93.01	0.80	0.41		0.50		0.50	70	0.47	62.6
	38.0		93.26	0.55	1.25		1.31		1.31	80	0.28	86.8
	39.5		95.81	-2.00								88.9
	41.0		95.81	-2.00								88.9
	41.1		93.41	0.40	1.30		1.36		1.36		0.52	85.8
	43.0		93.61	0.20	2.20		2.26		2.26		0.70	54.6
	44.2		93.54	0.27	0.15		0.23		0.23		0.08	32.6
	45.4		93.31	0.50	2.09		2.15		2.15		2.05	54.6
	48.0		93.41	0.40	2.32		2.38		2.38		2.66	45.6
	51.0		93.51	0.30	1.49		1.55		1.55		1.16	65.6
	53.0		93.21	0.60	2.05		2.11		2.11		1.90	86.8
	54.0		93.71	0.10	1.18		1.23		1.23		0.19	88.9
	56.0		92.81	1.00	3.40		3.43		3.43		7.73	87.6
	58.5		92.81	1.00	3.07		3.10		3.10		7.76	87.6
	61.0		92.66	1.15	2.05		2.11		2.11		4.26	85.8
	62.0		93.71	0.10	0.75		0.81		0.81		0.08	88.9
	63.0		92.56	1.25	0.90		0.95		0.95		1.49	85.8
	64.5		92.66	1.15	2.20		2.26		2.26		3.64	78.6
	65.8		92.46	1.35	1.69		1.75		1.75		4.15	78.6
	68.0		92.36	1.45	0.01		0.02		0.02		0.07	82.8
	70.0		92.96	0.85	0.64		0.71		0.71		0.60	85.8
	70.1		94.91	-1.10								85.9
	72.0		94.61	-0.80								85.9
	74.4		93.91	-0.10								85.9
	74.5		92.66	1.15	2.77		2.81		2.81		2.27	87.8
	75.9		93.36	0.45	0.47		0.55		0.55		0.31	87.7
	77.0		93.81	0.00	0.00		0.00		0.00		0.00	87.9
	78.2		93.61	0.20	1.49		1.55		1.55		0.19	87.8
	78.8		94.01	-0.20								87.9
	80.0		93.66	0.15	0.05		0.11		0.11		0.01	87.8
RWE	80.6		93.81	0.00	0.00		0.00		0.00		0.00	87.8
	81.4	5.95	95.32									87.8
	84.4	4.52	96.75									87.8
	86.5	6.23	95.04									87.8
	87.0	6.82	94.45									87.8
	89.4	6.18	95.09									88.9
	91.9	5.05	96.22									88.9
	93.2	4.39	96.88									88.9
	95.8	4.26	97.01									88.9
	97.8	3.14	98.13									88.9
	99.3	3.72	97.55									88.9
RWP	105.4	2.98	98.29									88.9
	110.0	1.70	99.57									88.9

28-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	15.9		94.68	0.00	0.00		0.00		0.00		0.00	23.6
	17.7		94.18	0.50	0.34		0.42		0.42		0.54	23.6
	21.0		94.16	0.52	1.93		2.00		2.00		2.75	54.7
	23.0		94.13	0.55	1.14		1.19		1.19		1.64	54.7
	26.0		93.58	1.10	0.55		0.63		0.63		1.55	43.7
	27.5		93.21	1.47	1.65		1.71		1.71		3.53	72.6
	28.8		92.86	1.82	1.64		1.70		1.70		5.43	72.6
	31.0		92.96	1.72	0.66		0.73		0.73		2.94	23.9
	33.5		93.18	1.50	2.64		2.69		2.69	60	3.53	62.6
	34.5		93.08	1.60	2.18		2.24		2.24	60	4.04	62.6
	38.0		94.03	0.65	4.52		4.57		4.57	50	3.34	88.9
	39.5		95.88	-1.20								88.9
	41.0		95.88	-1.20								85.8
	41.1		93.58	1.10	1.45		1.51		1.51		1.58	54.6
	43.0		93.33	1.35	2.68		2.73		2.73		5.71	32.6
	44.2		93.35	1.33	3.41		3.44		3.44		5.50	32.6
	45.4		93.51	1.17	3.15		3.18		3.18		7.07	54.6
	48.0		93.68	1.00	4.10		4.14		4.14		11.59	45.6
	51.0		93.58	1.10	3.00		3.04		3.04		8.35	65.6
	53.0		93.48	1.20	4.00		4.04		4.04		7.27	86.8
	54.0		93.73	0.95	4.51		4.56		4.56		6.49	88.9
	56.0		92.98	1.70	4.38		4.42		4.42		11.28	87.6
	57.0		92.83	1.85	3.25		3.28		3.28		7.59	87.6
	58.5		92.63	2.05	2.72		2.77		2.77	45	8.02	87.6
	61.0		92.80	1.88	2.42		2.48		2.48		8.14	85.8
	62.0		93.23	1.45	2.78		2.82		2.82		4.10	88.9
	63.0		93.16	1.52	1.77		1.84		1.84		3.49	85.8
	64.5		92.58	2.10	2.77		2.81		2.81		8.28	78.6
	65.8		92.58	2.10	3.17		3.20		3.20		8.40	78.6
	67.0		92.58	2.10	0.26		0.34		0.34	30	0.69	78.6
	68.0		92.58	2.10	0.26		0.34		0.34		1.08	82.8
	70.0		93.08	1.60	0.47		0.55		0.55		0.88	85.8
	70.1		94.98	-0.30								85.9
	72.0		94.68	0.00	0.00		0.00		0.00		0.00	85.9
	74.4		94.08	0.60	3.86		3.90		3.90	45	2.07	85.9
	74.5		93.13	1.55	4.19		4.23		4.23		4.92	87.8
	75.9		93.63	1.05	1.14		1.19		1.19		1.57	87.7
	77.0		94.08	0.60	1.21		1.27		1.27		0.87	87.9
	78.2		93.83	0.85	1.96		2.03		2.03		1.55	87.8
	78.8		94.18	0.50	1.92		1.99		1.99		0.89	87.9
	80.0		93.88	0.80	1.53		1.59		1.59		1.15	87.8
	80.6		94.08	0.60	0.95		1.00		1.00		0.18	87.8
	81.4		95.32									87.8
	84.4		96.75									87.8
	86.5		94.18	0.50	0.05		0.11		0.11		0.07	87.8
	89.0		94.23	0.45	0.23		0.32		0.32		0.33	88.9
RWE	91.1		94.68	0.00	0.00		0.00		0.00		0.00	88.9

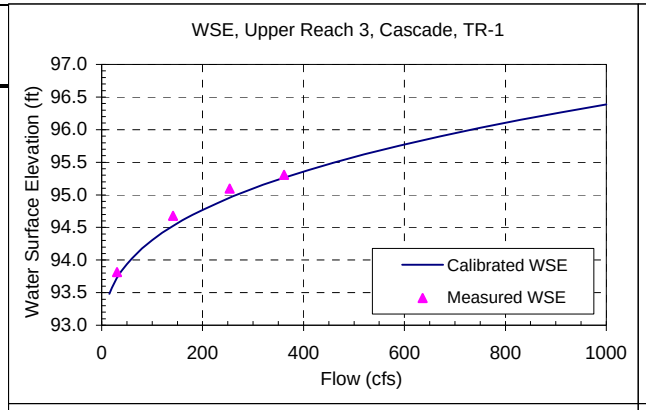
29-Jun-07

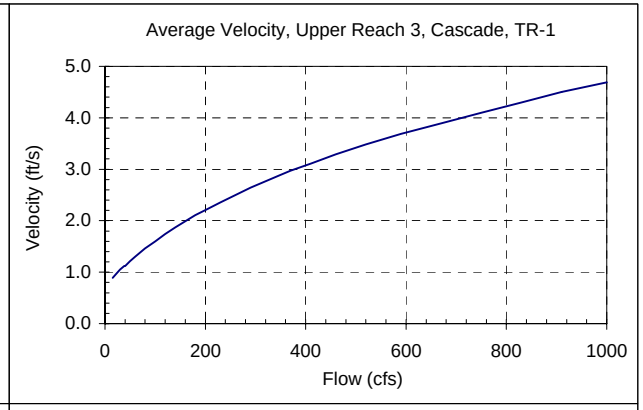
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	14.8		95.10	0.00	0.00		0.00		0.00		0.00	43.6
	15.9		94.60	0.50	0.01		0.04		0.04		0.03	23.6
	17.7		94.10	1.00	2.49		2.55		2.55		6.51	23.6
	21.0		93.98	1.12	4.22		4.22		4.22		12.52	54.7
	23.0		93.98	1.12	2.26		2.33		2.33		6.51	43.7
	26.0		93.75	1.35	1.63		1.69		1.69		5.14	72.6
	27.5		93.15	1.95	2.83		2.89		2.89		7.88	72.6
	28.8		92.78	2.32	1.90		1.97		1.97		7.98	62.6
	31.0		92.65	2.45	1.76		1.83		1.83	30	9.10	23.9
	33.5		92.60	2.50	5.77	1.16	5.77	1.21	3.49	45	10.80	62.6
	34.5		92.90	2.20	5.27		5.27		5.27		26.09	62.6
	38.0		93.10	2.00	0.85		0.90		0.90	80	0.55	86.8
	39.5		95.60	-0.50								88.9
	41.0		95.60	-0.50								88.9
	41.1		93.15	1.95	1.86		1.93		1.93		3.57	85.8
	43.0		93.10	2.00	3.59		3.62		3.62		11.21	54.6
	44.2		93.10	2.00	3.82		3.83		3.83		9.20	32.6
	45.4		93.20	1.90	3.36		3.40		3.40		12.26	54.6
	48.0		93.30	1.80	4.31		4.31		4.31		21.72	45.6
	51.0		93.40	1.70	3.59		3.62		3.62		15.37	65.6
	53.0		93.05	2.05	4.29		4.29		4.29		13.19	86.8
	54.0		93.60	1.50	5.26		5.26		5.26		11.84	88.9
	56.0		92.70	2.40	4.51		4.51		4.51		16.24	87.6
	57.0		93.10	2.00	3.83		3.84		3.84		9.61	87.6
	58.5		92.50	2.60	3.56	2.78	3.59	2.84	3.21		16.70	87.6
	61.0		92.65	2.45	4.67		4.67		4.67		20.02	85.8
	62.0		93.15	1.95	4.76		4.76		4.76	15	8.97	88.9
	63.0		92.45	2.65	2.22		2.29		2.29		7.57	85.8
	64.5		92.40	2.70	3.56		3.59		3.59		13.56	78.6
	65.8		92.60	2.50	3.66		3.68		3.68		16.11	78.6
	68.0		92.85	2.25	1.48		1.54		1.54		7.28	82.8
	70.0		93.10	2.00	0.60		0.66		0.66		1.38	85.8
	70.1		94.90	0.20	5.93		5.93		5.93		1.19	85.9
	72.0		94.60	0.50	5.63		5.63		5.63		6.05	85.9
	74.4		93.90	1.20	3.87		3.88		3.88		5.82	85.9
	74.5		92.85	2.25	4.09		4.09		4.09		6.90	87.8
	75.9		93.60	1.50	1.76		1.83		1.83		3.42	87.7
	77.0		94.18	0.92	1.95		2.02		2.02		2.13	87.9
	78.2		93.85	1.25	2.87		2.92		2.92		3.29	87.8
	78.8		94.20	0.90	1.99		2.06		2.06		1.67	87.9
	80.0		93.90	1.20	1.69		1.75		1.75		1.89	87.8
	80.6		94.10	1.00	0.43		0.49		0.49		0.61	87.8
	82.5		94.50	0.60	1.06		1.11		1.11		0.63	87.8
	82.8		96.40	-1.30								87.8
	84.3		96.70	-1.60								87.8
	85.8		94.60	0.50	1.46		1.52		1.52		0.27	87.8
	86.5		94.55	0.55	1.39		1.45		1.45		1.28	87.8
	89.0		94.15	0.95	0.29		0.35		0.35		0.63	88.9
	90.3		94.60	0.50	0.00		0.00		0.00		0.00	88.9
	91.1		94.60	0.50	0.17		0.23		0.23		0.05	88.9
	91.5		95.40	-0.30								88.9
RWE	91.6		95.10	0.00	0		0.00		0.00		0.00	88.9

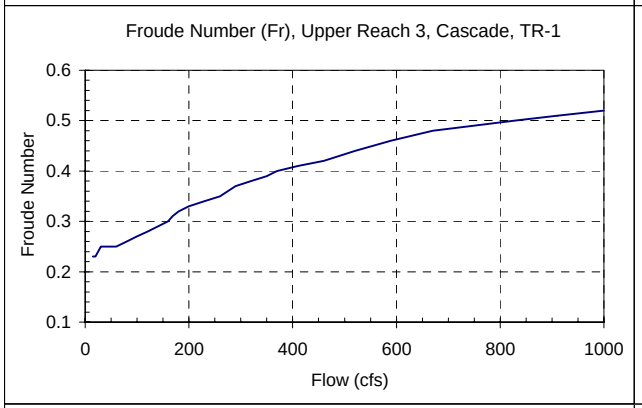


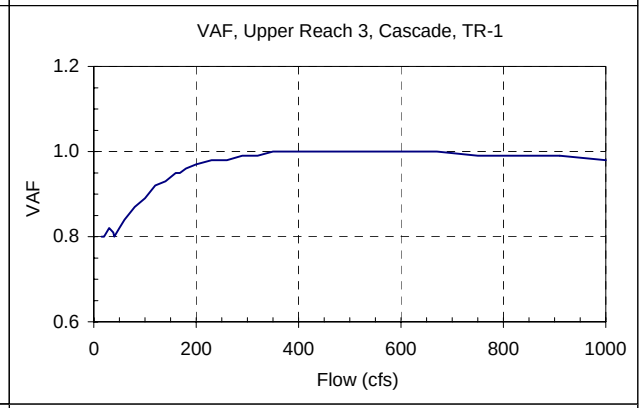
Stream: Sultan River
Site: Upper Reach 3
Habitat: Cascade
Transect: 1

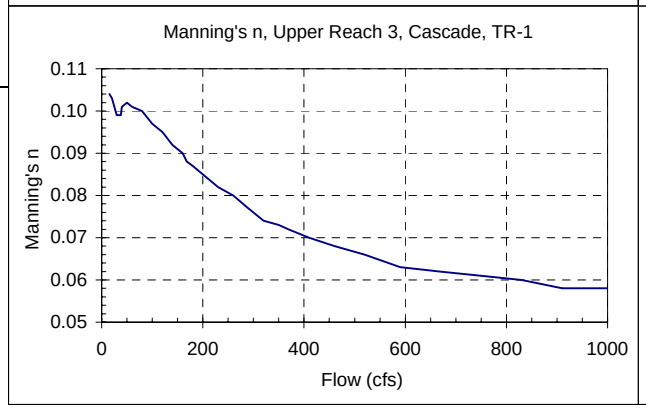
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted Perimeter (ft)
15	93.48	0.23	0.89	0.80	0.104	38.8
20	93.57	0.23	0.94	0.80	0.103	45.5
30	93.72	0.25	1.05	0.82	0.099	55.4
38.1	93.82	0.25	1.12	0.81	0.099	59.3
40	93.84	0.25	1.12	0.80	0.101	59.7
50	93.94	0.25	1.21	0.82	0.102	61.0
60	94.03	0.25	1.30	0.84	0.101	62.3
80	94.18	0.26	1.46	0.87	0.100	63.9
100	94.31	0.27	1.60	0.89	0.097	65.2
120	94.42	0.28	1.74	0.92	0.095	66.3
140	94.52	0.29	1.87	0.93	0.092	67.3
160	94.61	0.30	1.99	0.95	0.090	68.2
168.2	94.64	0.31	2.04	0.95	0.088	68.6
180	94.69	0.32	2.11	0.96	0.087	69.3
200	94.77	0.33	2.21	0.97	0.085	70.9
230	94.88	0.34	2.36	0.98	0.082	73.0
260	94.98	0.35	2.50	0.98	0.080	74.4
290	95.07	0.37	2.64	0.99	0.077	77.2
319.9	95.15	0.38	2.77	0.99	0.074	79.3
350	95.23	0.39	2.89	1.00	0.073	80.1
369.6	95.28	0.40	2.97	1.00	0.072	80.8
410	95.38	0.41	3.11	1.00	0.070	82.6
460	95.49	0.42	3.29	1.00	0.068	84.6
520	95.62	0.44	3.48	1.00	0.066	88.0
590	95.75	0.46	3.69	1.00	0.063	91.4
670	95.90	0.48	3.89	1.00	0.062	94.0
750	96.03	0.49	4.10	0.99	0.061	94.8
830	96.15	0.50	4.30	0.99	0.060	95.5
910	96.26	0.51	4.50	0.99	0.058	96.2
1000	96.39	0.52	4.69	0.98	0.058	97.1

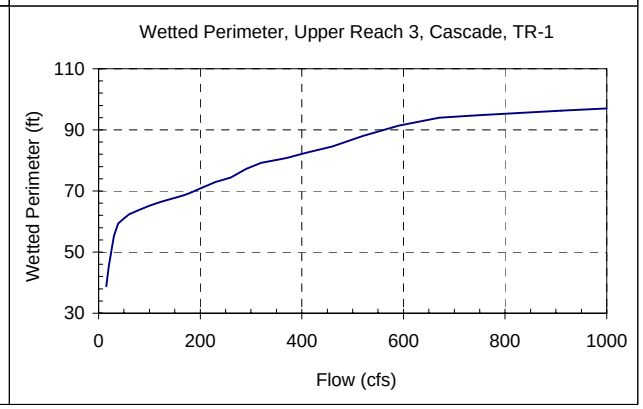


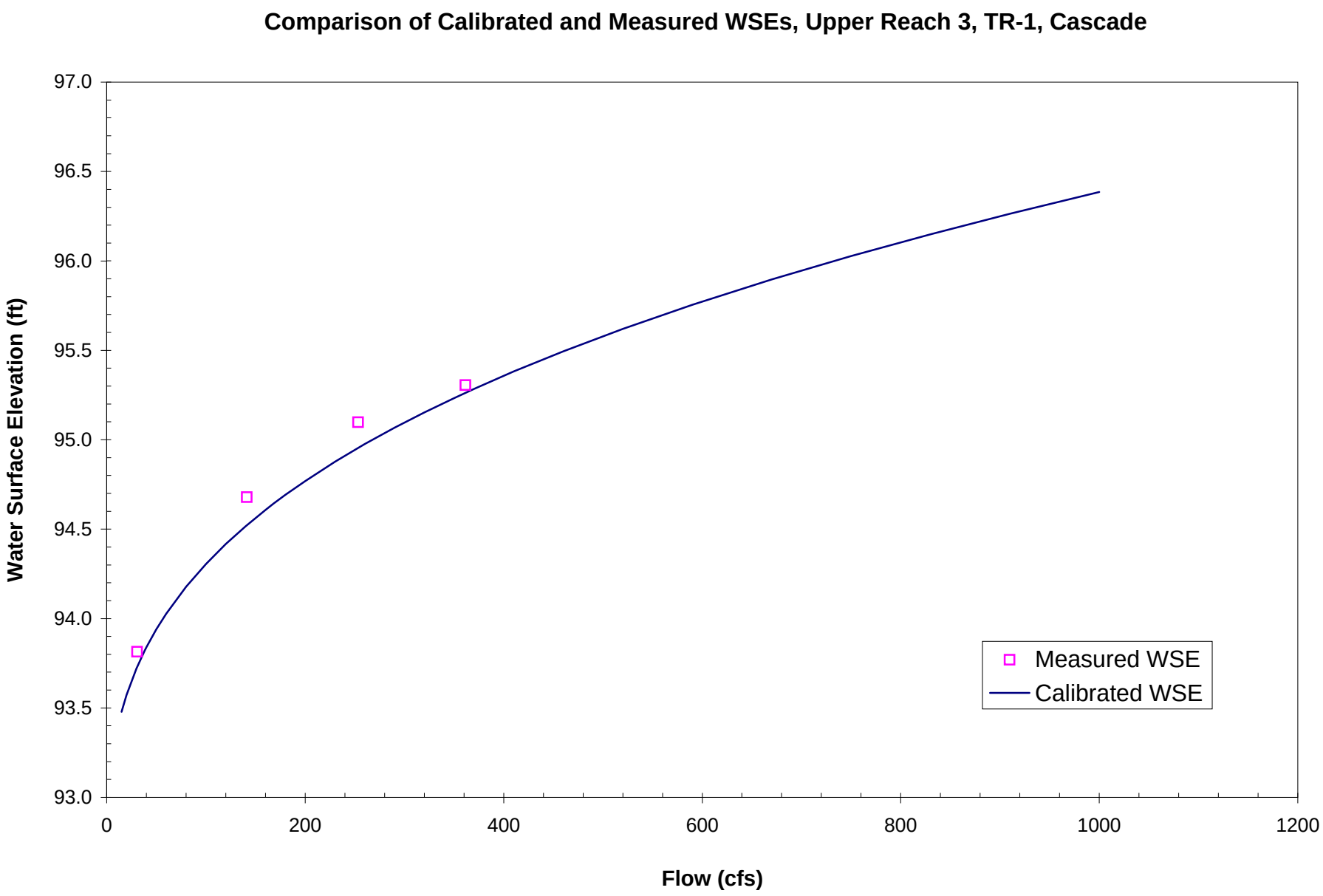











Comparison of Calibrated and Measured WSEs, Upper Reach 3, TR-1, Cascade
Water Surface Elevation (ft)
97.0
96.5
96.0
95.5
95.0
94.5
94.0
93.5
93.0
0
200
400
600
800
1000
1200
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Lower Reach 3

Date: 6/27/2007 **Transect:** TR7
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM6	4.14	104.14		100.00
HP6			3.71	100.43
BM7			5.09	99.05
HP7			6.50	97.64
TP				
HP7	6.45	104.09		
HP6			3.67	100.42
BM7			5.04	99.05
BM6			4.09	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	14.0		104.09	10.88	0.00	93.21	93.23	
CWSE	88.0			10.85	0.00	93.24		61.1
RWSE	143.0			10.85	0.00	93.24		

Ave Q= 61.1

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4B

Date: 6/28/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM6	4.12	104.12		100.00
HP6			3.69	100.43
BM7			5.06	99.06
HP7			6.46	97.66
TP				
HP1	6.30	103.96		
HP6			3.53	100.43
BM7			4.90	99.06
BM6			3.96	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	12.0		103.96	10.21	0.00	93.75	93.81	
CWSE	88.0			10.14	0.00	93.82		175.5
RWSE	145.0			10.10	0.00	93.86		

Ave Q= 175.5

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A

Date: 6/29/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM6	4.03	104.03		100.00
HP6			3.60	100.43
HP7			6.38	97.65
BM7			4.97	99.06
TP				
HP7	4.94	104.00		
HP6			3.57	100.43
HP7			6.35	97.65
BM6			4.00	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			104.00	9.85	0.00	94.15	94.19	
RWSE				9.78	0.00	94.22		

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	100		104.00	9.60	0.00	94.40
d/s	-50		104.00	9.98	0.00	94.02

Ave Q=

Note:

WSE slope = 0.253%

Date: 10/19/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM6	3.98	103.98		100.00
HP6			3.54	100.44
HP7				
BM7				
TP				
HP7				
HP6				
HP7				
BM6				

Comment: 1/2 level loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			103.98	9.52	0.00	94.46	94.50	
RWSE				9.45	0.00	94.53		

Ave Q=

Note: Water surface measurements made at ~12:40

Stream: Sultan R.
Site: Lower Reach 3
Transect: 1
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
6/26/2007	104.24	
6/27/2007	104.09	61.1
6/28/2007	103.96	175.5
6/29/2007	104.00	

27-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-6.0	7.20	97.04									11.90
LWP	1.0	9.24	95.00									15.60
	9.0	9.68	94.56									21.85
LWE	12.0		93.23	0.00	0.00		0.00		0.00		0.00	34.60
	18.6		92.63	0.60	0.28		0.35		0.35	10.0	0.68	28.60
	20.0		94.13	-0.90								88.90
	22.2		92.13	1.10	0.00		0.00		0.00		0.00	87.90
	26.0		92.25	0.98	0.08	0.14	0.22	0.25	0.23		0.69	86.90
	28.2		92.03	1.20	0.12		0.25		0.25		0.33	86.95
	29.0		93.83	-0.60								88.90
	33.1		92.23	1.00	0.35		0.41		0.41	10	0.80	86.95
	37.1		91.50	1.73	0.21		0.30		0.30		1.52	86.95
	39.0		90.93	2.30	0.26		0.34		0.34		3.43	82.60
	46.0		90.53	2.70	0.04	0.52	0.13	0.56	0.34		5.08	28.75
	50.0		90.23	3.00	0.23	0.08	0.32	0.22	0.27		4.01	82.65
	56.0		91.18	2.05	0.32		0.38		0.38	10	4.65	26.60
	62.0		91.63	1.60	0.35		0.41		0.41	10	3.84	84.80
	68.0		91.78	1.45	0.17		0.27		0.27	10	2.43	84.60
	74.5		92.13	1.10	0.57		0.60		0.60	10	3.69	48.70
	79.3		90.78	2.45	0.56		0.59		0.59		7.64	88.90
	85.0		91.33	1.90	0.60		0.63		0.63	10	6.11	32.55
	89.7		91.73	1.50	0.09		0.23		0.23		2.08	36.60
	97.3		92.63	0.60	0.43		0.48		0.48	10	1.87	87.90
	103.0		92.33	0.90	0.51		0.55		0.55	10	2.83	85.65
	109.0		91.53	1.70	0.20		0.29		0.29	45	2.12	87.60
	115.0		91.88	1.35	0.09		0.23		0.23	30	1.18	56.55
	118.0		91.73	1.50	0.44		0.48		0.48		2.18	82.60
	121.0		91.93	1.30	0.00		0.00		0.00		0.00	82.60
	129.0		92.68	0.55	0.29		0.36		0.36		1.38	28.55
	135.0		92.33	0.90	0.23		0.32		0.32	10	1.82	82.55
	142.0		92.53	0.70	0.12		0.25		0.25		0.73	83.70
	143.3		93.19	0.04	0.09		0.23		0.23		0.01	85.80
RWE	145.0		93.23	0.00	0.00		0.00		0.00		0.00	25.55
	148.0	9.66	94.58									62.60
	153.0	9.64	94.60									24.70
	158.0	9.83	94.41									21.70
	163.0	9.50	94.74									21.85
	168.0	8.44	95.80									82.55
RWP	174.7	7.93	96.31									11.90
	180.0	7.60	96.64									11.90
	185.0	5.40	98.84									11.90

Bank Surveyed on 6/26/07

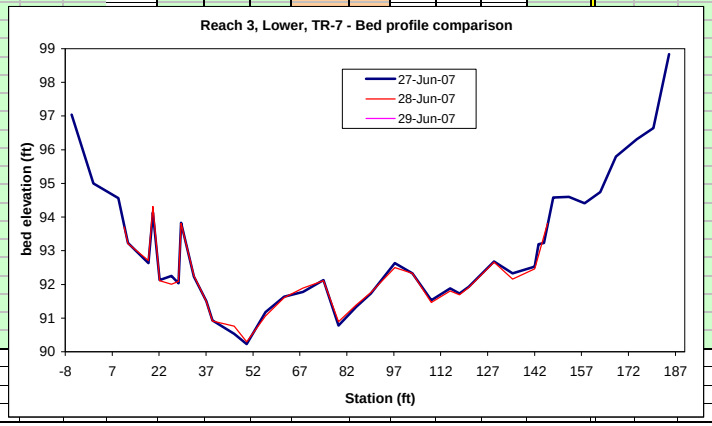
Bank Surveyed on 6/26/07

28-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	10.8		93.71	0.10	0.00		0.00		0.00		0.00	34.6
	12.0		93.21	0.60	0.06		0.18		0.18		0.43	34.6
	18.6		92.71	1.10	1.30		1.35		1.35	70	1.68	28.6
	20.0		94.31	-0.50								88.9
	22.2		92.11	1.70	0.03		0.11		0.11	45	0.25	87.9
	26.0		92.01	1.80	0.34		0.39		0.39	30	1.82	86.9
	28.2		92.09	1.72	0.78		0.83		0.83	5	1.57	87.0
	29.0		93.81	0.00								88.9
	33.1		92.26	1.55	0.89		0.94		0.94		2.93	87.0
	37.1		91.49	2.32	0.45		0.49		0.49		3.35	87.0
	39.0		90.91	2.90	0.57		0.62		0.62		7.95	82.6
	46.0		90.76	3.05	1.12		1.17		1.17		19.61	28.8
	50.0		90.29	3.52	0.40		0.44		0.44		7.77	82.7
	56.0		91.06	2.75	0.65		0.70		0.70	20	10.85	26.6
	62.0		91.61	2.20	1.06		1.11		1.11		14.67	84.8
	68.0		91.89	1.92	0.24		0.31		0.31		3.70	84.6
	74.5		92.11	1.70	0.87		0.92		0.92		8.88	48.7
	79.3		90.89	2.92	0.97		1.02		1.02	5	15.64	88.9
	85.0		91.39	2.42	0.75		0.80		0.80	10	9.96	32.6
	89.7		91.76	2.05	0.16		0.26		0.26	10	3.20	36.6
	97.3		92.50	1.31	1.60		1.66		1.66		14.45	87.9
	103.0		92.33	1.48	1.40		1.45		1.45	5	12.54	85.7
	109.0		91.46	2.35	0.19		0.28		0.28		3.94	87.6
	115.0		91.81	2.00	0.51		0.55		0.55		4.98	56.6
	118.0		91.69	2.12	0.43		0.47		0.47		2.98	82.6
	121.0		91.91	1.90	0.19		0.28		0.28		2.92	82.6
	129.0		92.66	1.15	0.91		0.96		0.96	10	7.65	28.6
	135.0		92.16	1.65	0.57		0.62		0.62	10	6.51	82.6
	142.0		92.46	1.35	0.79		0.84		0.84		4.73	83.7
	143.3		92.86	0.95	0.21		0.29		0.29		0.56	85.8
RWE	146.1		93.81	0.00	0.00		0.00		0.00		0.00	25.6

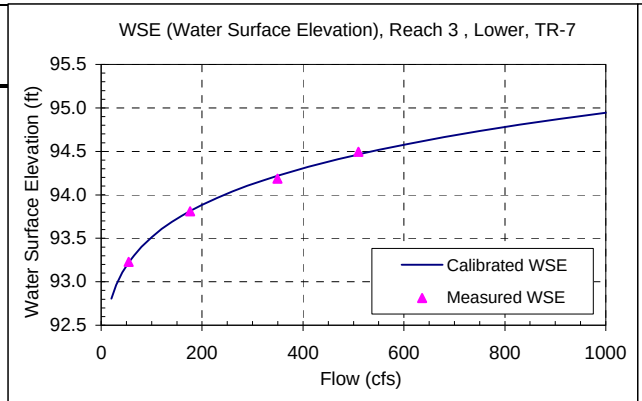
29-Jun-07

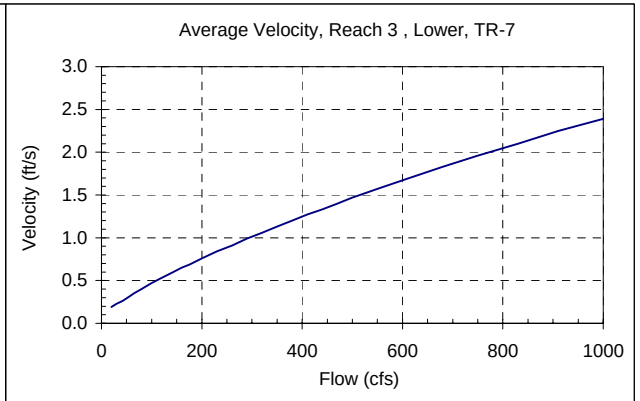
	Sta (ft)	FS (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate

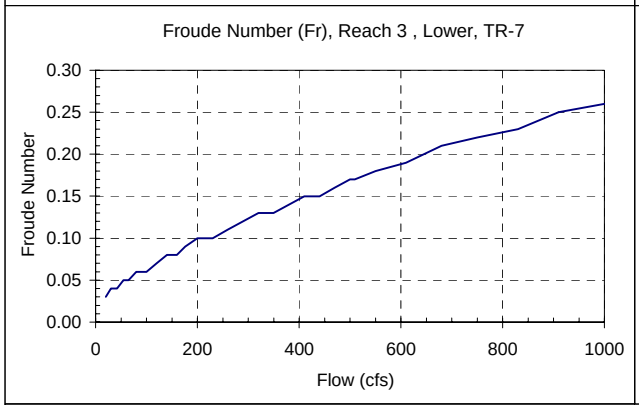


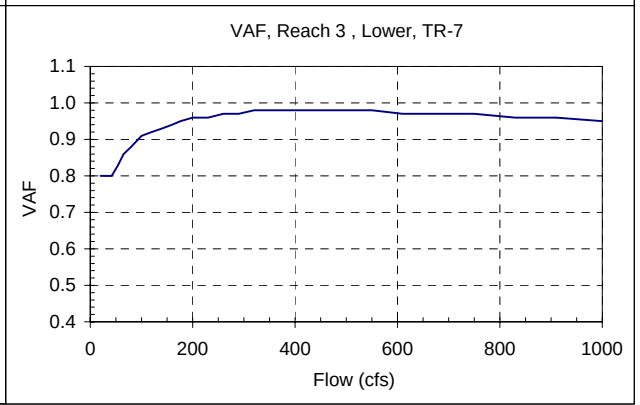
Stream: Sultan R.
Site: Lower Reach 3
Habitat: Riffle
Transect: 7

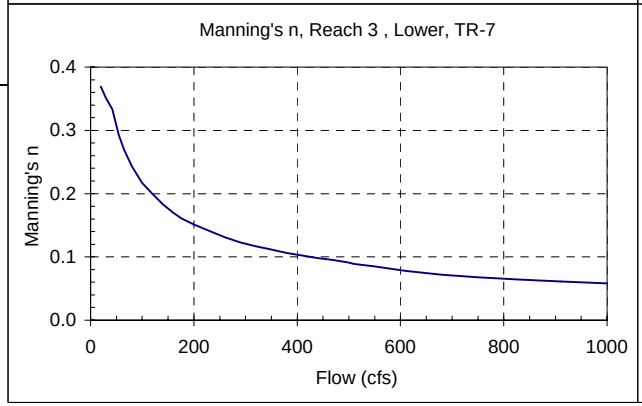
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
20	92.81	0.03	0.19	0.80	0.369	117.9
30	92.97	0.04	0.23	0.80	0.351	123.3
42	93.11	0.04	0.26	0.80	0.333	127.7
54.6	93.22	0.05	0.31	0.83	0.293	131.3
65	93.30	0.05	0.35	0.86	0.269	132.7
80	93.40	0.06	0.40	0.88	0.243	133.9
100	93.51	0.06	0.47	0.91	0.217	135.2
120	93.61	0.07	0.53	0.92	0.199	136.4
140	93.69	0.08	0.59	0.93	0.183	137.3
160	93.76	0.08	0.65	0.94	0.170	138.2
176.0	93.81	0.09	0.69	0.95	0.161	138.7
200	93.88	0.10	0.76	0.96	0.151	139.3
230	93.97	0.10	0.84	0.96	0.141	140.0
260	94.04	0.11	0.91	0.97	0.131	140.6
290	94.10	0.12	0.99	0.97	0.123	141.0
320	94.16	0.13	1.06	0.98	0.117	141.4
349.5	94.22	0.13	1.13	0.98	0.112	141.7
380	94.27	0.14	1.20	0.98	0.106	141.9
410	94.32	0.15	1.27	0.98	0.102	142.2
440	94.37	0.15	1.33	0.98	0.098	142.4
470	94.41	0.16	1.40	0.98	0.095	142.6
500	94.45	0.17	1.47	0.98	0.091	144.4
509.6	94.46	0.17	1.49	0.98	0.089	144.9
550	94.52	0.18	1.57	0.98	0.085	147.7
610	94.59	0.19	1.69	0.97	0.078	153.9
680	94.66	0.21	1.83	0.97	0.072	159.0
750	94.73	0.22	1.96	0.97	0.068	161.3
830	94.81	0.23	2.10	0.96	0.064	163.3
910	94.87	0.25	2.25	0.96	0.061	164.6
1000	94.95	0.26	2.39	0.95	0.058	166.5

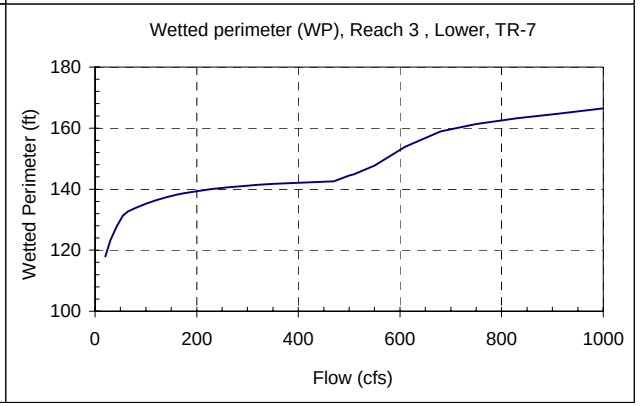


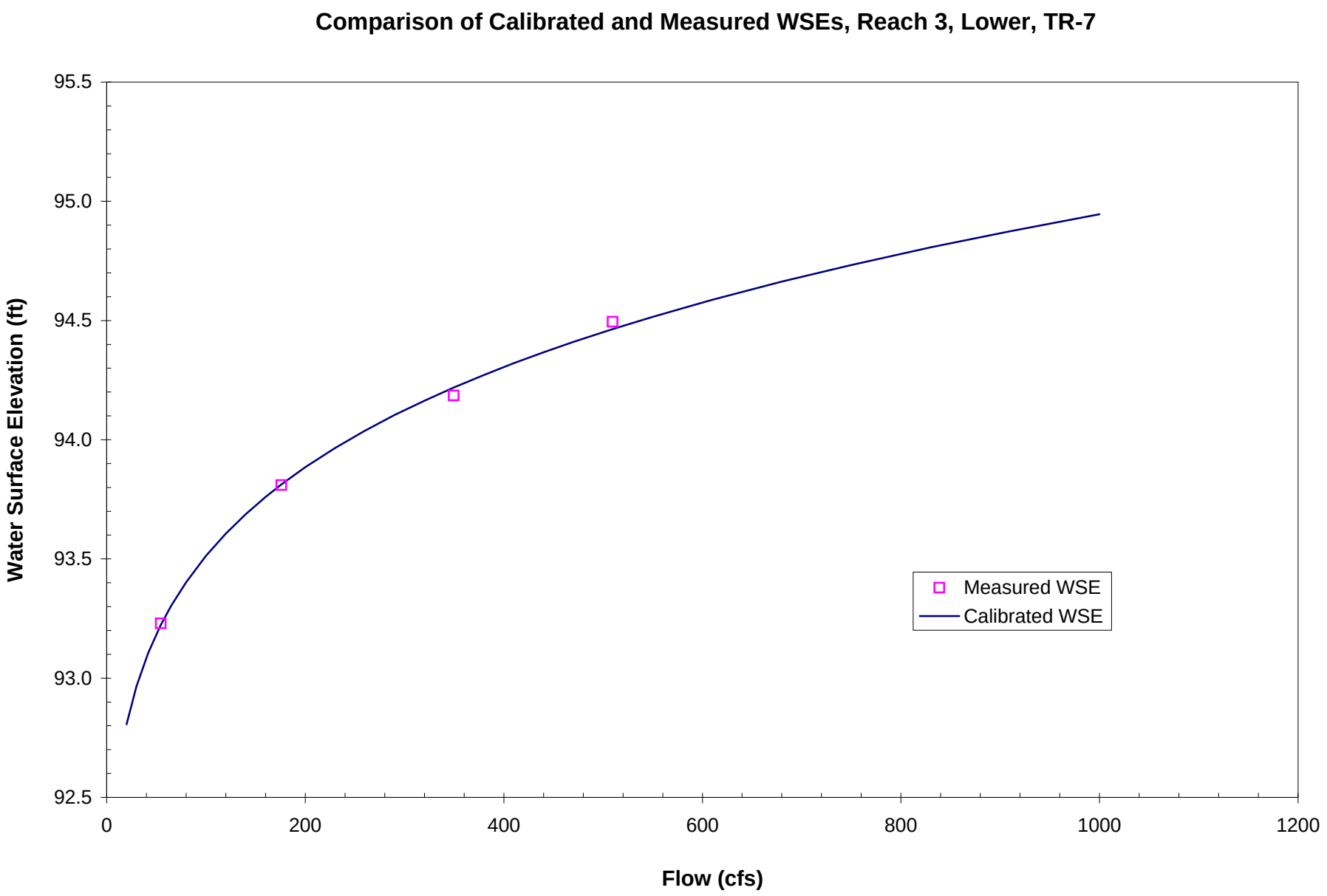











Comparison of Calibrated and Measured WSEs, Reach 3, Lower, TR-7
Water Surface Elevation (ft)
95.5
95.0
94.5
94.0
93.5
93.0
92.5
0
200
400
600
800
1000
1200
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Lower Reach 3
Date: 6/27/2007 **Transect:** TR6
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM6	4.14	104.14		100.00
HP6			3.71	100.43
BM7			5.09	99.05
HP7	6.45		6.50	97.64
TP				
HP7	6.45	104.09		
HP6			3.67	100.42
BM7			5.04	99.05
BM6			4.09	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	33.0		104.09	10.95	0.00	93.14	92.75	
	72.0			11.13	0.00	92.96		72.0
	142.0			11.93	0.00	92.16		
RWSE	180.0			11.64	0.00	92.45		

Note: Note: most water flowing between Sta=33 and Sta=143
Sta=180 has no flows, WSE not representative

Ave Q= 72.0

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4B

(4) 6/26/07 Level Loop Survey (BM & HP). Bank Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM6	4.25	104.25		100.00
HP6			3.82	100.43
TP				
HP6	3.81	104.24		
BM6			4.24	100.00

Comment:

Date: 6/28/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM6	4.12	104.12		100.00
HP6			3.69	100.43
BM7			5.06	99.06
HP7			6.46	97.66
TP				
HP7	6.30	103.96		
HP6			3.53	100.43
BM7			4.90	99.06
BM6			3.96	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	29.0		103.96	10.36	0.00	93.60	93.27	
	72.0			10.59	0.00	93.37		203.3
	142.0			11.11	0.00	92.85		
RWSE	184.0			10.05	0.00	93.91		

Note: Note: most water flowing between Sta=29 and Sta=142
Sta=184 has no flows, WSE not representative

Ave Q= 203.3

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A

Date: 6/29/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM6	4.03	104.03		100.00
HP6			3.60	100.43
HP7			6.38	97.65
BM7			4.97	99.06
TP				
HP1	4.94	104.00		
HP6			3.57	100.43
HP7			6.35	97.65
BM6			4.00	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	29.0		104.00	10.09		93.91	93.55	
	72.0			10.45		93.55		384.5
	142.0			10.80		93.20		
	184.0			10.76		93.24		

Note: Note: most water flowing between Sta=29 and Sta=142
Sta=184 has no flows, WSE not representative

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
d/s	-100		104.00	13.04	0.00	90.96
u/s	0		104.00			93.55

Ave Q= 384.5

Note:

WSE slope = 2.593%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A

Date: 10/19/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM6	3.98	103.98		100.00
HP6			3.54	100.44
HP7				
BM7				
TP				
HP1				
HP6				
HP7				
BM6				

Comment: 1/2 loop only using

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			103.98	12.56	2.16	93.58	93.74	
LWSE				12.39	2.57	94.16		
RWSE				11.34	0.84	93.48		

Ave Q=

Note: WSEs shot at ~12:40

Stream: Sultan R.
Site: Lower Reach 3
Transect: 6
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
6/27/2007	104.09	72.0
6/28/2007	103.96	203.3
6/29/2007	104.00	384.5
6/26/2007	104.24	

27-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) $NV_{0.2/0.6}$	Vel (ft/s) $NV_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate
	-10.0	1.02	103.22									18.80
	-4.0	3.44	100.80									18.55
LWP	1.0	5.61	98.63									18.55
	5.0	6.57	97.67									81.60
	10.0	6.70	97.54									81.80
	15.0	7.16	97.08									81.85
	20.0	8.29	95.95									81.60
	25.0	9.79	94.45									18.70
LWE	28.9		92.65	0.10	0.00		0.00		0.00		0.00	12.80
	31.0		92.35	0.40	0.23		0.32		0.32		0.26	21.65
	33.1		91.60	1.15	0.23		0.32		0.32	40	1.04	88.90
	38.5		91.75	1.00	0.18		0.28		0.28	10	1.67	87.85
	45.1		92.20	0.55	0.57		0.60		0.60	10	2.06	86.85
	51.1		90.95	1.80	0.36		0.41		0.41	5	4.83	87.70
	58.1		90.65	2.10	0.17		0.27		0.27		3.88	82.75
	64.7		91.45	1.30	1.22		1.24		1.24	45	5.32	86.90
	67.4		91.90	0.85	0.90		0.92		0.92	30	2.37	86.80
	71.7		91.85	0.90	1.11		1.13		1.13	40	2.93	85.70
	74.9		92.05	0.70	0.05		0.16		0.16		0.46	86.80
	79.9		92.25	0.50	0.35		0.41		0.41		0.74	86.85
	82.2		92.25	0.50	1.86		1.90		1.90	25	2.32	86.90
	85.3		92.15	0.60	0.35		0.41		0.41		1.19	86.90
	92.0		92.25	0.50	3.43		3.50		3.50	10	8.61	86.90
	95.3		92.15	0.60	0.09		0.23		0.23		0.88	82.70
	105.1		92.15	0.60	0.86		0.88		0.88		3.58	88.90
	108.9		92.20	0.55	1.61		1.64		1.64		5.92	48.55
	118.2		92.65	0.10	0.00		0.00		0.00		0.00	84.60
	122.5		92.25	0.50	0.46		0.50		0.50		2.09	75.55
	134.9		92.55	0.20	0.54		0.58		0.58	85	0.11	46.55
	145.4		92.45	0.30	1.01		1.03		1.03		3.12	86.60
	155.1		92.45	0.30	1.75		1.79		1.79		4.31	58.55
	161.5		91.95	0.80	1.64		1.67		1.67		10.30	86.70
	170.5		91.75	1.00	0.45		0.49		0.49	25	2.32	83.80
	171.9		92.05	0.70	0.00		0.00		0.00		0.00	83.90
	177.7		92.45	0.30	0.53		0.57		0.57		0.66	86.85
	179.7		92.25	0.50	0.83		0.85		0.85		1.04	84.75
	182.6		92.65	0.10	0.00		0.00		0.00		0.00	88.90
RWE	183.5		92.65	0.10	0.00		0.00		0.00		0.00	82.65
	192.0	11.50	92.74									65.55
	198.0	10.74	93.50									23.55
	205.0	10.20	94.04									28.60
	210.0	10.17	94.07									21.60
RWP	215.5	8.65	95.59									12.60
	217.0	5.35	98.89									11.90
	218.5	8.50	95.74									21.70
	224.0	6.69	97.55									11.90
	235.0	3.15	101.09									11.90

Bank survey was conducted on 6/26/07

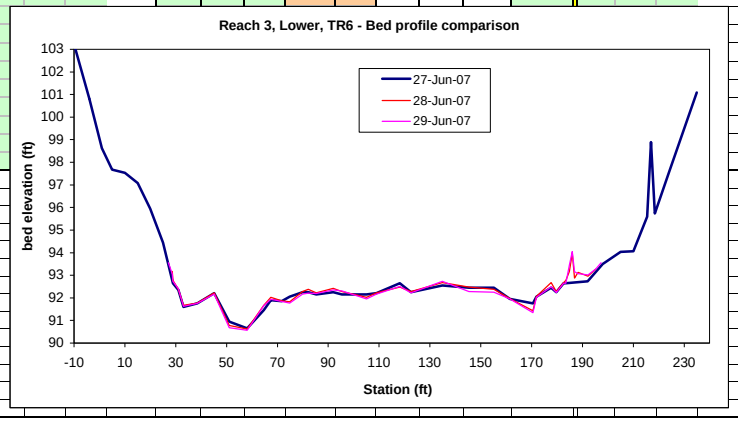
Bank survey was conducted on 6/26/07

28-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) $NV_{0.2/0.6}$	Vel (ft/s) $NV_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate
LWE	28.6		93.17	0.10	0.00		0.00		0.00		0.00	12.8
	28.9		92.77	0.50	0.08		0.19		0.19		0.12	12.8
	31.0		92.37	0.90	0.23		0.30		0.30		0.57	21.7
	33.1		91.67	1.60	0.59		0.64		0.64		3.82	88.9
	38.5		91.77	1.50	0.69		0.74		0.74		6.67	87.9
	45.1		92.22	1.05	1.10		1.15		1.15	10	7.49	86.9
	51.1		90.77	2.50	0.53		0.57		0.57		9.33	87.7
	58.1		90.62	2.65	0.29	0.04	0.34	0.15	0.24		4.41	82.8
	64.7		91.67	1.60	1.62		1.68		1.68	40	9.57	86.9
	67.4		92.02	1.25	1.13		1.18		1.18	30	4.47	86.8
	71.7		91.87	1.40	1.30		1.35		1.35	40	5.43	85.7
	74.9		91.82	1.45	0.25		0.32		0.32		1.87	86.8
	79.9		92.27	1.00	1.27		1.32		1.32		4.82	86.9
	82.2		92.37	0.90	2.89		2.97		2.97	25	6.54	86.9
	85.3		92.22	1.05	1.27		1.32		1.32		6.79	86.9
	92.0		92.42	0.85	3.91		3.99		3.99		16.95	86.9
	95.3		92.27	1.00	0.39		0.43		0.43		2.84	82.7
	105.1		92.02	1.25	1.32		1.37		1.37		11.66	88.9
	108.9		92.22	1.05	2.69		2.77		2.77		19.03	48.6
	118.2		92.47	0.80	0.01		0.04		0.04		0.20	84.6
	122.5		92.27	1.00	0.83		0.88		0.88		7.39	75.6
	134.9		92.67	0.60	1.29		1.34		1.34	85	0.80	46.6
	145.4		92.47	0.80	1.66		1.72		1.72		13.90	86.6
	155.1		92.37	0.90	0.95		1.00		1.00		7.28	58.6
	161.5		91.97	1.30	1.40		1.45		1.45		14.55	86.7
	170.5		91.42	1.85	1.80		1.86		1.86		17.93	83.8
	171.9		92.07	1.20	1.54		1.60		1.60		6.90	83.9
	177.7		92.67	0.60	2.32		2.39		2.39		5.60	86.9
	179.7		92.27	1.00	1.72		1.78		1.78		4.37	84.8
	182.6		92.67	0.60	0.43		0.47		0.47		0.53	88.9
	183.5		92.77	0.50	1.10		1.15		1.15		0.66	82.7
	184.9		93.17	0.10	0.00		0.00		0.00		0.00	82.7
	186.0		93.97	-0.70								82.7
	186.9		92.87	0.40	0.00		0.00		0.00		0.00	82.7
	188.3		93.12	0.15	0.00		0.00		0.00		0.00	65.6
	192.2		92.95	0.32	0.69		0.74		0.74		0.82	23.6
RWE	195.2		93.27	0.00	0.00		0.00		0.00		0.00	65.6

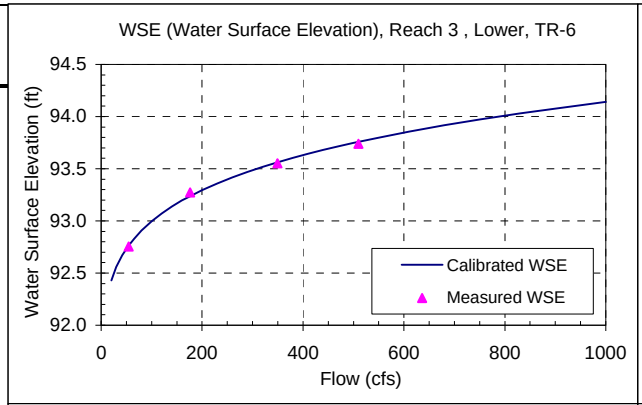
29-Jun-07

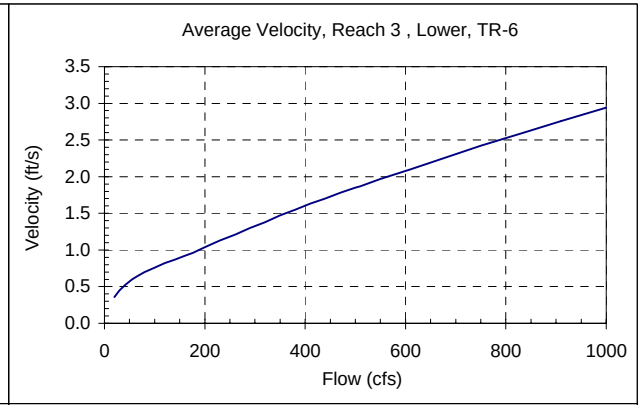
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) $NV_{0.2/0.6}$	Vel (ft/s) $NV_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate
LWE	27.1		93.55	0.00	0.00		0.00		0.00		0.00	12.8
	28.6		93.05	0.50	0.00		0.00		0.00		0.00	12.8
	28.9		92.73	0.82	0.16		0.26		0.26		0.25	12.8
	31.0		92.40	1.15	0.28		0.33		0.33		0.80	21.7
	33.1		91.63	1.92	1.40		1.45		1.45		10.47	88.9
	38.5		91.75	1.80	0.76		0.81		0.81		8.79	87.9
	45.1		92.17	1.38	1.15		1.20		1.20		10.41	86.9
	51.1		90.67	2.88	0.45	1.74	0.49	1.80	1.15		21.45	87.7
	58.1		90.57	2.98	0.90	0.19	0.95	0.28	0.62		12.50	82.8
	64.7		91.65	1.90	2.95		3.03		3.03	30	23.18	86.9
	67.4		91.94	1.61	1.78		1.84		1.84	40	7.96	86.8
	71.7		91.84	1.71	1.33		1.38		1.38	40	6.79	85.7
	74.9		91.76	1.79	1.21		1.26		1.26		9.23	86.8
	79.9		92.17	1.38	1.40		1.45		1.45		7.32	86.9
	82.2		92.20	1.35	3.23		3.31		3.31		12.06	86.9
	85.3		92.19	1.36	1.32		1.37		1.37		9.14	86.9
	92.0		92.35	1.20	3.35		3.43		3.43		20.58	86.9
	95.3		92.30	1.25	0.16		0.26		0.26		2.11	82.7
	105.1		91.95	1.60	2.27		2.34		2.34		25.48	88.9
	108.9		92.17	1.38	2.82		2.90		2.90		26.20	48.6
	118.2		92.50	1.05	0.46		0.50		0.50		3.57	84.6
	122.5		92.22	1.33	1.12		1.17		1.17		12.98	75.6
	134.9		92.73	0.82	1.08		1.13		1.13	30	9.19	46.6
	145.4		92.27	1.28	1.94		2.01		2.01		25.94	86.6
	155.1		92.25	1.30	1.56		1.62		1.62		16.93	58.6
	161.5		91.95	1.60	2.86		2.94		2.94		36.20	86.7
	170.5		91.34	2.21	2.13		2.20		2.20		25.28	83.8
	171.9		92.02	1.53	2.68		2.76		2.76		15.19	83.9
	177.7		92.49	1.06	2.44		2.51		2.51		10.40	86.9
	179.7		92.23	1.32	2.06		2.13		2.13		6.88	84.8
	182.6		92.65	0.90	1.22		1.27		1.27		2.17	88.9
	183.5		92.65	0.90	0.85		0.90		0.90		0.94	82.7
	184.9		93.45	0.10	0.00		0.00		0.00		0.00	82.7
	186.0		94.05	-0.50								82.7
	186.9		93.15	0.40	0.10		0.20		0.20		0.06	82.7
	188.3		93.07	0.48	0.33		0.38		0.38		0.48	65.6
	192.2		93.01	0.54	1.65		1.71		1.71		3.19	65.6
	195.2		93.27	0.28	1.04		1.09		1.09	60	0.39	23.6
RWE	197.3		93.55	0.00	0.00		0.00		0.00		0.00	23.6

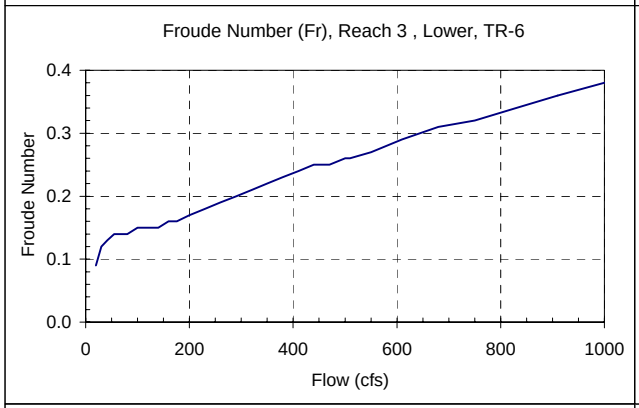


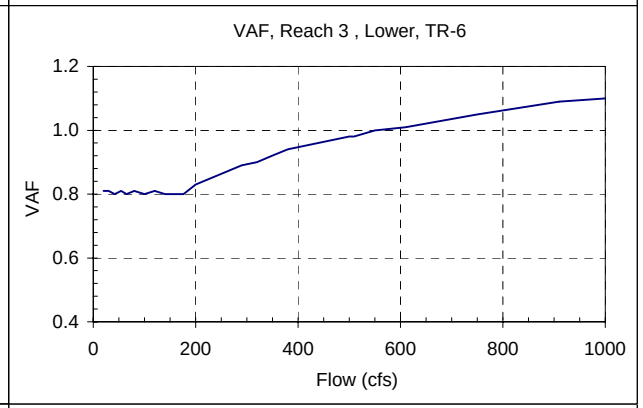
Stream: Sultan R.
Site: Lower Reach 3
Habitat: Riffle
Transect: 6

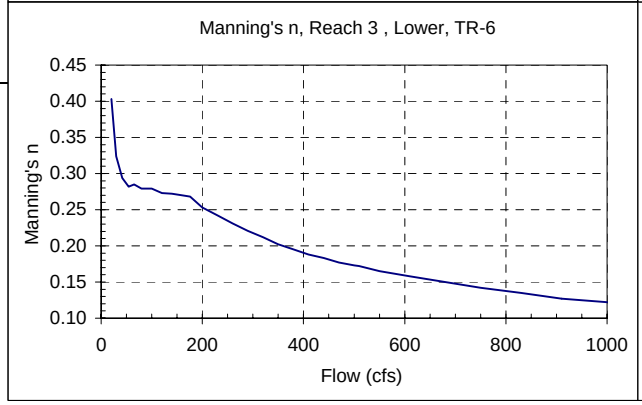
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
20	92.43	0.09	0.36	0.81	0.403	114.5
30	92.56	0.12	0.45	0.81	0.324	138.1
42	92.67	0.13	0.53	0.80	0.294	151.0
54.6	92.76	0.14	0.60	0.81	0.282	155.2
65	92.83	0.14	0.64	0.80	0.285	155.6
80	92.91	0.14	0.70	0.81	0.279	157.1
100	93.00	0.15	0.76	0.80	0.279	159.8
120	93.07	0.15	0.82	0.81	0.273	162.3
140	93.14	0.15	0.87	0.80	0.272	164.8
160	93.19	0.16	0.92	0.80	0.270	166.2
176.0	93.24	0.16	0.96	0.80	0.268	166.8
200	93.29	0.17	1.04	0.83	0.253	167.4
230	93.36	0.18	1.13	0.85	0.242	168.4
260	93.42	0.19	1.21	0.87	0.231	169.1
290	93.47	0.20	1.30	0.89	0.221	169.8
320	93.52	0.21	1.38	0.90	0.212	171.0
349.5	93.56	0.22	1.47	0.92	0.202	172.3
380	93.60	0.23	1.55	0.94	0.195	173.1
410	93.64	0.24	1.63	0.95	0.188	173.8
440	93.68	0.25	1.70	0.96	0.183	174.6
470	93.71	0.25	1.78	0.97	0.177	175.1
500	93.75	0.26	1.85	0.98	0.173	175.8
509.6	93.76	0.26	1.87	0.98	0.172	176.0
550	93.80	0.27	1.97	1.00	0.165	176.8
610	93.86	0.29	2.10	1.01	0.158	177.9
680	93.92	0.31	2.26	1.03	0.150	179.0
750	93.97	0.32	2.42	1.05	0.142	179.9
830	94.03	0.34	2.59	1.07	0.135	180.8
910	94.08	0.36	2.76	1.09	0.127	186.1
1000	94.14	0.38	2.94	1.10	0.122	186.5

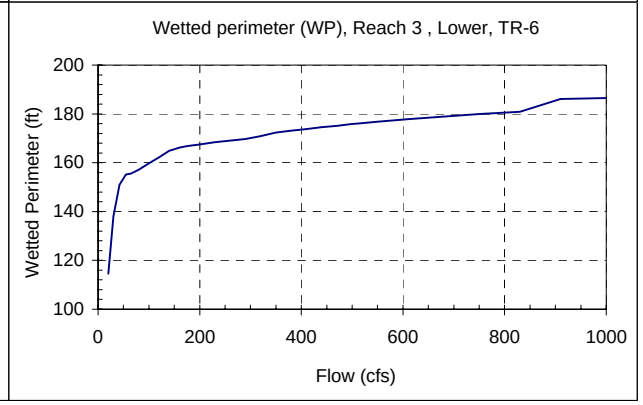




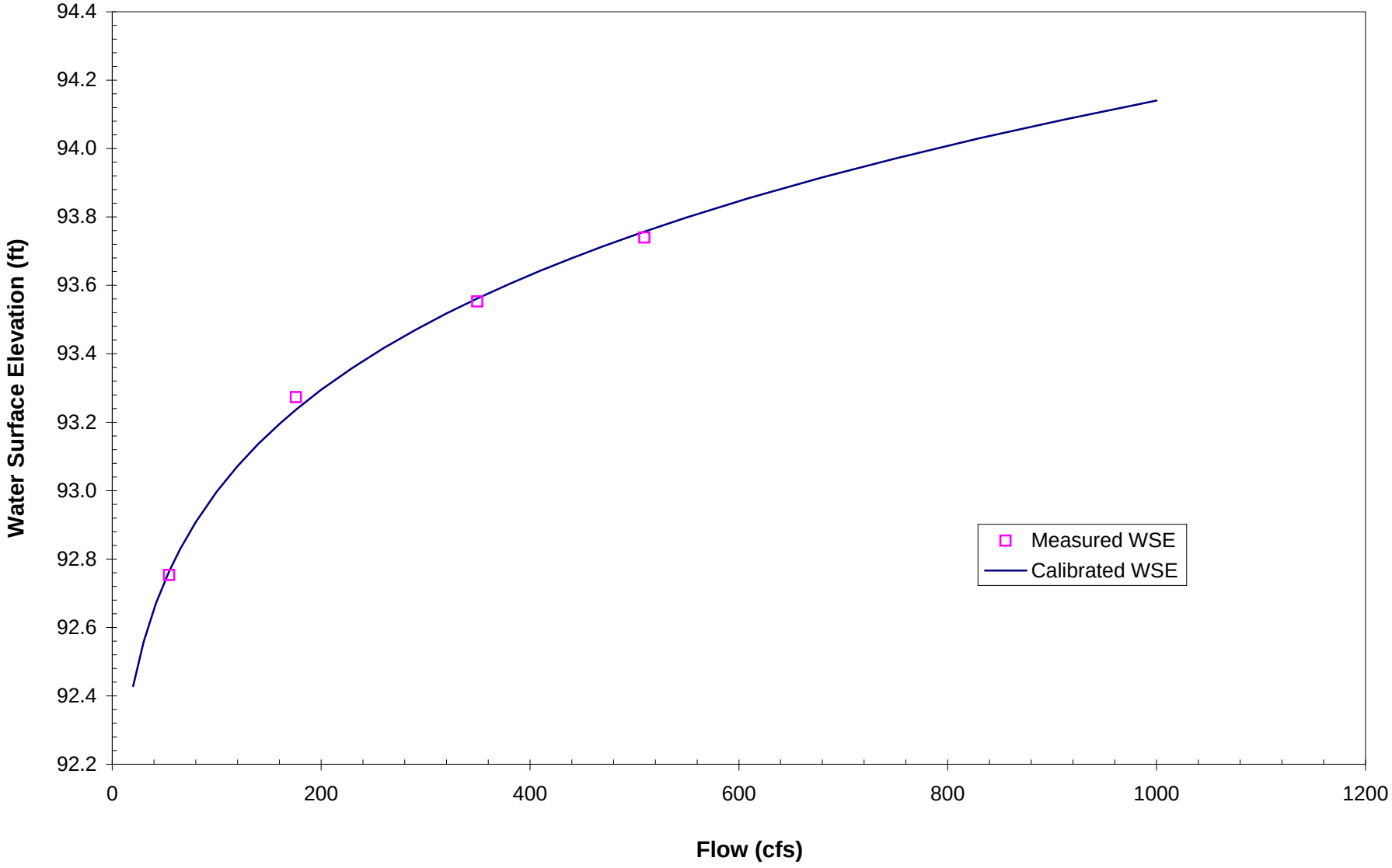








Comparison of Calibrated and Measured WSEs, Reach 3, Lower, TR-6



Stream: Sultan R.
Site: Lower Reach 3/TR5
Date: 6/27/2007 **Trabnsect:** 5
Habitat: Pool **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.10	101.10		100.00
HP5			0.62	100.48
TP				
HP5	0.88	101.36		
BM			1.36	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	15.0		101.36	7.55	0.00	93.81	93.81	
RWSE	102.0			7.55	0.00	93.81		

Ave Q=
Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

(4) 6/26/07 Level Loop Survey (BM & HP). Bank Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.44	101.44		100.00
HP5			0.95	100.49
TP				
HP5	0.89	101.38		
BM			1.38	100.00

Comment:

Date: 6/28/2007
Habitat: Pool **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.57	101.57		100.00
HP5			1.09	100.49
TP				
HP5	1.07	101.55		
BM			1.55	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			101.55	6.67	0.00	94.88	94.88	169.9
n/a								

Ave Q= 169.9
Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4B

Date: 6/29/2007
Habitat: Pool **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.55	101.55		100.00
HP5	0.89		1.07	100.48
TP				
HP5	0.89	101.38		
BM			1.38	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			101.38	5.72	0.00	95.66	95.65	
RWSE				5.74	0.00	95.64		

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	0					95.65
d/s	-100		101.38	5.85	0.00	95.53

Ave Q=
Note:
WSE slope = 0.120%

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 10/19/2007
Habitat: Pool **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.84	100.84		100.00
HP5			0.38	100.46
TP				
HP5				
BM				

Comment: 1/2 level loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			100.84	4.92	0.22	96.14	96.12	
RWSE				4.75	0.00	96.09		

Ave Q=
Note: WSE measurements completed at ~1:07

Stream: Sultan R.
Site: Lower Reach 3/TR5
Transect: 5
Habitat: Pool

Survey Date	HI (ft)	Q (cfs)
6/27/2007	101.36	
6/28/2007	101.55	169.9
6/29/2007	101.38	
6/26/2007	101.38	

27-Jun-07

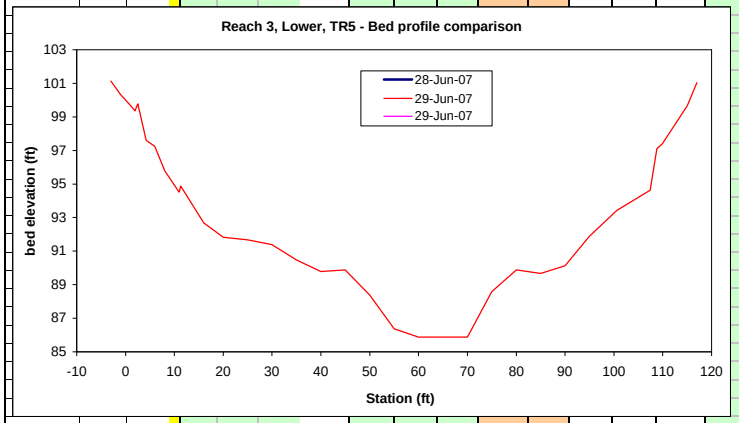
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate

28-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-3.0	0.25	101.13									11.90
	-1.0	1.04	100.34									11.90
LWP	1.0	1.69	99.69									18.75
	1.9	2.03	99.35									81.85
	2.5	1.60	99.78									81.95
	4.2	3.78	97.60									18.55
	6.0	4.14	97.24									81.60
	8.0	5.59	95.79									18.75
	11.0	6.86	94.52									18.70
LWE	11.3		94.88	0.00	0.00		0.00		0.00		0.00	18.65
	16.0		92.68	2.20	0.00		0.00		0.00		0.00	18.80
	20.0		91.83	3.05	0.06		0.19		0.19		2.65	11.90
	25.0		91.68	3.20	0.20		0.29		0.29		4.70	11.90
	30.0		91.38	3.50	0.32		0.38		0.38		6.72	11.90
	35.0		90.48	4.40	0.17		0.27		0.27		5.98	11.90
	40.0		89.78	5.10	0.13		0.24		0.24		6.13	26.85
	45.0		89.88	5.00	0.59		0.62		0.62		15.49	78.60
	50.0		88.38	6.50	1.03		1.05		1.05		34.14	22.90
	55.0		86.38	8.50	0.54		0.58		0.58		24.44	47.55
	60.0		85.88	**9.00**	1.04		1.06		1.06		47.74	**24.60**
	65.0		85.88	**9.00**	0.70		0.72		0.72		32.35	**22.90**
	70.0		85.88	**9.00**	0.32		0.38		0.38		17.28	**22.90**
	75.0		88.58	6.30	0.05		0.16		0.16		5.07	22.90
	80.0		89.88	5.00	-0.18		-0.28		-0.28		-7.07	11.90
	85.0		89.68	5.20	-0.25		-0.33		-0.33		-8.65	12.70
	90.0		90.13	4.75	-0.31		-0.38		-0.38		-8.98	12.70
	95.0		91.88	3.00	-0.29		-0.36		-0.36		-5.72	81.60
	100.6		93.43	1.45	-0.17		-0.27		-0.27		-2.45	81.70
RWE	107.4		94.63	0.25	0.00		0.00		0.00		0.00	18.65
	108.8	4.27	97.11									81.60
RWP	109.9	3.99	97.39									18.70
	115.0	1.72	99.66									81.70
	117.0	0.35	101.03									81.70

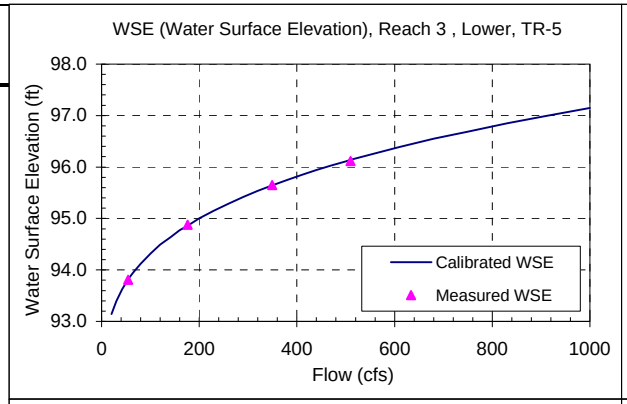
29-Jun-07

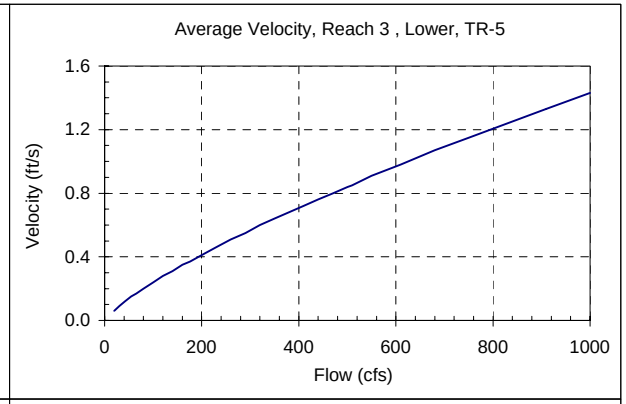
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate

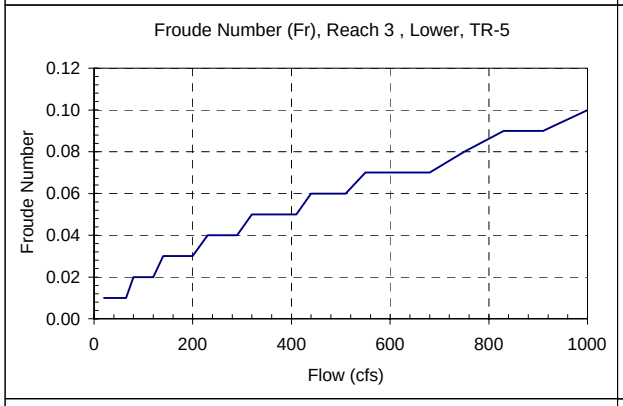


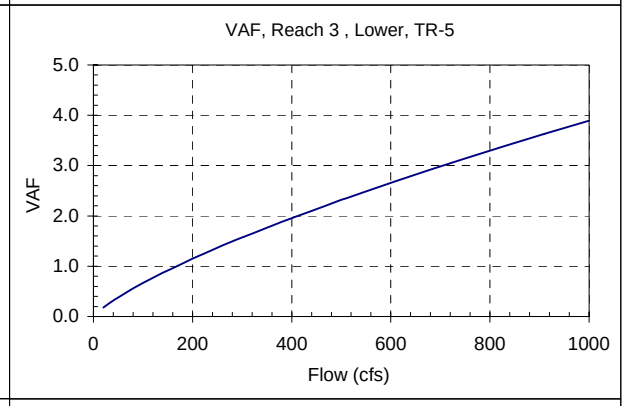
Stream: Sultan R.
Site: Lower Reach 3/TR5
Habitat: Pool
Transect: 5
Flow: Mid

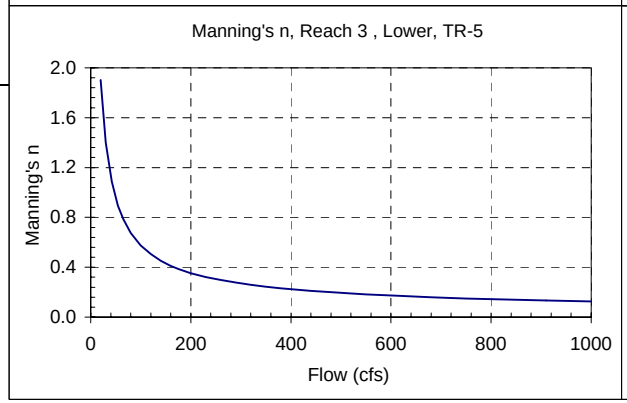
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
20	93.14	0.01	0.06	0.18	1.902	86.8
30	93.39	0.01	0.09	0.25	1.400	88.4
42	93.62	0.01	0.12	0.33	1.087	90.2
54.6	93.82	0.01	0.15	0.41	0.894	91.7
65	93.95	0.01	0.17	0.47	0.786	92.9
80	94.12	0.02	0.20	0.56	0.676	94.2
100	94.32	0.02	0.24	0.67	0.575	95.8
120	94.49	0.02	0.28	0.77	0.505	97.2
140	94.63	0.03	0.31	0.87	0.451	98.8
160	94.77	0.03	0.35	0.96	0.411	99.8
176.0	94.86	0.03	0.37	1.04	0.385	100.5
200	95.00	0.03	0.41	1.15	0.353	101.1
230	95.15	0.04	0.46	1.28	0.322	101.6
260	95.29	0.04	0.51	1.41	0.297	102.1
290	95.42	0.04	0.55	1.53	0.277	102.6
320	95.54	0.05	0.60	1.65	0.259	103.1
349.5	95.64	0.05	0.64	1.76	0.245	103.5
380	95.75	0.05	0.68	1.88	0.232	103.8
410	95.85	0.05	0.72	1.99	0.221	104.2
440	95.94	0.06	0.76	2.10	0.211	104.4
470	96.03	0.06	0.80	2.21	0.202	104.7
500	96.11	0.06	0.84	2.32	0.194	104.9
509.6	96.14	0.06	0.85	2.35	0.192	105.0
550	96.24	0.07	0.91	2.49	0.183	105.3
610	96.39	0.07	0.98	2.69	0.171	105.7
680	96.55	0.07	1.07	2.92	0.160	106.2
750	96.69	0.08	1.15	3.14	0.150	106.6
830	96.85	0.09	1.24	3.39	0.141	107.0
910	96.99	0.09	1.33	3.63	0.133	107.4
1000	97.15	0.1	1.43	3.89	0.125	108.0

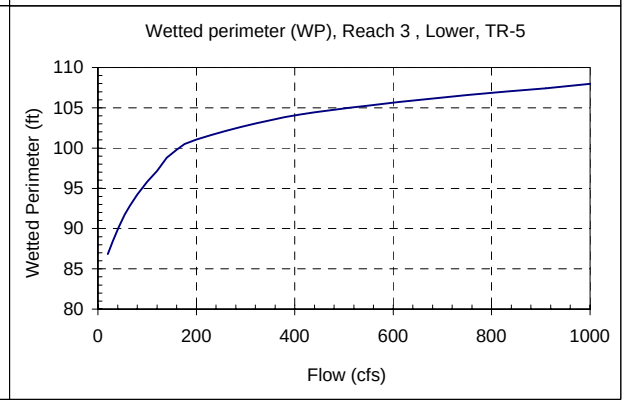


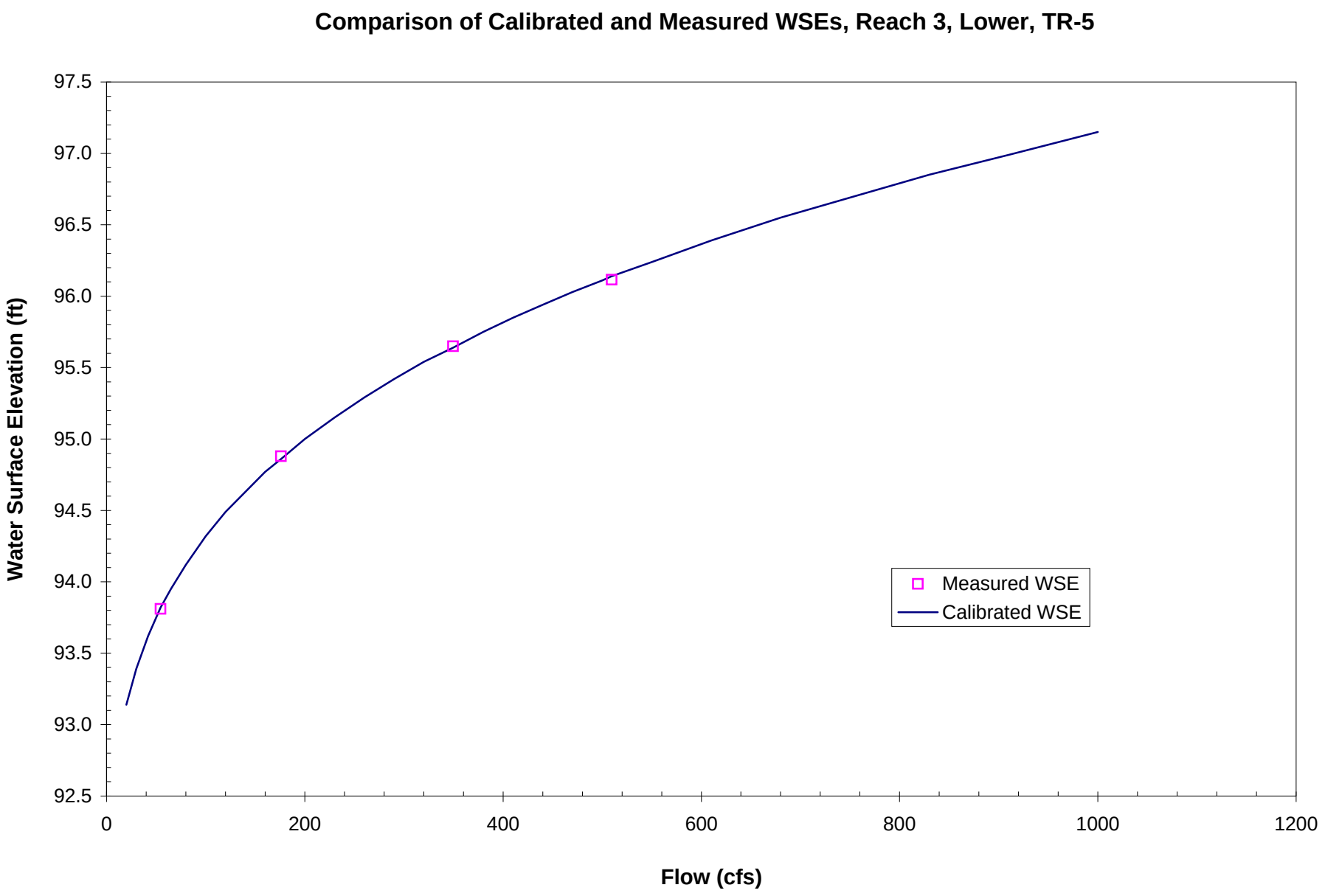











Comparison of Calibrated and Measured WSEs, Reach 3, Lower, TR-5
Water Surface Elevation (ft)
97.5
97.0
96.5
96.0
95.5
95.0
94.5
94.0
93.5
93.0
92.5
0
200
400
600
800
1000
1200
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Lower Reach 3
Date: 6/27/2007 **Transect:** TR4
Habitat: Glide **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.54	102.54		100.00
HP4			3.15	99.39
TP				
HP4	3.13	102.52		
BM			2.52	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	15.0		102.52	8.25		94.27	94.27	50.0
RWSE	113.0			8.26		94.26		

Ave Q= 50.0

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4B

(4) 6/26/07 Level Loop Survey (BM & HP). Bank Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.54	102.54		100.00
HP1			3.16	99.38
TP				
HP1	3.24	102.62		
BM			2.63	99.99

Comment:

Date: 6/28/2007
Habitat: Glide **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.30	102.30		100.00
HP4			2.91	99.39
TP				
HP4	2.88	102.27		
BM			2.27	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	10.0		102.27	7.24	0.00	95.03	95.03	179.9

Ave Q= 179.9

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A

Date: 6/29/2007
Habitat: Glide **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.41	102.41		100.00
HP4	3.05		3.02	99.39
TP				
HP4	3.05	102.44		
BM			2.44	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	11.0		102.44	6.89	0.00	95.55	95.55	332.9
RWSE	116.0			6.89	0.00	95.55		

(2.1) Longitudinal WSE Slope

Location	River Station	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
d/s	-100	102.44	6.95	0.00	95.49
u/s	100	102.44	6.87	0.00	95.57

Ave Q= 332.9

Note:

WSE slope = 0.0400%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A

Date: 10/19/2007
Habitat: Glide **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.33	102.33		100.00
HP4			2.94	99.39
TP				
HP3				
BM				

Comment: 1/2 loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			102.33	7.52	1.13	95.94	95.94	
RWSE			102.33	6.42	0.02	95.93		

Ave Q=

Note: WSE measurements completed at ~1:30

Stream: Sultan R.
Site: Lower Reach 3
Transect: 4
Habitat: Glide

Survey Date	HI (ft)	Q (cfs)
6/27/2007	102.52	50.0
6/28/2007	102.27	179.9
6/29/2007	102.44	332.9
6/26/2007	102.62	

27-Jun-07

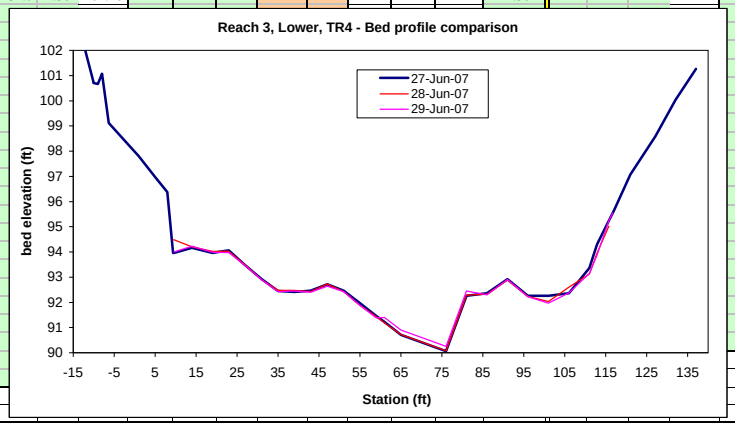
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-12.0	0.65	101.97									11.90
	-10.0	1.92	100.70									11.90
	-9.0	1.95	100.67									11.90
	-8.0	1.55	101.07									81.90
	-6.3	3.50	99.12									18.80
LWP	1.0	4.82	97.80									11.90
	5.0	5.65	96.97									21.80
	8.0	6.25	96.37									21.60
	9.4	8.66	93.96									18.80
LWE	9.6		93.97	0.30	0.00		0.00		0.00		0.00	24.90
	14.0		94.17	0.10	0.00		0.00		0.00		0.00	23.95
	19.0		93.97	0.30	0.06		0.19		0.19		0.26	56.55
	23.0		94.07	0.20	0.06		0.19		0.19		0.15	56.60
	27.0		93.47	0.80	0.04		0.13		0.13		0.41	26.80
	31.0		92.92	1.35	0.06		0.19		0.19		1.04	23.85
	35.0		92.45	1.82	0.06		0.19		0.19		1.41	23.95
	39.0		92.42	1.85	0.18		0.28		0.28		2.09	27.90
	43.0		92.47	1.80	0.16		0.26		0.26		1.90	67.55
	47.0		92.72	1.55	0.17		0.27		0.27		1.69	75.60
	51.0		92.47	1.80	0.21		0.30		0.30		2.15	65.55
	55.0		91.97	2.30	0.24		0.32		0.32		2.98	24.60
	59.0		91.47	2.80	0.22	0.23	0.31	0.32	0.31		2.62	23.70
	61.0		91.22	3.05	0.26	0.21	0.34	0.30	0.32		2.90	34.60
	65.0		90.72	3.55	0.28	0.31	0.35	0.38	0.36		9.69	34.70
	76.0		90.07	4.20	0.24	0.37	0.32	0.42	0.37		12.53	87.75
	81.0		92.27	2.00	0.22		0.31		0.31		3.08	88.90
	86.0		92.37	1.90	0.13		0.24		0.24		2.28	87.90
	91.0		92.92	1.35	0.08		0.22		0.22		1.49	21.60
	96.0		92.27	2.00	0.02		0.06		0.06		0.64	12.70
	101.0		92.27	2.00	0.02		0.06		0.06		0.64	18.60
	106.0		92.37	1.90	0.00		0.00		0.00		0.00	81.70
	111.0		93.37	0.90	0.00		0.00		0.00		0.00	81.60
RWE	112.8		94.27	0.00	0.00		0.00		0.00		0.00	18.70
	113.0	8.29	94.33									18.55
	117.0	6.97	95.65									11.90
	121.0	5.55	97.07									11.90
RWP	127.1	4.04	98.58									11.90
	132.0	2.59	100.03									14.65
	137.0	1.36	101.26									11.90

28-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	9.5		94.48	0.55	0.00		0.00		0.00		0.00	24.9
	9.6		94.48	0.55	0.00		0.00		0.00		0.00	24.9
	14.0		94.20	0.83	0.00		0.00		0.00		0.00	24.0
	19.0		94.03	1.00	0.49		0.53		0.53		2.39	56.6
	23.0		94.03	1.00	0.67		0.72		0.72		2.88	56.6
	27.0		93.48	1.55	0.49		0.53		0.53		3.30	26.8
	31.0		92.90	2.13	0.45		0.49		0.49		4.17	23.9
	35.0		92.48	2.55	0.58	0.63	0.63	0.68	0.65		6.66	24.0
	39.0		92.48	2.55	0.59	0.72	0.64	0.77	0.70		7.19	27.9
	43.0		92.43	2.60	0.48	0.68	0.52	0.73	0.63		6.51	67.6
	47.0		92.73	2.30	0.54		0.58		0.58		5.38	75.6
	51.0		92.43	2.60	0.62	0.61	0.67	0.66	0.66		6.90	65.6
	55.0		91.88	3.15	0.75	0.65	0.80	0.70	0.75		9.47	24.6
	59.0		91.43	3.60	0.46	0.85	0.50	0.90	0.70		7.59	23.7
	61.0		91.18	3.85	1.10	0.92	1.15	0.97	1.06		12.27	34.6
	65.0		90.73	4.30					1.10		35.48	34.7
	76.0		90.08	4.95					1.10		43.56	87.8
	81.0		92.28	2.75	0.63	0.70	0.68	0.75	0.72		9.84	88.9
	86.0		92.33	2.70	0.14	0.16	0.24	0.26	0.25		3.39	87.9
	91.0		92.88	2.15	0.15		0.25		0.25		2.71	21.6
	96.0		92.23	2.80	0.14	0.16	0.24	0.26	0.25		3.52	12.7
	101.0		92.03	3.00	0.12	0.15	0.23	0.25	0.24		3.58	18.6
	106.0		92.60	2.43	0.16		0.26		0.26		3.13	81.7
	111.0		93.13	1.90	0.00		0.00		0.00		0.00	81.6
	112.8		93.93	1.10	0.00		0.00		0.00		0.00	18.7
RWE	115.8		95.03	0.00	0.00		0.00		0.00		0.00	18.6

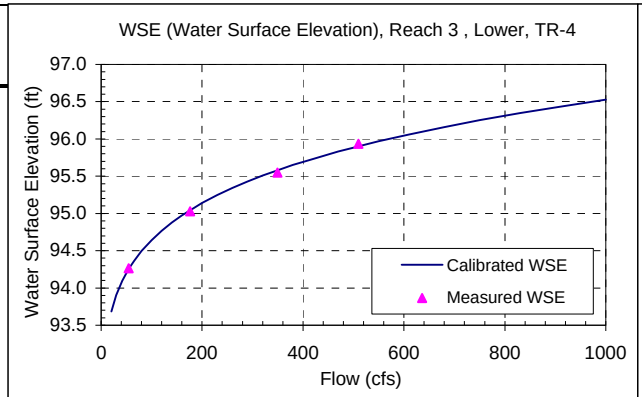
29-Jun-07

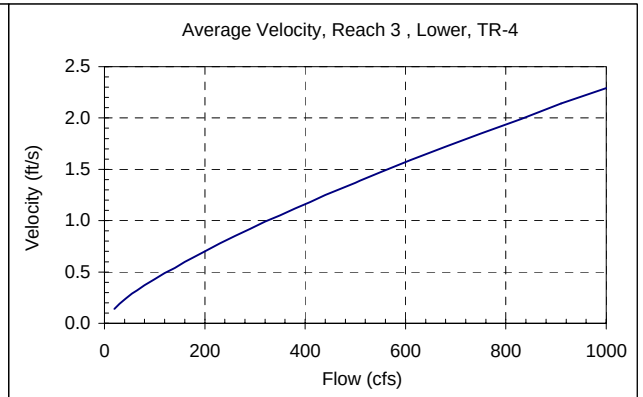
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	9.6		94.00	1.55	0.00		0.00		0.00		0.00	24.9
	14.0		94.23	1.32	0.00		0.00		0.00		0.00	24.0
	19.0		93.99	1.56	0.76		0.81		0.81		5.71	56.6
	23.0		93.97	1.58	0.86		0.91		0.91		5.78	56.6
	27.0		93.45	2.10	0.89		0.94		0.94		7.94	26.8
	31.0		92.90	2.65	0.84	0.75	0.89	0.80	0.85		9.00	23.9
	35.0		92.43	3.12	0.85	0.86	0.90	0.91	0.91		11.36	24.0
	39.0		92.45	3.10	0.84	0.90	0.89	0.95	0.92		11.47	27.9
	43.0		92.40	3.15	0.84	0.75	0.89	0.80	0.85		10.70	67.6
	47.0		92.64	2.91	0.67	0.76	0.72	0.81	0.77		8.93	75.6
	51.0		92.42	3.13	0.82	0.67	0.87	0.72	0.80		9.99	65.6
	55.0		91.88	3.67	1.25	1.33	1.30	1.38	1.34		19.68	24.6
	59.0		91.39	4.16	1.58	1.77	1.64	1.83	1.74		21.66	23.7
	61.0		91.40	4.15					2.20		27.39	34.6
	65.0		90.90	4.65					2.20		76.73	34.7
	76.0		90.25	5.30					1.50		63.60	87.8
	81.0		92.45	3.10	0.64	0.63	0.69	0.68	0.68		10.60	88.9
	86.0		92.30	3.25	0.32	0.36	0.37	0.41	0.39		6.33	87.9
	91.0		92.91	2.64	0.26	0.34	0.32	0.39	0.36		4.70	21.6
	96.0		92.22	3.33	0.24	0.35	0.31	0.40	0.35		5.89	12.7
	101.0		91.97	3.58	0.29	0.28	0.34	0.33	0.34		6.05	18.6
	106.0		92.38	3.17	0.48	0.23	0.52	0.30	0.41		6.51	81.7
	111.0		93.15	2.40	0.30		0.35		0.35		2.88	81.6
	112.8		93.85	1.70	0.00		0.00		0.00		0.00	18.7
	115.8		95.25	0.30	0.00		0.00		0.00		0.00	11.9
RWE	116.7		95.55	0.00	0.00		0.00		0.00		0.00	11.9

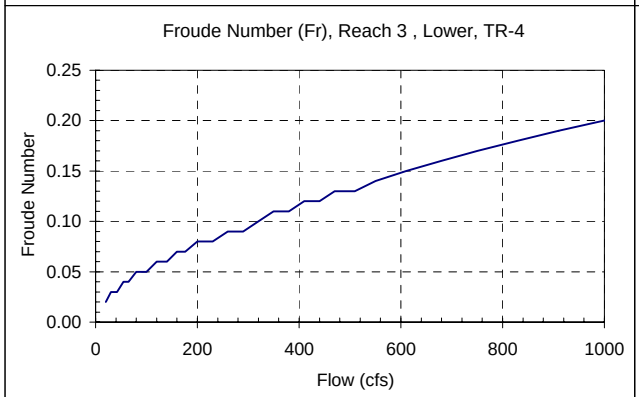


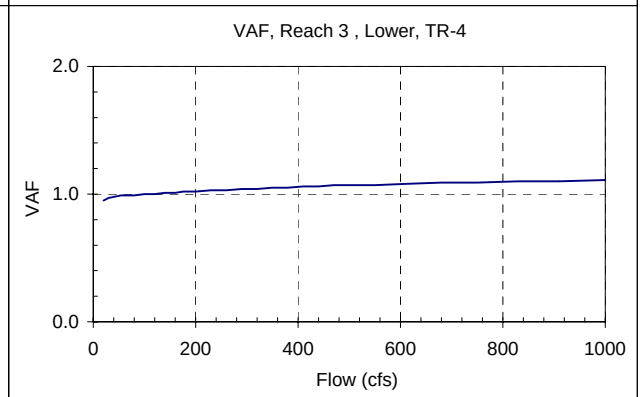
Stream: Sultan R.
Site: Lower Reach 3
Habitat: Glide
Transect: 4

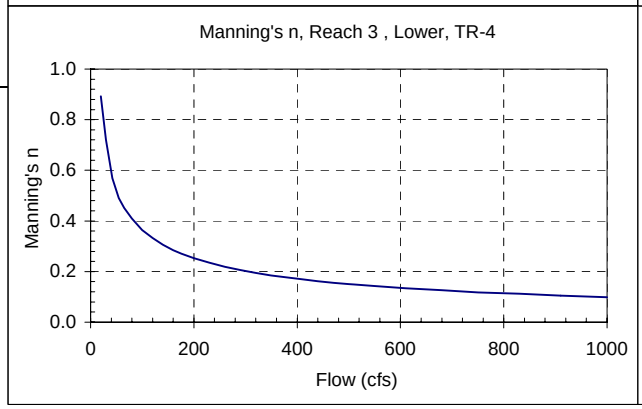
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
20	93.69	0.02	0.14	0.95	0.892	87.0
30	93.90	0.03	0.19	0.97	0.721	88.9
42	94.10	0.03	0.24	0.98	0.569	101.1
54.6	94.25	0.04	0.29	0.99	0.490	105.2
65	94.36	0.04	0.32	0.99	0.451	105.9
80	94.50	0.05	0.37	0.99	0.409	106.9
100	94.64	0.05	0.43	1.00	0.364	107.7
120	94.77	0.06	0.49	1.00	0.332	108.3
140	94.88	0.06	0.54	1.01	0.306	108.9
160	94.97	0.07	0.60	1.01	0.284	109.4
176.0	95.04	0.07	0.64	1.02	0.270	109.7
200	95.14	0.08	0.70	1.02	0.253	110.0
230	95.25	0.08	0.78	1.03	0.235	110.4
260	95.34	0.09	0.85	1.03	0.219	110.7
290	95.43	0.09	0.92	1.04	0.206	111.0
320	95.51	0.10	0.99	1.04	0.195	111.2
349.5	95.58	0.11	1.05	1.05	0.185	111.5
380	95.65	0.11	1.12	1.05	0.177	111.8
410	95.71	0.12	1.18	1.06	0.169	112.0
440	95.77	0.12	1.25	1.06	0.162	112.3
470	95.83	0.13	1.31	1.07	0.156	112.5
500	95.88	0.13	1.37	1.07	0.150	112.7
509.6	95.90	0.13	1.39	1.07	0.149	112.8
550	95.97	0.14	1.47	1.07	0.143	113.1
610	96.06	0.15	1.59	1.08	0.134	113.5
680	96.16	0.16	1.72	1.09	0.126	113.9
750	96.25	0.17	1.85	1.09	0.118	114.3
830	96.35	0.18	1.99	1.10	0.112	114.7
910	96.43	0.19	2.14	1.10	0.105	115.2
1000	96.53	0.2	2.29	1.11	0.099	116.0

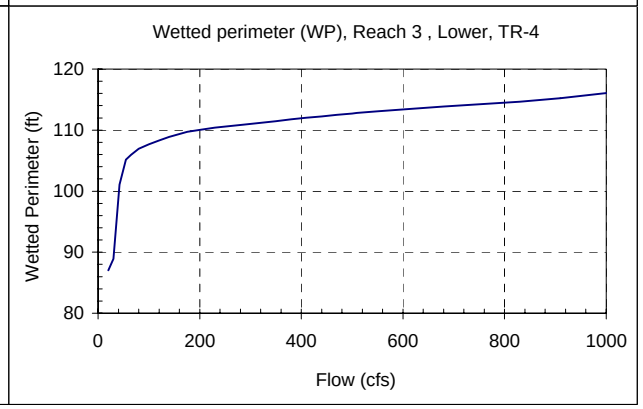


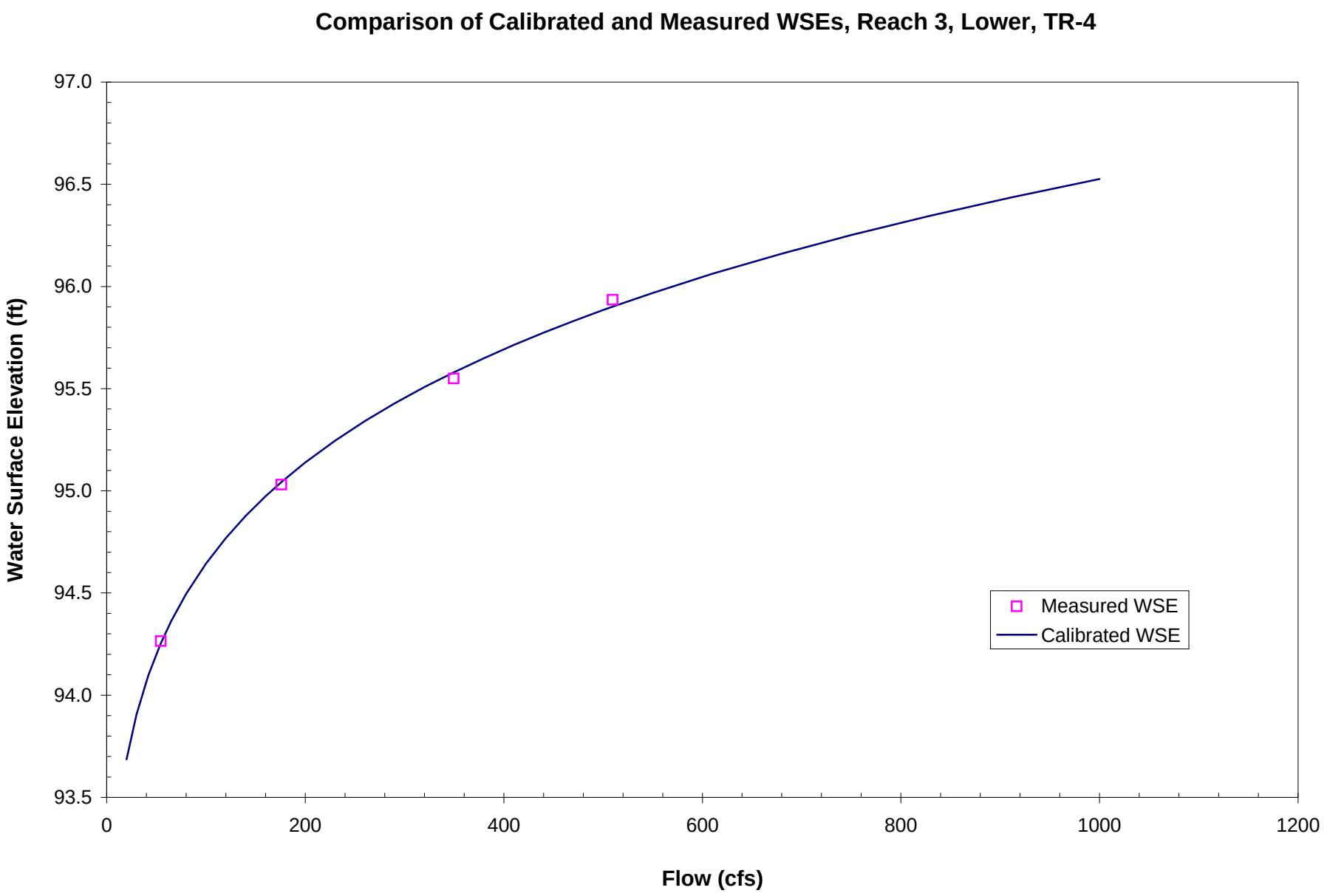











Comparison of Calibrated and Measured WSEs, Reach 3, Lower, TR-4
Water Surface Elevation (ft)
97.0
96.5
96.0
95.5
95.0
94.5
94.0
93.5
0
200
400
600
800
1000
1200
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Lower Reach 3
Date: 6/27/2007 **Transect:** TR3
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.14	103.14		100.00
HP3			4.34	98.80
TP				
HP3	4.31	103.11		
BM			3.11	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	13.0		103.11	7.45	0.00	95.66	95.56	
CWSE	54.0			7.58	0.00	95.53		48.2
RWSE	102.0			7.65	0.00	95.46		

Ave Q= 48.2

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A

(4) Level Loop (BM & HP) on 6/26 for Bank Profile Surev

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.35	101.35		100.00
HP3			2.55	98.80
TP				
HP3	2.52	101.32		
BM			1.33	99.99

Comment:

Date: 6/28/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP3	2.93	101.73		98.80
BM			1.73	100.00
TP				
BM	1.78	101.78		
HP3			2.98	98.80

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	8.0		101.78	5.52	0.00	96.26	96.13	
CWSE	54.0			5.68	0.00	96.10		169.6
RWSE	103.0			5.78	0.00	96.00		

Ave Q= 169.6

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A

Date: 6/29/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.14	103.14		100.00
HP3			4.34	98.80
TP				
HP3	4.32	103.12		
BM			3.12	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			103.12	6.39	0.00	96.73	96.52	
CWSE	54.0			6.73	0.00	96.39		356.4
RWSE	103.0			6.82	0.00	96.30		

Ave Q= 356.4

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
d/s	-100		103.12	5.59	0.00	97.53
u/s	100		103.12	8.31	0.00	94.81

Note:

WSE slope = 1.360%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A

Date: 10/19/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM				
HP3				98.80
TP				
HP3	3.99	102.79		
BM				

Comment: No level loop shot

(2) Water Surface Elevation (WSE) Sun Need to check with Glen re: surveying for this transect

Location	TR Station STA (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			102.79	5.98	0.27	97.08	96.87	
RWSE				6.13	0.00	96.66		

Ave Q=

Note: WSE measurements completed at ~1:45

Stream: Sultan R.
Site: Lower Reach 3
Transect: 3
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
6/27/2007	103.11	48.2
6/28/2007	101.78	169.6
6/29/2007	103.12	356.4
6/26/2007	101.33	

27-Jun-07

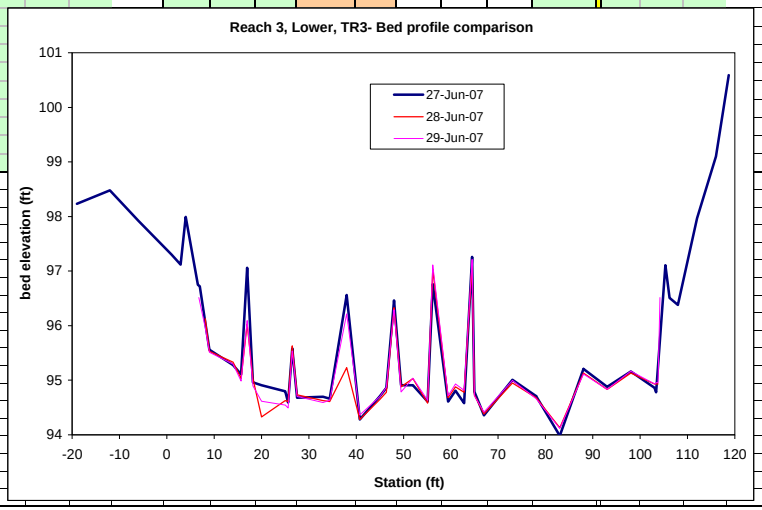
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-19.0	3.10	98.23									11.90
	-12.0	2.85	98.48									11.90
	-6.0	3.41	97.92									11.90
LWP	1.0	4.03	97.30									11.90
	2.9	4.21	97.12									81.55
	4.0	3.34	97.99									88.90
	6.6	4.58	96.75									81.55
	7.0	4.61	96.72									21.55
LWE	9.0		95.56	0.00	0.00		0.00		0.00		0.00	32.55
	14.0		95.28	0.28	0.33		0.38		0.38		0.36	85.80
	15.7		95.11	0.45	0.05		0.17		0.17		0.06	86.60
	17.0		97.06	-1.50								88.90
	18.2		94.96	0.60	0.03		0.11		0.11		0.06	87.70
	20.0		94.91	0.65	0.20		0.28		0.28		0.63	87.75
	25.0		94.80	0.76	0.00	0.66	0.00	0.71	0.36		0.76	86.75
	25.6		94.59	0.97	0.15		0.25		0.25		0.07	85.75
	26.5		95.58	-0.02								88.90
	27.5		94.68	0.88	0.42		0.46		0.46		1.11	68.55
	33.0		94.70	0.86	1.25		1.30		1.30	30	3.34	83.55
	34.4		94.66	0.90	0.63		0.68		0.68	15	0.41	83.60
	38.0		96.56	-1.00								88.90
	40.8		94.28	1.28	0.89		0.94		0.94	15	2.45	87.70
	45.0		94.71	0.85	0.70		0.75		0.75	25	1.62	76.80
	46.4		94.86	0.70	0.90		0.95		0.95	40	0.36	83.70
	48.0		96.46	-0.90								88.90
	49.5		94.91	0.65	0.48		0.52		0.52	15	0.41	38.60
	52.0		94.91	0.65	1.37		1.42		1.42		2.59	84.60
	55.1		94.61	0.95	1.16		1.21		1.21		1.78	78.65
	56.2		96.76	-1.20								88.90
	59.4		94.61	0.95	1.44		1.49		1.49		1.14	86.60
	61.0		94.81	0.75	1.11		1.16		1.16	30	1.28	85.65
	62.8		94.58	0.98	0.16		0.26		0.26	35	0.19	78.60
	64.5		97.26	-1.70								88.90
	65.0		94.79	0.77	0.34		0.39		0.39	20	0.28	85.70
	67.0		94.36	1.20	2.16		2.23		2.23	30	9.27	78.55
	73.0		95.01	0.55	1.66		1.72		1.72	40	3.99	87.70
	78.0		94.71	0.85	0.14		0.24		0.24		1.04	68.60
	83.0		93.98	1.58	1.10		1.15		1.15		9.08	87.85
	88.0		95.21	0.35	2.96		3.04		3.04	70	1.82	86.60
	93.0		94.88	0.68	0.42		0.46		0.46	45	1.10	87.65
	98.0		95.16	0.40	1.25		1.30		1.30		2.60	56.55
	103.0		94.86	0.70	0.07		0.19		0.19		0.36	65.55
RWE	103.4		94.78	0.78	0.00		0.00		0.00		0.00	68.60
	105.3	4.22	97.11									88.90
	106.2	4.82	96.51									87.70
	108.0	4.95	96.38									16.55
	112.0	3.36	97.97									81.85
	116.0	2.23	99.10									81.90
RWP	118.7	0.74	100.59									11.90

28-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	8.1		96.13	0.00	0.00		0.00		0.00		0.00	32.6
	9.0		95.53	0.60	0.06		0.18		0.18		0.32	32.6
	14.0		95.33	0.80	1.37		1.42		1.42		3.81	85.8
	15.7		95.03	1.10	0.14		0.24		0.24		0.40	86.6
	17.0		96.03	0.10	0.00		0.00		0.00		0.00	88.9
	18.2		95.03	1.10	0.11		0.21		0.21		0.35	87.7
	20.0		94.33	1.80	1.67		1.73		1.73		10.59	87.8
	25.0		94.63	1.50	1.25		1.30		1.30		5.46	86.8
	25.6		94.61	1.52	0.49		0.53		0.53		0.61	85.8
	26.5		95.63	0.50	1.28		1.33		1.33		0.63	88.9
	27.5		94.73	1.40	1.40		1.45		1.45		6.61	68.6
	33.0		94.63	1.50	1.61		1.67		1.67		8.64	83.6
	34.4		94.61	1.52	1.63		1.69		1.69		6.42	83.6
	38.0		95.23	0.90	0.26		0.32		0.32		0.93	88.9
	40.8		94.28	1.85	2.60		2.68		2.68		17.33	87.7
	45.0		94.65	1.48	1.62		1.68		1.68		6.96	76.8
	46.4		94.78	1.35	2.76		2.84		2.84		2.68	83.7
	48.0		96.33	-0.20								88.9
	49.5		94.88	1.25	0.30		0.35		0.35		0.55	38.6
	52.0		95.03	1.10	2.07		2.14		2.14		6.59	84.6
	55.1		94.58	1.55	2.16		2.23		2.23		5.36	78.7
	56.2		97.03	-0.90								88.9
	59.4		94.68	1.45	2.81		2.89		2.89		3.35	86.6
	61.0		94.88	1.25	2.89		2.97		2.97		6.31	85.7
	62.8		94.78	1.35	0.86		0.91		0.91		1.11	78.6
	64.5		97.13	-1.00								88.9
	65.0		94.73	1.40	0.84		0.89		0.89		1.25	85.7
	67.0		94.38	1.75	2.12		2.19		2.19		15.33	78.6
	73.0		94.95	1.18	0.56		0.61		0.61		3.93	87.7
	78.0		94.68	1.45	0.35		0.40		0.40		2.89	68.6
	83.0		94.13	2.00	1.30		1.35		1.35		13.51	87.9
	88.0		95.13	1.00	1.75		1.81		1.81		9.06	86.6
	93.0		94.83	1.30	2.00		2.07		2.07		13.44	87.7
	98.0		95.13	1.00	2.78		2.86		2.86		14.29	56.6
	103.0		94.93	1.20	0.12		0.23		0.23		0.73	65.6
	103.4		94.93	1.20	0.18		0.27		0.27		0.13	68.6
RWE	103.8		94.93	1.20	0.12		0.23		0.23		0.05	68.6

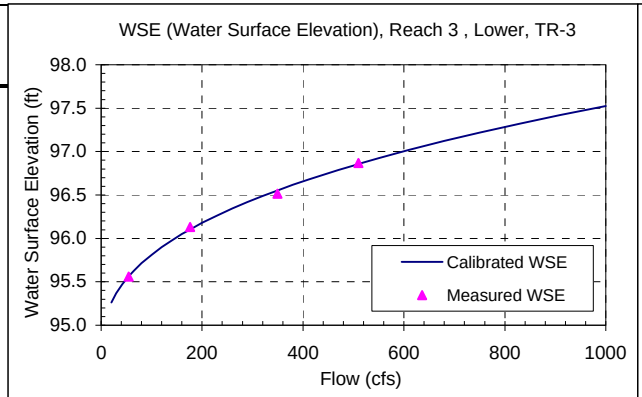
29-Jun-07

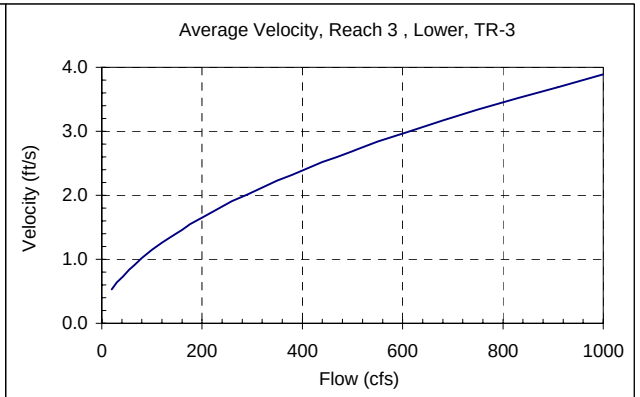
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	6.8		96.52	0.00	0.00		0.00		0.00		0.00	21.6
	8.1		95.97	0.55	0.00		0.00		0.00		0.00	32.6
	9.0		95.52	1.00	0.02		0.07		0.07		0.22	32.6
	14.0		95.30	1.22	1.68		1.74		1.74		7.11	85.8
	15.7		94.99	1.53	1.02		1.07		1.07		2.46	86.6
	17.0		96.10	0.42	2.84		2.92		2.92		1.53	88.9
	18.2		94.90	1.62	0.08		0.19		0.19		0.47	87.7
	20.0		94.62	1.90	2.31		2.38		2.38		15.39	87.8
	25.0		94.55	1.97	1.18		1.23		1.23		6.77	86.8
	25.6		94.50	2.02	1.20		1.25		1.25		1.89	85.8
	26.5		95.54	0.98	1.81		1.87		1.87		1.74	88.9
	27.5		94.71	1.81	1.03		1.08		1.08		6.36	68.6
	33.0		94.60	1.92	2.46		2.53		2.53		16.79	83.6
	34.4		94.64	1.88	2.27		2.34		2.34		11.01	83.6
	38.0		96.22	0.30	0.07		0.19		0.19		0.18	88.9
	40.8		94.37	2.15	3.95		4.03		4.03		30.32	87.7
	45.0		94.71	1.81	2.03		2.10		2.10		10.63	76.8
	46.4		94.88	1.64	3.35		3.43		3.43		8.44	83.7
	48.0		96.30	0.22	2.81		2.89		2.89		0.98	88.9
	49.5		94.79	1.73	2.99		3.07		3.07		10.62	38.6
	52.0		95.04	1.48	1.83		1.89		1.89		7.85	84.6
	55.1		94.64	1.88	2.08		2.15		2.15		6.26	78.7
	56.2		97.12	-0.60								88.9
	59.4		94.72	1.80	3.60		3.68		3.68		5.30	86.6
	61.0		94.94	1.58	3.35		3.43		3.43		9.21	85.7
	62.8		94.82	1.70	2.28		2.35		2.35		3.60	78.6
	64.5		97.22	-0.70								88.9
	65.0		94.72	1.80	3.75		3.83		3.83		6.89	85.7
	67.0		94.42	2.10	4.75		4.85		4.85		40.70	78.6
	73.0		95.00	1.52	2.52		2.60		2.60		21.70	87.7
	78.0		94.67	1.85	0.76		0.81		0.81		7.53	68.6
	83.0		94.12	2.40	2.75		2.83		2.83		33.93	87.9
	88.0		95.12	1.40	3.49		3.57		3.57		24.99	86.6
	93.0		94.84	1.68	1.75		1.81		1.81		15.22	87.7
	98.0		95.17	1.35	5.30		5.41		5.41		36.49	56.6
	103.0		94.94	1.58	0.71		0.76		0.76		3.25	65.6
	103.4		94.96	1.56	0.42		0.46		0.46		0.29	68.6
	103.8		94.96	1.56	0.33		0.38		0.38		0.24	65.6
RWE	104.2		96.52	0.00	0.00		0.00		0.00		0.00	68.6

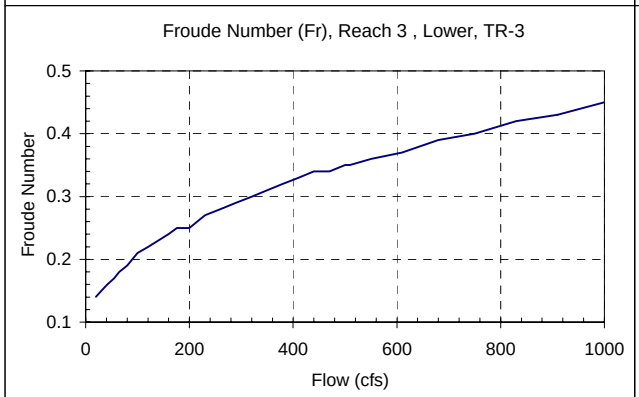


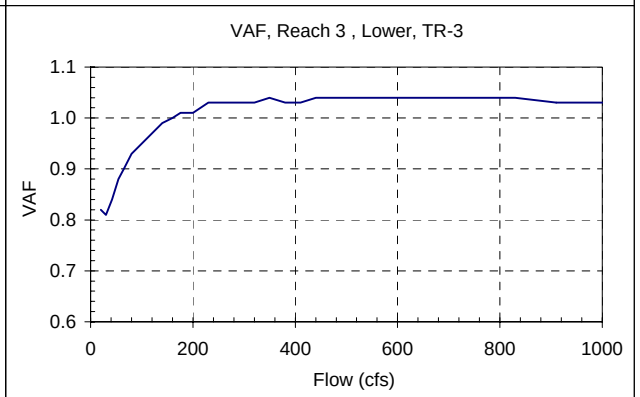
Stream: Sultan R.
Site: Lower Reach 3
Habitat: Riffle
Transect: 3

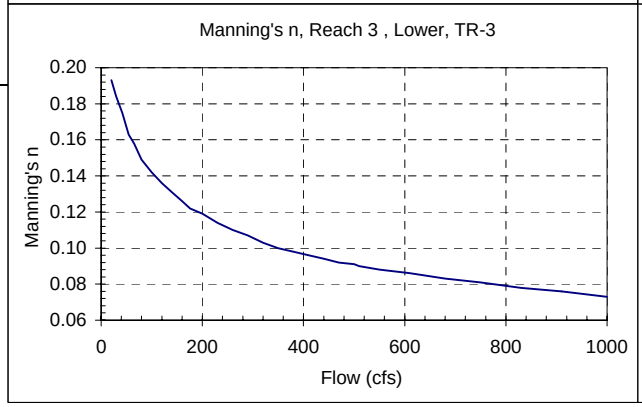
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
20	95.26	0.14	0.53	0.82	0.193	82.3
30	95.37	0.15	0.64	0.81	0.184	85.1
42	95.47	0.16	0.73	0.84	0.175	89.9
54.6	95.56	0.17	0.84	0.88	0.163	92.9
65	95.63	0.18	0.91	0.90	0.158	94.0
80	95.71	0.19	1.02	0.93	0.149	95.1
100	95.81	0.21	1.15	0.95	0.142	96.5
120	95.90	0.22	1.26	0.97	0.136	97.8
140	95.98	0.23	1.36	0.99	0.131	98.9
160	96.05	0.24	1.46	1.00	0.126	99.8
176.0	96.10	0.25	1.55	1.01	0.122	100.4
200	96.18	0.25	1.65	1.01	0.119	101.3
230	96.26	0.27	1.78	1.03	0.114	102.3
260	96.34	0.28	1.91	1.03	0.110	103.3
290	96.42	0.29	2.01	1.03	0.107	104.7
320	96.49	0.30	2.12	1.03	0.103	106.5
349.5	96.55	0.31	2.23	1.04	0.100	107.6
380	96.62	0.32	2.32	1.03	0.098	108.5
410	96.68	0.33	2.42	1.03	0.096	109.3
440	96.73	0.34	2.52	1.04	0.094	109.9
470	96.79	0.34	2.60	1.04	0.092	110.7
500	96.84	0.35	2.69	1.04	0.091	111.4
509.6	96.86	0.35	2.72	1.04	0.090	111.7
550	96.92	0.36	2.84	1.04	0.088	112.6
610	97.02	0.37	2.99	1.04	0.086	114.0
680	97.12	0.39	3.17	1.04	0.083	115.1
750	97.22	0.40	3.34	1.04	0.081	116.8
830	97.32	0.42	3.52	1.04	0.078	118.5
910	97.42	0.43	3.69	1.03	0.076	120.3
1000	97.52	0.45	3.89	1.03	0.073	122.1

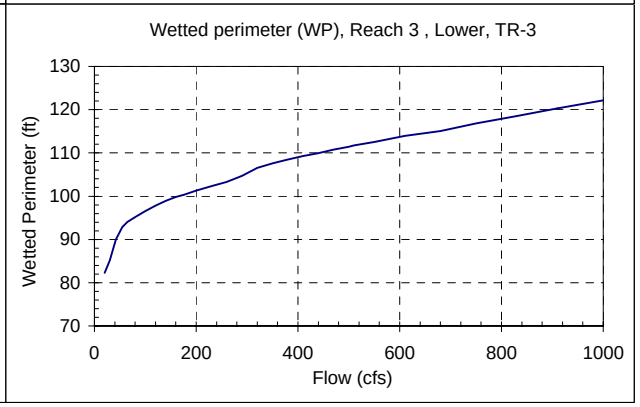


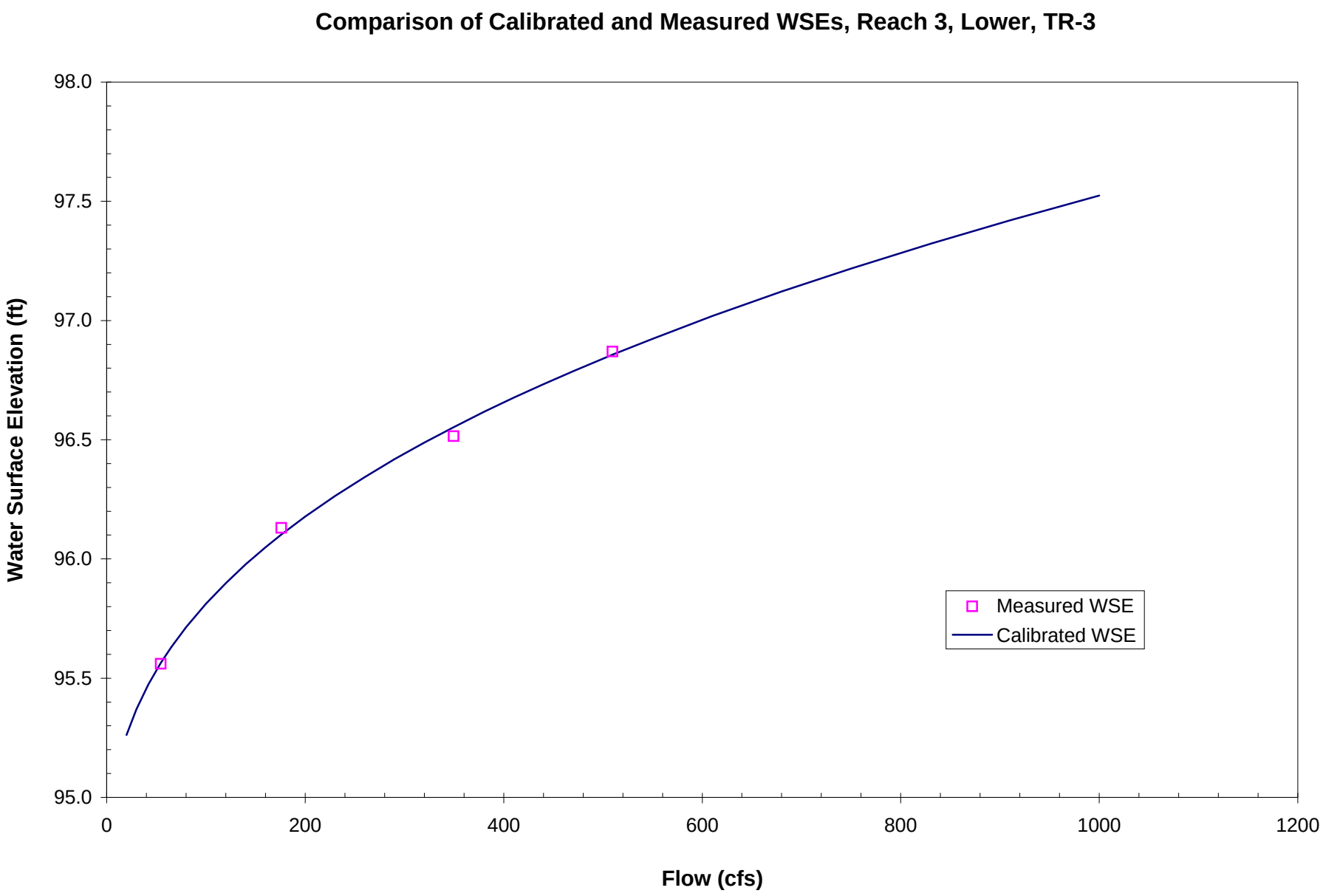











Comparison of Calibrated and Measured WSEs, Reach 3, Lower, TR-3
Water Surface Elevation (ft)
98.0
97.5
97.0
96.5
96.0
95.5
95.0
0
200
400
600
800
1000
1200
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Lower Reach 3
Date: 6/27/2007 **Transect:** TR2
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.74	104.74		100.00
HP2			4.85	99.89
TP				
HP2	4.83	104.73		
BM			4.73	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	16.9		104.73	9.95	0.00	94.78	94.86	
CWSE	51.0			9.95	0.00	94.78		48.0
RWSE	92.0			9.72	0.00	95.01		
							Ave Q=	48.0

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4B

(4) 6/26/07 Level Loop Survey (BM & HP). Bank Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.58	104.58		100.00
HP2			4.69	99.89
TP				
HP2	4.67	104.56		
BM			4.56	100.00

Comment:

Date: 6/28/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.53	104.53		100.00
HP2			4.63	99.90
TP				
HP2	4.60	104.49		
BM			4.49	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	17		104.49	9.01	0.00	95.48	95.51	
CWSE	51			9.03	0.00	95.46		161.3
RWSE	92			8.89	0.00	95.60		
							Ave Q=	161.3

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A

Date: 6/29/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.57	104.57		100.00
HP2			4.67	99.90
TP				
HP2	4.66	104.56		
BM			4.56	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	12		104.56	8.34	0.00	96.22	96.22	
CWSE	51			8.32	0.00	96.24		332.9
RWSE	n/a							
							Ave Q=	332.9

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A

Date: 10/19/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM				
HP2				
TP				
HP2				
BM				

Comment: No level loop was shot

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			105.72	9.29	0.28	96.71	96.76	
RWSE				8.91	0.00	96.81		
							Ave Q=	

Note: Water surface elevations shot at ~2:15
WSE slope = NA

Stream: Sultan R.
Site: Lower Reach 3
Transect: 2
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
6/27/2007	104.73	48.0
6/28/2007	104.49	161.3
6/29/2007	104.56	332.9
6/26/2007	104.56	

27-Jun-07

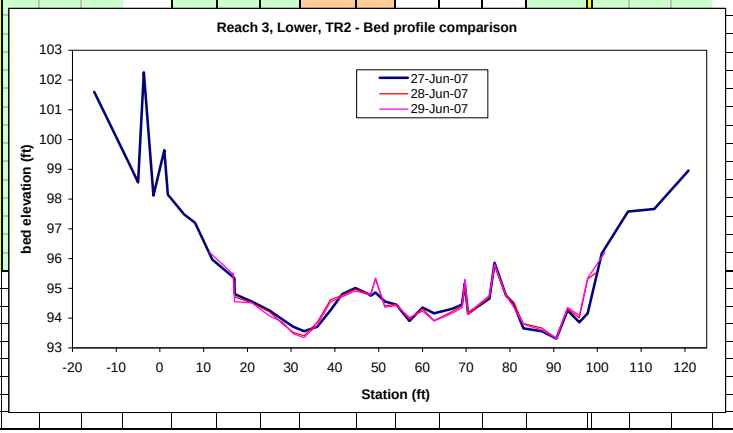
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-15.0	2.96	101.60									11.90
	-7.0	5.39	99.17									11.90
	-5.0	6.00	98.56									11.90
	-3.7	2.30	102.26									11.90
	-1.5	6.44	98.12									18.65
LWP	1.0	4.92	99.64									18.70
	1.8	6.41	98.15									81.65
	5.5	7.08	97.48									81.60
	8.0	7.36	97.20									81.85
	12.0	8.59	95.97									81.80
	17.0	9.22	95.34									87.75
LWE	17.1		94.81	0.05	0.00		0.00		0.00		0.00	87.60
	21.0		94.56	0.30	0.00		0.00		0.00		0.00	32.55
	25.0		94.26	0.60	0.20		0.29		0.29		0.62	83.60
	28.0		93.96	0.90	0.41		0.46		0.46	10	1.12	57.55
	30.5		93.71	1.15	0.81		0.83		0.83		2.38	87.60
	33.0		93.56	1.30	0.98		1.00		1.00		3.57	62.60
	36.0		93.71	1.15	0.95		0.97		0.97		3.34	52.60
	39.0		94.26	0.60	0.13		0.24		0.24		0.41	34.55
	41.7		94.81	0.05	0.00		0.00		0.00		0.00	34.70
	44.7		95.01	-0.15								34.60
	47.7		94.81	0.05	0.00		0.00		0.00		0.00	43.65
	48.2		94.76	0.10	0.00		0.00		0.00		0.00	43.65
	49.3		94.86	0.00	0.00		0.00		0.00		0.00	88.90
	51.4		94.56	0.30	1.79		1.83		1.83		1.29	88.90
	54.0		94.46	0.40	2.21		2.25		2.25		2.52	43.60
	57.0		93.91	0.95	1.88		1.92		1.92		5.47	46.60
	60.0		94.36	0.50	0.31		0.38		0.38		0.54	87.55
	62.7		94.16	0.70	0.36		0.41		0.41		0.99	78.70
	66.8		94.31	0.55	1.81		1.85		1.85		3.20	78.60
	69.0		94.46	0.40	0.00		0.00		0.00		0.00	87.65
	69.7		95.16	-0.30								88.90
	70.4		94.16	0.70	0.86		0.88		0.88		1.50	88.90
	75.3		94.66	0.20	1.83		1.87		1.87		0.91	86.70
	76.5		95.86	-1.00								88.90
	79.1		94.76	0.10	1.42		1.45		1.45		0.12	88.90
	80.8		94.51	0.35	0.75		0.77		0.77		0.54	86.80
	83.1		93.66	1.20	0.18		0.28		0.28		1.10	85.75
	87.3		93.56	1.30	2.02		2.06		2.06		10.04	46.60
	90.6		93.31	1.55	0.86	2.08	0.88	2.12	1.50		6.86	84.55
	93.2		94.26	0.60	0.75		0.77		0.77	10	1.20	82.55
	95.9		93.86	1.00	0.03		0.10		0.10		0.22	28.70
RWE	97.8		94.16	0.70	0.01		0.03		0.03		0.02	28.95
	101.0	8.39	96.17									21.90
	107.0	6.98	97.58									21.90
	113.0	6.89	97.67									21.60
RWP	120.8	5.60	98.96									11.90

28-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	16.7		95.51	0.00	0.00		0.00		0.00		0.00	87.6
	17.1		94.71	0.80	0.00		0.00		0.00		0.00	87.6
	21.0		94.51	1.00	0.01		0.04		0.04		0.14	32.6
	25.0		94.21	1.30	0.71		0.76		0.76		3.47	83.6
	28.0		93.81	1.70	1.55		1.61		1.61		7.52	57.6
	30.5		93.51	2.00	2.68		2.76		2.76	5	13.73	87.6
	33.0		93.41	2.10	1.87		1.94		1.94	10	11.01	62.6
	36.0		93.86	1.65	1.90		1.97		1.97		9.73	52.6
	39.0		94.61	0.90	1.23		1.28		1.28		3.28	34.6
	41.7		94.76	0.75	0.71		0.76		0.76		1.63	34.7
	44.7		94.96	0.55	2.49		2.57		2.57	10	4.17	34.6
	47.7		94.81	0.70	2.63		2.71		2.71	30	2.87	43.7
	48.2		94.81	0.70	2.99		3.07		3.07	10	1.69	43.7
	49.3		95.31	0.20	2.78		2.86		2.86		0.91	88.9
	51.4		94.41	1.10	3.03		3.11		3.11		8.04	88.9
	54.0		94.46	1.05	2.53		2.61		2.61		7.66	43.6
	57.0		93.96	1.55	2.01		2.08		2.08		9.66	46.6
	60.0		94.31	1.20	2.77		2.85		2.85		9.74	87.6
	62.7		93.91	1.60	0.92		0.97		0.97		5.30	78.7
	66.8		94.21	1.30	1.69		1.75		1.75		7.17	78.6
	69.0		94.41	1.10	0.51		0.55		0.55		0.88	87.7
	69.7		95.11	0.40	0.49		0.53		0.53		0.15	88.9
	70.4		94.11	1.40	0.48		0.52		0.52		2.04	88.9
	75.3		94.71	0.80	0.49		0.53		0.53		1.30	86.7
	76.5		95.76	-0.25	0.00		0.00		0.00		0.00	88.9
	79.1		94.76	0.75	2.39		2.46		2.46		3.97	88.9
	80.8		94.51	1.00	0.55		0.60		0.60	45	0.84	86.8
	83.1		93.81	1.70	0.95		1.00		1.00		5.55	85.8
	87.3		93.66	1.85	3.29		3.37		3.37		23.38	46.6
	90.6		93.31	2.20	1.97		2.04		2.04		13.22	84.6
	93.2		94.31	1.20	0.59		0.64		0.64		2.03	82.6
	95.9		94.01	1.50	0.00		0.00		0.00		0.00	28.7
	97.8		95.31	0.20	0.58		0.63		0.63		0.23	29.0
RWE	99.6		95.51	0.00	0.00		0.00		0.00		0.00	21.9

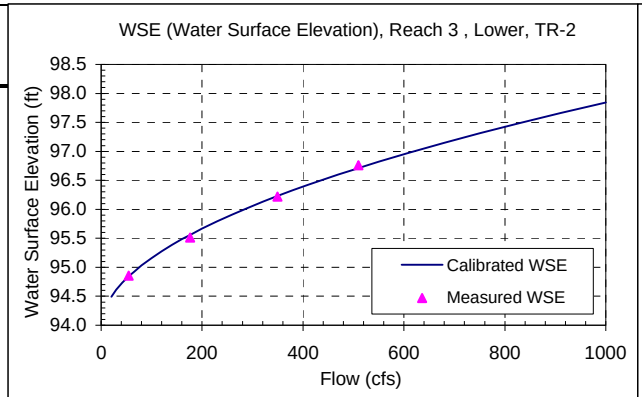
29-Jun-07

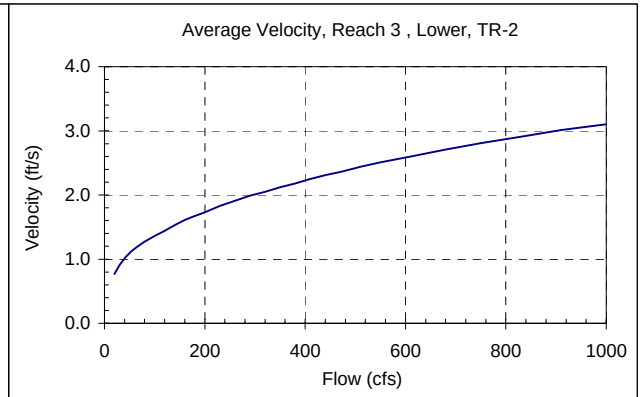
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	11.3		96.22	0.00	0.00		0.00		0.00		0.00	81.8
	16.7		95.47	0.75	0.00		0.00		0.00		0.00	87.8
	17.1		94.55	1.67	0.00		0.00		0.00		0.00	87.6
	21.0		94.52	1.70	0.09		0.19		0.19		1.26	32.6
	25.0		94.07	2.15	1.69		1.75		1.75		13.18	83.6
	28.0		93.87	2.35	4.52		4.61		4.61		29.79	57.6
	30.5		93.47	2.75	3.10	3.42	3.18	3.50	3.34		22.96	87.6
	33.0		93.34	2.88	1.83	1.16	1.89	1.21	1.55		12.28	62.6
	36.0		93.77	2.45	1.53		1.59		1.59		11.67	52.6
	39.0		94.54	1.68	1.52		1.58		1.58		7.55	34.6
	41.7		94.72	1.50	1.73		1.79		1.79		7.66	34.7
	44.7		94.91	1.31	2.40		2.47		2.47		9.72	34.6
	47.7		94.80	1.42	2.82		2.90		2.90		7.20	43.7
	48.2		94.77	1.45	2.87		2.95		2.95		3.42	43.7
	49.3		95.34	0.88	3.45		3.53		3.53		4.97	88.9
	51.4		94.37	1.85	4.17		4.25		4.25		18.49	88.9
	54.0		94.42	1.80	3.96		4.04		4.04		20.36	43.6
	57.0		94.02	2.20	3.08		3.16		3.16		20.85	46.6
	60.0		94.24	1.98	1.15		1.20		1.20		6.76	87.6
	62.7		93.90	2.32	1.30		1.35		1.35		10.65	78.7
	66.8		94.16	2.06	1.46		1.52		1.52		9.83	78.6
	69.0		94.34	1.88	0.81		0.86		0.86		2.36	87.7
	69.7		95.30	0.92	0.53		0.57		0.57		0.37	88.9
	70.4		94.16	2.06	0.25		0.32		0.32		1.82	88.9
	75.3		94.76	1.46	3.06		3.14		3.14		13.98	86.7
	76.5		95.82	0.40	0.25		0.32		0.32		0.24	88.9
	79.1		94.74	1.48	0.22		0.29		0.29		0.93	88.9
	80.8		94.39	1.83	2.37		2.44		2.44		8.94	86.8
	83.1		93.80	2.42	1.63		1.69		1.69		13.29	85.8
	87.3		93.60	2.62	4.50	3.50	4.59	3.58	4.08		40.13	46.6
	90.6		93.32	2.90	4.10	0.48	4.18	0.52	2.35		20.12	84.6
	93.2		94.35	1.87	2.30		2.37		2.37		11.76	82.6
	95.9		94.10	2.12	0.05		0.17		0.17		0.82	28.7
	97.8		95.34	0.88	-0.09		-0.19		-0.19		-0.48	29.0
RWE	101.7		96.22	0.00	0.00		0.00		0.00		0.00	21.9

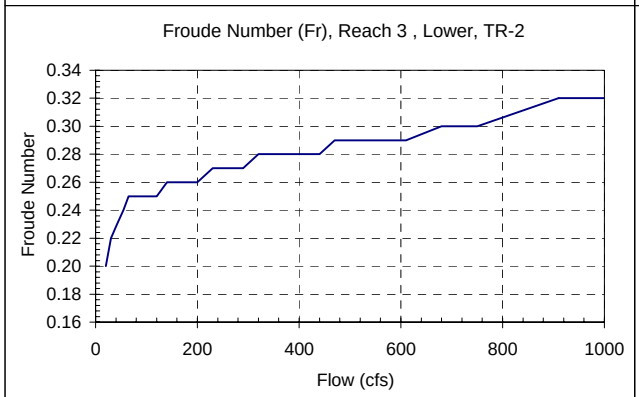


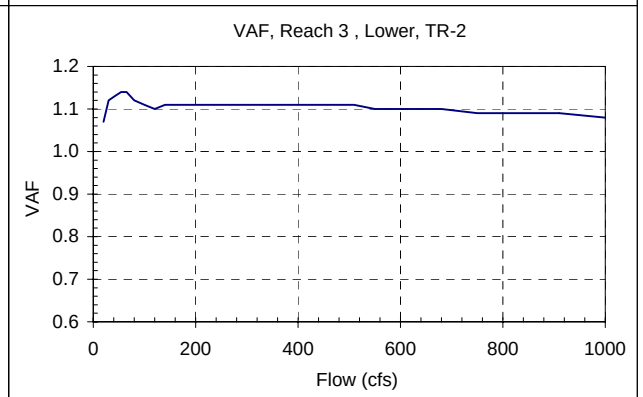
Stream: Sultan R.
Site: Lower Reach 3
Habitat: Riffle
Transect: 2

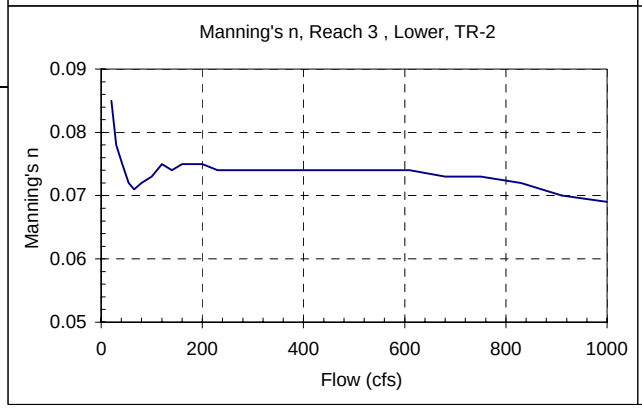
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
20	94.49	0.20	0.77	1.07	0.085	55.9
30	94.61	0.22	0.91	1.12	0.078	62.9
42	94.73	0.23	1.03	1.13	0.075	68.2
54.6	94.84	0.24	1.13	1.14	0.072	74.1
65	94.92	0.25	1.19	1.14	0.071	77.6
80	95.03	0.25	1.27	1.12	0.072	81.4
100	95.16	0.25	1.36	1.11	0.073	82.7
120	95.28	0.25	1.44	1.10	0.075	83.6
140	95.38	0.26	1.53	1.11	0.074	84.3
160	95.48	0.26	1.61	1.11	0.075	85.0
176.0	95.56	0.26	1.66	1.11	0.075	86.1
200	95.67	0.26	1.73	1.11	0.075	87.9
230	95.79	0.27	1.83	1.11	0.074	89.9
260	95.91	0.27	1.91	1.11	0.074	91.6
290	96.02	0.27	1.99	1.11	0.074	92.6
320	96.13	0.28	2.05	1.11	0.074	93.3
349.5	96.23	0.28	2.12	1.11	0.074	93.8
380	96.33	0.28	2.18	1.11	0.074	94.6
410	96.42	0.28	2.25	1.11	0.074	95.2
440	96.51	0.28	2.31	1.11	0.074	95.9
470	96.60	0.29	2.36	1.11	0.074	96.6
500	96.68	0.29	2.42	1.11	0.074	97.2
509.6	96.71	0.29	2.44	1.11	0.074	97.4
550	96.82	0.29	2.51	1.10	0.074	98.2
610	96.98	0.29	2.60	1.10	0.074	99.4
680	97.15	0.30	2.71	1.10	0.073	100.7
750	97.31	0.30	2.81	1.09	0.073	102.5
830	97.49	0.31	2.91	1.09	0.072	104.8
910	97.66	0.32	3.01	1.09	0.070	111.4
1000	97.84	0.32	3.10	1.08	0.069	114.1

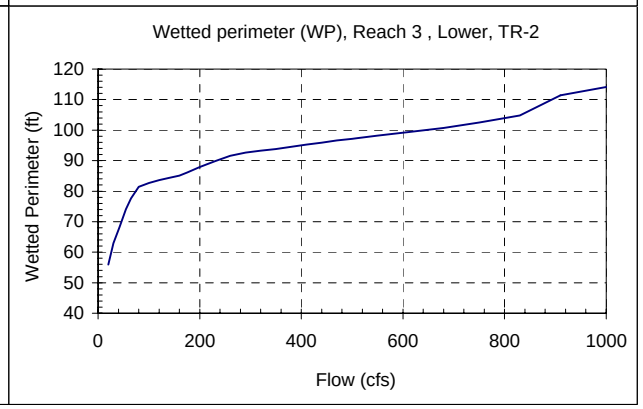


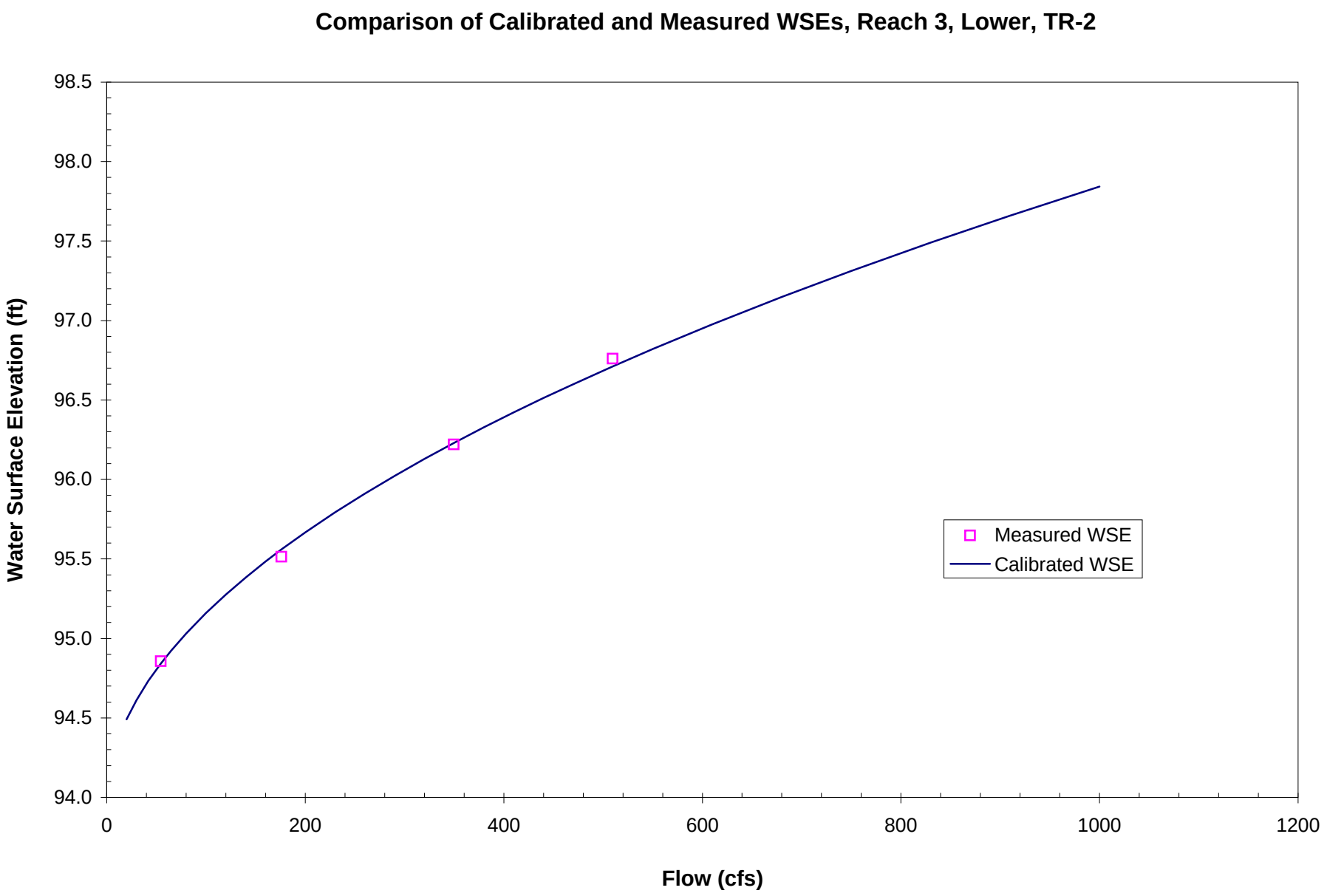











Comparison of Calibrated and Measured WSEs, Reach 3, Lower, TR-2
Water Surface Elevation (ft)
98.5
98.0
97.5
97.0
96.5
96.0
95.5
95.0
94.5
94.0
0
200
400
600
800
1000
1200
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Lower Reach 3
Date: 6/27/2007 **Transect:** TR1
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.20	102.20		100.00
HP1			1.43	100.77
TP				
HP1	1.37	102.14		
BM			2.14	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	38.0		102.14	9.41	0.00	92.73	92.80	
CWSE	67.0			9.29	0.00	92.85		48.6
RWSE	98.0			9.33	0.00	92.81		

Ave Q= 48.6

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4B

(4) 6/26/07 Level Loop Survey (BM & HP). Bank Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.74	101.74		100.00
HP1			0.96	100.78
TP				
HP1	1.02	101.80		
BM			1.80	100.00

Comment:

Date: 6/28/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.87	101.87		100.00
HP1			1.10	100.77
TP				
HP1	1.07	101.84		
BM			1.84	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	30		101.84	8.13	0.00	93.71	93.71	
CWSE	67			8.07	0.00	93.77		172.7
RWSE	98			8.19	0.00	93.65		

Ave Q= 172.7

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099 for stations between 29.1 and 37.4
Propeller ID: 4A

Meter ID: 5750 for stations between 40.5 and 98.6
Propeller ID: 6A

Date: 6/29/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.95	101.95		100.00
HP1			1.17	100.78
TP				
HP1	1.09	101.87		
BM			1.87	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE	23		101.87	7.53	0.00	94.34	94.34	
								340.8

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	-35		101.87	7.83	0.00	94.04
d/s	60		101.87	7.33	0.00	94.54

Ave Q= 340.8

Note:
WSE slope = 0.526%

Date: 10/19/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.95	101.95		100.00
HP1			1.17	100.78
TP				
HP1				
BM				

Comment: 1/2 level loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			101.95	6.96	0.02	95.01	94.90	
RWSE				8.73	1.56	94.78		

Ave Q=

Note: Water surface elevations shot at ~2:30

Stream: Sultan R.
Site: Lower Reach 3
Transect: 7
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
6/27/2007	102.14	48.6
6/28/2007	101.84	172.7
6/29/2007	101.87	340.8
6/26/2007	101.80	

27-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-12.0	0.81	100.99									11.90
	-6.0	2.11	99.69									11.90
	-2.0	3.31	98.49									12.90
LWP	0.0	4.09	97.71									12.80
	1.1	4.66	97.14									21.55
	5.0	5.27	96.53									12.55
	9.0	7.63	94.17									21.55
	13.1	7.80	94.00									54.70
	17.0	6.32	95.48									84.90
	23.0	7.55	94.25									45.80
	27.0	7.81	93.99									23.75
	32.8	8.87	92.93									47.65
LWE	33.5		92.80	0.00	0.00		0.00		0.00		0.00	47.65
	34.2		92.70	0.10	0.40		0.45		0.45		0.02	43.55
	36.0		93.70	-0.90								88.90
	37.4		91.60	1.20	0.00		0.00		0.00		0.00	87.70
	40.5		91.60	1.20	0.32		0.38		0.38	45	1.01	84.75
	43.6		92.10	0.70	2.65		2.70		2.70		5.87	45.55
	46.7		91.80	1.00	1.66		1.69		1.69	5	5.06	85.65
	49.6		91.80	1.00	0.76		0.78		0.78		2.29	23.55
	52.6		91.60	1.20	1.33		1.36		1.36	10	4.81	23.55
	55.6		91.80	1.00	1.34		1.37		1.37	25	3.72	56.60
	58.6		92.30	0.50	1.27		1.30		1.30	20	1.83	34.55
	61.6		92.50	0.30	0.90		0.92		0.92	20	0.78	32.70
	64.6		92.65	0.15	0.66		0.68		0.68	35	0.25	32.60
	67.6		92.50	0.30	1.48		1.51		1.51	30	1.18	34.65
	70.6		91.95	0.85	1.39		1.42		1.42		3.62	36.60
	73.6		91.50	1.30	1.39		1.42		1.42		6.82	36.55
	78.0		92.00	0.80	0.82		0.84		0.84	5	2.47	56.55
	81.0		91.08	1.72	0.14		0.25		0.25		1.27	82.60
	84.0		90.60	2.20	0.10		0.24		0.24		1.58	86.70
	87.0		91.10	1.70	0.76		0.78		0.78		4.61	86.65
	91.0		91.60	1.20	0.00		0.00		0.00		0.00	86.60
	95.0		91.70	1.10	0.40		0.45		0.45		1.49	42.60
	97.0		92.25	0.55	0.00		0.00		0.00		0.00	34.55
RWE	98.5		92.45	0.35	0.00		0.00		0.00		0.00	34.55
	99.0	6.93	94.87									82.90
	103.6	7.03	94.77									34.50
	105.0	6.90	94.90									56.60
	112.0	5.22	96.58									82.90
	117.0	4.60	97.20									67.55
	120.0	6.10	95.70									87.55
	124.0	5.30	96.50									35.60
RWP	127.6	4.70	97.10									21.80
	143.0	2.30	99.50									12.55

Note:
Sta=-12 through Sta=32.8 and Sta=99 through Sta=143.0 are surevyed on 6/26/07 and the elevations are referenced to 6/26 HI

Note:
Sta=-12 through Sta=32.8 and Sta=99 through Sta=143.0 are surevyed on 6/26/07and the elevations are referenced to 6/26 HI

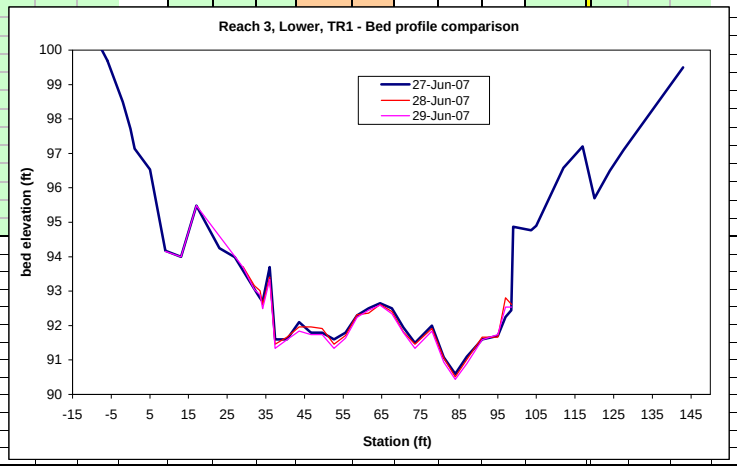
28-Jun-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	29.1		93.71	0.00	0.00		0.00		0.00		0.00	23.8
	32.0		93.16	0.55	1.21		1.27		1.27		1.53	47.7
	33.5		93.01	0.70	1.16		1.22		1.22		0.94	47.7
	34.2		92.61	1.10	1.39		1.45		1.45		1.99	43.6
	36.0		93.41	0.30	1.88		1.95		1.95		0.93	88.9
	37.4		91.46	2.25	0.76		0.81		0.81		4.11	87.7
	40.5		91.66	2.05	0.49		**0.53**		0.53		3.38	84.8
	43.6		91.96	1.75	2.31		**2.38**		2.38		12.93	45.6
	46.7		91.96	1.75	1.19		**1.24**		1.24		6.50	85.7
	49.6		91.91	1.80	0.63		**0.68**		0.68		3.61	23.6
	52.6		91.46	2.25	1.67		**1.73**		1.73	40	8.95	23.6
	55.6		91.71	2.00	2.31		**2.38**		2.38	30	12.38	56.6
	58.6		92.31	1.40	2.38		**2.45**		2.45	10	10.15	34.6
	61.6		92.36	1.35	1.64		**1.70**		1.70		6.88	32.7
	64.6		92.61	1.10	2.28		**2.35**		2.35		7.76	32.6
	67.6		92.41	1.30	2.47		**2.55**		2.55	10	9.77	34.7
	70.6		91.81	1.90	2.39		**2.46**		2.46	5	13.99	36.6
	73.6		91.46	2.25	2.33		**2.40**		2.40		20.01	36.6
	78.0		91.91	1.80	1.65		**1.71**		1.71		11.39	56.6
	81.0		91.06	2.65	0.69	0.15	**0.74**	**0.25**	0.50		3.95	82.6
	84.0		90.51	3.20	1.02	1.80	**1.07**	**1.86**	1.47	5	14.04	86.7
	87.0		91.01	2.70	1.27	1.10	**1.32**	**1.15**	1.23	15	11.27	86.7
	91.0		91.66	2.05	0.05		**0.17**		0.17		1.37	86.6
	95.0		91.66	2.05	0.38		**0.43**		0.43		2.61	42.6
	97.0		92.81	0.90	1.19		**1.24**		1.24		2.00	34.6
RWE	98.6		92.61	1.10	0.24		**0.31**		0.31		0.27	34.6

NOTE:
Sta=29.1 through Sta=37.4, vel meter 4099_4A was used.
Sta=40.5 through Sta=98.6, vel meter 5750_6A was used

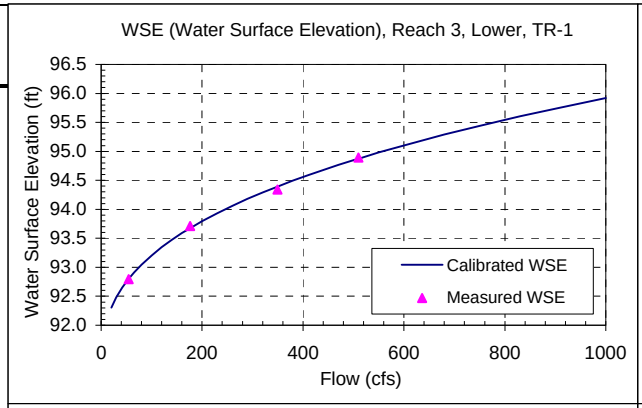
29-Jun-07

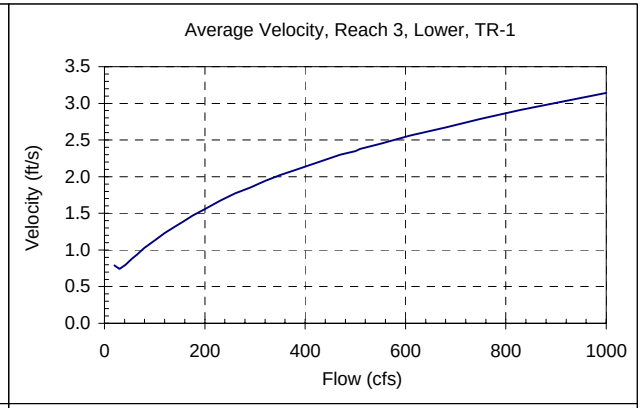
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	9.0		94.15	0.19	0.00		0.00		0.00		0.00	21.6
	13.1		94.00	0.34	0.00		0.00		0.00		0.00	54.7
	17.0		95.48	-1.14								84.9
	29.1		93.69	0.65	1.26		1.31		1.31	30	1.07	23.8
	32.0		93.05	1.29	0.70		0.75		0.75		2.13	47.7
	33.5		92.89	1.45	1.08		1.13		1.13		1.80	47.7
	34.2		92.49	1.85	1.23		1.28		1.28		2.96	43.6
	36.0		93.34	1.00	1.30		1.35		1.35		2.16	88.9
	37.4		91.34	3.00	0.56		0.61		0.61		4.09	87.7
	40.5		91.59	2.75	1.03		1.08		1.08	20	8.67	84.8
	43.6		91.84	2.50	2.74		2.82		2.82	20	20.52	45.6
	46.7		91.74	2.60	2.70		2.78		2.78	20	20.36	85.7
	49.6		91.74	2.60	0.43		0.47		0.47		3.59	23.6
	52.6		91.34	3.00	2.09		2.16		2.16		19.43	23.6
	55.6		91.64	2.70	3.47		3.55		3.55	10	28.32	56.6
	58.6		92.24	2.10	3.42		3.50		3.50		22.05	34.6
	61.6		92.44	1.90	3.05		3.13		3.13		17.84	32.7
	64.6		92.59	1.75	2.44		2.51		2.51		13.20	32.6
	67.6		92.34	2.00	2.38		2.45		2.45	15	14.22	34.7
	70.6		91.79	2.55	2.30		2.37		2.37	10	17.88	36.6
	73.6		91.34	3.00	2.26		2.33		2.33		25.89	36.6
	78.0		91.84	2.50	2.20		2.27		2.27		21.01	56.6
	81.0		90.94	**3.40**					**0.80**		8.16	82.6
	84.0		90.44	**3.90**					**2.40**		28.08	86.7
	87.0		90.89	3.45	2.40		2.47		2.47		29.88	86.7
	91.0		91.59	2.75	0.00		0.00		0.00		0.00	86.6
	95.0		91.74	2.60	1.89		1.96		1.96		15.25	42.6
	97.0		92.54	1.80	2.67		2.75		2.75		8.90	34.6
RWE	98.6		92.54	1.80	2.25		2.32		2.32		3.34	34.6

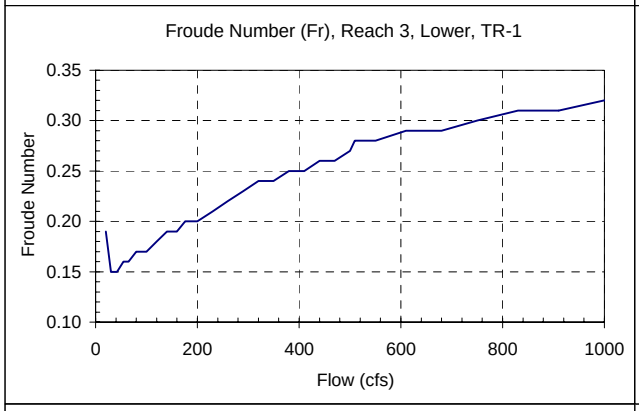


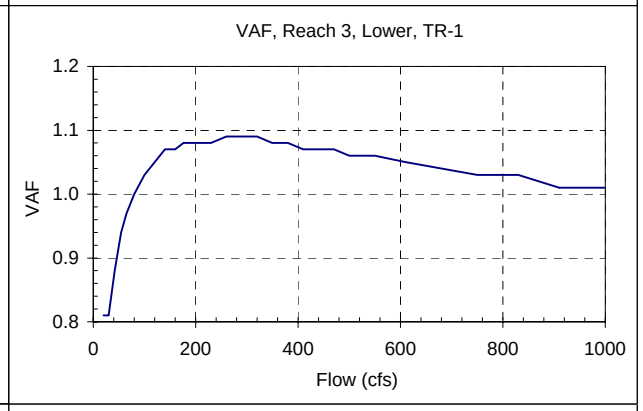
Stream: Sultan R.
Site: Lower Reach 3
Habitat: Riffle
Transect: 1

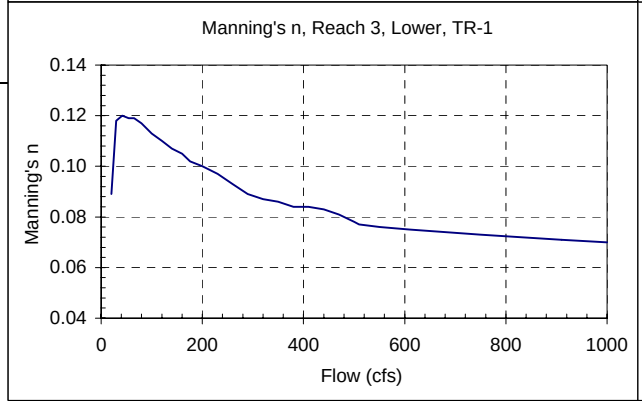
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
20	92.30	0.19	0.79	0.81	0.089	48.4
30	92.48	0.15	0.74	0.81	0.118	55.4
42	92.65	0.15	0.80	0.88	0.120	63.1
54.6	92.80	0.16	0.88	0.94	0.119	64.4
65	92.91	0.16	0.94	0.97	0.119	65.5
80	93.05	0.17	1.03	1.00	0.117	66.8
100	93.21	0.17	1.13	1.03	0.113	68.2
120	93.35	0.18	1.23	1.05	0.110	69.5
140	93.47	0.19	1.32	1.07	0.107	70.6
160	93.59	0.19	1.40	1.07	0.105	71.7
176.0	93.67	0.20	1.47	1.08	0.102	72.4
200	93.79	0.20	1.56	1.08	0.100	73.4
230	93.93	0.21	1.67	1.08	0.097	74.6
260	94.06	0.22	1.77	1.09	0.093	77.9
290	94.18	0.23	1.85	1.09	0.089	82.9
320	94.29	0.24	1.94	1.09	0.087	84.8
349.5	94.39	0.24	2.02	1.08	0.086	85.9
380	94.49	0.25	2.09	1.08	0.084	87.0
410	94.59	0.25	2.16	1.07	0.084	88.1
440	94.68	0.26	2.23	1.07	0.083	89.0
470	94.76	0.26	2.30	1.07	0.081	89.9
500	94.85	0.27	2.35	1.06	0.078	95.4
509.6	94.87	0.28	2.38	1.06	0.077	96.8
550	94.98	0.28	2.45	1.06	0.076	98.5
610	95.13	0.29	2.56	1.05	0.075	100.6
680	95.29	0.29	2.67	1.04	0.074	102.9
750	95.44	0.30	2.79	1.03	0.073	105.0
830	95.60	0.31	2.91	1.03	0.072	106.3
910	95.76	0.31	3.02	1.01	0.071	107.7
1000	95.92	0.32	3.14	1.01	0.070	109.9

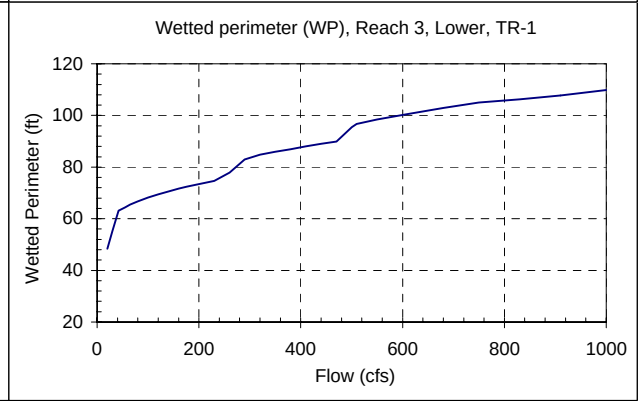




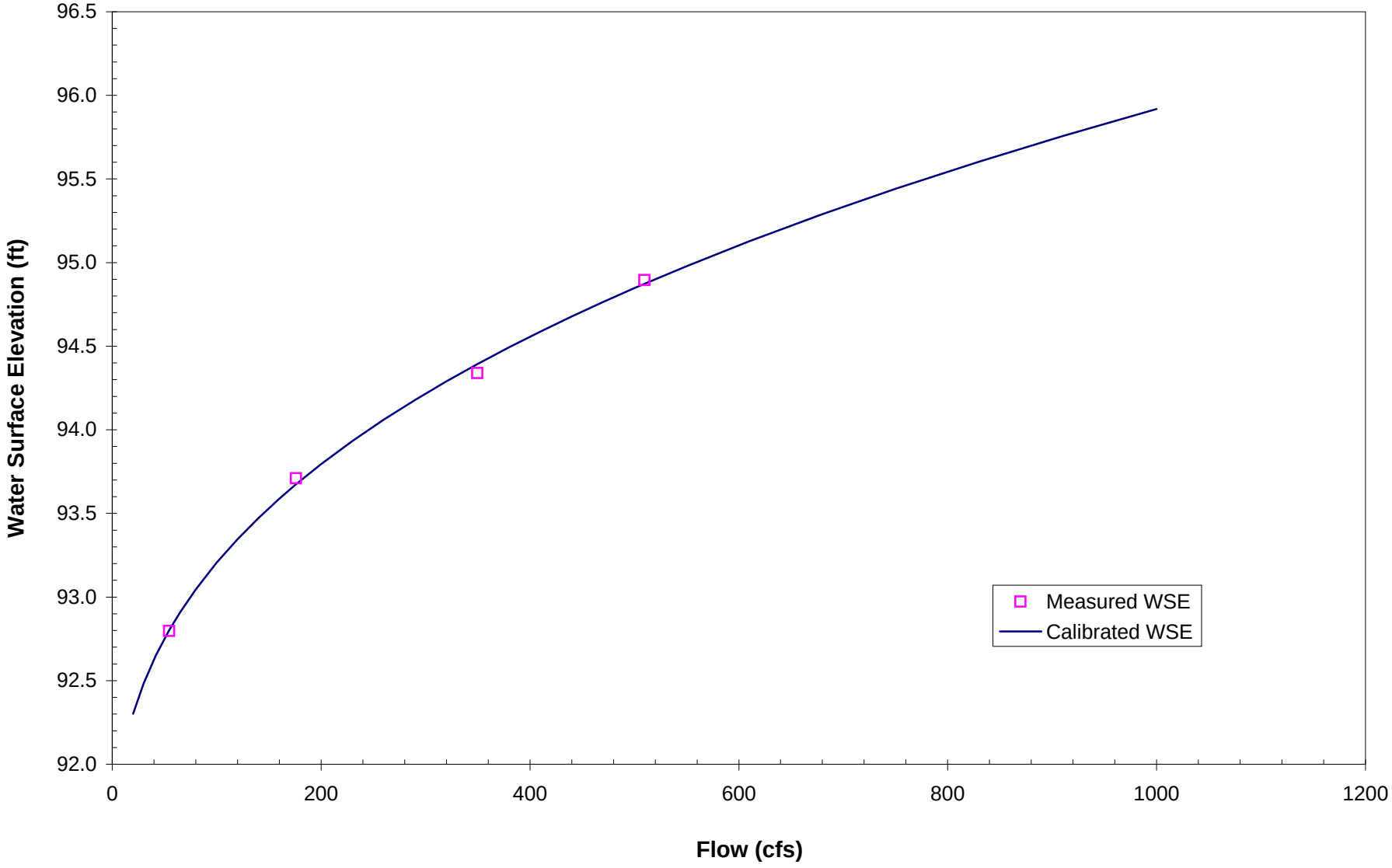








Comparison of Calibrated and Measured WSEs, Reach 3, Lower, TR-1, Riffle



Stream: Sultan R.
Site: Upper Reach 2
Date: 7/10/2007 **Transect:** TR7
Habitat: Riffle **Flow:** Bed Profile Only

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.34	100.34		100.00
HP6			2.51	97.83
HP7			1.42	98.92
RWP6			1.89	98.45
TP				
BM	0.33	100.33		100.00
HP7			1.41	98.92
RWP6			1.88	98.45
HP6			2.50	97.83

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
7-L						0.00	0.00	
7-M								
7-R						0.00		

Ave Q=

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Calib. #:

Date: 7/11/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.34	100.34		100.00
HP6			2.52	97.82
HP7			1.43	98.91
RWP6			1.89	98.45
TP				
RWP6	1.87	100.32		
HP7			1.41	98.91
HP6			2.49	97.83
BM			0.32	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
7-L	129		100.32	7.22	0.00	93.10	93.11	
7-M	75			7.20	0.00	93.12		121.5
7-R	48			7.22	0.00	93.10		

Ave Q= 121.5

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
d/s	-60		100.32	8.51	0.00	91.81
u/s	60			7.10	0.00	93.22

WSE slope = 1.175%
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib. #: 167

Date: 7/12/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.28	100.28		100.00
HP6			2.46	97.82
HP7			1.37	98.91
RWP6			1.83	98.45
TP				
RWP6	1.80	100.25		
HP7			1.34	98.91
HP6			2.42	97.83
BM			0.25	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
7-L	132		100.25	6.69	0.00	93.56	93.60	
7-M	75			6.60	0.00	93.65		243.9
7-R	44			6.65	0.00	93.60		

Ave Q= 243.9

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
at TR	0					93.60
u/s	60		100.25	6.47	0.00	93.78

WSE slope = 0.294%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib. #: 167

Date: 7/13/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.11	100.11		100.00
HP6			2.28	97.83
HP7			1.20	98.91
RWP6			1.66	98.45
TP				
RWP6	1.78	100.23		
HP7			1.32	98.91
HP6			2.40	97.83
BM			0.23	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
7-L	134		100.23	6.19	0.00	94.04	94.08	
7-M	75			6.11	0.00	94.12		420.3
7-R	36			6.16	0.00	94.07		

Ave Q= 420.3

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
at TR	0					94.08
u/s	60		100.23	5.41	0.00	94.82

WSE slope = 1.239%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750 STA 74-139.4
Propeller ID: 6A 4099 STA 35.1-69.1
Calib. #: 167 4B 125

Date: 10/19/2007
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.21	#####		100.00
HP6				
HP7				
RWP6				
TP				
RWP6				
HP7				
HP6				
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
7-L							94.56	
7-M								
7-R			#####	5.65		94.56		

Ave Q=

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Calib. #:

WSE slope = NA
Note: No longitudinal WSE slope surveyed

Date: 10/20/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.06	101.06		100.00
HP6				
HP7				
RWP6				
TP				
RWP6				
HP7				
HP6				
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
7-L							95.16	
7-M								
7-R			#####	5.90	0.00	95.16		

Ave Q=

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Calib. #:

WSE slope = NA
Note: completed at 1:00

Stream: Sultan R.
Site: Upper Reach 2
Transect: 7
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/10/2007	100.16	
7/11/2007	100.32	121.5
7/12/2007	100.21	243.9
7/13/2007	101.06	420.3
Bank Sur.	100.16	

10-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWP	1.3	0.50	99.66									18.7
	2.7	1.78	98.38									18.6
	4.3	1.68	98.48									81.6
	5.5	2.99	97.17									81.7
	8.0	3.62	96.54									56.6
	10.0	4.21	95.95									81.8
	14.0	4.65	95.51									11.9
	19.0	5.12	95.04									11.9
	24.0	5.64	94.52									11.9
	31.0	5.42	94.74									34.7
	37.0	6.66	93.50									34.7
	38.0	6.85	93.31									34.7
	42.0	6.54	93.62									45.7
	46.5	6.97	93.19									54.7
	130.6	7.10	93.06									63.6
	132.5	6.73	93.43									23.7
	135.5	6.75	93.41									24.8
	138.0	6.85	93.31									24.7
	141.0	5.69	94.47									22.9
	144.0	4.95	95.21									22.9
	146.5	3.62	96.54									81.7
	150.3	2.21	97.95									81.7
LWP	155.0	1.50	98.66									81.6

11-Jul-07

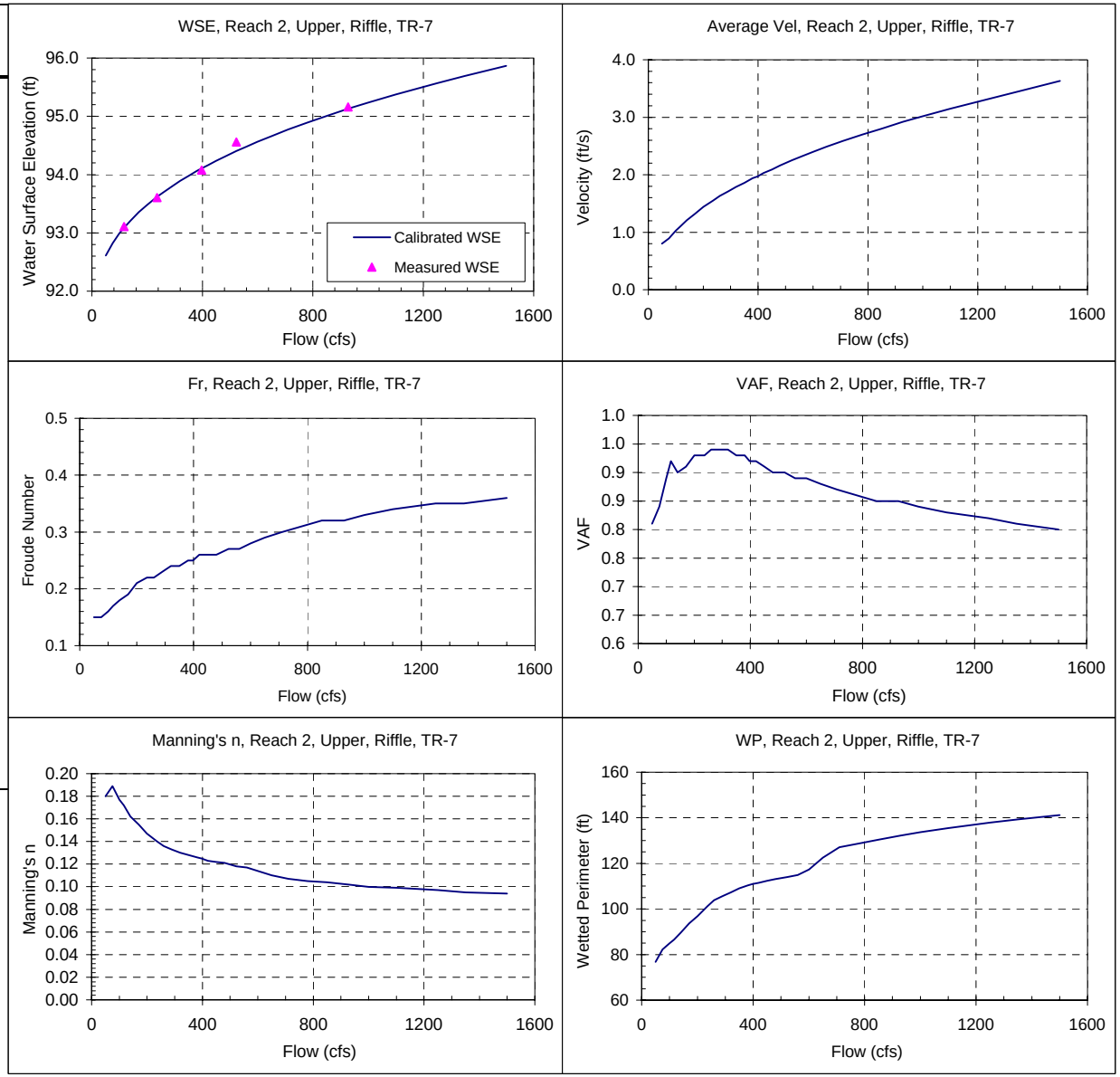
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	47.0		93.11	0.00	0.00		0.00		0.00		0.00	45.6
	52.0		92.29	0.82	1.43		1.48		1.48		6.09	65.6
	57.0		91.56	1.55	1.98		2.05		2.05		15.87	67.6
	62.0		91.76	1.35	2.24		2.31		2.31		15.14	76.7
	66.7		91.31	1.80	2.57		2.65		2.65		14.05	87.6
	67.9		92.36	0.75	2.81		2.89		2.89		2.60	88.9
	69.1		90.86	2.25	2.09		2.16		2.16		14.82	85.6
	74.0		91.11	2.00	0.19		0.28		0.28		2.26	87.6
	77.2		91.91	1.20	1.18		1.23		1.23		3.98	86.7
	79.4		93.11	0.00	0.00		0.00		0.00		0.00	88.9
	80.9		91.41	1.70	1.60		1.66		1.66	30	8.06	86.8
	86.0		91.16	1.95	1.64		1.70		1.70	20	15.73	86.7
	91.0		91.56	1.55	0.82		0.87		0.87		3.39	86.6
	92.8		94.01	-0.90								88.9
	95.5		91.58	1.53	1.57		1.63		1.63		4.36	82.6
	99.0		90.91	2.20	0.89	0.11	0.94	0.21	0.58		3.44	82.6
	100.9		91.21	1.90	0.29		0.34		0.34		0.95	82.6
	101.9		92.83	0.28	0.00		0.00		0.00		0.00	88.9
	103.3		91.99	1.12	0.00		0.00		0.00		0.00	28.6
	107.7		91.45	1.66	0.41		0.45		0.45		3.62	86.6
	113.0		92.09	1.02	0.86		0.91		0.91		4.81	86.6
	118.0		92.06	1.05	0.29		0.34		0.34	30	1.56	58.8
	123.0		91.89	1.22	0.02		0.07		0.07		0.38	82.6
	126.4		91.94	1.17	0.03		0.11		0.11		0.46	85.6
LWE	130.2		93.11	0.00	0.00		0.00		0.00		0.00	84.6

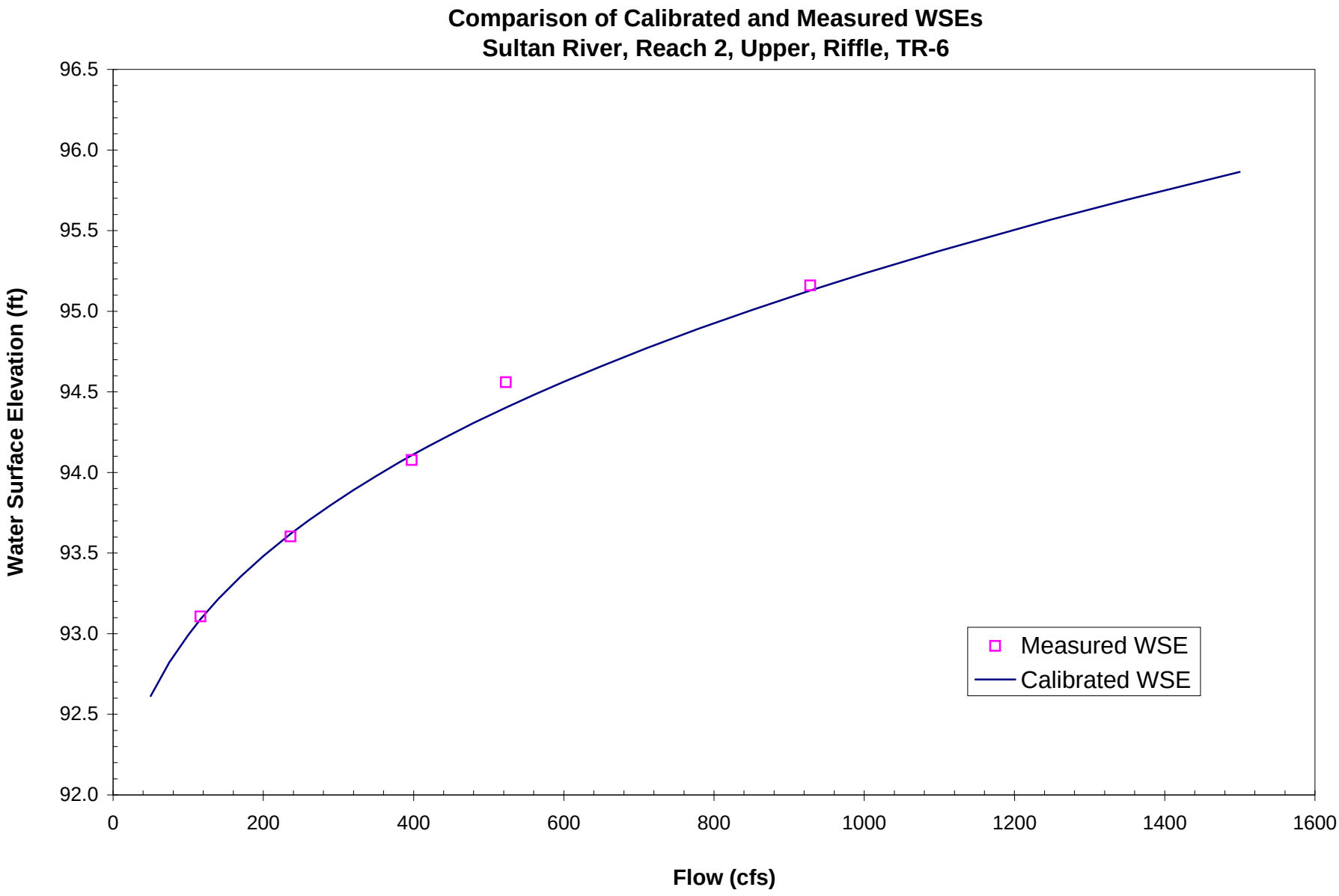
12-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	43.1		93.60	0.00	0.00		0.00		0.00		0.00	45.7
	47.0		93.10	0.50	2.20		2.27		2.27		5.05	45.6
	52.0		92.22	1.38	2.39		2.46		2.46		17.00	65.6
	57.0		91.52	2.08	3.08		3.16		3.16		32.86	67.6
	62.0		91.78	1.82	3.62		3.70		3.70		32.65	76.7
	66.7		91.28	2.32	3.26		3.34		3.34		22.86	87.6
	67.9		92.37	1.23	3.59		3.67		3.67		5.42	88.9
	69.1		90.90	2.70	3.19	2.43	3.27	2.50	2.89		23.78	85.6
	74.0		91.11	2.49	1.19		1.24		1.24		12.48	87.6
	77.2		91.90	1.70	2.39		2.46		2.46		11.31	86.7
	79.4		93.10	0.50	2.98		3.06		3.06	10	2.79	88.9
	80.9		91.42	2.18	2.23		2.30		2.30		16.56	86.8
	86.0		91.15	2.45	1.99		2.06		2.06	15	24.59	86.7
	91.0		91.54	2.06	0.31		0.36		0.36		1.87	86.6
	92.8		94.00	-0.40								88.9
	95.5		91.57	2.03	0.78		0.83		0.83		2.96	82.6
	99.0		90.90	2.70	0.61	0.11	0.66	0.21	0.44		3.18	82.6
	100.9		91.07	2.53	0.10	0.10	0.20	0.20	0.20		0.74	82.6
	101.9		92.80	0.80	0.11		0.21		0.21		0.21	88.9
	103.3		91.92	1.68	0.02		0.07		0.07		0.36	28.6
	107.7		91.44	2.16	0.25	0.16	0.32	0.26	0.29		3.00	86.6
	113.0		92.09	1.51	2.11		2.18		2.18		16.95	86.6
	118.0		92.08	1.52	0.46		0.50		0.50		3.80	58.8
	123.0		92.00	1.60	0.98		1.03		1.03	60	3.47	82.6
	126.4		91.93	1.67	0.54		0.58		0.58		3.52	85.6
	130.2		93.03	0.57	0.91		0.96		0.96	30	3.02	84.6
LWE	139.1		93.60	0.00	0.00		0.00		0.00		0.00	24.7

Stream: Sultan R.
Site: Upper Reach 2
Habitat: Riffle
Transect: 7
Flow: Low

Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	92.61	0.15	0.80	0.81	0.180	76.8
75	92.82	0.15	0.89	0.84	0.189	82.3
100	92.99	0.16	1.03	0.89	0.177	85.0
116.5	93.09	0.17	1.10	0.92	0.172	86.5
140	93.21	0.18	1.21	0.90	0.162	89.6
170	93.36	0.19	1.32	0.91	0.155	93.6
200	93.48	0.21	1.44	0.93	0.147	96.9
236.3	93.62	0.22	1.55	0.93	0.140	101.2
260	93.70	0.22	1.63	0.94	0.136	103.8
290	93.80	0.23	1.71	0.94	0.133	105.6
320	93.89	0.24	1.79	0.94	0.130	107.3
350	93.98	0.24	1.86	0.93	0.128	109.0
380	94.06	0.25	1.94	0.93	0.126	110.3
397.6	94.11	0.25	1.97	0.92	0.125	111.0
420	94.16	0.26	2.03	0.92	0.123	111.5
450	94.24	0.26	2.09	0.91	0.122	112.3
480	94.31	0.26	2.16	0.90	0.121	113.1
523.0	94.40	0.27	2.25	0.90	0.118	114.0
560	94.48	0.27	2.32	0.89	0.117	114.9
600	94.56	0.28	2.40	0.89	0.114	117.4
650	94.66	0.29	2.49	0.88	0.110	122.6
710	94.77	0.30	2.59	0.87	0.107	127.1
780	94.89	0.31	2.70	0.86	0.105	128.8
850	95.01	0.32	2.80	0.85	0.104	130.4
928.3	95.13	0.32	2.92	0.85	0.102	132.2
1000	95.23	0.33	3.02	0.84	0.100	133.6
1100	95.37	0.34	3.15	0.83	0.099	135.4
1250	95.57	0.35	3.33	0.82	0.097	137.9
1350	95.69	0.35	3.45	0.81	0.095	139.3
1500	95.86	0.36	3.63	0.80	0.094	141.2




Comparison of Calibrated and Measured WSEs
Sultan River, Reach 2, Upper, Riffle, TR-6
Water Surface Elevation (ft)
96.5
96.0
95.5
95.0
94.5
94.0
93.5
93.0
92.5
92.0
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Upper Reach 2
Date: 7/10/2007 **Transect:** TR6
Habitat: Riffle **Flow:** Bed Profile Only

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.34	100.34		100.00
HP6			2.51	97.83
HP7			1.42	98.92
RWP6			1.89	98.45
TP				
BM	0.33	100.33		100.00
HP7			1.41	98.92
RWP6			1.88	98.45
HP6			2.50	97.83

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L						0.00	0.00	
6-M								
6-R						0.00		

Ave Q=

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Clib. No:

Date: 7/11/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.34	100.34		100.00
HP6			2.52	97.82
HP7			1.43	98.91
RWP6			1.89	98.45
TP				
RWP6	1.87	100.32		
HP7			1.41	98.91
HP6			2.49	97.83
BM			0.32	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L	106		100.32	7.33	0.00	92.99	93.03	
6-M	54			7.26	0.00	93.06		116.3
6-R	19			7.29	0.00	93.03		

Ave Q= 116.3

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Clib. No: 167

Date: 7/12/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.28	100.28		100.00
HP6			2.46	97.82
HP7			1.37	98.91
RWP6			1.83	98.45
TP				
RWP6	1.80	100.25		
HP7			1.34	98.91
HP6			2.42	97.83
BM			0.25	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L	121.5	65	100.25	6.73	0.00	93.52	93.54	
6-M	54			6.72	0.00	93.53		224.5
6-R	18			6.70	0.00	93.55		

Ave Q= 224.5

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
d/s	-60		100.25	8.45	0.00	91.80
at TR	0					93.54

WSE slope = 2.892%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Clib. No: 167

Date: 7/13/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.11	100.11		100.00
HP6			2.28	97.83
HP7			1.20	98.91
RWP6			1.66	98.45
TP				
RWP6	1.78	100.23		
HP7			1.32	98.91
HP6			2.40	97.83
BM			0.23	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L	110	60	100.23	6.23	0.00	94.00	94.05	
6-M	54			6.21	0.00	94.02		365.9
6-R	17			6.13	0.00	94.10		

Ave Q= 365.9

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
d/s	-60		100.2	7.84	0.00	92.39
at TR	0					94.05

WSE slope = 2.767%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Clib. No: 167

Date: 10/19/2007
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.21	100.21		100.00
HP6				
HP7				
RWP6				
TP				
RWP6				
HP7				
HP6				
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L							94.42	
6-M								
6-R			#####	5.79	0.00	94.42		

Ave Q=

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Clib. No:

Date: 10/20/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.06	####		100.00
HP6				
HP7				
RWP6				
TP				
RWP6				
HP7				
HP6				
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L							95.03	
6-M								
6-R			#####	6.03	0.00	95.03		

Ave Q=

WSE slope = NA
Note: completed at 1:00

(3) Meter and propeller ID for Velocity Correction

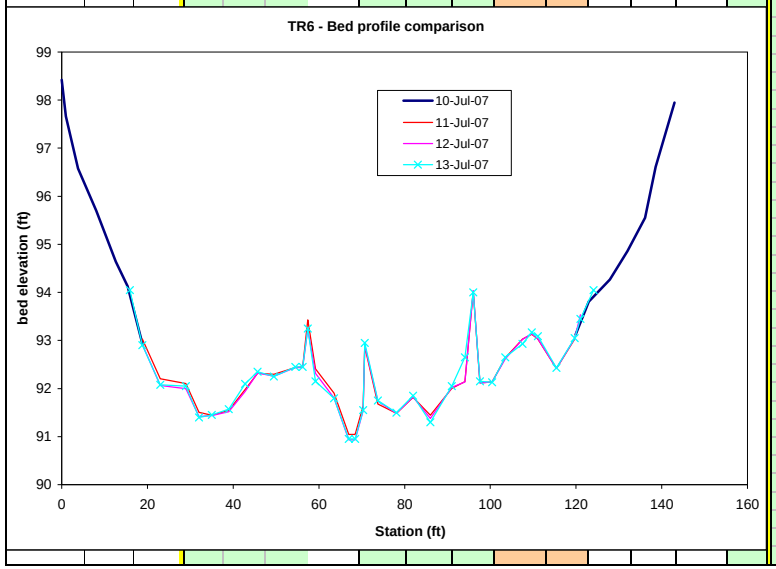
Meter ID:
Propeller ID:
Clib. No:

Stream: Sultan R.
Site: Upper Reach 2
Transect: 6
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/10/2007	99.37	
7/11/2007	100.32	116.3
7/12/2007	100.25	224.5
7/13/2007	100.23	365.9

10-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	sub.
	0.0	0.95	98.42									81.7
RWP	1.0	1.71	97.66									81.8
	3.8	2.79	96.58									81.9
	8.1	3.67	95.70									81.9
	12.6	4.73	94.64									81.9
	15.4	5.24	94.13									28.6
	18.9	6.46	92.91									82.6
	119.9	6.25	93.12									22.9
	123.0	5.56	93.81									22.9
	127.9	5.10	94.27									22.9
	132.0	4.51	94.86									22.9
	136.1	3.82	95.55									28.9
LWP	138.6	2.76	96.61									81.9
	143.0	1.42	97.95									81.9



11-Jul-07

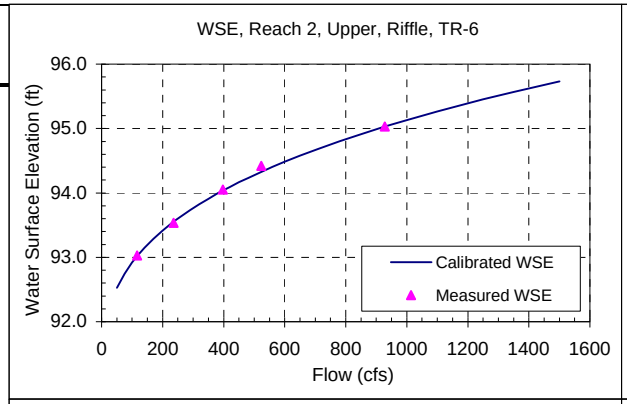
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	sub.
RWE	18.8		93.03	0.00	0.00		0.00		0.00		0.00	22.9
	23.0		92.21	0.82	0.29		0.34		0.34		1.27	23.8
	29.0		92.11	0.92	1.34		1.39		1.39		3.84	46.6
	32.0		91.51	1.52	1.68		1.74		1.74	30	8.02	54.7
	35.0		91.45	1.58	0.78		0.83		0.83	40	3.94	56.6
	39.0		91.55	1.48	0.91		0.96		0.96	20	4.49	45.7
	42.8		91.98	1.05	2.47		2.55		2.55	35	7.33	65.7
	45.7		92.32	0.71	1.86		1.92		1.92		6.01	56.6
	49.5		92.30	0.73	1.04		1.09		1.09		2.67	85.8
	54.5		92.44	0.59	0.93		0.98		0.98	5	0.84	86.7
	56.2		92.45	0.58	2.27		2.34		2.34		0.82	64.6
	57.4		93.43	-0.40								88.9
	59.2		92.41	0.62	3.26		3.34		3.34	20	3.41	88.9
	63.5		91.91	1.12	2.98		3.06		3.06	10	8.44	46.6
	67.0		91.05	1.98	1.67		1.73		1.73	5	5.63	45.6
	68.5		91.05	1.98	1.58		1.64		1.64	5	3.55	45.6
	70.3		91.64	1.39	1.16		1.21		1.21	10	1.82	45.6
	70.7		92.88	0.15	0.80		0.85		0.85	60	0.11	88.9
	73.8		91.68	1.35	1.32		1.37		1.37		6.85	88.9
	78.1		91.49	1.54	2.03		2.10		2.10		13.25	85.7
	82.0		91.82	1.21	2.74		2.82		2.82		13.47	48.6
	86.0		91.45	1.58	1.42		1.47		1.47		10.48	25.6
	91.0		92.01	1.02	1.48		1.54		1.54		6.34	34.6
	94.1		92.15	0.88	1.22		1.27		1.27	5	1.72	48.6
	96.0		94.03	-1.00								88.9
	97.6		92.12	0.91	0.17		0.27		0.27		0.34	88.9
	100.4		92.14	0.89	0.53		0.57		0.57	20	1.42	85.6
	103.5		92.64	0.39	0.10		0.20		0.20		0.28	24.9
	107.5		93.03	0.00	0.00		0.00		0.00		0.00	24.9
	109.7		93.13	-0.10	0.00		0.00		0.00		0.00	23.8
	111.1		93.03	0.00	0.00		0.00		0.00		0.00	23.8
	115.4		92.42	0.61	0.00		0.00		0.00		0.00	34.6
LWE	119.7		93.03	0.00	0.00		0.00		0.00		0.00	12.6

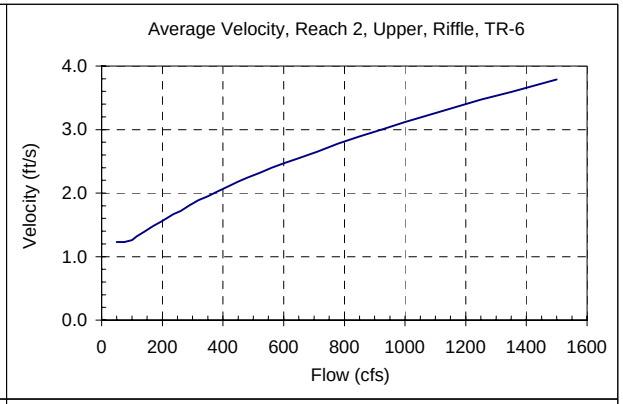
12-Jul-07

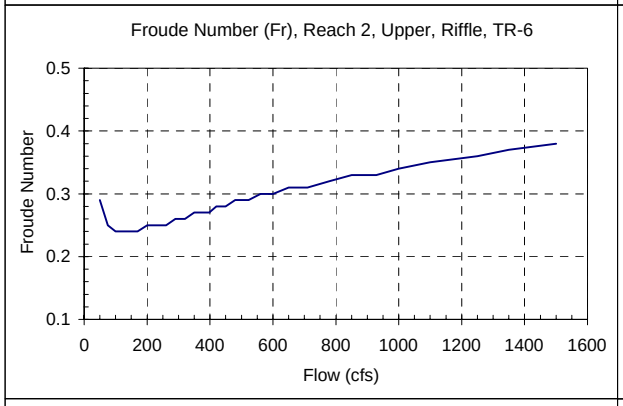
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	sub.
RWE	18.8		92.92	0.62	0.21		0.29		0.29		0.54	82.6
	23.0		92.07	1.47	0.14		0.24		0.24	20	1.52	23.8
	29.0		92.00	1.54	1.88		1.95		1.95		8.99	46.6
	32.0		91.42	2.12	3.07		3.15		3.15	5	23.28	54.7
	35.0		91.44	2.10	1.17		1.22		1.22	60	4.98	56.6
	39.0		91.52	2.02	0.65		0.70		0.70	20	4.45	45.7
	42.8		91.94	1.60	2.58		2.66		2.66	5	14.18	65.7
	45.7		92.33	1.21	1.81		1.87		1.87	15	9.64	56.6
	49.5		92.26	1.28	1.17		1.22		1.22	40	4.00	85.8
	54.5		92.44	1.10	2.49		2.57		2.57		4.09	86.7
	56.2		92.44	1.10	3.61		3.69		3.69		6.09	64.6
	57.4		93.24	0.30	4.17		4.25		4.25	5	3.88	88.9
	59.2		92.32	1.22	4.30		4.39		4.39		20.87	88.9
	63.5		91.81	1.73	2.97		3.05		3.05	10	12.99	46.6
	67.0		90.94	2.60	2.16	1.17	2.23	1.22	1.72		7.39	45.6
	68.5		90.94	2.60	2.09	1.48	2.16	1.54	1.85	10	5.20	45.6
	70.3		91.54	2.00	1.12	0.12	1.17	0.23	0.70		1.53	45.6
	70.7		92.91	0.63	1.64		1.70		1.70	25	1.70	88.9
	73.8		91.74	1.80	1.78		1.84		1.84		12.28	88.9
	78.1		91.49	2.05	2.63		2.71		2.71		22.75	85.7
	82.0		91.83	1.71	2.63		2.71		2.71		18.28	48.6
	86.0		91.38	2.16	1.52		1.58		1.58		15.33	25.6
	91.0		92.03	1.51	1.88		1.95		1.95	20	11.18	34.6
	94.1		92.14	1.40	1.17		1.22		1.22	15	2.55	48.6
	96.0		94.04	-0.50								88.9
	97.6		92.12	1.42	0.82		0.87		0.87		1.74	88.9
	100.4		92.14	1.40	0.43		0.47		0.47	15	1.87	85.6
	103.5		92.62	0.92	0.56		0.61		0.61	45	1.40	24.9
	107.5		93.03	0.51	0.96		1.01		1.01	45	1.13	24.9
	109.7		93.15	0.39	0.52		0.56		0.56	60	0.20	23.8
	111.1		93.04	0.50	0.41		0.45		0.45	45	0.45	23.8
	115.4		92.42	1.12	0.04		0.15		0.15		0.71	34.6
	119.7		93.05	0.49	-0.03		-0.11		-0.11		-0.15	12.6
LWE	121.0		93.54	0.00	0.00		0.00		0.00		0.00	22.9

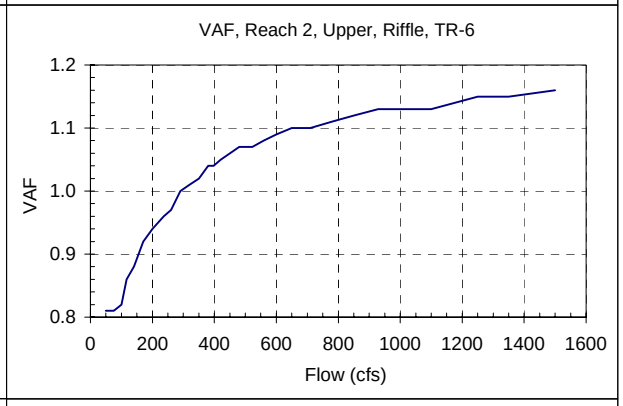
Stream: Sultan R.
Site: Upper Reach 2
Habitat: Riffle
Transect: 6

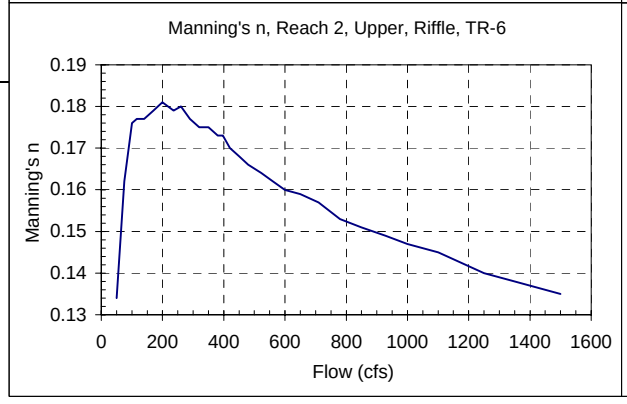
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	92.53	0.29	1.23	0.81	0.134	75.4
75	92.75	0.25	1.23	0.81	0.162	85.0
100	92.92	0.24	1.26	0.82	0.176	93.2
116.5	93.02	0.24	1.32	0.86	0.177	96.8
140	93.15	0.24	1.39	0.88	0.177	102.3
170	93.29	0.24	1.48	0.92	0.179	104.1
200	93.42	0.25	1.56	0.94	0.181	105.7
236.3	93.55	0.25	1.67	0.96	0.179	107.1
260	93.64	0.25	1.72	0.97	0.180	108.1
290	93.73	0.26	1.81	1.00	0.177	109.1
320	93.82	0.26	1.89	1.01	0.175	110.1
350	93.91	0.27	1.95	1.02	0.175	111.1
380	93.99	0.27	2.02	1.04	0.173	111.9
397.6	94.04	0.27	2.06	1.04	0.173	112.5
420	94.09	0.28	2.11	1.05	0.170	113.5
450	94.16	0.28	2.18	1.06	0.168	115.1
480	94.23	0.29	2.24	1.07	0.166	116.7
523.0	94.33	0.29	2.32	1.07	0.164	118.4
560	94.40	0.30	2.40	1.08	0.162	119.3
600	94.48	0.30	2.47	1.09	0.160	120.3
650	94.58	0.31	2.55	1.10	0.159	121.5
710	94.69	0.31	2.65	1.10	0.157	122.9
780	94.80	0.32	2.78	1.11	0.153	124.1
850	94.91	0.33	2.89	1.12	0.151	125.3
928.3	95.03	0.33	3.01	1.13	0.149	126.6
1000	95.13	0.34	3.12	1.13	0.147	127.6
1100	95.27	0.35	3.26	1.13	0.145	129.1
1250	95.45	0.36	3.47	1.15	0.140	130.9
1350	95.57	0.37	3.59	1.15	0.138	132.1
1500	95.73	0.38	3.79	1.16	0.135	133.2

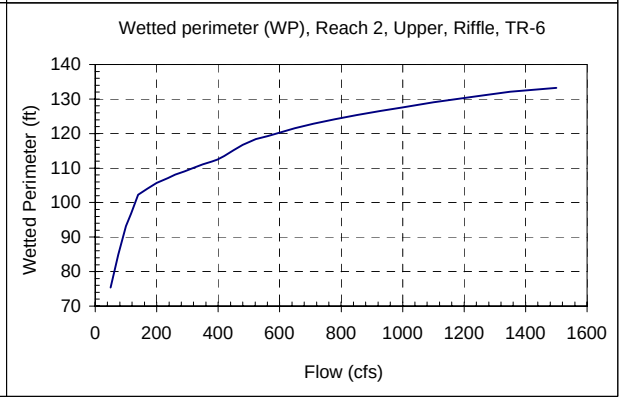


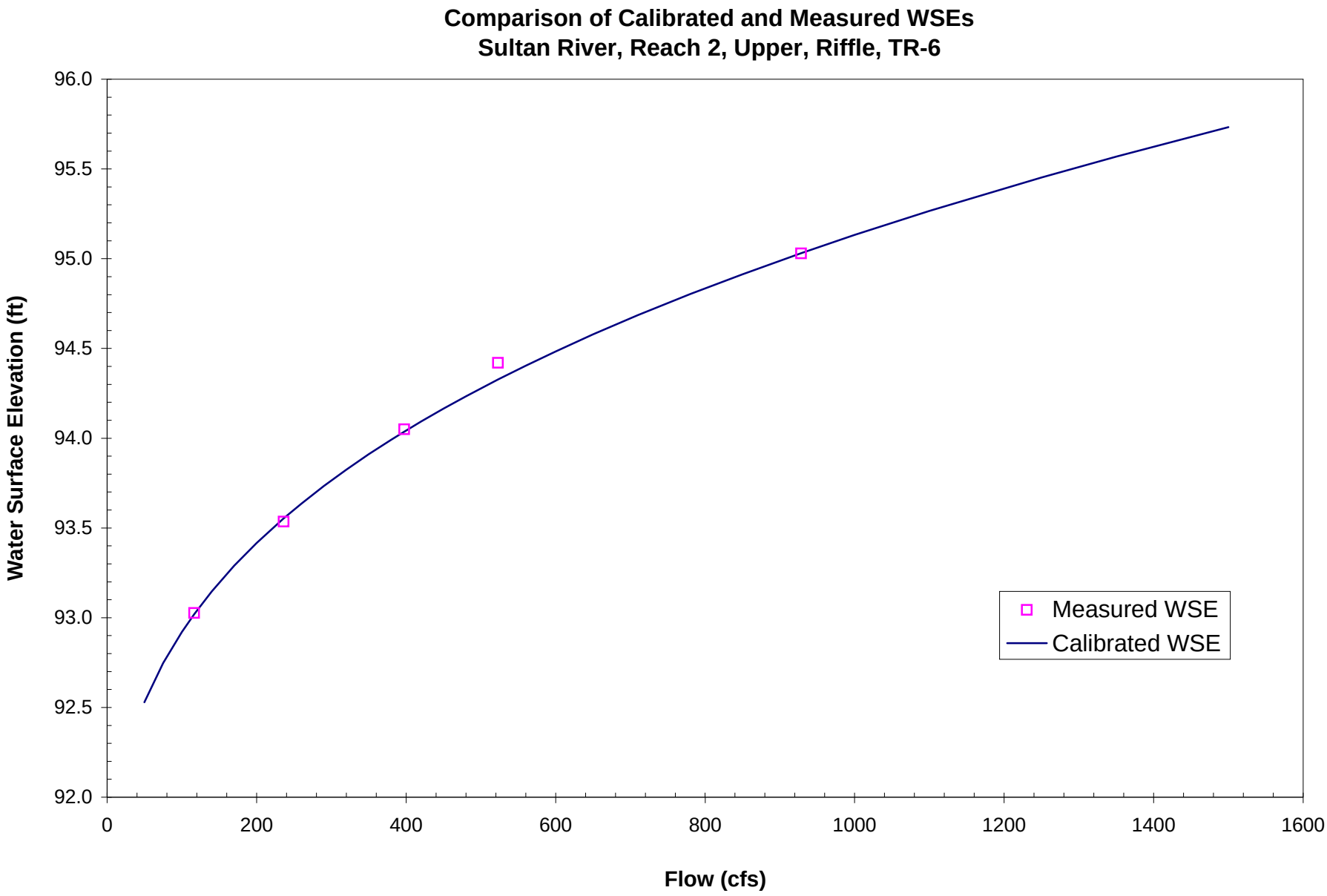











Comparison of Calibrated and Measured WSEs
Sultan River, Reach 2, Upper, Riffle, TR-6
Water Surface Elevation (ft)
96.0
95.5
95.0
94.5
94.0
93.5
93.0
92.5
92.0
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Upper Reach 2
Date: 7/10/2007 **Transect:** TR5
Habitat: Cascade **Flow:** Bed Profile Only

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP5	1.08	101.08		100.00
RWP5			0.25	100.83
TP				
RWP5	0.24	101.07		
HP5			1.07	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L						0.00	0.00	
1-R						0.00		

Ave Q=

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Clib. No:

Date: 7/11/2007
Habitat: Cascade **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP5	2.12	102.12		100.00
RWP5			1.29	100.83
TP				
RWP5	1.27	102.10		
HP5			2.11	99.99

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L	80		102.10	9.59	0.00	92.51	92.66	
1-M	47			9.49	0.00	92.61		137.8
1-R	17			9.24	0.00	92.86		

Ave Q= 137.8

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Clib. No: 167

Date: 7/12/2007
Habitat: Cascade **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP5	2.20	102.20		100.00
RWP			1.36	100.84
TP				
RWP	1.34	102.18		
HP5			2.17	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			102.18	9.07	0.00	93.11	93.23	
								259.7
1-R				8.83	0.00	93.35		

Ave Q= 259.7

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
d/s	-40		102.18	9.77	0.00	92.41
u/s	40		102.18	8.50	0.00	93.68

WSE slope = 1.588%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Clib. No: 167

Date: 7/13/2007
Habitat: Cascade **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP5	2.10	102.10		100.00
RWP			1.26	100.84
TP				
RWP	1.25	102.09		
HP5			2.09	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L	87	51	102.10	8.50	0.00	93.60	93.70	
								404.3
1-R	15		102.10	8.31	0.00	93.79		

Ave Q= 404.3

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
d/s	-40		102.1	9.06	0.00	93.04
u/s	40		102.1	7.86	0.00	94.24

WSE slope = 1.500%
Note:

(3) Meter and propeller ID for Velocity Correction

		STA	STA
Meter ID:	5750	33.5-87.8	4099 ,4.7-29.9
Propeller ID:	6A		4B
Clib. No:	167		125

Date: 10/19/2007
Habitat: Cascade **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP5	1.74	101.74		#####
RWP			0.90	#####
TP				
RWP				
HP5				

Comment: 1/2 loop

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L							94.03	
								0.0
1-R			#####	7.71	0.00	94.03		

Ave Q= 0.0

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Clib. No:

Date: 10/20/2007
Habitat: Cascade **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP5	4.93	104.93		100.00
RWP				
RWP				
HP5				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L							94.73	
								0.0
1-R			104.93	10.20	0.00	94.73		

Ave Q= 0.0

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

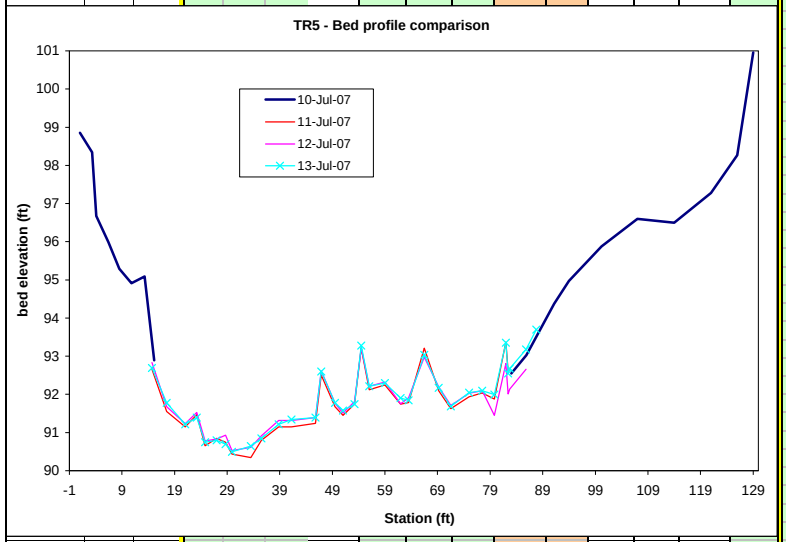
Meter ID:
Propeller ID:
Clib. No:

Stream: Sultan R.
Site: Upper Reach 2
Transect: 5
Habitat: Cascade

Survey Date	HI (ft)	Q (cfs)
7/10/2007	101.23	
7/11/2007	102.10	137.8
7/12/2007	102.18	259.7
7/13/2007	102.09	404.3

10-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	sub.
RWP	1.0	2.38	98.85									81.9
	3.3	2.89	98.34									81.9
	4.1	4.56	96.67									81.9
	6.4	5.24	95.99									81.9
	8.5	5.94	95.29									92.9
	10.8	6.32	94.91									28.8
	13.3	6.14	95.09									88.9
	15.1	8.34	92.89									88.9
	83.0	8.68	92.55									86.6
	85.9	8.20	93.03									43.6
	91.2	6.85	94.38									32.6
	94.0	6.26	94.97									22.9
	100.2	5.35	95.88									22.9
	107.0	4.63	96.60									82.8
	114.0	4.73	96.50									81.6
	121.0	3.95	97.28									18.6
	126.0	2.96	98.27									81.6
	129.0	0.27	100.96									81.8



11-Jul-07

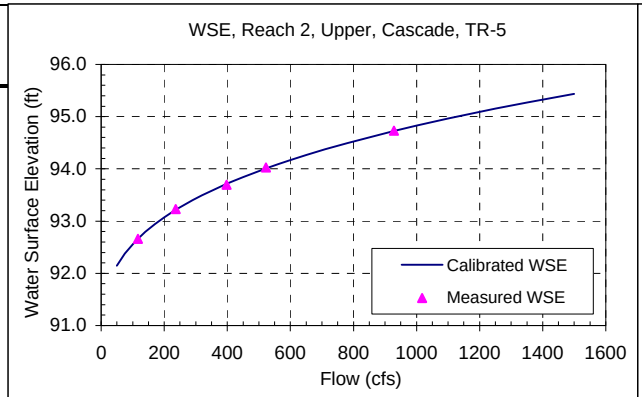
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	sub.
RWE	14.7		92.66	0.00	0.00		0.00		0.00		0.00	88.9
	17.5		91.55	1.11	0.59		0.64		0.64		2.23	83.7
	21.0		91.15	1.51	2.35		2.42		2.42		10.43	83.7
	23.2		91.47	1.19	1.72		1.78		1.78		4.03	83.9
	24.8		90.65	2.01	2.77		2.85		2.85		10.88	83.9
	27.0		90.85	1.81	0.18	4.39	0.27	4.48	2.38	5	8.35	83.9
	28.7		90.75	1.91	3.39	0.58	3.47	0.63	2.05	10	5.59	83.9
	29.9		90.44	2.22	3.70		3.78		3.78	5	20.06	83.9
	33.5		90.34	2.32	0.27		0.33		0.33	20	2.00	83.9
	35.5		90.80	1.86	2.01		2.08		2.08	15	9.89	83.9
	38.8		91.15	1.51	2.52		2.60		2.60		11.17	86.7
	41.2		91.15	1.51	2.24		2.31		2.31	5	12.17	86.6
	45.8		91.24	1.42	2.44		2.51		2.51		10.18	56.6
	46.9		92.51	0.15	2.70		2.78		2.78		0.77	88.9
	49.5		91.68	0.98	2.60		2.68		2.68		5.38	88.9
	51.0		91.45	1.21	3.19		3.27		3.27		7.32	65.6
	53.2		91.74	0.92	0.33		0.38		0.38	30	0.53	65.6
	54.5		93.21	-0.55	0.00		0.00		0.00		0.00	88.9
	56.0		92.12	0.54	3.78		3.86		3.86	5	4.67	88.9
	59.0		92.25	0.41	0.28		0.33		0.33		0.41	86.8
	62.0		91.74	0.92	1.32		1.37		1.37		2.84	84.6
	63.5		91.79	0.87	0.34		0.39		0.39	5	0.76	86.6
	66.5		93.21	-0.55	0.00		0.00		0.00		0.00	88.9
	69.2		92.10	0.56	-0.09		-0.19		-0.19		-0.26	88.9
	71.5		91.63	1.03	1.21		1.26		1.26		3.76	83.7
	75.0		91.94	0.72	0.64		0.69		0.69		1.49	74.6
	77.5		92.04	0.62	1.07		1.12		1.12		1.67	75.6
	79.8		91.88	0.78	0.80		0.85		0.85		1.50	56.7
	82.0		93.37	-0.71	0.00		0.00		0.00		0.00	88.9
	82.4		92.61	0.05	0.15		0.25		0.25		0.00	88.9
LWE	82.7		92.66	0.00	0.00		0.00		0.00		0.00	84.6

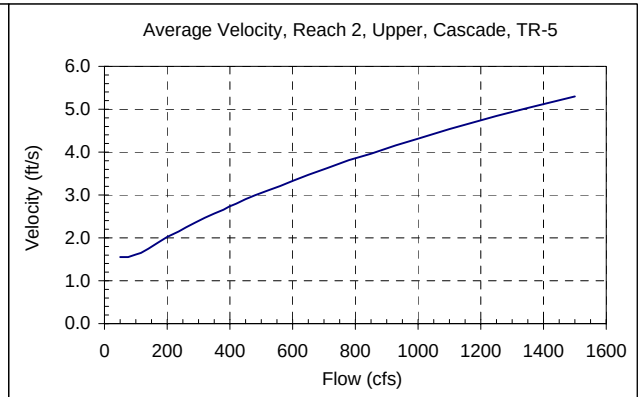
12-Jul-07

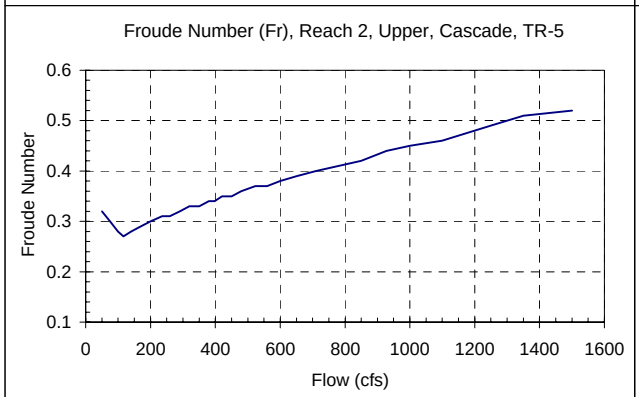
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	sub.
RWE	14.7		92.83	0.40	0.00		0.00		0.00		0.00	88.9
	17.5		91.68	1.55	0.15		0.25		0.25		1.23	83.7
	21.0		91.23	2.00	3.62		3.70		3.70		21.08	83.7
	23.2		91.53	1.70	3.65		3.73		3.73		12.04	83.9
	24.8		90.78	2.45	3.07	2.46	3.15	2.53	2.84		13.23	83.9
	27.0		90.83	2.40	6.91	0.34	7.05	0.39	3.72		17.41	83.9
	28.7		90.93	2.30	3.65		3.73		3.73	20	11.69	83.9
	29.9		90.53	2.70	5.10	2.45	5.20	2.52	3.86	20	23.53	83.9
	33.5		90.61	2.62	2.45	1.47	2.52	1.53	2.03		14.86	83.9
	35.5		90.91	2.32	3.21		3.29		3.29		20.23	83.9
	38.8		91.32	1.91	2.28		2.35		2.35		12.81	86.7
	41.2		91.32	1.91	3.80		3.88		3.88		25.92	86.6
	45.8		91.39	1.84	1.42		1.47		1.47	5	7.70	56.6
	46.9		92.62	0.61	3.27		3.35		3.35	5	3.77	88.9
	49.5		91.77	1.46	4.02		4.10		4.10		12.27	88.9
	51.0		91.51	1.72	2.59		2.67		2.67		8.48	65.6
	53.2		91.81	1.42	1.56		1.62		1.62	15	3.88	65.6
	54.5		93.22	0.01	2.50		2.58		2.58		0.04	88.9
	56.0		92.21	1.02	3.99		4.07		4.07		9.34	88.9
	59.0		92.32	0.91	-0.26		-0.32		-0.32		-0.88	86.8
	62.0		91.75	1.48	2.56		2.64		2.64		8.78	84.6
	63.5		91.91	1.32	2.08		2.15		2.15	5	6.36	86.6
	66.5		92.98	0.25	3.93		4.01		4.01	5	2.85	88.9
	69.2		92.20	1.03	1.99		2.06		2.06	45	3.75	88.9
	71.5		91.71	1.52	0.36		0.41		0.41	20	1.69	83.7
	75.0		92.03	1.20	2.04		2.11		2.11		7.59	74.6
	77.5		92.10	1.13	2.08		2.15		2.15		5.83	75.6
	79.8		91.45	1.21	1.24		1.29		1.29		3.51	56.7
	82.0		92.81	-0.15	0.00		0.00		0.00		0.00	88.9
	82.4		92.01	0.65	1.50		1.56		1.56		0.35	88.9
	82.7		92.14	0.52	0.36		0.41		0.41		0.36	84.6
LWE	85.8		92.66	0.00	0.00		0.00		0.00		0.00	43.6

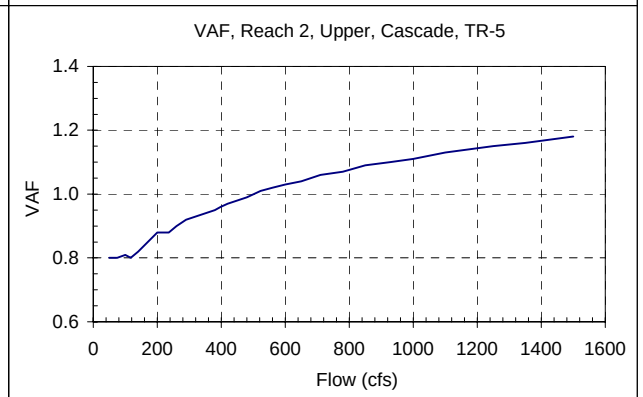
Stream: Sultan R.
Site: Upper Reach 2
Habitat: Cascade
Transect: 5

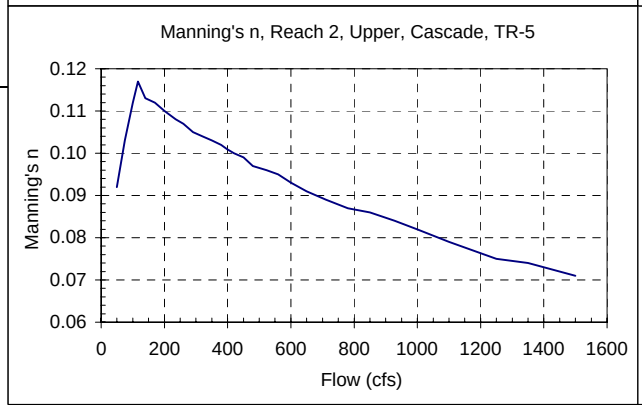
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	92.15	0.32	1.55	0.80	0.092	46.5
75	92.38	0.30	1.55	0.80	0.103	59.3
100	92.56	0.28	1.61	0.81	0.112	63.2
116.5	92.66	0.27	1.65	0.80	0.117	65.2
140	92.79	0.28	1.75	0.82	0.113	70.4
170	92.94	0.29	1.89	0.85	0.112	72.5
200	93.07	0.30	2.02	0.88	0.110	74.4
236.3	93.22	0.31	2.15	0.88	0.108	76.4
260	93.30	0.31	2.25	0.90	0.107	76.9
290	93.40	0.32	2.36	0.92	0.105	77.5
320	93.49	0.33	2.47	0.93	0.104	77.8
350	93.58	0.33	2.57	0.94	0.103	78.1
380	93.67	0.34	2.66	0.95	0.102	78.4
397.6	93.71	0.34	2.73	0.96	0.101	78.5
420	93.77	0.35	2.80	0.97	0.100	78.9
450	93.84	0.35	2.90	0.98	0.099	79.3
480	93.91	0.36	2.99	0.99	0.097	79.8
523.0	94.01	0.37	3.11	1.01	0.096	80.4
560	94.09	0.37	3.21	1.02	0.095	80.9
600	94.17	0.38	3.33	1.03	0.093	81.4
650	94.26	0.39	3.47	1.04	0.091	82.0
710	94.37	0.40	3.63	1.06	0.089	82.7
780	94.49	0.41	3.81	1.07	0.087	83.4
850	94.61	0.42	3.96	1.09	0.086	84.1
928.3	94.72	0.44	4.16	1.10	0.084	84.8
1000	94.83	0.45	4.31	1.11	0.082	85.4
1100	94.96	0.46	4.54	1.13	0.079	87.2
1250	95.15	0.49	4.84	1.15	0.075	91.6
1350	95.27	0.51	5.03	1.16	0.074	93.2
1500	95.43	0.52	5.30	1.18	0.071	94.9

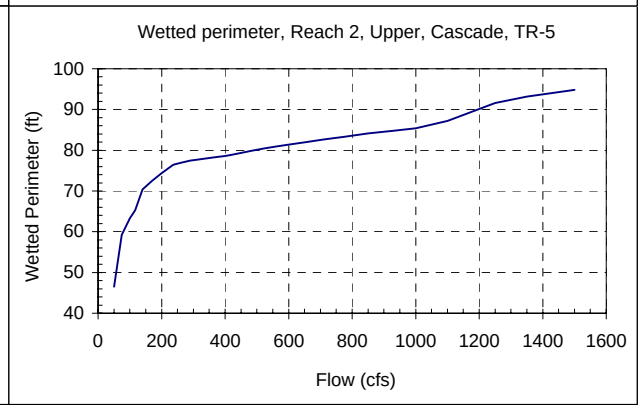


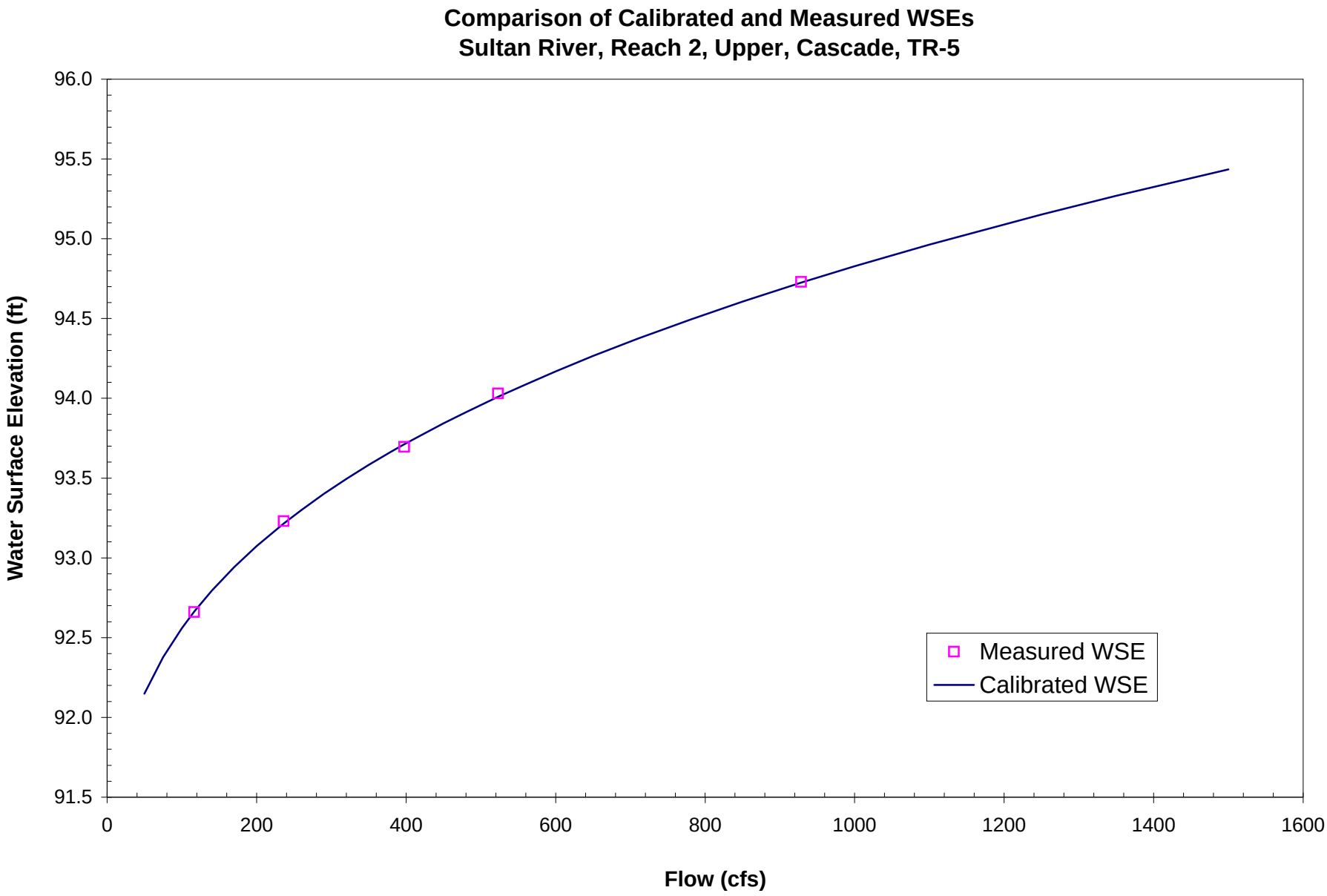











Comparison of Calibrated and Measured WSEs
Sultan River, Reach 2, Upper, Cascade, TR-5
Water Surface Elevation (ft)
96.0
95.5
95.0
94.5
94.0
93.5
93.0
92.5
92.0
91.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Upper Reach 2
Date: 7/10/2007 **Transect:** TR4
Habitat: Riffle **Flow:** Bed Profile Only

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP4	3.25	103.25		100.00
RWP4			3.32	99.93
TP RWP4	3.28	103.21		99.93
HP4			3.21	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L						0.00	0.00	
1-R						0.00		

Ave Q=

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Calib No.:

Date: 7/11/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
RWP	1.31	101.24		99.93
HP4			1.24	100.00
TP HP4	1.21	101.21		
RWP			1.28	99.93

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L	81		101.21	7.11	0.00	94.10	94.14	98.1
1-R	32			7.04	0.00	94.17		

Ave Q= 98.1

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib No.: 167

Date: 7/12/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP4	1.18	101.18		100.00
RWP			1.25	99.93
RWP	1.21	101.14		99.93
HP4			1.14	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L	83	56	101.14	6.44	0.00	94.70	94.69	225.2
1-R	29			6.47	0.00	94.67		

Ave Q= 225.2

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
d/s	-40		101.14	6.55	0.00	94.59
u/s	50		101.14	6.09	0.00	95.05

WSE slope = 0.511%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib No.: 167

Date: 7/13/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP4	1.15	101.15		100.00
RWP			1.22	99.93
RWP	1.17	101.10		99.93
HP4			1.10	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L	86	86	#####	5.77	0.00	95.38	95.33	357.5
1-R			#####	5.88	0.00	95.27		

Ave Q= 357.5

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
d/s	-40		#####	5.87	0.00	95.28
u/s	50		#####	5.41	0.00	95.74

WSE slope = 0.511%
Note:

(3) Meter and propeller ID for Velocity Correction

		STA		STA
Meter ID:	5750	58.5-86	4099	26.7-49.4
Propeller ID:	6A		4B	
Calib No.:	167		125	

Date: 10/19/2007
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP4	1.20	101.20		100.00
RWP			1.27	99.93
RWP				
HP4				

Comment: 1/2 loop only

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L							95.70	
1-R			####	5.50	0.00	95.70		

Ave Q=

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Calib No.:

Date: 10/20/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP4	2.84	102.84		#####
RWP				
RWP				
HP4				

Comment: no loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L							96.49	
1-R			102.84	6.35	0.00	96.49		

Ave Q=

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

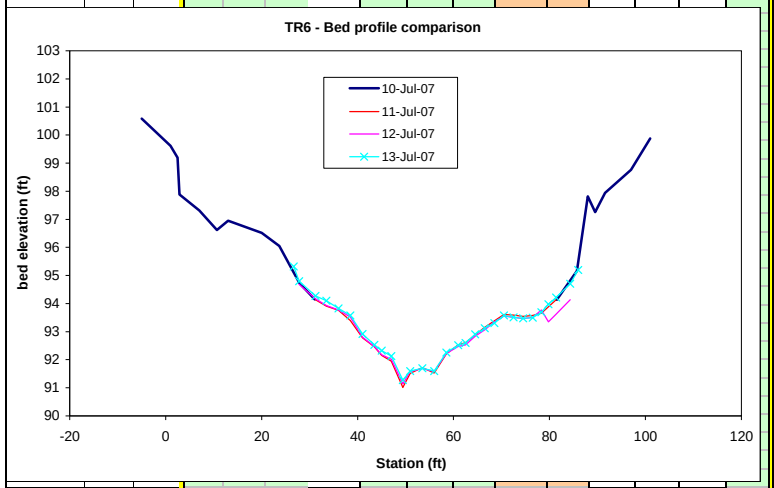
Meter ID:
Propeller ID:
Calib No.:

Stream: Sultan R.
Site: Upper Reach 2
Transect: 4
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/10/2007	101.35	
7/11/2007	101.21	98.1
7/12/2007	101.14	225.2
7/13/2007	101.15	357.5
Bank Sur.	101.35	

10-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	sub.
	-5.0	0.77	100.58									81.9
RWP	1.0	1.73	99.62									81.9
	2.5	2.15	99.20									88.9
	2.9	3.46	97.89									88.9
	7.0	4.04	97.31									22.9
	10.7	4.73	96.62									28.9
	13.0	4.40	96.95									22.9
	20.0	4.83	96.52									23.8
	23.7	5.30	96.05									23.6
	27.9	6.62	94.73									82.7
	31.1	7.20	94.15									28.7
	81.5	7.21	94.14									22.9
	85.7	6.19	95.16									62.6
	88.0	3.53	97.82									88.9
	89.5	4.09	97.26									81.9
LWP	91.6	3.41	97.94									81.9
	97.0	2.59	98.76									18.8
	101.0	1.47	99.88									18.9



11-Jul-07

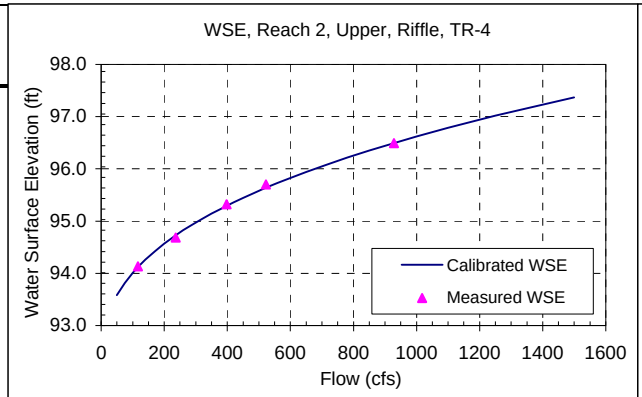
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	sub.
RWE	31.2		94.14	0.00	0.00		0.00		0.00		0.00	23.9
	33.5		93.91	0.23	0.00		0.00		0.00		0.00	23.8
	36.0		93.76	0.38	0.10		0.20		0.20		0.19	23.7
	38.5		93.40	0.74	0.10		0.20		0.20		0.37	23.6
	41.0		92.78	1.36	0.24		0.31		0.31		1.05	32.6
	43.5		92.47	1.67	0.40		0.44		0.44	5	1.47	34.6
	45.0		92.16	1.98	1.58		1.64		1.64	10	5.59	68.6
	47.0		91.95	2.19	1.39	2.84	1.44	2.92	2.18		10.51	84.8
	49.4		91.02	3.12	4.49	2.08	4.58	2.15	3.36		20.99	84.8
	51.0		91.52	2.62	3.18	0.72	3.26	0.77	2.02		10.83	84.8
	53.5		91.72	2.42	1.05	1.99	1.10	2.06	1.58		9.56	84.7
	56.0		91.53	2.61	1.82	0.15	1.88	0.25	1.07		6.97	84.7
	58.5		92.22	1.92	2.00		2.07		2.07		9.92	85.6
	61.0		92.53	1.61	2.78		2.86		2.86		9.20	58.6
	62.5		92.61	1.53	1.95		2.02		2.02	5	5.38	54.6
	64.5		92.89	1.25	0.62		0.67		0.67	10	1.65	45.6
	66.5		93.16	0.98	0.13		0.24		0.24	10	0.46	45.6
	68.5		93.39	0.75	0.97		1.02		1.02		1.54	54.7
	70.5		93.62	0.52	1.11		1.16		1.16		1.21	54.8
	72.5		93.59	0.55	0.58		0.63		0.63	5	0.69	54.8
	74.5		93.55	0.59	0.22		0.29		0.29	15	0.33	54.8
	76.5		93.58	0.56	0.04		0.15		0.15		0.16	54.8
	78.3		93.66	0.48	0.00		0.00		0.00		0.00	45.6
	79.8		93.89	0.25	0.00		0.00		0.00		0.00	82.6
LWE	81.4		94.14	0.00	0.00		0.00		0.00		0.00	22.9

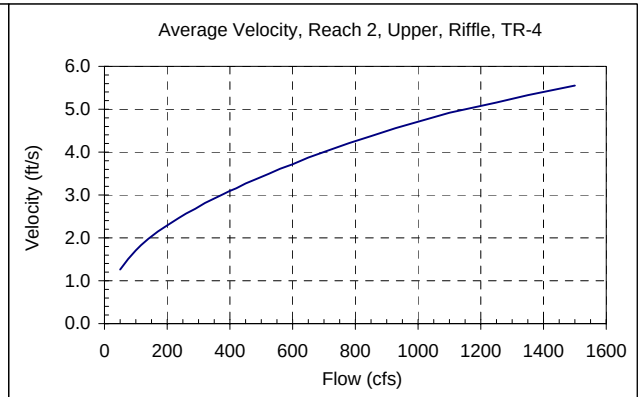
12-Jul-07

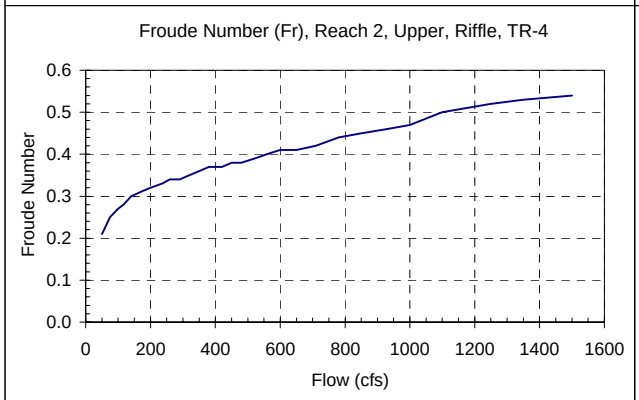
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	sub.
RWE	27.8		94.69	0.00	0.00		0.00		0.00		0.00	82.7
	31.2		94.17	0.52	0.44		0.48		0.48		0.71	23.9
	33.5		93.94	0.75	0.32		0.37		0.37	5.00	0.67	23.8
	36.0		93.78	0.91	0.65		0.70		0.70		1.59	23.7
	38.5		93.52	1.17	0.13		0.24		0.24		0.69	23.6
	41.0		92.81	1.88	0.86		0.91		0.91		4.30	32.6
	43.5		92.48	2.21	2.52		2.60		2.60		11.47	34.6
	45.0		92.18	2.51	2.97	0.43	3.05	0.47	1.76		7.73	68.6
	47.0		92.02	2.67	2.70	2.31	2.78	2.38	2.58		15.16	84.8
	49.4		91.14	3.55	4.20	3.16	4.28	3.24	3.76		26.71	84.8
	51.0		91.59	3.10	6.74	3.28	6.87	3.36	5.12		32.52	84.8
	53.5		91.69	3.00	5.09	1.13	5.19	1.18	3.19		23.89	84.7
	56.0		91.59	3.10	4.35	0.5	4.44	0.54	2.49		19.30	84.7
	58.5		92.23	2.46	1.54		1.60		1.60		9.82	85.6
	61.0		92.48	2.21	2.16		2.23		2.23		9.86	58.6
	62.5		92.54	2.15	2.45		2.52		2.52		9.50	54.6
	64.5		92.84	1.85	2.55		2.63		2.63		9.72	45.6
	66.5		93.07	1.62	3.51		3.59		3.59		11.63	45.6
	68.5		93.36	1.33	2.12		2.19		2.19		5.83	54.7
	70.5		93.56	1.13	2.54		2.62		2.62		5.91	54.8
	72.5		93.51	1.18	2.97		3.05		3.05		7.20	54.8
	74.5		93.47	1.22	2.62		2.70		2.70		6.58	54.8
	76.5		93.51	1.18	1.62		1.68		1.68		3.77	54.8
	78.3		93.78	0.91	0.36		0.41		0.41		0.61	45.6
	79.8		93.36	0.78	0.16		0.26		0.26		0.31	82.6
	81.4		93.63	0.51	-0.07		-0.19		-0.19		-0.22	22.9
LWE	84.3		94.14	0.00	0.00		0.00		0.00		0.00	62.6

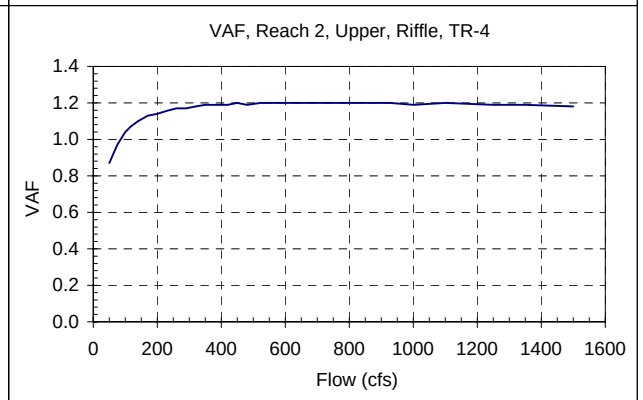
Stream: Sultan R.
Site: Upper Reach 2
Habitat: Riffle
Transect: 4

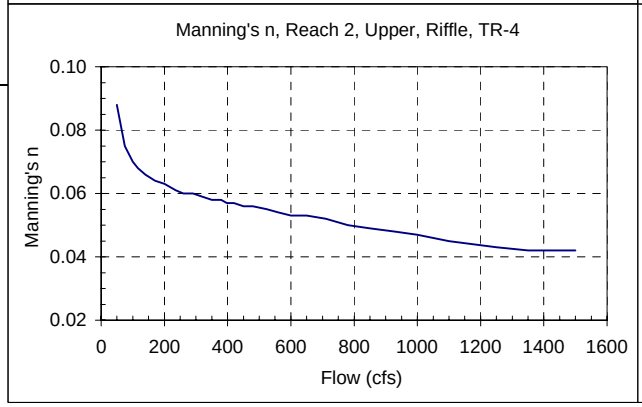
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	93.58	0.21	1.26	0.87	0.088	37.0
75	93.82	0.25	1.51	0.97	0.075	45.0
100	94.01	0.27	1.71	1.04	0.070	48.7
116.5	94.12	0.28	1.83	1.07	0.068	50.5
140	94.26	0.30	1.98	1.10	0.066	52.1
170	94.42	0.31	2.15	1.13	0.064	53.8
200	94.57	0.32	2.29	1.14	0.063	55.3
236.3	94.73	0.33	2.46	1.16	0.061	57.0
260	94.82	0.34	2.57	1.17	0.060	57.7
290	94.94	0.34	2.68	1.17	0.060	58.4
320	95.04	0.35	2.81	1.18	0.059	59.0
350	95.14	0.36	2.92	1.19	0.058	59.6
380	95.24	0.37	3.02	1.19	0.058	60.1
397.6	95.29	0.37	3.09	1.19	0.057	60.3
420	95.36	0.37	3.16	1.19	0.057	60.6
450	95.44	0.38	3.27	1.20	0.056	61.0
480	95.53	0.38	3.36	1.19	0.056	61.5
523.0	95.64	0.39	3.49	1.20	0.055	62.2
560	95.73	0.40	3.61	1.20	0.054	62.7
600	95.83	0.41	3.72	1.20	0.053	63.2
650	95.94	0.41	3.87	1.20	0.053	63.8
710	96.07	0.42	4.03	1.20	0.052	64.6
780	96.21	0.44	4.21	1.20	0.050	65.9
850	96.35	0.45	4.37	1.20	0.049	67.2
928.3	96.49	0.46	4.56	1.20	0.048	68.5
1000	96.62	0.47	4.71	1.19	0.047	70.5
1100	96.78	0.50	4.92	1.20	0.045	75.3
1250	97.02	0.52	5.16	1.19	0.043	80.9
1350	97.16	0.53	5.33	1.19	0.042	81.8
1500	97.37	0.54	5.55	1.18	0.042	84.0

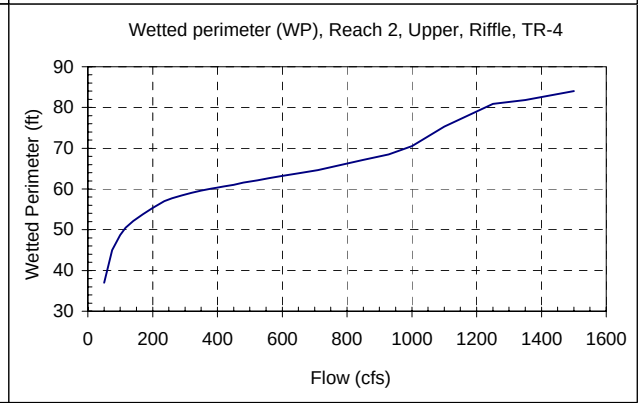


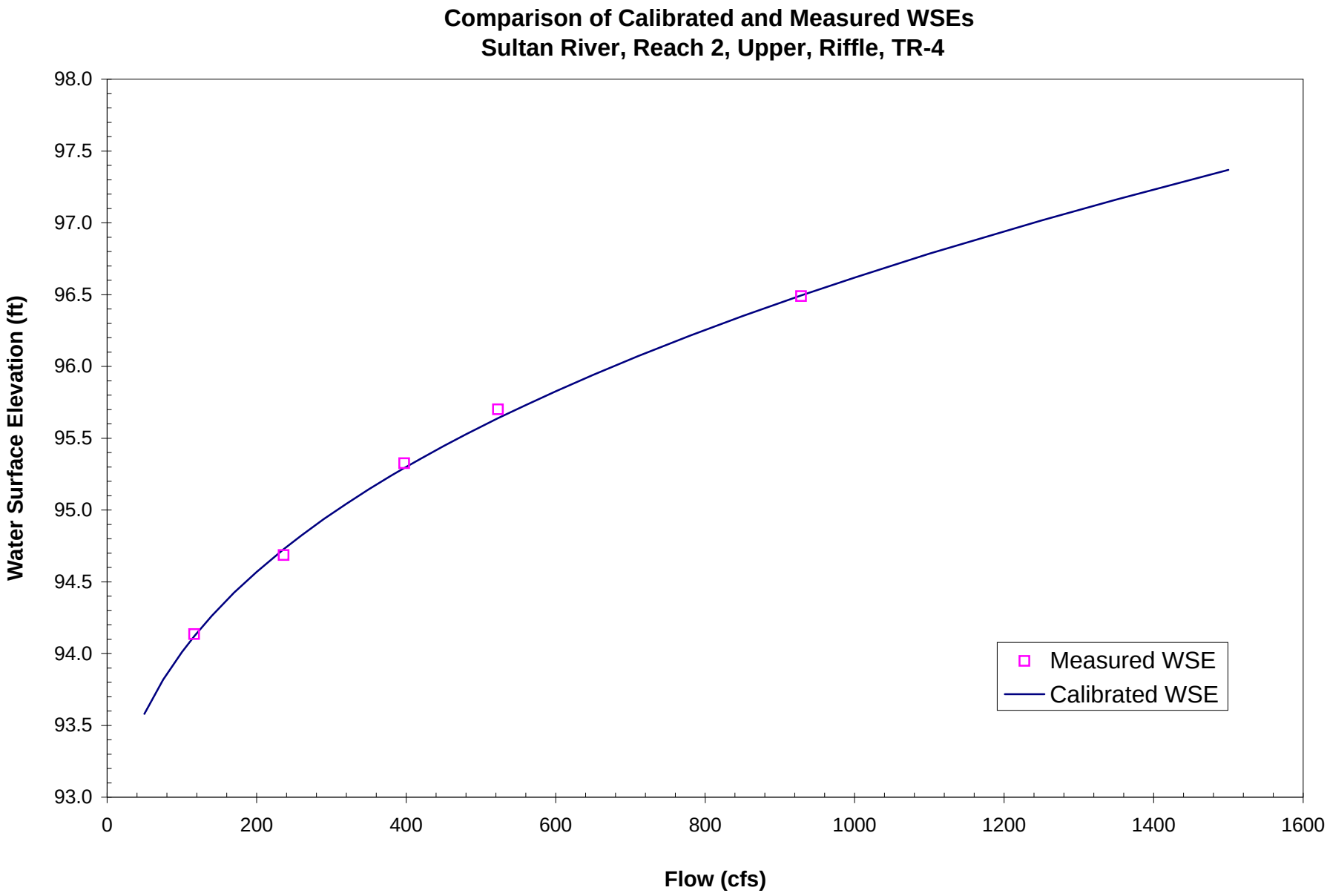











Comparison of Calibrated and Measured WSEs
Sultan River, Reach 2, Upper, Riffle, TR-4
Water Surface Elevation (ft)
98.0
97.5
97.0
96.5
96.0
95.5
95.0
94.5
94.0
93.5
93.0
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Upper Reach 2
Date: 7/10/2007 **Transect:** TR3
Habitat: Riffle **Flow:** Bed Profile Only

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	9.37	109.37		100.00
HP1			6.90	102.47
HP2			4.72	104.65
HP3			5.50	103.87
TP				
HP3	5.47	109.34		103.87
HP2			4.69	104.65
HP1			6.88	102.46
BM			9.34	100.00

Comment: TR-1, 2 & 3 HP included in the loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L						0.00	0.00	
1-R						0.00		

Ave Q=

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Calib No.:

Date: 7/11/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP3	5.29	109.16		103.87
HP2			4.49	104.67
TR-2 BM			7.78	101.38
BM			9.14	100.02
HP1			6.69	102.47
HP1	6.73	109.20		
TR-2 BM			7.83	101.37
HP2			4.54	104.66
HP3			5.33	103.87

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L	67		109.19	12.28	0.00	96.91	96.88	
1-M	45			12.34	0.00	96.85		129.5
1-R	32			12.32	0.00	96.87		

Ave Q= 129.5

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
at TR	0					96.88
u/s	40		109.19	11.86	0.00	97.33

WSE slope = 1.133%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib No.: 167

Date: 7/12/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	9.43	109.43		100.00
HP3			5.57	103.86
HP2			4.77	104.66
HP1			6.97	102.46
TP				
HP1	6.95	109.41		
HP2			4.76	104.65
HP3			5.55	103.86
BM			9.41	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L	72		109.41	11.81	0.00	97.60	97.53	
1-R	16			11.95	0.00	97.46		249.8

Ave Q= 249.8

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
at TR	0					97.53
u/s	40		109.41	11.43	0.00	97.98

WSE slope = 1.125%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib No.: 167

Date: 7/13/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM Lowe	9.31	109.31		#####
HP3			5.47	#####
HP2			4.66	#####
HP1			6.85	#####
TP				
HP1	6.83	109.29		
HP2			4.64	#####
HP3			5.45	#####
BM			9.29	#####

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			#####	10.32	0.00	98.27	98.21	
1-R			#####	11.15	0.00	98.14		450.9

Ave Q= 450.9

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
at TR	0					98.21
u/s	40		#####	10.00	0.00	98.59

WSE slope = 0.962%
Note:

(3) Meter and propeller ID for Velocity Correction

		STA	STA
Meter ID:	5750	58-74.1	4099 12.6-54
Propeller ID:	6A		4B
Calib No.:	167		125

Date: 10/19/2007
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM TR-2	5.07	#####		101.36
HP3				
TR-2 HP				
HP1				
TP				
HP1				
HP3				
BM TR-2				
BM				

Comment: no level loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L							98.49	
1-R			#####	7.94	0.00	98.49		0.0

Ave Q= 0.0

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Calib No.:

Date: 10/20/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	10.15	#####		100.00
HP3				
HP2			5.50	104.65
HP1				
TP				
HP1				
HP3				0.00
BM TR-2				0.00
BM				0.00

Comment: 1/2 loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L							99.55	
1-R			#####	13.15	2.55	99.55		0.0

Ave Q= 0.0

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

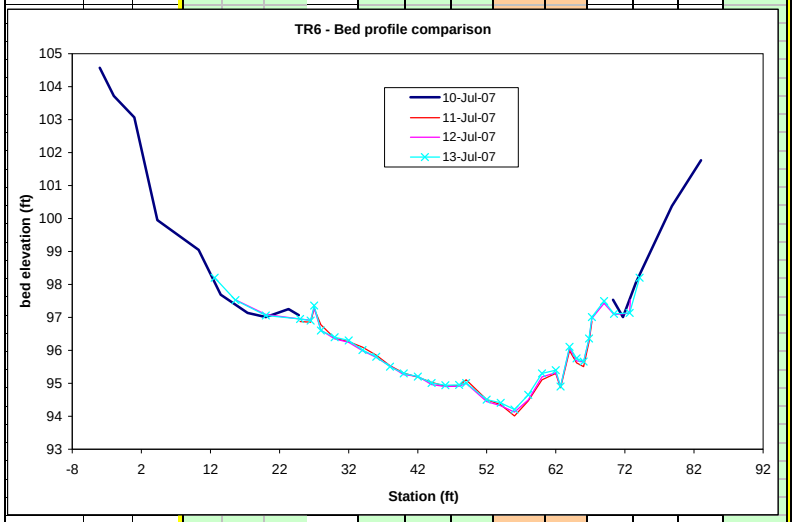
Meter ID:
Propeller ID:
Calib No.:

Stream: Sultan R.
Site: Upper Reach 2
Transect: 3
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/10/2007	105.22	
7/11/2007	109.20	129.5
7/12/2007	109.41	249.8
7/13/2007	109.29	450.9

10-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-4.0	0.65	104.57									82.9
	-2.0	1.50	103.72									82.9
RWP	1.0	2.15	103.07									82.9
	4.3	5.27	99.95									88.9
	10.3	6.17	99.05									22.9
	13.5	7.53	97.69									22.9
	17.4	8.08	97.14									22.9
	20.0	8.21	97.01									45.7
	23.3	7.97	97.25									54.6
	24.8	8.15	97.07									45.6
	70.3	7.69	97.53									99.9
	71.7	8.21	97.01									97.9
	73.6	7.15	98.07									82.9
LWP	78.8	4.84	100.38									88.9
	83.0	3.45	101.77									81.9



11-Jul-07

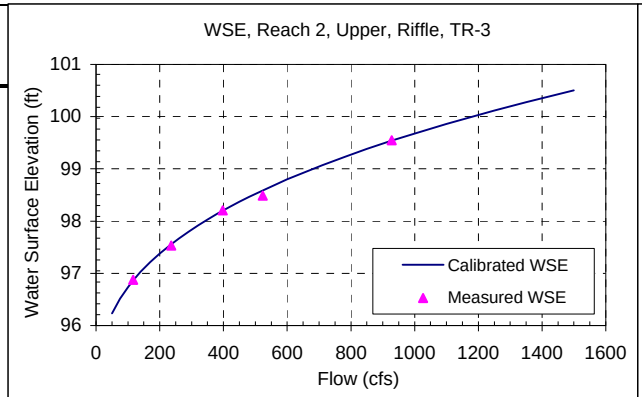
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs
RWE	25.0		96.88	0.00	0.00		0.00		0.00		0.00	54.6
	26.5		96.86	0.02	0.10		0.20		0.20		0.00	54.6
	27.0		97.28	-0.40	0.00		0.00		0.00		0.00	80.9
	28.0		96.78	0.10	0.15		0.25		0.25		0.04	80.9
	30.0		96.37	0.51	-0.12		-0.23		-0.23	15	-0.22	26.6
	32.0		96.27	0.61	-0.08		-0.19		-0.19	20	-0.22	65.6
	34.0		96.10	0.78	0.04		0.15		0.15	15	0.22	34.6
	36.0		95.86	1.02	0.51		0.55		0.55	5	1.12	37.7
	38.0		95.54	1.34	2.68		2.76		2.76		7.39	67.6
	40.0		95.31	1.57	1.53		1.59		1.59		4.98	68.7
	42.0		95.19	1.69	1.14		1.19		1.19		4.02	78.6
	44.0		95.03	1.85	2.56		2.64		2.64		9.75	36.6
	46.0		94.92	1.96	1.45	4.29	1.50	4.38	2.94		11.53	38.6
	48.0		94.94	1.94	3.37		3.45		3.45		10.04	86.7
	49.0		95.11	1.77	3.32		3.40		3.40	5	11.99	87.8
	52.0		94.51	2.37	0.67		0.72		0.72	5	4.25	86.8
	54.0		94.35	2.53	3.36	0.56	3.44	0.61	2.02		10.24	84.8
	56.0		94.01	2.87	3.90		3.98		3.98		22.83	86.8
	58.0		94.47	2.41	3.95		4.03		4.03		19.42	86.8
	60.0		95.11	1.77	1.11		1.16		1.16		4.10	87.9
	62.0		95.30	1.58	0.47		0.51		0.51	30	0.94	83.7
	62.7		94.87	2.01	0.15	0.85	0.25	0.90	0.58	30	1.01	32.6
	64.0		95.99	0.89	2.14		2.21		2.21	5	2.25	80.9
	65.0		95.62	1.26	1.84		1.90		1.90	5	2.39	99.9
	66.0		95.51	1.37	0.88		0.93		0.93		1.15	99.9
	66.8		96.27	0.61	0.80		0.85		0.85		0.31	99.9
LWE	67.2		96.88	0.00	0.00		0.00		0.00		0.00	99.9

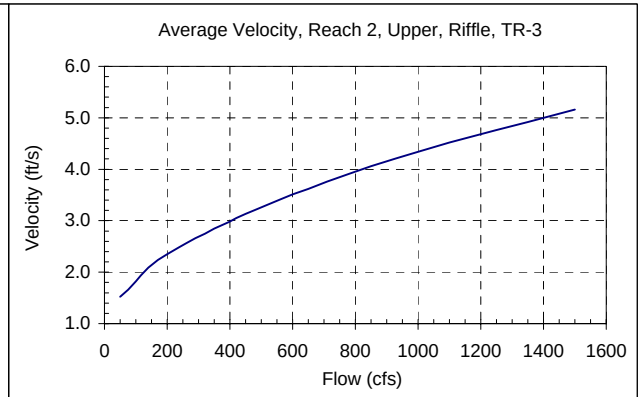
12-Jul-07

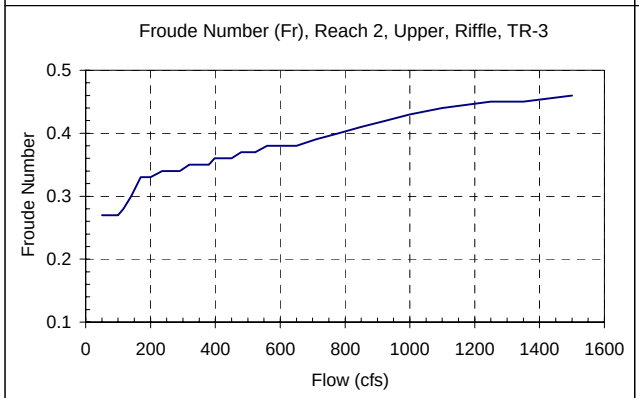
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	15.6		97.53	0.00	0.00		0.00		0.00		0.00	22.9
	20.0		97.09	0.44	2.41		2.48		2.48	10	5.06	45.7
	25.0		96.95	0.58	1.88		1.95		1.95	60	1.83	54.6
	26.5		96.91	0.62	1.21		1.26		1.26	15	0.75	54.6
	27.0		97.28	0.25	1.17		1.22		1.22	10	0.22	80.9
	28.0		96.61	0.92	1.18		1.23		1.23	10	1.67	80.9
	30.0		96.35	1.18	0.66		0.71		0.71		1.68	26.6
	32.0		96.24	1.29	0.26		0.32		0.32	10	0.82	65.6
	34.0		95.99	1.54	0.54		0.58		0.58		1.80	34.6
	36.0		95.79	1.74	3.63		3.71		3.71		12.91	37.7
	38.0		95.52	2.01	2.66		2.74		2.74		11.00	67.6
	40.0		95.26	2.27	2.32		2.39		2.39		10.86	68.7
	42.0		95.21	2.32	1.52	3.46	1.58	3.54	2.56		11.87	78.6
	44.0		94.96	2.57	4.46	2.44	4.55	2.51	3.53		18.15	36.6
	46.0		94.90	2.63	4.32	0.85	4.41	0.90	2.66		13.97	38.6
	48.0		94.91	2.62	4.65	2.71	4.74	2.79	3.77		14.80	86.7
	49.0		95.00	2.53	3.96	2.40	4.04	2.47	3.26		16.48	87.8
	52.0		94.45	3.08	4.19	2.52	4.27	2.60	3.43		26.45	86.8
	54.0		94.32	3.21	4.55	2.22	4.64	2.29	3.47		22.25	84.8
	56.0		94.13	3.40	4.47	2.14	4.56	2.21	3.38		23.02	86.8
	58.0		94.50	3.03	5.11	3.56	5.21	3.64	4.43		26.82	86.8
	60.0		95.19	2.34	1.77		1.83		1.83		8.58	87.9
	62.0		95.32	2.21	0.55		0.60		0.60	10	1.75	83.7
	62.7		94.90	2.63	1.86	0.56	1.92	0.61	1.27	10	3.28	32.6
	64.0		96.07	1.46	3.53		3.61		3.61		6.06	80.9
	65.0		95.68	1.85	2.79		2.87		2.87		5.31	99.9
	66.0		95.65	1.88	0.28		0.33		0.33		0.56	99.9
	66.8		96.34	1.19	1.17		1.22		1.22		0.87	99.9
	67.2		96.97	0.56	0.98		1.03		1.03		0.64	99.9
	69.0		97.43	0.10	0.00		0.00		0.00		0.00	99.9
	70.4		97.09	0.44	0.40		0.44		0.44	10	0.35	99.9
	72.7		97.13	0.40	0.00		0.00		0.00		0.00	97.9
LWE	72.8		97.53	0.00	0.00		0.00		0.00		0.00	82.9

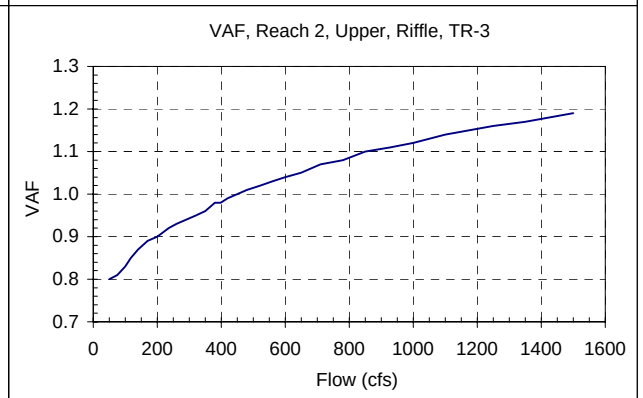
Stream: Sultan R.
Site: Upper Reach 2
Habitat: Riffle
Transect: 3

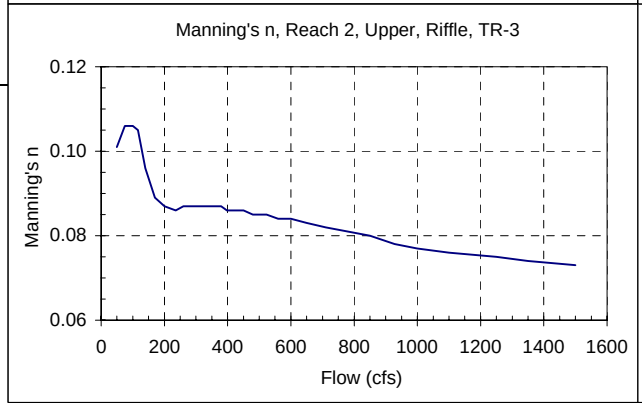
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	96.23	0.27	1.52	0.80	0.101	34.5
75	96.51	0.27	1.66	0.81	0.106	38.9
100	96.73	0.27	1.82	0.83	0.106	40.7
116.5	96.86	0.28	1.94	0.85	0.105	41.0
140	97.03	0.30	2.09	0.87	0.096	46.8
170	97.21	0.33	2.24	0.89	0.089	53.7
200	97.38	0.33	2.35	0.90	0.087	57.4
236.3	97.56	0.34	2.48	0.92	0.086	60.1
260	97.67	0.34	2.56	0.93	0.087	60.8
290	97.80	0.34	2.66	0.94	0.087	61.6
320	97.92	0.35	2.75	0.95	0.087	62.3
350	98.03	0.35	2.85	0.96	0.087	63.0
380	98.14	0.35	2.93	0.98	0.087	63.7
397.6	98.20	0.36	2.98	0.98	0.086	64.1
420	98.27	0.36	3.05	0.99	0.086	64.4
450	98.37	0.36	3.13	1.00	0.086	65.0
480	98.46	0.37	3.21	1.01	0.085	65.4
523.0	98.59	0.37	3.32	1.02	0.085	66.1
560	98.69	0.38	3.41	1.03	0.084	66.7
600	98.80	0.38	3.51	1.04	0.084	67.2
650	98.93	0.38	3.62	1.05	0.083	67.9
710	99.07	0.39	3.76	1.07	0.082	68.7
780	99.23	0.40	3.91	1.08	0.081	70.2
850	99.38	0.41	4.06	1.10	0.080	71.6
928.3	99.54	0.42	4.21	1.11	0.078	73.0
1000	99.68	0.43	4.34	1.12	0.077	74.3
1100	99.86	0.44	4.52	1.14	0.076	75.9
1250	100.12	0.45	4.76	1.16	0.075	77.4
1350	100.28	0.45	4.92	1.17	0.074	78.0
1500	100.50	0.46	5.16	1.19	0.073	78.9

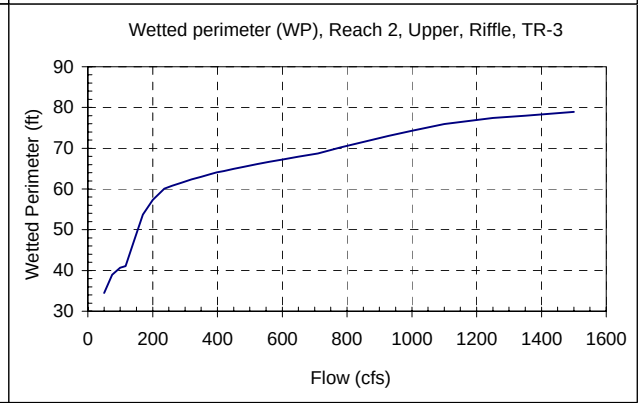


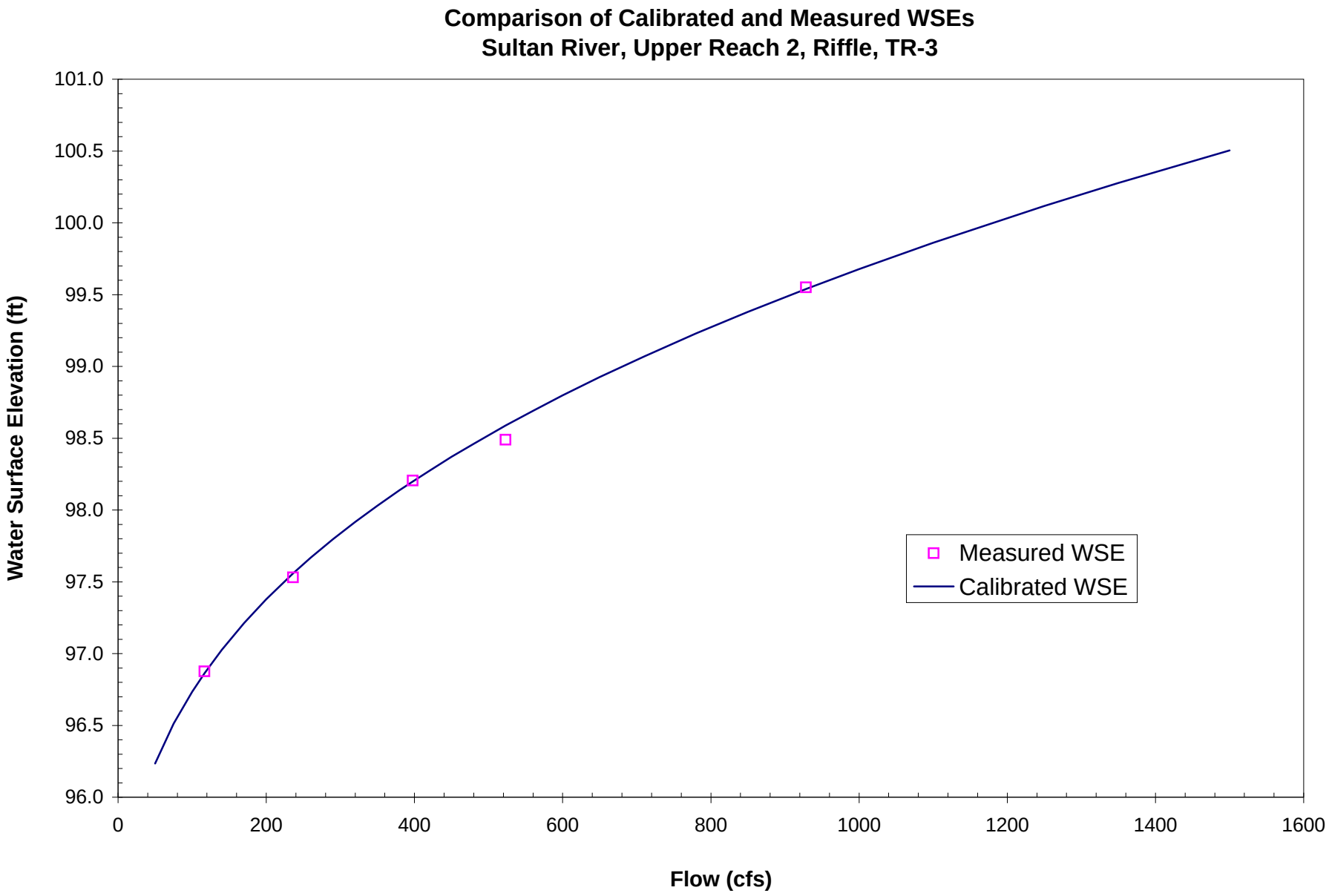











Comparison of Calibrated and Measured WSEs
Sultan River, Upper Reach 2, Riffle, TR-3
Water Surface Elevation (ft)
101.0
100.5
100.0
99.5
99.0
98.5
98.0
97.5
97.0
96.5
96.0
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Upper Reach 2
Date: 7/10/2007 **Transect:** TR2
Habitat: Pool **Flow:** Bed Profile Only

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	9.37	109.37		100.00
HP1			6.90	102.47
HP2			4.72	104.65
HP3			5.50	103.87
TP HP3	5.47	109.34		103.87
HP2			4.69	104.65
HP1			6.88	102.46
BM			9.34	100.00

Comment: TR-1, 2 & 3 HP included in the loop

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	River Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L								
1-R								

Ave Q=

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)

WSE slope =
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Calib No.

Date: 7/11/2007
Habitat: Pool **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP3	5.29	109.16		103.87
HP2			4.49	104.67
TR-2 BM			7.78	101.38
BM			9.14	100.02
HP1			6.69	102.47
HP1	6.73	109.20		
TR-2 BM			7.83	101.37
HP2			4.54	104.66
HP3			5.33	103.87

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	River Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L	19		109.19	12.69		96.50	96.51	102.1
1-R	76			12.68		96.51		

Ave Q= 102.1

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib No. 167

Date: 7/12/2007
Habitat: Pool **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	9.43	109.43		100.00
HP3			5.57	103.86
HP2			4.77	104.66
HP1			6.97	102.46
TP HP1	6.95	109.41		
HP2			4.76	104.65
HP3			5.55	103.86
BM			9.41	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	River Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			109.41	12.23		97.18	97.19	234.9
1-R				12.22		97.19		

Ave Q= 234.9

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4B
Calib No. 125

Date: 7/13/2007
Habitat: Pool **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM Lower	9.31	109.31		100.00
HP3			5.47	103.84
HP2			4.66	104.65
HP1			6.85	102.46
TP HP1	6.83	109.29		
HP2			4.64	104.65
HP3			5.45	103.84
BM			9.29	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	River Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			108.59	10.77		97.82	97.84	0.0
1-R			109.29	11.44		97.85		

Ave Q= 0.0

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Calib No.

Date: 10/19/2007
Habitat: Pool **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM TR-2	5.07	106.43		101.36
HP3				
TR-2 HP				
HP1				
TP HP1				
HP3				
BM TR-2				
BM				

Comment: 1/2 loop only

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	River Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L							98.35	0.0
1-R			106.43	8.08		98.35		

Ave Q= 0.0

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:
Calib No.

Date: 10/20/2007
Habitat: Pool **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	10.15	110.15		100.00
HP3				
HP2			5.50	104.65
HP1				
TP HP1				
HP3				0.00
BM TR-2				0.00
BM				0.00

Comment: 1/2 loop

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	River Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L							99.30	0.0
1-R			110.15	13.96	3.11	99.30		

Ave Q= 0.0

WSE slope = NA
Note: No longitudinal WSE slope surveyed

(3) Meter and propeller ID for Velocity Correction

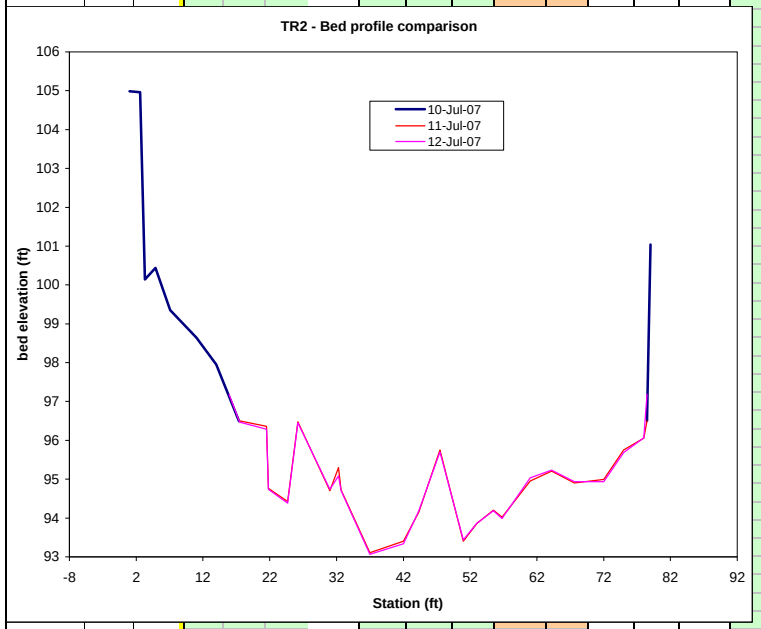
Meter ID:
Propeller ID:
Calib No.

Stream:	Sultan R.
Site:	Upper Reach 2
Transect:	2
Habitat:	Pool

Survey Date	HI (ft)	Q (cfs)
7/10/2007	109.34	
7/11/2007	109.19	102.1
7/12/2007	109.41	234.9
7/13/2007	108.59	

10-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
RWP	1.0	4.35	104.99									88.9
	2.6	4.38	104.96									88.9
	3.3	9.20	100.14									88.9
	4.9	8.90	100.44									88.9
	7.1	9.99	99.35									22.9
	11.0	10.70	98.64									22.9
	14.0	11.39	97.95									28.9
	17.4	12.85	96.49									28.7
	78.5		*96.51*									
LWP	79.0	8.30	101.04									99.9



11-Jul-07

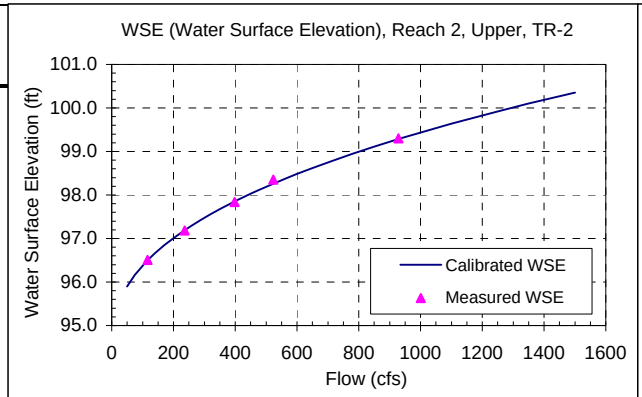
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	17.5		96.51	0.00	0.00		0.00		0.00		0.00	28.8
	21.5		96.37	0.14	0.00		0.00		0.00		0.00	82.8
	21.8		94.77	1.74	0.04		0.15		0.15		0.41	28.6
	24.7		94.43	2.08	0.00		0.00		0.00		0.00	82.6
	26.2		96.48	0.03	0.00		0.00		0.00		0.00	88.9
	31.0		94.71	1.80	0.10		0.20		0.20		1.11	78.7
	32.3		95.30	1.21	0.33		0.38		0.38	20	0.37	88.9
	32.7		94.73	1.78	0.53		0.57		0.57		2.40	78.6
	37.0		93.11	3.40	0.72	0.68	0.77	0.73	0.75		11.89	84.6
	42.0		93.41	3.10	1.57	0.60	1.63	0.65	1.14		12.88	47.6
	44.3		94.16	2.35	0.32		0.37		0.37		2.40	87.6
	47.5		95.76	0.75	1.42		1.47		1.47		3.70	88.9
	51.0		93.41	3.10	1.98	2.00	2.05	2.07	2.06		17.54	85.6
	53.0		93.86	2.65	1.55	1.45	1.61	1.50	1.56		9.28	58.7
	55.5		94.21	2.30	1.74		1.80		1.80		7.88	58.7
	56.8		94.03	2.48	2.01		2.08		2.08		14.17	95.6
	61.0		94.96	1.55	1.28		1.33		1.33		7.63	99.9
	64.2		95.21	1.30	0.89		0.94		0.94		4.05	99.9
	67.6		94.91	1.60	0.44		0.48		0.48		2.99	99.9
	72.0		95.00	1.51	0.52		0.56		0.56		3.15	91.7
	75.0		95.76	0.75	0.02		0.07		0.07		0.16	91.8
	78.0		96.06	0.45	0.04		0.15		0.15		0.12	91.9
LWE	78.5		96.51	0.00	0.00		0.00		0.00		0.00	91.9

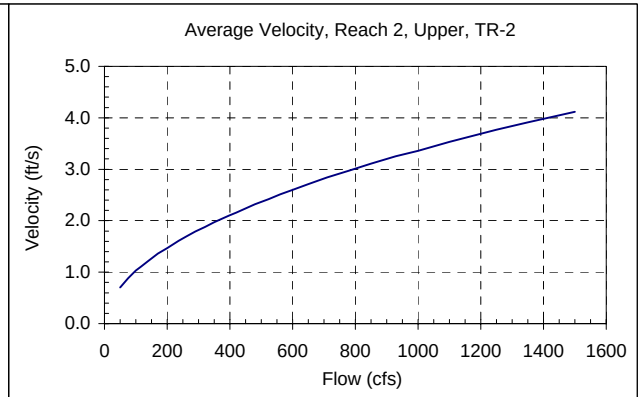
12-Jul-07

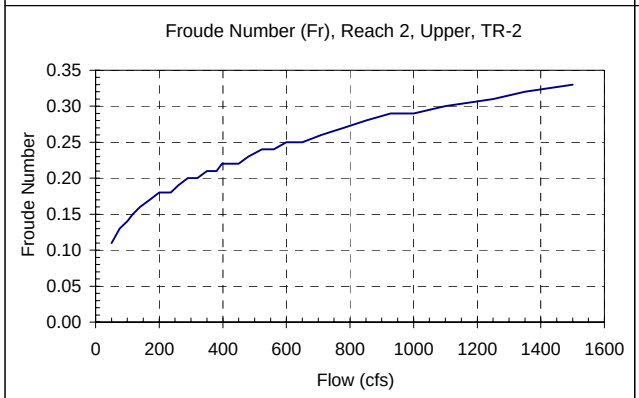
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	15.9		97.19	0.00	0.00		0.00		0.00		0.00	28.9
	17.5		96.47	0.72	0.00		0.00		0.00		0.00	28.8
	21.5		96.29	0.90	0.02		0.06		0.06		0.12	82.8
	21.8		94.74	2.45	0.14		0.25		0.25		0.97	28.6
	24.7		94.39	2.80	0.28	0.25	0.35	0.33	0.34		2.10	82.6
	26.2		96.46	0.73	0.76		0.78		0.78	40	1.37	88.9
	31.0		94.74	2.45	0.24		0.32		0.32		2.42	78.7
	32.3		95.09	2.10	0.94		0.96		0.96		1.71	88.9
	32.7		94.71	2.48	0.64		0.66		0.66		3.87	78.6
	37.0		93.07	4.12	1.41	0.73	1.44	0.74	1.09		20.91	84.6
	42.0		93.34	3.85	2.42	1.09	2.47	1.11	1.79		25.16	47.6
	44.3		94.19	3.00	3.13	0.01	3.19	0.03	1.61		13.30	87.6
	47.5		95.71	1.48	3.19		3.25		3.25		16.13	88.9
	51.0		93.44	3.75	3.99	2.23	4.07	2.27	3.17		32.71	85.6
	53.0		93.87	3.32	3.52	2.82	3.59	2.88	3.23		24.15	58.7
	55.5		94.19	3.00	3.40	1.89	3.47	1.93	2.70		15.38	58.7
	56.8		93.99	3.20	3.17	1.93	3.23	1.97	2.60		22.89	95.6
	61.0		95.04	2.15	2.33		2.38		2.38		18.91	99.9
	64.2		95.24	1.95	2.20		2.24		2.24		14.44	99.9
	67.6		94.94	2.25	1.01		1.03		1.03		9.04	99.9
	72.0		94.94	2.25	0.72		0.74		0.74		6.13	91.7
	75.0		95.69	1.50	0.54		0.58		0.58		2.59	91.8
	78.0		96.07	1.12	0.20		0.29		0.29		0.58	91.9
LWE	78.5		97.19	0.00	0.00		0.00		0.00		0.00	91.9

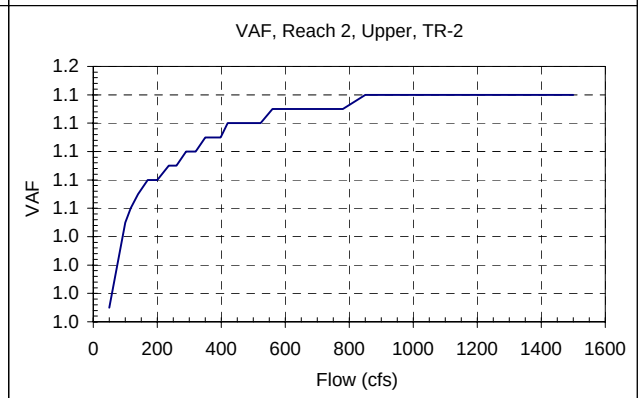
Stream: Sultan R.
Site: Upper Reach 2
Habitat: Pool
Transect: 2

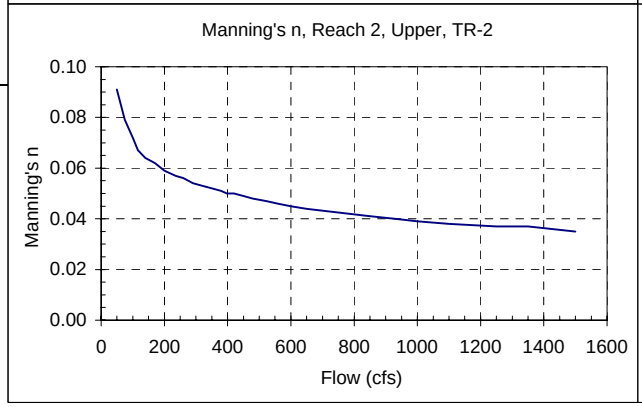
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	95.90	0.11	0.70	0.99	0.091	57.0
75	96.16	0.13	0.88	1.02	0.079	60.1
100	96.37	0.14	1.03	1.05	0.072	61.5
116.5	96.50	0.15	1.11	1.06	0.067	65.8
140	96.66	0.16	1.22	1.07	0.064	66.7
170	96.84	0.17	1.36	1.08	0.062	67.3
200	97.01	0.18	1.47	1.08	0.059	67.9
236.3	97.19	0.18	1.61	1.09	0.057	68.6
260	97.30	0.19	1.69	1.09	0.056	69.0
290	97.43	0.20	1.79	1.10	0.054	69.5
320	97.56	0.20	1.88	1.10	0.053	69.9
350	97.67	0.21	1.97	1.11	0.052	70.3
380	97.79	0.21	2.05	1.11	0.051	70.8
397.6	97.85	0.22	2.10	1.11	0.050	71.0
420	97.93	0.22	2.16	1.12	0.050	71.3
450	98.03	0.22	2.24	1.12	0.049	71.8
480	98.13	0.23	2.32	1.12	0.048	72.4
523.0	98.26	0.24	2.42	1.12	0.047	73.1
560	98.37	0.24	2.51	1.13	0.046	73.7
600	98.48	0.25	2.60	1.13	0.045	74.3
650	98.62	0.25	2.71	1.13	0.044	75.0
710	98.77	0.26	2.84	1.13	0.043	76.0
780	98.95	0.27	2.97	1.13	0.042	77.2
850	99.11	0.28	3.11	1.14	0.041	78.2
928.3	99.28	0.29	3.25	1.14	0.040	79.4
1000	99.44	0.29	3.36	1.14	0.039	80.1
1100	99.64	0.30	3.53	1.14	0.038	80.8
1250	99.92	0.31	3.77	1.14	0.037	81.7
1350	100.10	0.32	3.91	1.14	0.037	82.3
1500	100.35	0.33	4.12	1.14	0.035	84.8

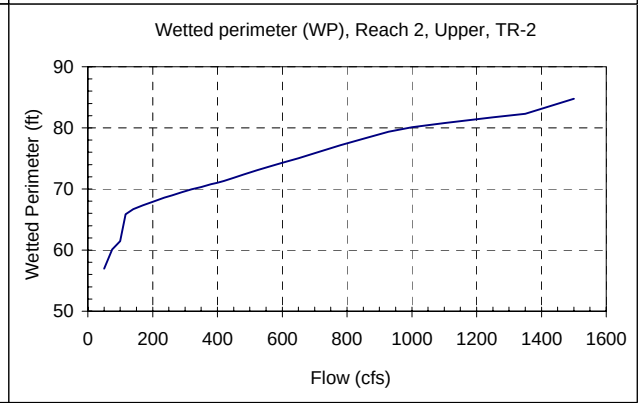


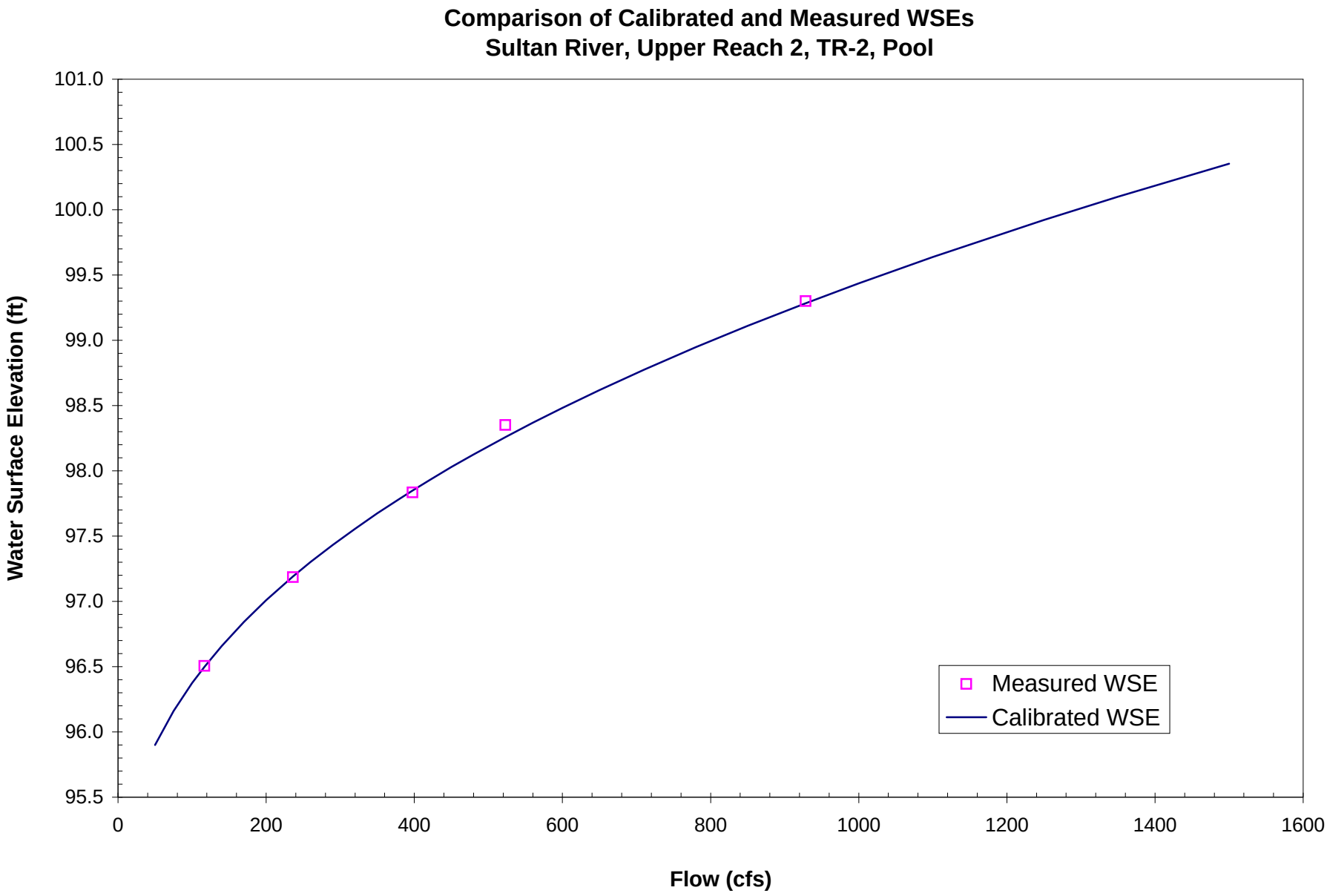











Comparison of Calibrated and Measured WSEs
Sultan River, Upper Reach 2, TR-2, Pool
Water Surface Elevation (ft)
101.0
100.5
100.0
99.5
99.0
98.5
98.0
97.5
97.0
96.5
96.0
95.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Upper Reach 2
Date: 7/10/2007 **Transect:** TR1
Habitat: Pool Control **Flow:** Bed Profile Only

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	9.37	109.37		100.00
HP1			6.90	102.47
HP2			4.72	104.65
HP3			5.50	103.87
TP HP3	5.47			103.87
		109.34		
HP2			4.69	104.65
HP1			6.88	102.46
BM			9.34	100.00

Comment: TR-1, 2 & 3 HP included in the loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect L/R bank (ft)	Transect Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L						0.00	0.00	
1-R						0.00		
						Ave Q=		

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	11.1		109.34	12.80	0.00	96.54
d/s	78.6		109.34	12.90	0.00	96.44

WSE slope = 0.148%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:

Date: 7/11/2007
Habitat: Pool Control **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP3	5.29	109.16		103.87
HP2			4.49	104.67
TR-2 BM			7.78	101.38
BM			9.14	100.02
HP1			6.69	102.47
HP1	6.73	109.20		
TR-2 BM			7.83	101.37
HP2			4.54	104.66
HP3			5.33	103.87

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect L/R bank (ft)	Transect Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L	14		109.19	12.71	0.00	96.48	96.49	109.9
1-R	77			12.70	0.00	96.49		
						Ave Q=		109.9

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	0	@ TR				96.49
d/s	40		109.19	12.76	0.00	96.43

WSE slope = 0.137%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
167

Date: 7/12/2007
Habitat: Pool Control **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	9.43	109.43		100.00
HP3			5.57	103.86
HP2			4.77	104.66
HP1			6.97	102.46
TP HP1	6.95	109.41		
HP2			4.76	104.65
HP3			5.55	103.86
BM			9.41	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect L/R bank (ft)	Transect Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L	10	46	109.41	12.24		97.17	97.17	218.6
1-R	81			12.24		97.17		
						Ave Q=		214.5

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	0	@ TR				97.17
d/s	40		109.41	12.42	0.00	96.99

WSE slope = 0.450%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
167

Date: 7/13/2007
Habitat: Pool Control **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM Lower	9.31	109.31		100.00
HP3			5.47	103.84
HP2			4.66	104.65
HP1			6.85	102.46
TP HP1	6.83	109.29		
HP2			4.64	104.65
HP3			5.45	103.84
BM			9.29	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect L/R bank (ft)	Transect Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			108.59	10.80		97.79	97.80	394.0
1-R			109.29	11.49		97.80		
						Ave Q=		387.1

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	0	@ TR				97.80
d/s	40		108.59	11.10	0.00	97.49

WSE slope = 0.763%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
167

Date: #######
Habitat: Pool Control **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM TR-2	5.07	106.43		101.36
HP3				
TR-2 HP				
HP1				
TP HP1				
HP3				
BM TR-2				
BM				

Comment: 1/2 loop only

(2) Water Surface Elevation (WSE) Survey

TR	Transect L/R bank (ft)	Transect Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L							98.24	
1-R			106.43	8.19	0.00	98.24		
						Ave Q=		

WSE slope = NA
Note: SG=26.16(10:55am) SG=27.46at 1:07pm

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:

Date: 10/20/2007
Habitat: Pool Control **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	10.15	110.15		100.00
HP3				
HP2			5.50	104.65
HP1				
TP HP1				
HP3			0.00	
BM TR-2			0.00	
BM			0.00	

Comment: 1/2 loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect L/R bank (ft)	Transect Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L							99.30	
1-R			#####	10.85		99.30		
						Ave Q=		

WSE slope = NA
Note: Flow was stable at time of survey. Only 0.02ft change in SG reading

(3) Meter and propeller ID for Velocity Correction

Meter ID:
Propeller ID:

Stream: Sultan R.
Site: Upper Reach 2
Transect: 6
Habitat: Pool Control

Survey Date	HI (ft)	Q (cfs)
7/10/2007	109.34	
7/11/2007	109.19	109.9
7/12/2007	109.41	218.6
7/13/2007	109.29	394.0

10-Jul-07

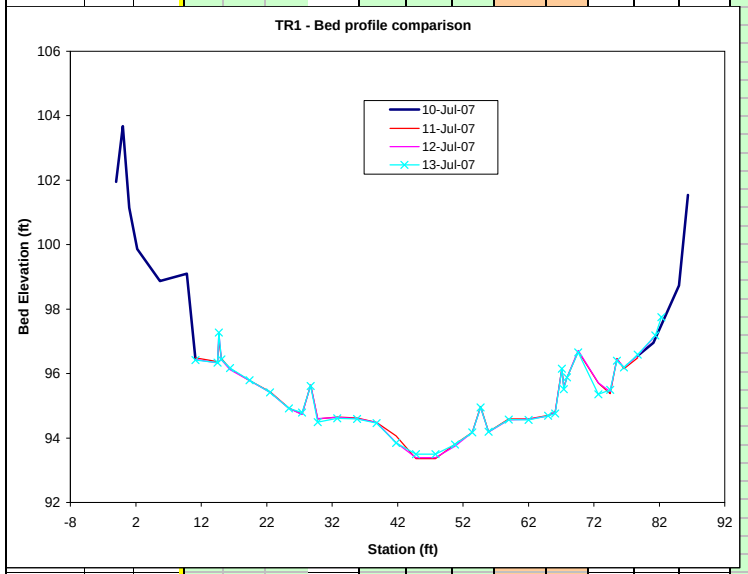
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	-1.0	7.39	101.95									88.9
	0.0	5.66	103.68									88.9
	1.0	8.20	101.14									88.9
	2.2	9.48	99.86									87.7
	5.7	10.47	98.87									18.6
	9.8	10.24	99.10									81.8
LWE	11.1	12.90	96.44									22.9
RWE	78.6	12.80	96.54									82.9
	81.1	12.39	96.95									28.8
	85.0	10.61	98.73									21.6
RWP	86.4	7.80	101.54									88.9

11-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	11.1		96.49	0.00	0.00		0.00		0.00		0.00	22.9
	14.5		96.37	0.12	0.00		0.00		0.00		0.00	22.9
	14.7		97.04	-0.55	0.00		0.00		0.00		0.00	88.9
	15.1		96.47	0.02	0.00		0.00		0.00		0.00	88.9
	16.4		96.16	0.33	0.00		0.00		0.00		0.00	52.6
	19.4		95.79	0.70	0.23		0.30		0.30		0.64	52.6
	22.5		95.44	1.05	0.49		0.53		0.53		1.68	26.8
	25.4		94.93	1.56	0.44		0.48		0.48	5	1.82	43.7
	27.4		94.75	1.74	1.09		1.14		1.14		3.27	45.6
	28.7		95.65	0.84	1.09		1.14		1.14		1.15	88.9
	29.8		94.60	1.89	1.04		1.09		1.09		4.23	88.9
	32.8		94.66	1.83	1.39		1.44		1.44		7.92	43.7
	35.8		94.63	1.86	1.57		1.63		1.63		9.09	43.7
	38.8		94.49	2.00	1.59		1.65		1.65		9.89	34.6
	41.8		94.07	2.42	1.17		1.22		1.22		8.83	32.6
	44.8		93.37	3.12	1.22	1.18	1.27	1.23	1.25		11.68	32.6
	47.8		93.37	3.12	1.25	1.16	1.30	1.21	1.25		11.73	84.6
	50.8		93.81	2.68	1.12	1.14	1.17	1.19	1.18		8.84	57.7
	53.4		94.18	2.31	1.17		1.22		1.22		5.48	45.7
	54.7		94.98	1.51	1.26		1.31		1.31		2.47	88.9
	55.9		94.20	2.29	1.19		1.24		1.24		6.09	88.9
	59.0		94.60	1.89	0.75		0.80		0.80		4.63	85.7
	62.0		94.60	1.89	0.48		0.52		0.52	60	1.48	63.6
	65.0		94.71	1.78	0.88		0.93		0.93	50	2.19	23.6
	66.1		94.81	1.68	1.28		1.33		1.33	55	1.35	23.6
	67.1		96.17	0.32	1.60		1.66		1.66	65	0.15	88.9
	67.4		95.59	0.90	1.53		1.59		1.59	40	0.44	88.9
	67.9		95.88	0.61	1.23		1.28		1.28	40	0.66	88.9
	69.6		96.69	-0.20	0.00		0.00		0.00		0.00	88.9
	72.7		95.71	0.78	1.28		1.33		1.33		2.54	88.9
	74.5		95.38	1.11	0.68		0.73		0.73		1.14	86.9
	75.5		96.47	0.02	0.10		0.20		0.20		0.00	88.9
	76.6		96.16	0.33	0.86		0.91		0.91		0.48	88.9
RWE	78.7		96.49	0.00	0.00		0.00		0.00		0.00	82.9

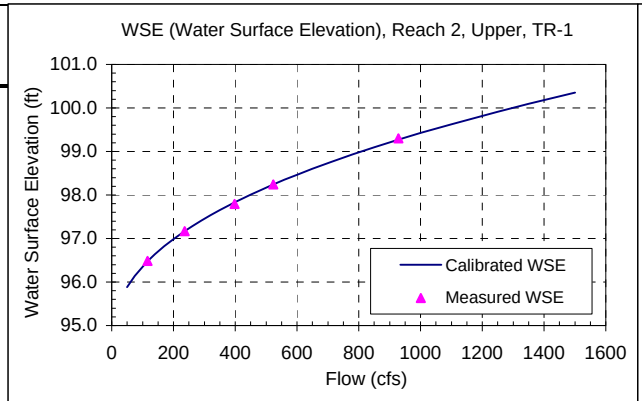
12-Jul-07

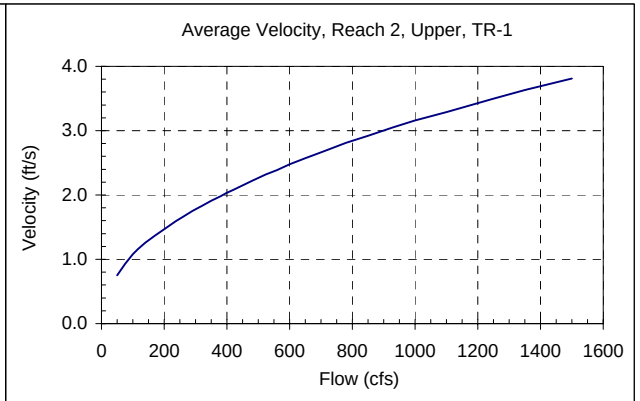
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	10.0		97.17	0.00	0.00		0.00		0.00		0.00	22.9
	11.1		96.44	0.73	0.00		0.00		0.00		0.00	22.9
	14.5		96.33	0.84	0.00		0.00		0.00		0.00	22.9
	14.7		97.27	-0.10	0.00		0.00		0.00		0.00	88.9
	15.1		96.43	0.74	0.00		0.00		0.00		0.00	88.9
	16.4		96.12	1.05	0.46		0.50		0.50		1.13	52.6
	19.4		95.78	1.39	0.63		0.68		0.68		2.88	52.6
	22.5		95.42	1.75	0.79		0.84		0.84		4.43	26.8
	25.4		94.92	2.25	1.19		1.24		1.24		6.82	43.7
	27.4		94.73	2.44	1.48		1.54		1.54		6.18	45.6
	28.7		95.64	1.53	1.94		2.01		2.01		3.68	88.9
	29.8		94.60	2.57	1.94	1.54	2.01	1.60	1.80		9.49	88.9
	32.8		94.64	2.53	2.29	1.65	2.36	1.71	2.04		15.46	43.7
	35.8		94.60	2.57	2.29	1.87	2.36	1.94	2.15		16.57	43.7
	38.8		94.48	2.69	1.93	1.73	2.00	1.79	1.89		15.29	34.6
	41.8		93.86	3.31	1.91	1.47	1.98	1.53	1.75		17.38	32.6
	44.8		93.39	3.78	1.95	1.68	2.02	1.74	1.88		21.31	32.6
	47.8		93.39	3.78	1.92	1.85	1.99	1.91	1.95		22.12	84.6
	50.8		93.75	3.42	1.92	1.71	1.99	1.77	1.88		17.99	57.7
	53.4		94.17	3.00	1.75	1.62	1.81	1.68	1.75		10.21	45.7
	54.7		94.95	2.22	1.67		1.73		1.73		4.80	88.9
	55.9		94.18	2.99	1.60	1.38	1.66	1.43	1.55		9.94	88.9
	59.0		94.56	2.61	1.27	0.52	1.32	0.56	0.94		7.50	85.7
	62.0		94.58	2.59	0.65	0.28	0.70	0.33	0.52	5	4.00	63.6
	65.0		94.68	2.49	1.09		1.14		1.14		5.82	23.6
	66.1		94.80	2.37	0.56		0.61		0.61		1.51	23.6
	67.1		96.15	1.02	1.10		1.15		1.15	5	0.76	88.9
	67.4		95.57	1.60	0.80		0.85		0.85	45	0.39	88.9
	67.9		95.87	1.30	1.24		1.29		1.29	20	1.73	88.9
	69.6		96.72	0.45	1.21		1.26		1.26		1.36	88.9
	72.7		95.71	1.46	1.28		1.33		1.33	5	4.74	88.9
	74.5		95.44	1.73	1.14		1.19		1.19		2.88	86.9
	75.5		96.45	0.72	0.74		0.79		0.79		0.60	88.9
	76.6		96.19	0.98	0.71		0.76		0.76		1.20	88.9
	78.7		96.56	0.61	0.23		0.30		0.30		0.44	82.9
RWE	81.4		97.17	0.00	0.00		0.00		0.00		0.00	28.8

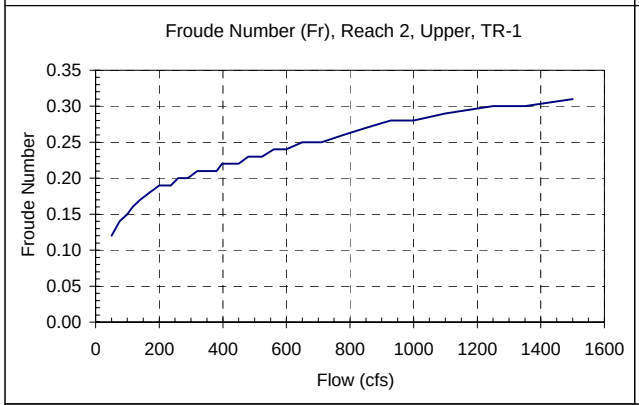


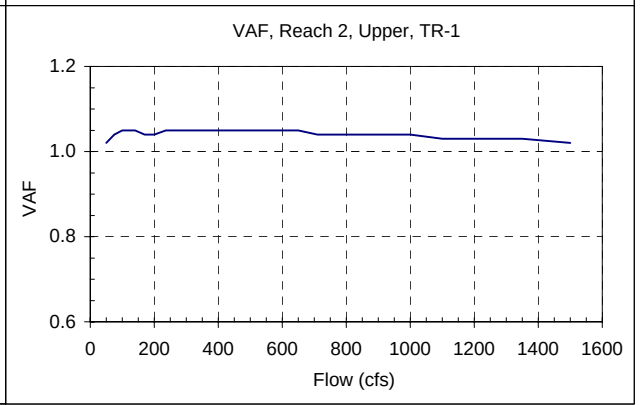
Stream: Sultan R.
Site: Upper Reach 2
Habitat: Pool Control
Transect: 1

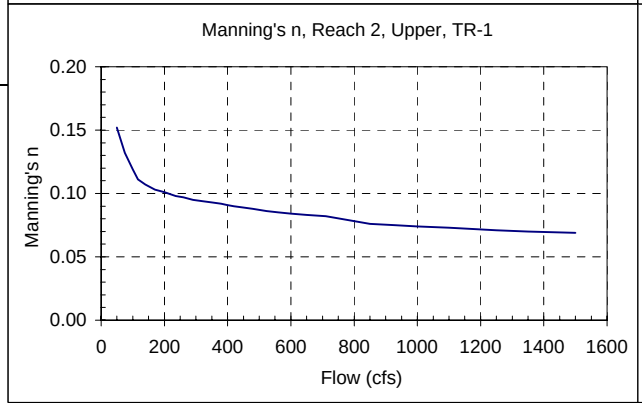
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	95.88	0.12	0.75	1.02	0.152	54.2
75	96.14	0.14	0.93	1.04	0.132	58.7
100	96.35	0.15	1.08	1.05	0.119	63.2
116.5	96.48	0.16	1.16	1.05	0.111	69.1
140	96.64	0.17	1.26	1.05	0.107	71.6
170	96.82	0.18	1.37	1.04	0.103	73.4
200	96.99	0.19	1.47	1.04	0.101	74.8
236.3	97.17	0.19	1.59	1.05	0.098	76.0
260	97.28	0.20	1.66	1.05	0.097	76.3
290	97.41	0.20	1.75	1.05	0.095	76.7
320	97.54	0.21	1.83	1.05	0.094	77.1
350	97.65	0.21	1.91	1.05	0.093	77.4
380	97.77	0.21	1.98	1.05	0.092	77.7
397.6	97.83	0.22	2.03	1.05	0.091	78.0
420	97.91	0.22	2.08	1.05	0.090	78.3
450	98.01	0.22	2.15	1.05	0.089	78.7
480	98.11	0.23	2.22	1.05	0.088	79.1
523.0	98.24	0.23	2.32	1.05	0.086	79.6
560	98.35	0.24	2.39	1.05	0.085	80.0
600	98.46	0.24	2.48	1.05	0.084	80.5
650	98.60	0.25	2.57	1.05	0.083	81.0
710	98.76	0.25	2.68	1.04	0.082	81.6
780	98.93	0.26	2.81	1.04	0.079	83.2
850	99.10	0.27	2.92	1.04	0.076	87.3
928.3	99.27	0.28	3.05	1.04	0.075	88.1
1000	99.42	0.28	3.16	1.04	0.074	88.8
1100	99.63	0.29	3.29	1.03	0.073	89.8
1250	99.91	0.30	3.50	1.03	0.071	91.0
1350	100.09	0.30	3.63	1.03	0.070	91.5
1500	100.35	0.31	3.81	1.02	0.069	92.1

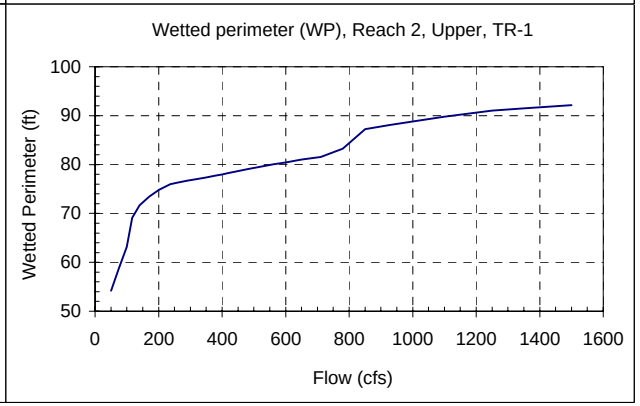


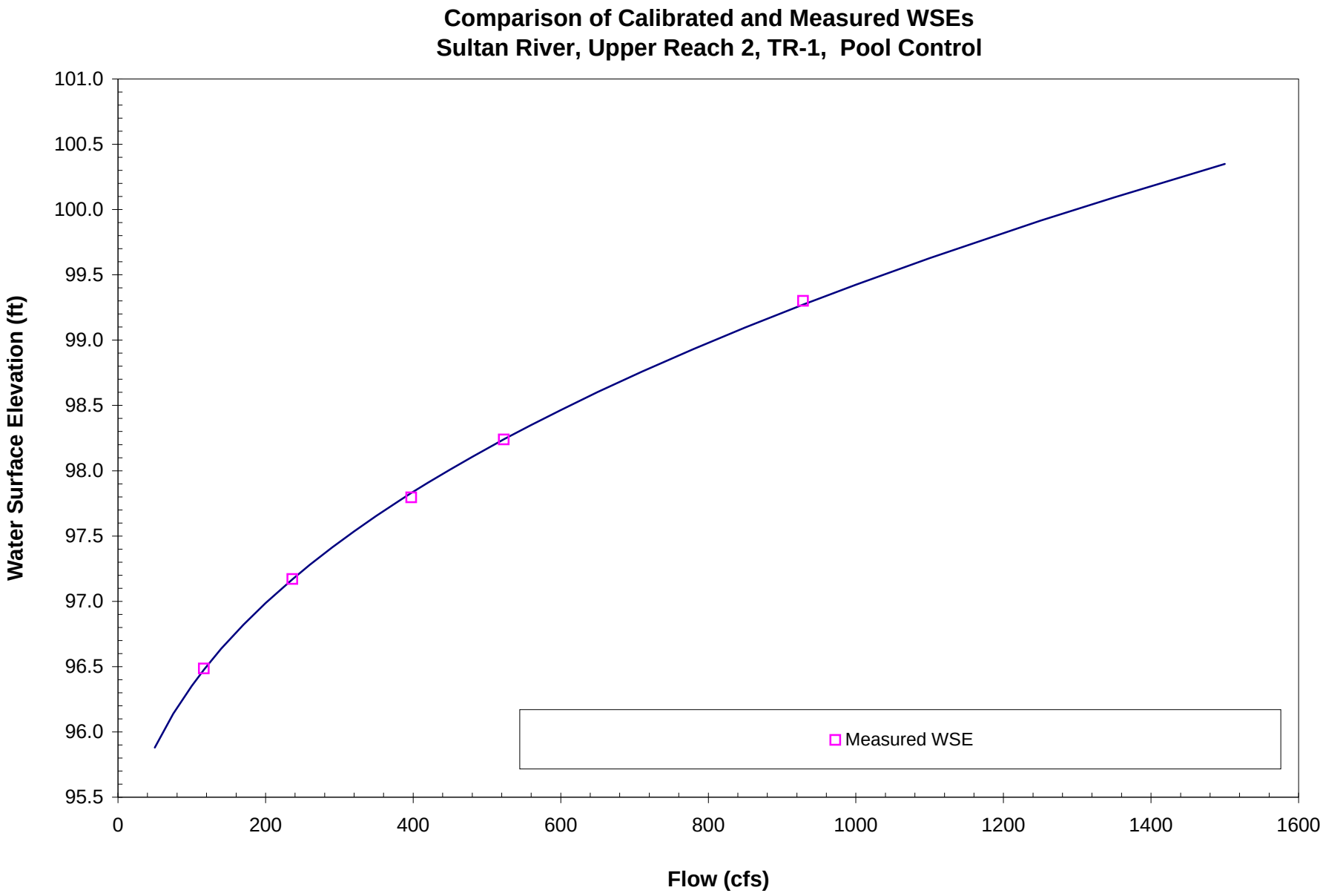











Comparison of Calibrated and Measured WSEs
Sultan River, Upper Reach 2, TR-1, Pool Control
Water Surface Elevation (ft)
101.0
100.5
100.0
99.5
99.0
98.5
98.0
97.5
97.0
96.5
96.0
95.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE

Stream: Sultan R.
Site: Lower Reach 2
Date: 7/11/2007 **Transect:** TR6
Habitat: Glide **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.59	103.59		100.00
HP1			4.68	98.91
HP2			4.79	98.80
TP				
HP2	4.65	103.45		103.45
HP1			4.54	98.91
BM			3.45	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	20		103.45	8.84	0.00	94.61	94.61	114.4
RWS	106			8.84	0.00	94.61		

Ave Q= 114.4

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	40		103.45	8.83	0.00	94.62
d/s	-45		103.45	8.85	0.00	94.60

WSE slope = 0.024%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A
Calib. # 175
Propeller for Sta=18 to 24.2

Propeller ID (a):
Prop1a= 5B
Calib. # 125
Propeller for Sta=27 to 106.6

(4) 7/10/07 Level Loop Survey (BM & HP). Bank Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.82	103.82		100.00
HP1			4.91	98.91
HP2			5.01	98.81
TP				
HP2	4.73	103.54		
HP1			4.64	98.90
BM			3.54	100.00

Comment:

Date: 7/12/2007
Habitat: Glide **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.95	102.95		100.00
HP1			4.04	98.91
HP2			4.15	98.80
TP				
HP2	4.48	103.28	4.48	98.80
HP1			4.37	98.91
BM			3.28	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	22		103.28	8.34	0.00	94.94	94.95	229.9
RWS	104			8.33	0.00	94.95		

Ave Q= 229.9

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	0					94.95
d/s	-55		103.28	10.48	2.14	94.94

WSE slope = 0.009%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A
Calib. # 175

Date: 7/13/2007
Habitat: Glide **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.13	103.13		100.00
HP1			4.22	98.91
HP2			4.33	98.80
TP				
HP2	4.20	103.00		103.00
HP1			4.09	98.91
BM			3.00	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	19		103.00	7.66	0.00	95.34	95.34	400.9
RWS	106			7.66	0.00	95.34		

Ave Q= 400.9

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	45		103.00	10.95	3.27	95.32
d/s	0					95.34

WSE slope = -0.044%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A
Calib. # 175

Date: 10/19/2007
Habitat: Glide **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.80	102.80		100.00
HP1			3.89	98.91
HP2				
TP				
HP2				
HP1				
BM				

Comment: 1/2 level loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			102.80	7.12	0.00	95.68	95.68	
RWS								

Ave Q=

Note: Unable to cross LWSE only, measured at 2:15

Date: 10/20/2007
Habitat: Glide **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.00	104.00		100.00
HP1			5.08	98.92
HP2				
TP				
HP2				
HP1				
BM				

Comment: 1/2 level loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			104.00	7.55	0.00	96.45	96.45	
RWS								

Ave Q=

Note: Unable to cross LWSE only, measured at 1:40

Stream: Sultan R.
Site: Lower Reach 2
Transect: 6
Habitat: Glide

Survey Date	HI (ft)	Q (cfs)
7/10/2007	103.54	
7/11/2007	103.45	114.4
7/12/2007	103.28	229.9
7/13/2007	103.00	400.9

11-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-6.0	3.07	100.47									82.9
LWP	1.0	5.26	98.28									82.9
	4.0	5.94	97.60									81.9
	9.0	6.20	97.34									78.6
	15.2	7.95	95.59									82.9
LWE	18.0		94.61	0.00	0.00		0.00		0.00		0.00	87.7
	19.0		93.91	0.70	0.05		0.11		0.11		0.14	87.7
	21.5		92.96	1.65	0.01		0.02		0.02		0.07	87.8
	23.0		93.41	1.20	0.23		0.32		0.32		0.51	87.8
	24.2		92.11	2.50	0.09		0.17		0.17		0.87	87.7
	27.0		92.24	2.37	0.20		0.27		0.27		1.53	87.7
	29.0		91.91	2.70	0.32	0.01	0.38	0.04	0.21		1.28	87.7
	31.5		92.06	2.55	0.40	0.17	0.45	0.24	0.35		2.65	78.6
	35.0		91.89	2.72	0.41	0.14	0.46	0.21	0.33		3.41	78.6
	39.0		91.73	2.88	0.61	0.31	0.66	0.38	0.52		5.97	76.6
	43.0		91.79	2.82	0.51	0.22	0.56	0.29	0.42		4.78	68.7
	47.0		92.26	2.35	0.77		0.82		0.82		7.75	86.5
	51.0		91.53	3.08	0.84	0.57	0.89	0.62	0.76		9.32	65.7
	55.0		91.81	2.80	0.83	0.51	0.88	0.56	0.72		8.09	54.6
	59.0		91.91	2.70	0.56	0.66	0.61	0.71	0.66		7.14	65.6
	63.0		92.11	2.50	0.77		0.82		0.82		8.24	65.7
	67.0		92.21	2.40	0.59		0.64		0.64		6.15	65.7
	71.0		92.23	2.38	0.70		0.75		0.75		7.17	65.7
	75.0		92.41	2.20	0.58		0.63		0.63		5.55	56.6
	79.0		92.51	2.10	0.61		0.66		0.66		5.55	56.6
	83.0		92.43	2.18	0.64		0.69		0.69		6.03	56.7
	87.0		92.23	2.38	0.56		0.61		0.61		5.80	56.7
	91.0		91.91	2.70	0.58	0.45	0.63	0.50	0.57		6.12	48.7
	95.0		91.51	3.10	0.54	0.33	0.59	0.39	0.49		6.01	23.7
	98.9		91.81	2.80	0.36	0.15	0.42	0.22	0.32		2.31	28.6
	100.2		93.71	0.90	0.40		0.45		0.45		0.43	86.7
	101.0		92.61	2.00	0.22		0.29		0.29		1.09	86.7
	104.0		93.61	1.00	0.13		0.19		0.19		0.48	76.7
	106.0		93.66	0.95	0.00		0.00		0.00		0.00	78.6
RWE	106.6		94.61	0.00	0.00		0.00		0.00		0.00	81.6
	109.4	7.71	95.83									82.9
	110.8	7.90	95.64									82.6
	113.2	6.32	97.22									82.6
	115.3	6.25	97.29									28.7
RWP	117.7	5.82	97.72									28.7
	123.7	5.63	97.91									28.7

Propepller 5A

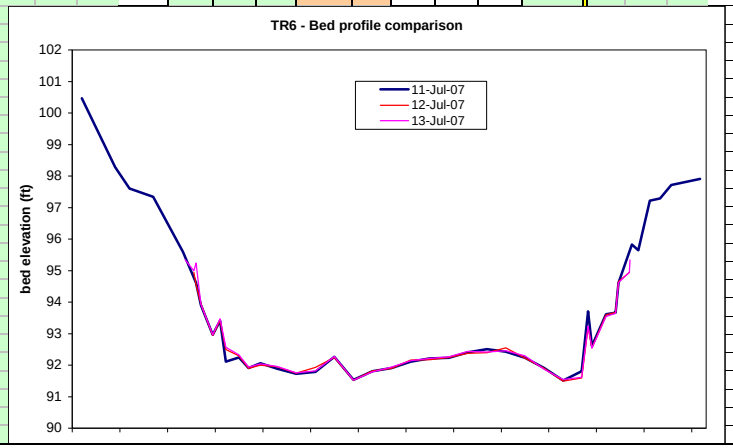
Propepller 5B

12-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	17.5		94.95	0.00	0.00		0.00		0.00		0.00	87.7
	18.0		94.55	0.40	0.00		0.00		0.00		0.00	87.7
	19.0		93.95	1.00	0.10		0.19		0.19		0.33	87.7
	21.5		92.95	2.00	0.05		0.11		0.11		0.45	87.8
	23.0		93.43	1.52	0.34		0.42		0.42		0.87	87.8
	24.2		92.50	2.45	0.32		0.40		0.40		1.98	87.7
	27.0		92.30	2.65	0.63	0.20	0.70	0.28	0.49		3.12	87.7
	29.0		91.90	3.05	0.70	0.03	0.76	0.07	0.42		2.85	87.7
	31.5		92.00	2.95	0.74	0.55	0.80	0.63	0.71		6.31	78.6
	35.0		91.95	3.00	0.89	0.37	0.94	0.46	0.70		7.86	78.6
	39.0		91.75	3.20	1.05	0.68	1.10	0.74	0.92		11.81	76.6
	43.0		91.93	3.02	1.02	0.77	1.07	0.83	0.95		11.46	68.7
	47.0		92.25	2.70	1.44	1.03	1.50	1.08	1.29		13.94	86.5
	51.0		91.53	3.42	1.43	1.03	1.49	1.08	1.29		17.59	65.7
	55.0		91.82	3.13	1.42	0.90	1.48	0.95	1.22		15.23	54.6
	59.0		91.90	3.05	1.20	0.92	1.26	0.97	1.11		13.59	65.6
	63.0		92.17	2.78	1.20	1.06	1.26	1.11	1.18		13.16	65.7
	67.0		92.18	2.77	1.31	0.99	1.37	1.04	1.20		13.34	65.7
	71.0		92.25	2.70	1.45	1.04	1.51	1.09	1.30		14.05	65.7
	75.0		92.38	2.57	1.31	1.06	1.37	1.11	1.24		12.74	56.6
	79.0		92.40	2.55	1.28	0.94	1.34	0.99	1.16		11.88	56.6
	83.0		92.55	2.40	1.07		1.12		1.12		10.77	56.7
	87.0		92.23	2.72	1.18	0.91	1.23	0.96	1.10		11.95	56.7
	91.0		91.90	3.05	1.14	0.65	1.19	0.72	0.96		11.66	48.7
	95.0		91.50	3.45	0.88	0.90	0.93	0.95	0.94		12.85	23.7
	98.9		91.60	3.35	0.75	0.34	0.81	0.42	0.62		5.36	28.6
	100.2		93.20	1.75	0.38		0.47		0.47		0.86	86.7
	101.0		92.55	2.40	0.39		0.48		0.48		2.17	86.7
	104.0		93.60	1.35	0.30		0.38		0.38		1.30	76.7
	106.0		93.68	1.27	0.11		0.20		0.20		0.33	78.6
	106.6		94.65	0.30	0.16		0.24		0.24		0.10	81.6
RWE	108.9		94.95	0.00	0.00		0.00		0.00		0.00	82.9

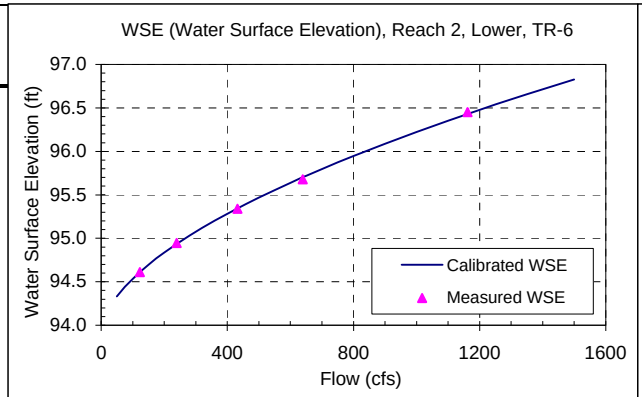
13-Jul-07

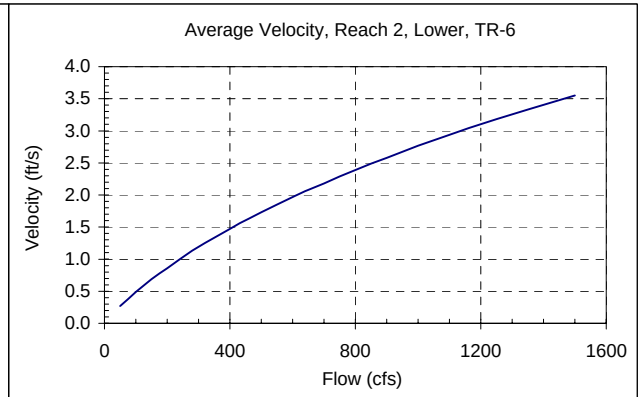
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	15.7		95.34	0.00	0.00		0.00		0.00		0.00	82.9
	17.5		94.99	0.35	0.00		0.00		0.00		0.00	87.7
	18.0		95.24	0.10	0.07		0.16		0.16		0.01	87.7
	19.0		93.94	1.40	0.31		0.39		0.39		0.96	87.7
	21.5		92.96	2.38	-0.10		-0.19		-0.19		-0.89	87.8
	23.0		93.47	1.87	0.77		0.83		0.83		2.09	87.8
	24.2		92.57	2.77	0.86	0.43	0.91	0.51	0.71		3.95	87.7
	27.0		92.32	3.02	1.06	0.52	1.11	0.60	0.86		6.20	87.7
	29.0		91.94	3.40	1.05	0.17	1.10	0.25	0.68		5.17	87.7
	31.5		92.04	3.30	1.05	0.77	1.10	0.83	0.96		9.55	78.6
	35.0		91.96	3.38	1.36	0.72	1.42	0.78	1.10		13.94	78.6
	39.0		91.76	3.58	1.63	1.11	1.69	1.16	1.43		20.46	76.6
	43.0		91.82	3.52	1.75	1.33	1.82	1.39	1.60		22.55	68.7
	47.0		92.27	3.07	1.99	1.57	2.06	1.63	1.84		22.65	86.5
	51.0		91.52	3.82	1.98	1.42	2.05	1.48	1.76		26.94	65.7
	55.0		91.79	3.55	2.14	1.45	2.20	1.51	1.86		26.37	54.6
	59.0		91.94	3.40	1.81	1.44	1.88	1.50	1.69		22.96	65.6
	63.0		92.14	3.20	2.11	1.71	2.17	1.77	1.97		25.27	65.7
	67.0		92.21	3.13	2.18	1.56	2.24	1.62	1.93		24.19	65.7
	71.0		92.26	3.08	2.27	1.62	2.33	1.68	2.01		24.72	65.7
	75.0		92.44	2.90	2.12	1.49	2.18	1.55	1.87		21.66	56.6
	79.0		92.42	2.92	2.08	1.42	2.14	1.48	1.81		21.17	56.6
	83.0		92.46	2.88	2.01	1.45	2.08	1.51	1.79		20.66	56.7
	87.0		92.29	3.05	1.97	1.35	2.04	1.41	1.72		21.01	56.7
	91.0		91.87	3.47	1.87	1.08	1.94	1.13	1.53		21.30	48.7
	95.0		91.54	3.80	1.68	1.32	1.74	1.38	1.56		23.43	23.7
	98.9		91.61	3.73	0.67	0.65	0.74	0.72	0.73		7.05	28.6
	100.2		93.24	2.10	0.47		0.55		0.55		1.21	86.7
	101.0		92.54	2.80	0.66	0.28	0.73	0.36	0.55		2.90	86.7
	104.0		93.54	1.80	0.39		0.48		0.48		2.14	76.7
	106.0		93.64	1.70	0.20		0.28		0.28		0.62	78.6
	106.6		94.62	0.72	0.52		0.60		0.60		0.63	81.6
	108.9		94.94	0.40	0.09		0.17		0.17		0.08	82.9
RWE	109.0		95.34	0.00	0.00		0.00		0.00		0.00	82.9

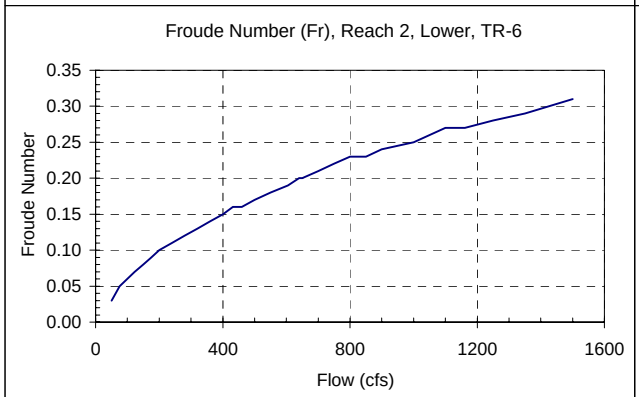


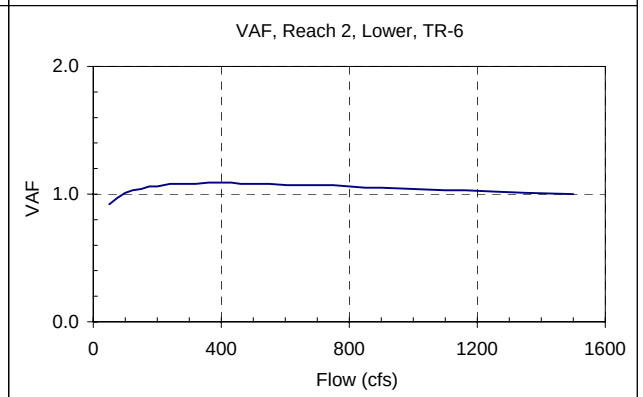
Stream: Sultan R.
Site: Lower Reach 2
Habitat: Glide
Transect: 6

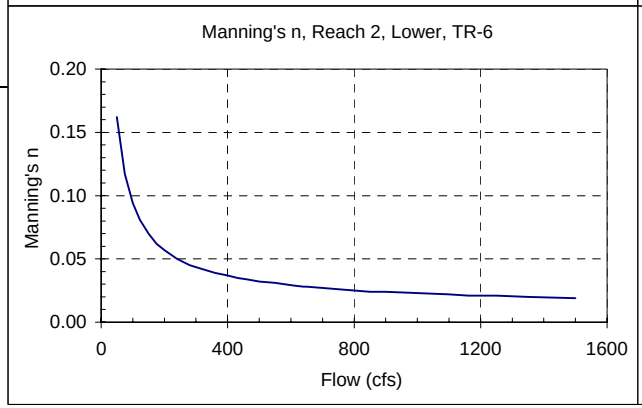
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	94.33	0.03	0.27	0.92	0.162	91.3
75	94.44	0.05	0.38	0.97	0.117	91.6
100	94.53	0.06	0.49	1.01	0.094	91.9
122.8	94.61	0.07	0.58	1.03	0.081	92.1
150	94.70	0.08	0.69	1.04	0.070	92.9
175	94.77	0.09	0.78	1.06	0.062	93.5
200	94.84	0.10	0.86	1.06	0.057	94.1
239.6	94.93	0.11	1.00	1.08	0.050	94.9
280	95.03	0.12	1.13	1.08	0.045	95.3
320	95.12	0.13	1.25	1.08	0.042	95.9
360	95.20	0.14	1.36	1.09	0.039	96.4
400	95.28	0.15	1.47	1.09	0.037	96.9
431.9	95.34	0.16	1.56	1.09	0.035	97.3
460	95.40	0.16	1.63	1.08	0.034	97.5
500	95.47	0.17	1.73	1.08	0.032	97.7
550	95.55	0.18	1.85	1.08	0.031	98.0
605	95.65	0.19	1.98	1.07	0.029	98.6
639.6	95.70	0.20	2.06	1.07	0.028	99.3
650	95.72	0.20	2.08	1.07	0.028	99.6
700	95.80	0.21	2.18	1.07	0.027	100.7
750	95.87	0.22	2.29	1.07	0.026	101.3
800	95.95	0.23	2.39	1.06	0.025	101.8
850	96.02	0.23	2.49	1.05	0.024	102.2
900	96.09	0.24	2.58	1.05	0.024	102.5
1000	96.22	0.25	2.77	1.04	0.023	103.3
1100	96.35	0.27	2.94	1.03	0.022	104.0
1161.7	96.43	0.27	3.04	1.03	0.021	104.4
1250	96.54	0.28	3.18	1.02	0.021	105.0
1350	96.66	0.29	3.33	1.01	0.020	105.7
1500	96.83	0.31	3.55	1.00	0.019	106.6

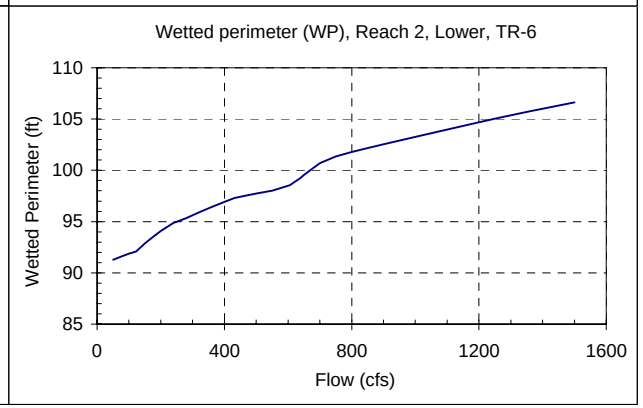


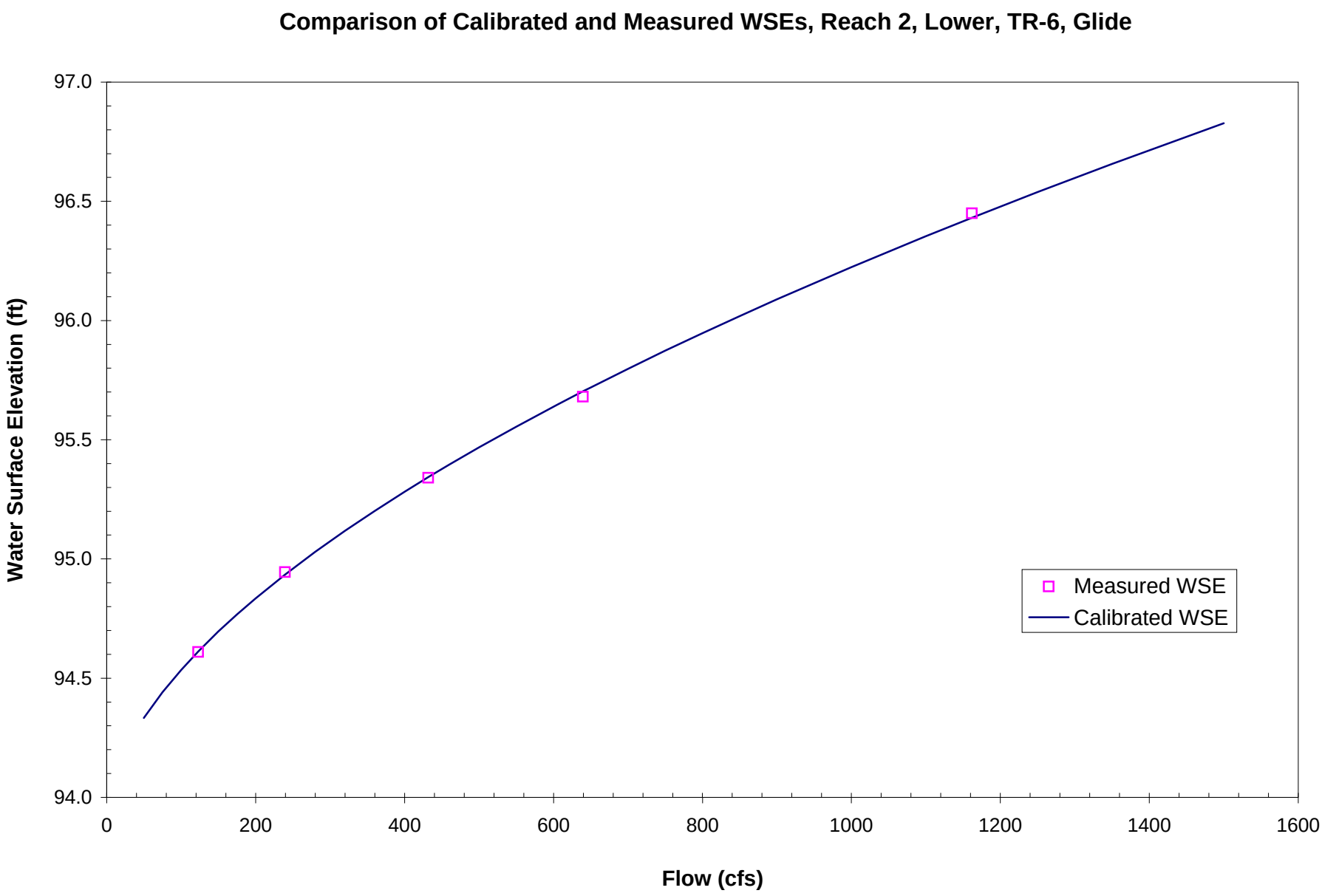











Comparison of Calibrated and Measured WSEs, Reach 2, Lower, TR-6, Glide
Water Surface Elevation (ft)
97.0
96.5
96.0
95.5
95.0
94.5
94.0
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Lower Reach 2

Date: 7/11/2007 **Transect:** TR5
Habitat: Wide Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.13	102.13		100.00
HP			2.38	99.75
Rock			4.30	97.83
TP Rock	4.20	102.03		
HP			2.27	99.76
BM			2.02	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
	32		102.03	4.95	0.00	97.08	96.59	
	58			4.95	0.00	97.08		
	103			5.52	0.00	96.51		126.1
	130			5.90	0.00	96.13		
	167			5.87	0.00	96.16		
							Ave Q=	126.1

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50		102.03	6.66	2.29	97.66
d/s	0					96.59

WSE slope = 2.136%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

(4) 7/10/07 Level Loop Survey (BM & HP). Bank Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.32	102.32		100.00
HP			2.56	99.76
Rock			4.49	97.83
TP Rock	4.65	102.48		
HP			2.72	99.76
BM			2.47	100.01

Comment:

Date: 7/12/2007
Habitat: Wide Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.61	101.61		100.00
HP			1.85	99.76
Rock			3.78	97.83
TP Rock	3.97	101.80		
HP			2.05	99.75
BM			1.80	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
	25		101.80	4.45	0.00	97.35	96.98	
	63			4.45	0.00	97.35		
middle	95			4.77	0.00	97.03		282.9
	128			5.25	0.00	96.55		
	165			5.19	0.00	96.61		
							Ave Q=	282.9

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 7/13/2007
Habitat: Wide Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.31	102.31		100.00
HP1			2.57	99.74
Rock			4.48	97.83
TP Rock	4.38	102.21		
HP1			2.45	99.76
BM			2.20	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
	22		102.21	4.57	0.00	97.64	97.30	
	66			4.57	0.00	97.64		
	94			5.01	0.00	97.20		
	127			5.18	0.00	97.03		447.4
	148			5.07	0.00	97.14		
	166			5.05	0.00	97.16		
							Ave Q=	447.4

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 10/19/2007
Habitat: Wide Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.44	102.44		100.00
HP1			2.69	99.75
Rock				
TP Rock				
HP1				
BM				

Comment: 1/2 level loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			102.44	4.49	0.00	97.95	97.73	
R/MWS				4.94	0.00	97.50		
							Ave Q=	

Note: Unable to cross LWSE only, measured at 2:35

Date: 10/20/2007
Habitat: Wide Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.34	104.34		100.00
HP1			4.60	99.74
Rock				
TP Rock				
HP1				
BM				

Comment: 1/2 level loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			104.34	5.76	0.00	98.58	98.50	
L/MWS				5.93	0.00	98.41		
							Ave Q=	

Note: Unable to cross LWSE only, measured at 1:55

Stream: Sultan R.
Site: Lower Reach 2
Transect: 5
Habitat: Wide Riffle

Survey Date	HI (ft)	Q (cfs)
7/10/2007	102.48	
7/11/2007	102.03	126.1
7/12/2007	101.80	282.9
7/13/2007	102.21	447.4

11-Jul-07

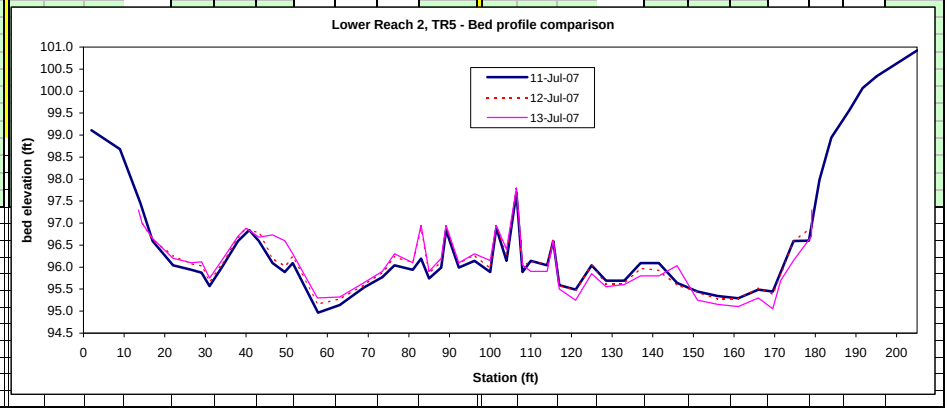
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate
LWP	2.0	3.37	99.11							12.6
	9.0	3.80	98.68							12.6
	14.0	5.03	97.45							12.6
LWE	17.0		96.59	0.00	0.00		0.00		0.00	21.7
	22.0		96.04	0.55	0.34		0.42	45	0.78	65.7
	26.5		95.94	0.65	0.39		0.48		1.08	65.7
	29.0		95.87	0.72	-0.30		-0.38		-0.62	65.7
	31.0		95.57	1.02	0.65		0.72		1.83	65.6
	34.0		95.99	0.60	0.51		0.59		1.24	56.7
RWE	38.0		96.59	0.00	0.00		0.00		0.00	56.8
	40.8		96.84	-0.25						56.8
LWE	43.1		96.59	0.00	0.00		0.00		0.00	56.8
	46.5		96.09	0.50	0.50		0.58		0.93	54.6
	49.5		95.89	0.70	0.05		0.11		0.20	56.8
	51.5		96.09	0.50	0.62		0.69	35	1.16	65.6
	57.7		94.96	1.63	0.53		0.61	35	4.67	68.7
	63.0		95.14	1.45	0.32		0.40	35	2.71	65.8
	69.0		95.54	1.05	0.72		0.78	35	3.52	65.7
	73.5		95.77	0.82	0.55		0.63		1.93	68.7
	76.5		96.04	0.55	0.45		0.53	45	0.78	87.7
	81.0		95.94	0.65	0.88		0.93		1.97	85.8
	83.0		96.19	0.40	0.00		0.00		0.00	85.8
	85.0		95.74	0.85	1.41		1.47		3.12	67.6
	88.0		95.99	0.60	1.20		1.26		1.13	68.6
	89.2		96.84	-0.25						86.9
	92.3		95.99	0.60	0.39		0.48		0.56	86.7
	96.2		96.14	0.45	1.28		1.34		2.32	87.6
	100.0		95.89	0.70	2.65		2.70		3.59	87.7
	101.5		96.89	-0.30						87.9
	104.0		96.14	0.45	2.56		2.61		1.47	87.8
	106.5		97.69	-1.10						87.9
	108.0		95.89	0.70	0.85		0.90		0.63	87.8
	110.0		96.14	0.45	0.05		0.11		0.15	68.6
	114.0		96.04	0.55	1.16		1.21	45	1.30	86.7
	115.5		96.59	0.00	0.00		0.00	45	0.00	86.8
	117.0		95.59	1.00	2.03		2.09		5.76	68.6
	121.0		95.49	1.10	2.87		2.91	45	9.06	67.7
	125.0		96.04	0.55	3.13		3.16	45	4.61	65.7
	128.5		95.69	0.90	1.75		1.82		6.54	56.7
	133.0		95.69	0.90	0.05		0.11		0.43	23.6
	137.0		96.09	0.50	0.57		0.65	35	1.12	23.6
	141.5		96.09	0.50	1.31		1.37	35	2.52	67.6
	146.0		95.64	0.95	1.34		1.40	35	5.17	76.6
	151.0		95.44	1.15	2.23		2.29	30	11.41	67.6
	156.0		95.34	1.25	2.40		2.46	30	13.29	67.8
	161.0		95.29	1.30	2.24		2.30	30	12.95	65.7
	166.0		95.49	1.10	2.12		2.18		10.21	65.6
	169.5		95.44	1.15	1.89		1.96		6.19	65.7
	171.5		95.89	0.70	0.15		0.23		0.42	38.7
RWE	174.6		96.59	0.00	0.00		0.00		0.00	32.7
	178.4	5.88	96.60							81.7
	181.0	4.50	97.98							81.6
	183.9	3.54	98.94							81.6
	188.3	2.92	99.56							81.6
	191.6	2.41	100.07							81.6
RWP	195.1	2.14	100.34							81.6
	205.1	1.55	100.93							81.6

12-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate
LWE	14.4		96.98	0.00	0.00		0.00		0.00	12.6
	17.0		96.63	0.35	0.05		0.12		0.16	21.7
	22.0		96.26	0.72	0.32		0.40	45	0.98	65.7
	26.5		96.08	0.90	0.69		0.76	45	1.68	65.7
	29.0		96.03	0.95	-0.03		-0.07		-0.14	65.7
	31.0		95.68	1.30	0.80		0.86	30	2.41	65.6
	34.0		96.06	0.92	0.83		0.88	30	2.46	56.7
	38.0		96.68	0.30	0.64		0.71	30	0.55	56.8
	40.0		96.88	0.10	0.92		0.97	30	0.21	56.8
	43.1		96.78	0.20	1.05		1.10	30	0.62	56.8
	46.5		96.20	0.78	0.86		0.91		2.28	54.6
	49.5		96.03	0.95	-0.62		-0.69		-1.64	56.8
	51.5		96.23	0.75	0.98		1.03	25	2.87	65.6
	57.7		95.16	1.82	0.86		0.91	25	8.66	68.7
	63.0		95.28	1.70	0.66		0.73	25	6.33	65.8
	69.0		95.60	1.38	1.45		1.51	15	10.57	65.7
	73.5		95.88	1.10	1.38		1.44	15	5.73	68.7
	76.5		96.23	0.75	0.82		0.87		2.46	87.7
	81.0		96.11	0.87	1.27		1.33		3.75	85.8
	83.0		96.88	0.10	1.55		1.61		0.32	85.8
	85.0		95.86	1.12	1.91		1.98		5.53	67.6
	88.0		96.13	0.85	2.20		2.26		4.04	68.6
	89.2		96.88	0.10	2.64		2.69		0.58	86.9
	92.3		96.08	0.90	3.43		3.46		10.91	86.7
	96.2		96.28	0.70	1.02		1.07		2.89	87.6
	100.0		95.98	1.00	2.95		2.99		7.92	87.7
	101.5		96.93	0.05	3.00		3.04		0.30	87.9
	104.0		96.28	0.70	4.63		4.68		4.09	87.8
	106.5		97.78	-0.80						87.9
	108.0		96.03	0.95	3.12		3.15		2.99	87.8
	110.0		96.13	0.85	0.20		0.28		0.72	68.6
	114.0		96.08	0.90	3.34		3.37		8.35	86.7
	115.5		96.63	0.35	2.46		2.51	25	1.20	86.8
	117.0		95.58	1.40	3.47		3.50	25	12.23	68.6
	121.0		95.48	1.50	2.27		2.33	25	12.67	67.7
	125.0		96.03	0.95	1.65		1.71		6.11	65.7
	128.5		95.63	1.35	0.71		0.77		4.17	56.7
	133.0		95.63	1.35	0.08		0.16		0.94	23.6
	137.0		95.98	1.00	0.84		0.89	35	3.11	23.6
	141.5		95.93	1.05	1.47		1.53	35	5.93	67.6
	146.0		95.60	1.38	1.66		1.72	35	9.26	76.6
	151.0		95.43	1.55	3.93		3.97	10	30.29	67.6
	156.0		95.28	1.70	3.29		3.32		28.24	67.8
	161.0		95.28	1.70	3.87		3.91		33.22	65.7
	166.0		95.53	1.45	3.37		3.40		20.98	65.6
	169.5		95.38	1.60	3.32		3.35		14.75	65.7
	171.5		95.83	1.15	0.60		0.67		1.98	38.7
	174.6		96.58	0.40	-0.38		-0.47		-0.78	32.7
RWE	179.9		96.98	0.00	0.00		0.00		0.00	81.7

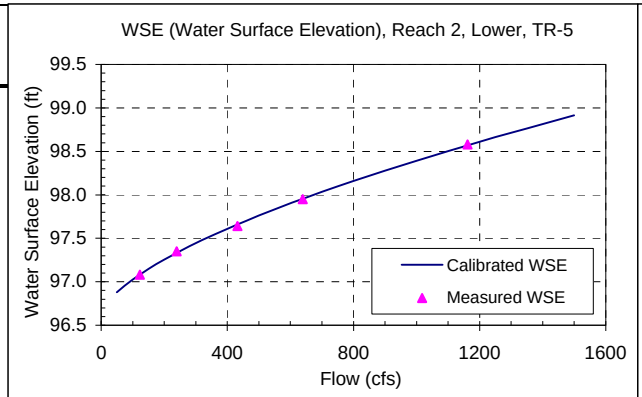
13-Jul-07

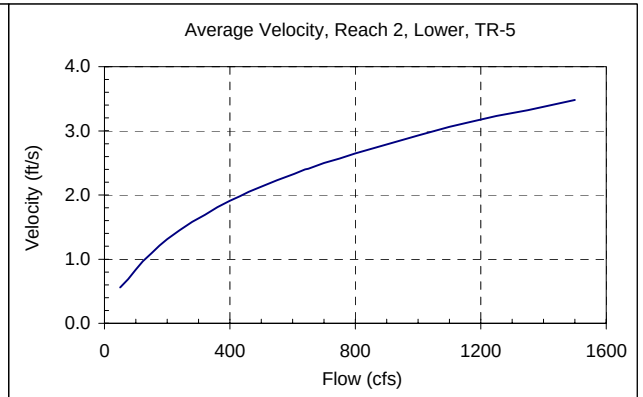
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate
LWE	13.5		97.30	0.00	0.00		0.00		0.00	12.6
	14.4		97.00	0.30	0.00		0.00		0.00	12.6
	17.0		96.65	0.65	0.00		0.00		0.00	21.7
	22.0		96.20	1.10	0.20		0.28	45	1.04	65.7
	26.5		96.10	1.20	0.48		0.56	45	1.66	65.7
	29.0		96.12	1.18	0.05		0.11		0.30	65.7
	31.0		95.75	1.55	0.98		1.03		4.00	65.6
	34.0		96.15	1.15	1.10		1.15		4.64	56.7
	38.0		96.70	0.60	1.09		1.14		2.06	56.8
	40.0		96.88	0.42	1.42		1.48		1.59	56.8
	43.1		96.68	0.62	0.82		0.87	15	1.70	56.8
	46.5		96.73	0.57	0.52		0.60	15	1.06	54.6
	49.5		96.60	0.70	0.07		0.16		0.28	56.8
	51.5		96.30	1.00	1.41		1.47	20	5.53	65.6
	57.5		95.30	2.00	1.24		1.30	20	14.01	68.7
	63.0		95.32	1.98	0.75		0.81	20	8.64	65.8
	69.0		95.65	1.65	1.92		1.99	15	16.62	65.7
	73.5		95.90	1.40	2.03		2.09	10	10.83	68.7
	76.5		96.30	1.00	0.57		0.65		2.42	87.7
	81.0		96.10	1.20	2.31		2.37		9.24	85.8
	83.0		96.95	0.35	3.47		3.50		2.45	85.8
	85.0		95.90	1.40	2.38		2.44		8.53	67.6
	88.0		96.20	1.10	2.02		2.09		4.82	68.6
	89.2		96.95	0.35	3.96		4.00		3.01	86.9
	92.3		96.10	1.20	2.71		2.76		11.58	86.7
	96.2		96.30	1.00	2.16		2.22		8.56	87.6
	100.0		96.15	1.15	4.11		4.15		12.65	87.7
	101.5		96.95	0.35	4.68		4.73		3.31	87.9
	104.0		96.40	0.90	5.06		5.11		5.75	87.8
	106.5		97.80	-0.50						87.9
	108.0		96.05	1.25	3.38		3.41		4.27	87.8
	110.0		95.90	1.40	0.49		0.57	15	2.31	68.6
	114.0		95.90	1.40	2.81		2.85	15	10.61	86.7
	115.5		96.60	0.70	4.63		4.68	15	4.74	86.8
	117.0		95.50	1.80	3.30		3.33	15	15.94	68.6
	121.0		95.25	2.05	3.28		3.31	15	26.24	67.7
	125.0		95.85	1.45	0.82		0.87	15	4.59	65.7
	128.5		95.55	1.75	0.69		0.76	15	5.11	56.7
	133.0		95.60	1.70	0.03		0.07		0.49	23.6
	137.0		95.80	1.50	0.45		0.53		3.39	23.6
	141.5		95.80	1.50	1.44		1.50		10.13	67.6
	146.0		96.03	1.27	2.03		2.09		12.64	76.6
	151.0		95.25	2.05	4.76		4.81		49.28	67.6
	156.0		95.15	2.15	3.74		3.78		40.61	67.8
	161.0		95.10	2.20	4.28		4.32		47.55	65.7
	166.0		95.30	2.00	3.95		3.99		33.91	65.6
	169.5		95.05	2.25	3.23		3.26		20.19	65.7
	171.5		95.70	1.60	1.48		1.54		6.29	38.7
	174.6		96.15	1.15	0.58		0.66		2.83	32.7
	179.0		96.70	0.60	0.00		0.00		0.00	81.7
RWE	179.1		97.30	0.00	0.00		0.00		0.00	81.7

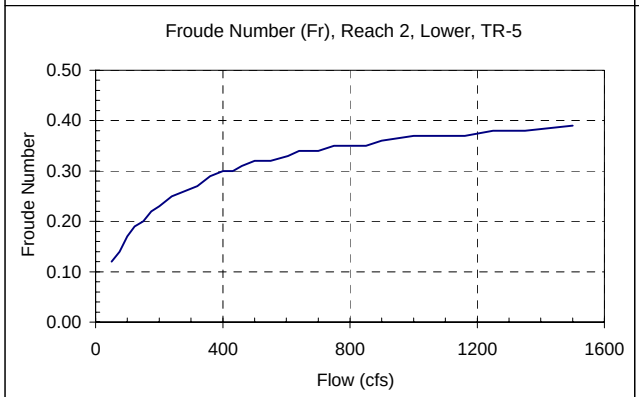


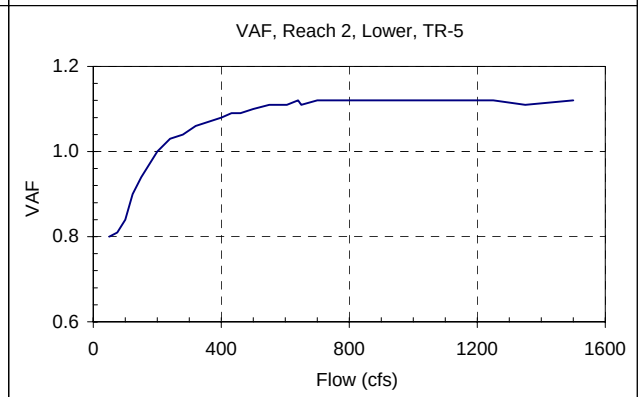
Stream: Sultan R.
Site: Lower Reach 2
Habitat: Wide Riffle
Transect: 5

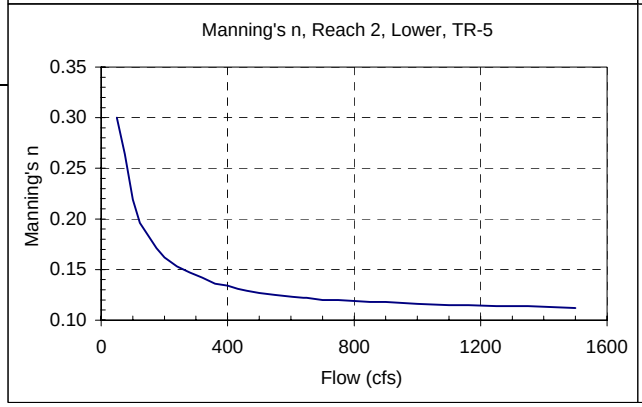
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	96.88	0.12	0.56	0.80	0.300	133.0
75	96.96	0.14	0.69	0.81	0.264	142.2
100	97.03	0.17	0.84	0.84	0.219	152.3
122.8	97.08	0.19	0.97	0.90	0.196	154.6
150	97.15	0.20	1.09	0.94	0.183	156.1
175	97.20	0.22	1.21	0.97	0.171	157.1
200	97.25	0.23	1.31	1.00	0.162	158.1
239.6	97.33	0.25	1.45	1.03	0.153	159.8
280	97.41	0.26	1.58	1.04	0.147	161.4
320	97.48	0.27	1.69	1.06	0.142	162.5
360	97.54	0.29	1.81	1.07	0.136	163.8
400	97.61	0.30	1.91	1.08	0.134	165.6
431.9	97.66	0.30	1.98	1.09	0.131	166.9
460	97.70	0.31	2.05	1.09	0.129	168.0
500	97.76	0.32	2.13	1.10	0.127	169.6
550	97.83	0.32	2.23	1.11	0.125	170.5
605	97.91	0.33	2.33	1.11	0.123	171.1
639.6	97.95	0.34	2.40	1.12	0.122	171.4
650	97.97	0.34	2.41	1.11	0.122	171.6
700	98.03	0.34	2.50	1.12	0.120	172.1
750	98.10	0.35	2.57	1.12	0.120	172.6
800	98.16	0.35	2.65	1.12	0.119	173.1
850	98.22	0.35	2.72	1.12	0.118	173.5
900	98.28	0.36	2.79	1.12	0.118	173.8
1000	98.39	0.37	2.93	1.12	0.116	174.3
1100	98.50	0.37	3.06	1.12	0.115	174.9
1161.7	98.57	0.37	3.13	1.12	0.115	175.2
1250	98.66	0.38	3.23	1.12	0.114	175.6
1350	98.77	0.38	3.32	1.11	0.114	177.3
1500	98.91	0.39	3.48	1.12	0.112	179.8

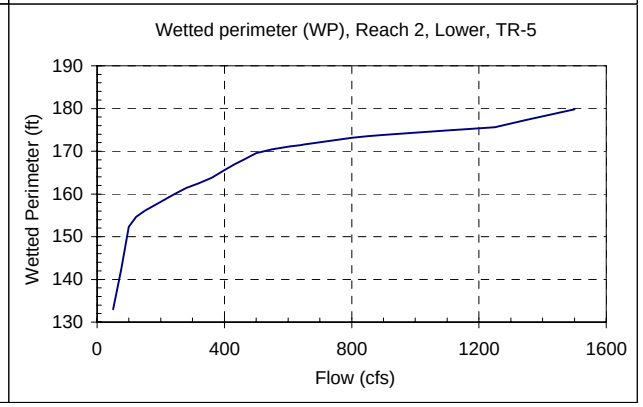


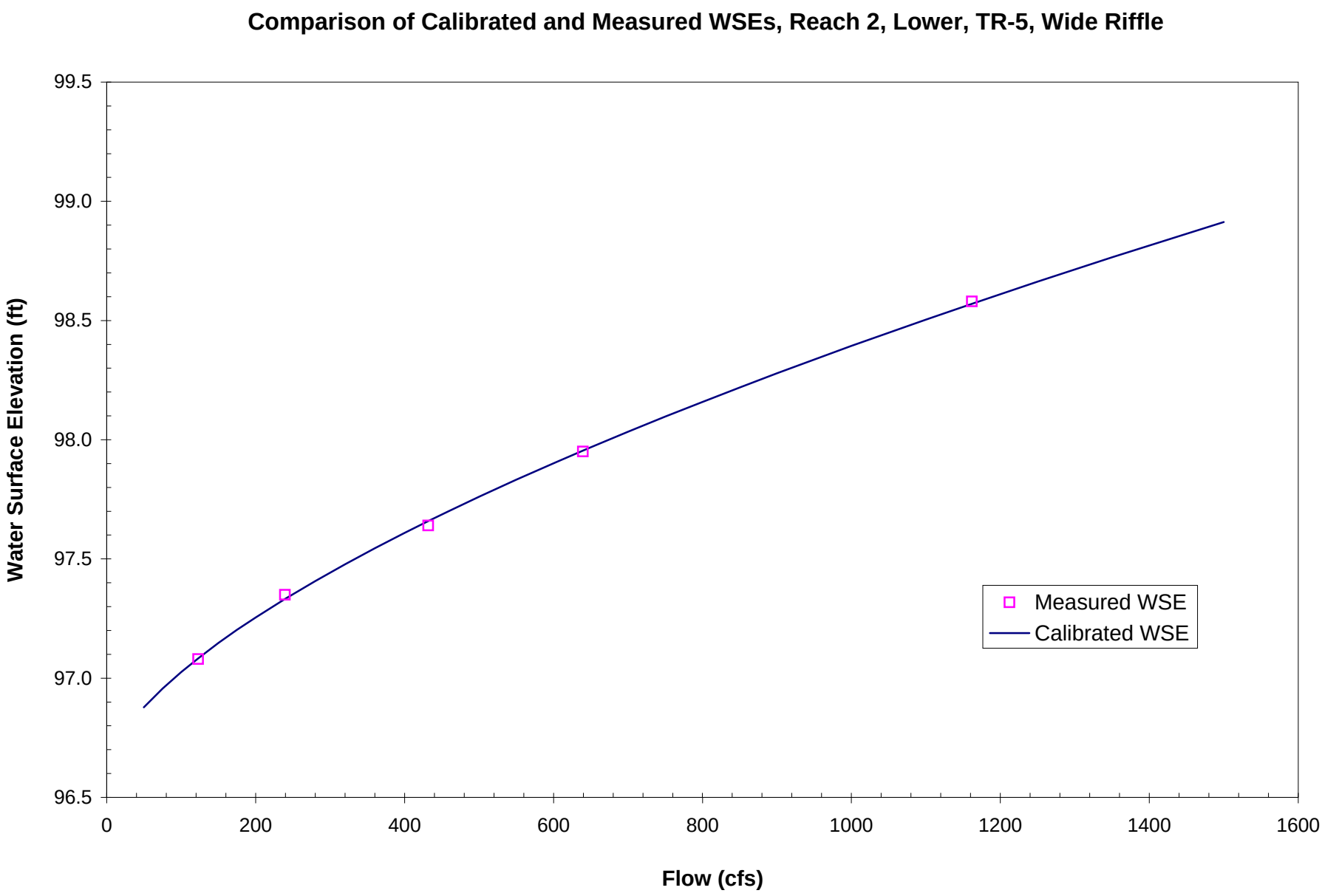











Comparison of Calibrated and Measured WSEs, Reach 2, Lower, TR-5, Wide Riffle
Water Surface Elevation (ft)
99.5
99.0
98.5
98.0
97.5
97.0
96.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Lower Reach 2
Date: 7/11/2007 **Transect:** TR4
Habitat: Pool **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.93	102.93		100.00
HP			4.61	98.32
Rock			3.10	99.83
TP				
Rock	3.29	103.12		
HP			4.80	98.32
BM			3.11	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			103.12	7.38	0.00	95.74	95.74	
RWS				7.38	0.00	95.74		
							Ave Q=	

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	0					95.74
d/s	-90		103.12	7.41	0.00	95.71

WSE slope = 0.033%

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

(4) 7/10/07 Level Loop Survey (BM & HP). Bank Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.86	102.86		100.00
HP1			4.55	98.31
Rock			6.47	96.39
TP				
Rock	6.51	102.90		
HP1			4.58	98.32
BM			2.90	100.01

Comment:

Date: 7/12/2007
Habitat: Pool **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.74	102.74		100.00
HP1			4.42	98.32
HP2			0.98	101.76
TP				
HP2	0.83	102.59		
HP1			4.28	98.31
BM			2.59	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	25	69	102.59	6.36	0.00	96.23	96.24	235.5
RWS	113			6.35	0.00	96.24		
							Ave Q=	235.5

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5B

Date: 7/13/2007
Habitat: Pool **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.72	102.72		100.00
HP2			0.96	101.76
HP1			4.40	98.32
TP				
HP1	4.27	102.59		
HP2			0.82	101.77
BM			2.58	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			102.59	5.89	0.00	96.70	96.71	
RWS				5.87	0.00	96.72		
							Ave Q=	

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 10/19/2007
Habitat: Pool **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.75	102.75		100.00
HP2			0.99	101.76
HP1				
TP				
HP1				
HP2				
BM				

Comment: 1/2 loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			102.75	5.60	0.00	97.15	97.15	
RWS								
							Ave Q=	

Note: Unable to cross LWSE only, measured at 2:50

Date: 10/20/2007
Habitat: Pool **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.76	103.76		100.00
HP2				
HP1			5.45	98.31
TP				
HP1				
HP2				
BM				

Comment: 1/2 loop only

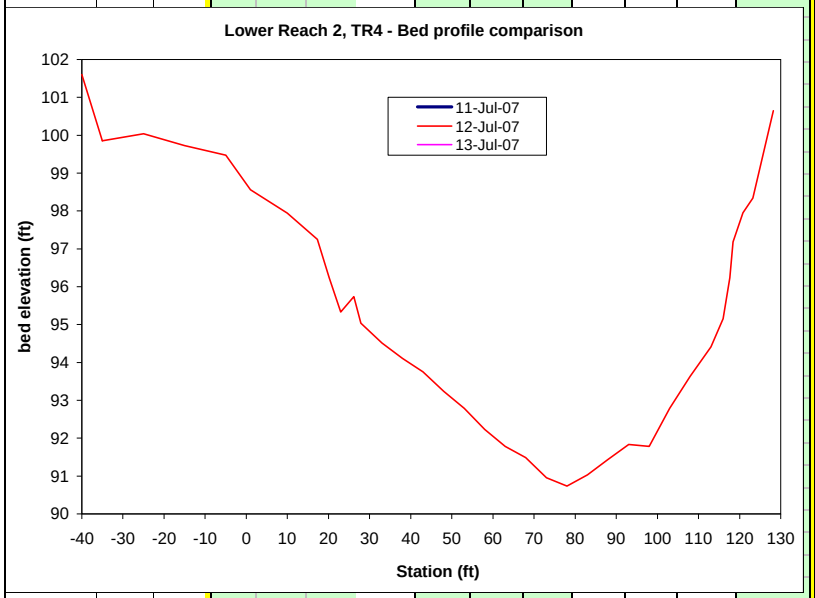
(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			103.76	5.89	0.00	97.87	97.87	
RWS								
							Ave Q=	

Note: Unable to cross LWSE only, measured at 2:10

Stream:	Sultan R.
Site:	Lower Reach 2
Transect:	4
Habitat:	Pool

Survey Date	HI (ft)	Q (cfs)
7/10/2007	102.90	
7/11/2007	103.12	
7/12/2007	102.59	235.5
7/13/2007	102.59	



11-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate

12-Jul-07

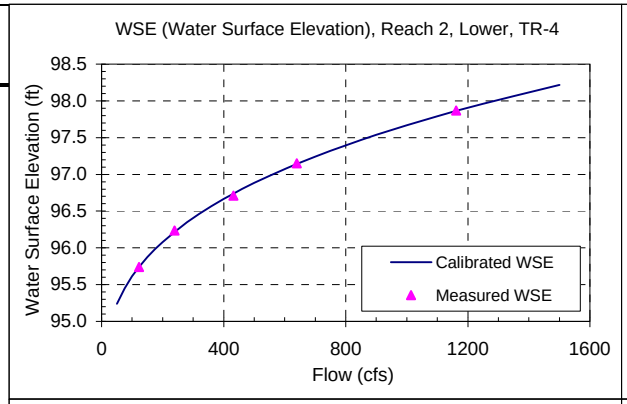
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate
	-40.0	1.30	101.60							21.6
	-35.0	3.05	99.85							21.6
	-25.0	2.86	100.04							21.6
	-15.0	3.17	99.73							26.7
	-5.0	3.43	99.47							87.6
LWP	1.0	4.34	98.56							87.6
	10.0	4.96	97.94							28.7
	17.3	5.65	97.25							28.7
LWE	20.2		96.24	0.00	0.00		0.00		0.00	82.7
	23.0		95.34	0.90	0.21		0.28		0.75	28.7
	26.2		95.74	0.50	0.32		0.38		0.47	28.7
	27.9		95.04	1.20	0.30		0.37		1.49	28.7
	33.0		94.52	1.72	0.61		0.66		5.74	34.7
	38.0		94.11	2.13	0.97		1.02		10.87	24.7
	43.0		93.76	2.48	1.05		1.10		13.60	52.8
	48.0		93.24	3.00	1.33	1.04	1.23		18.40	52.8
	53.0		92.79	3.45	1.86	1.62	1.77		30.58	56.8
	58.0		92.24	4.00	1.86	1.76	1.84		36.83	65.6
	63.0		91.79	4.45	2.11	1.45	1.81		40.27	65.6
	68.0		91.49	4.75	1.76	1.12	1.48		35.09	65.6
	73.0		90.96	5.28	1.39	1.00	1.24		32.67	65.6
	78.0		90.74	5.50	0.72	0.38	0.60		16.60	65.6
	83.0		91.04	5.20	0.26	0.38	0.38		9.89	65.6
	88.0		91.44	4.80	0.17	0.07	0.20		4.76	65.6
	93.0		91.84	4.40	0.11	0.06	0.16		3.57	67.7
	98.0		91.79	4.45	-0.30	-0.08	-0.26		-5.85	78.7
	103.0		92.79	3.45	-0.29	-0.53	-0.47		-8.07	12.9
	108.0		93.64	2.60	-0.50		-0.55		-7.17	18.8
	113.0		94.42	1.82	-0.59		-0.64		-4.66	18.6
	116.0		95.16	1.08	-0.05		-0.14		-0.34	18.6
RWE	117.6		96.24	0.00	0.00		0.00		0.00	72.7
	118.4	5.72	97.18							12.6
	120.8	4.95	97.95							12.6
RWP	123.2	4.56	98.34							12.6
	128.2	2.25	100.65							12.6

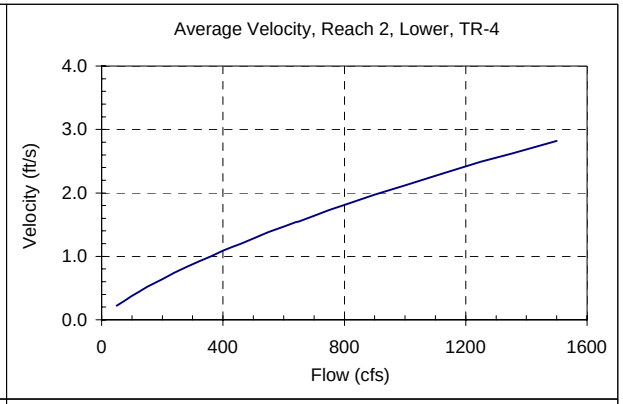
13-Jul-07

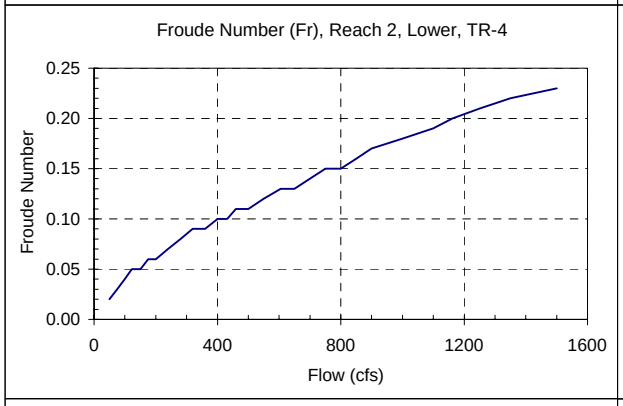
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate

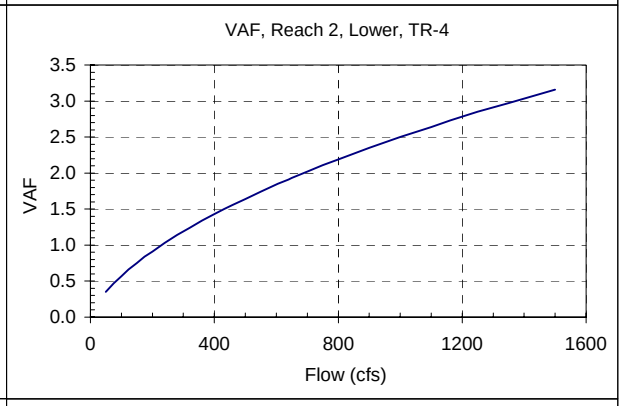
Stream: Sultan R.
Site: Lower Reach 2
Habitat: Pool
Transect: 4
Calibration Flow: Mid

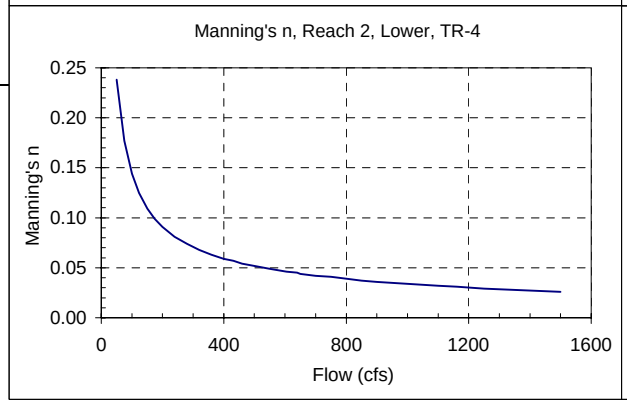
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	95.24	0.02	0.22	0.35	0.238	89.3
75	95.45	0.03	0.30	0.47	0.177	91.5
100	95.61	0.04	0.38	0.57	0.144	94.1
122.8	95.74	0.05	0.44	0.66	0.125	96.1
150	95.87	0.05	0.52	0.75	0.109	96.8
175	95.98	0.06	0.58	0.84	0.099	97.3
200	96.08	0.06	0.64	0.91	0.091	97.8
239.6	96.22	0.07	0.74	1.03	0.081	98.5
280	96.35	0.08	0.83	1.14	0.074	99.1
320	96.46	0.09	0.92	1.24	0.068	99.6
360	96.57	0.09	1.00	1.34	0.063	100.0
400	96.67	0.10	1.09	1.43	0.059	100.5
431.9	96.74	0.10	1.15	1.50	0.057	100.8
460	96.80	0.11	1.20	1.56	0.054	101.1
500	96.88	0.11	1.28	1.64	0.052	101.4
550	96.98	0.12	1.38	1.74	0.049	101.8
605	97.08	0.13	1.48	1.85	0.046	102.3
639.6	97.14	0.13	1.54	1.91	0.045	102.5
650	97.16	0.13	1.55	1.93	0.044	102.6
700	97.24	0.14	1.64	2.02	0.042	103.1
750	97.32	0.15	1.73	2.11	0.041	104.2
800	97.40	0.15	1.81	2.19	0.039	105.3
850	97.47	0.16	1.89	2.27	0.037	106.3
900	97.54	0.17	1.97	2.35	0.036	107.2
1000	97.67	0.18	2.12	2.50	0.034	109.1
1100	97.79	0.19	2.27	2.64	0.032	110.8
1161.7	97.86	0.20	2.36	2.73	0.031	111.8
1250	97.96	0.21	2.49	2.85	0.029	113.3
1350	98.07	0.22	2.62	2.97	0.028	115.5
1500	98.22	0.23	2.82	3.16	0.026	118.6

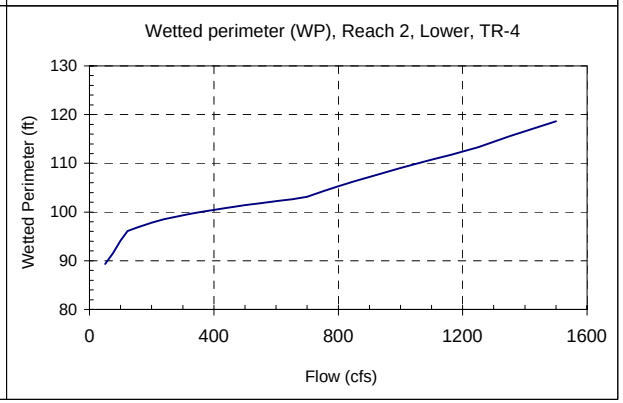


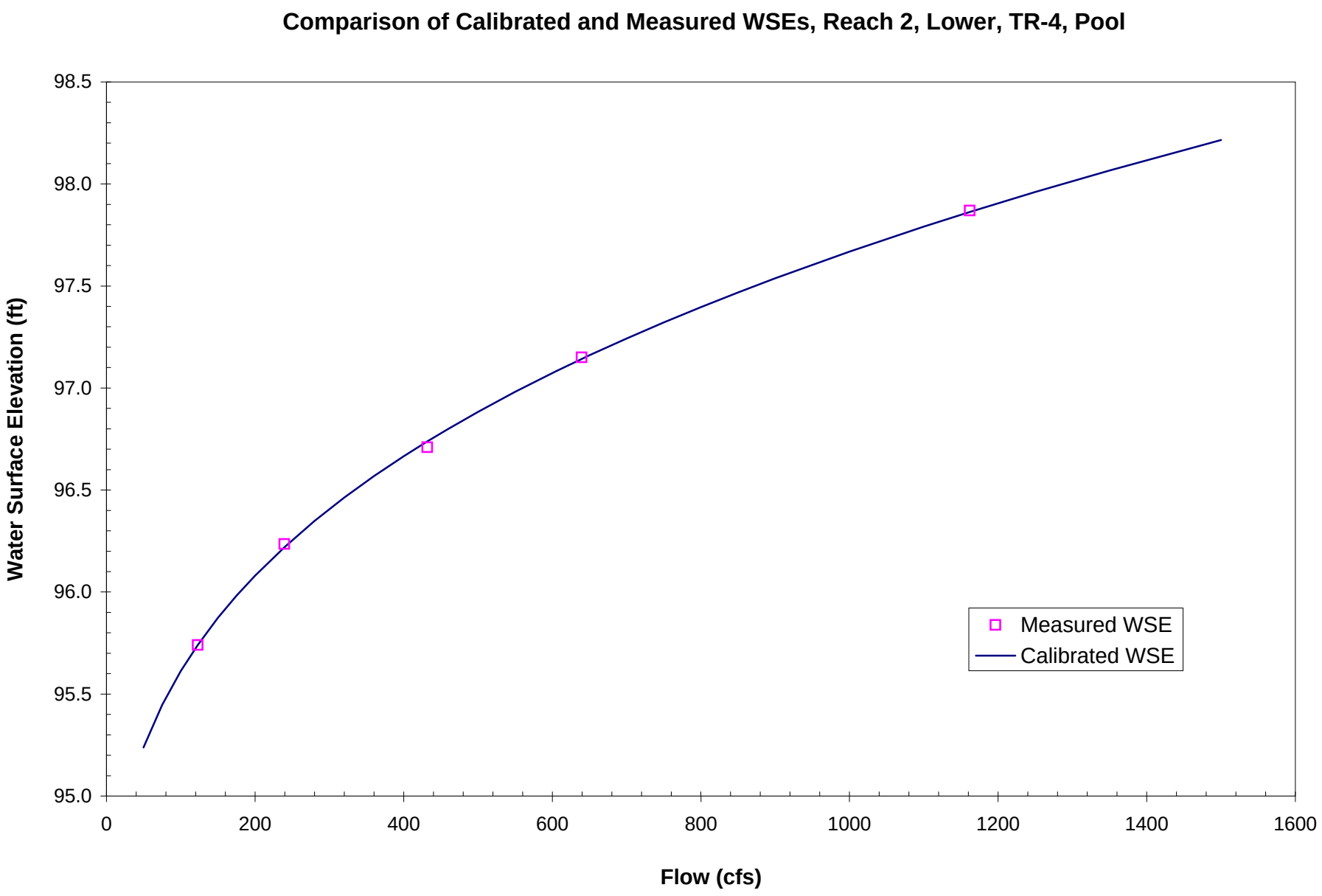











Comparison of Calibrated and Measured WSEs, Reach 2, Lower, TR-4, Pool
Water Surface Elevation (ft)
98.5
98.0
97.5
97.0
96.5
96.0
95.5
95.0
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Lower Reach 2

Date: 7/11/2007 **Transect:** 3
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.17	101.17		100.00
HP1			1.85	99.32
HP2			1.79	99.38
TP				
HP2	1.99	101.37		
HP1			2.05	99.32
BM			1.37	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	26		101.37	6.28	0.00	95.09	95.09	
MWS	63			6.29	0.00	95.08		138.0
RWS	99			6.28	0.00	95.09		

Ave Q= 138.0

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	0					95.09
d/s	-60		101.37	6.57	0.00	94.80

WSE slope = 0.478%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

(4) 7/10/07 Level Loop Survey (BM & HP). Bank Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.13	103.13		100.00
HP1			2.81	100.32
HP2			3.75	99.38
TP				
HP2	3.61	102.99		
HP1			3.68	99.31
BM			2.99	100.00

Comment:

Date: 7/12/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.57	101.57		100.00
HP1			2.25	99.32
HP2			2.20	99.37
TP				
HP2	2.09	101.46		
HP1			2.15	99.31
BM			1.46	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	19		101.46	5.96	0.00	95.50	95.53	
MWS	70.8			5.92	0.00	95.54		251.1
RWS	114			5.91	0.00	95.55		

Ave Q= 251.1

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 7/13/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.37	100.37		100.00
HP1			1.05	99.32
HP2			1.00	99.37
TP				
HP2	1.80	101.17		
HP1			1.85	99.32
BM			1.17	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	17		101.17	5.25	0.00	95.92	95.98	
MWS	70			5.15	0.00	96.02		445.7
RWS	120			5.16	0.00	96.01		

Ave Q= 445.7

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 10/19/2007
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.13	102.13		100.00
HP1			2.82	99.31
HP2				
TP				
HP2				
HP1				
BM				

Comment: 1/2 loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			102.13	5.78	0.00	96.35	96.35	
RWS								

Ave Q=

Note: Unable to cross LWSE only, measured at 3:10

Date: 10/20/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.72	103.72		100.00
HP1			4.41	99.31
HP2				
TP				
HP2				
HP1				
BM				

Comment: 1/2 loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			103.72	6.66	0.00	97.06	97.06	
RWS								

Ave Q=

Note: Unable to cross LWSE only, measured at 2:15

Stream: Sultan R.
Site: Lower Reach 2
Transect: 3
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/10/2007	102.99	
7/11/2007	101.37	138.0
7/12/2007	101.46	251.1
7/13/2007	101.17	445.7

11-Jul-07

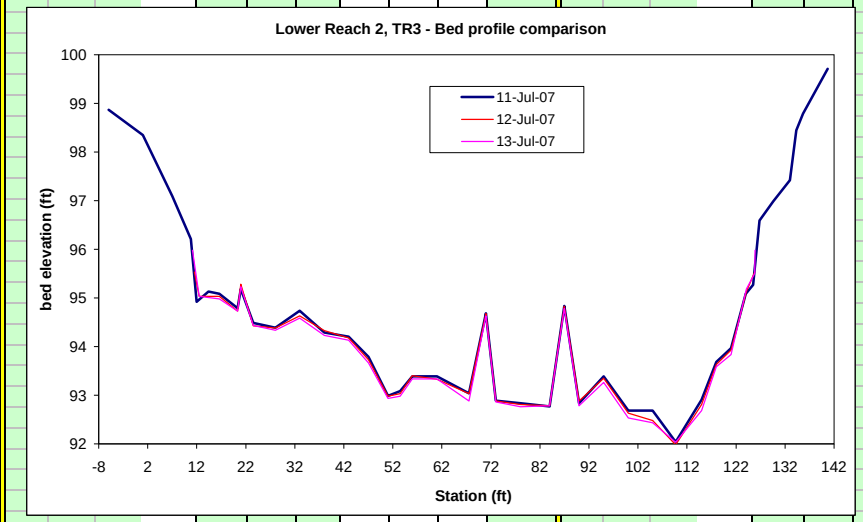
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate
	-6.0	4.12	98.87							54.6
LWP	1.0	4.64	98.35							54.6
	7.0	5.90	97.09							56.6
	10.8	6.78	96.21							12.6
	12.0	8.07	94.92							24.6
	14.4	7.86	95.13							34.6
LWE	16.6		95.09	0.00	0.00		0.00		0.00	43.7
	20.3		94.79	0.30	1.72		1.78		0.99	45.6
	21.0		95.19	-0.10						84.8
	23.5		94.49	0.60	2.34		2.40		3.24	45.7
	28.0		94.39	0.70	2.09		2.15		7.16	54.6
	33.0		94.74	0.35	2.78		2.82		4.94	54.8
	38.0		94.29	0.80	1.32		1.38		5.51	56.8
	43.0		94.21	0.88	2.26		2.32	10.0	9.05	56.7
	47.0		93.79	1.30	2.17		2.23	10.0	11.43	56.8
	51.0		92.99	2.10	1.44		1.50		10.24	65.6
	53.5		93.09	2.00	1.07		1.12		5.61	56.8
	56.0		93.39	1.70	2.02		2.09		13.29	68.7
	61.0		93.39	1.70	1.21		1.27		12.37	56.7
	67.5		93.04	2.05	1.39		1.45		14.86	65.7
	71.0		94.69	0.40	0.34		0.42		0.47	86.9
	73.0		92.89	2.20	0.46		0.54		4.17	87.7
	78.0		92.84	2.25	0.32		0.40		4.99	78.6
	84.0		92.77	2.32	0.75		0.81		8.43	68.7
	87.0		94.84	0.25	0.52		0.60		0.45	86.9
	90.0		92.84	2.25	0.68		0.74		6.70	68.6
	95.0		93.39	1.70	0.61		0.68		5.80	86.7
	100.0		92.69	2.40	0.10		0.19		2.23	87.8
	105.0		92.69	2.40	0.19		0.27		3.16	87.8
	109.7		92.04	3.05	0.05		0.11		1.72	87.8
	115.0		92.91	2.18	0.05		0.11		1.02	87.8
	118.0		93.69	1.40	0.01		0.02		0.09	86.9
	121.0		93.97	1.12	0.01		0.02		0.08	87.7
RWE	124.0		95.09	0.00	0.00		0.00		0.00	87.7
	125.5	7.72	95.27							81.8
	126.8	6.40	96.59							81.8
	129.6	6.00	96.99							81.8
	133.0	5.57	97.42							81.8
	134.3	4.54	98.45							81.8
RWP	135.7	4.20	98.79							81.8
	140.7	3.28	99.71							81.8

12-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate
LWE	11.5		95.53	0.00	0.00		0.00		0.00	24.6
	12.5		95.03	0.50	0.01		0.02		0.03	24.6
	16.6		95.03	0.50	2.08		2.14		4.18	43.7
	20.3		94.73	0.80	2.19		2.25		3.96	45.6
	21.0		95.28	0.25	2.41		2.47		0.99	84.8
	23.5		94.43	1.10	2.30		2.36	10	8.94	45.7
	28.0		94.38	1.15	2.38		2.44	10	13.11	54.6
	33.0		94.63	0.90	2.82		2.86	10	12.69	54.8
	38.0		94.33	1.20	2.05		2.11	10	12.49	56.8
	43.0		94.18	1.35	2.72		2.77	10	16.55	56.7
	47.0		93.73	1.80	2.36		2.42	10	17.14	56.8
	51.0		92.98	2.55	2.28	1.77	2.09	20	16.26	65.6
	53.5		93.03	2.50	2.74	1.76	2.31	20	13.54	56.8
	56.0		93.40	2.13	2.43		2.48	20	18.65	68.7
	61.0		93.33	2.20	1.60		1.66	20	19.77	56.7
	67.5		93.03	2.50	2.17	1.63	1.96	20	23.06	65.7
	71.0		94.68	0.85	0.76		0.82	20	1.80	86.9
	73.0		92.88	2.65	0.55	0.18	0.44		4.12	87.7
	78.0		92.81	2.72	0.17	0.34	0.34		5.04	78.6
	84.0		92.78	2.75	1.83	0.52	1.25		15.44	68.7
	87.0		94.83	0.70	1.61		1.67		3.51	86.9
	90.0		92.88	2.65	0.95	0.85	0.95		10.10	68.6
	95.0		93.35	2.18	1.24		1.30		14.13	86.7
	100.0		92.63	2.90	0.93	0.05	0.55		7.94	87.8
	105.0		92.48	3.05	0.22	0.24	0.31		4.66	87.8
	109.7		91.98	3.55	0.05	0.05	0.11		2.01	87.8
	115.0		92.81	2.72	0.03	0.03	0.07		0.77	87.8
	118.0		93.63	1.90	0.01		0.02		0.13	86.9
	121.0		93.93	1.60	0.01		0.02		0.11	87.7
	124.1		95.13	0.40	0.01		0.02		0.02	87.7
RWE	125.8		95.53	0.00	0.00		0.00		0.00	81.8

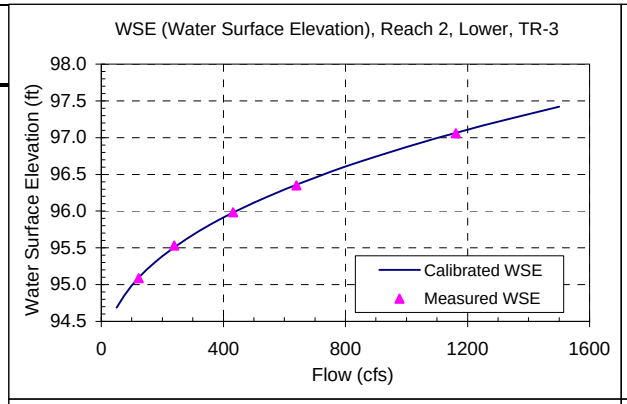
13-Jul-07

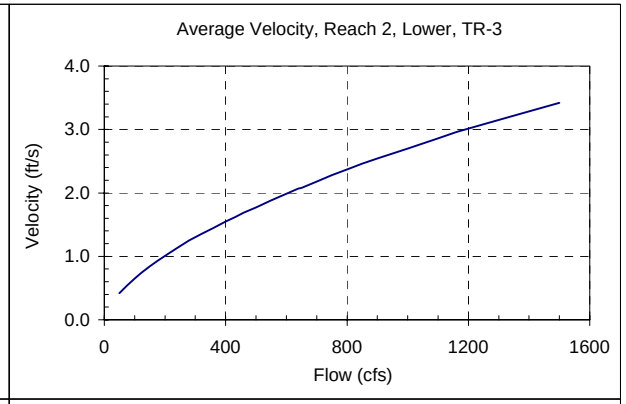
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	substrate
LWE	11.1		95.98	0.00	0.00		0.00		0.00	12.6
	12.5		95.03	0.95	0.69		0.76		1.97	24.6
	16.6		94.98	1.00	2.28		2.34		9.12	43.7
	20.3		94.73	1.25	2.62		2.67		7.34	45.6
	21.0		95.23	0.75	3.09		3.12		3.75	84.8
	23.5		94.43	1.55	2.49		2.54	10	13.58	45.7
	28.0		94.33	1.65	2.56		2.61	10	20.15	54.6
	33.0		94.58	1.40	3.68		3.72	10	25.62	54.8
	38.0		94.23	1.75	2.57		2.62	10	22.58	56.8
	43.0		94.13	1.85	3.27		3.30		27.49	56.7
	47.0		93.66	2.32	3.07		3.10		28.80	56.8
	51.0		92.93	3.05	3.04	1.64	2.39		23.69	65.6
	53.5		92.98	3.00	2.95	1.82	2.44		18.28	56.8
	56.0		93.33	2.65	3.40	2.53	3.01		29.89	68.7
	61.0		93.33	2.65	2.88	1.92	2.45		37.39	56.7
	67.5		92.88	3.10	2.86	1.87	2.42		37.50	65.7
	71.0		94.63	1.35	1.48		1.54		5.72	86.9
	73.0		92.86	3.12	1.03	0.87	1.00		10.94	87.7
	78.0		92.76	3.22	1.14	0.90	1.07		19.01	78.6
	84.0		92.78	3.20	2.49	0.72	1.66		23.92	68.7
	87.0		94.78	1.20	1.48		1.54		5.55	86.9
	90.0		92.78	3.20	1.38	0.93	1.21		15.50	68.6
	95.0		93.26	2.72	1.92	1.22	1.63		22.18	86.7
	100.0		92.53	3.45	1.52	0.13	0.90		15.53	87.8
	105.0		92.43	3.55	0.83	0.74	0.84		14.48	87.8
	109.7		92.03	3.95	0.11	0.25	0.26		5.23	87.8
	115.0		92.68	3.30	0.01	0.00	0.01		0.15	87.8
	118.0		93.58	2.40	0.01		0.02		0.16	86.9
	121.0		93.83	2.15	0.01		0.02		0.15	87.7
	124.1		95.18	0.80	0.01		0.02		0.04	87.7
	125.8		95.50	0.48	0.01		0.02		0.01	81.8
RWE	125.9		95.98	0.00	0.00		0.00		0.00	81.8

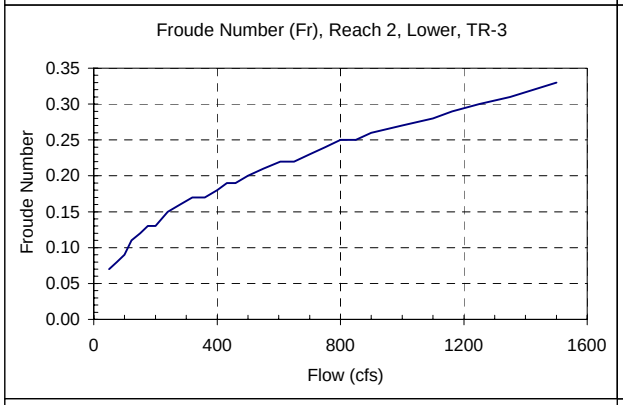


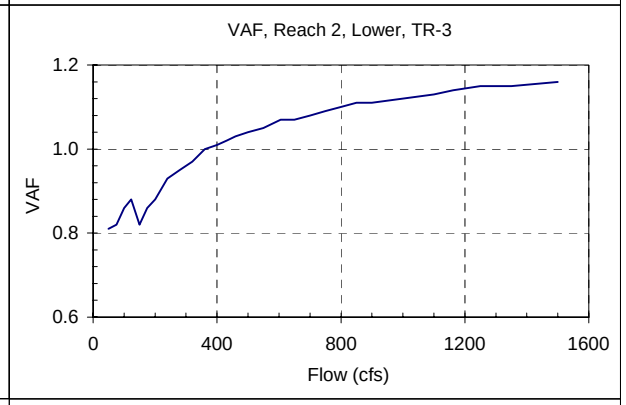
Stream: Sultan R.
Site: Lower Reach 2
Habitat: Riffle
Transect: 3

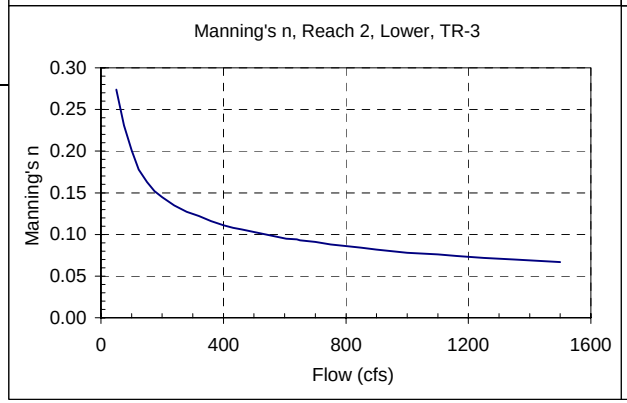
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	94.69	0.07	0.42	0.81	0.274	99.3
75	94.85	0.08	0.54	0.82	0.231	105.0
100	94.99	0.09	0.65	0.86	0.201	107.9
122.8	95.10	0.11	0.74	0.88	0.178	114.4
150	95.21	0.12	0.84	0.82	0.163	116.0
175	95.30	0.13	0.93	0.86	0.152	116.7
200	95.39	0.13	1.01	0.88	0.145	117.0
239.6	95.51	0.15	1.13	0.93	0.135	117.3
280	95.62	0.16	1.25	0.95	0.127	117.7
320	95.73	0.17	1.35	0.97	0.122	118.0
360	95.82	0.17	1.45	1.00	0.116	118.3
400	95.91	0.18	1.55	1.01	0.111	118.5
431.9	95.98	0.19	1.62	1.02	0.108	118.7
460	96.04	0.19	1.69	1.03	0.106	118.9
500	96.12	0.20	1.77	1.04	0.103	119.2
550	96.21	0.21	1.88	1.05	0.099	119.5
605	96.30	0.22	2.00	1.07	0.095	120.1
639.6	96.36	0.22	2.07	1.07	0.094	120.4
650	96.38	0.22	2.08	1.07	0.093	120.6
700	96.46	0.23	2.18	1.08	0.091	121.1
750	96.53	0.24	2.28	1.09	0.088	121.5
800	96.60	0.25	2.37	1.10	0.086	122.0
850	96.67	0.25	2.46	1.11	0.084	122.8
900	96.74	0.26	2.54	1.11	0.082	123.6
1000	96.87	0.27	2.70	1.12	0.078	125.1
1100	96.99	0.28	2.86	1.13	0.076	126.5
1161.7	97.06	0.29	2.96	1.14	0.074	127.3
1250	97.16	0.30	3.08	1.15	0.072	128.6
1350	97.27	0.31	3.22	1.15	0.070	130.0
1500	97.42	0.33	3.42	1.16	0.067	131.9

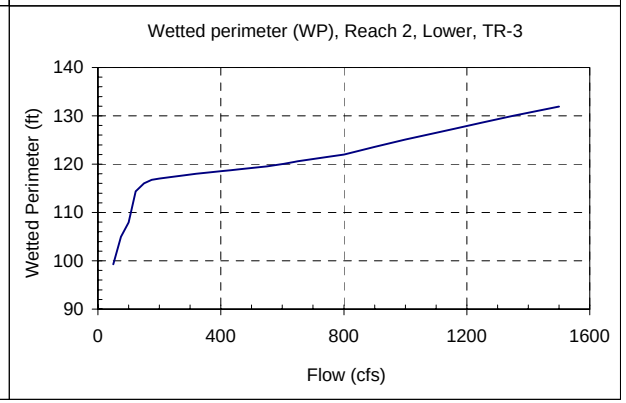


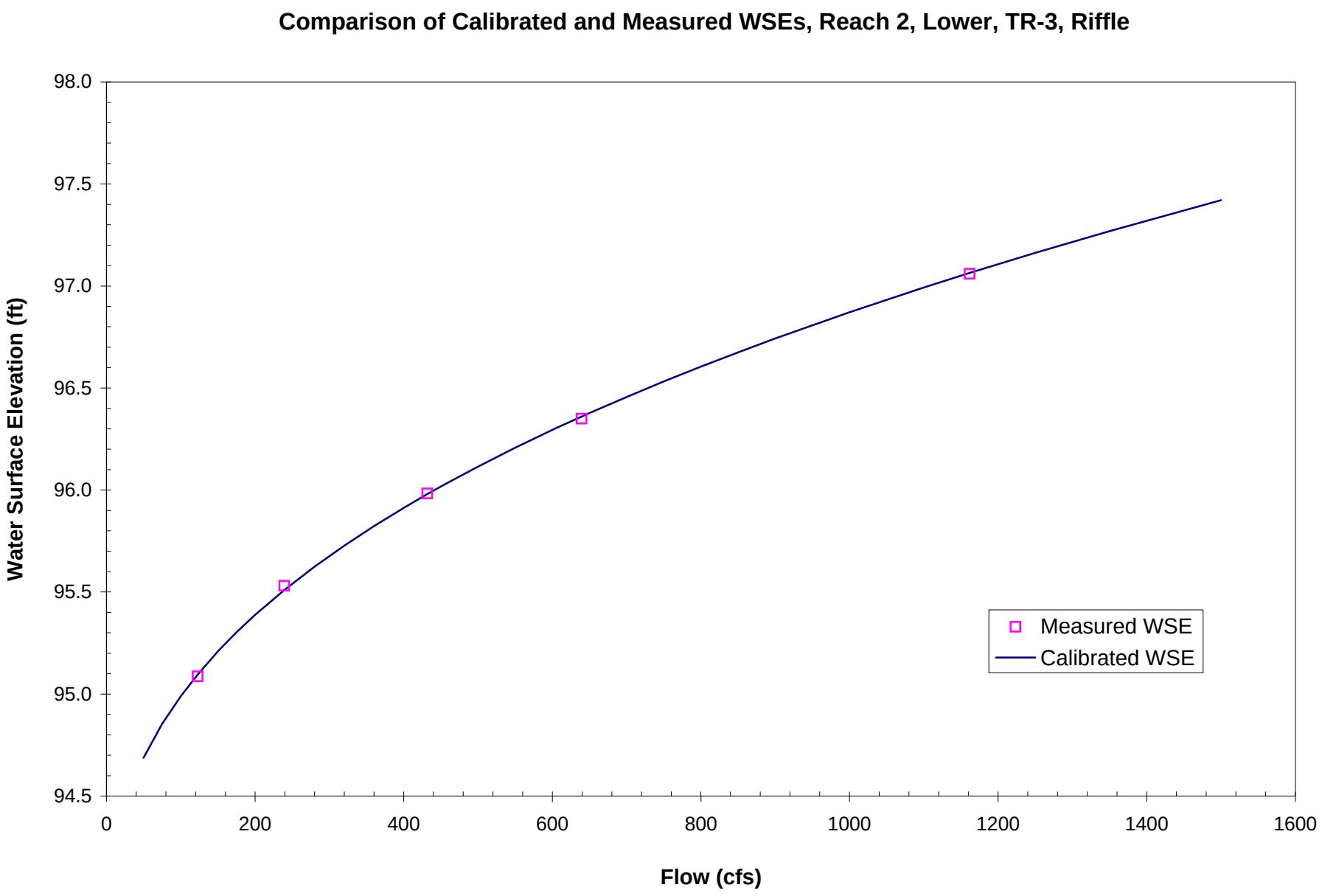











Comparison of Calibrated and Measured WSEs, Reach 2, Lower, TR-3, Riffle
Water Surface Elevation (ft)
98.0
97.5
97.0
96.5
96.0
95.5
95.0
94.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Lower Reach 2

Date: 7/11/2007 **Transect:** 2
Habitat: Cascade **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.12	102.12		100.00
HP1			2.32	99.80
HP2			1.40	100.72
TP				
HP2	1.58	102.30		
HP1			2.51	99.79
BM			2.30	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	32		102.30	5.93	0.00	96.37	96.48	
	75			5.81	0.00	96.49		114.7
	100			5.71	0.00	96.59		
	135			5.44	0.00	**96.86**		
							Ave Q=	114.7

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	105		102.30	6.98	1.64	96.96
d/s	-50		102.30	8.19	1.36	95.47

WSE slope = 0.961%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

(4) 7/10/07 Level Loop Survey (BM & HP). Bank Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.97	101.97		100.00
HP1			2.18	99.79
HP2			1.24	100.73
TP				
HP2	1.06	101.79		
HP1			2.02	99.77
BM			1.80	99.99

Comment:

Date: 7/12/2007
Habitat: Cascade **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.92	101.92		100.00
HP1			2.13	99.79
HP2			1.19	100.73
TP				
HP3	1.13	101.86		
HP1			2.08	99.78
BM			1.86	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
	21		101.86	5.07	0.00	96.79	96.90	
	51			4.87	0.00	96.99		
	80			4.94	0.00	96.92		257.8
	119			4.57	0.00	**97.29**		
	148			4.54	0.00	**97.32**		
							Ave Q=	257.8

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	0					96.90
d/s	-50		101.86	7.68	1.69	95.87

WSE slope = 2.060%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 7/13/2007
Habitat: Cascade **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.94	101.94		100.00
HP1			2.15	99.79
HP2			1.21	100.73

Comment: 1/2 loop OK. Relative elev same.

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	19		101.94	4.71		97.23	97.34	
MWS	54			4.49		97.45		
	78			4.62		97.32		433.7
	100			4.57		97.37		
	125			4.28		**97.66**		
	150			4.10		**97.84**		
							Ave Q=	433.7

Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 10/19/2007
Habitat: Cascade **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM				
HP1				
HP2				

NEED 1/2 LEVEL LOOP DATA

Comment: No level loop shot

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			102.98	5.21	0.00	97.77	97.77	
MWS								
							Ave Q=	

Note: Unable to cross LWSE only, measured at 3:30

Date: 10/20/2007
Habitat: Cascade **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM				
HP1				
HP2				

Comment: No level loop shot

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			103.54	5.25		98.29	98.29	
							Ave Q=	

Note: Unable to cross LWSE only, measured at 2:30

Stream:	Sultan R.	
Site:	Lower Reach 2	
Transect:	2	
Habitat:	Cascade	
Survey Date	HI (ft)	Q (cfs)
7/10/2007	101.79	
7/11/2007	102.30	114.7
7/12/2007	101.86	257.8
7/13/2007	101.94	433.7

11-Jul-07

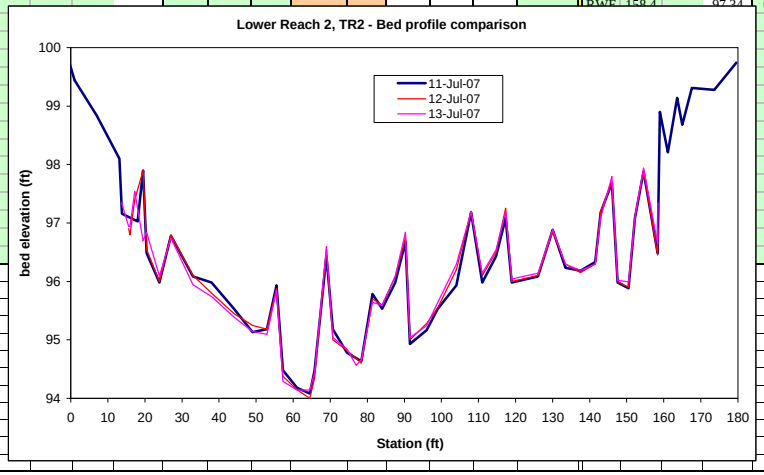
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-6.0	0.86	100.93									21.7
LWP	1.0	2.35	99.44									21.7
	7.0	2.95	98.84									21.7
	13.1	3.69	98.10									21.7
	13.8	4.63	97.16									45.6
	18.0	4.76	97.03									85.6
	19.5		97.90									85.6
LWE	20.5		96.48	0.00	0.00		0.00		0.00		0.00	56.7
	23.9		95.98	0.50	0.08		0.16		0.16		0.14	65.8
	27.0		96.78	-0.30								76.7
	33.0		96.08	0.40	0.62		0.69		0.69		0.69	67.7
	38.0		95.98	0.50	0.68		0.74		0.74		2.05	67.8
	44.0		95.53	0.95	1.09		1.14		1.14		5.97	76.8
	49.0		95.13	1.35	2.49		2.54		2.54		15.28	76.7
	52.9		95.18	1.30	1.39		1.45		1.45		6.12	76.7
	55.5		95.93	0.55	4.04		4.08		4.08		4.83	87.8
	57.2		94.48	2.00	3.38		3.41		3.41		18.78	86.8
	61.0		94.18	2.30	1.97		2.04		2.04		17.09	86.6
	64.5		94.08	2.40	1.34		1.40		1.40		8.06	87.8
	65.8		94.48	2.00	1.58		1.64		1.64		7.39	87.8
	69.0		96.43	0.05	0.50		0.58		0.58		0.07	87.9
	70.7		95.18	1.30	2.25		2.31		2.31		8.26	87.7
	74.5		94.78	1.70	-0.30		-0.38		-0.38		-2.51	87.6
	78.4		94.63	1.85	1.82		1.89		1.89		12.04	78.7
	81.4		95.78	0.70	0.05		0.11		0.11		0.22	87.8
	84.0		95.53	0.95	1.81		1.88		1.88		5.44	87.7
	87.5		95.98	0.50	1.10		1.15		1.15	45	0.71	78.7
	90.3		96.68	-0.20								87.8
	91.5		94.93	1.55	0.04		0.09		0.09		0.32	87.8
	96.0		95.16	1.32	0.47		0.55		0.55		2.72	76.7
	99.0		95.53	0.95	0.06		0.14		0.14		0.52	87.8
	104.0		95.93	0.55	0.01		0.02		0.02		0.03	87.9
	108.0		97.18	-0.70								87.9
	111.0		95.98	0.50	0.10		0.19		0.19		0.17	87.8
	114.7		96.43	0.05	0.10		0.19		0.19		0.02	87.8
	117.3		97.08	-0.60								87.8
	119.0		95.98	0.50	0.01		0.02		0.02		0.04	87.8
	126.0		96.08	0.40	0.05		0.11		0.11		0.16	87.8
	130.0		96.88	-0.40								87.8
	133.5		96.23	0.25	0.05		0.11		0.11		0.06	87.8
	137.5		96.18	0.30	0.01		0.02		0.02		0.03	87.8
	141.5		96.33	0.15	0.01		0.02		0.02		0.01	87.8
	143.0		97.18	-0.70								87.8
	146.0		97.68	-1.20								87.8
	147.5		95.98	0.50	0.01		0.02		0.02		0.02	87.8
	150.5		95.88	0.60	0.01		0.02		0.02		0.02	87.8
	152.2		97.08	-0.60								87.8
	154.5		97.88	-1.40								87.8
RWE	158.3		96.48	0.00	0.00		0.00		0.00		0.00	87.8
	158.9	2.89	98.90									81.7
	161.1	3.58	98.21									18.6
	163.6	2.65	99.14									18.7
	165.0	3.11	98.68									18.9
RWP	167.6	2.48	99.31									18.9
	173.6	2.51	99.28									18.9
	179.6	2.05	99.74									18.9

12-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	15.6		96.90	0.00	0.00		0.00		0.00		0.00	45.6
	16.0		96.80	0.10	1.46		1.52		1.52		0.03	85.6
	17.3		97.40	-0.50								85.6
	19.5		97.90	-1.00								85.6
	20.5		96.55	0.35	0.39		0.48		0.48		0.28	56.7
	23.9		96.00	0.90	0.84		0.89		0.89		2.61	65.8
	27.0		96.80	0.10	0.10		0.19		0.19		0.08	76.7
	33.0		96.10	0.80	1.67		1.73		1.73		7.63	67.7
	38.0		95.80	1.10	3.07		3.10		3.10		18.78	67.8
	44.0		95.45	1.45	2.63		2.68		2.68		21.36	76.8
	49.0		95.25	1.65	3.43		3.46		3.46		25.44	76.7
	52.9		95.18	1.72	2.28		2.34		2.34		13.08	76.7
	55.5		95.88	1.02	4.72		4.77		4.77		10.45	87.8
	57.2		94.38	2.52	5.50	2.96	5.56	3.00	4.28		29.64	86.8
	61.0		94.15	2.75	4.67	1.39	4.72	1.45	3.08		30.95	86.6
	64.5		94.00	2.90	2.94	0.52	2.98	0.60	1.79		12.45	87.8
	65.8		94.35	2.55	1.34	0.41	1.40	0.50	0.95		5.43	87.8
	69.0		96.55	0.35	3.34		3.37		3.37		2.89	87.9
	70.7		95.00	1.90	3.80		3.84		3.84		20.05	87.7
	74.5		94.82	2.08	-0.10		-0.19		-0.19		-1.49	87.6
	78.4		94.60	2.30	2.01		2.08		2.08		16.47	78.7
	81.4		95.70	1.20	2.20		2.26		2.26		7.60	87.8
	84.0		95.60	1.30	2.93		2.97		2.97		11.77	87.7
	87.5		96.08	0.82	0.41		0.50		0.50	75	0.33	78.7
	90.3		96.75	0.15	0.56		0.64		0.64	75	0.05	87.8
	91.5		95.00	1.90	1.29		1.35		1.35		7.30	87.8
	96.0		95.28	1.62	1.04		1.09		1.09		6.63	76.7
	99.0		95.55	1.35	0.36		0.44		0.44		2.40	87.8
	104.0		96.20	0.70	0.01		0.02		0.02		0.04	87.9
	108.0		97.20	-0.30								87.9
	111.0		96.10	0.80	0.38		0.47		0.47	75	0.18	87.8
	114.7		96.50	0.40	0.16		0.24		0.24	75	0.05	87.8
	117.3		97.25	-0.35								87.8
	119.0		96.00	0.90	0.03		0.07		0.07		0.21	87.8
	126.0		96.10	0.80	0.29		0.37		0.37		1.65	87.8
	130.0		96.85	0.05	0.42		0.50		0.50		0.09	87.8
	133.5		96.30	0.60	0.57		0.65		0.65		1.45	87.8
	137.5		96.15	0.75	0.79		0.85		0.85	60	1.27	87.8
	141.5		96.30	0.60	0.07		0.16		0.16		0.19	87.8
	143.0		97.20	-0.30								87.8
	146.0		97.70	-0.80								87.8
	147.5		96.00	0.90	0.05		0.11		0.11		0.15	87.8
	150.5		95.90	1.00	0.11		0.20		0.20		0.30	87.8
	152.2		97.10	-0.20								87.8
	154.5		97.90	-1.00								87.8
	158.3		96.45	0.45	0.00		0.00		0.00		0.00	87.8
RWE	158.4		96.90	0.00	0.00		0.00		0.00		0.00	87.8

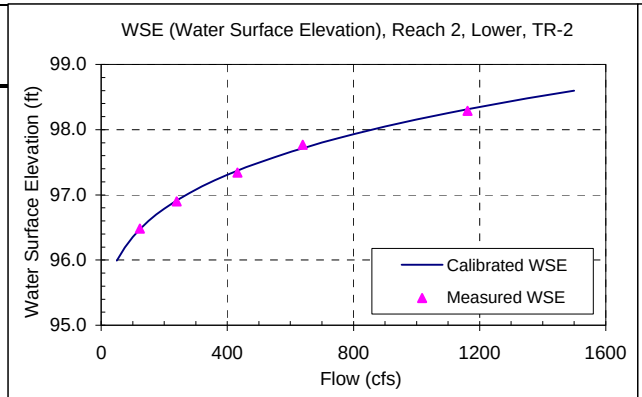
13-Jul-07

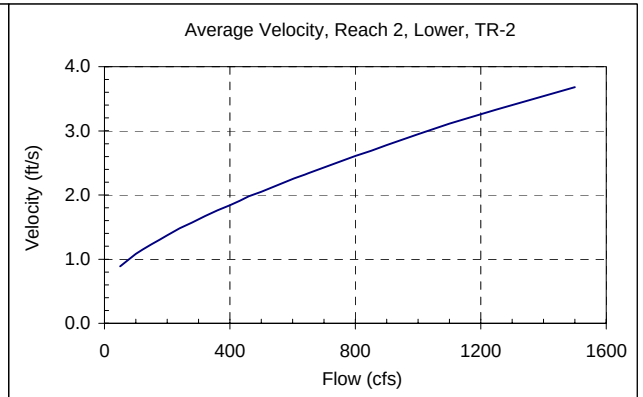
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	13.7		97.34	0.00	0.00		0.00		0.00		0.00	21.7
	15.6		96.94	0.40	2.84		2.88		2.88		1.33	45.6
	16.0		96.94	0.40	3.24		3.27		3.27		0.26	85.6
	17.3		97.54	-0.20								85.6
	19.5		96.69	0.65	0.05		0.11		0.11		0.04	85.6
	20.5		96.84	0.50	2.11		2.17		2.17		2.39	56.7
	23.9		96.09	1.25	2.59		2.64		2.64		10.73	65.8
	27.0		96.74	0.60	1.30		1.36		1.36		3.71	76.7
	33.0		95.94	1.40	2.74		2.79		2.79		21.45	67.7
	38.0		95.74	1.60	4.24		4.28		4.28		37.69	67.8
	44.0		95.39	1.95	3.53		3.57		3.57		38.24	76.8
	49.0		95.14	2.20	4.32		4.36		4.36		42.72	76.7
	52.9		95.09	2.25	3.13		3.16		3.16		23.12	76.7
	55.5		95.84	1.50	6.06		6.12		6.12		19.74	87.8
	57.2		94.29	3.05	1.31	5.96	1.37	6.02	3.69		30.98	86.8
	61.0		94.14	3.20	4.86	1.56	4.91	1.62	3.27		38.14	86.6
	64.5		94.14	3.20	2.11	0.30	2.17	0.38	1.28		9.82	87.8
	65.8		94.44	2.90	1.27	0.94	1.33	0.99	1.16		7.57	87.8
	69.0		96.59	0.75	4.08		4.12		4.12		7.57	87.9
	70.7		95.04	2.30	3.45		3.48		3.48		22.04	87.7
	74.5		94.84	2.50	0.31		0.39		0.39		3.10	87.6
	77.0		94.56	2.78	2.41	3.11	2.47	3.14	2.80		15.20	78.7
	78.4		94.66	2.68	2.25	0.96	2.31	1.01	1.66		9.79	78.7
	81.4		95.64	1.70	0.12		0.21		0.21		0.98	87.8
	84.0		95.59	1.75	2.64		2.69		2.69		14.35	87.7
	87.5		96.09	1.25	0.11		0.20		0.20		0.78	78.7
	90.3		96.84	0.50	1.29		1.35		1.35		1.35	87.8
	91.5		95.04	2.30	0.99		1.04		1.04		6.82	87.8
	96.0		95.24	2.10	1.41		1.47		1.47		11.58	76.7
	99.0		95.64	1.70	0.84		0.89		0.89		6.07	87.8
	104.0		96.29	1.05	1.08		1.13		1.13	45	3.78	87.9
	108.0		97.19	0.15	1.24		1.30		1.30	75	0.18	87.9
	111.0		96.14	1.20	0.95		1.00		1.00	75	1.04	87.8
	114.7		96.54	0.80	0.05		0.11		0.11		0.28	87.8
	117.3		97.19	0.15	1.93		2.00		2.00	85	0.06	87.8
	119.0		96.04	1.30	0.52		0.60		0.60		3.39	87.8
	126.0		96.14	1.20	3.49		3.52		3.52		23.26	87.8
	130.0		96.89	0.45	1.75		1.82		1.82		3.06	87.8
	133.5		96.29	1.05	1.06		1.11		1.11		4.38	87.8
	137.5		96.19	1.15	1.92		1.99		1.99	60	4.57	87.8
	141.5		96.29	1.05	0.93		0.98		0.98	85	0.25	87.8
	143.0		97.09	0.25	1.50		1.56		1.56		0.29	87.8
	146.0		97.79	-0.45								87.8
	147.5		96.02	1.32	0.14		0.23		0.23		0.45	87.8
	150.5		95.99	1.35	0.27		0.35		0.35		1.12	87.8
	152.2		97.09	0.25	0.17		0.25		0.25		0.05	87.8
	154.5		97.94	-0.60								87.8
	158.3		96.64	0.70	0.01		0.02		0.02		0.00	87.8
RWE	158.4		97.34	0.00	0.00		0.00		0.00		0.00	87.8

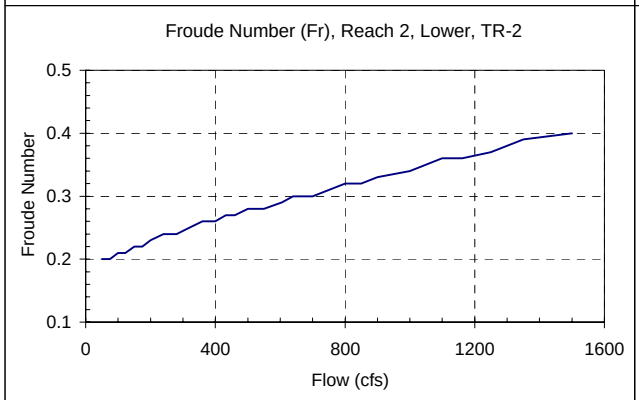


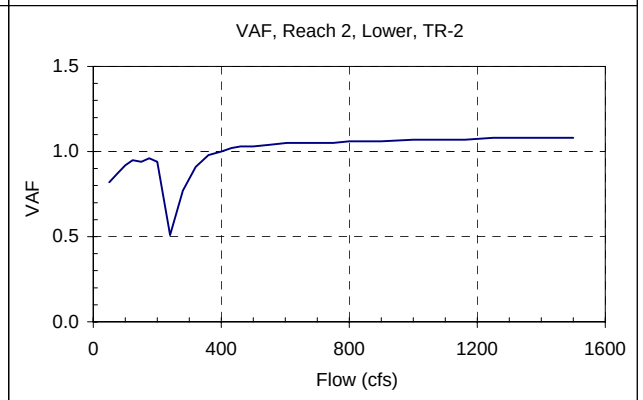
Stream: Sultan R.
Site: Lower Reach 2
Habitat: Cascade
Transect: 2

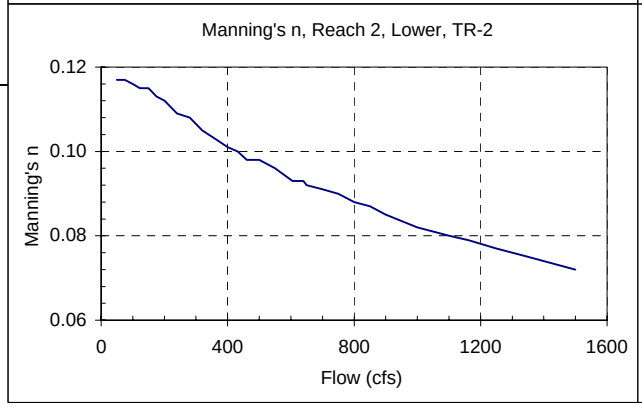
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	95.99	0.20	0.89	0.82	0.117	92.9
75	96.19	0.20	0.99	0.87	0.117	106.5
100	96.35	0.21	1.08	0.92	0.116	116.2
122.8	96.47	0.21	1.15	0.95	0.115	123.2
150	96.60	0.22	1.23	0.94	0.115	129.1
175	96.70	0.22	1.30	0.96	0.113	133.2
200	96.79	0.23	1.37	0.94	0.112	136.7
239.6	96.91	0.24	1.48	0.51	0.109	139.8
280	97.03	0.24	1.57	0.77	0.108	142.8
320	97.13	0.25	1.67	0.91	0.105	145.7
360	97.22	0.26	1.76	0.98	0.103	148.0
400	97.31	0.26	1.84	1.00	0.101	150.0
431.9	97.37	0.27	1.91	1.02	0.100	151.0
460	97.42	0.27	1.98	1.03	0.098	151.7
500	97.50	0.28	2.05	1.03	0.098	152.6
550	97.58	0.28	2.15	1.04	0.096	153.0
605	97.66	0.29	2.26	1.05	0.093	153.5
639.6	97.72	0.30	2.32	1.05	0.093	153.8
650	97.73	0.30	2.34	1.05	0.092	153.9
700	97.80	0.30	2.43	1.05	0.091	154.2
750	97.87	0.31	2.52	1.05	0.090	155.0
800	97.93	0.32	2.61	1.06	0.088	155.6
850	97.99	0.32	2.69	1.06	0.087	156.1
900	98.05	0.33	2.78	1.06	0.085	156.6
1000	98.15	0.34	2.95	1.07	0.082	157.8
1100	98.25	0.36	3.11	1.07	0.080	159.4
1161.7	98.31	0.36	3.20	1.07	0.079	160.5
1250	98.39	0.37	3.33	1.08	0.077	162.4
1350	98.48	0.39	3.47	1.08	0.075	164.4
1500	98.60	0.4	3.68	1.08	0.072	166.8

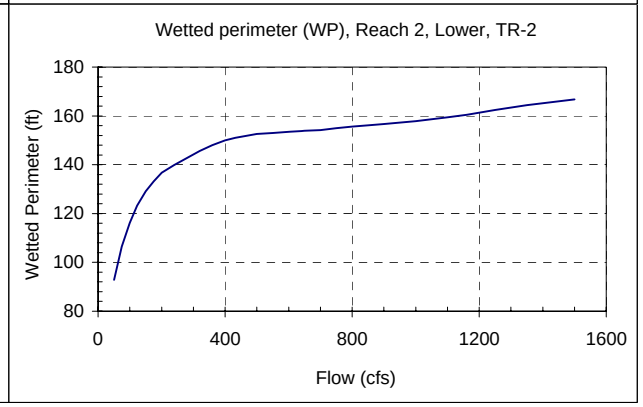


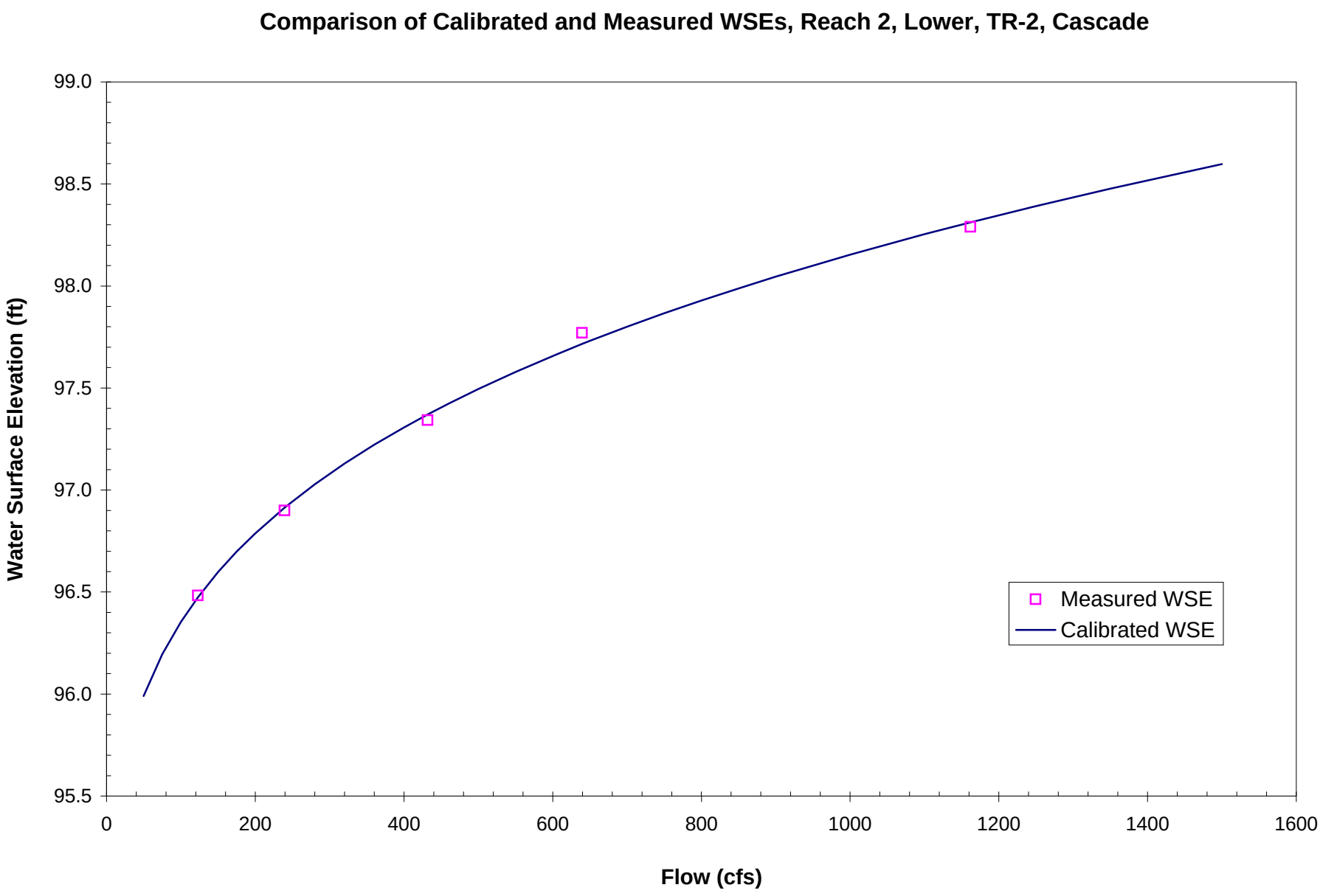











Comparison of Calibrated and Measured WSEs, Reach 2, Lower, TR-2, Cascade
Water Surface Elevation (ft)
99.0
98.5
98.0
97.5
97.0
96.5
96.0
95.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Lower Reach 2
Date: 7/11/2007 **Transect:** TR-1
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.39	100.39		100.00
HP			2.42	97.97
Rock			3.26	97.13
TP Rock	3.46	100.59		97.13
HP			2.62	97.97
BM			0.59	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	21.0		100.59	6.90	0.00	93.69	93.69	
CWS	59.0			6.90	0.00	93.69		120.6
RWS	95.0			6.90	0.00	93.69		

Ave Q= 120.6

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	40		100.59	9.83	2.96	93.72
d/s	-40		100.59	9.54	2.19	93.24

Note:
WSE slope = 0.600%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

(4) 7/10/07 Level Loop Survey (BM & HP). Bank Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.42	100.42		100.00
HP			2.45	97.97
WP			2.60	97.82
TP WP	2.79	100.61		
HP			3.64	96.97
BM			0.61	100.00

Comment:

Date: 7/12/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.29	100.29		100.00
HP			2.32	97.97
Rock			3.16	97.13
TP Rock	3.35	100.48		97.13
HP			2.51	97.97
BM			0.48	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	20		100.48	6.27	0.00	94.21	94.20	
CWS	61			6.29	0.00	94.19		223.5
RWS	93			6.28	0.00	94.20		

Ave Q= 223.5

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50		100.48	9.52	3.29	94.25
d/s	-50		100.48	8.35	1.80	93.93

Note:
WSE slope = 0.320%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A

Date: 7/13/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.62	100.62		100.00
HP			2.66	97.96
Rock			3.50	97.12
TP Rock	3.41	100.53		
HP			2.58	97.95
BM			0.54	99.99

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	20		100.42	5.62	0.00	94.80	94.77	
	50			5.62	0.00	94.80		373.7
MWS	67			5.67	0.00	94.75		
RWS	94			5.68	0.00	94.74		

Ave Q= 373.7

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	47.5		100.42	5.59	0.00	94.83
d/s	-50		100.42	5.91	0.00	94.51

Note:
WSE slope = 0.328%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A

Date: 10/19/2007
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.69	100.69		100.00
HP			2.72	97.97
Rock				
TP Rock				
HP				
BM				

Comment: 1/2 level loop shot

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
RWS			100.69	5.61	0.00	95.08	95.11	
MWS				5.55	0.00	95.14		

Ave Q=

Note: Unable to cross river, right & middle WSE only, measurement made at 5

Date: 10/20/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.71	101.71		100.00
HP			3.74	97.97
Rock				
TP Rock				
HP				
BM				

Comment: 1/2 level loop shot

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
RWS			101.71	5.66	0.00	96.05	96.05	

Ave Q=

Note: Unable to cross river, right & middle WSE only, measurement made at 3

Stream: Sultan R.
Site: Lower Reach 2
Transect: 1
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/10/2007	100.61	
7/11/2007	100.59	120.6
7/12/2007	100.48	223.5
7/13/2007	100.42	373.7

11-Jul-07

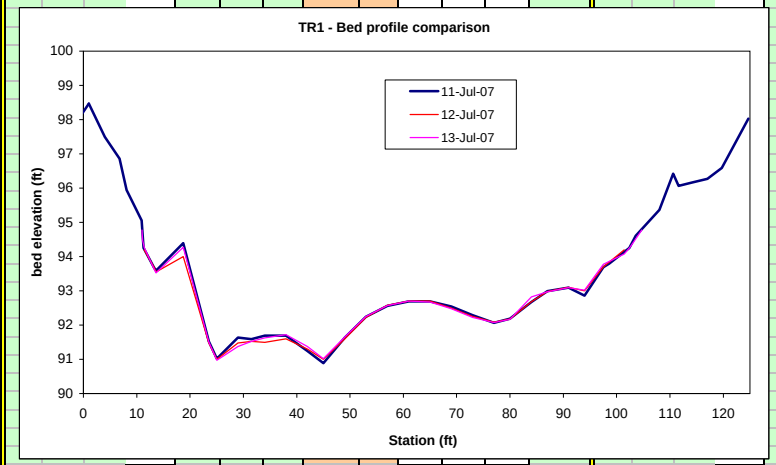
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
	-4.0	3.31	97.30									19.6
LWP	1.0	2.14	98.47									19.6
	4.0	3.11	97.50									19.6
	6.8	3.75	96.86									92.6
	8.1	4.67	95.94									91.9
	10.9	5.55	95.06									91.9
	11.3	6.36	94.25									92.8
LWE	13.2		93.69	0.00	0.00		0.00		0.00		0.00	92.9
	13.6		93.59	0.10	0.00		0.00		0.00		0.00	92.9
	18.7		94.39	-0.70								92.9
	23.5		91.52	2.17	0.20		0.28		0.28		0.46	96.7
	25.0		91.02	2.67	0.55	0.25	0.63	0.33	0.48	10	3.47	65.8
	29.0		91.64	2.05	1.39		1.45		1.45	10	9.51	65.7
	31.5		91.59	2.10	0.08		0.16		0.16		0.86	68.7
	34.0		91.69	2.00	1.49		1.55		1.55		10.09	65.7
	38.0		91.69	2.00	1.26		1.32		1.32		10.53	65.8
	42.0		91.24	2.45	0.54		0.62		0.62		5.30	65.6
	45.0		90.89	2.80	0.62	0.73	0.69	0.79	0.74		7.25	68.7
	49.0		91.64	2.05	1.64		1.70		1.70		13.97	65.6
	53.0		92.24	1.45	1.49		1.55		1.55		9.00	56.6
	57.0		92.56	1.13	1.67		1.73		1.73		7.84	56.7
	61.0		92.69	1.00	1.49		1.55		1.55		6.21	56.8
	65.0		92.69	1.00	1.57		1.63		1.63		6.53	56.8
	69.0		92.54	1.15	1.63		1.69		1.69		7.79	45.6
	73.0		92.29	1.40	0.63		0.70		0.70		3.92	45.7
	77.0		92.07	1.62	0.68		0.74		0.74		4.22	45.7
	80.0		92.19	1.50	1.15		1.20		1.20		6.32	48.6
	84.0		92.67	1.02	0.90		0.95		0.95		3.40	54.7
	87.0		92.99	0.70	0.73		0.79		0.79		1.93	85.8
	91.0		93.09	0.60	0.30		0.38		0.38		0.81	58.8
	94.0		92.86	0.83	0.34		0.42		0.42		1.14	58.6
RWE	97.5		93.69	0.00	0.00		0.00		0.00		0.00	84.6
	98.6	6.82	93.79									32.6
	102.4	6.36	94.25									32.6
	103.6	6.00	94.61									32.6
	108.0	5.25	95.36									92.6
	110.6	4.19	96.42									92.6
	111.6	4.54	96.07									92.6
	114.0	4.45	96.16									92.7
	117.0	4.34	96.27									92.7
RWP	119.7	4.02	96.59									82.7
	124.7	2.58	98.03									82.7

12-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	11.4		94.20	0.00	0.00		0.00		0.00		0.00	92.8
	13.2		93.70	0.50	0.00		0.00		0.00		0.00	92.9
	13.6		93.55	0.65	0.05		0.11		0.11		0.20	92.9
	18.7		94.00	0.20	0.00		0.00		0.00		0.00	92.9
	23.5		91.48	2.72	0.40	0.10	0.49	0.19	0.34	15	2.78	96.7
	25.0		91.00	3.20	0.50	0.29	0.58	0.37	0.48	15	4.05	65.8
	29.0		91.48	2.72	1.74	1.32	1.81	1.38	1.59	10	13.86	65.7
	31.5		91.52	2.68	1.77	0.14	1.84	0.23	1.03		6.91	68.7
	34.0		91.50	2.70	1.90	1.66	1.97	1.72	1.85	10	15.95	65.7
	38.0		91.60	2.60	2.01	1.11	2.08	1.16	1.62		16.84	65.8
	42.0		91.30	2.90	1.89	0.32	1.96	0.40	1.18		11.98	65.6
	45.0		91.00	3.20	1.60	0.88	1.66	0.93	1.30		14.54	68.7
	49.0		91.60	2.60	2.34	1.68	2.40	1.74	2.07		21.54	65.6
	53.0		92.22	1.98	2.10		2.16		2.16		17.14	56.6
	57.0		92.58	1.62	2.03		2.09		2.09		13.57	56.7
	61.0		92.70	1.50	2.14		2.20		2.20		13.22	56.8
	65.0		92.70	1.50	2.28		2.34		2.34		14.04	56.8
	69.0		92.50	1.70	2.04		2.10		2.10		14.31	45.6
	73.0		92.25	1.95	1.15		1.20		1.20		9.39	45.7
	77.0		92.08	2.12	0.45	0.84	0.53	0.89	0.71		5.29	45.7
	80.0		92.18	2.02	1.34		1.40		1.40		9.89	48.6
	84.0		92.68	1.52	0.97		1.02		1.02		5.43	54.7
	87.0		92.98	1.22	0.99		1.04		1.04		4.45	85.8
	91.0		93.10	1.10	0.84		0.89		0.89		3.44	58.8
	94.0		93.00	1.20	0.64		0.71		0.71		2.77	58.6
	97.5		93.70	0.50	1.01		1.06		1.06		1.96	84.6
RWE	101.4		94.20	0.00	0.00		0.00		0.00		0.00	32.6

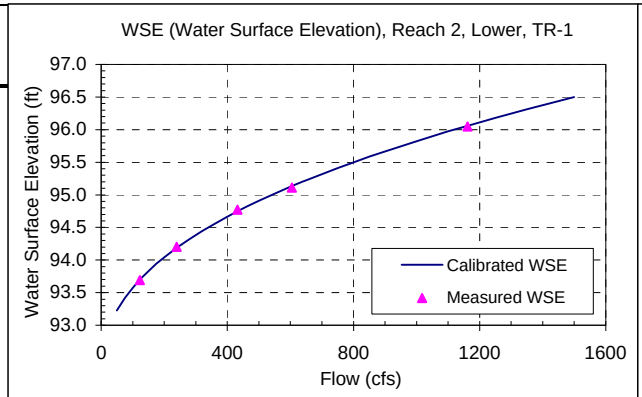
13-Jul-07

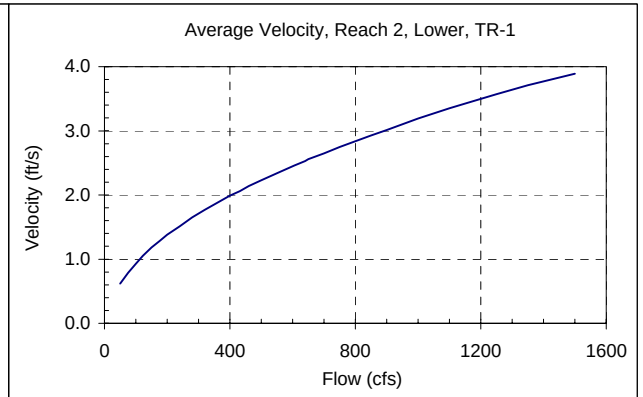
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	11.0		94.77	0.00	0.00		0.00		0.00		0.00	91.9
LWE	11.1		94.47	0.30	0.00		0.00		0.00		0.00	92.8
	11.4		94.27	0.50	0.01		0.04		0.04		0.02	92.8
	13.2		93.65	1.12	-0.27		-0.33		-0.33		-0.41	92.9
	13.6		93.52	1.25	-0.44		-0.50		-0.50		-1.72	92.9
	18.7		94.27	0.50	-0.41		-0.47		-0.47		-1.17	92.9
	23.5		91.50	3.27	0.27	0.25	0.33	0.31	0.32		3.31	96.7
	25.0		90.97	3.80	0.72	0.63	0.77	0.68	0.73	10	7.48	65.8
	29.0		91.37	3.40	2.09	1.00	2.16	1.05	1.60	10	17.44	65.7
	31.5		91.52	3.25	2.20	0.22	2.27	0.29	1.28	10	10.21	68.7
	34.0		91.62	3.15	2.34	1.51	2.40	1.57	1.99	10	20.04	65.7
	38.0		91.72	3.05	2.32	1.75	2.38	1.81	2.10	10	25.23	65.8
	42.0		91.37	3.40	2.83	0.48	2.89	0.54	1.71	10	20.05	65.6
	45.0		91.02	3.75	2.29	0.52	2.35	0.58	1.47	10	18.95	68.7
	49.0		91.65	3.12	2.89	2.26	2.94	2.33	2.63		32.88	65.6
	53.0		92.25	2.52	3.03	2.67	3.08	2.73	2.90		29.27	56.6
	57.0		92.57	2.20	2.75		2.81		2.81		24.70	56.7
	61.0		92.70	2.07	2.88		2.93		2.93		24.29	56.8
	65.0		92.67	2.10	2.90		2.95		2.95		24.81	56.8
	69.0		92.47	2.30	2.79		2.85		2.85		26.19	45.6
	73.0		92.22	2.55	2.95		3.00		3.00		30.62	45.7
	77.0		92.07	2.70	0.92		0.97		0.97		9.16	45.7
	80.0		92.17	2.60	1.35		1.41		1.41		12.82	48.6
	84.0		92.82	1.95	1.15		1.20		1.20		8.22	54.7
	87.0		92.97	1.80	1.09		1.14		1.14		7.20	85.8
	91.0		93.09	1.68	1.33		1.39		1.39		8.16	58.8
	94.0		93.02	1.75	1.27		1.33		1.33		7.55	58.6
	97.5		93.77	1.00	1.53		1.59		1.59		5.89	84.6
	101.4		94.07	0.70	1.27		1.33		1.33		2.32	32.6
RWE	102.5		94.27	0.50	0.19		0.26		0.26		0.21	32.6
RWE	104.7		94.77	0.00	0.00		0.00		0.00		0.00	32.6

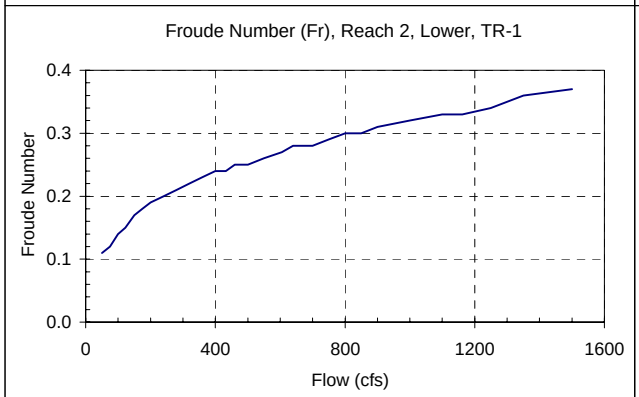


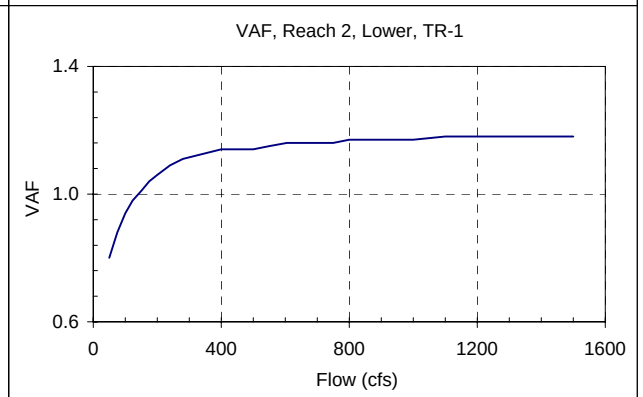
Stream: Sultan R.
Site: Lower Reach 2
Habitat: Riffle
Transect: 1

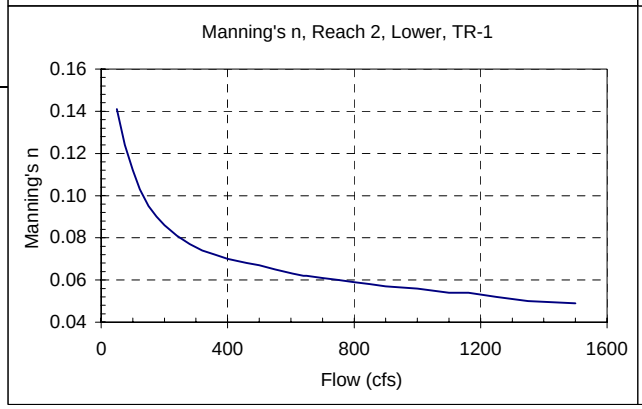
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
50	93.23	0.11	0.62	0.80	0.141	75.8
75	93.42	0.12	0.79	0.88	0.124	77.0
100	93.58	0.14	0.93	0.94	0.112	78.0
122.8	93.70	0.15	1.05	0.98	0.103	80.0
150	93.83	0.17	1.18	1.01	0.095	82.8
175	93.94	0.18	1.28	1.04	0.090	85.3
200	94.04	0.19	1.38	1.06	0.086	87.5
239.6	94.19	0.20	1.51	1.09	0.081	90.2
280	94.32	0.21	1.65	1.11	0.077	92.3
320	94.44	0.22	1.77	1.12	0.074	93.6
360	94.56	0.23	1.88	1.13	0.072	94.3
400	94.66	0.24	1.99	1.14	0.070	94.9
431.9	94.75	0.24	2.06	1.14	0.069	95.4
460	94.81	0.25	2.14	1.14	0.068	95.8
500	94.91	0.25	2.23	1.14	0.067	96.5
550	95.02	0.26	2.34	1.15	0.065	97.2
605	95.13	0.27	2.46	1.16	0.063	98.1
639.6	95.20	0.28	2.53	1.16	0.062	98.7
650	95.22	0.28	2.56	1.16	0.062	98.9
700	95.32	0.28	2.65	1.16	0.061	99.8
750	95.41	0.29	2.75	1.16	0.060	100.5
800	95.50	0.30	2.84	1.17	0.059	101.0
850	95.58	0.30	2.93	1.17	0.058	101.5
900	95.67	0.31	3.01	1.17	0.057	102.0
1000	95.82	0.32	3.19	1.17	0.056	102.9
1100	95.97	0.33	3.35	1.18	0.054	103.8
1161.7	96.06	0.33	3.44	1.18	0.054	104.2
1250	96.18	0.34	3.57	1.18	0.052	108.0
1350	96.31	0.36	3.71	1.18	0.050	111.7
1500	96.50	0.37	3.89	1.18	0.049	114.3

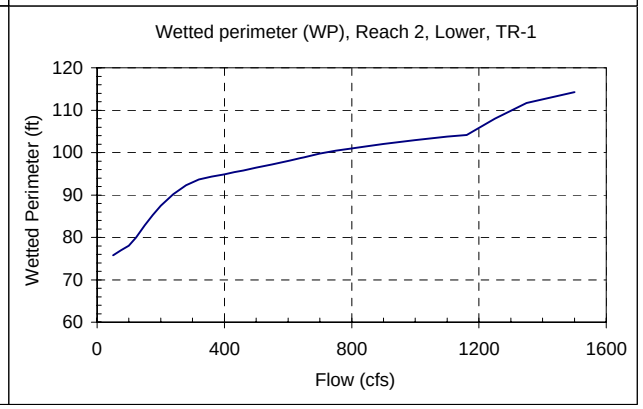


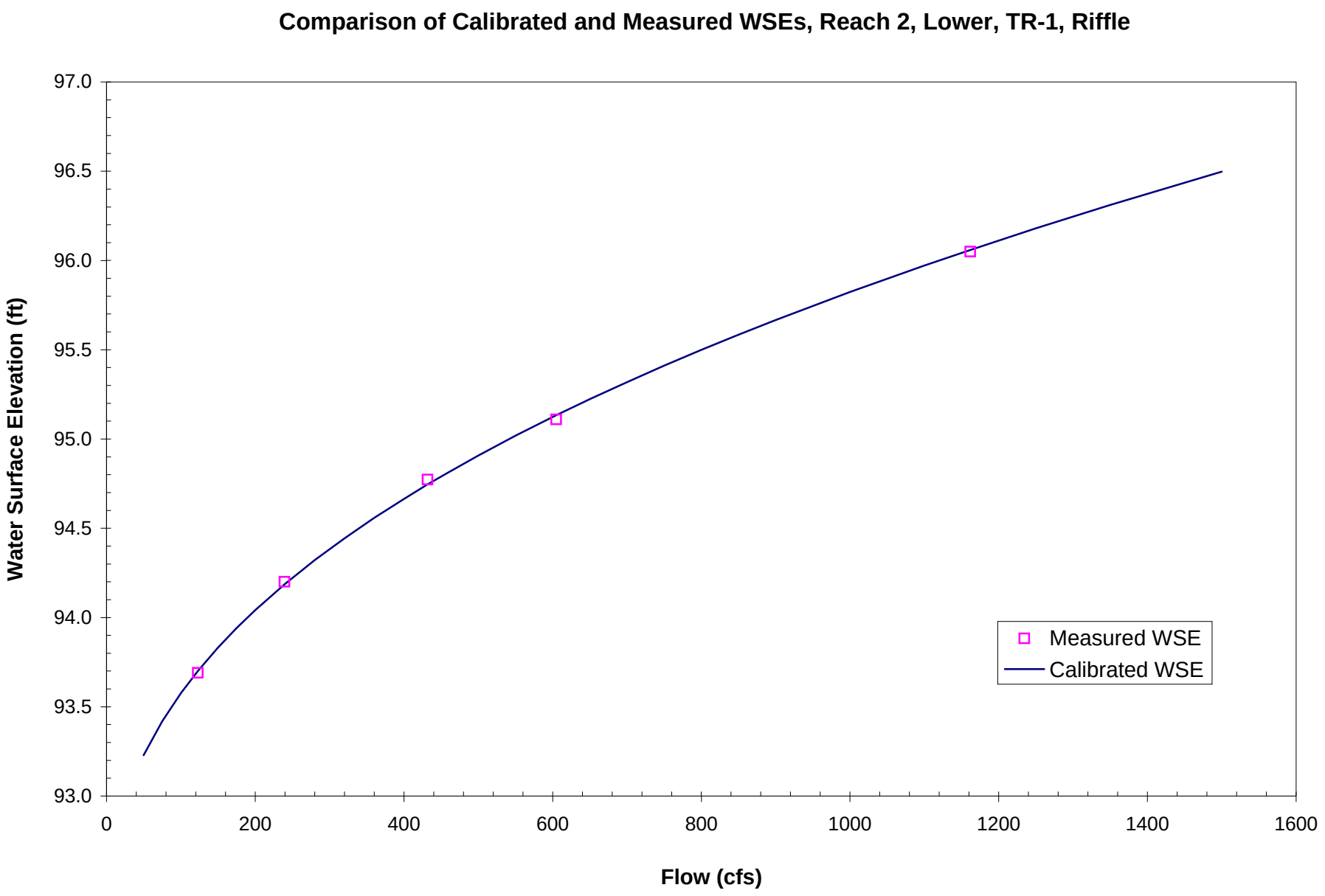











Comparison of Calibrated and Measured WSEs, Reach 2, Lower, TR-1, Riffle
Water Surface Elevation (ft)
97.0
96.5
96.0
95.5
95.0
94.5
94.0
93.5
93.0
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan River
Site: Reach 1B
Transect: 2
Habitat: Glide

Date: 7/18/2007
Flow: High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.39	100.39		100.00
HP			1.51	98.88
Rock			5.36	95.03
TP				
Rock	5.33	100.36		
HP			1.48	98.88
BM			0.36	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
	19		100.36	6.53	0.00	93.83	93.82	
	80			6.53	0.00	93.83		422.9
	140			6.55	0.00	93.81		

Ave Q= 422.9

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	45		100.36	6.52	0.00	93.84
d/s	-50		100.36	6.63	0.00	93.73

WSE slope = 0.116%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A
Calib. # Not Recoded
Note: Counter 4099 was used in taking velocity, but Counter 3602 is used for velocity correction. See data entry notes for justification.

Date: 7/19/2007
Flow: Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.24	100.24		100.00
HP			1.35	98.89
Rock			5.82	94.42
TP				
Rock	5.72	100.14		
HP			1.25	98.89
BM			0.13	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	26		100.14	6.87	0.00	93.27	93.25	
	81			6.88	0.00	93.26		252.7
	132			6.92	0.00	93.22		

Ave Q= 252.7

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50		100.14	6.91	0.00	93.23
d/s	-50		100.14	6.97	0.00	93.17

WSE slope = 0.060%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A
Calib. # Not Recoded
Note: Counter 4099 was used in taking velocity, but Counter 3602 is used for velocity correction. See data entry notes for justification.

Date: 7/20/2007
Flow: Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.61	102.61		100.00
HP			3.72	98.89
Rock			7.81	94.80
TP				
Rock	7.70	102.50		
HP			3.60	98.90
BM			2.49	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	28		102.50	9.65	0.00	92.85	92.79	
MWS	79			9.72	0.00	92.78		187.6
RWS	139			9.77	0.00	92.73		

Ave Q= 187.6

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50		102.50	9.73	0.00	92.77
d/s	-60		102.50	9.75	0.00	92.75

WSE slope = 0.018%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A
Calib. # 175
Note: Counter 4099 was used in taking velocity, but Counter 3602 is used for velocity correction. See data entry notes for justification.

Date: 10/21/2007
Flow: Highest

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.93	104.93		100.00
HP			6.06	98.87
Rock				
TP				
Rock				
HP				
BM				

Comment: 1/2 level loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			104.93	9.64	0.00	95.29	95.29	
RWS								1400.0

Ave Q= 1400.0

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s						
d/s						

WSE slope = N/A
Note: Unable to cross river, measured LWSE only, sampled at 1:30

(3) Meter and propeller ID for Velocity Correction

Meter ID: N/A
Propeller ID: N/A
Calib. # N/A

Date: 12/20/2007
Flow: Higher

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.45	104.45		100.00
HP			5.58	98.87
Rock				
TP				
Rock				
HP				
BM				

Comment: 1/2 level loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			104.45	9.81	0.00	94.64	94.66	
MWS				13.08	3.30	94.67		900.0

Ave Q= 900.0

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s						
d/s						

WSE slope = N/A
Note: Unable to cross river, measured LWSE only, sampled at 9:45

(3) Meter and propeller ID for Velocity Correction

Meter ID: N/A
Propeller ID: N/A
Calib. # N/A

Stream: Sultan River
Site: Reach 1B
Transect: 1
Habitat: Glide

Survey Date	HI (ft)	Q (cfs)
7/20/2007	102.50	187.6
7/19/2007	100.14	252.7
7/18/2007	100.36	422.9

18-Jul-07

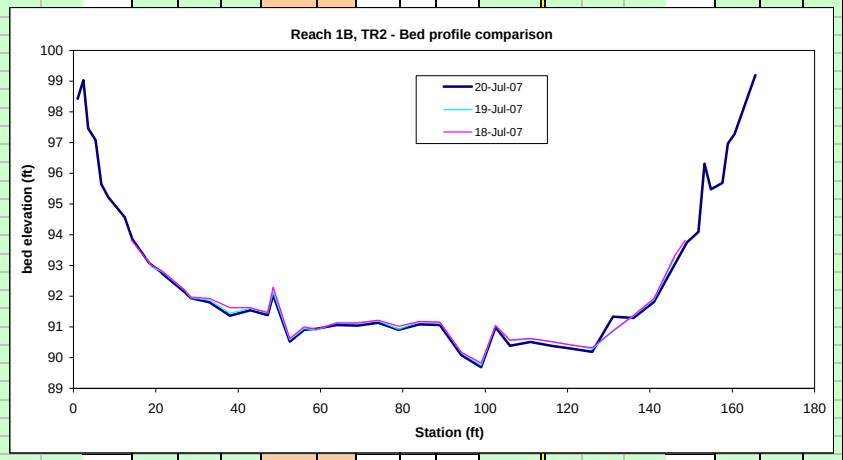
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	14.1		93.82	0.00	0.00		0.00		0.00		0.00	28.9
	19.0		93.00	0.82	0.06		0.14		0.14		0.41	48.6
	21.5		92.82	1.00	0.22		0.31		0.31		1.22	65.7
	27.0		92.20	1.62	0.65		0.72		0.72		4.07	56.6
	28.5		91.97	1.85	1.35		1.41		1.41		7.82	56.7
	33.0		91.92	1.90	1.72		1.78		1.78		16.11	45.7
	38.0		91.62	2.20	1.18		1.23		1.23		13.58	54.6
	43.0		91.62	2.20	2.77		2.81		2.81		28.49	58.7
	47.2		91.47	2.35	2.19		2.25		2.25		14.55	85.8
	48.5		92.29	1.53	2.68		2.73		2.73		11.06	87.9
	52.5		90.62	3.20	2.98	1.88	3.02	1.95	2.48		29.78	85.7
	56.0		91.00	2.82	1.91	0.91	1.98	0.96	1.47		13.47	58.7
	59.0		90.92	2.90	2.81	0.56	2.85	0.64	1.75		20.24	56.6
	64.0		91.12	2.70	2.62	0.44	2.67	0.52	1.60		21.55	86.6
	69.0		91.12	2.70	1.49	1.20	1.55	1.26	1.40		18.95	85.7
	74.0		91.22	2.60	1.99	0.40	2.06	0.49	1.27		16.52	78.6
	79.0		91.02	2.80	2.14	0.22	2.20	0.31	1.25		17.56	85.6
	84.0		91.17	2.65	1.95	0.54	2.02	0.62	1.32		17.45	58.6
	89.0		91.15	2.67	1.73	0.73	1.80	0.79	1.29		17.59	85.6
	94.2		90.17	3.65	1.62	1.28	1.68	1.34	1.51		27.56	87.6
	99.0		89.82	4.00	1.19	0.35	1.24	0.43	0.84		13.94	87.7
	102.5		91.04	2.78	1.09	0.15	1.14	0.23	0.69		6.70	87.7
	106.0		90.57	3.25	1.41	0.87	1.47	0.92	1.20		16.53	83.8
	111.0		90.62	3.20	1.10	0.86	1.15	0.91	1.03		16.53	38.6
	116.0		90.52	3.30	1.15	0.56	1.20	0.64	0.92		15.19	86.6
	121.0		90.40	3.42	1.13	0.81	1.18	0.86	1.02		17.51	86.6
	126.0		90.32	3.50	1.13	0.38	1.18	0.47	0.82		14.43	83.8
	131.0		90.87	2.95	1.23	0.30	1.29	0.38	0.83		12.32	86.8
	136.0		91.37	2.45	0.61		0.68		0.68		8.36	78.6
	141.0		91.92	1.90	0.26		0.34		0.34		3.26	78.6
	146.0		93.32	0.50	0.03		0.07		0.07		0.13	82.8
RWE	148.6		93.82	0.00	0.00		0.00		0.00		0.00	28.8

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	17.7		93.25	0.00	0.00		0.00		0.00		0.00	48.6
	19.0		92.95	0.30	0.01		0.02		0.02		0.01	48.6
	21.5		92.80	0.45	0.35		0.43		0.43		0.78	65.7
	27.0		92.20	1.05	0.26		0.34		0.34		1.26	56.6
	28.5		91.95	1.30	0.23		0.32		0.32		1.23	56.7
	33.0		91.87	1.38	1.76		1.83		1.83		11.97	45.7
	38.0		91.45	1.80	0.94		0.99		0.99		8.93	54.6
	43.0		91.60	1.65	2.27		2.33		2.33		17.68	58.7
	47.2		91.45	1.80	1.46		1.52		1.52		7.53	85.8
	48.5		92.15	1.10	2.37		2.43		2.43		7.07	87.9
	52.5		90.58	2.67	2.07	1.08	2.13	1.13	1.63		16.35	85.7
	56.0		90.95	2.30	1.01		1.06		1.06		7.93	58.7
	59.0		90.90	2.35	0.98		1.03		1.03		9.69	56.6
	64.0		91.15	2.10	0.71		0.77		0.77		8.10	86.6
	69.0		91.15	2.10	1.81		1.88		1.88		19.70	85.7
	74.0		91.20	2.05	0.64		0.71		0.71		7.27	78.6
	79.0		90.93	2.32	0.22		0.31		0.31		3.55	85.6
	84.0		91.17	2.08	0.73		0.79		0.79		8.20	58.6
	89.0		91.15	2.10	0.74		0.80		0.80		8.55	85.6
	94.2		90.17	3.08	1.29	0.89	1.35	0.94	1.14		17.63	87.6
	99.0		89.75	3.50	1.05	0.10	1.10	0.19	0.64		9.35	87.7
	102.5		91.05	2.20	0.24		0.32		0.32		2.49	87.7
	106.0		90.55	2.70	1.05	0.47	1.10	0.55	0.83		9.47	83.8
	111.0		90.60	2.65	1.32	0.89	1.38	0.94	1.16		15.37	38.6
	116.0		90.53	2.72	0.79	0.43	0.85	0.51	0.68		9.25	86.6
	121.0		90.42	2.83	0.89	0.65	0.94	0.72	0.83		11.75	86.6
	126.0		90.28	2.97	0.86	0.33	0.91	0.41	0.66		9.84	83.8
	131.0		90.85	2.40	0.82		0.87		0.87		10.49	86.8
	136.0		91.35	1.90	0.71		0.77		0.77		7.33	78.6
	141.0		91.90	1.35	0.50		0.58		0.58		3.91	78.6
RWE	146.0		93.25	0.00	0.00		0.00		0.00		0.00	82.8

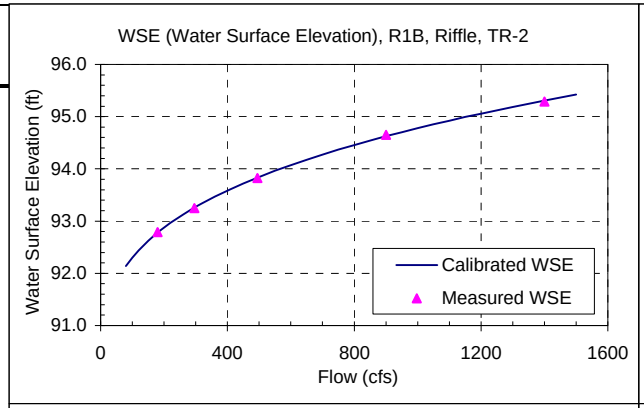
20-Jul-07

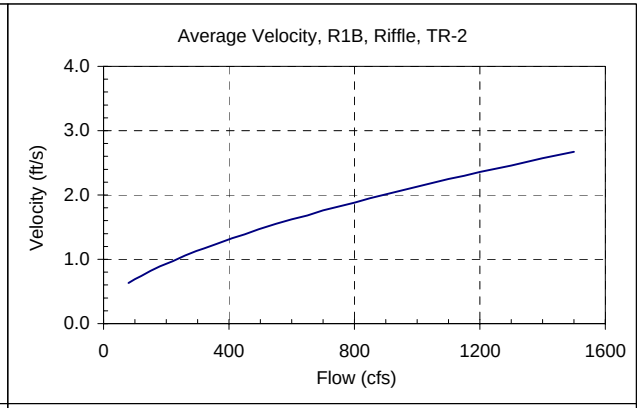
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWP	1.0	4.07	98.43									18.9
	2.4	3.47	99.03									18.7
	3.6	5.04	97.46									87.9
	5.4	5.42	97.08									87.9
	6.8	6.85	95.65									85.7
	8.5	7.28	95.22									85.8
	12.4	7.93	94.57									28.9
	14.3	8.65	93.85									28.9
	18.5	9.44	93.06									48.6
LWE	21.2		92.79	0.00	0.00		0.00		0.00		0.00	65.7
	21.5		92.74	0.05	0.01		0.02		0.02		0.00	65.7
	27.0		92.14	0.65	0.29		0.37		0.37		0.85	56.6
	28.5		91.94	0.85	0.15		0.23		0.23		0.60	56.7
	33.0		91.81	0.98	1.41		1.47		1.47		6.84	45.7
	38.0		91.37	1.42	0.47		0.55		0.55		3.90	54.6
	43.0		91.54	1.25	1.78		1.85		1.85		10.61	58.7
	47.2		91.39	1.40	0.98		1.03		1.03		3.97	85.8
	48.5		92.04	0.75	2.21		2.27		2.27		4.51	87.9
	52.5		90.52	2.27	1.60		1.66		1.66		14.16	85.7
	56.0		90.91	1.88	0.84		0.89		0.89		5.46	58.7
	59.0		90.94	1.85	1.76		1.83		1.83		13.51	56.6
	64.0		91.07	1.72	2.72	0.63	2.77	0.70	1.73		14.91	86.6
	69.0		91.04	1.75	0.61		0.68		0.68		5.97	85.7
	74.0		91.14	1.65	0.36		0.44		0.44		3.67	78.6
	79.0		90.91	1.88	0.19		0.27		0.27		2.55	85.6
	84.0		91.09	1.70	0.73		0.79		0.79		6.70	58.6
	89.0		91.07	1.72	1.39		1.45		1.45	15	12.28	85.6
	94.2		90.09	2.70	0.99	0.50	1.04	0.58	0.81	15	10.57	87.6
	99.0		89.69	3.10	0.96	0.10	1.01	0.19	0.60	25	6.98	87.7
	102.5		90.99	1.80	0.37		0.46		0.46	25	2.60	87.7
	106.0		90.39	2.40	1.09		1.14		1.14		11.65	83.8
	111.0		90.51	2.28	0.68		0.74		0.74		8.48	38.6
	116.0		90.39	2.40	0.69		0.76		0.76		9.06	86.6
	121.0		90.29	2.50	0.64		0.71		0.71		8.87	86.6
	126.0		90.19	2.60	0.87	0.34	0.92	0.42	0.67		8.75	83.8
	131.0		91.34	1.45	0.89		0.94		0.94		6.83	86.8
	136.0		91.29	1.50	0.21		0.29		0.29		2.21	78.6
	141.0		91.82	0.97	0.18		0.26		0.26		1.14	78.6
RWE	145.0		92.79	0.00	0.00		0.00		0.00		0.00	82.8
	149.0	8.75	93.75									28.8
	151.8	8.41	94.09									28.9
	153.3	6.19	96.31									28.9
	154.8	7.02	95.48									81.8
	157.6	6.81	95.69									81.8
	158.9	5.53	96.97									81.8
RWP	160.6	5.22	97.28									81.8
	165.6	3.30	99.20									81.8

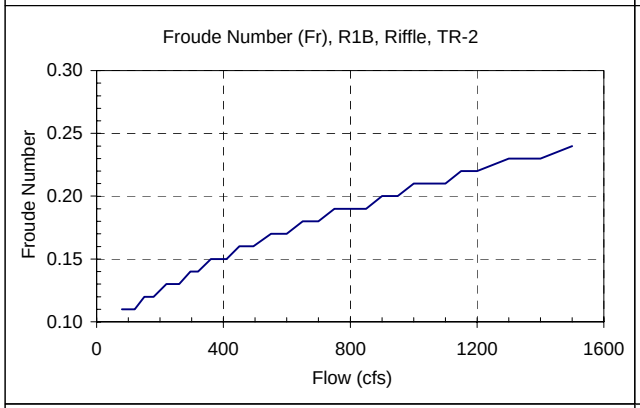


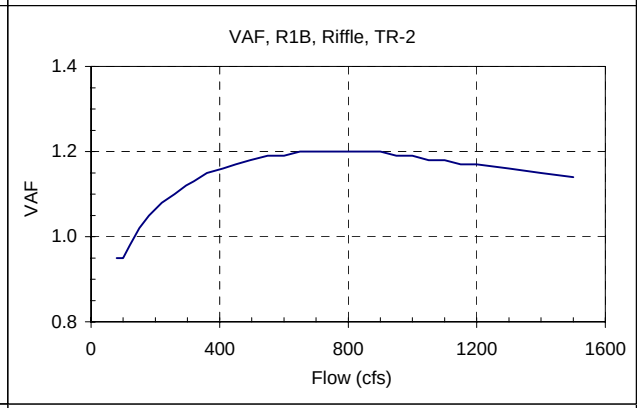
Stream: Sultan River
Site: Reach 1B
Transect: 2
Habitat: Glide

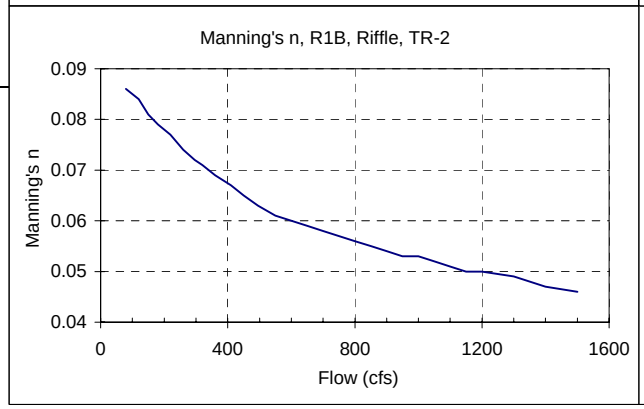
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
80	92.14	0.11	0.63	0.95	0.086	114.8
100	92.30	0.11	0.69	0.95	0.085	117.4
120	92.44	0.11	0.74	0.98	0.084	119.1
150	92.62	0.12	0.82	1.02	0.081	121.4
180.0	92.78	0.12	0.89	1.05	0.079	123.4
220	92.97	0.13	0.97	1.08	0.077	126.6
260	93.13	0.13	1.06	1.10	0.074	128.4
296.0	93.26	0.14	1.13	1.12	0.072	129.7
320	93.34	0.14	1.17	1.13	0.071	130.5
360	93.47	0.15	1.24	1.15	0.069	131.9
410	93.61	0.15	1.33	1.16	0.067	133.5
450	93.72	0.16	1.39	1.17	0.065	134.8
495.0	93.83	0.16	1.47	1.18	0.063	137.0
550	93.96	0.17	1.55	1.19	0.061	138.4
600	94.07	0.17	1.62	1.19	0.060	139.6
650	94.18	0.18	1.68	1.20	0.059	140.1
700	94.27	0.18	1.76	1.20	0.058	140.5
750	94.37	0.19	1.82	1.20	0.057	140.8
800	94.46	0.19	1.88	1.20	0.056	141.2
850	94.54	0.19	1.95	1.20	0.055	141.5
900.0	94.62	0.20	2.01	1.20	0.054	141.9
950	94.70	0.20	2.07	1.19	0.053	142.5
1000	94.78	0.21	2.13	1.19	0.053	143.1
1050	94.85	0.21	2.19	1.18	0.052	143.6
1100	94.92	0.21	2.25	1.18	0.051	144.1
1150	94.99	0.22	2.30	1.17	0.050	144.6
1200	95.06	0.22	2.36	1.17	0.050	145.2
1300	95.19	0.23	2.46	1.16	0.049	146.1
1400.0	95.31	0.23	2.57	1.15	0.047	146.8
1500	95.42	0.24	2.67	1.14	0.046	147.4

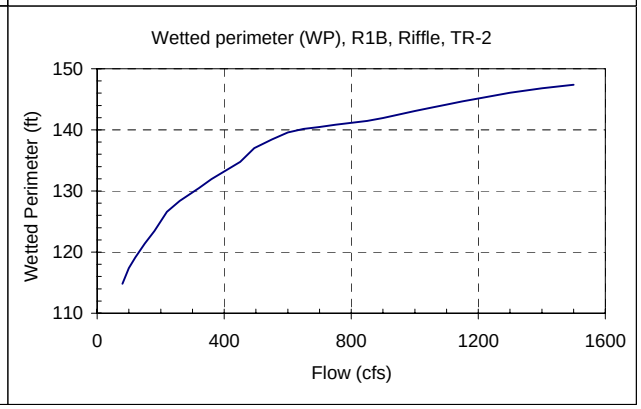


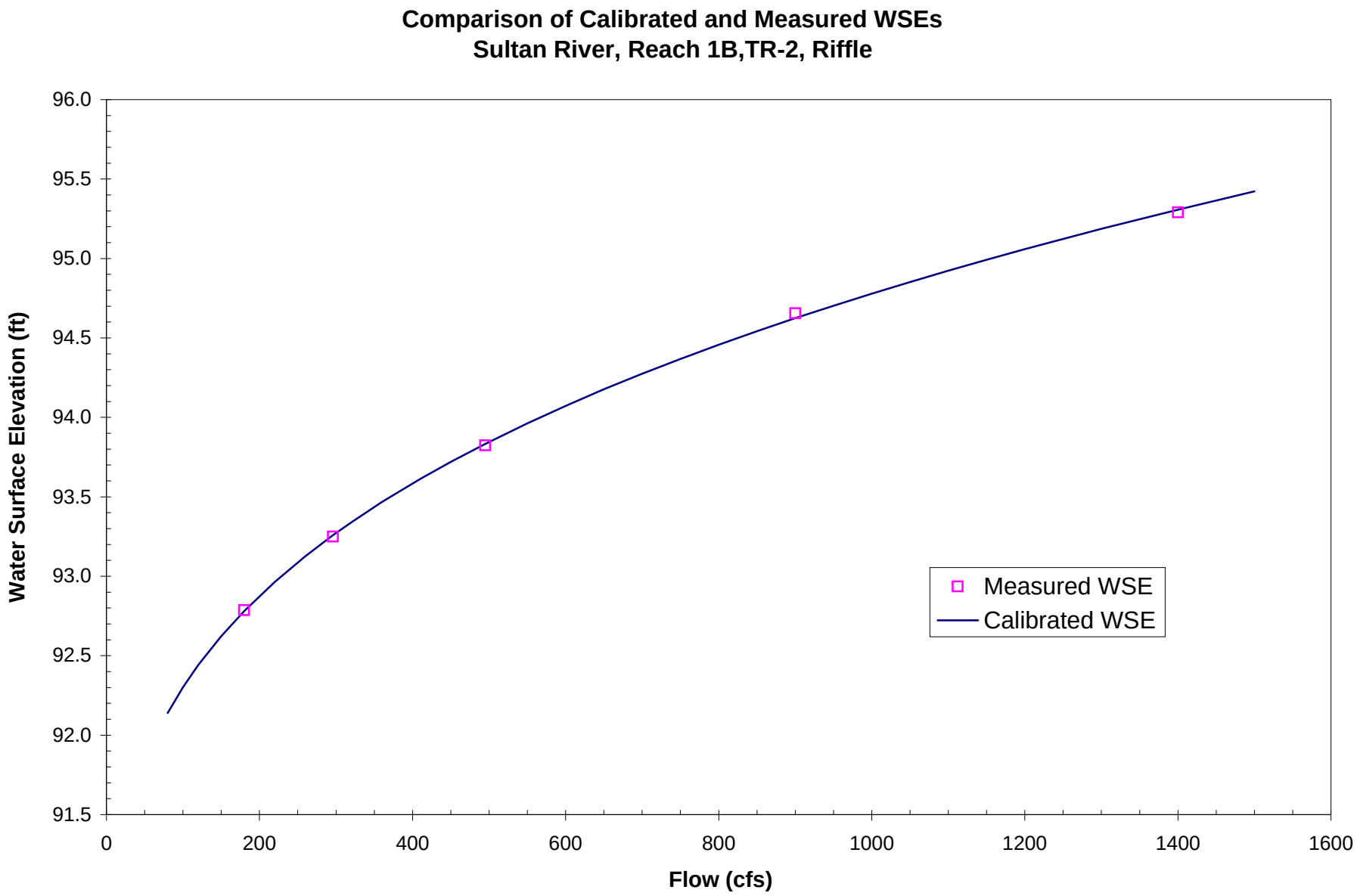











Comparison of Calibrated and Measured WSEs
Sultan River, Reach 1B,TR-2, Riffle
Water Surface Elevation (ft)
96.0
95.5
95.0
94.5
94.0
93.5
93.0
92.5
92.0
91.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan River
Site: Reach 1B **Transect:** 1
Habitat: Riffle

Date: 7/18/2007
Flow: High

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.52	103.52		100.00
HP			2.35	101.17
Rock			7.55	95.97
TP				
Rock	7.37	103.34		
HP			2.16	101.18
BM			3.34	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
	58		103.34	7.75	0.00	95.59	95.76	
	90			7.65	0.00	95.69		452.7
	126			7.55	0.00	95.79		
	171			7.38	0.00	95.96		

Ave Q= 452.7

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50		103.34	7.23	0.00	96.11
d/s	-50		103.34	8.38	0.00	94.96

WSE slope = 1.150%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A
Calib. # Not Recoded
Note: Counter 4099 was used in taking velocity, but Counter 3602 is used for velocity correction. See data entry notes for justification.

Date: 7/19/2007
Flow: Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.78	103.78		100.00
HP			2.59	101.19
Rock			8.75	95.03
TP				
Rock	8.55	103.58		
HP			2.39	101.19
BM			3.58	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
	67		100.66	5.44	0.00	95.22	95.31	
	95			5.41	0.00	95.25		281.3
	126			5.34	0.00	95.32		
RWSE	159			5.22	0.00	95.44		

Ave Q= 281.3

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	60		100.66	5.01	0.00	95.65
d/s	-60		100.66	6.07	0.00	94.59

WSE slope = 0.883%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A
Calib. # 175
Note: Counter 4099 was used in taking velocity, but Counter 3602 is used for velocity correction. See data entry notes for justification.

Date: 7/20/2007
Flow: Low

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.71	103.71		100.00
HP			2.55	101.16
Rock			7.76	95.95
TP				
Rock	7.50	103.45		
HP			2.28	101.17
BM			3.45	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS	42		101.15	6.61	0.00	94.54	94.90	
	67			6.26	0.00	94.89		
	99			6.28	0.00	94.87		203.7
	134			6.26	0.00	94.89		
RWS	159			6.19	0.00	94.96		

Ave Q= 203.7

Note: WSE @ Sta=42 not used in ave, because of stagnant water

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	60		101.15	5.94	0.00	95.21
d/s	-50		101.15	6.67	0.00	94.48

WSE slope = 0.664%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A
Calib. # 175
Note: Counter 4099 was used in taking velocity, but Counter 3602 is used for velocity correction. See data entry notes for justification.

Date: 10/21/2007
Flow: Highest

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.52	104.52		100.00
HP			3.35	101.17
Rock				
TP				
Rock				
HP				
BM				

Comment: 1/2 level loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			104.52	8.24	0.00	96.28	96.28	1400.0
RWS								

Ave Q= 1400.0

Note: Unable to cross river, measured LWSE only, sampled at 1:15
Flows are taken from USGS gage

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	60		104.52	5.94	0.00	98.58
d/s	-50		104.52	6.67	0.00	97.85

WSE slope = ######

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib. # NA
Note:

Date: 12/20/2007
Flow: Higher

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.77	103.77		100.00
HP			2.60	101.17
Rock				
TP				
Rock				
HP				
BM				

Comment: 1/2 level loop only

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			103.77	7.84	0.00	95.93	96.14	900.0
MWS			103.77	9.55	2.12	96.34		

Ave Q= 900.0

Note: Unable to cross river, measured LWSE only, sampled at 9:30
Flows are taken from USGS gage

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s						
d/s						

WSE slope = N/A

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib. # NA

Stream: Sultan River
Site: Reach 1B
Transect: 1
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/18/2007	103.34	452.7
7/19/2007	100.66	281.3
7/20/2007	101.15	203.7

18-Jul-07

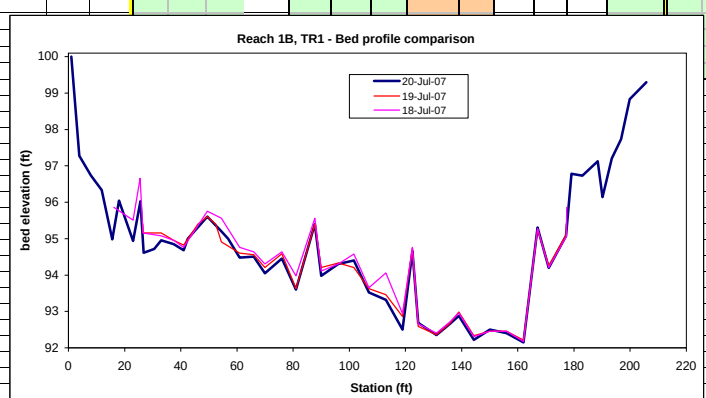
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	16.2		95.76	0.00	0.00		0.00		0.00		0.00	38.6
	23.0		95.41	0.35	1.40		1.46		1.46		2.38	48.6
	25.5		96.56	-0.80	0.00		0.00		0.00		0.00	48.6
	26.5		95.06	0.70	0.60		0.67		0.67		1.77	45.6
	33.0		94.98	0.78	1.28		1.34		1.34	60	2.87	68.7
	37.5		94.86	0.90	0.09		0.17		0.17		0.63	68.7
	41.0		94.66	1.10	0.90		0.95		0.95		6.29	78.6
	49.5		95.66	0.10	1.00		1.05		1.05	83	0.09	45.7
	54.5		95.46	0.30	0.44		0.52		0.52		0.90	87.7
	61.0		94.66	1.10	0.24		0.32		0.32		2.05	56.7
	66.0		94.54	1.22	0.92		0.97		0.97		5.34	87.6
	70.0		94.21	1.55	2.14		2.20		2.20		17.07	86.6
	76.0		94.54	1.22	1.90		1.97		1.97		13.20	87.6
	81.0		93.88	1.88	0.12		0.21		0.21		2.27	87.6
	87.7		95.46	0.30	2.79		2.83		2.83		3.83	87.6
	90.0		94.01	1.75	1.63		1.69		1.69		12.30	87.6
	96.0		94.21	1.55	1.39		1.45		1.45		13.03	87.6
	101.6		94.48	1.28	0.99		1.04		1.04		7.33	87.6
	107.0		93.56	2.20	1.98		2.05		2.05		25.65	87.6
	113.0		93.96	1.80	2.05		2.11		2.11		22.84	85.7
	119.0		92.84	2.92	2.76	1.44	2.81	1.50	2.15		29.86	85.7
	122.5		94.66	1.10	3.75		3.79		3.79		11.46	85.9
	124.5		92.56	3.20	3.27	0.51	3.30	0.59	1.95		26.47	87.7
	131.0		92.31	3.45	2.84	2.01	2.88	2.08	2.48		47.89	87.7
	135.7		92.61	3.15	3.69	0.37	3.73	0.46	2.09		26.35	87.7
	139.0		92.86	2.90	0.43	0.30	0.51	0.38	0.45		5.60	83.7
	144.3		92.21	3.55	2.84	1.06	2.88	1.11	2.00		38.99	87.6
	150.0		92.36	3.40	3.36	1.86	3.39	1.93	2.66		52.91	87.6
	156.0		92.36	3.40	3.00	1.11	3.04	1.16	2.10		42.84	86.6
	162.0		92.08	3.68	1.71	0.79	1.77	0.85	1.31		26.52	86.6
	167.0		95.18	0.58	0.94		0.99		0.99		2.59	86.6
	171.0		94.11	1.65	0.06		0.14		0.14		1.15	87.7
	177.3		94.96	0.80	0.05		0.11		0.11		0.29	87.7
RWE	177.4		95.76	0.00	0.00		0.00		0.00		0.00	87.7

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWE	26.4		95.31	0.00	0.00		0.00		0.00		0.00	45.6
	26.5		95.06	0.25	0.01		0.02		0.02		0.02	45.6
	33.0		95.06	0.25	0.05		0.11		0.11		0.16	68.7
	37.5		94.86	0.45	0.01		0.02		0.02		0.04	68.7
	41.0		94.73	0.58	0.23		0.32		0.32		0.79	78.6
	46.1		95.31	0.00	0.00		0.00		0.00		0.00	45.7
	49.5		95.51	-0.20								45.7
	52.4		95.31	0.00	0.00		0.00		0.00		0.00	87.7
	54.5		94.81	0.50	0.01		0.02		0.02		0.05	87.7
	61.0		94.51	0.80	0.03		0.07		0.07		0.31	56.7
	66.0		94.46	0.85	0.96		1.01		1.01		3.87	87.6
	70.0		94.11	1.20	1.73		1.80		1.80		10.77	86.6
	76.0		94.49	0.82	1.50		1.56		1.56		7.04	87.6
	81.0		93.53	1.78	0.16		0.24		0.24		2.50	87.6
	87.7		95.31	0.00	0.00		0.00		0.00		0.00	87.6
	90.0		94.11	1.20	1.50		1.56		1.56		7.78	87.6
	96.0		94.23	1.08	0.68		0.74		0.74		4.66	87.6
	101.6		94.11	1.20	0.88		0.93		0.93		6.16	87.6
	107.0		93.53	1.78	0.88		0.93		0.93		9.46	87.6
	113.0		93.36	1.95	2.06		2.12		2.12		24.86	85.7
	119.0		92.76	2.55	2.83	0.39	2.87	0.48	1.67		20.28	85.7
	122.5		94.64	0.67	3.08		3.11		3.11		5.74	85.9
	124.5		92.49	2.82	2.57	1.26	2.62	1.32	1.97		23.59	87.7
	131.0		92.26	3.05	2.08	1.25	2.14	1.31	1.73		29.47	87.7
	135.7		92.56	2.75	1.01	1.26	1.06	1.32	1.19		13.07	87.7
	139.0		92.89	2.42	0.25		0.33		0.33		3.46	83.7
	144.3		92.24	3.07	2.45	0.84	2.50	0.89	1.70		28.68	87.6
	150.0		92.36	2.95	2.74	1.43	2.79	1.49	2.14		36.90	87.6
	156.0		92.36	2.95	2.11	0.48	2.17	0.56	1.37		24.19	86.6
	162.0		92.11	3.20	1.01	0.76	1.06	0.82	0.94		16.52	86.6
	167.0		95.16	0.15	0.75		0.81		0.81		0.55	86.6
	171.0		94.16	1.15	0.03		0.07		0.07		0.40	87.7
	177.2		95.01	0.30	0.01		0.02		0.02		0.02	87.7
RWE	177.3		95.31	0.00	0.00		0.00		0.00		0.00	87.7

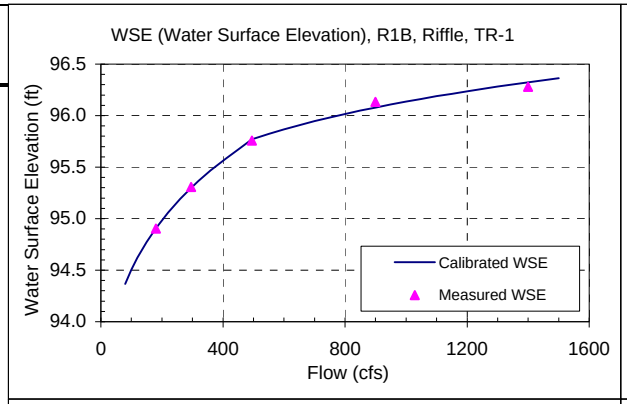
20-Jul-07

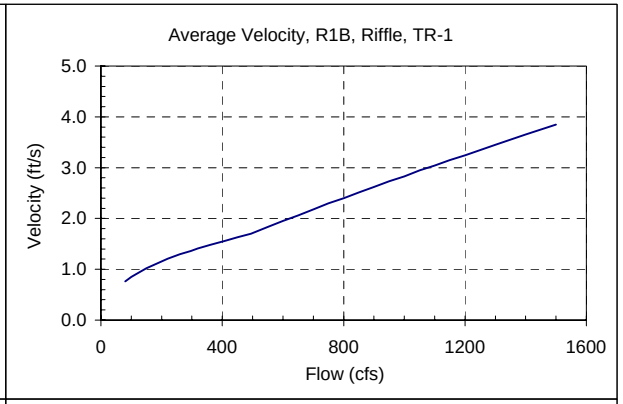
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWP	1.0	1.25	99.90									81.6
	3.9	3.97	97.18									81.6
	8.0	4.51	96.64									28.7
	11.9	4.91	96.24									28.7
	14.3	5.82	95.33									38.6
	15.6	6.27	94.88									38.6
	18.0	5.20	95.95									38.6
	23.0	6.31	94.84									48.6
	25.6	5.22	95.93									48.6
	26.8	6.64	94.51									45.6
LWE	30.5	6.53	94.62	0.00	0.00		0.00		0.00		0.00	58.7
	33.0		94.85	0.05	0.00		0.00		0.00		0.00	68.7
	37.5		94.75	0.15	0.01		0.02		0.02		0.01	68.7
	41.0		94.58	0.32	0.03		0.07		0.07		0.05	78.6
	42.5		94.90	0.00	0.00		0.00		0.00		0.00	45.7
	49.5		95.50	-0.60								45.7
	54.5		95.10	-0.20								87.7
	56.8		94.90	0.00	0.00		0.00		0.00		0.00	86.8
	61.0		94.38	0.52	0.03		0.07		0.07		0.16	56.7
	66.0		94.40	0.50	0.40		0.49		0.49		1.09	87.6
	70.0		93.95	0.95	1.40		1.46		1.46		6.93	86.6
	76.0		94.35	0.55	1.24		1.30		1.30		3.92	87.6
	81.0		93.50	1.40	0.10		0.19		0.19		0.65	87.6
	87.7		95.30	-0.40								87.6
	90.0		93.88	1.02	0.73		0.79		0.79		2.41	87.6
	96.0		94.20	0.70	0.63		0.70		0.70		2.84	87.6
	101.6		94.30	0.60	0.55		0.63		0.63		2.07	87.6
	107.0		93.42	1.48	0.62		0.69		0.69		5.84	87.6
	113.0		93.22	1.68	1.91		1.98		1.98		19.92	85.7
	119.0		92.40	2.50	2.32		2.38		2.38		28.24	85.7
	122.5		94.55	0.35	2.73		2.78		2.78		2.67	85.9
	124.5		92.58	2.32	1.82		1.89		1.89		18.60	87.7
	131.0		92.25	2.65	1.73	0.81	1.80	0.86	1.33		19.74	87.7
	135.7		92.55	2.35	1.09		1.14		1.14		10.74	87.7
	139.0		92.78	2.12	0.15		0.23		0.23		2.13	83.7
	144.3		92.12	2.78	2.28	1.30	2.34	1.36	1.85		28.26	87.6
	150.0		92.40	2.50	1.63		1.69		1.69		24.77	87.6
	156.0		92.30	2.60	1.50	0.33	1.56	0.41	0.99		15.40	86.6
	162.0		92.05	2.85	0.91	0.38	0.96	0.47	0.71		6.11	86.6
	167.0		95.20	-0.30								86.6
	171.0		94.10	0.80	0.80	0.01	0.86	0.02	0.44		1.09	87.7
RWE	177.2	6.17	94.98	0.00	0.00	0.00	0.00	0.00	0.00		0.00	87.7
	179.1	4.47	96.68									87.7
	183.0	4.52	96.63									87.7
	188.4	4.12	97.03									87.7
	190.1	5.11	96.04									81.6
	193.5	4.04	97.11									81.6
	196.8	3.52	97.63									18.7
RWP	199.8	2.42	98.73									18.7
	205.8	1.95	99.20									18.7

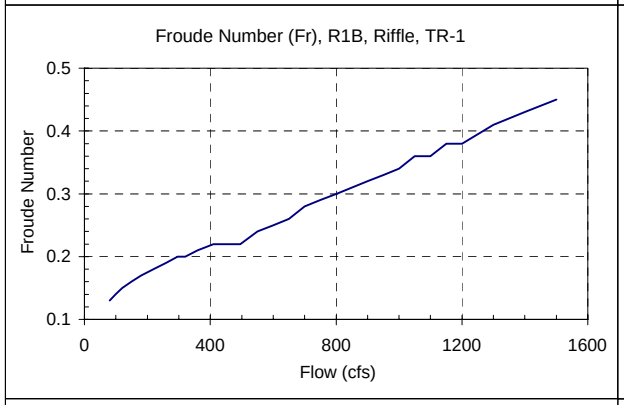


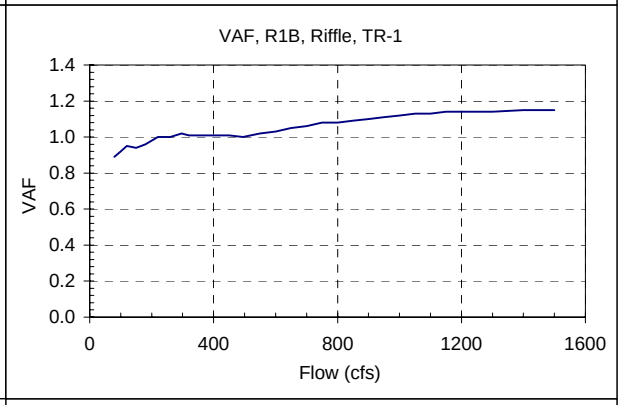
Stream: Sultan River
Site: Reach 1B
Transect: 1
Habitat: Riffle
Date: 7/18/07

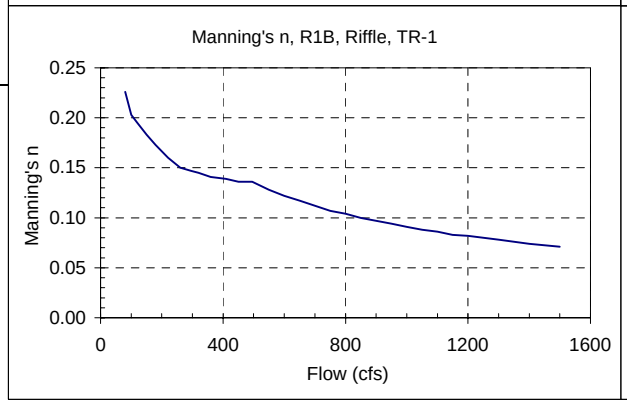
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
80	94.37	0.13	0.76	0.89	0.226	94.4
100	94.50	0.14	0.85	0.92	0.203	104.7
120	94.62	0.15	0.92	0.95	0.195	109.5
150	94.77	0.16	1.02	0.94	0.183	115.4
180.0	94.91	0.17	1.10	0.96	0.173	125.1
220	95.06	0.18	1.21	1.00	0.160	136.3
260	95.19	0.19	1.30	1.00	0.150	149.6
296.0	95.30	0.20	1.36	1.02	0.147	154.9
320	95.37	0.20	1.41	1.01	0.145	158.1
360	95.47	0.21	1.48	1.01	0.141	162.7
410	95.59	0.22	1.56	1.01	0.139	165.9
450	95.67	0.22	1.63	1.01	0.136	167.3
495.0	95.77	0.22	1.70	1.00	0.136	168.9
550	95.82	0.24	1.83	1.02	0.128	169.3
600	95.87	0.25	1.95	1.03	0.122	169.8
650	95.91	0.26	2.06	1.05	0.117	170.1
700	95.95	0.28	2.18	1.06	0.112	170.3
750	95.98	0.29	2.30	1.08	0.107	170.5
800	96.02	0.30	2.40	1.08	0.104	170.7
850	96.05	0.31	2.51	1.09	0.100	170.9
900.0	96.08	0.32	2.62	1.10	0.097	171.1
950	96.11	0.33	2.73	1.11	0.094	171.4
1000	96.14	0.34	2.83	1.12	0.091	171.7
1050	96.16	0.36	2.95	1.13	0.088	171.9
1100	96.19	0.36	3.04	1.13	0.086	172.2
1150	96.21	0.38	3.15	1.14	0.083	172.4
1200	96.24	0.38	3.24	1.14	0.082	172.7
1300	96.28	0.41	3.45	1.14	0.078	173.4
1400.0	96.32	0.43	3.65	1.15	0.074	174.1
1500	96.36	0.45	3.85	1.15	0.071	174.7

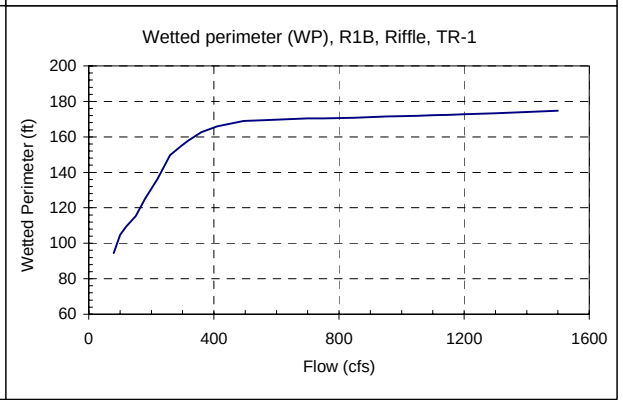


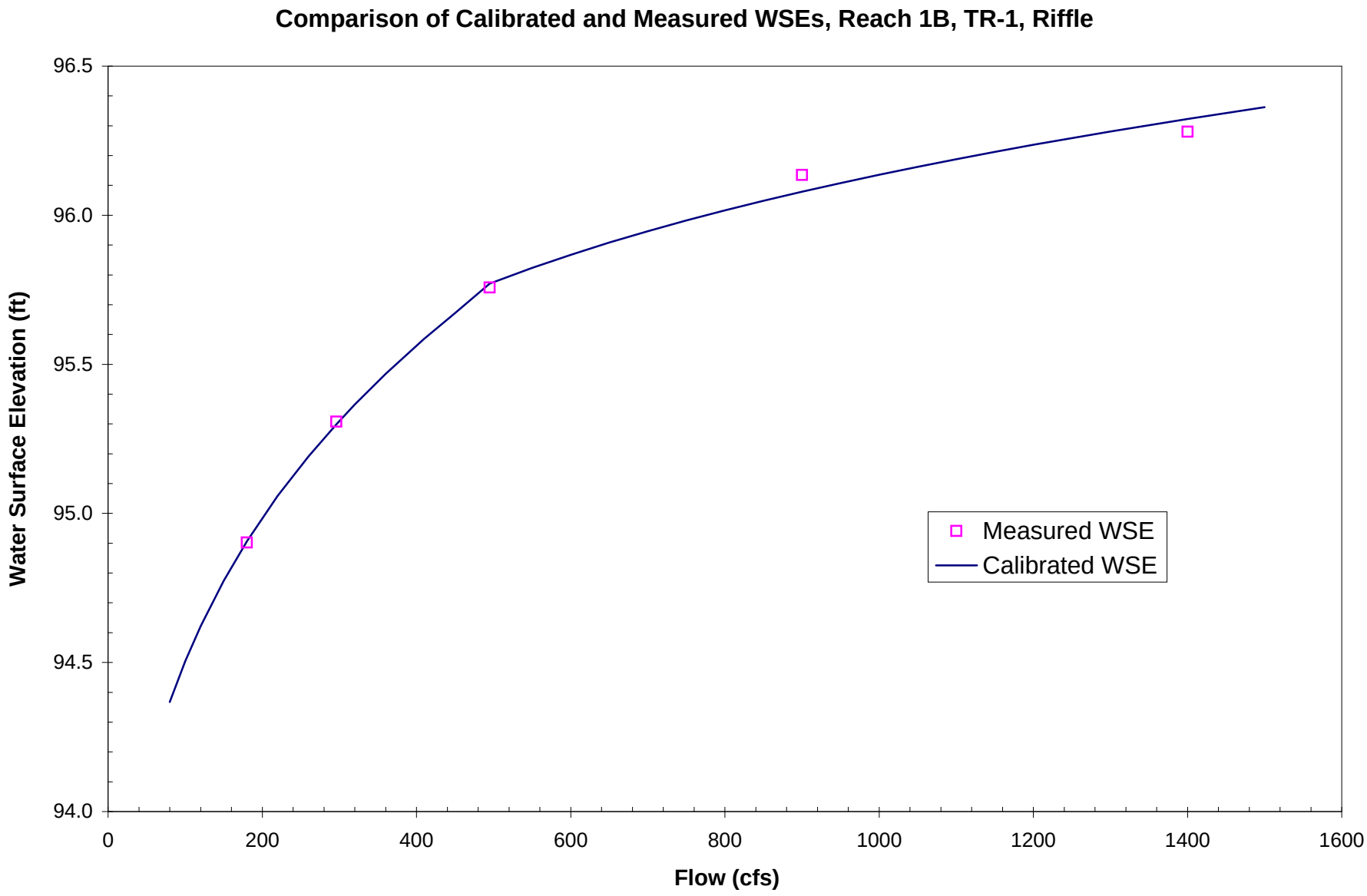











Comparison of Calibrated and Measured WSEs, Reach 1B, TR-1, Riffle
Water Surface Elevation (ft)
96.5
96.0
95.5
95.0
94.5
94.0
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A

Date: 7/18/2007 **Transect:** 10
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	1.62	101.62		100.00
HP-1			2.33	99.29
rock			3.38	98.24
TP				
rock	3.45	101.69		
HP-1			2.40	99.29
BM			1.69	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
10-L	73		101.69	5.40	0.00	96.29	96.29	
10-R			101.69	5.59	0.00	96.10		405.2
			101.69					

Ave Q= 405.2

(2.1) Longitudinal WSE Slope

Location	River Station	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	60	101.69	4.06	0.00	97.63
d/s	-50		6.03	0.00	95.66

Note: SC#3 TR-6 WSE = 97.79
WSE slope = 1.791%

Level Loop for side Channel

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)	
HP-1	2.42	101.71		99.29	
BM2 (SC3, TR6)			2.41	99.30	99.77 in SC3, TR-6 Datum

(2.2) WSE at Side Channel 2, TR-6

Datum of R1A, TR-10	101.71	3.98	0.00	97.73		
Datum of SC-3, TR-6				98.20		54

Note: Q=54 estimated from the rating curves of SC-3, TR-6
Actual Side Channel measurement is 40.32 cfs

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4A
Calib #: NA

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	1.37	101.37		100.00
HP-1			2.03	99.34
rock			3.17	98.20
TP				
rock	3.23	101.43		
HP-1			2.09	99.34
BM			1.43	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
10-L	61		101.43	5.44	0.00	95.99	95.89	
10-M	82		101.43	5.53	0.00	95.90		261.7
10-R	118		101.43	5.66	0.00	95.77		

Ave Q= 261.7

(2.1) Longitudinal WSE Slope

Location	River Station	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50	101.43	4.22	0.00	97.21
d/s	-50		6.20	0.00	95.23

Note: SC#3 TR-6 WSE = 97.49
WSE slope = 1.980%

(2.2) Side Channel 3, TR-6 WSE

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			102.69	5.51	0.00	97.18	97.43	
6-M				5.01	0.00	97.68		
6-R				5.02	0.00	97.67		

(2.2) WSE at Side Channel 2, TR-6

Datum of R1A, TR-10	101.76	3.98	0.00	97.43		
Datum of SC-3, TR-6				97.90		25

Note: Q=25 estimated from the rating curves of SC-3, TR-6
Actual Side Channel measurement is 18.11 cfs

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4A
Calib #: NA

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	1.25	101.25		100.00
HP-1			1.90	99.35
rock			3.14	98.11
TP				
rock	3.06	101.17		
HP-1			1.82	99.35
BM			1.16	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
10-L			101.17				95.62	
10-M	81		101.17	5.50	0.00	95.67		188.0
10-R	116		101.17	5.60	0.00	95.57		

Ave Q= 188.0

(2.1) Longitudinal WSE Slope

Location	River Station	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50	101.17	4.82	0.00	96.35
d/s	-50		6.03	0.00	95.14

Note:
WSE slope = 1.210%

Note: Actual Side Channel measurement is 8.21 cfs

Date: 10/21/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.26	102.26		100.00
HP-1			2.97	99.29

Comment: No Level Loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
10-L			102.26	4.60	0.00	97.66	97.66	
10-R			102.26	5.03	0.00	97.23		

Ave Q= 1160

Note: SC#3 TR-6 WSE = 98.32
WSE slope = NA

(2.2) Side Channel 3, TR-6 WSE

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-R			102.26	3.94	0.00	98.32		

(2.2) WSE at Side Channel 2, TR-6

Based on datum of R1A, TR-10				98.32		
Based on datum of SC-3, TR-6				98.79	240	

Note: Q=240 estimated from the extended rating curves of SC-2, TR-6

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 12/20/2007
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP-1	3.25	102.54		99.29

Comment: No Level Loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
10-L			102.54	5.08	0.00	97.46	97.16	
10-M			102.54	6.73	1.35	97.16		

Ave Q= 737

Note: SC#3 TR-6 WSE = 98.14
WSE slope = NA

(2.2) Side Channel 3, TR-6 WSE

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-M			102.54	5.68	1.32	98.18	98.14	
6-R				5.60	1.16	98.10		

(2.2) WSE at Side Channel 2, TR-6

Based on datum of R1A, TR-10				98.14		
Based on datum of SC-3, TR-6				98.61	163	

Note: Q=163 estimated from the extended rating curves of SC-2, TR-6

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Stream:	Sultan R.	
Site:	Reach 1A	
Transect:	10	
Habitat:	Riffle	
Survey	HI	Q
Date	(ft)	(cfs)
7/18/2007	101.69	405.2
7/19/2007	101.43	261.7
7/20/2007	101.17	188.0

18-Jul-07

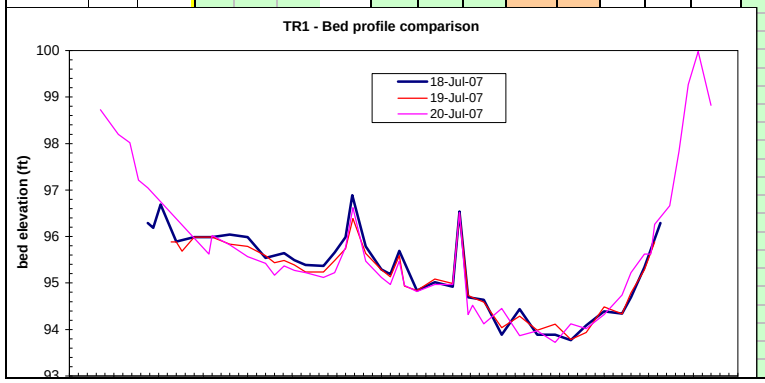
	Sta	FS	Ground	Depth	Vel (ft/s)					Angle	q	
	(ft)	(ft)	(ft)	(ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	(deg)	(cfs)	subs.
LWP	1.0											
LWE	7.6		96.29	0.00	0.00		0.00		0.00		0.00	87.7
	8.8		96.19	0.10	0.20		0.30		0.30		0.02	87.7
	10.5		96.69	-0.40								87.7
	14.0		95.89	0.40	0.57		0.62		0.62		0.50	67.6
	18.0		95.99	0.30	0.34		0.40		0.40		0.48	67.6
	22.0		95.99	0.30	0.38		0.44		0.44		0.52	67.6
	26.0		96.04	0.25	1.68		1.74		1.74	75	0.45	67.6
	30.0		95.99	0.30	2.60		2.67		2.67	75	0.83	67.6
	34.0		95.54	0.75	0.54		0.59		0.59	75	0.47	67.6
	38.2		95.64	0.65	1.09		1.14		1.14		2.42	68.7
	40.5		95.49	0.80	0.36		0.42		0.42		0.80	68.7
	43.0		95.39	0.90	0.97		1.02		1.02	25	2.72	67.7
	47.0		95.37	0.92	1.14		1.19		1.19	15	3.45	76.6
	49.5		95.66	0.63	0.83		0.88		0.88		1.39	87.7
	52.0		95.99	0.30	0.03		0.10		0.10		0.04	86.7
	53.5		96.89	-0.60								86.8
	56.5		95.79	0.50	0.75		0.80		0.80		0.70	86.8
	60.0		95.29	1.00	1.26		1.32		1.32	70	1.24	87.7
	62.0		95.19	1.10	0.65		0.70		0.70		1.55	46.6
	64.0		95.69	0.60	1.93		2.00		2.00	60	1.80	67.6
	68.0		94.84	1.45	1.01		1.06		1.06	45	4.36	67.6
	72.0		95.02	1.27	2.21		2.28		2.28		11.59	67.6
	76.0		94.92	1.37	1.43		1.49		1.49		4.08	86.6
	77.5		96.54	-0.25								86.6
	79.5		94.69	1.60	1.75		1.82		1.82		5.08	87.6
	83.0		94.64	1.65	3.93		4.01		4.01		24.80	76.7
	87.0		93.89	2.40	3.92		4.00		4.00		38.38	76.7
	91.0		94.44	1.85	5.50		5.61		5.61		41.51	78.7
	95.0		93.89	2.40	5.61		5.72		5.72		54.93	87.6
	99.0		93.89	2.40	4.71		4.80		4.80		43.24	76.6
	102.5		93.77	2.52	5.66		5.77		5.77		50.92	78.7
	106.0		94.09	2.20	3.14		3.21		3.21		26.50	76.7
	110.0		94.39	1.90	4.88		4.98		4.98		37.83	76.7
	114.0		94.34	1.95	4.72		4.81		4.81		28.16	76.7
	116.0		94.69	1.60	3.16		3.23		3.23		12.93	67.6
	119.0		95.34	0.95	0.42		0.47		0.47		1.47	67.6
RWE	122.6		96.29	0.00	0.00		0.00		0.00		0.00	76.7
RWP	134.0											

19-Jul-07

	Sta	FS	Ground	Depth	Vel (ft/s)					Angle	q	
	(ft)	(ft)	(ft)	(ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	(deg)	(cfs)	subs.
LWE	12.8		95.89	0.00	0.00		0.00		0.00		0.00	67.6
	14.0		95.89	0.00	0.00		0.00		0.00		0.00	67.6
	15.3		95.69	0.20	0.11		0.21		0.21		0.03	67.6
	18.0		95.99	-0.10								67.6
	22.0		95.99	-0.10								67.6
	26.0		95.84	0.05	0.44		0.49		0.49	80	0.01	67.6
	30.0		95.79	0.10	1.60		1.66		1.66	80	0.12	67.6
	34.0		95.59	0.30	0.11		0.21		0.21		0.19	67.6
	36.0		95.44	0.45	1.74		1.80		1.80		1.71	68.6
	38.2		95.49	0.40	0.42		0.47		0.47	15	0.41	68.7
	40.5		95.39	0.50	0.84		0.89		0.89		1.07	68.7
	43.0		95.24	0.65	0.73		0.78		0.78		1.65	67.7
	47.0		95.24	0.65	0.88		0.93		0.93		1.97	76.6
	49.5		95.49	0.40	0.48		0.53		0.53		0.53	87.7
	52.0		95.74	0.15	0.05		0.16		0.16		0.03	86.7
	53.6		96.39	-0.50								86.8
	56.5		95.64	0.25	0.35		0.41		0.41		0.18	86.8
	60.0		95.29	0.60	1.15		1.20		1.20	45	1.41	87.7
	62.0		95.14	0.75	0.53		0.58		0.58	25	0.79	46.6
	64.0		95.59	0.30	1.05		1.10		1.10	30	0.46	67.6
	65.2		94.94	0.95	1.49		1.55		1.55	30	2.55	67.7
	68.0		94.84	1.05	0.90		0.95		0.95	30	2.95	67.6
	72.0		95.09	0.80	1.28		1.34		1.34		4.28	67.6
	76.0		94.99	0.90	0.74		0.79		0.79		1.43	86.6
	77.5		96.49	-0.60								86.6
	79.5		94.74	1.15	0.69		0.74		0.74		0.43	87.6
	80.5		94.69	1.20	1.91		1.98		1.98		4.15	87.6
	83.0		94.59	1.30	3.48		3.55		3.55		15.01	76.7
	87.0		94.04	1.85	3.31		3.38		3.38		25.03	76.7
	91.0		94.29	1.60	4.14		4.22		4.22		27.03	78.7
	95.0		93.99	1.90	5.69		5.80		5.80		44.11	87.6
	99.0		94.12	1.77	3.71		3.78		3.78		25.12	76.6
	102.5		93.79	2.10	4.81		4.91		4.91		36.06	78.7
	106.0		93.94	1.95	2.52		2.59		2.59		18.96	76.7
	110.0		94.49	1.40	3.09		3.16		3.16		17.71	76.7
	114.0		94.34	1.55	4.06		4.14		4.14		19.26	76.7
	116.0		94.79	1.10	2.34		2.41		2.41		6.63	67.6
	119.0		95.29	0.60	0.19		0.29		0.29		0.46	67.6
RWE	121.3		95.89	0.00	0.00		0.00		0.00		0.00	76.6

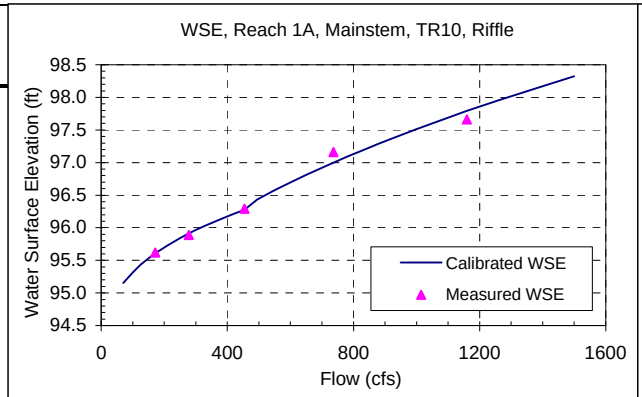
20-Jul-07

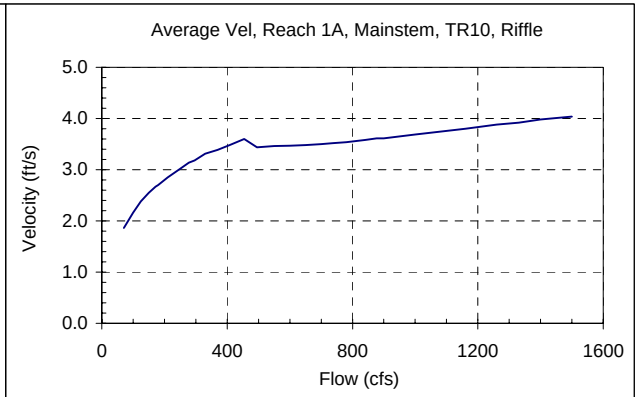
	Sta	FS	Ground	Depth	Vel (ft/s)					Angle	q	
	(ft)	(ft)	(ft)	(ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	(deg)	(cfs)	subs.
	-3.0	2.44	98.73									19.7
LWP	1.0	2.97	98.20									19.7
	3.6	3.15	98.02									91.7
	5.5	3.96	97.21									91.7
	7.6	4.12	97.05									87.7
LWE	21.3		95.62	0.00	0.00		0.00		0.00		0.00	67.6
	22		96.02	-0.40								67.6
	26		95.82	-0.20								67.6
	30.0		95.57	0.05	0.01		0.03		0.03		0.00	67.6
	34.0		95.42	0.20	0.20		0.30		0.30		0.18	67.6
	36.0		95.17	0.45	0.98		1.03		1.03		0.98	68.6
	38.2		95.37	0.25	0.01		0.03		0.03		0.02	68.7
	40.5		95.27	0.35	0.10		0.21		0.21		0.17	68.7
	43.0		95.22	0.40	0.43		0.48		0.48		0.62	67.7
	47.0		95.12	0.50	0.93		0.98		0.98		1.60	76.6
	49.5		95.22	0.40	0.09		0.19		0.19		0.09	87.7
	52.0		95.77	-0.15								86.7
	53.6		96.62	-1.00								86.8
	56.5		95.47	0.15	0.43		0.48		0.48		0.13	86.8
	60.0		95.12	0.50	1.85		1.92		1.92		2.64	87.7
	62.0		94.97	0.65	0.10		0.21		0.21		0.27	46.6
	64.0		95.47	0.15	0.80		0.85		0.85		0.20	67.6
	65.2		94.95	0.67	0.70		0.75		0.75		1.01	67.7
	68.0		94.82	0.80	0.16		0.27		0.27		0.73	67.6
	72.0		94.97	0.65	0.77		0.82		0.82		2.14	67.6
	76.0		94.97	0.65	0.99		1.04		1.04		1.36	86.6
	77.5		96.52	-0.90								86.6
	79.5		94.32	1.30	0.58		0.63		0.63		0.41	87.6
	80.5		94.52	1.0	1.70		1.76		1.76		3.09	87.6
	83.0		94.12	1.10	2.77		2.84		2.84		10.16	76.7
	87.0		94.45	1.50	3.99		4.07		4.07		24.42	76.7
	91.0		93.87	1.17	3.98		4.06		4.06		19.00	78.7
	95.0		93.97	1.75	3.78		3.86		3.86		26.99	87.6
	99.0		93.72	1.65	2.85		2.92		2.92		18.08	76.6
	102.5		94.12	1.90	4.28		4.37		4.37		29.03	78.7
	106.0		94.02	1.50	2.02		2.09		2.09		11.75	76.7
	110.0		94.32	1.60	2.79		2.86		2.86		18.31	76.7
	114.0		94.74	1.30	2.96		3.03		3.03		11.82	76.7
	116.0		95.22	0.88	1.13		1.18		1.18		2.61	67.6
	119.0		95.62	0.40	0.11		0.21		0.21		0.19	67.6
RWE	120.5		95.62	0.00	0.00		0.00		0.00		0.00	76.6
	121.3	4.91	96.26									76.7
	124.7	4.51	96.66									76.7
	126.8	3.34	97.83									76.7
	128.9	1.90	99.27									65.7
	131.1	1.19	99.98									65.8
RWP	134.0	2.35	98.82									65.7

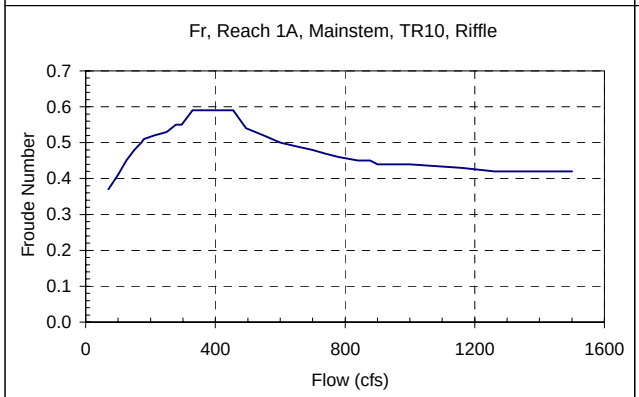


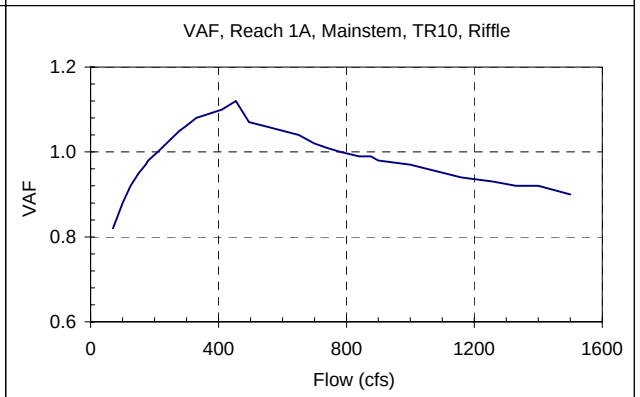
Stream: Sultan R.
Site: Reach 1A
Habitat: Riffle
Transect: 10

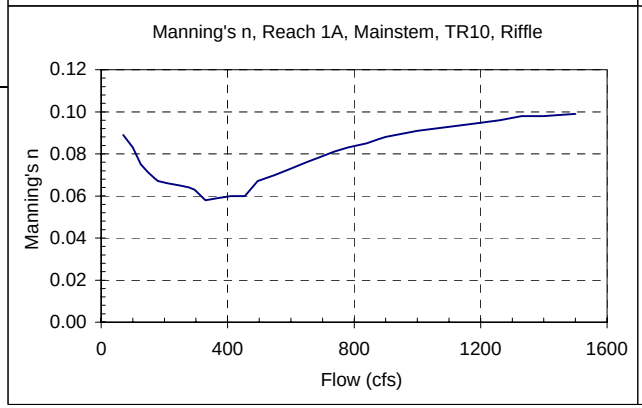
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
70	95.15	0.37	1.86	0.82	0.089	49.4
100	95.32	0.41	2.16	0.88	0.083	54.2
125	95.43	0.45	2.38	0.92	0.075	62.3
150	95.53	0.48	2.55	0.95	0.071	67.5
171.8	95.61	0.50	2.67	0.97	0.068	74.8
180	95.64	0.51	2.70	0.98	0.067	77.8
210	95.73	0.52	2.85	1.00	0.066	81.0
250	95.84	0.53	3.02	1.03	0.065	84.1
277.9	95.91	0.55	3.14	1.05	0.064	88.0
296	95.96	0.55	3.18	1.06	0.063	91.5
330	96.03	0.59	3.31	1.08	0.058	104.5
370	96.12	0.59	3.39	1.09	0.059	107.5
410	96.20	0.59	3.49	1.10	0.060	108.8
454.7	96.28	0.59	3.60	1.12	0.060	111.2
495	96.44	0.54	3.44	1.07	0.067	114.9
550	96.57	0.52	3.46	1.06	0.070	117.7
600	96.69	0.50	3.47	1.05	0.073	120.0
650	96.81	0.49	3.48	1.04	0.076	121.1
700	96.92	0.48	3.50	1.02	0.079	122.0
737	97.00	0.47	3.52	1.01	0.081	122.4
780	97.09	0.46	3.54	1.00	0.083	122.8
840	97.21	0.45	3.58	0.99	0.085	123.3
877	97.28	0.45	3.61	0.99	0.087	123.6
900	97.33	0.44	3.61	0.98	0.088	123.9
1000	97.51	0.44	3.69	0.97	0.091	124.7
1160	97.79	0.43	3.80	0.94	0.094	126.0
1260	97.95	0.42	3.88	0.93	0.096	126.7
1330	98.07	0.42	3.92	0.92	0.098	127.8
1400	98.17	0.42	3.98	0.92	0.098	129.4
1500	98.32	0.42	4.04	0.90	0.099	131.0

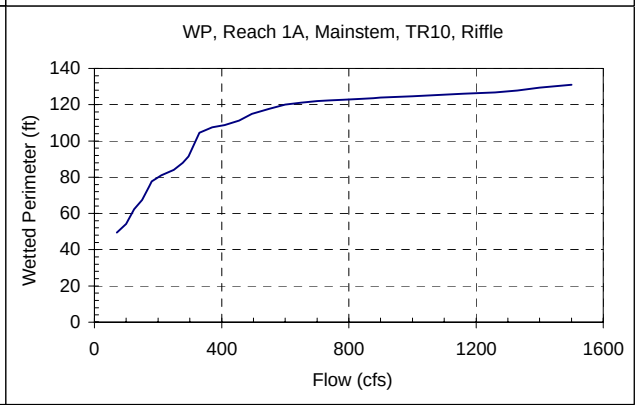


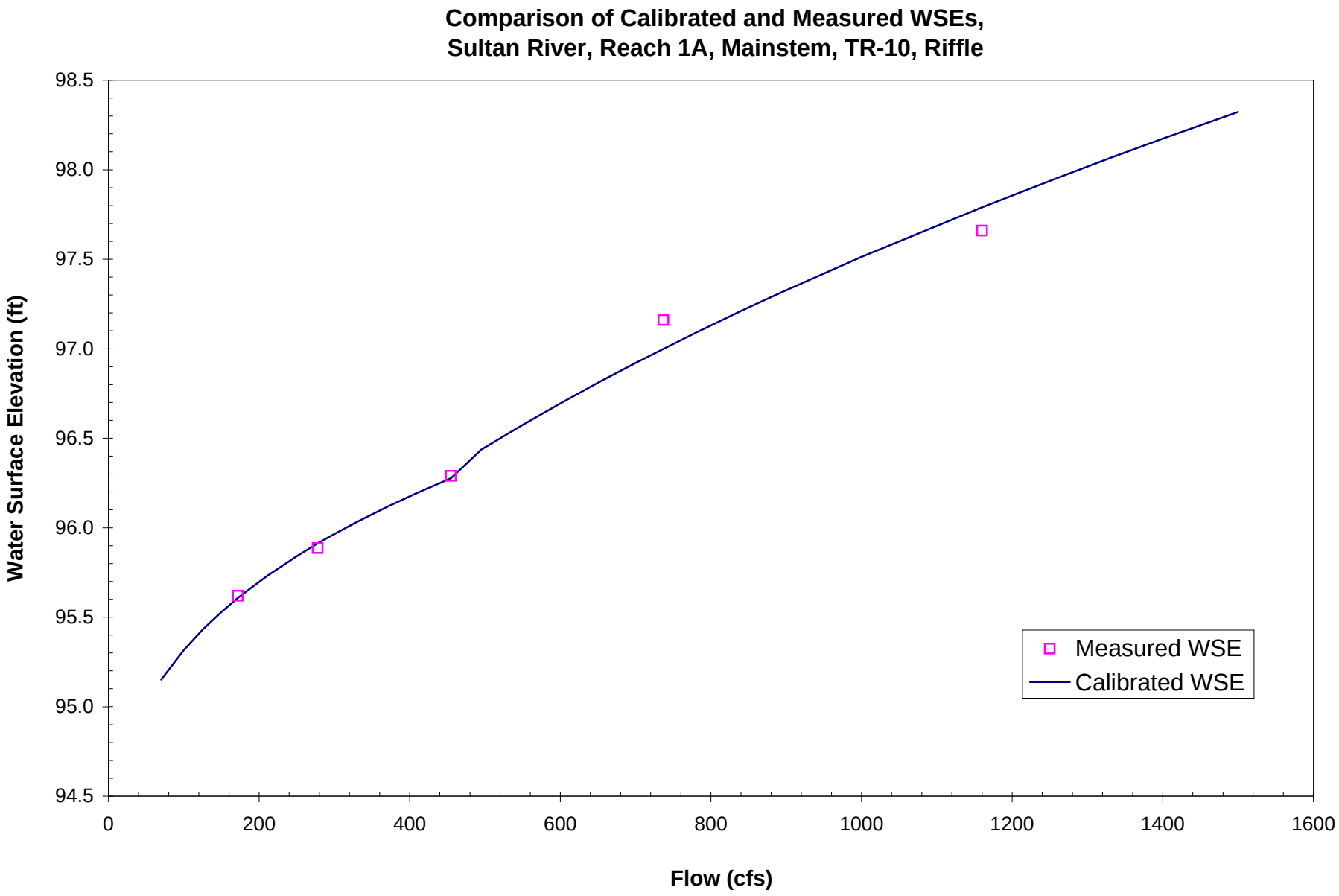











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Mainstem, TR-10, Riffle
Water Surface Elevation (ft)
98.5
98.0
97.5
97.0
96.5
96.0
95.5
95.0
94.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Date: 10/21/2007
Habitat: Pool **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.60	100.60		100.00
HP			3.88	96.72

Comment: No Level Loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
9-L			######	6.54	0.00	94.06	94.07	
9-R				6.53	0.00	94.07		

Ave Q= 1160

Note: Use Q - measurement from USGS flow records
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 12/20/2007
Habitat: Pool **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.07	103.07		100.00
HP			6.35	96.72

Comment: No Level Loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
9-L			103.07	9.39	0.00	93.68	93.72	
9-M				13.13	3.81	93.75		

Ave Q= 737

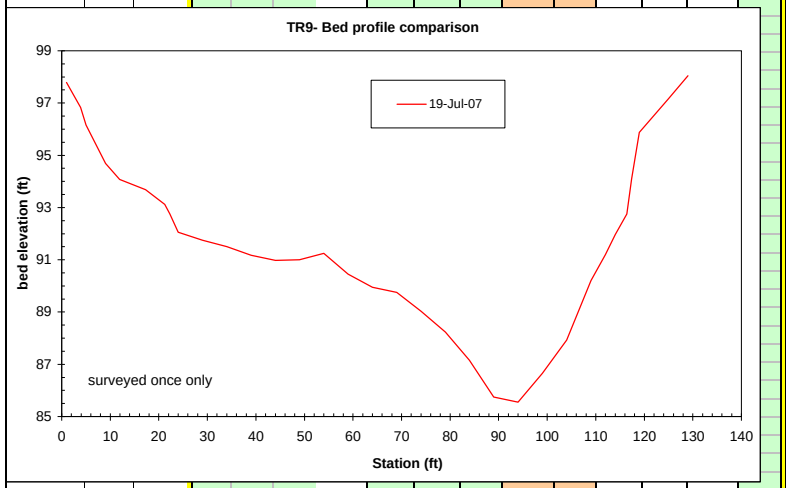
Note: Use Q - measurement from USGS flow records
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Stream: Sultan R.
Site: Reach 1A
Transect: 9
Habitat: Pool

Survey Date	HI (ft)	Q (cfs)
7/18/2007	101.01	
7/19/2007	100.64	251.9
7/20/2007	99.41	



18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

19-Jul-07

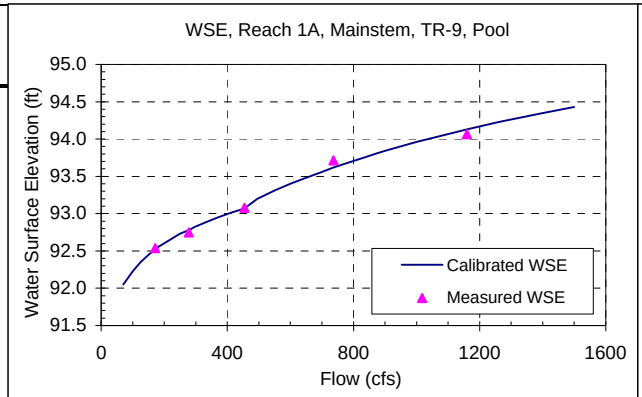
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	2.85	97.79									21.6
	3.9	3.81	96.83									31.6
	5.0	4.48	96.16									34.7
	9	5.95	94.69									24.6
	11.9	6.56	94.08									23.7
	17.3	6.95	93.69									23.7
	21.2	7.52	93.12									23.7
LWE	22.3		92.75	0.00	0.00		0.00		0.00		0.00	21.8
	24.0		92.05	0.70	0.06		0.14		0.14		0.32	21.8
	29.0		91.75	1.00	0.25		0.33		0.33		1.66	21.8
	34.0		91.50	1.25	0.32		0.40		0.40		2.52	21.8
	39.0		91.17	1.58	0.52		0.60		0.60		4.73	23.8
	44.0		90.98	1.77	0.50		0.58		0.58		5.13	23.8
	49.0		91.00	1.75	0.48		0.56		0.56		4.90	23.6
	54.0		91.25	1.50	0.42		0.50		0.50		3.78	32.6
	59.0		90.45	2.30	0.62		0.69		0.69		7.96	32.7
	64.0		89.95	2.80	0.70	0.63	0.76	0.70	0.73		10.25	32.7
	69.0		89.75	3.00	0.76	0.72	0.82	0.78	0.80		11.98	34.7
	74.0		89.03	3.72	0.88	0.76	0.93	0.82	0.88		16.28	45.8
	79.0		88.23	4.52	0.89	0.80	0.94	0.86	0.90		20.32	54.8
	84.0		87.15	5.60	1.02	0.88	1.07	0.93	1.00		28.05	56.6
	89.0		85.75	7.00	0.95	0.24	1.00	0.32	0.66		23.20	76.7
	94.0		85.55	7.20	1.32	0.82	1.38	0.87	1.13		40.54	76.7
	99.0		86.65	6.10	1.51	0.76	1.57	0.82	1.19		36.44	87.6
	104.0		87.93	4.82	1.50	0.36	1.56	0.44	1.00		24.18	86.6
	109.0		90.20	2.55	0.71		0.77		0.77		7.87	68.6
	112.0		91.20	1.55	0.21		0.29		0.29		1.14	87.7
	114.0		91.97	0.78	0.33		0.41		0.41		0.71	76.6
RWE	116.4		92.75	0.00	0.00		0.00		0.00		0.00	75.8
	117.4	6.54	94.10									81.6
RWP	119.0	4.76	95.88									81.6
	125.0	3.48	97.16									81.6
	129.0	2.60	98.04									81.6

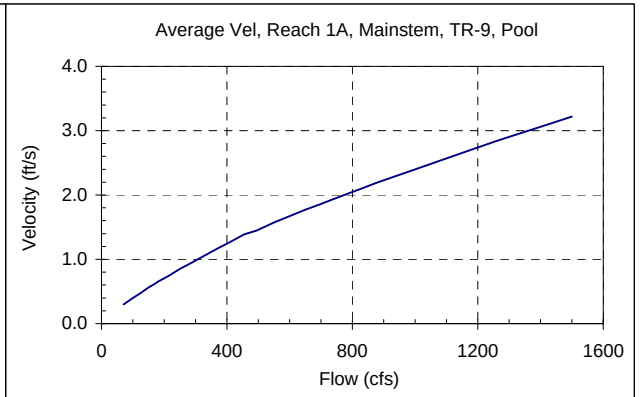
20-Jul-07

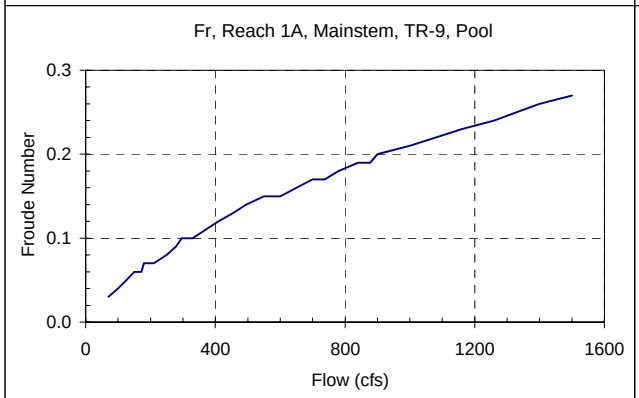
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

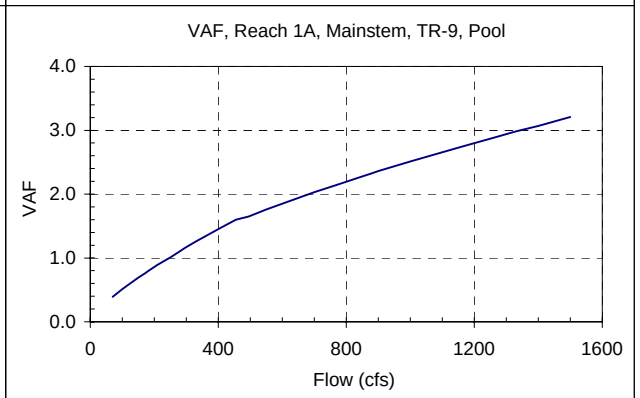
Stream: Sultan R.
Site: Reach 1A
Habitat: Pool
Transect: 9

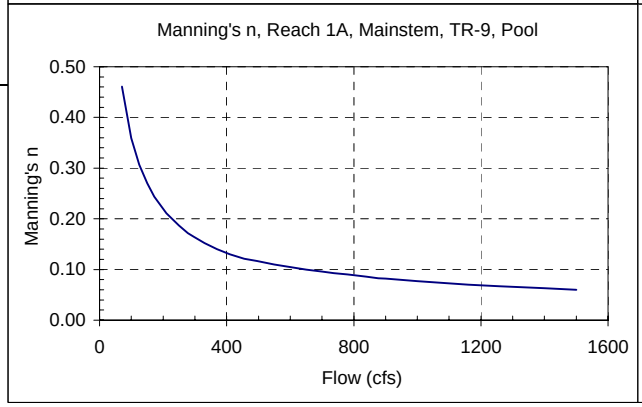
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
70	92.05	0.03	0.30	0.39	0.461	91.9
100	92.23	0.04	0.40	0.51	0.359	92.9
125	92.35	0.05	0.48	0.60	0.307	93.7
150	92.45	0.06	0.56	0.69	0.270	94.2
171.8	92.52	0.06	0.62	0.76	0.244	94.6
180	92.55	0.07	0.65	0.79	0.237	94.8
210	92.63	0.07	0.73	0.89	0.211	95.3
250	92.73	0.08	0.85	1.01	0.187	95.9
277.9	92.78	0.09	0.92	1.10	0.172	96.1
296	92.82	0.10	0.97	1.16	0.165	96.3
330	92.88	0.10	1.06	1.26	0.152	96.6
370	92.95	0.11	1.17	1.37	0.140	96.9
410	93.01	0.12	1.27	1.48	0.130	97.1
454.7	93.07	0.13	1.39	1.60	0.121	97.4
495	93.20	0.14	1.45	1.65	0.117	98.3
550	93.31	0.15	1.57	1.76	0.110	99.2
600	93.40	0.15	1.67	1.85	0.105	99.9
650	93.48	0.16	1.77	1.94	0.100	100.6
700	93.56	0.17	1.86	2.03	0.096	101.2
737	93.62	0.17	1.93	2.09	0.093	101.7
780	93.68	0.18	2.01	2.16	0.090	102.2
840	93.76	0.19	2.12	2.26	0.086	103.3
877	93.81	0.19	2.19	2.32	0.083	104.1
900	93.84	0.20	2.23	2.36	0.082	104.5
1000	93.96	0.21	2.40	2.51	0.077	106.4
1160	94.13	0.23	2.67	2.74	0.070	108.5
1260	94.23	0.24	2.84	2.88	0.067	109.1
1330	94.29	0.25	2.95	2.98	0.065	109.5
1400	94.35	0.26	3.06	3.07	0.063	109.8
1500	94.43	0.27	3.22	3.21	0.060	110.3

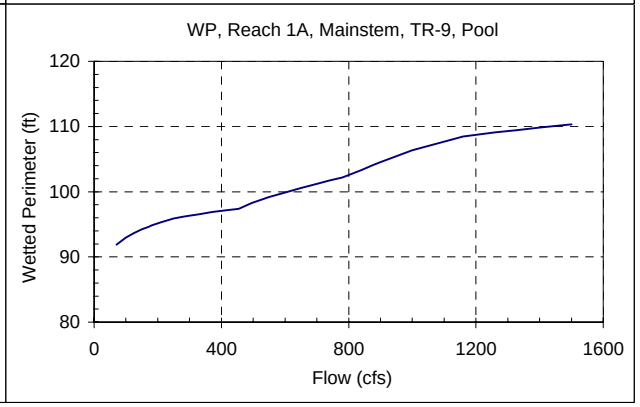


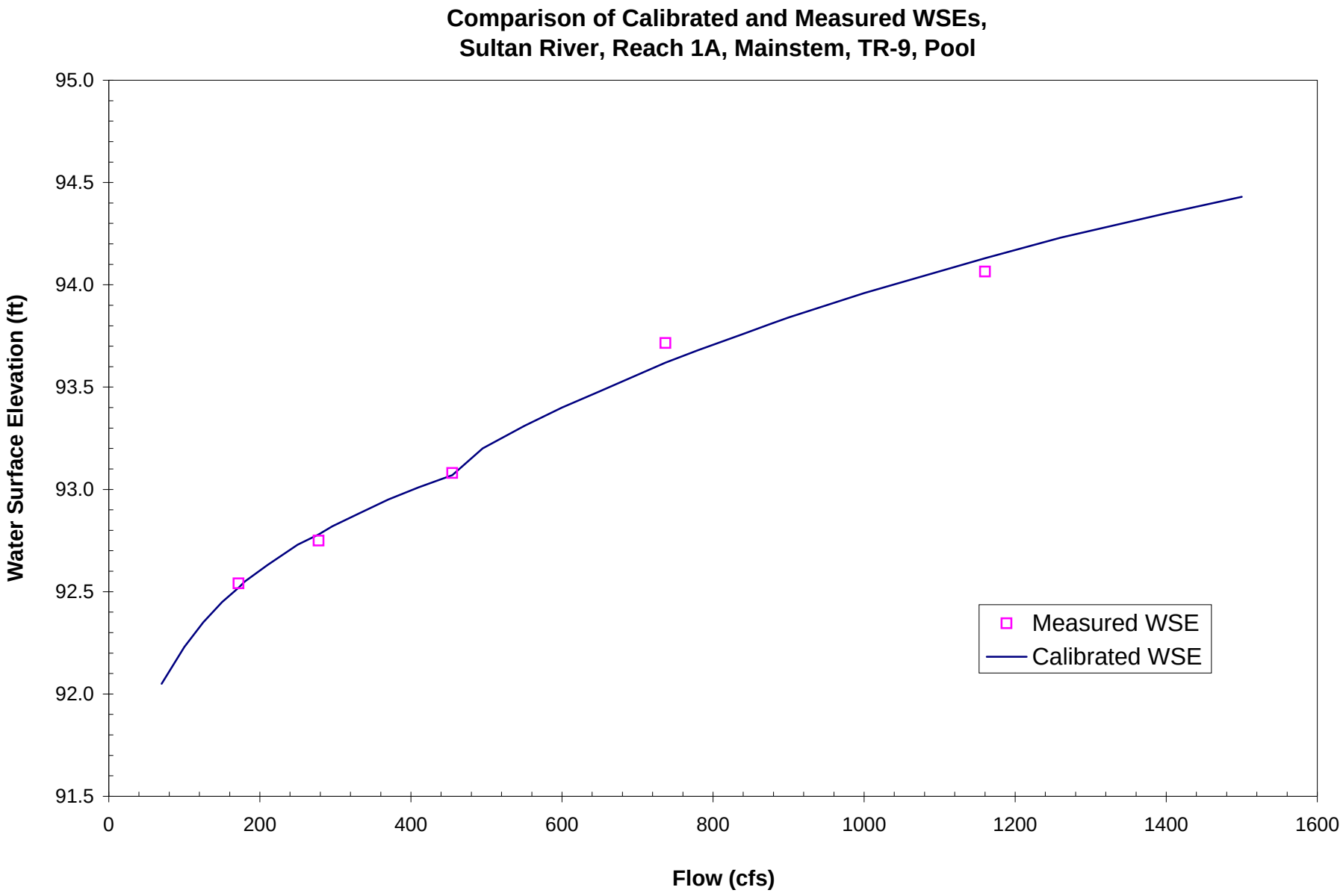











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Mainstem, TR-9, Pool
Water Surface Elevation (ft)
95.0
94.5
94.0
93.5
93.0
92.5
92.0
91.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A
Date: 7/17/2007 **Transect:** 8
Habitat: Riffle **Flow:** Bank Profile

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.83	104.83		100.00
BM2			4.85	99.98
BM3			2.00	102.83

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
8-L						0.00	0.00	
8-R						0.00		

Ave Q=

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 7/18/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.54	#####		100.00
BM2			4.56	99.98

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
8-L			104.54	7.46	0.00	97.08	97.12	464.1
8-R				7.38	0.00	97.16		

Ave Q= 464.1

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.09	#####		#####
BM2			4.11	99.98
BM3			1.26	#####

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
8-L			104.09	7.20	0.00	96.89	96.86	265.3
8-R				7.27	0.00	96.82		

Ave Q= 265.3

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.11	104.11		100.00
BM2			4.13	99.98
BM3			1.29	102.82

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
8-L			104.11	7.42		96.69	96.67	168.2
8-R				7.47		96.64		

Ave Q= 168.2

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 10/21/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.68	104.68		100.00
BM2			4.70	99.98
BM3			1.86	102.82

Comment: 1/2 loop only

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
8-L			104.68	6.87	0.00	97.81	97.83	
8-R				6.84	0.00	97.84		

Ave Q= 0

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 12/20/2007
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM2	4.92	104.90		99.98
BM1			4.90	100.00

Comment: 1/2 loop only

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
8-L			104.90	7.33	0.00	97.57	97.58	
8-M				9.40	2.08	97.58		

Ave Q= 0

Note:

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

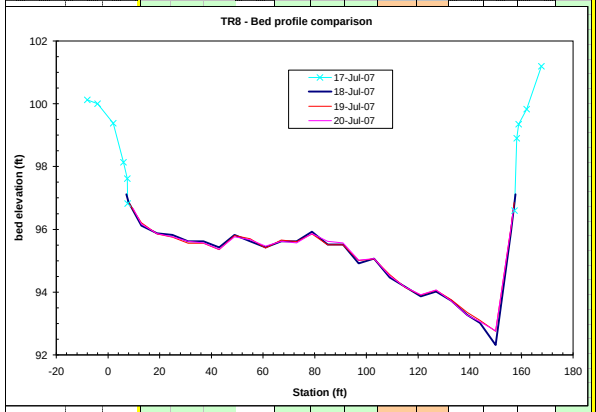
Meter ID: NA
Propeller ID: NA
Calib #: NA

Stream: Sultan R.
Site: Reach 1A
Transect: 8
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/17/2007	104.83	
7/18/2007	104.54	464.1
7/19/2007	104.09	265.3
7/20/2007	104.11	168.2

17-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs
	-8.0	4.71	100.12									11.9
	-4.0	4.83	100.00									11.9
	2.0	5.45	99.38									11.9
	6.0	6.69	98.14									11.9
	7.5	7.21	97.62									11.9
RWE	7.6	8.01	96.82									11.9
LWE	157.3	8.23	96.60									11.9
	158.2	5.93	98.90									11.9
	159.0	5.48	99.35									11.9
	162.0	5.00	99.83									11.9
LWP	167.8	3.64	101.19									11.9



18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs
RWE	7.1		97.12	0.00	0.00		0.00		0.00		0.00	26.8
	8.0		96.86	0.26	0.05		0.17		0.17		0.13	26.8
	13.0		96.12	1.00	1.11		1.16		1.16		6.38	57.5
	19.0		95.87	1.25	1.78		1.84		1.84		13.82	76.6
	25.0		95.82	1.30	1.49		1.55		1.55		12.06	65.6
	31.0		95.62	1.50	0.98		1.03		1.03		9.30	58.5
	37.0		95.62	1.50	1.44		1.49		1.49		13.45	64.5
	43.0		95.42	1.70	1.87		1.94		1.94		19.74	57.5
	49.0		95.82	1.30	1.85		1.91		1.91		14.93	75.6
	55.0		95.62	1.50	1.21		1.26		1.26		11.32	87.6
	61.0		95.42	1.70	1.69		1.75		1.75		17.86	74.6
	67.0		95.62	1.50	1.71		1.77		1.77		15.94	43.6
	73.0		95.62	1.50	1.56		1.62		1.62		14.56	68.6
	79.0		95.92	1.20	1.75		1.81		1.81		13.05	56.6
	85.0		95.52	1.60	1.20		1.25		1.25		11.98	65.6
	91.0		95.52	1.60	1.40		1.45		1.45		13.95	43.6
	97.0		94.92	2.20	1.51		1.57		1.57		20.68	48.6
	103.0		95.07	2.05	1.51		1.57		1.57		19.27	54.6
	109.0		94.47	2.65	1.09	1.69	1.14	1.75	1.45		22.98	56.8
	115.0		94.17	2.95	1.18	1.88	1.23	1.95	1.59		28.08	56.6
	121.0		93.87	3.25	1.00	1.80	1.05	1.86	1.46		28.43	58.6
	127.0		94.02	3.10	1.18	1.65	1.23	1.71	1.47		27.32	45.8
	133.0		93.72	3.40	1.23	1.60	1.28	1.66	1.47		29.96	45.8
	139.0		93.27	3.85	1.25	1.58	1.30	1.64	1.47		31.10	46.8
	144.0		93.02	4.10	1.74	1.78	1.80	1.84	1.82		41.10	85.6
	150.0		92.32	4.80	0.60	1.09	0.65	1.14	0.89		25.74	81.8
	156.0		95.92	1.20	0.10		0.20		0.20		0.93	16.9
LWE	157.7		97.12	0.00	0.00		0.00		0.00		0.00	11.9

19-Jul-07

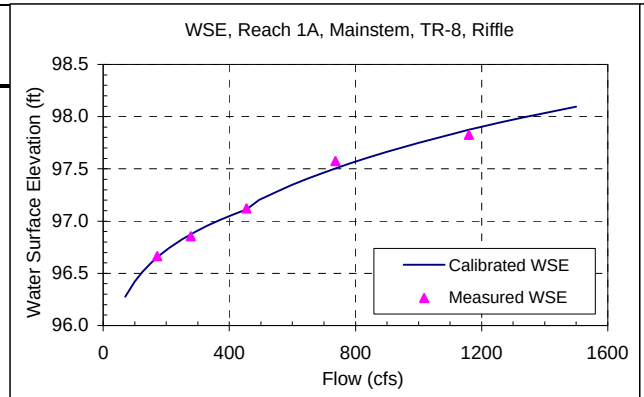
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs
RWE	8.0		96.86	0.00	0.00		0.00		0.00		0.00	26.8
	13.0		96.21	0.65	0.66		0.71		0.71		3.92	57.5
	19.0		95.86	1.00	1.11		1.16		1.16		6.96	76.6
	25.0		95.76	1.10	1.22		1.27		1.27		8.37	65.6
	31.0		95.56	1.30	0.45		0.49		0.49		3.82	58.5
	37.0		95.56	1.30	1.25		1.30		1.30		10.13	64.5
	43.0		95.36	1.50	1.07		1.12		1.12		10.09	57.5
	49.0		95.81	1.05	1.59		1.65		1.65		10.39	75.6
	55.0		95.71	1.15	1.42		1.47		1.47		10.17	87.6
	61.0		95.41	1.45	1.24		1.29		1.29		11.21	74.6
	67.0		95.66	1.20	1.17		1.22		1.22		8.76	43.6
	73.0		95.61	1.25	0.85		0.90		0.90		6.79	68.6
	79.0		95.86	1.00	1.08		1.13		1.13		6.78	56.6
	85.0		95.51	1.35	0.88		0.93		0.93		7.57	65.6
	91.0		95.51	1.35	1.03		1.08		1.08		8.76	43.6
	97.0		95.01	1.85	1.00		1.05		1.05		11.68	48.6
	103.0		95.06	1.80	0.90		0.95		0.95		10.31	54.6
	109.0		94.56	2.30	0.96		1.01		1.01		13.99	56.8
	115.0		94.16	2.70	0.77	1.11	0.82	1.16	0.99		16.07	56.6
	121.0		93.91	2.95	0.76	1.28	0.81	1.33	1.07		18.97	58.6
	127.0		94.06	2.80	0.88	1.11	0.93	1.16	1.05		17.59	45.8
	133.0		93.76	3.10	0.82	1.06	0.87	1.11	0.99		16.93	45.8
	139.0		93.36	3.50	0.89	1.00	0.94	1.05	1.00		19.23	46.8
	144.0		93.11	3.75	0.48	0.84	0.52	0.89	0.71		15.93	85.6
	150.0		92.76	4.10	0.06	0.61	0.18	0.66	0.42		10.33	81.8
	156.0		96.06	0.80	0.09		0.19		0.19		0.54	16.9
LWE	157.2		96.86	0.00	0.00		0.00		0.00		0.00	11.9

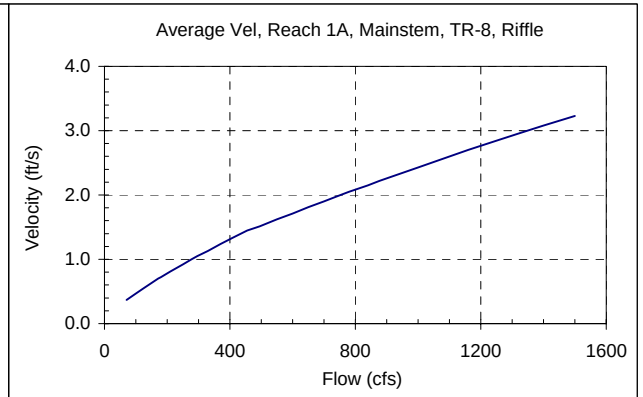
20-Jul-07

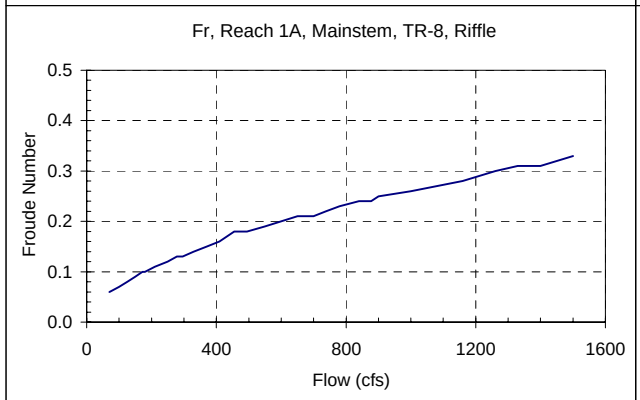
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs
RWE	9.7		96.67	0.00	0.00		0.00		0.00		0.00	26.8
	13.0		96.17	0.50	0.39		0.43		0.43		1.01	57.5
	19.0		95.87	0.80	0.85		0.90		0.90		4.34	76.6
	25.0		95.77	0.90	1.18		1.23		1.23		6.63	65.6
	31.0		95.62	1.05	0.46		0.50		0.50		3.15	58.5
	37.0		95.57	1.10	0.65		0.70		0.70		4.62	64.5
	43.0		95.37	1.30	1.42		1.47		1.47		11.50	57.5
	49.0		95.77	0.90	1.27		1.32		1.32		7.13	75.6
	55.0		95.67	1.00	0.07		0.19		0.19		1.14	87.6
	61.0		95.47	1.20	1.12		1.17		1.17		8.42	74.6
	67.0		95.62	1.05	0.94		0.99		0.99		6.26	43.6
	73.0		95.57	1.10	0.89		0.94		0.94		6.24	68.6
	79.0		95.87	0.80	0.89		0.94		0.94		4.54	56.6
	85.0		95.62	1.05	0.72		0.77		0.77		4.87	65.6
	91.0		95.57	1.10	0.79		0.84		0.84		5.57	43.6
	97.0		95.02	1.65	0.61		0.66		0.66		6.52	48.6
	103.0		95.07	1.60	0.65		0.70		0.70		6.72	54.6
	109.0		94.52	2.15	0.64		0.69		0.69		8.89	56.8
	115.0		94.17	2.50	0.69		0.74		0.74		11.12	56.6
	121.0		93.92	2.75	0.46	0.87	0.50	0.92	0.71		11.76	58.6
	127.0		94.07	2.60	0.53	0.84	0.57	0.89	0.73		11.46	45.8
	133.0		93.72	2.95	0.47	0.68	0.51	0.73	0.62		10.99	45.8
	139.0		93.27	3.40	0.38	0.71	0.43	0.76	0.59		11.10	46.8
	144.0		93.07	3.60	0.30	0.55	0.35	0.60	0.47		9.39	85.6
	150.0		92.77	3.90	0.00	0.37	0.00	0.42	0.21		4.87	81.8
	156.0		96.07	0.60	0.00		0.00		0.00		0.00	16.9
LWE	157.0		96.67	0.00	0.00		0.00		0.00		0.00	11.9

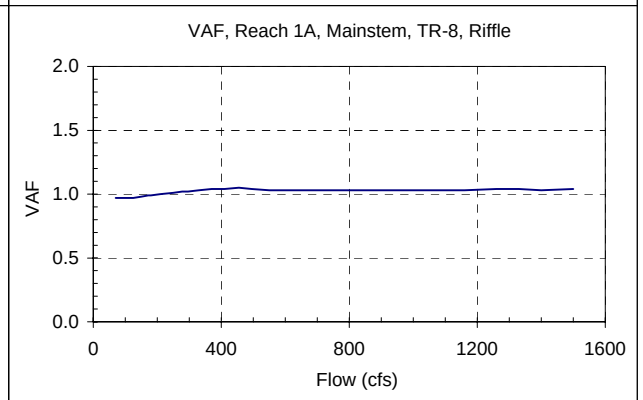
Stream: Sultan R.
Site: Reach 1A
Habitat: Riffle
Transect: 8

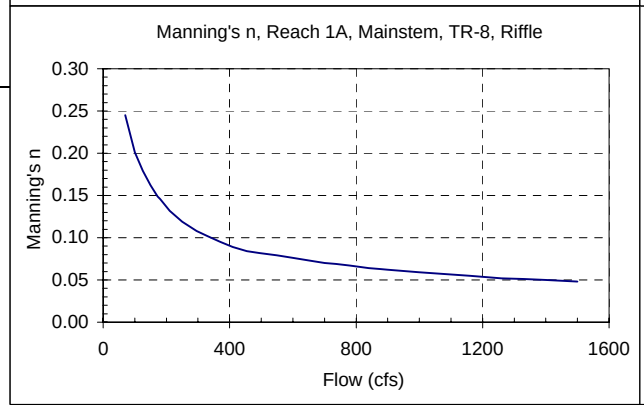
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
70	96.28	0.06	0.37	0.97	0.245	145.9
100	96.42	0.07	0.47	0.97	0.201	147.1
125	96.52	0.08	0.55	0.97	0.179	148.0
150	96.60	0.09	0.63	0.98	0.162	148.7
171.8	96.65	0.10	0.70	0.99	0.149	149.1
180	96.68	0.10	0.72	0.99	0.146	149.3
210	96.74	0.11	0.81	1.00	0.132	149.9
250	96.82	0.12	0.92	1.01	0.119	150.5
277.9	96.87	0.13	1.00	1.02	0.112	150.9
296	96.90	0.13	1.05	1.02	0.108	151.1
330	96.96	0.14	1.13	1.03	0.102	151.4
370	97.01	0.15	1.24	1.04	0.095	151.7
410	97.06	0.16	1.34	1.04	0.089	152.0
454.7	97.11	0.18	1.45	1.05	0.084	152.2
495	97.20	0.18	1.51	1.04	0.082	152.5
550	97.28	0.19	1.62	1.03	0.079	152.7
600	97.35	0.20	1.71	1.03	0.076	152.9
650	97.41	0.21	1.81	1.03	0.073	153.0
700	97.47	0.21	1.90	1.03	0.070	153.2
737	97.51	0.22	1.97	1.03	0.069	153.3
780	97.55	0.23	2.05	1.03	0.067	153.4
840	97.61	0.24	2.15	1.03	0.064	153.5
877	97.64	0.24	2.22	1.03	0.063	153.6
900	97.66	0.25	2.26	1.03	0.062	153.6
1000	97.75	0.26	2.43	1.03	0.059	153.9
1160	97.87	0.28	2.70	1.03	0.055	154.2
1260	97.94	0.30	2.86	1.04	0.052	154.3
1330	97.99	0.31	2.97	1.04	0.051	154.5
1400	98.04	0.31	3.08	1.03	0.050	154.6
1500	98.10	0.33	3.23	1.04	0.048	154.7

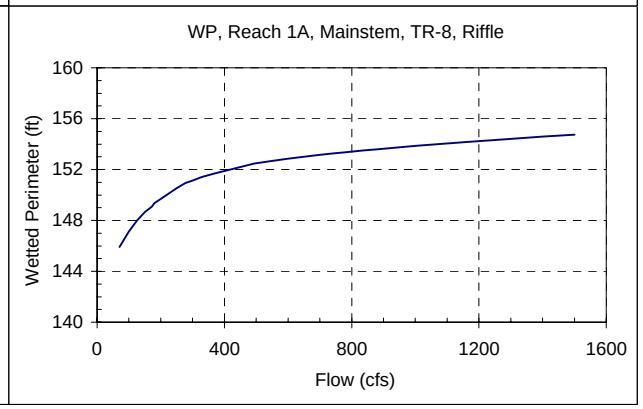


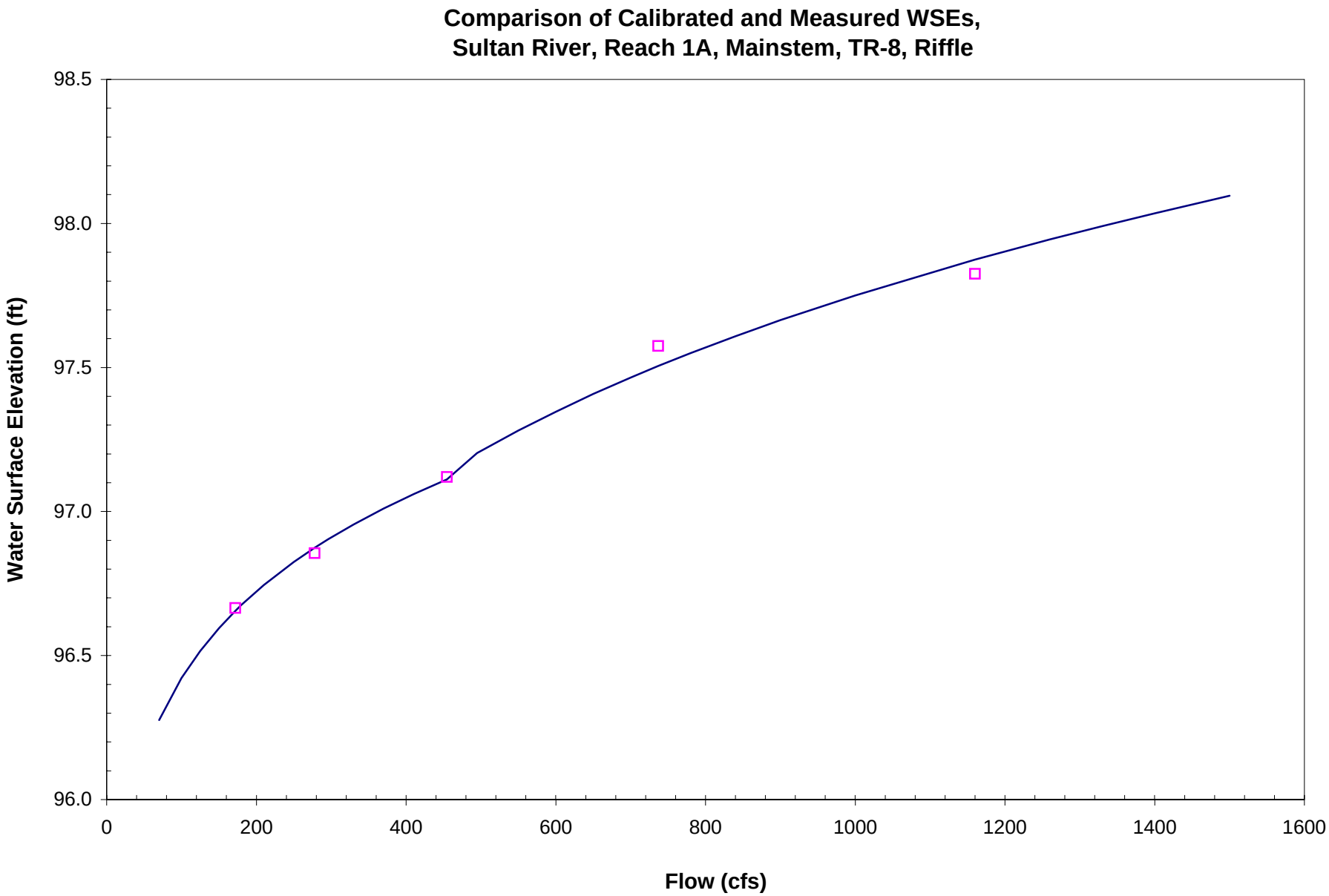











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Mainstem, TR-8, Riffle
Water Surface Elevation (ft)
98.5
98.0
97.5
97.0
96.5
96.0
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)

Stream: Sultan R.
Site: Reach 1A
Date: 7/18/2007 **Transect:** 7
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.86	100.86		100.00
HP			0.25	100.61
Rock TP			4.53	96.33
Rock	4.59	100.92		96.33
HP			0.31	100.61
BM			0.92	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L	13		100.92	4.53	0.00	96.39	96.38	
6-M	48		100.92	4.53	0.00	96.39		384.5
6-R	84		100.92	4.57	0.00	96.35		

Ave Q= 384.5

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	55		100.92	4.43	0.00	96.49
d/s	-45			4.89	0.00	96.03

Note:
WSE slope = 0.460%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 Replaced by 4099. See data entry notes for details. Cmh
Propeller ID: 5A
Calib #: 175

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP	0.36	100.97		100.61
BM			0.96	100.01

Comment: 1/2 Level Loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			100.97	4.97	0.00	96.00	95.97	244.9
6-R	104		100.97	5.04	0.00	95.93		

Ave Q= 244.9

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	70		100.97	4.91	0.00	96.06
d/s	-70			5.29	0.00	95.68

Note:
WSE slope = 0.271%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750 Assumed based on notes from 7/18 for SC2-TR4
Propeller ID: 6A MRG agreed. 3/19/08
Calib #: NA

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.50	100.50		100.00
HP			-0.10	100.60
LWP			0.61	99.89

Comment: 1/2 Level Loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			100.50	4.82	0.00	95.68	95.66	168.1
6-R			100.50	4.86	0.00	95.64		

Ave Q= 168.1

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750 Assumed based on notes from 7/18 for SC2-TR4
Propeller ID: 6A MRG agreed. 3/19/08
Calib #: NA

Date: 10/21/08
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP	1.94	102.55		100.61

Comment: No Level Loop - HI from HP only
HP Elev from 7/18/08

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			102.55	4.95	0.00	97.60	97.60	
6-R			102.55	4.98	0.00	97.57		

Ave Q= 1160

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 12/20/08
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.22	102.22		100.00
HP			1.62	100.60
LWP			2.33	99.89

Comment: No Level Loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			102.22	4.99	0.00	97.23	97.23	
6-R			102.22	7.95	3.07	97.34		

Ave Q= 737

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Stream:	Sultan R.	
Site:	Reach 1A	
Transect:	7	
Habitat:	Riffle	
Survey Date	HI (ft)	Q (cfs)
7/18/2007	100.92	384.5
7/19/2007	100.97	244.9
7/20/2007	100.50	168.1

18-Jul-07

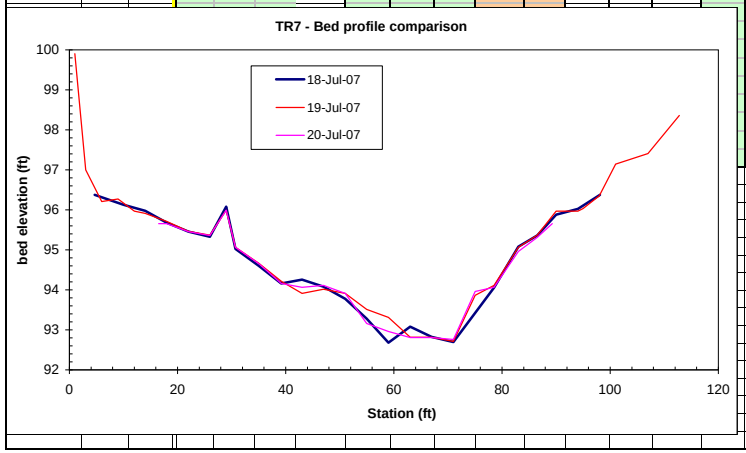
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	4.7		96.38	0.00	0.00		0.00		0.00		0.00	57.6
	10.0		96.13	0.25	0.37		0.46		0.46		0.53	68.6
	14.0		95.98	0.40	0.82		0.87		0.87		1.40	86.5
	18.0		95.68	0.70	1.61		1.67		1.67		4.69	86.8
	22.0		95.46	0.92	2.28		2.34		2.34		8.61	87.6
	26.0		95.33	1.05	1.64		1.70		1.70		6.26	87.6
	29.0		96.08	0.30	2.95		2.99		2.99		2.11	87.8
	30.7		95.03	1.35	2.09		2.15		2.15		8.72	87.6
	35.0		94.60	1.78	2.00		2.07		2.07		15.62	76.6
	39.2		94.16	2.22	1.65		1.71		1.71		15.22	87.5
	43.0		94.26	2.12	1.52		1.58		1.58		13.08	87.8
	47.0		94.08	2.30	2.47		2.52		2.52		23.22	86.8
	51.0		93.78	2.60	3.47	0.98	3.50	1.03	2.27		23.59	87.8
	55.0		93.28	3.10	3.61	1.69	3.65	1.75	2.70		33.48	78.6
	59.0		92.68	3.70	3.39	2.01	3.42	2.08	2.75		40.69	87.6
	63.0		93.08	3.30	3.42	2.58	3.45	2.63	3.04		40.16	87.6
	67.0		92.83	3.55	3.49	2.50	3.52	2.55	3.04		43.15	87.8
	71.0		92.70	3.68	3.26	2.24	3.29	2.30	2.80		41.17	87.6
	75.0		93.43	2.95	3.44	0.54	3.47	0.62	2.05		22.64	87.6
	78.5		94.06	2.32	2.03		2.09		2.09		19.44	87.6
	83.0		95.08	1.30	2.85		2.89		2.89		15.04	87.6
	86.5		95.36	1.02	0.88		0.93		0.93		3.33	87.8
	90.0		95.88	0.50	1.01		1.06		1.06		1.99	87.6
	94.0		96.03	0.35	0.18		0.26		0.26		0.37	78.8
RWE	98.1		96.38	0.00	0.00		0.00		0.00		0.00	64.6

19-Jul-07

	Sta (ft)	Sta adj	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
		10.0											
LWP	11.0	1.0	1.07	99.90									11.9
	13	3.0	3.97	97.00									41.6
	16	6.0	4.76	96.21									57.6
	19	9.0	4.70	96.27									68.6
LWE	22.0	12.0		95.97	0.00	0.00		0.00		0.00		0.00	56.6
	24.0	14.0		95.92	0.05	0.05		0.17		0.17		0.03	86.5
	28.0	18.0		95.72	0.25	0.31		0.36		0.36		0.36	86.8
	32.0	22.0		95.47	0.50	1.57		1.63		1.63		3.26	87.6
	36.0	26.0		95.37	0.60	1.11		1.16		1.16		1.39	87.6
	39.0	29.0		96.00	-0.03								87.8
	40.7	30.7		95.07	0.90	0.98		1.03		1.03		2.00	87.6
	45.0	35.0		94.67	1.30	1.00		1.05		1.05		5.82	76.6
	49.2	39.2		94.22	1.75	1.28		1.33		1.33		9.31	87.5
	53.0	43.0		93.92	2.05	1.72		1.78		1.78		14.25	87.8
	57.0	47.0		94.02	1.95	1.79		1.85		1.85		14.46	86.8
	61.0	51.0		93.92	2.05	1.66		1.72		1.72		14.11	87.8
	65.0	55.0		93.52	2.45	2.07		2.14		2.14		20.96	78.6
	69.0	59.0		93.32	2.65	2.14		2.21		2.21		23.43	87.6
	73.0	63.0		92.82	3.15	2.41		2.48		2.48		31.30	87.6
	77.0	67.0		92.82	3.15	2.55		2.63		2.63		33.09	87.8
	81.0	71.0		92.72	3.25	2.41		2.48		2.48		32.30	87.6
	85.0	75.0		93.87	2.10	2.27		2.34		2.34		18.45	87.6
	88.5	78.5		94.12	1.85	1.61		1.67		1.67		12.35	87.6
	93.0	83.0		95.07	0.90	2.01		2.08		2.08		7.48	87.6
	96.5	86.5		95.37	0.60	0.21		0.29		0.29		0.61	87.8
	100.0	90.0		95.97	0.00	0.00		0.00		0.00		0.00	87.6
RWE	104.0	94.0		95.97	0.00	0.00		0.00		0.00		0.00	78.8
	105.0	95.0	4.94	96.03									86.5
	108.0	98.0	4.62	96.35									64.6
	111.0	101.0	3.83	97.14									17.9
	117.0	107.0	3.56	97.41									17.9
RWP	122.8	112.8	2.61	98.36									13.9

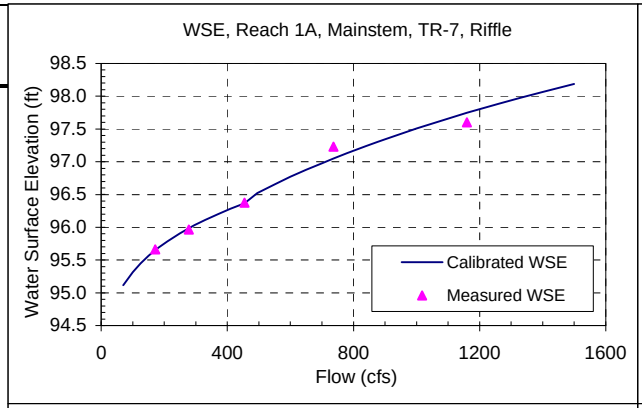
20-Jul-07

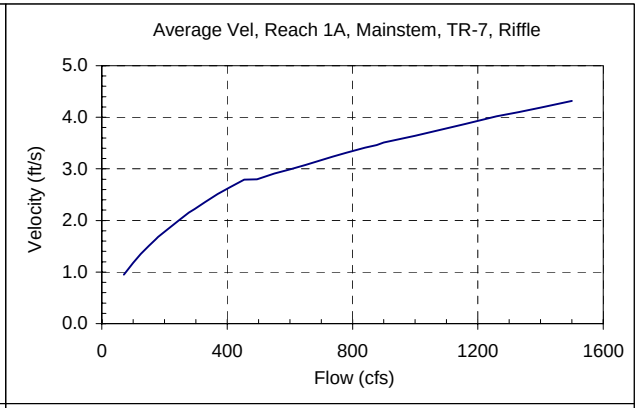
	Sta (ft)	Sta adj	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
		10.0											
LWE	26.5	16.5		95.66	0.00	0.00		0.00		0.00		0.00	86.8
	28	18.0		95.66	0.00	0.00		0.00		0.00		0.00	86.8
	32	22.0		95.46	0.20	0.41		0.45		0.45		0.36	87.6
	36	26.0		95.36	0.30	0.22		0.29		0.29		0.18	87.6
	39	29.0		96.00									87.8
	40.7	30.7		95.06	0.60	0.32		0.37		0.37		0.48	87.6
	45	35.0		94.66	1.00	1.02		1.07		1.07		4.56	76.6
	49.2	39.2		94.16	1.50	0.75		0.80		0.80		4.82	87.5
	53	43.0		94.06	1.60	0.23		0.30		0.30		1.88	87.8
	57	47.0		94.11	1.55	1.67		1.73		1.73		10.73	86.8
	61	51.0		93.91	1.75	1.81		1.87		1.87		13.12	87.8
	65	55.0		93.16	2.50	1.46		1.52		1.52		15.15	78.6
	69	59.0		92.96	2.70	1.58	1.87	1.64	1.94	1.79		19.30	87.6
	73	63.0		92.81	2.85	1.58	2.46	1.64	2.53	2.09		23.79	87.6
	77	67.0		92.81	2.85	1.94	2.40	2.01	2.47	2.24		25.54	87.8
	81	71.0		92.76	2.90	1.57	2.21	1.63	2.28	1.95		22.68	87.6
	85	75.0		93.96	1.70	1.92		1.99		1.99		12.66	87.6
	88.5	78.5		94.06	1.60	1.47		1.53		1.53		9.76	87.6
	93	83.0		94.96	0.70	0.94		0.99		0.99		2.78	87.6
	96.5	86.5		95.31	0.35	0.24		0.31		0.31		0.34	87.8
RWE	99.3	89.3		95.66	0.00	0.00		0.00		0.00		0.00	87.6

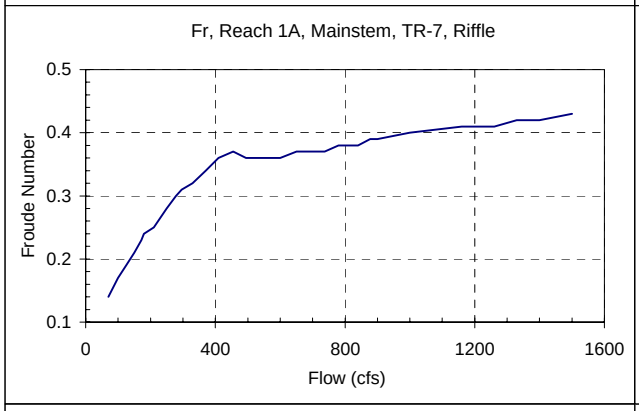


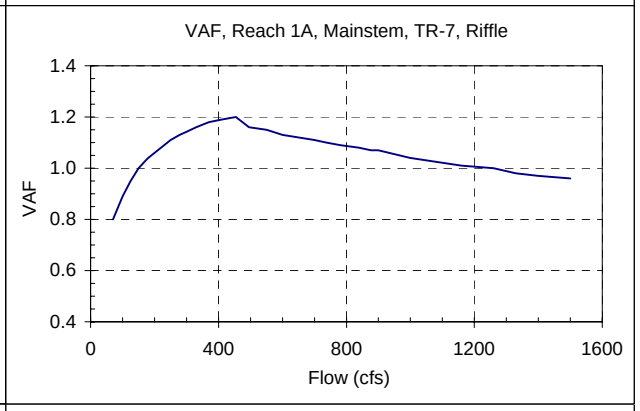
Stream: Sultan R.
Site: Reach 1A
Habitat: Riffle
Transect: 7

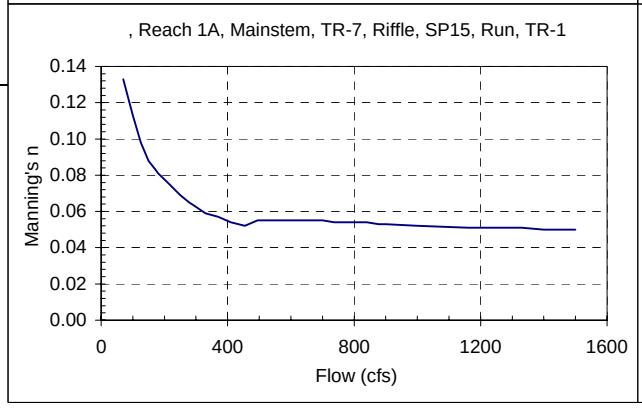
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
70	95.12	0.14	0.95	0.80	0.133	53.4
100	95.32	0.17	1.18	0.89	0.113	56.3
125	95.45	0.19	1.35	0.95	0.098	61.8
150	95.56	0.21	1.51	1.00	0.088	65.4
171.8	95.65	0.23	1.63	1.03	0.083	68.1
180	95.68	0.24	1.68	1.04	0.081	69.1
210	95.79	0.25	1.83	1.07	0.076	72.0
250	95.91	0.28	2.02	1.11	0.069	75.7
277.9	95.98	0.30	2.15	1.13	0.065	78.9
296	96.03	0.31	2.22	1.14	0.063	81.9
330	96.11	0.32	2.36	1.16	0.059	85.3
370	96.20	0.34	2.51	1.18	0.057	88.4
410	96.28	0.36	2.65	1.19	0.054	91.0
454.7	96.37	0.37	2.79	1.20	0.052	94.0
495	96.52	0.36	2.80	1.16	0.055	95.3
550	96.65	0.36	2.91	1.15	0.055	96.1
600	96.77	0.36	2.99	1.13	0.055	97.0
650	96.88	0.37	3.08	1.12	0.055	97.7
700	96.98	0.37	3.17	1.11	0.055	98.4
737	97.05	0.37	3.24	1.10	0.054	98.8
780	97.13	0.38	3.31	1.09	0.054	99.2
840	97.24	0.38	3.41	1.08	0.054	101.6
877	97.31	0.39	3.46	1.07	0.053	103.3
900	97.34	0.39	3.51	1.07	0.053	104.0
1000	97.51	0.40	3.64	1.04	0.052	106.3
1160	97.75	0.41	3.87	1.01	0.051	108.1
1260	97.88	0.41	4.02	1.00	0.051	109.1
1330	97.98	0.42	4.10	0.98	0.051	109.8
1400	98.07	0.42	4.19	0.97	0.050	110.5
1500	98.19	0.43	4.32	0.96	0.050	111.4

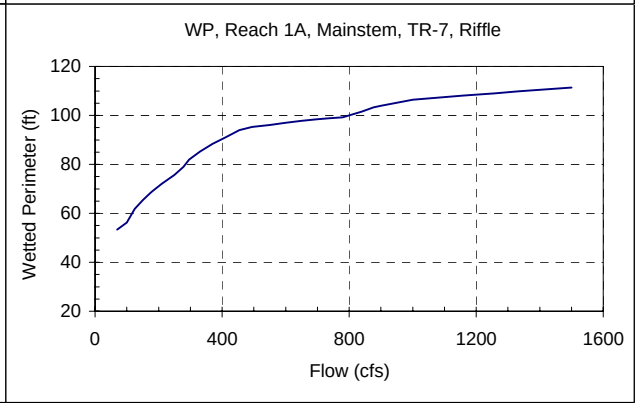


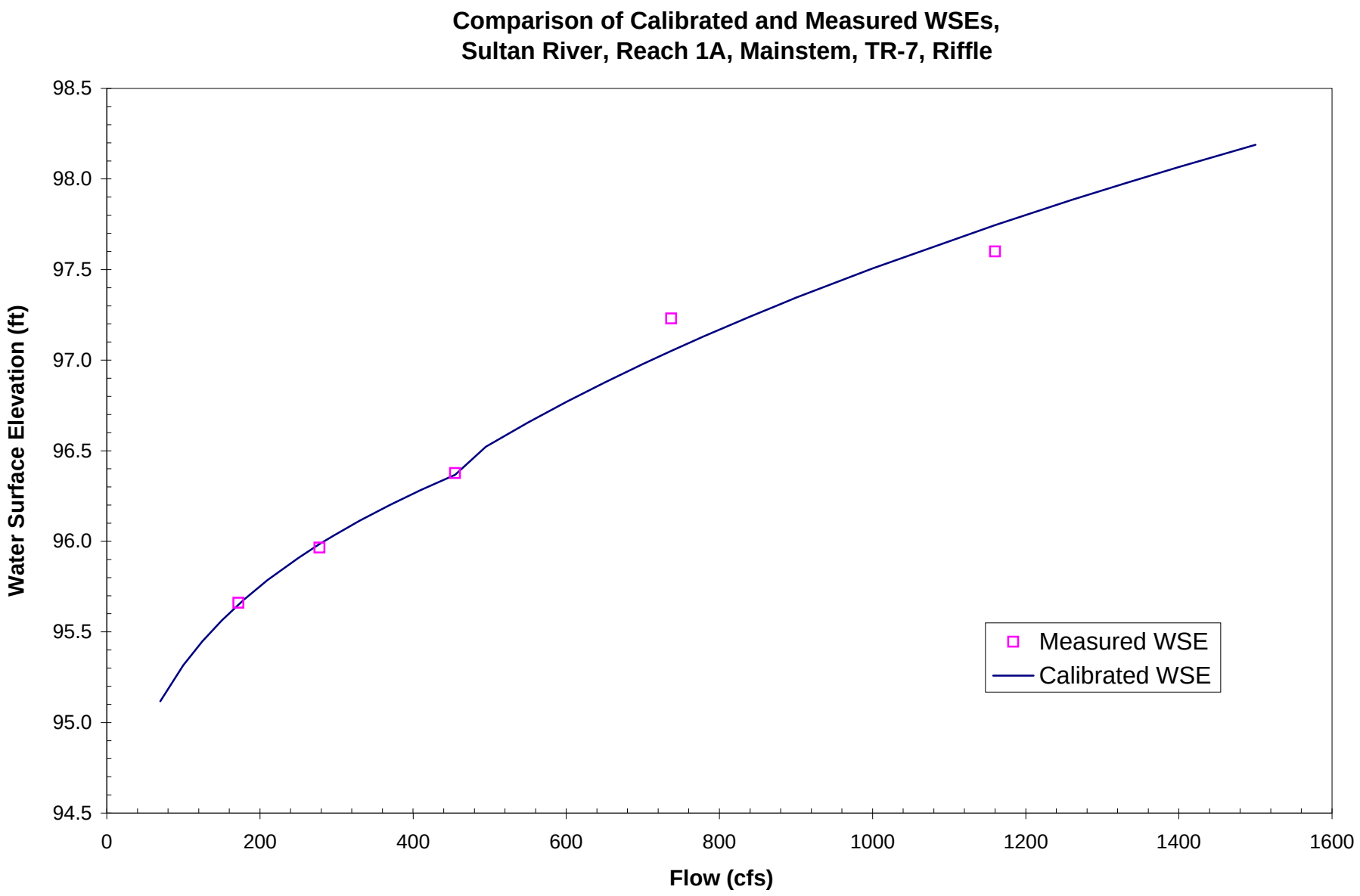











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Mainstem, TR-7, Riffle
Water Surface Elevation (ft)
98.5
98.0
97.5
97.0
96.5
96.0
95.5
95.0
94.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A

Date: 7/18/2007 **Transect:** 6
Habitat: Glide/Run **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.18	102.18		100.00
HP			3.08	99.10
Rock			5.68	96.50
TP				
Rock	5.51	102.01		
HP			2.92	99.09
BM			2.01	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L	7	69	102.01	6.89	0.00	95.12	95.12	480.2
6-R	131			6.89	0.00	95.12		

Ave Q= 480.2

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 4099
Propeller ID: 5A
Calib #: 0175

Date: 7/19/2007
Habitat: Glide/Run **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.49	101.49		100.00
HP			2.39	99.10
Rock			6.60	94.89
TP				
Rock	6.78	101.67		
HP			2.57	99.10
BM			1.67	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L	9		101.67	6.87	0.00	94.80	94.80	280.9
6-R	132			6.88	0.00	94.79		

Ave Q= 280.9

(2.1) Longitudinal WSE Slope

Location	River Station	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	45	101.67	6.84	0.00	94.83
d/s	-35		6.89	0.00	94.78

Note:
WSE slope = 0.062%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 4099
Propeller ID: 5A
Calib #:

Date: 7/20/2007
Habitat: Glide/Run **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.12	102.12		100.00
HP			3.02	99.10
Rock			7.23	94.89
TP				
Rock	7.13	102.02		94.89
HP			2.92	99.10
BM			2.01	100.01

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L	10.00		102.02	7.44	0.00	94.58	94.56	163.8
6-M				7.49	0.00	94.53		

Ave Q= 163.8

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #:

Date: 10/21/08
Habitat: Glide/Run **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.95	#####		100.00
HP			2.86	99.09

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			101.95	5.93	0.00	96.02	96.01	
6-R				5.95	0.00	96.00		

Ave Q= 0

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #:

Date: 12/20/08
Habitat: Glide/Run **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.07	#####		100.00
HP			2.98	99.09

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			102.07	7.97	1.63	95.73	95.73	
6-M				10.37	4.03	95.73		

Ave Q= 0

Note:
WSE slope = NA

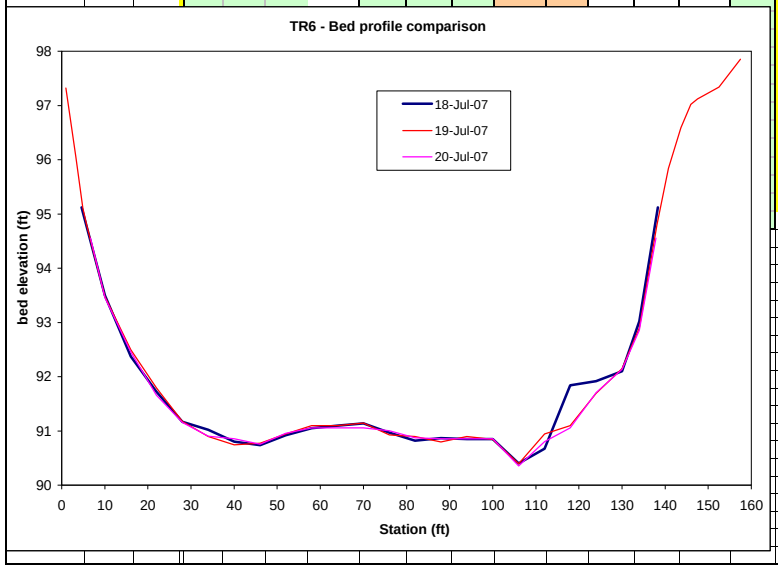
(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #:

Stream:	Sultan R.	
Site:	Reach 1A	
Transect:	6	
Habitat:	Glide/Run	
Survey	HI	Q
Date	(ft)	(cfs)
7/18/2007	102.01	480.2
7/19/2007	101.67	280.9
7/20/2007	102.02	163.8

18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	4.6		95.12	0.00	0.00		0.00		0.00		0.00	28.8
	10.0		93.50	1.62	0.05		0.11		0.11		1.04	76.7
	16.0		92.37	2.75	0.38	0.15	0.47	0.23	0.35		5.77	76.6
	22.0		91.72	3.40	0.49	0.25	0.57	0.33	0.45		9.20	67.7
	28.0		91.17	3.95	0.71	0.31	0.77	0.39	0.58		13.81	87.7
	34.0		91.02	4.10	0.55	0.14	0.63	0.23	0.43		10.51	87.7
	40.0		90.80	4.32	0.91	0.98	0.96	1.03	1.00		25.84	68.7
	46.0		90.74	4.38	1.50	1.16	1.56	1.21	1.39		36.48	43.6
	52.0		90.92	4.20	1.56	1.07	1.62	1.12	1.37		34.58	43.7
	58.0		91.05	4.07	1.59	1.18	1.65	1.23	1.44		35.26	43.7
	64.0		91.10	4.02	1.58	1.12	1.64	1.17	1.41		33.97	53.6
	70.0		91.14	3.98	1.64	1.33	1.70	1.39	1.55		36.92	35.6
	76.0		90.97	4.15	1.67	1.29	1.73	1.35	1.54		38.37	36.6
	82.0		90.82	4.30	1.76	1.37	1.83	1.43	1.63		41.98	36.7
	88.0		90.87	4.25	1.50	1.24	1.56	1.30	1.43		36.44	36.7
	94.0		90.85	4.27	1.52	1.13	1.58	1.18	1.38		35.43	36.7
	100.0		90.85	4.27	1.21	0.59	1.27	0.66	0.97		24.72	36.6
	106.0		90.40	4.72	0.93	0.56	0.98	0.64	0.81		22.93	78.6
	112.0		90.67	4.45	0.63	0.27	0.70	0.35	0.53		14.08	87.6
	118.0		91.84	3.28	0.46	0.35	0.54	0.43	0.49		9.59	87.7
	124.0		91.92	3.20	0.49	0.19	0.57	0.27	0.42		8.08	78.7
	130.0		92.10	3.02	0.23	0.16	0.32	0.24	0.28		4.19	76.8
	134.0		93.02	2.10	0.05		0.11		0.11		0.98	76.6
RWE	138.3		95.12	0.00	0.00		0.00		0.00		0.00	72.9



19-Jul-07

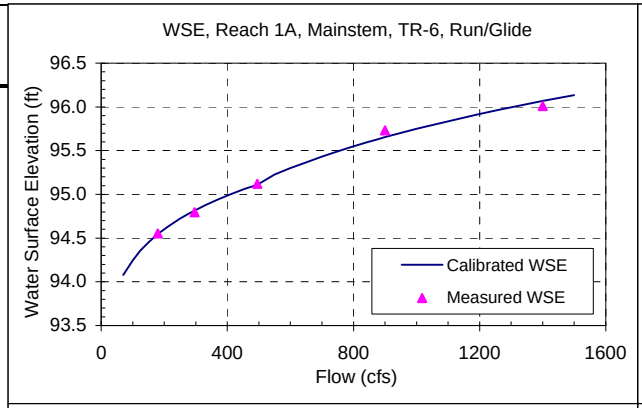
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
	-4.0	2.27	99.40									12.6
LWP	1.0	4.35	97.32									12.6
	3.3	5.61	96.06									12.6
	4.9	6.56	95.11									12.6
LWE	5.8		94.80	0.00	0.00		0.00		0.00		0.00	28.8
	10.0		93.48	1.32	0.05		0.11		0.11		0.76	76.7
	16.0		92.50	2.30	0.05		0.11		0.11		1.56	76.6
	22.0		91.80	3.00	0.32	0.01	0.40	0.02	0.21		3.83	67.7
	28.0		91.18	3.62	0.25	0.16	0.33	0.24	0.29		6.22	87.7
	34.0		90.90	3.90	0.29	0.12	0.37	0.21	0.29		6.79	87.7
	40.0		90.75	4.05	0.75	0.48	0.81	0.56	0.68		16.62	68.7
	46.0		90.78	4.02	0.96	0.77	1.01	0.83	0.92		22.17	43.6
	52.0		90.95	3.85	1.12	0.78	1.17	0.84	1.00		23.21	43.7
	58.0		91.10	3.70	1.02	0.82	1.07	0.87	0.97		21.59	43.7
	64.0		91.10	3.70	0.98	0.68	1.03	0.74	0.89		19.71	53.6
	70.0		91.15	3.65	1.11	0.71	1.16	0.77	0.97		21.19	35.6
	76.0		90.93	3.87	1.05	0.81	1.10	0.86	0.98		22.83	36.6
	82.0		90.90	3.90	1.13	0.77	1.18	0.83	1.01		23.52	36.7
	88.0		90.80	4.00	0.95	0.73	1.00	0.79	0.90		21.48	36.7
	94.0		90.90	3.90	0.94	0.79	0.99	0.85	0.92		21.50	36.7
	100.0		90.85	3.95	0.69	0.40	0.76	0.49	0.62		14.70	36.6
	106.0		90.40	4.40	0.55	0.26	0.63	0.34	0.49		12.81	78.6
	112.0		90.95	3.85	0.37	0.19	0.46	0.27	0.36		8.39	87.6
	118.0		91.10	3.70	0.27	0.23	0.35	0.32	0.33		7.42	87.7
	124.0		91.70	3.10	0.10	0.11	0.19	0.20	0.19		3.56	78.7
	130.0		92.15	2.65	0.03		0.07		0.07		0.90	76.8
	134.0		92.90	1.90	0.01		0.02		0.02		0.17	76.6
RWE	138.1		94.80	0.00	0.00		0.00		0.00		0.00	72.9
	140.8	5.83	95.84									12.6
	143.7	5.08	96.59									12.6
	146.0	4.65	97.02									12.6
RWP	147.5	4.55	97.12									12.6
	152.5	4.33	97.34									12.6
	157.5	3.82	97.85									12.6

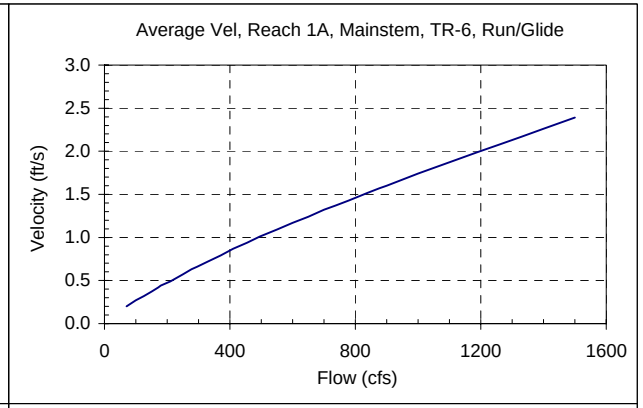
20-Jul-07

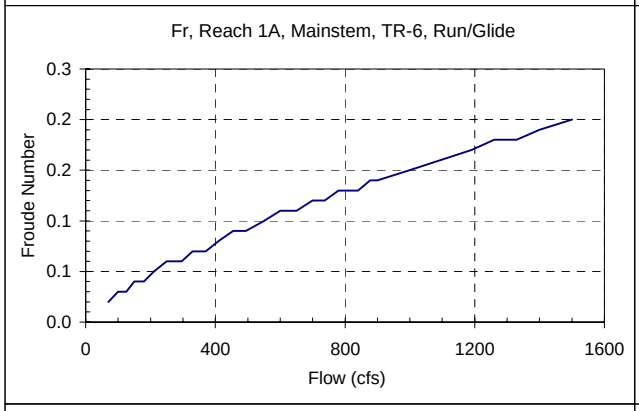
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	6.7		94.56	0.00	0.00		0.00		0.00		0.00	28.8
	10.0		93.46	1.10	0.01		0.01		0.01		0.05	76.7
	16.0		92.46	2.10	0.05		0.05		0.05		0.63	76.6
	22.0		91.66	2.90	0.12	0.05	0.12	0.05	0.09		1.48	67.7
	28.0		91.16	3.40	0.24	0.15	0.24	0.15	0.20		3.98	87.7
	34.0		90.91	3.65	0.20	0.07	0.20	0.07	0.14		2.96	87.7
	40.0		90.86	3.70	0.44	0.38	0.44	0.38	0.41		9.10	68.7
	46.0		90.76	3.80	0.63	0.54	0.63	0.54	0.59		13.34	43.6
	52.0		90.96	3.60	0.67	0.59	0.67	0.59	0.63		13.61	43.7
	58.0		91.06	3.50	0.65	0.52	0.65	0.52	0.59		12.29	43.7
	64.0		91.06	3.50	0.62	0.59	0.62	0.59	0.61		12.71	53.6
	70.0		91.06	3.50	0.73	0.66	0.73	0.66	0.70		14.60	35.6
	76.0		91.01	3.55	0.74	0.52	0.74	0.52	0.63		13.42	36.6
	82.0		90.88	3.68	0.79	0.73	0.79	0.73	0.76		16.78	36.7
	88.0		90.86	3.70	0.70	0.53	0.70	0.53	0.62		13.65	36.7
	94.0		90.86	3.70	0.64	0.61	0.64	0.61	0.63		13.88	36.7
	100.0		90.86	3.70	0.47	0.39	0.47	0.39	0.43		9.55	36.6
	106.0		90.36	4.20	0.30	0.19	0.30	0.19	0.25		6.17	78.6
	112.0		90.81	3.75	0.14	0.03	0.14	0.03	0.09		1.91	87.6
	118.0		91.06	3.50	0.18	0.07	0.18	0.07	0.13		2.63	87.7
	124.0		91.71	2.85	0.05	0.03	0.05	0.03	0.04		0.68	78.7
	130.0		92.14	2.42	0.03		0.03		0.03		0.36	76.8
	134.0		92.86	1.70	0.01		0.01		0.01		0.07	76.6
RWE	137.9		94.56	0.00	0.00		0.00		0.00		0.00	72.9

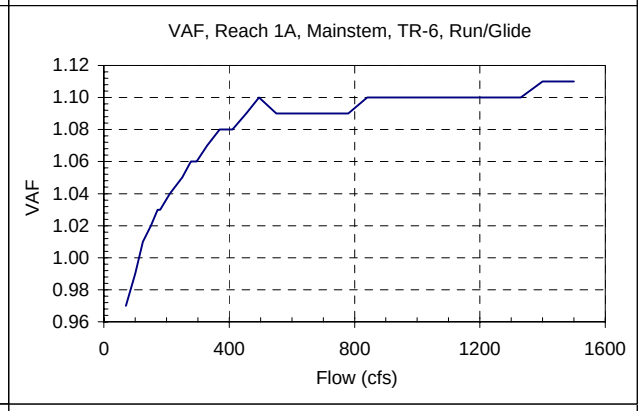
Stream: Sultan R.
Site: Reach 1A
Habitat: Glide/Run
Transect: 6

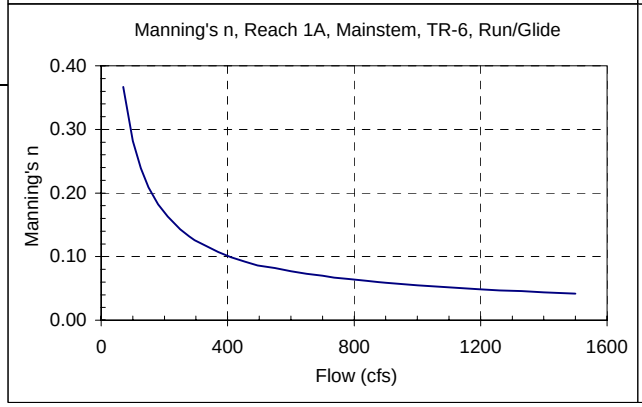
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
70	94.08	0.02	0.20	0.97	0.367	128.9
100	94.25	0.03	0.27	0.99	0.282	129.8
125	94.36	0.03	0.32	1.01	0.239	130.5
150	94.45	0.04	0.37	1.02	0.209	131.0
171.8	94.52	0.04	0.42	1.03	0.189	131.4
180	94.54	0.04	0.44	1.03	0.182	131.5
210	94.63	0.05	0.49	1.04	0.163	132.0
250	94.72	0.06	0.57	1.05	0.143	132.5
277.9	94.78	0.06	0.63	1.06	0.132	132.9
296	94.81	0.06	0.66	1.06	0.126	133.1
330	94.88	0.07	0.72	1.07	0.117	133.5
370	94.94	0.07	0.79	1.08	0.107	133.8
410	95.00	0.08	0.87	1.08	0.099	134.2
454.7	95.06	0.09	0.94	1.09	0.092	134.5
495	95.11	0.09	1.01	1.10	0.086	134.8
550	95.23	0.10	1.09	1.09	0.082	135.4
600	95.30	0.11	1.17	1.09	0.077	135.8
650	95.37	0.11	1.24	1.09	0.073	136.2
700	95.43	0.12	1.32	1.09	0.070	136.5
737	95.48	0.12	1.37	1.09	0.067	136.8
780	95.53	0.13	1.43	1.09	0.065	137.0
840	95.59	0.13	1.52	1.10	0.062	137.3
877	95.63	0.14	1.57	1.10	0.060	137.6
900	95.65	0.14	1.60	1.10	0.059	137.7
1000	95.75	0.15	1.74	1.10	0.055	138.2
1190	95.91	0.17	1.99	1.10	0.049	139.1
1260	95.97	0.18	2.08	1.10	0.047	139.4
1330	96.02	0.18	2.17	1.10	0.046	139.7
1400	96.07	0.19	2.26	1.11	0.044	140.0
1500	96.14	0.2	2.39	1.11	0.042	140.4

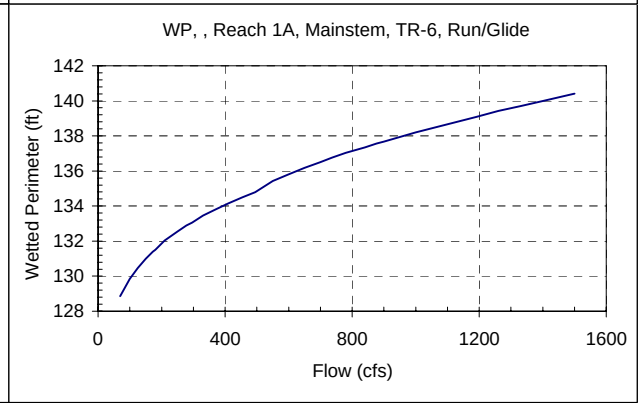


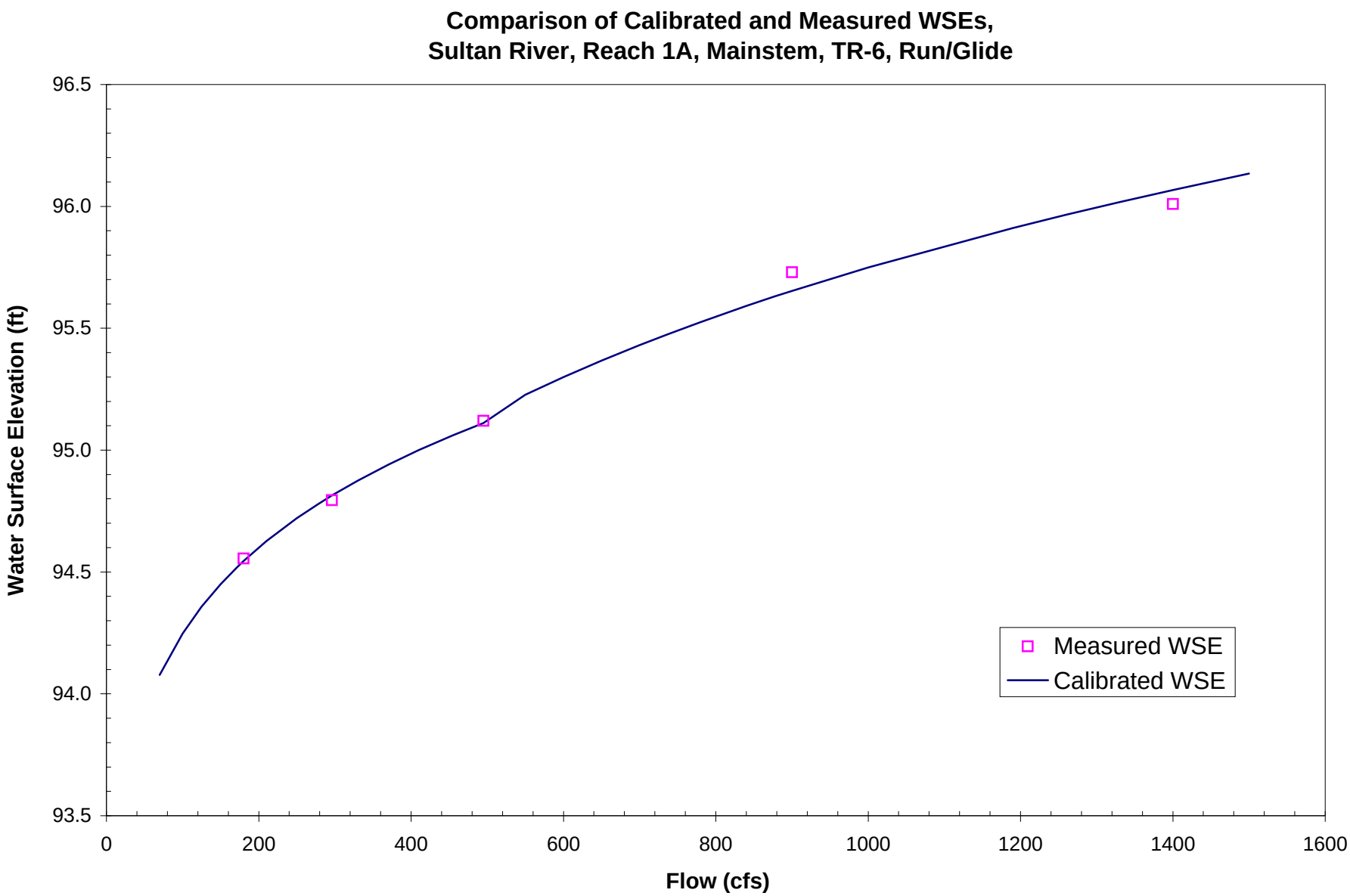











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Mainstem, TR-6, Run/Glide
Water Surface Elevation (ft)
96.5
96.0
95.5
95.0
94.5
94.0
93.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A
Date: 7/18/2007 **Transect:** 5
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.66	101.66		100.00
HP-1			4.57	97.09
Rock			7.83	93.83
TP				
Rock	7.67	101.50		93.83
HP-1			4.41	97.09
BM			1.50	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
L-LWS	10		101.50	6.07	0.00	95.43	95.28	364.7
L-MWS	87		101.50	6.37	0.00	95.13		
L-RWS	134		101.50	5.81	0.00	95.69	95.69	
R-LWS	190		101.50	5.77	0.00	95.73	95.73	63.2
R-MWS	225		101.50	5.92	0.00	95.58	95.40	
R-RWS	255		101.50	6.29	0.00	95.21		
Transition	268		100.46	5.82	0.00	94.64	94.64	16.5
Transition	281		100.46	5.83	0.00	94.63		
Transition	291		100.46	5.81	0.00	94.65		

Ave Q= 428.0

(2.1) Longitudinal WSE Slope

Location	River Station	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
R-u/s	70	100.46	4.34	0.00	96.12
R-d/s	-60		8.04	0.00	92.42

Note:
WSE slope = 2.846%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 4099
Propeller ID: 5A
Calib #: 175

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)	
BM	0.76	100.76		100.00	99.96
HP-1			3.63	97.13	97.09
Rock			5.09	95.67	95.63
TP					
Rock	5.32	100.99			
HP-1			3.86	97.13	97.09
BM			0.99	100.00	99.96
HP-1	3.39	100.52		97.09	97.05
HP-2			2.20	98.32	98.28
TP					
HP-2	2.27	100.55		98.28	98.24
SC2-BM1			4.23	96.32	96.28
SC2-BM2			3.35	97.20	97.16

Comment: **Includes tie-in to SC2-TR6**

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
Left	15		100.99	5.88	0.00	95.11	94.97	239.9
	74		100.99	6.16	0.00	94.83		
	102		100.99	5.86	0.00	95.13		
	142		100.99	5.22	0.00	95.77	95.77	
Right	202		100.99	5.46	0.00	95.53	95.53	16.2
	240		100.99	5.66	0.00	95.33	95.33	
Transition	263		100.99	6.10	0.00	94.89	94.50	17.8
Transition	272		100.99	6.59	0.00	94.40		
Right Ch	279		100.48	6.12	0.00	94.36	94.36	
Right Ch	292		100.48	6.13	0.00	94.35		

Ave Q= 273.9

(2.1) Longitudinal WSE Slope

Location	River Station	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
R-u/s	0				94.36
R-d/s	-50	100.48	8.42	0.00	92.06

Note: Several measurements for slope in notes
WSE slope = 4.590%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 4099
Propeller ID: 5A
Calib #: 175

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)	
BM	1.22	101.22		100.00	99.94
HP-1			4.07	97.15	97.09
Rock			7.04	94.18	94.12
TP					
Rock	7.16	101.28			
HP-1			4.19	97.09	97.03
BM			1.33	99.95	99.89

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
Left-ch	15	216	101.28	6.44		94.84	94.81	190.6
Left-ch	51		101.28	6.50		94.78		
Right-ch	205		100.71	5.30		95.41	95.34	8.2
Right-ch	232		100.71	5.45		95.26		
Transition	258		100.71	5.82		94.89	94.89	3.0
Transition	264		100.71	6.06		94.65	94.65	
Right Ch	270		100.71	6.50		94.21	94.19	
Right Ch	281		100.71	6.52		94.19		
Right Ch	291		100.71	6.54		94.17		
Right Ch	291		100.71	6.54		94.17		

Ave Q= 201.9

Note:
WSE slope = NA

Date: 10/21/08
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP-2	2.90	101.18		98.28
SC2-BM1			4.86	96.32
TP				
SC2-BM1	8.19	104.51		
BM			4.63	99.88

Comment: BM 0.08 off - could be from variation in HP-1 elev on 7/19

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LC-L			104.63	8.12	0.00	96.51	96.46	
LC-R			104.63	8.23	0.00	96.40		
RC-L			104.63	8.30	0.00	96.33	95.68	
RC-M			104.63	9.10	0.00	95.53		
RC-R			104.63	9.45	0.00	95.18		
SC2-L			101.18	4.88	0.00	96.30	96.32	
SC2-R			101.18	4.84	0.00	96.34		

Ave Q= 0

(2.2) WSE at Side Channel 2, TR-6

Datum of R1A, TR-5					96.32	
Datum of SC-2, TR-6					#####	140

Note: Q=140 estimated from the extended rating curves of SC-2, TR-6

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 12/20/08
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)	
HP-2	2.90	101.18		98.28	
SC2-BM1			4.86	96.32	100.00 for SC-2, TR-6 Datum
SC2-BM2			3.96	97.22	100.90 for SC-2, TR-6 Datum
TP					
SC2-BM1	7.19	103.51			
BM			3.65	99.86	

Comment: BM 0.1 off - could be from variation in HP-1 elev on 7/19

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LC-L			103.55	7.76	0.00	95.79	95.85	
LC-M			103.55	9.19	1.45	95.81		
LC-R			103.55	7.59	0.00	95.96		
RC-L			103.55	7.79	0.00	95.76	95.26	
RC-M			103.55	9.11	0.96	95.40		
RC-R			103.55	10.24	1.30	94.61		
SC2-L			101.18	5.20	0.00	95.98	95.99	
SC2-R			101.18	5.98	0.79	95.99		

Ave Q= 0

(2.2) WSE at Side Channel 2, TR-6

Datum of R1A, TR-5					95.99	
Datum of SC-2, TR-6					99.67	60

Note: Q=60 estimated from the extended rating curves of SC-2, TR-6

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Stream: Sultan R.
Site: Reach 1A
Transect: 5
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/18/2007	101.50	444.5
7/19/2007	100.99	273.9
7/20/2007	101.28	201.9

18-Jul-07

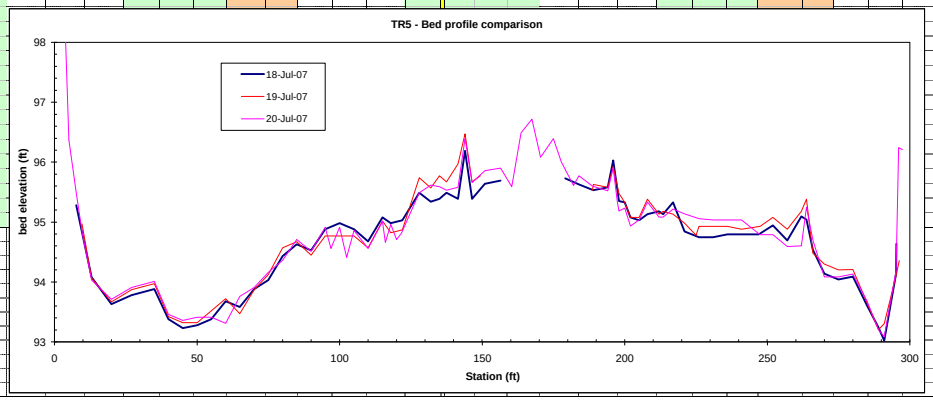
	Sta (ft)	FS (ft)	Ground (ft) calc'd	Ground (ft) adj	Ground (ft) model	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) $NV_{0.2/0.6}$	Vel (ft/s) $NV_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	subs.
LWE	7.6		95.28	0.00	95.28	0.00	0.00		0.00		0.00		0.00	67.6
	13.0		94.08	0.00	94.08	1.20	0.93		0.98		0.98	15	7.06	75.8
	20.0		93.63	0.00	93.63	1.65	1.74		1.81		1.81		20.85	67.6
	27.0		93.78	0.00	93.78	1.50	2.47		2.52		2.52		28.39	68.6
	35.0		93.88	0.00	93.88	1.40	3.35		3.38		3.38	10	30.32	67.8
	40.0		93.38	0.00	93.38	1.90	3.35		3.38		3.38	10	31.65	76.6
	45.0		93.23	0.00	93.23	2.05	3.15		3.18		3.18		32.61	76.7
	50.0		93.28	0.00	93.28	2.00	2.69		2.74		2.74		27.37	76.6
	55.0		93.38	0.00	93.38	1.90	4.33		4.37		4.37		41.55	67.6
	60.0		93.68	0.00	93.68	1.60	4.55		4.60		4.60		36.76	67.7
	65.0		93.58	0.00	93.58	1.70	3.15		3.18		3.18		27.04	67.6
	70.0		93.88	0.00	93.88	1.40	3.31		3.34		3.34		23.40	67.6
	75.0		94.03	0.00	94.03	1.25	3.21		3.24		3.24		20.26	67.7
	80.0		94.43	0.00	94.43	0.85	2.18		2.24		2.24		9.53	67.8
	85.0		94.63	0.00	94.63	0.65	3.21		3.24		3.24		10.54	76.6
	90.0		94.53	0.00	94.53	0.75	0.90		0.95		0.95	40	2.74	67.6
	95.0		94.88	0.00	94.88	0.40	1.11		1.16		1.16		2.33	67.6
	100.0		94.98	0.00	94.98	0.30	0.53		0.61		0.61	25	0.83	67.6
	105.0		94.88	0.00	94.88	0.40	1.47		1.53		1.53		3.06	75.6
	110.0		94.68	0.00	94.68	0.60	0.80		0.86		0.86		2.57	75.6
	115.0		95.08	0.00	95.08	0.20	0.29		0.37		0.37		0.30	75.6
	118.0		94.98	0.00	94.98	0.30	0.03		0.07		0.07		0.07	75.6
	122.0		95.03	0.00	95.03	0.25	0.05		0.11		0.11	70	0.05	57.6
	128.0		95.49	-0.41	95.08	0.20	0.20		0.28		0.28		0.28	57.8
	132.0		95.34	-0.41	94.93	0.35	2.41		2.47		2.47		3.02	57.6
	135.0		95.39	-0.41	94.98	0.30	0.20		0.28		0.28	80	0.04	56.7
	137.5		95.49	-0.41	95.08	0.20	1.72		1.78		1.78		1.16	56.7
	141.5		95.39	-0.41	94.98	0.30	0.76		0.82		0.82		0.49	75.6
	144.0		96.19	-0.41	95.78	-0.50								75.8
	146.5		95.39	-0.41	94.98	0.30	0.56		0.64		0.64		0.43	75.8
	151.0		95.64	-0.41	95.23	0.05	0.10		0.19		0.19		0.05	75.7
RWE	156.5		95.69	-0.41	95.28	0.00	0.00		0.00		0.00		0.00	45.6
WP														
LWE	179.1		95.73	-0.45	95.28	0.00	0.00		0.00		0.00		0.00	72.7
	184.0		95.63	-0.45	95.18	0.10	0.03		0.07		0.07		0.03	57.7
	189.0		95.53	-0.45	95.08	0.20	1.03		1.08		1.08	45	0.76	57.6
	194.0		95.58	-0.45	95.13	0.15	0.60		0.67		0.67	45	0.18	57.6
	196.0		96.03	-0.45	95.58	-0.30								57.6
	198.0		95.35	-0.45	94.90	0.38	0.10		0.19		0.19		0.07	76.5
	200.0		95.33	-0.45	94.88	0.40	1.25		1.31		1.31		1.05	75.6
	202.0		95.08	-0.45	94.63	0.65	0.08		0.16		0.16		0.27	75.6
	205.0		95.03	-0.45	94.58	0.70	0.63		0.70		0.70		1.47	65.6
	208.0		95.13	-0.45	94.68	0.60	1.04		1.09		1.09		2.29	65.6
	212.0		95.18	-0.45	94.73	0.55	0.11		0.20		0.20		0.30	65.6
	213.5		95.13	-0.45	94.68	0.60	2.58		2.63		2.63		3.95	65.6
	217.0		95.33	-0.45	94.88	0.40	0.56		0.64		0.64		0.96	65.6
	221.0		94.85	-0.11	94.73	0.55	0.49		0.57		0.57		1.41	65.8
	226.0		94.75	-0.11	94.63	0.65	0.83		0.88		0.88		2.87	67.6
	231.0		94.75	-0.11	94.63	0.65	1.02		1.07		1.07		3.48	76.8
	236.0		94.80	-0.11	94.68	0.60	3.07		3.10		3.10		9.31	76.8
	241.0		94.80	-0.11	94.68	0.60	2.67		2.72		2.72	30	7.77	75.8
	247.0		94.80	-0.11	94.68	0.60	2.84		2.88		2.88	30	8.24	75.7
	252.0		94.95	-0.11	94.83	0.45	4.01		4.05		4.05	30	7.89	75.7
	257.0		94.70	-0.11	94.58	0.70	2.75		2.80		2.80		9.78	67.8
	262.0		95.10	-0.11	94.98	0.30	1.46		1.52		1.52		1.14	67.7
	263.8		95.04	0.64	95.68	-0.40								57.7
	266.0		94.54	0.64	95.18	0.10	1.28		1.34		1.34	80	0.05	57.7
	270.0		94.14	0.64	94.78	0.50	0.21		0.29		0.29	30	0.57	75.7
	275.0		94.04	0.64	94.68	0.60	0.25		0.33		0.33	45	0.71	76.6
	280.0		94.09	0.64	94.73	0.55	1.16		1.21		1.21	45	2.36	76.6
	285.0		93.61	0.64	94.25	1.03	1.54		1.60		1.60	45	5.25	67.8
	289.0		93.24	0.64	93.88	1.40	0.07		0.16		0.16		0.66	67.8
	291.0		93.02	0.64	93.66	1.62	1.02		1.07		1.07		5.38	67.8
	295.2		94.14	0.64	94.78	0.50	1.37		1.43		1.43		1.54	67.8
RWE	295.3		94.64	0.64	95.28	0.00	0.00		0.00		0.00		0.00	67.8

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft) calc'd	Ground (ft) adj	Ground (ft) model	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) $NV_{0.2/0.6}$	Vel (ft/s) $NV_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	subs.
LWE	9.6		94.97	0.00	94.97	0.00	0.00		0.00		0.00		0.00	76.7
	13.0		94.07	0.00	94.07	0.90	0.59		0.66		0.66	15	3.00	75.8
	20.0		93.67	0.00	93.67	1.30	1.06		1.11		1.11	20	9.51	67.6
	27.0		93.87	0.00	93.87	1.10	2.38		2.44		2.44	10	19.80	68.6
	35.0		93.97	0.00	93.97	1.00	2.69		2.74		2.74	10	17.52	67.8
	40.0		93.42	0.00	93.42	1.55	2.29		2.35		2.35	10	17.93	76.6
	45.0		93.32	0.00	93.32	1.65	3.38		3.41		3.41	10	27.74	76.7
	50.0		93.32	0.00	93.32	1.65	2.27		2.33		2.33	10	18.93	76.6
	55.0		93.52	0.00	93.52	1.45	3.33		3.36		3.36		24.38	67.6
	60.0		93.72	0.00	93.72	1.25	4.38		4.42		4.42		27.65	67.7
	65.0		93.47	0.00	93.47	1.50	3.76		3.80		3.80		28.48	67.6
	70.0		93.87	0.00	93.87	1.10	2.94		2.98		2.98		16.38	67.6
	75.0		94.12	0.00	94.12	0.85	3.30		3.33		3.33		14.17	67.7
	80.0		94.57	0.00	94.57	0.40	2.04		2.10		2.10	10	4.15	67.8
	85.0		94.67	0.00	94.67	0.30	2.52		2.57		2.57	20	3.62	76.6
	90.0		94.45	0.00	94.45	0.52	0.87		0.92		0.92	30	2.08	67.6
	95.0		94.77	0.00	94.77	0.20	0.10		0.19		0.19	20	0.17	67.6
	100.0		94.77	0.00	94.77	0.20	1.84		1.91		1.91	15	1.84	67.6
	105.0		94.77	0.00	94.77	0.20	0.78		0.84		0.84	15	0.81	75.6
	110.0		94.57	0.00	94.57	0.40	0.90		0.95		0.95	15	0.92	75.6
	115.0		95.02	0.00	95.02	-0.05								75.6
	118.0		94.82	0.00	94.82	0.15	0.30		0.38		0.38		0.12	75.6
	122.0		94.87	0.00	94.87	0.10	0.60		0.67		0.67		0.34	57.6
	128.0		95.74	-0.80	94.94	0.03	0.50		0.58		0.58		0.09	57.8
	132.0		95.57	-0.80	94.77	0.20	0.32		0.40		0.40		0.28	57.6
	135.0		95.77	-0.80	94.97	0.00	0.00		0.00		0.00		0.00	56.7
	137.5		95.67	-0.80	94.87	0.10	0.20		0.28		0.28		0.04	56.7
	141.5		95.97	-0.80	95.17	-0.20								75.6
	144.0		96.47	-0.80	95.67	-0.70								75.8
	146.5		95.67	-0.80	94.87	0.10	0.00		0.00		0.00		0.00	75.8
RWE	149.4		95.77	-0.80	94.97	0.00	0.00		0.00		0.00		0.00	75.7
WP														
LWE	188.7		95.53	-0.56	94.97	0.00	0.00		0.00		0.00		0.00	57.6
	189.0		95.63	-0.56	95.07	-0.10								57.6
	194.0		95.58	-0.56	95.02	-0.05								57.6
	196.0		95.93	-0.56	95.37	-0.40								57.6
	198.0		95.48	-0.56	94.92	0.05	0.01		0.02		0.02		0.00	76.5
	200.0		95.33	-0.56	94.77	0.20	0.46		0.54		0.54		0.22	75.6
	202.0		95.08	-0.56	94.52	0.45	0.05		0.11		0.11		0.13	75.6
	205.0		95.08	-0.56	94.52	0.45	0.88		0.93		0.93		1.26	65.6
	208.0		95.38	-0.56	94.82	0.15	1.09		1.14		1.14		0.60	65.6
	212.0		95.13	-0.56	94.57	0.40	0.07		0.16		0.16		0.17	65.6
	213.5		95.18	-0.56	94.62	0.35	0.72		0.78		0.78		0.68	65.6
	217.0		95.13	-0.56	94.57	0.40	0.20		0.28		0.28		0.42	65.6
	221.0		94.98	-0.36	94.62	0.35	0.34		0.42		0.42		0.59	65.8
	225.0		94.78	-0.36	94.42	0.55	1.28		1.34		1.34		1.84	67.6
	226.0		94.93	-0.36	94.57	0.40	0.08		0.16		0.16		0.20	67.6
	231.0		94.93	-0.36	94.57	0.40	2.42		2.48		2.48		4.95	76.8
	236.0		94.93	-0.36	94.57	0.40	2.92		2.96		2.96	30	5.13	76.8
	241.0		94.88	-0.36	94.52	0.45	0.96		1.01		1.01	30	2.27	75.8
	247.5		94.93	-0.36	94.57	0.40	2.69		2.74		2.74	30	5.22	75.7
	252.0		95.08	-0.36	94.72	0.25	2.93		2.97		2.97	30	3.05	75.7
	257.0		94.88	-0.36	94.52	0.45	1.35		1.41		1.41	30	2.74	67.8
	262.0		95.18	-0.36	94.82	0.15	2.02		2.09		2.09	30	0.92	67.7
	263.8		95.38	-0.36	95.02	0.15	1.80		1.87		1.87	80	0.10	57.7
	266.0		94.48	0.47	94.95	0.02	0.50		0.58		0.58	80	0.01	57.7
	270.0		94.30	0.47	94.77	0.20	0.10		0.19		0.19	80	0.03	75.7
	275.0		94.20	0.47	94.67	0.30	0.05		0.11		0.11		0.17	76.6
	280.0		94.21	0.62	94.82	0.15	0.45		0.53		0.53		0.40	76.6
	285.0		93.66	0.62	94.27	0.70	0.47		0.55		0.55	45	1.22	67.8
	289.0		93.21	0.62	93.82	1.15	0.05		0.11		0.11		0.39	67.8
	291.0		93.31	0.62	93.92	1.05	0.31		0.39		0.39		1.28	67.8
	295.2		94.11	0.62	94.72	0.25	0.01		0.02		0.02		0.01	67.8
RWE	296.3		94.36	0.62	94.97	0.00	0.00		0.00		0.00		0.00	64.7

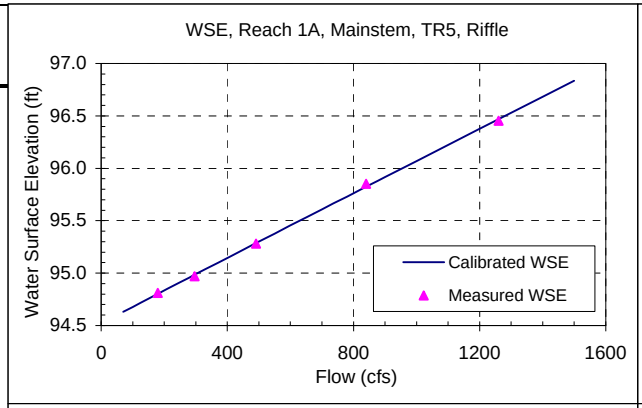
20-Jul-07

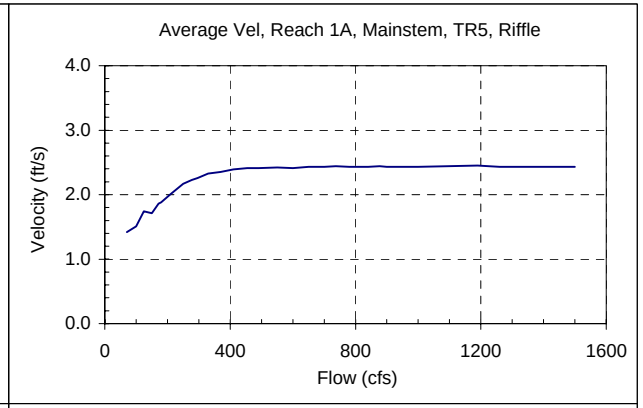
	Sta (ft)	FS (ft)	Ground (ft) calc'd	Ground (ft) adj	Ground (ft) model	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) $NV_{0.2/0.6}$	Vel (ft/s) $NV_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	0.90	100.38	0.00	100.38									32.6
	2.6	1.36	99.92	0.00	99.92									32.7
	5.0	4.91	96.37	0.00	96.37									67.7
	7.7	5.83	95.45	0.00	95.45									67.6
LWE	9.8		94.81	0.00	94.81	0.00	0.00		0.00		0.00		0.00	76.7
	13.0		94.03	0.00	94.03	0.78	0.49		0.57		0.57		2.27	75.8
	20.0		93.71	0.00	93.71	1.10	1.06		1.11		1.11		8.56	67.6
	27.0		93.91	0.00	93.91	0.90	1.61		1.67		1.67		11.30	68.6
	35.0		94.01	0.00	94.01	0.80	2.71		2.76		2.76		14.33	67.8
	40.0		93.46	0.00	93.46	1.35	3.04		3.08		3.08		20.76	76.6
	45.0		93.36	0.00	93.36	1.45	3.49		3.52		3.52		25.56	76.7
	50.0		93.41	0.00	93.41	1.40	2.09		2.15		2.15		15.08	76.6
	55.0		93.41	0.00	93.41	1.40	3.18		3.21		3.21		22.48	67.6
	60.0		93.31	0.00	93.31	1.50	2.75		2.80		2.80		20.97	67.7
	65.0		93.76	0.00	93.76	1.05	4.16		4.20		4.20		22.06	67.6
	70.0		93.91	0.00	93.91	0.90	2.22		2.28		2.28		10.26	67.6
	75.0		94.16	0.00	94.16	0.65	2.68		2.73		2.73		8.86	67.7
	80.0		94.36	0.00	94.36	0.45	2.28		2.34		2.34		5.26	67.8
	85.0		94.71	0.00	94.71	0.10	1.07		1.12		1.12		0.56	76.6
	90.0		94.51	0.00	94.51	0.30	1.09		1.14		1.14		0.86	67.6
	95.0		94.91	0.00	94.91	-0.10								67.6
	97.0		94.56	0.00	94.56	0.25	0.71		0.77		0.77		0.29	65.6
	100.0		94.91	0.00	94.91	-0.10								67.6
	102.5		94.41	0.00	94.41	0.40	1.75		1.82		1.82		0.91	65.6
	105.0		94.86	0.00	94.86	-0.05								75.6
	110.0		94.56	0.00	94.56	0.25	0.18		0.26		0.26		0.16	75.6
	115.0		95.01	0.00	95.01	-0.20								75.6
	116.0		94.66	0.00	94.66	0.15	0.39		0.48		0.48		0.07	75.6
	118.0		94.96	0.00	94.96	-0.15								75.6
	120.0		94.71	0.00	94.71	0.10	0.05		0.11		0.11		0.01	65.6
RWE	121.7		94.81	0.00	94.81	0.00	0.00		0.00		0.00		0.00	57.6
	128.0	5.79	95.49	0.00	95.49									57.8
	132.0	5.66	95.62	0.00	95.62									57.6
	135.0	5.69	95.59	0.00	95.59									56.7
	137.5	5.75	95.53	0.00	95.53									56.7
	141.5	5.70	95.58	0.00	95.58									75.6
	144.0	4.89	96.39	0.00	96.39									75.8
	146.5	5.62	95.66	0.00	95.66									75.8
	151.0	5.42	95.86	0.00	95.86									75.7
	156.5	5.38	95.90	0.00	95.90									45.6
	160.4	5.69	95.59	0.00	95.59									27.6
	163.6	4.79	96.49	0.00	96.49									32.6
WP	167.4	4.56	96.72	0.00	96.72									32.6
	170.5	5.20	96.08	0.00	96.08									72.7
	175.0	4.89	96.39	0.00	96.39									72.7
	177.8	5.28	96.00	0.00	96.00									72.7
	182.0	5.67	95.61	0.00	95.61									57.7
	184.0	5.51	95.77	0.00	95.77									57.6
	188.7	5.68	95.60	0.00	95.60									57.6
	194.0	5.76	95.52	0.00	95.52									57.6
	196.0	5.38	95.90	0.00	95.90									57.6
LWE	197.4		95.34	-0.53	94.81	0.00	0.00		0.00		0.00		0.00	76.5
	198.0		95.19	-0.53	94.66	0.15	0.00		0.00		0.00		0.00	76.5
	200.0		95.24	-0.53	94.71	0.10	0.10		0.19		0.19		0.04	75.6
	202.0		94.94	-0.53	94.41	0.40	0.14		0.23		0.23		0.23	75.6
	205.0		95.04	-0.53	94.51	0.30	0.66		0.73		0.73		0.65	65.6
	208.0		95.34	-0.53	94.81	0.00	0.00		0.00		0.00		0.00	65.6
	212.0		95.09	-0.53	94.56	0.25	0.22		0.31		0.31		0.21	65.6
	213.5		95.09	-0.53	94.56	0.25	0.31		0.39		0.39		0.25	65.6
	217.0		95.22	-0.53	94.69	0.12	0.05		0.11		0.11		0.05	65.6
	221.0		95.14	-0.53	94.61	0.20	0.52		0.60		0.60		0.54	65.8
	226.0		95.06	-0.53	94.53	0.28	0.10		0.19		0.19		0.26	67.6
	231.0		95.04	-0.53	94.51	0.30	0.39		0.48		0.48		0.71	76.8
	236.0		95.04	-0.53	94.51	0.30	2.47		2.52		2.52		3.79	76.8
	241.0		95.04	-0.53	94.51	0.30	0.83		0.88		0.88		1.52	75.8
	247.5		94.79	-0.08	94.71	0.10	0.60		0.67		0.67		0.37	75.7
	252.0		94.79	-0.08	94.71	0.10	2.26		2.32		2.32		1.10	75.7
	257.0		94.59	-0.08	94.51	0.30	0.24		0.32		0.32		0.49	67.8
	262.0		94.60	0.16	94.76	0.05	0.80		0.86		0.86		0.11	67.7
	263.8		95.25	0.16	95.41	-0.60								57.7
	266.0		94.70	0.16	94.86	-0.05								57.7
	270.0		94.09	0.62	94.71	0.10	0.00		0.00		0.00		0.00	75.7
	275.0		94.09	0.62	94.71	0.10	0.00		0.00		0.00		0.00	76.6
	280.0		94.14	0.62	94.76	0.05	0.00		0.00		0.00		0.00	76.6
	285.0		93.69	0.62	94.31	0.50	0.05		0.11		0.11		0.25	67.8
	289.0		93.21	0.62	93.83	0.98	0.05		0.11		0.11		0.33	67.8
	291.0		93.09	0.62	93.71	1.10	0.05		0.11		0.11		0.39	67.8
RWE	295.2		94.19	0.62	94.81	0.00	0.00		0.00		0.00		0.00	67.8
	296.1	4.47	96.24	0.62	96.87									64.7
RWP	297.4	4.50	96.21	0.62	96.84									61.6

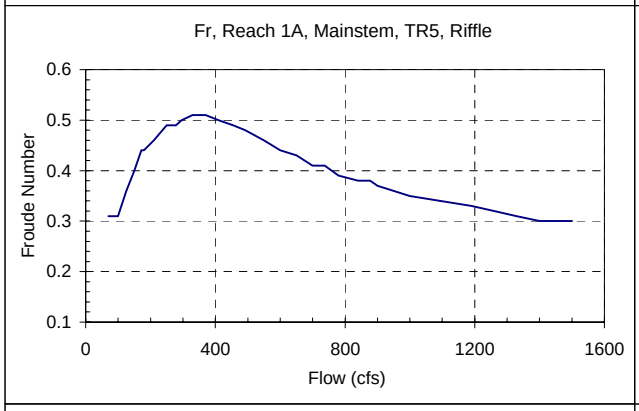


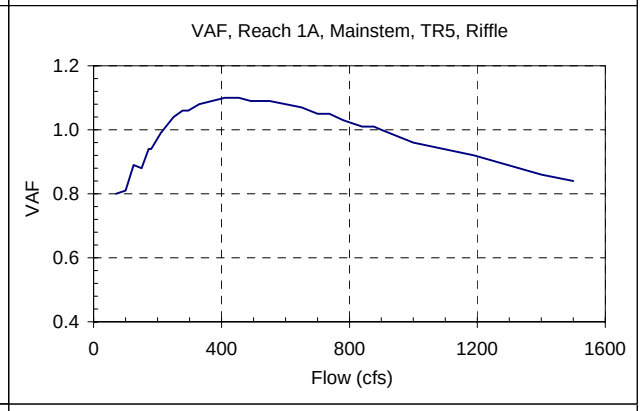
Stream: Sultan R.
Site: Reach 1A
Habitat: Riffle
Transect: 5

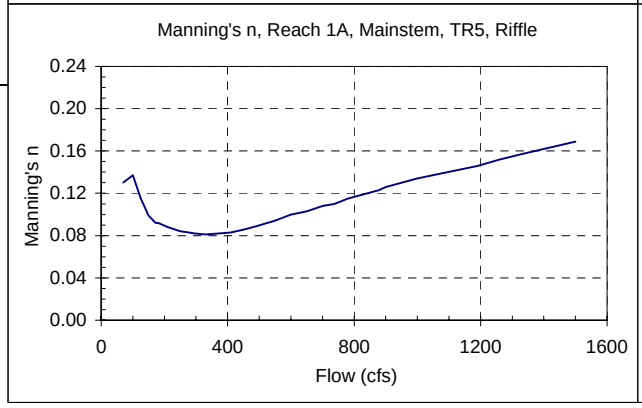
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
70	94.63	0.31	1.42	0.80	0.130	77.4
100	94.68	0.31	1.51	0.81	0.137	88.3
125	94.72	0.36	1.74	0.89	0.115	101.0
150	94.76	0.40	1.71	0.88	0.099	157.8
171.8	94.79	0.44	1.86	0.94	0.092	164.7
180	94.80	0.44	1.88	0.94	0.092	168.4
210	94.85	0.46	2.01	0.99	0.088	177.0
250	94.91	0.49	2.17	1.04	0.084	187.7
277.9	94.96	0.49	2.23	1.06	0.083	197.4
296	94.98	0.50	2.26	1.06	0.082	204.6
330	95.04	0.51	2.33	1.08	0.081	218.0
370	95.10	0.51	2.35	1.09	0.082	235.8
410	95.16	0.50	2.39	1.10	0.083	243.7
454.7	95.23	0.49	2.41	1.10	0.086	251.2
491.4	95.29	0.48	2.41	1.09	0.089	259.4
550	95.38	0.46	2.42	1.09	0.094	262.9
600	95.45	0.44	2.41	1.08	0.100	266.0
650	95.53	0.43	2.43	1.07	0.103	268.7
700	95.61	0.41	2.43	1.05	0.108	271.3
737	95.67	0.41	2.44	1.05	0.110	272.4
780	95.73	0.39	2.43	1.03	0.115	273.6
840	95.82	0.38	2.43	1.01	0.120	274.7
877	95.88	0.38	2.44	1.01	0.123	275.2
900	95.92	0.37	2.43	1.00	0.126	275.6
1000	96.07	0.35	2.43	0.96	0.134	277.4
1190	96.36	0.33	2.45	0.92	0.146	286.4
1260	96.47	0.32	2.43	0.90	0.152	288.7
1330	96.58	0.31	2.43	0.88	0.157	290.6
1400	96.68	0.30	2.43	0.86	0.162	293.0
1500	96.84	0.3	2.43	0.84	0.169	294.8

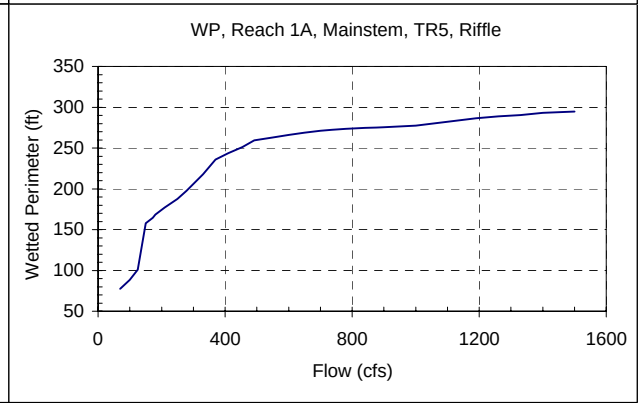


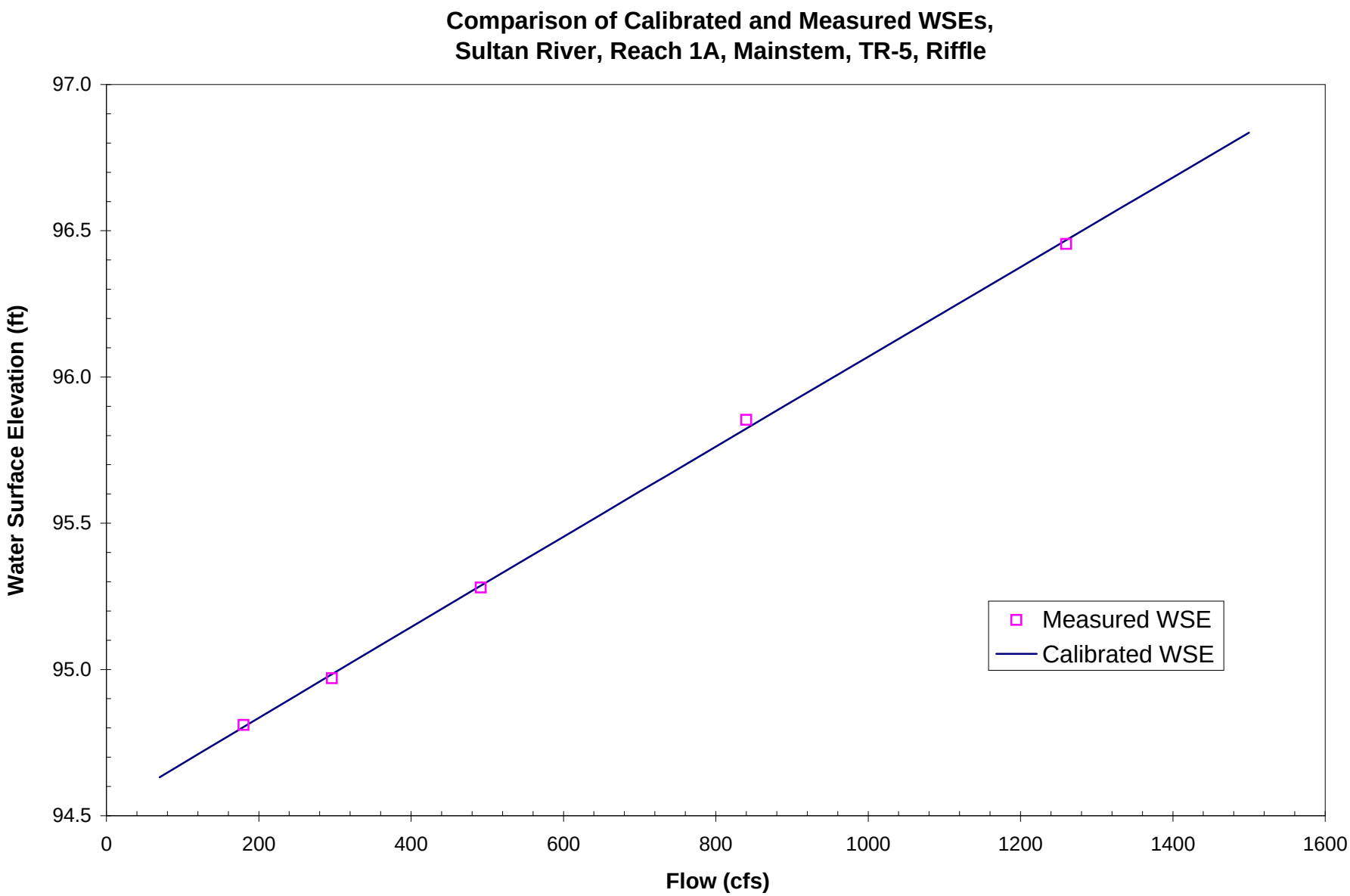











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Mainstem, TR-5, Riffle
Water Surface Elevation (ft)
97.0
96.5
96.0
95.5
95.0
94.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A
Date: 7/18/2007 **Transect:** 4
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.20	104.20		100.00
HP			4.65	99.55
Rock			8.49	95.71
TP				
Rock	8.39	104.10		95.71
HP			4.55	99.55
BM			4.10	100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
L-LWS			104.10	7.62	0.00	96.48	96.47	
L-MWS	57			7.65	0.00	96.45		439.2
L-RWS	93			7.61	0.00	96.49		
R-LWS	176		104.10	8.74	0.00	95.36	95.31	
R-MWS	203			8.79	0.00	95.31		66.7
R-RWS	213			8.85	0.00	95.25		

Ave Q= 505.8

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
L-u/s	60		104.10	7.49	0.00	96.61
L-d/s	-45			8.00	0.00	96.10
R-u/s	45		104.10	8.61	0.00	95.49
R-d/s	-50			9.50	0.00	94.60

Note: Left channel WSE determined from rate of change
L-WSE slope = 0.486%
R-WSE slope = 0.937%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4A
Calib #: NA

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.42	104.42		100.00
HP			4.86	99.56

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
L-LWS			104.42	8.19	0.00	96.23	96.17	
L-MWS				8.33	0.00	96.09		224.2
L-RWS				8.23	0.00	96.19		
R-LWS			104.42	9.32	0.00	95.10	95.02	
R-MWS				9.33	0.00	95.09		23.5
R-RWS				9.56	0.00	94.86		

Ave Q= 247.8

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: 186

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	3.94	103.94		100.00
HP1			4.39	99.55
BM3				
HP3				
TP				
HP3				
HP2				
HP1				
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
L-LWS	10		103.94	7.95	0.00	95.99	95.99	161.6
L-RWS	95.8			7.96	0.00	95.98		
R-LWS	174.9		103.94	9.02	0.00	94.92	94.99	8.5
R-RWS	214.5			9.02	0.00	94.92		

Ave Q= 170.1

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: 186

Stream:	Sultan R.	
Site:	Reach 1A	
Transect:	4	
Habitat:	Riffle	
Survey Date	HI (ft)	Q (cfs)
7/18/2007		505.8
7/19/2007		247.8
7/20/2007	103.94	170.1

18-Jul-07 (adjusted = 1.16)

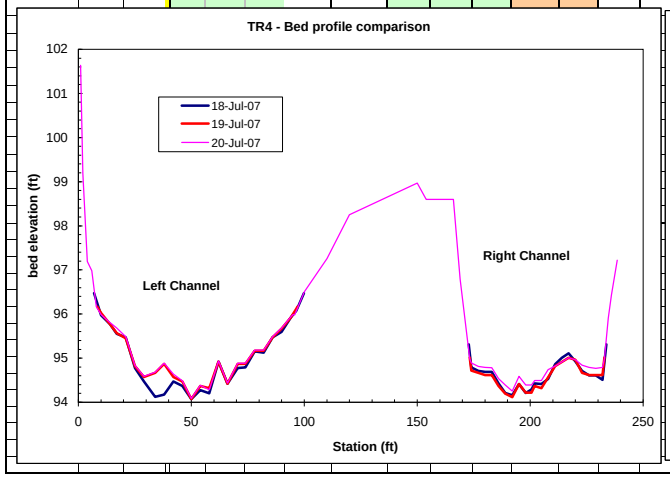
Sta (ft)	FS (ft)	Ground (ft)	adjusted Ground	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
6.9		96.47	96.47	0.00	0.00		0.00		0.00		0.00	62.7
10.0		95.97	95.97	0.50	1.02		1.07		1.07		1.91	27.6
14.0		95.77	95.77	0.70	0.67		0.72		0.72		1.77	85.7
17.0		95.55	95.55	0.92	1.51		1.57		1.57		5.05	76.6
21.0		95.47	95.47	1.00	2.22		2.29		2.29		9.16	86.7
25.0		94.77	94.77	1.70	3.16		3.23		3.23		21.98	87.7
29.0		94.47	94.47	2.00	3.31		3.38		3.38		30.45	87.6
34.0		94.12	94.12	2.35	4.37		4.46		4.46		47.14	86.6
38.0		94.17	94.17	2.30	5.25		5.36		5.36		49.27	78.6
42.0		94.47	94.47	2.00	3.09		3.16		3.16		25.30	78.6
46.0		94.37	94.37	2.10	3.36		3.43		3.43		28.84	78.7
50.0		94.07	94.07	2.40	3.12		3.19		3.19		30.65	86.6
54.0		94.27	94.27	2.20	3.81		3.89		3.89		34.20	67.6
58.0		94.20	94.20	2.27	3.00		3.07		3.07		27.89	78.7
62.0		94.92	94.92	1.55	3.36		3.43		3.43		21.28	86.6
66.0		94.42	94.42	2.05	2.91		2.98		2.98		25.98	75.7
70.5		94.77	94.77	1.70	3.21		3.28		3.28		22.32	78.6
74.0		94.79	94.79	1.68	2.36		2.43		2.43		15.32	56.6
78.0		95.15	95.15	1.32	2.12		2.19		2.19		11.57	57.6
82.0		95.12	95.12	1.35	2.25		2.32		2.32		12.54	47.6
86.0		95.47	95.47	1.00	1.90		1.97		1.97		7.87	74.6
90.0		95.59	95.59	0.88	1.55		1.61		1.61		5.67	73.6
94.0		95.92	95.92	0.55	1.25		1.31		1.31		2.34	36.6
96.5		96.07	96.07	0.40	0.53		0.58		0.58		0.67	26.5
99.8		96.47	96.47	0.00	0.00		0.00		0.00		0.00	27.6
172.8		95.31	96.47	0.00	0.00		0.00		0.00		0.00	32.6
174.0		94.79	95.95	0.52	0.75		0.80		0.80		0.88	34.5
177.0		94.71	95.87	0.60	1.59		1.65		1.65		2.97	43.7
180.0		94.69	95.85	0.62	1.93		2.00		2.00		3.72	54.7
183.0		94.69	95.85	0.62	1.96		2.03		2.03		3.77	56.6
186.0		94.43	95.59	0.88	2.04		2.11		2.11		5.57	65.7
189.0		94.21	95.37	1.10	2.61		2.68		2.68		8.85	65.7
192.0		94.16	95.32	1.15	2.88		2.95		2.95		10.18	56.7
195.0		94.41	95.57	0.90	2.64		2.71		2.71		7.32	56.7
198.0		94.21	95.37	1.10	1.73		1.79		1.79		5.43	65.6
200.5		94.29	95.45	1.02	0.97		1.02		1.02		2.09	65.7
202.0		94.43	95.59	0.88	1.89		1.96		1.96		3.88	76.6
205.0		94.41	95.57	0.90	0.10		0.21		0.21		0.55	82.7
208.0		94.53	95.69	0.78	1.25		1.31		1.31		3.06	86.7
211.0		94.86	96.02	0.45	0.70		0.75		0.75		1.02	73.8
214.0		95.01	96.17	0.30	1.31		1.37		1.37		1.23	73.5
217.0		95.11	96.27	0.20	1.07		1.12		1.12	30	0.58	73.6
220.0		94.93	96.09	0.38	0.51		0.56		0.56	30	0.55	73.6
223.0		94.71	95.87	0.60	0.20		0.30		0.30		0.54	75.6
226.0		94.61	95.77	0.70	0.05		0.16		0.16		0.34	56.7
229.0		94.61	95.77	0.70	0.95		1.00		1.00		2.11	45.6
232.0		94.51	95.67	0.80	1.02		1.07		1.07		2.02	34.6
233.7		95.31	96.47	0.00	0.00		0.00		0.00		0.00	83.7

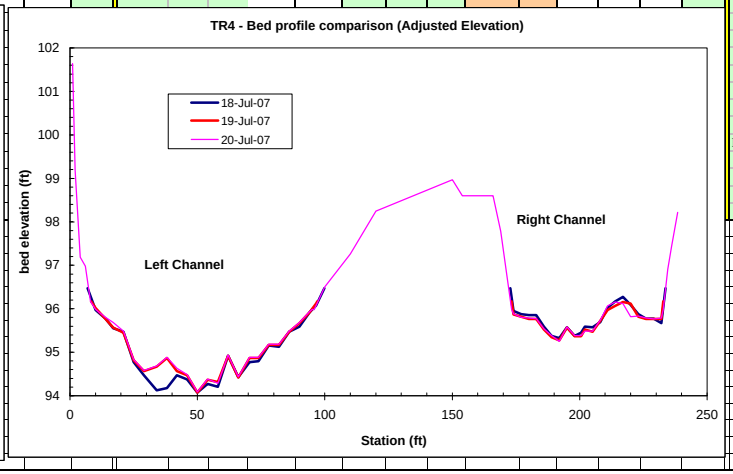
19-Jul-07 (adjusted = 1.15)

	Sta (ft)	FS (ft)	Ground (ft)	adjusted Ground	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
L-RWE	8.3		96.17	96.17	0.00	0.00		0.00		0.00		0.00	26.7
	10.0		96.02	96.02	0.15	0.84		0.89		0.89		0.38	27.6
	14.0		95.77	95.77	0.40	0.36		0.42		0.42		0.59	85.7
	17.0		95.57	95.57	0.60	0.88		0.93		0.93		1.95	76.6
	21.0		95.45	95.45	0.72	1.05		1.10		1.10		3.17	86.7
	25.0		94.82	94.82	1.35	2.04		2.11		2.11		11.37	87.7
	29.0		94.57	94.57	1.60	2.26		2.33		2.33		16.74	87.6
	34.0		94.67	94.67	1.50	2.48		2.54		2.54		17.16	86.6
	38.0		94.87	94.87	1.30	0.99		1.04		1.04		5.40	78.6
	42.0		94.57	94.57	1.60	2.88		2.93		2.93		18.78	78.6
	46.0		94.47	94.47	1.70	2.25		2.32		2.32		15.74	78.7
	50.0		94.07	94.07	2.10	2.16		2.23		2.23		18.70	86.6
	54.0		94.37	94.37	1.80	2.71		2.77		2.77		19.93	67.6
	58.0		94.32	94.32	1.85	2.83		2.89		2.89		21.35	78.7
	62.0		94.92	94.92	1.25	2.59		2.65		2.65		13.25	86.6
	66.0		94.42	94.42	1.75	2.30		2.36		2.36		17.59	75.7
	70.5		94.87	94.87	1.30	2.01		2.08		2.08		10.80	78.6
	74.0		94.87	94.87	1.30	2.02		2.09		2.09		10.17	56.6
	78.0		95.17	95.17	1.00	2.08		2.15		2.15		8.58	57.6
	82.0		95.17	95.17	1.00	1.65		1.71		1.71		6.86	47.6
	86.0		95.47	95.47	0.70	1.30		1.36		1.36		3.80	74.6
	90.0		95.67	95.67	0.50	0.69		0.74		0.74		1.48	73.6
	94.0		95.92	95.92	0.25	0.47		0.53		0.53		0.43	36.6
	96.5		96.12	96.12	0.05	0.00		0.00		0.00		0.00	26.5
L-LWE	97.0		96.17	96.17	0.00	0.00		0.00		0.00		0.00	26.5
R-RWE	173.3		95.02	96.17	0.00	0.00		0.00		0.00		0.00	32.6
	174.0		94.72	95.87	0.30	0.65		0.70		0.70		0.39	34.5
	177.0		94.67	95.82	0.35	1.08		1.13		1.13		1.19	43.7
	180.0		94.62	95.77	0.40	0.74		0.79		0.79		0.95	54.7
	183.0		94.62	95.77	0.40	0.93		0.98		0.98		1.17	56.6
	186.0		94.37	95.52	0.65	1.17		1.22		1.22		2.39	65.7
	189.0		94.20	95.35	0.82	1.56		1.62		1.62		3.99	65.7
	192.0		94.12	95.27	0.90	1.58		1.64		1.64		4.44	56.7
	195.0		94.42	95.57	0.60	1.76		1.83		1.83		3.29	56.7
	198.0		94.22	95.37	0.80	1.28		1.34		1.34		2.94	65.6
	200.5		94.22	95.37	0.80	0.55		0.61		0.61		0.97	65.7
	202.0		94.37	95.52	0.65	0.29		0.35		0.35		0.51	76.6
	205.0		94.32	95.47	0.70	0.16		0.22		0.22		0.47	82.7
	208.0		94.57	95.72	0.45	0.29		0.35		0.35	45	0.34	86.7
	211.0		94.82	95.97	0.20	0.00		0.00		0.00		0.00	73.8
	214.0		94.92	96.07	0.10	0.55		0.61		0.61	5	0.18	73.5
	217.0		95.01	96.16	0.01	0.05		0.19		0.19	90	0.00	73.6
	220.0		94.97	96.12	0.05	0.15		0.22		0.22	45	0.02	73.6
	223.0		94.67	95.82	0.35	0.00		0.00		0.00		0.00	75.6
	226.0		94.62	95.77	0.40	0.00		0.00		0.00		0.00	56.7
	229.0		94.62	95.77	0.40	0.18		0.24		0.24		0.29	45.6
	232.0		94.62	95.77	0.40	0.00		0.00		0.00		0.00	34.6
R-LWE	232.8		95.02	96.17	0.00	0.00		0.00		0.00		0.00	83.7

20-Jul-07 (adjusted = 1.00)

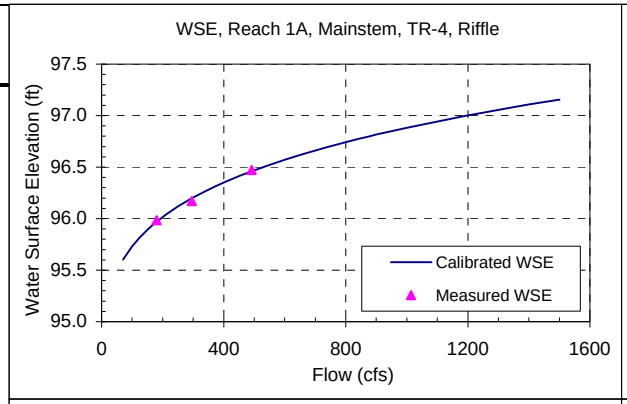
	Sta (ft)	FS (ft)	Ground (ft)	adjusted Ground	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	2.30	101.64	101.64									11.9
	2.0	4.75	99.19	99.19									11.9
	4.0	6.75	97.19	97.19									12.5
	6.0	6.96	96.98	96.98									62.7
	8.0	7.77	96.17	96.17									26.7
L-RWE	10.0		95.99	95.99	0.00	0.00		0.00		0.00		0.00	27.6
	14.0		95.81	95.81	0.18	0.19		0.26		0.26		0.16	85.7
	17.0		95.69	95.69	0.30	0.86		0.91		0.91		0.95	76.6
	21.0		95.49	95.49	0.50	0.88		0.93		0.93		1.86	86.7
	25.0		94.84	94.84	1.15	0.87		0.92		0.92		4.23	87.7
	29.0		94.59	94.59	1.40	1.89		1.96		1.96		12.32	87.6
	34.0		94.69	94.69	1.30	2.25		2.32		2.32		13.54	86.6
	38.0		94.89	94.89	1.10	2.01		2.08		2.08		9.13	78.6
	42.0		94.64	94.64	1.35	1.97		2.04		2.04		10.99	78.6
	46.0		94.49	94.49	1.50	2.76		2.82		2.82		16.90	78.7
	50.0		94.09	94.09	1.90	1.79		1.86		1.86		14.10	86.6
	54.0		94.39	94.39	1.60	1.75		1.81		1.81		11.62	67.6
	58.0		94.29	94.29	1.70	2.21		2.28		2.28		15.47	78.7
	62.0		94.94	94.94	1.05	2.61		2.67		2.67		11.22	86.6
	66.0		94.44	94.44	1.55	1.40		1.46		1.46		9.62	75.7
	70.5		94.89	94.89	1.10	2.05		2.12		2.12		9.31	78.6
	74.0		94.89	94.89	1.10	1.68		1.74		1.74		7.20	56.6
	78.0		95.19	95.19	0.80	1.66		1.72		1.72		5.52	57.6
	82.0		95.19	95.19	0.80	1.42		1.48		1.48		4.74	47.6
	86.0		95.49	95.49	0.50	0.92		0.97		0.97		1.94	74.6
	90.0		95.69	95.69	0.30	0.63		0.68		0.68		0.82	73.6
	94.0		95.94	95.94	0.05	0.00		0.00		0.00		0.00	36.6
L-LWE	95.0		95.99	95.99	0.00	0.00		0.00		0.00		0.00	36.6
	95.8	7.96	95.98	95.98									26.5
	100.0	7.44	96.50	96.50									27.6
	110.0	6.68	97.26	97.26									12.8
	120.0	5.69	98.25	98.25									11.9
	150.0	4.97	98.97	98.97									11.9
	154.0	5.34	98.60	98.60									45.6
	166.0	5.34	98.60	98.60									35.5
	169.0	7.15	96.79	97.79									36.7
R-RWE	173.3		94.99	95.99	0.00	0.00		0.00		0.00		0.00	32.6
	174.0		94.89	95.89	0.10	0.09		0.25		0.25		0.05	34.5
	177.0		94.81	95.81	0.18	0.55		0.61		0.61		0.33	43.7
	180.0		94.79	95.79	0.20	0.00		0.00		0.00		0.00	54.7
	183.0		94.78	95.78	0.21	0.42		0.48		0.48		0.30	56.6
	186.0		94.54	95.54	0.45	0.88		0.93		0.93		1.25	65.7
	189.0		94.39	95.39	0.60	0.91		0.96		0.96		1.73	65.7
	192.0		94.26	95.25	0.74	0.82		0.87		0.87		1.92	56.7
	195.0		94.59	95.59	0.40	0.99		1.04		1.04		1.25	56.7
	198.0		94.39	95.39	0.60	0.57		0.63		0.63		1.03	65.6
	200.5		94.39	95.39	0.60	0.32		0.38		0.38		0.46	65.7
	202.0		94.49	95.49	0.50	0.14		0.22		0.22	45	0.18	76.6
	205.0		94.49	95.49	0.50	0.00		0.00		0.00		0.00	82.7
	208.0		94.74	95.74	0.25	0.00		0.00		0.00		0.00	86.7
	211.0		94.82	96.07	0.00	0.00		0.00		0.00		0.00	73.8
	214.0		94.92	96.16	0.00	0.00		0.00		0.00		0.00	73.5
	217.0		95.01	96.12	0.00	0.00		0.00		0.00		0.00	73.6
	220.0		94.97	95.82	0.00	0.00		0.00		0.00		0.00	73.6
	223.0		94.84	95.84	0.15	0.00		0.00		0.00		0.00	75.6
	226.0		94.79	95.79	0.20	0.00		0.00		0.00		0.00	56.7
	229.0		94.77	95.77	0.22	0.00		0.00		0.00		0.00	45.6
	232.0		94.79	95.79	0.20	0.00		0.00		0.00		0.00	34.6
R-LWE	232.8		94.99	95.99	0.00	0.00		0.00		0.00		0.00	83.7
	234.5	8.03	95.91	96.91									17.5
	236.0	7.50	96.44	97.44									12.8
RWP	238.5	6.72	97.22	98.22									11.9

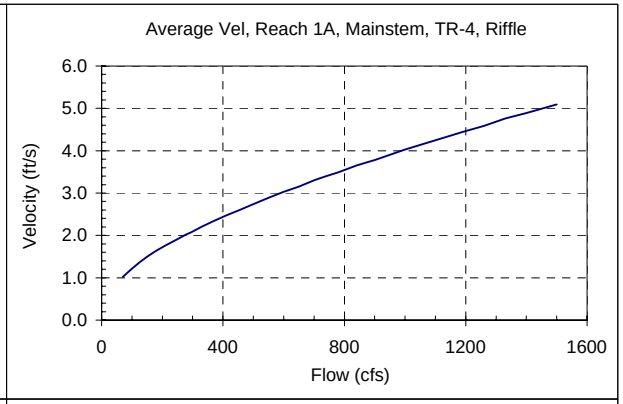


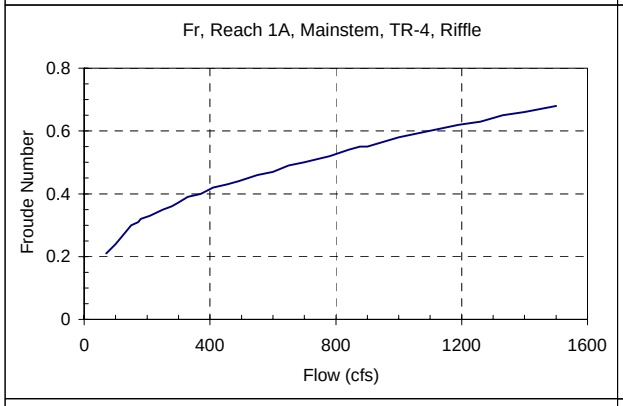


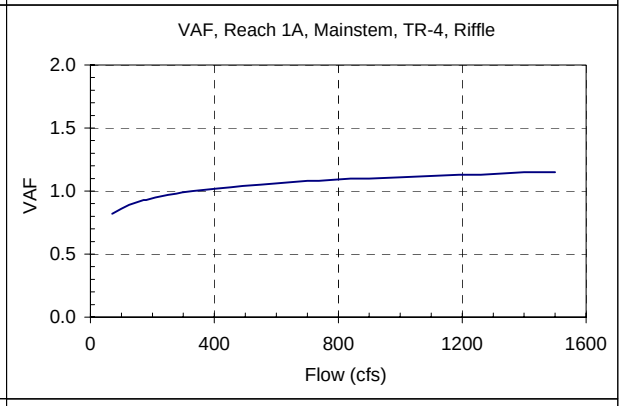
Stream: Sultan R.
Site: Reach 1A
Habitat: Riffle
Transect: 4
Flow: All

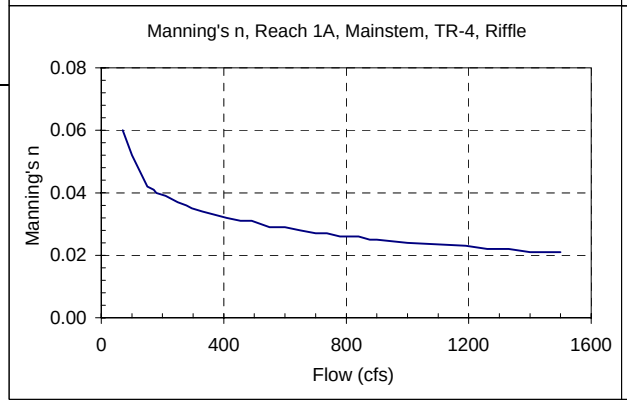
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
70	95.60	0.21	1.02	0.82	0.060	94.0
100	95.73	0.24	1.22	0.86	0.052	103.4
125	95.82	0.27	1.37	0.89	0.047	113.8
150	95.89	0.30	1.50	0.91	0.042	125.7
171.8	95.95	0.31	1.60	0.93	0.041	131.6
180	95.97	0.32	1.64	0.93	0.040	132.9
210	96.04	0.33	1.76	0.95	0.039	136.6
250	96.12	0.35	1.91	0.97	0.037	141.2
277.9	96.17	0.36	2.02	0.98	0.036	144.0
296	96.20	0.37	2.08	0.99	0.035	146.0
330	96.25	0.39	2.21	1.00	0.034	149.3
370	96.31	0.40	2.34	1.01	0.033	151.4
410	96.36	0.42	2.47	1.02	0.032	152.4
454.7	96.42	0.43	2.60	1.03	0.031	153.6
491.4	96.46	0.44	2.71	1.04	0.031	154.3
550	96.52	0.46	2.89	1.05	0.029	155.8
600	96.57	0.47	3.03	1.06	0.029	157.3
650	96.62	0.49	3.15	1.07	0.028	158.7
700	96.66	0.50	3.30	1.08	0.027	159.9
737	96.69	0.51	3.39	1.08	0.027	160.8
780	96.73	0.52	3.49	1.09	0.026	161.9
840	96.77	0.54	3.65	1.10	0.026	163.1
877	96.80	0.55	3.73	1.10	0.025	163.9
900	96.82	0.55	3.78	1.10	0.025	164.3
1000	96.88	0.58	4.03	1.11	0.024	165.4
1190	97.00	0.62	4.44	1.13	0.023	168.0
1260	97.04	0.63	4.59	1.13	0.022	169.1
1330	97.07	0.65	4.76	1.14	0.022	169.9
1400	97.11	0.66	4.89	1.15	0.021	171.0
1500	97.16	0.68	5.09	1.15	0.021	172.4

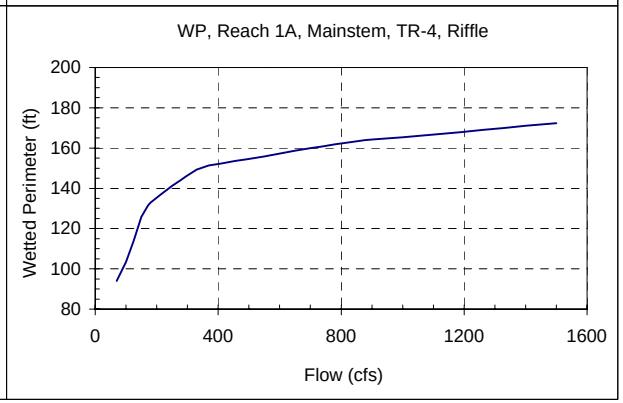


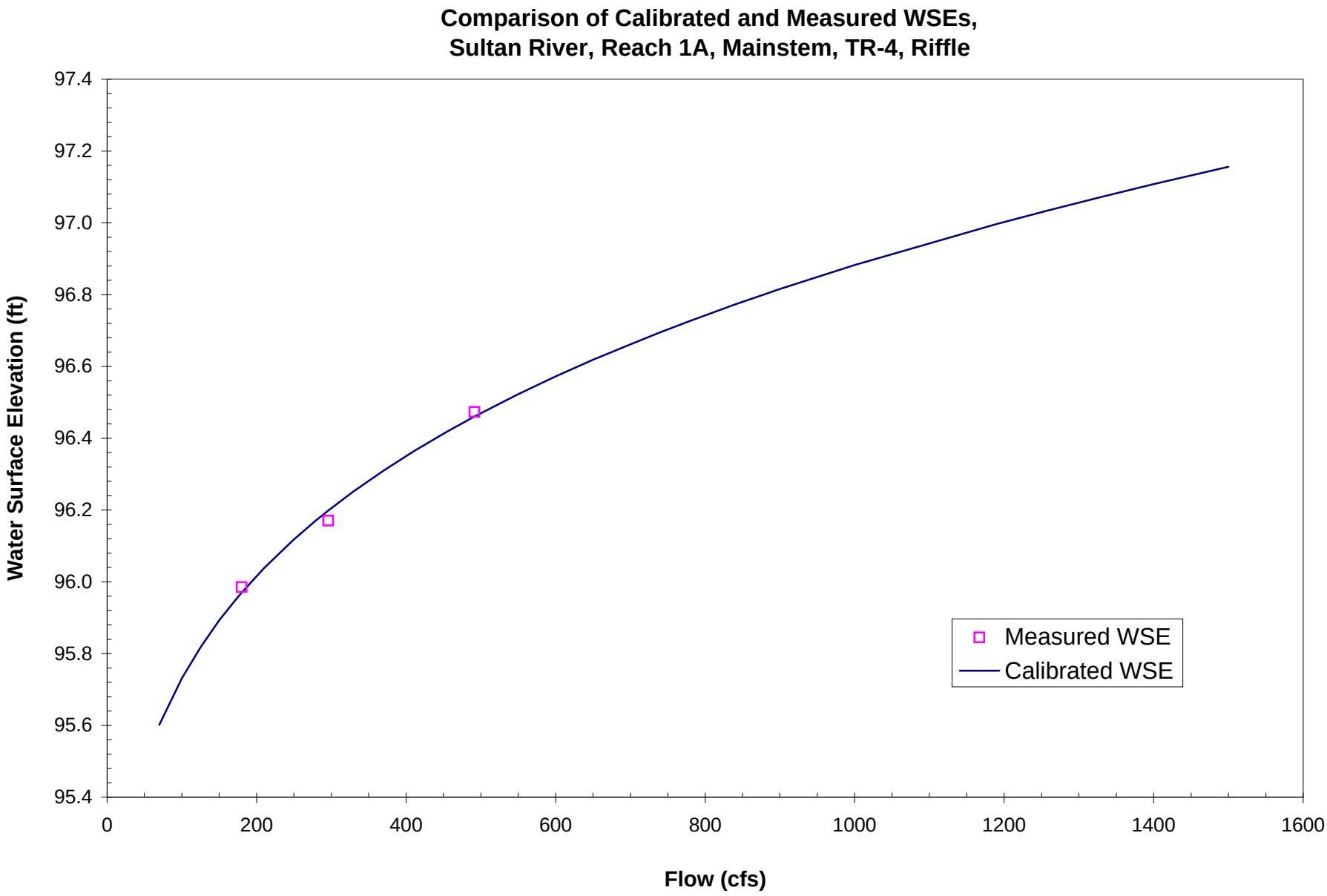











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Mainstem, TR-4, Riffle
Water Surface Elevation (ft)
97.4
97.2
97.0
96.8
96.6
96.4
96.2
96.0
95.8
95.6
95.4
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Date: 10/21/2007
Habitat: Run/Glide **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.78	101.78		100.00
HP			2.55	99.23
rock				
TP				
rock				
HP				
BM				

Comment: No level loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L			101.78	4.33	0.00	97.45	97.48	
3-M								
3-R				4.27	0.00	97.51		
							Ave Q=	0

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 12/20/2007
Habitat: Run/Glide **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.24	102.24		100.00
HP			3.01	99.23
rock				
TP				
rock				
HP				
BM				

Comment: No level loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L			102.24	6.33	0.64	96.55	96.61	
3-M				8.90	3.32	96.66		
							Ave Q=	0

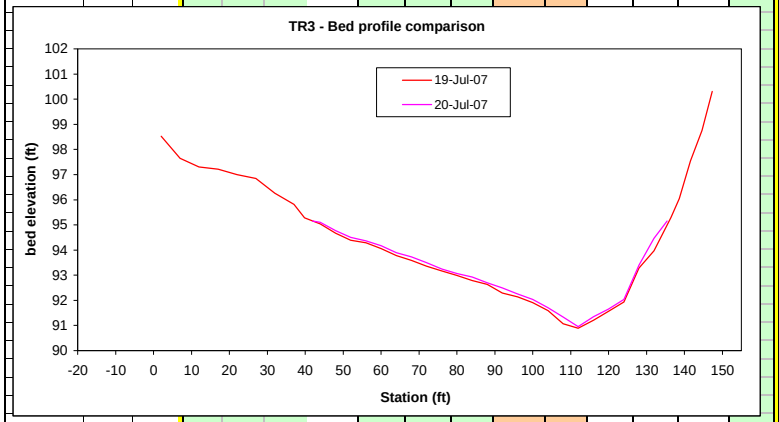
Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Stream: Sultan R.
Site: Reach 1A
Transect: 2
Habitat: Run/Glide

Survey Date	HI (ft)	Q (cfs)
7/18/2007	101.69	
7/19/2007	101.00	262.3
7/20/2007	101.13	179.7
7/17/2007	101.70	
10/21/2007	103.47	
12/20/2007	103.50	



18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

19-Jul-07

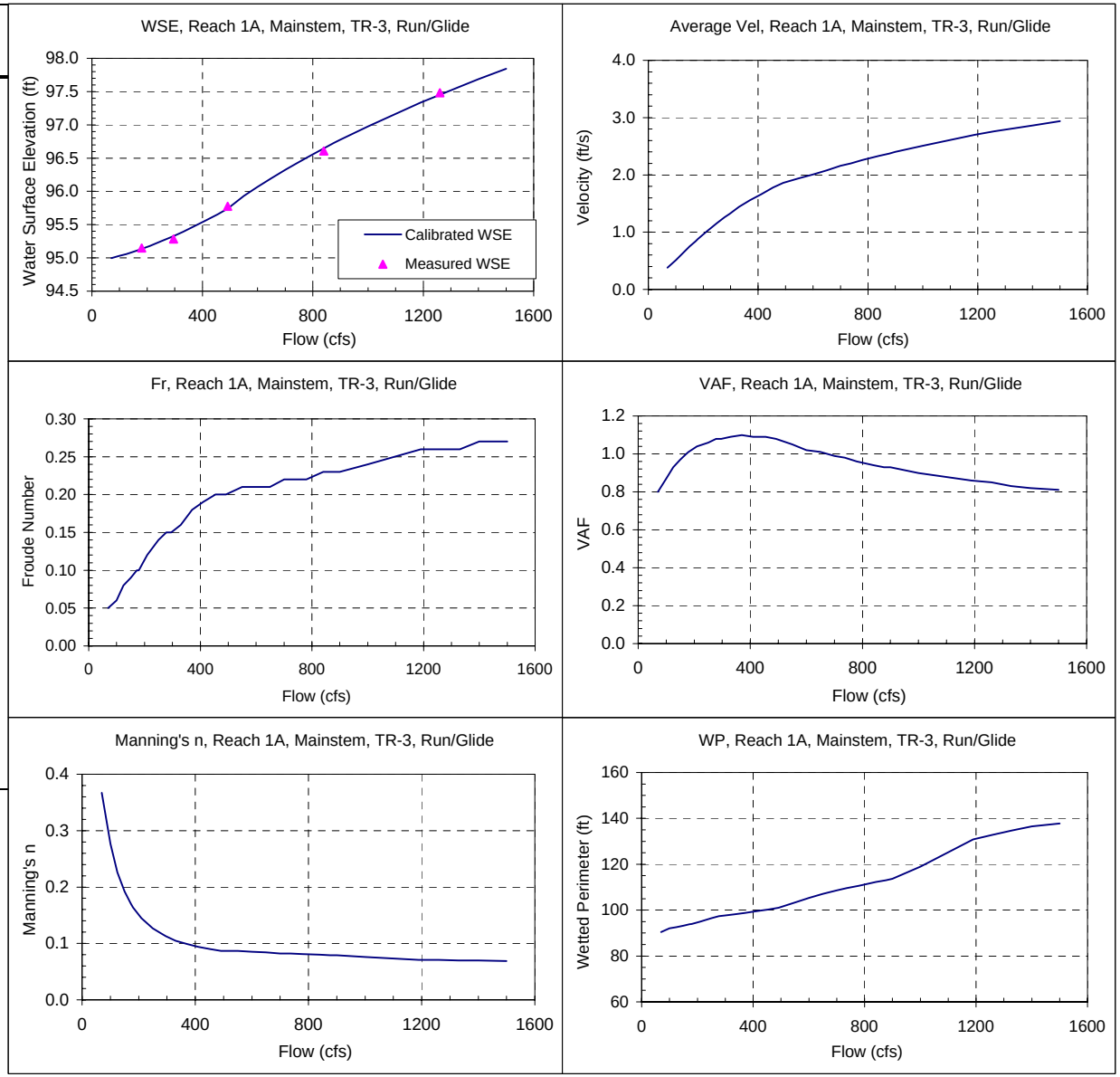
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	2.0	2.47	98.53									11.9
	7.0	3.35	97.65									11.9
	12.0	3.70	97.30									11.9
	17.0	3.78	97.22									11.9
	22.0	4.00	97.00									11.9
	27.0	4.16	96.84									11.9
	32.0	4.74	96.26									11.9
	37.0	5.18	95.82									11.9
LWE	39.8		95.29	0.00	0.00		0.00		0.00		0.00	75.6
	44.0		95.04	0.25	0.03		0.12		0.12		0.13	57.7
	48.0		94.67	0.62	0.18		0.24		0.24		0.61	57.6
	52.0		94.39	0.90	0.35		0.41		0.41		1.49	54.6
	56.0		94.29	1.00	0.38		0.44		0.44		1.77	54.6
	60.0		94.07	1.22	0.48		0.54		0.54		2.62	32.6
	64.0		93.79	1.50	0.65		0.70		0.70		4.22	32.6
	68.0		93.59	1.70	0.72		0.77		0.77		5.23	32.6
	72.0		93.37	1.92	0.82		0.87		0.87		6.67	32.6
	76.0		93.17	2.12	0.83		0.88		0.88		7.45	32.6
	80.0		92.99	2.30	0.88		0.93		0.93		8.55	34.7
	84.0		92.79	2.50	1.11		1.16		1.16		11.63	34.6
	88.0		92.64	2.65	1.40	1.07	1.46	1.12	1.29		13.68	45.6
	92.0		92.29	3.00	1.52	1.06	1.58	1.11	1.35		16.16	45.6
	96.0		92.14	3.15	1.39	1.21	1.45	1.27	1.36		17.11	54.6
	100.0		91.92	3.37	1.69	1.37	1.75	1.43	1.59		21.46	53.7
	104.0		91.59	3.70	1.70	1.20	1.76	1.26	1.51		22.35	54.7
	108.0		91.07	4.22	1.79	1.45	1.86	1.51	1.68		28.41	68.6
	112.0		90.89	4.40	2.21	1.27	2.28	1.33	1.80		31.70	86.6
	116.0		91.22	4.07	1.84	1.22	1.91	1.28	1.59		25.90	86.6
	120.0		91.57	3.72	1.43	0.73	1.49	0.78	1.13		16.89	76.6
	124.0		91.94	3.35	1.19	0.30	1.25	0.36	0.80		10.77	78.7
	128.0		93.29	2.00	0.63		0.68		0.68		5.47	65.6
	132.0		93.97	1.32	0.30		0.36		0.36		2.01	75.7
RWE	136.4	5.70	95.30	0.00	0.00		0.00		0.00		0.00	76.7
	138.6	4.96	96.04									64.6
	141.6	3.46	97.54									27.6
	144.6	2.24	98.76									27.6
RWP	147.3	0.69	100.31									17.8

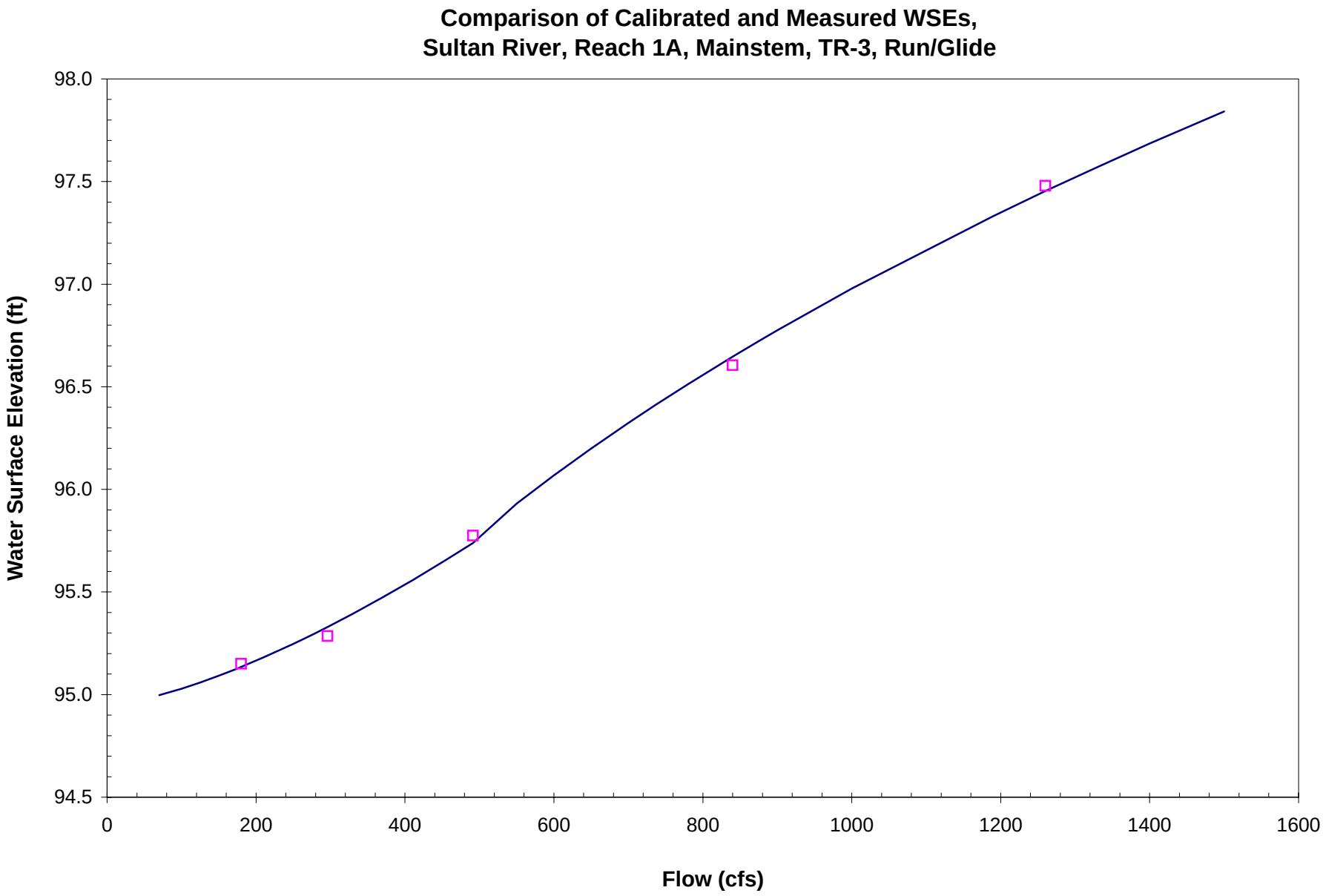
20-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	41.9		95.15	0.00	0.00		0.00		0.00		0.00	75.6
	44.0		95.10	0.05	0.05		0.19		0.19		0.03	57.7
	48.0		94.77	0.38	0.05		0.19		0.19		0.29	57.6
	52.0		94.50	0.65	0.18		0.24		0.24		0.64	54.6
	56.0		94.37	0.78	0.28		0.34		0.34		1.06	54.6
	60.0		94.17	0.98	0.37		0.43		0.43		1.70	32.6
	64.0		93.90	1.25	0.40		0.46		0.46		2.32	32.6
	68.0		93.73	1.42	0.51		0.57		0.57		3.22	32.6
	72.0		93.50	1.65	0.63		0.68		0.68		4.52	32.6
	76.0		93.25	1.90	0.65		0.70		0.70		5.34	32.6
	80.0		93.07	2.08	0.66		0.71		0.71		5.93	34.7
	84.0		92.93	2.22	0.76		0.81		0.81		7.18	34.6
	88.0		92.70	2.45	1.01		1.06		1.06		10.38	45.6
	92.0		92.50	2.65	1.17	0.69	1.22	0.74	0.98		10.42	45.6
	96.0		92.25	2.90	1.21	0.88	1.27	0.93	1.10		12.73	54.6
	100.0		92.03	3.12	1.20	0.99	1.26	1.04	1.15		14.32	53.7
	104.0		91.70	3.45	1.34	1.12	1.40	1.17	1.29		17.75	54.7
	108.0		91.33	3.82	1.34	1.10	1.40	1.15	1.28		19.49	68.6
	112.0		90.95	4.20	1.53	1.21	1.59	1.27	1.43		24.01	86.6
	116.0		91.35	3.80	1.14	0.75	1.19	0.80	1.00		15.14	86.6
	120.0		91.65	3.50	1.03	0.47	1.08	0.53	0.80		11.25	76.6
	124.0		92.03	3.12	0.70	0.52	0.75	0.58	0.66		8.29	78.7
	128.0		93.40	1.75	0.39		0.45		0.45		3.17	65.6
	132.0		94.47	0.68	0.05		0.19		0.19		0.48	75.7
RWE	135.4		95.15	0.00	0.00		0.00		0.00		0.00	76.7

Stream: Sultan R.
Site: Reach 1A
Habitat: Run/Glide
Transect: 3
Flow: All

Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
70	95.00	0.05	0.38	0.80	0.367	90.5
100	95.03	0.06	0.51	0.87	0.277	92.0
125	95.06	0.08	0.63	0.93	0.226	92.6
150	95.09	0.09	0.75	0.97	0.192	93.2
171.8	95.12	0.10	0.84	1.00	0.171	93.8
180	95.13	0.10	0.88	1.01	0.164	94.0
210	95.18	0.12	1.00	1.04	0.145	95.0
250	95.25	0.14	1.16	1.06	0.127	96.4
277.9	95.30	0.15	1.26	1.08	0.118	97.3
296	95.33	0.15	1.32	1.08	0.113	97.6
330	95.39	0.16	1.44	1.09	0.105	98.1
370	95.47	0.18	1.56	1.10	0.099	98.8
410	95.56	0.19	1.66	1.09	0.094	99.5
454.7	95.65	0.20	1.78	1.09	0.090	100.3
491.4	95.74	0.20	1.86	1.08	0.087	101.1
550	95.93	0.21	1.94	1.05	0.087	103.4
600	96.07	0.21	2.01	1.02	0.085	105.4
650	96.20	0.21	2.08	1.01	0.084	107.1
700	96.32	0.22	2.16	0.99	0.082	108.6
737	96.41	0.22	2.20	0.98	0.082	109.6
780	96.51	0.22	2.26	0.96	0.081	110.7
840	96.65	0.23	2.33	0.94	0.080	112.2
877	96.73	0.23	2.37	0.93	0.079	113.1
900	96.78	0.23	2.40	0.93	0.079	113.6
1000	96.98	0.24	2.51	0.90	0.076	119.0
1190	97.33	0.26	2.70	0.86	0.071	130.8
1260	97.45	0.26	2.76	0.85	0.071	132.8
1330	97.57	0.26	2.81	0.83	0.070	134.8
1400	97.69	0.27	2.86	0.82	0.070	136.5
1500	97.84	0.27	2.94	0.81	0.069	137.8




Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Mainstem, TR-3, Run/Glide
Water Surface Elevation (ft)
98.0
97.5
97.0
96.5
96.0
95.5
95.0
94.5
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)

Stream: Sultan R.
Site: Reach 1A

Date: 7/18/2007 **Transect:** 2
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.70	101.70		100.00
RWP			2.67	99.03
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			101.70	7.26	0.00	94.44	94.44	441.7
2-R				7.31	0.00	94.39		

Ave Q= 441.7

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: NA
(Sta >=108)

Meter ID: 5750
Propeller ID: 6A
Calib #: 167
(Sta <=103)

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.95	102.95		100.00
RWP			3.93	99.02
BM				

Comment: Staff guage = 3.625 inches @ 1500 pm

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			102.95	8.88	0.00	94.07	94.06	250.3
2-R				8.90	0.00	94.05		

Ave Q= 250.3

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: 186

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.14	103.14		100.00
RWP			4.11	99.03
BM				

Comment: Staff guage = 2.750 inches @ 1409 pm

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L	142	87	103.14	9.29	0.00	93.85	93.85	167.7
2-R	31.4			9.30	0.00	93.84		

Ave Q= 167.7

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: 186

Date: 10/21/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP	3.47	103.47		100.00
BM				

Comment: No level loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			103.47	7.63		95.84	96.04	
2-R				7.43		96.04		

Ave Q= 0.0

WSE at Side Channel 1, TR-6

Datum of R1A, TR-2	103.47	7.49	0.00	95.98	95.98	
Datum of SC-1, TR-6	104.38	7.49	0.00	96.89	96.89	70

Note: Q=70 estimated from extended rating curve of TR-6 in Side Channel 1
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 12/20/2007
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)	
HP	3.50	103.50		100.00	
SC-1, TR-6, Nail			4.41	99.09	100 for SC-1, TR6 Datum
BM					

Comment: No level loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-M			103.50	11.56	3.48	95.42	95.34	
2-R				10.15	1.99	95.34		

Ave Q= 0.0

WSE at Side Channel 1, TR-6

Datum of R1A, TR-2	103.50	9.07	0.97	95.40	95.40	
Datum of SC-1, TR-6	104.41	9.07	0.97	96.31	96.31	23

Note: Q=23 estimated from rating curve of TR-6 in Side Channel 1
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Stream: Sultan R.
Site: Reach 1A
Transect: 2
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/18/2007	101.70	441.7
7/19/2007	102.95	250.3
7/20/2007	103.14	167.7
10/21/2007	103.47	
12/20/2007	103.50	

18-Jul-07

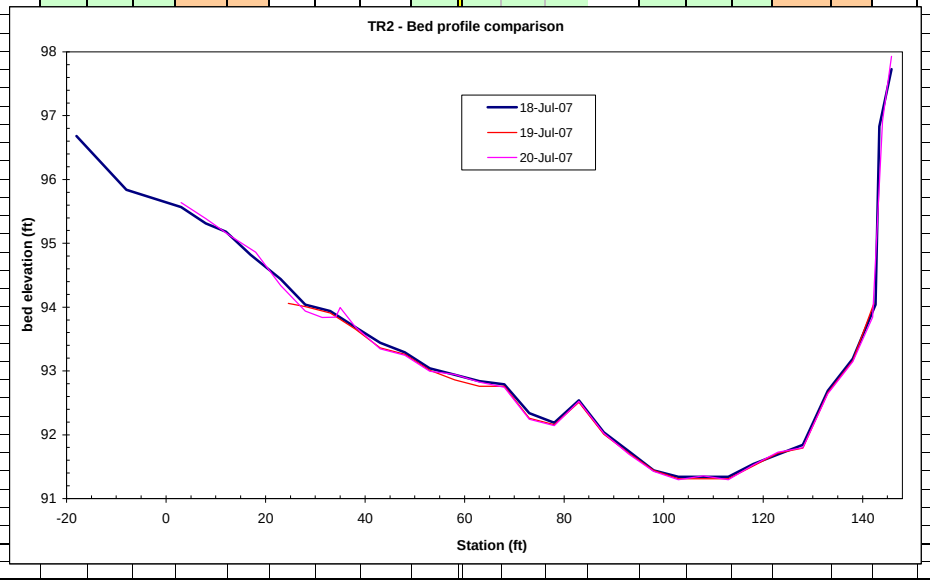
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs
	-18.0	5.02	96.68									11.9
	-8.0	5.86	95.84									11.9
RWP	3.0	6.13	95.57									11.9
	8.0	6.39	95.31									11.9
	12.0	6.52	95.18									16.9
	17.0	6.88	94.82									61.6
RWE	23.0		94.44	0.00	0.00		0.00		0.00		0.00	61.8
	28.0		94.04	0.40	0.34		0.39		0.39		0.78	62.8
	33.0		93.94	0.50	1.14		1.19		1.19		2.97	75.6
	38.0		93.69	0.75	1.13		1.18		1.18		4.42	65.6
	43.0		93.44	1.00	1.31		1.36		1.36		6.81	56.6
	48.0		93.29	1.15	1.60		1.66		1.66		9.54	65.6
	53.0		93.04	1.40	1.90		1.97		1.97		13.76	65.7
	58.0		92.94	1.50	1.77		1.83		1.83		13.75	67.7
	63.0		92.84	1.60	1.93		2.00		2.00		15.97	85.6
	68.0		92.79	1.65	1.73		1.79		1.79		14.78	74.7
	73.0		92.34	2.10	2.06		2.13		2.13		22.35	56.6
	78.0		92.19	2.25	2.07		2.14		2.14		24.06	76.6
	83.0		92.54	1.90	2.61		2.69		2.69		25.52	65.6
	88.0		92.04	2.40	2.29		2.36		2.36		28.35	62.7
	93.0		91.74	2.70	1.81	2.50	1.87	2.58	2.22		30.03	58.6
	98.0		91.44	3.00	2.06	2.79	2.13	2.87	2.50		37.48	75.6
	103.0		91.34	3.10	2.02	2.69	2.09	2.77	2.43		37.63	56.6
	108.0		91.34	3.10	1.71	2.14	1.77	2.21	1.99		30.85	56.6
	113.0		91.34	3.10	1.68	1.91	1.74	1.98	1.86		28.83	56.6
	118.0		91.54	2.90	1.48	2.12	1.54	2.19	1.86		27.02	64.6
	123.0		91.69	2.75	1.69	1.98	1.75	2.05	1.90		26.13	64.7
	128.0		91.84	2.60	1.12	1.93	1.17	2.00	1.58		20.60	65.7
	133.0		92.69	1.75	1.46		1.52		1.52		13.31	78.7
	138.0		93.19	1.25	1.08		1.13		1.13		6.79	63.6
LWE	142.6		94.04	0.40	0.00		0.00		0.00		0.00	63.6
	143.4	4.87	96.83									11.9
LWP	145.8	3.97	97.73									12.8

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs
RWE	24.6		94.06	0.00	0.00		0.00		0.00		0.00	61.8
	28.0		94.01	0.05	0.00		0.00		0.00		0.00	62.8
	33.0		93.91	0.15	0.26		0.32		0.32		0.24	72.7
	38.0		93.66	0.40	0.57		0.63		0.63		1.25	65.6
	43.0		93.36	0.70	0.72		0.77		0.77		2.69	56.6
	48.0		93.26	0.80	0.87		0.92		0.92		3.68	65.6
	53.0		93.01	1.05	1.29		1.35		1.35		7.07	65.7
	58.0		92.86	1.20	0.97		1.02		1.02		6.11	67.7
	63.0		92.76	1.30	1.03		1.08		1.08		7.02	85.6
	68.0		92.76	1.30	1.00		1.05		1.05		6.82	74.7
	73.0		92.26	1.80	1.30		1.36		1.36		12.22	56.6
	78.0		92.16	1.90	1.35		1.41		1.41		13.38	76.6
	83.0		92.51	1.55	1.53		1.59		1.59		12.34	65.6
	88.0		92.01	2.05	1.50		1.56		1.56		16.01	62.7
	93.0		91.71	2.35	1.73		1.79		1.79		21.09	58.6
	98.0		91.44	2.62	1.71	1.36	1.77	1.42	1.60		20.92	75.6
	103.0		91.31	2.75	1.63	1.32	1.69	1.38	1.54		21.12	56.6
	108.0		91.31	2.75	1.58	1.32	1.64	1.38	1.51		20.77	56.6
	113.0		91.31	2.75	1.61	1.26	1.67	1.32	1.50		20.56	56.6
	118.0		91.51	2.55	1.46	1.06	1.52	1.11	1.32		16.78	64.6
	123.0		91.71	2.35	1.29		1.35		1.35		15.83	64.7
	128.0		91.79	2.27	1.27		1.33		1.33		15.06	65.7
	133.0		92.66	1.40	0.86		0.91		0.91		6.36	78.7
	138.0		93.16	0.90	0.66		0.71		0.71		2.98	63.6
LWE	142.3		94.06	0.00	0.00		0.00		0.00		0.00	63.6

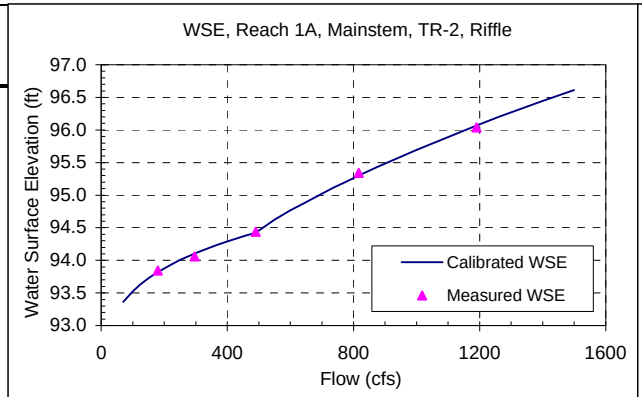
20-Jul-07

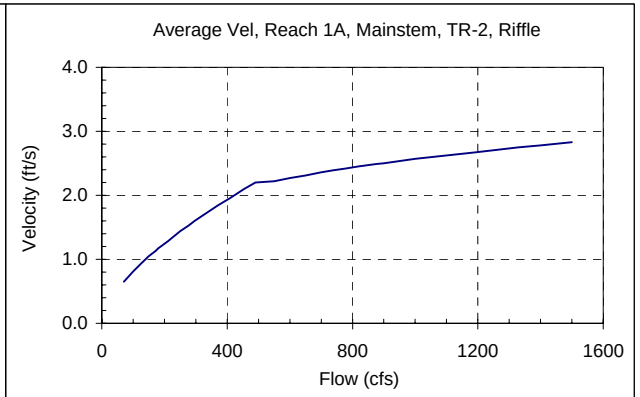
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs
RWP	3.0	7.50	95.64									11.9
	8.0	7.75	95.39									11.9
	13.0	8.03	95.11									16.9
	18.0	8.28	94.86									61.6
	23.0	8.80	94.34									61.8
	28.0	9.20	93.94									62.8
	31.4	9.30	93.84									56.6
RWE	34.1		93.85	0.00	0.00		0.00		0.00		0.00	72.7
	35.0		94.00	-0.15								75.6
	38.0		93.70	0.15	0.38		0.44		0.44		0.17	65.6
	43.0		93.35	0.50	0.42		0.48		0.48		1.20	56.6
	48.0		93.25	0.60	0.61		0.67		0.67		2.00	65.6
	53.0		93.00	0.85	0.77		0.82		0.82		3.48	65.7
	58.0		92.95	0.90	0.96		1.01		1.01		4.54	67.7
	63.0		92.83	1.02	0.76		0.81		0.81		4.12	85.6
	68.0		92.75	1.10	0.80		0.85		0.85		4.67	74.7
	73.0		92.25	1.60	0.92		0.97		0.97		7.75	56.6
	78.0		92.15	1.70	0.97		1.02		1.02		8.66	76.6
	83.0		92.53	1.32	1.06		1.11		1.11		7.33	65.6
	88.0		92.03	1.82	0.97		1.02		1.02		9.27	62.7
	93.0		91.70	2.15	1.33		1.39		1.39		14.93	58.6
	98.0		91.43	2.42	1.13		1.18		1.18		14.32	75.6
	103.0		91.30	2.55	1.33	0.99	1.39	1.04	1.21		15.48	56.6
	108.0		91.36	2.49	1.19		1.25		1.25		15.50	56.6
	113.0		91.30	2.55	1.19	0.84	1.25	0.89	1.07		13.61	56.6
	118.0		91.53	2.32	1.15		1.20		1.20		13.97	64.6
	123.0		91.73	2.12	0.93		0.98		0.98		10.38	64.7
	128.0		91.80	2.05	0.90		0.95		0.95		9.73	65.7
	133.0		92.65	1.20	0.74		0.79		0.79		4.73	78.7
	138.0		93.15	0.70	0.55		0.61		0.61		1.91	63.6
LWE	142.0		93.85	0.00	0.00		0.00		0.00		0.00	63.6
	144.0	6.22	96.92									11.9
LWP	145.8	5.21	97.93									12.8

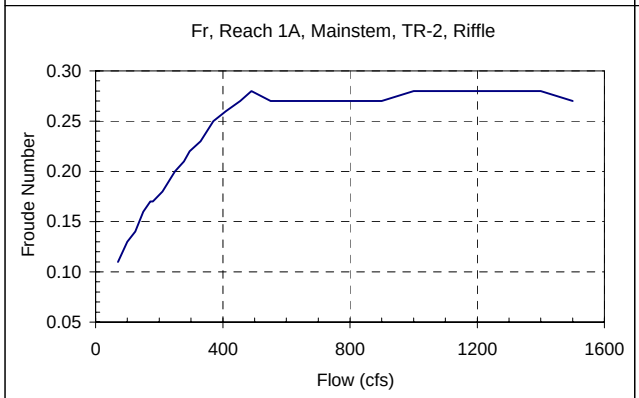


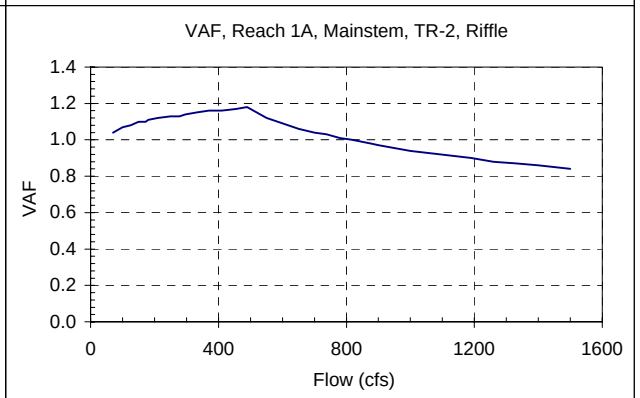
Stream: Sultan R.
Site: Reach 1A
Habitat: Riffle
Transect: 2

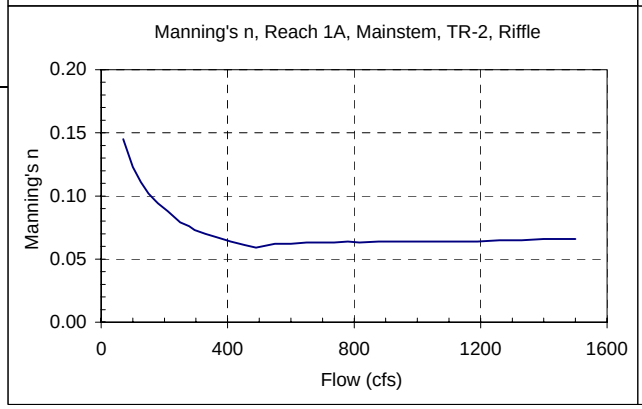
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
70	93.36	0.11	0.65	1.04	0.145	93.5
100	93.52	0.13	0.81	1.07	0.123	98.6
125	93.63	0.14	0.93	1.08	0.111	101.4
150	93.72	0.16	1.05	1.10	0.102	103.7
171.8	93.80	0.17	1.13	1.10	0.096	105.8
180	93.82	0.17	1.17	1.11	0.094	106.3
210	93.91	0.18	1.28	1.12	0.088	108.6
250	94.00	0.20	1.44	1.13	0.079	112.7
277.9	94.07	0.21	1.53	1.13	0.076	115.3
296	94.10	0.22	1.60	1.14	0.073	115.7
330	94.17	0.23	1.71	1.15	0.070	116.7
370	94.24	0.25	1.84	1.16	0.067	117.6
410	94.31	0.26	1.96	1.16	0.064	118.6
454.7	94.37	0.27	2.10	1.17	0.061	119.4
489.7	94.42	0.28	2.20	1.18	0.059	120.0
550	94.63	0.27	2.22	1.12	0.062	122.8
600	94.76	0.27	2.27	1.09	0.062	124.5
650	94.90	0.27	2.31	1.06	0.063	127.9
700	95.02	0.27	2.36	1.04	0.063	129.7
737	95.11	0.27	2.39	1.03	0.063	131.0
780	95.22	0.27	2.42	1.01	0.064	133.4
817	95.30	0.27	2.45	1.00	0.063	135.9
877	95.44	0.27	2.49	0.98	0.064	138.9
900	95.49	0.27	2.50	0.97	0.064	139.9
1000	95.70	0.28	2.57	0.94	0.064	147.0
1190	96.07	0.28	2.67	0.90	0.064	155.8
1260	96.20	0.28	2.71	0.88	0.065	157.5
1330	96.32	0.28	2.75	0.87	0.065	159.1
1400	96.44	0.28	2.78	0.86	0.066	160.6
1500	96.61	0.27	2.83	0.84	0.066	162.8

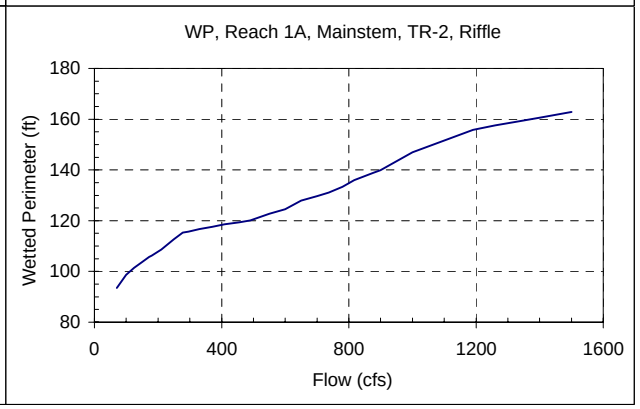


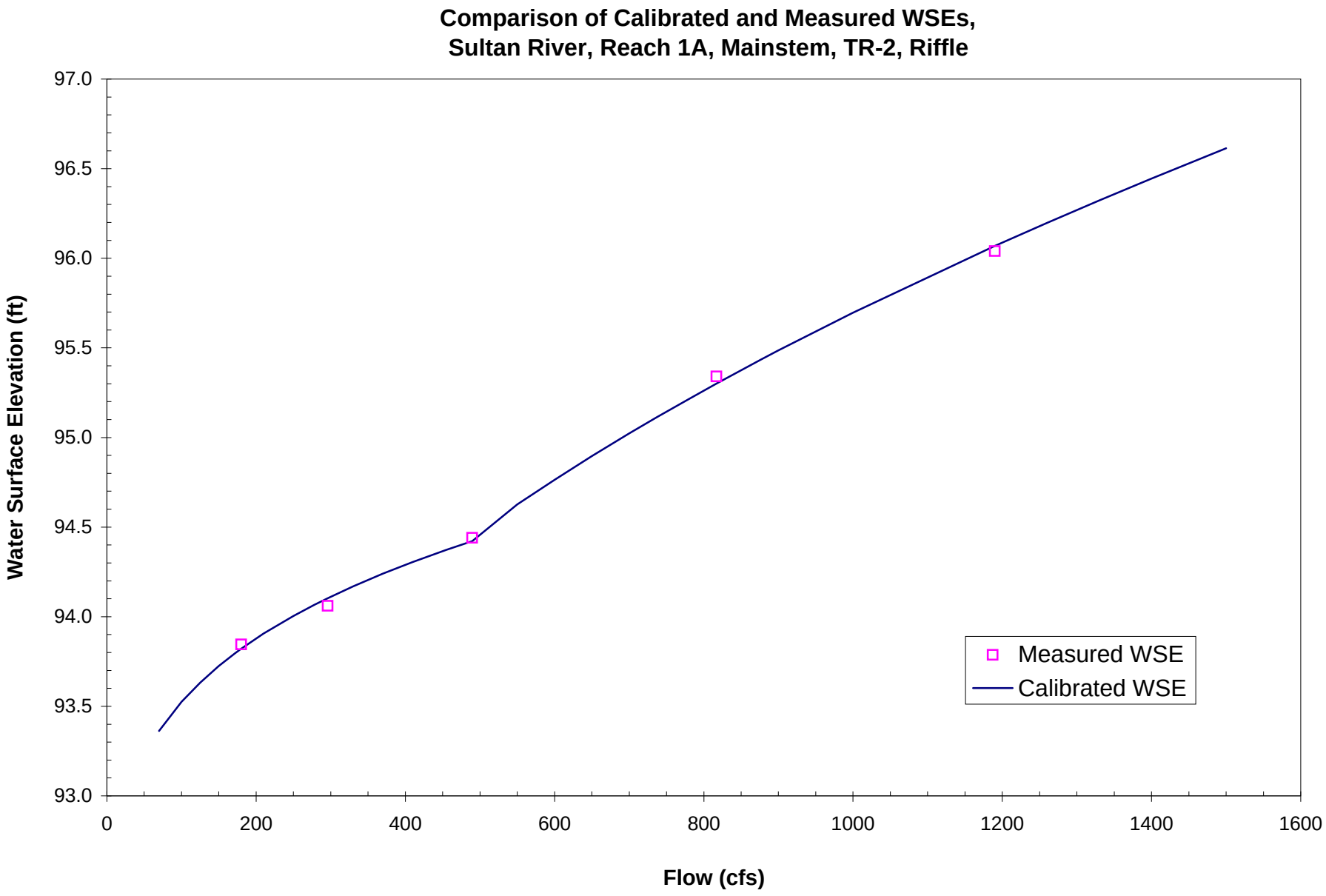











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Mainstem, TR-2, Riffle
Water Surface Elevation (ft)
97.0
96.5
96.0
95.5
95.0
94.5
94.0
93.5
93.0
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A
Date: 7/18/2007 **Transect:** 1
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.66	103.66		100.00
LWP			0.85	102.81

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			103.66	9.37	0.00	94.29	94.27	414.2
1-R				9.41	0.00	94.25		

Ave Q= 414.2

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: NA

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.57	103.57		100.00
LWP			0.76	102.81

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			103.57	9.54	0.00	94.03	94.03	254.2
1-R				9.55	0.00	94.02		

Ave Q= 254.2

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: 186

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.81	103.81		100.00
LWP			1.00	102.81

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			103.81	9.95	0.00	93.86	93.83	147.3
1-R				10.01	0.00	93.80		

Ave Q= 147.3

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: 186

Date: 10/21/2007
Habitat: Riffle **Flow:** Highest

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP	3.90	103.90		100.00
nail			3.90	100.00

Comment: No Level Loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			103.90	8.45	0.00	95.45	95.49	
1-R				8.38	0.00	95.52		

Ave Q= 1750

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 12/20/2007
Habitat: Riffle **Flow:** Higher

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.84	103.84		100.00
HP			3.85	99.99

Comment: No Level Loop

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			103.84	11.44	2.56	94.96	94.94	
1-R				11.40	2.47	94.91		

Ave Q= 950.0

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Stream: Sultan R.
Site: Reach 1A
Transect: 1
Habitat: Run

Survey Date	HI (ft)	Q (cfs)
7/18/2007	103.66	414.2
7/19/2007	103.57	254.2
7/20/2007	103.81	147.3
10/21/2007	103.90	
12/20/2007	103.84	

18-Jul-07

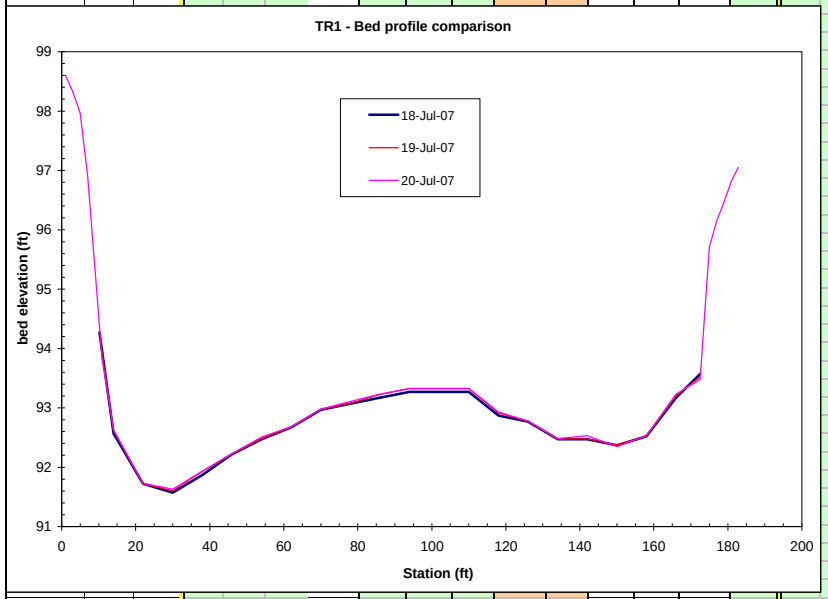
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	10.2		94.27	0.00	0.00		0.00		0.00		0.00	27.6
	14.0		92.57	1.70	0.70		0.75		0.75		7.54	62.7
	22.0		91.72	2.55	1.46	1.15	1.52	1.20	1.36		27.80	58.6
	30.0		91.57	2.70	1.95	1.16	2.02	1.21	1.62		34.89	52.7
	38.0		91.87	2.40	1.75		1.81		1.81		34.85	43.7
	46.0		92.22	2.05	2.08		2.15		2.15		35.20	43.7
	54.0		92.47	1.80	1.96		2.03		2.03		29.18	43.7
	62.0		92.67	1.60	1.91		1.98		1.98		25.29	43.7
	70.0		92.97	1.30	1.66		1.72		1.72		17.93	43.7
	78.0		93.07	1.20	1.61		1.67		1.67		16.07	43.7
	86.0		93.17	1.10	1.52		1.58		1.58		13.92	43.7
	94.0		93.27	1.00	1.50		1.56		1.56		12.49	43.7
	102.0		93.27	1.00	1.31		1.37		1.37		10.94	45.6
	110.0		93.27	1.00	1.38		1.44		1.44		11.52	43.7
	118.0		92.87	1.40	1.34		1.40		1.40		15.67	45.7
	126.0		92.77	1.50	1.48		1.54		1.54		18.50	56.6
	134.0		92.47	1.80	1.66		1.72		1.72		24.83	65.7
	142.0		92.47	1.80	1.62		1.68		1.68		24.24	75.6
	150.0		92.37	1.90	1.42		1.48		1.48		22.50	65.6
	158.0		92.52	1.75	1.46		1.52		1.52		21.30	75.6
	166.0		93.17	1.10	0.99		1.04		1.04		8.29	76.6
RWE	172.5		93.57	0.70	0.51		0.57		0.57		1.29	65.7

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	10.6		94.03	0.00	0.00		0.00		0.00		0.00	27.6
	14.0		92.63	1.40	0.44		0.50		0.50		3.99	62.7
	22.0		91.73	2.30	0.85		0.90		0.90		16.54	58.6
	30.0		91.61	2.42	1.43		1.49		1.49		28.86	52.7
	38.0		91.93	2.10	1.37		1.43		1.43		24.01	43.7
	46.0		92.23	1.80	1.51		1.57		1.57		22.64	43.7
	54.0		92.48	1.55	1.27		1.33		1.33		16.46	43.7
	62.0		92.68	1.35	1.20		1.26		1.26		13.56	43.7
	70.0		92.98	1.05	1.21		1.27		1.27		10.63	43.7
	78.0		93.08	0.95	1.13		1.18		1.18		8.99	43.7
	86.0		93.23	0.80	0.97		1.02		1.02		6.52	43.7
	94.0		93.33	0.70	0.83		0.88		0.88		4.92	43.7
	102.0		93.33	0.70	0.81		0.86		0.86		4.81	45.6
	110.0		93.33	0.70	0.89		0.94		0.94		5.26	43.7
	118.0		92.92	1.11	1.02		1.07		1.07		9.50	45.7
	126.0		92.78	1.25	1.15		1.20		1.20		12.04	56.6
	134.0		92.48	1.55	0.98		1.03		1.03		12.76	65.7
	142.0		92.48	1.55	1.26		1.32		1.32		16.33	75.6
	150.0		92.38	1.65	1.24		1.30		1.30		17.11	65.6
	158.0		92.53	1.50	1.13		1.18		1.18		14.20	75.6
	166.0		93.21	0.82	0.75		0.80		0.80		4.75	76.6
RWE	172.5		93.53	0.50	0.12		0.21		0.21		0.35	65.7

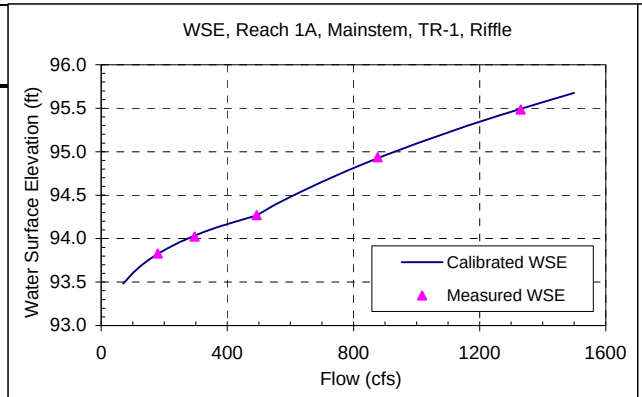
20-Jul-07

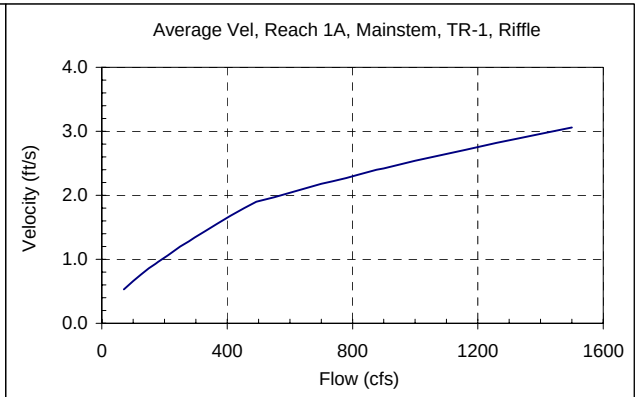
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	5.21	98.60									11.9
	3.0	5.49	98.32									11.9
	5.0	5.85	97.96									11.9
	7.0	6.90	96.91									12.5
LWE	10.9		93.83	0.00	0.00		0.00		0.00		0.00	27.6
	14.0		92.63	1.20	0.38		0.44		0.44		2.95	62.7
	22.0		91.73	2.10	0.74		0.79		0.79		13.24	58.6
	30.0		91.63	2.20	0.85		0.90		0.90		15.83	52.7
	38.0		91.93	1.90	0.83		0.88		0.88		13.36	43.7
	46.0		92.23	1.60	0.86		0.91		0.91		11.64	43.7
	54.0		92.51	1.32	0.88		0.93		0.93		9.81	43.7
	62.0		92.68	1.15	0.77		0.82		0.82		7.53	43.7
	70.0		92.98	0.85	0.64		0.69		0.69		4.72	43.7
	78.0		93.11	0.72	0.72		0.77		0.77		4.43	43.7
	86.0		93.23	0.60	0.64		0.69		0.69		3.33	43.7
	94.0		93.33	0.50	0.52		0.58		0.58		2.31	43.7
	102.0		93.33	0.50	0.72		0.77		0.77	10	3.03	45.6
	110.0		93.33	0.50	0.58		0.64		0.64	25	2.31	43.7
	118.0		92.93	0.90	0.61		0.67		0.67		4.79	45.7
	126.0		92.78	1.05	0.73		0.78		0.78		6.54	56.6
	134.0		92.48	1.35	0.61		0.67		0.67		7.18	65.7
	142.0		92.53	1.30	0.88		0.93		0.93		9.66	75.6
	150.0		92.35	1.48	0.95		1.00		1.00		11.83	65.6
	158.0		92.53	1.30	0.90		0.95		0.95		9.87	75.6
	166.0		93.23	0.60	0.58		0.64		0.64		2.77	76.6
RWE	172.5		93.48	0.35	0.04		0.16		0.16		0.19	65.7
	175.0	8.10	95.71									11.9
	177.0	7.66	96.15									11.9
	179.0	7.34	96.47									11.9
	181.0	6.99	96.82									11.9
RWP	182.8	6.76	97.05									11.9

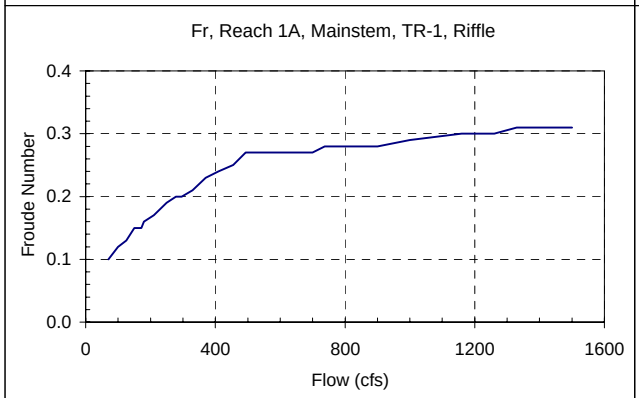


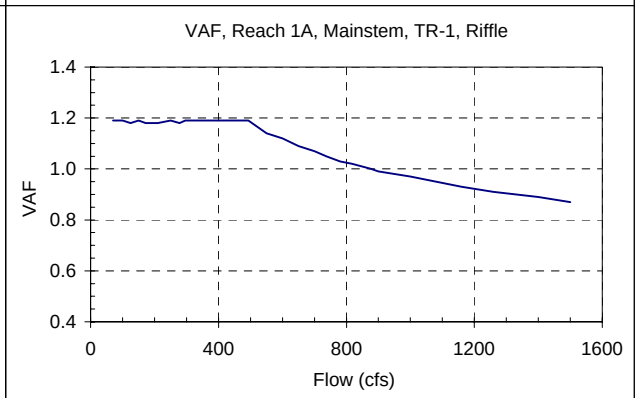
Stream: Sultan R.
Site: Reach 1A
Habitat: Riffle
Transect: 1

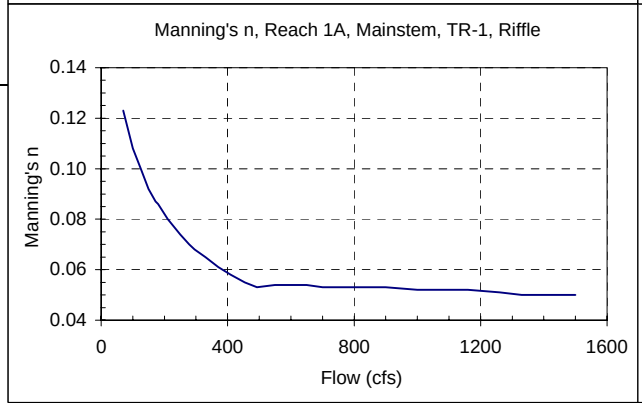
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
70	93.48	0.10	0.53	1.19	0.123	159.4
100	93.60	0.12	0.66	1.19	0.108	161.2
125	93.69	0.13	0.76	1.18	0.100	161.6
150	93.75	0.15	0.86	1.19	0.092	161.8
171.8	93.81	0.15	0.93	1.18	0.087	162.0
180	93.83	0.16	0.96	1.18	0.086	162.1
210	93.89	0.17	1.06	1.18	0.080	162.4
250	93.96	0.19	1.20	1.19	0.074	162.6
277.9	94.01	0.20	1.28	1.18	0.070	162.8
296	94.03	0.20	1.34	1.19	0.068	162.9
330	94.08	0.21	1.44	1.19	0.065	163.1
370	94.13	0.23	1.56	1.19	0.061	163.3
410	94.18	0.24	1.68	1.19	0.058	163.5
454.7	94.23	0.25	1.80	1.19	0.055	163.7
493.2	94.27	0.27	1.90	1.19	0.053	163.9
550	94.39	0.27	1.97	1.14	0.054	164.2
600	94.48	0.27	2.04	1.12	0.054	164.5
650	94.57	0.27	2.11	1.09	0.054	164.8
700	94.65	0.27	2.18	1.07	0.053	165.1
737	94.71	0.28	2.22	1.05	0.053	165.2
780	94.78	0.28	2.27	1.03	0.053	165.5
817	94.84	0.28	2.32	1.02	0.053	165.6
877	94.92	0.28	2.40	1.00	0.053	165.9
900	94.96	0.28	2.42	0.99	0.053	166.0
1000	95.09	0.29	2.54	0.97	0.052	166.4
1160	95.30	0.30	2.71	0.93	0.052	167.1
1260	95.41	0.30	2.82	0.91	0.051	167.4
1330	95.49	0.31	2.89	0.90	0.050	167.7
1400	95.57	0.31	2.96	0.89	0.050	167.9
1500	95.67	0.31	3.06	0.87	0.050	168.2

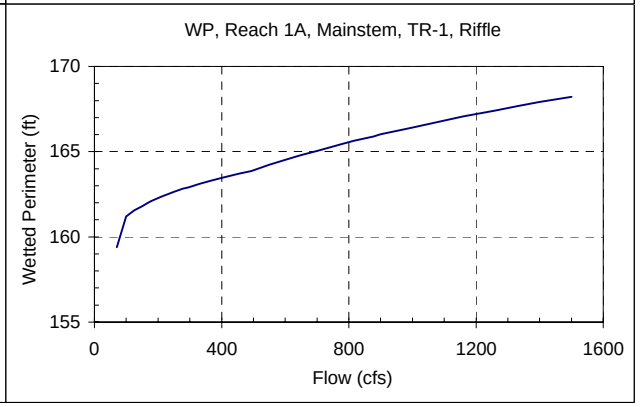


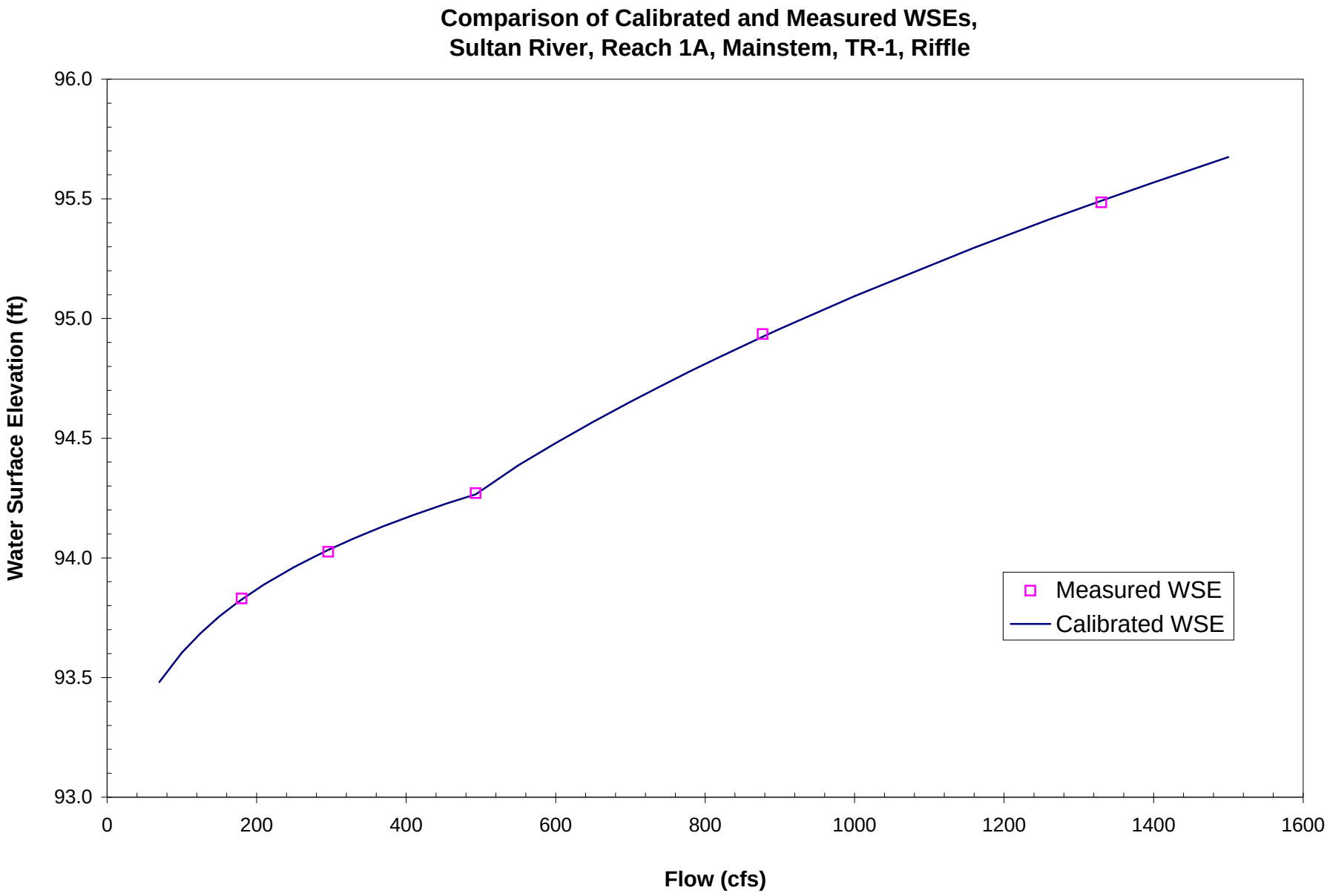











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Mainstem, TR-1, Riffle
Water Surface Elevation (ft)
96.0
95.5
95.0
94.5
94.0
93.5
93.0
0
200
400
600
800
1000
1200
1400
1600
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 3
Date: 7/17/2007 **Transect:** 6
Habitat: Riffle **Flow:** Bank Profile

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	2.79	102.79		100.00
BM2			3.02	99.77

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L						0.00	0.00	
6-R						0.00		

Ave Q=

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50		102.75	4.50	0.00	98.25
d/s	-50		102.75	5.17	0.00	97.58

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 7/18/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.04	104.04		100.00
BM2			4.26	99.78

Comment: Staff guage = 7.25 inches @ 1335 p

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			104.04	5.86	0.00	98.18	98.09	42.4
6-R				6.05	0.00	97.99		

Ave Q= 42.4

Note: Photo #25 looking u/s, #26 looking Left to Right across transect, #27 looking d/s
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	2.75	102.75		100.00
BM2			2.97	99.78

Comment: Staff guage = 4.675 inches @ 1155 am

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			102.75	4.73	0.00	98.02	97.89	18.7
6-R				4.99	0.00	97.76		

Ave Q= 18.7

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50		102.75	4.50	0.00	98.25
d/s	-50		102.75	5.17	0.00	97.58

Note: Photo #56 looking u/s, #57, 58 looking Left to Right across transect, #59 looking d/s
WSE slope = 0.670%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	2.85	102.85		100.00
BM2			3.08	99.77

Comment: Staff guage = 2.675 inches @ 1420 pm

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			102.85	4.98	0.00	97.87	97.73	9.0
6-R				5.26	0.00	97.59		

Ave Q= 9.0

Note: Photo #104, 105 looking u/s, #106 looking Left to Right across transect, #107, 108 looking d/s
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 8/21/2007
Habitat: Riffle **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.14	104.14		100.00
BM2			4.38	99.76

Comment: Staff gauge = 10.25 inches @ 9:05 am

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			104.14	6.39	0.66	98.41	98.38	
6-R				6.40	0.61	98.35		

Ave Q= 90.7

Note: Photo #1 looking d/s, #2 looking Left to Right across transect, #3 looking u/s; No depth and velocity measurements taken
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 8/23/2007
Habitat: Riffle **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	2.71	102.71		100.00
BM2			2.95	99.76
HP-1			2.97	99.74

Comment: Staff gauge = 9 1/8 inches @ 900 am and 5:30 pm

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			102.71	4.85	0.46	98.32	98.27	
6-M				4.57	0.29	98.43		
6-R				5.02	0.53	98.22		

Ave Q= 63.8

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
TR-6	35		102.71	5.56	1.50	98.65
d/s	-30		102.71	5.61	0.54	97.64

Note: Photo #58 looking d/s, #59 looking Left to Right across transect, #60 staff guage, #61 looking u/s
WSE slope = 1.554%

(3) Meter and propeller ID for Velocity Correction

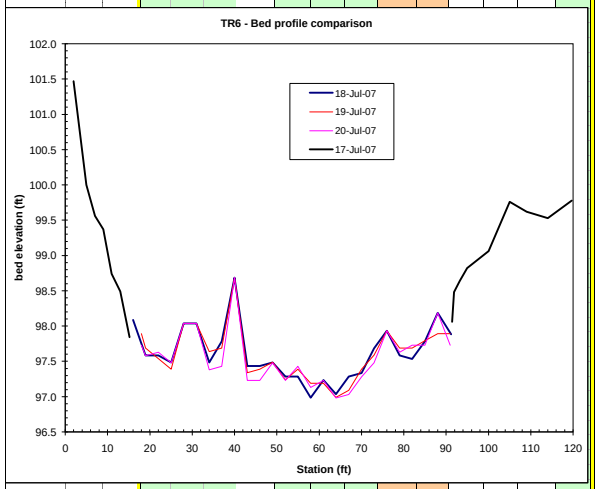
Meter ID: 4099
Propeller ID: 5A
Calib #: 175

Stream: Sultan R.
Site: Reach 1A, Side Channel 3
Transect: 6
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/17/2007	102.79	
7/18/2007	104.04	42.4
7/19/2007	102.75	18.7
7/20/2007	102.85	9.0
8/21/2007	104.14	
8/23/2007	102.71	

17-Jul-07

Chann	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWP	2.0	1.32	101.47									11.9
	5.0	2.79	100.00									11.9
	7.0	3.23	99.56									11.9
	9.0	3.42	99.37									11.9
	11.0	4.05	98.74									11.9
	13.0	4.30	98.49									11.9
	15.2	4.95	97.84									11.9
RWE												67.6
LWE	91.4	4.73	98.06									65.8
	91.9	4.31	98.48									11.9
	93.2	4.15	98.64									11.9
	95.0	3.97	98.82									11.9
	100.0	3.73	99.06									11.9
	105.0	3.03	99.76									11.9
	109.0	3.17	99.62									11.9
	114.0	3.26	99.53									11.9
LWP	119.7	3.01	99.78									11.9



18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	16.0		98.09	0.00	0.00		0.00		0.00		0.00	67.6
	19.0		97.59	0.50	2.59		2.59		2.59		3.89	67.6
	22.0		97.59	0.50	1.63		1.63		1.63		2.45	76.8
	25.0		97.49	0.60	0.44		0.44		0.44		0.79	67.6
	28.0		98.04	0.05	1.40		1.40		1.40		0.21	99.9
	31.0		98.04	0.05	1.40		1.40		1.40		0.21	99.9
	34.0		97.49	0.60	1.98		1.98		1.98		3.56	78.6
	37.0		97.79	0.30	2.06		2.06		2.06		0.93	88.9
	40.0		98.69	-0.60								88.9
	43.0		97.44	0.65	0.86		0.86		0.86		0.84	88.9
	46.0		97.44	0.65	2.18		2.18		2.18		4.25	87.8
	49.0		97.49	0.60	1.70		1.70		1.70		3.06	78.6
	52.0		97.29	0.80	1.31		1.31		1.31		3.14	86.8
	55.0		97.29	0.80	1.23		1.23		1.23		2.95	86.8
	58.0		96.99	1.10	1.24		1.24		1.24		4.09	87.5
	61.0		97.24	0.85	1.01		1.01		1.01		2.58	87.6
	64.0		97.04	1.05	0.98		0.98		0.98		3.09	87.8
	67.0		97.29	0.80	0.91		0.91		0.91		2.18	87.8
	70.0		97.34	0.75	0.55		0.55		0.55		1.24	87.8
	73.0		97.69	0.40	0.77		0.77		0.77		0.92	76.6
	76.0		97.94	0.15	0.38		0.38		0.38		0.17	87.6
	79.0		97.59	0.50	0.51		0.51		0.51		0.77	86.8
	82.0		97.54	0.55	0.32		0.32		0.32		0.53	87.6
	85.0		97.79	0.30	1.29		1.29		1.29		0.58	87.8
	88.0		98.19	-0.10								87.8
LWE	91.2		97.89	0.20	0.00		0.00		0.00		0.00	65.8

19-Jul-07

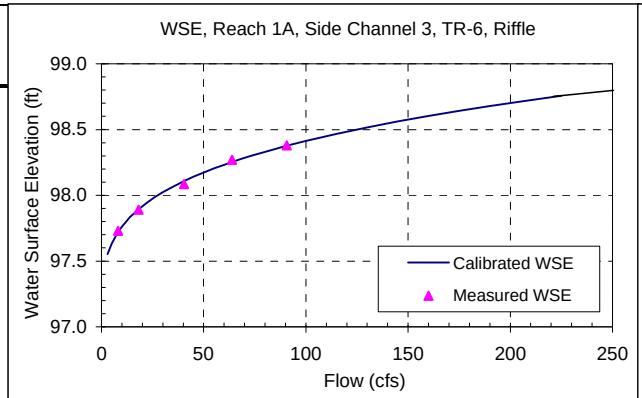
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	18.0		97.89	0.00	0.00		0.00		0.00		0.00	67.6
	19.0		97.69	0.20	2.78		2.86		2.86		2.00	67.6
	22.0		97.54	0.35	1.17		1.22		1.22		1.28	76.8
	25.0		97.39	0.50	1.07		1.12		1.12		0.84	67.6
	28.0		98.04									99.9
	31.0		98.04									99.9
	34.0		97.64	0.25	0.68		0.73		0.73		0.27	78.6
	37.0		97.69	0.20	0.99		1.04		1.04		0.31	88.9
	40.0		98.69									88.9
	43.0		97.34	0.55	0.66		0.71		0.71		0.59	88.9
	46.0		97.39	0.50	1.14		1.19		1.19		1.78	87.8
	49.0		97.49	0.40	0.86		0.91		0.91		1.10	78.6
	52.0		97.24	0.65	0.43		0.47		0.47		0.91	86.8
	55.0		97.39	0.50	0.86		0.91		0.91		1.37	86.8
	58.0		97.19	0.70	0.94		0.99		0.99		2.09	87.5
	61.0		97.19	0.70	0.70		0.75		0.75		1.58	87.6
	64.0		96.99	0.90	0.66		0.71		0.71		1.92	87.8
	67.0		97.09	0.80	0.22		0.29		0.29		0.70	87.8
	70.0		97.39	0.50	0.56		0.61		0.61		0.91	87.8
	73.0		97.59	0.30	0.40		0.44		0.44		0.20	76.6
	76.0		97.94									87.6
	79.0		97.69	0.20	0.82		0.87		0.87		0.26	86.8
	82.0		97.69	0.20	0.92		0.97		0.97		0.58	87.6
	85.0		97.79	0.10	0.00		0.00		0.00		0.00	87.8
	88.0		97.89	0.00	0.36		0.41		0.41		0.00	87.8
LWE	91.0		97.89	0.00	0.00		0.00		0.00		0.00	65.8

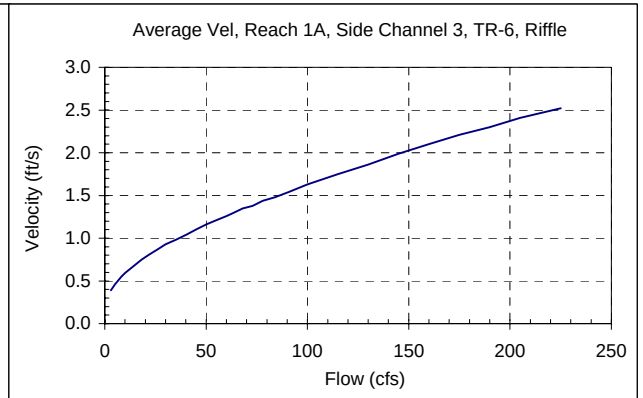
20-Jul-07

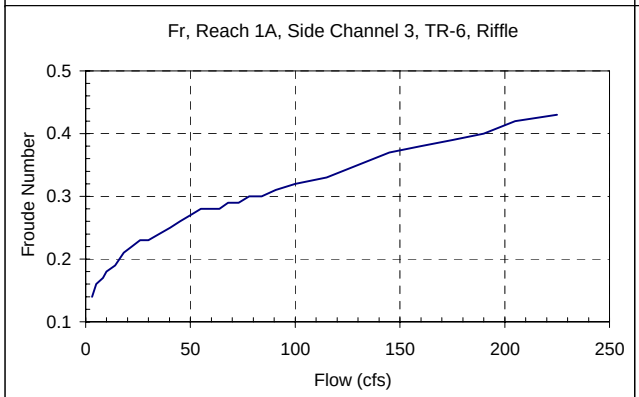
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	18.0		97.73	0.00	0.00		0.00		0.00		0.00	67.6
	19.0		97.58	0.15	0.22		0.29		0.29		0.09	67.6
	22.0		97.63	0.10	1.75		1.81		1.81		0.54	76.8
	25.0		97.48	0.25	0.54		0.58		0.58		0.22	67.6
	28.0		98.04									99.9
	31.0		98.04									99.9
	34.0		97.38	0.35	0.27		0.33		0.33		0.17	78.6
	37.0		97.43	0.30	0.25		0.32		0.32		0.14	88.9
	40.0		98.69									88.9
	43.0		97.23	0.50	0.20		0.28		0.28		0.21	88.9
	46.0		97.23	0.50	0.79		0.84		0.84		1.27	87.8
	49.0		97.48	0.25	0.19		0.28		0.28		0.21	78.6
	52.0		97.23	0.50	0.13		0.24		0.24		0.35	86.8
	55.0		97.43	0.30	1.00		1.05		1.05		0.95	86.8
	58.0		97.13	0.60	0.63		0.68		0.68		1.22	87.5
	61.0		97.23	0.50	0.64		0.69		0.69		1.03	87.6
	64.0		96.98	0.75	0.55		0.60		0.60		1.34	87.8
	67.0		97.03	0.70	0.21		0.29		0.29		0.61	87.8
	70.0		97.28	0.45	0.36		0.41		0.41		0.55	87.8
	73.0		97.48	0.25	0.17		0.27		0.27		0.10	76.6
	76.0		97.94									87.6
	79.0		97.63	0.10	0.05		0.17		0.17		0.03	86.8
	82.0		97.73	0.00	0.00		0.00		0.00		0.00	87.6
	85.0		97.73	0.00	0.00		0.00		0.00		0.00	87.8
	88.0		98.19									87.8
LWE	91.0		97.73	0.00	0.00		0.00		0.00		0.00	65.8

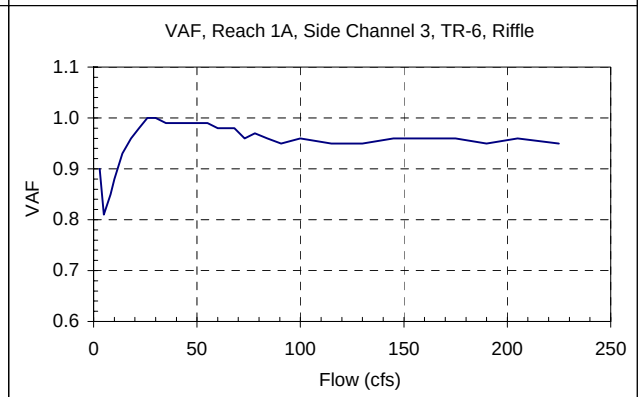
Stream: Sultan R.
Site: Reach 1A, Side Channel 3
Habitat: Riffle
Transect: 6

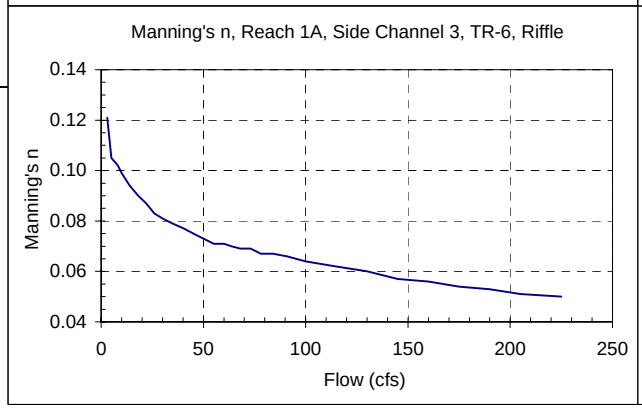
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
3	97.55	0.14	0.39	0.90	0.121	32.9
5	97.63	0.16	0.46	0.81	0.105	43.7
8.2	97.72	0.17	0.55	0.85	0.102	49.1
10	97.76	0.18	0.59	0.88	0.099	51.6
14	97.83	0.19	0.67	0.93	0.094	55.5
18.1	97.89	0.21	0.75	0.96	0.090	59.0
22	97.94	0.22	0.81	0.98	0.087	62.5
26	97.98	0.23	0.87	1.00	0.083	64.5
30	98.02	0.23	0.93	1.00	0.081	66.5
35	98.07	0.24	0.98	0.99	0.079	71.7
40.3	98.11	0.25	1.04	0.99	0.077	73.0
45	98.14	0.26	1.10	0.99	0.075	73.9
50	98.17	0.27	1.16	0.99	0.073	74.8
55	98.20	0.28	1.21	0.99	0.071	75.5
60	98.23	0.28	1.26	0.98	0.071	75.8
63.8	98.25	0.28	1.30	0.98	0.070	76.1
68	98.27	0.29	1.35	0.98	0.069	76.3
73	98.30	0.29	1.38	0.96	0.069	76.6
78	98.32	0.30	1.44	0.97	0.067	76.8
84	98.35	0.30	1.48	0.96	0.067	77.2
90.7	98.38	0.31	1.54	0.95	0.066	77.5
100	98.41	0.32	1.63	0.96	0.064	77.8
115	98.47	0.33	1.75	0.95	0.062	78.5
130	98.52	0.35	1.86	0.95	0.060	79.5
145	98.56	0.37	1.99	0.96	0.057	80.4
160	98.60	0.38	2.10	0.96	0.056	81.3
175	98.64	0.39	2.21	0.96	0.054	82.2
190	98.68	0.40	2.30	0.95	0.053	83.1
205	98.71	0.42	2.41	0.96	0.051	83.7
225	98.76	0.43	2.52	0.95	0.050	84.5

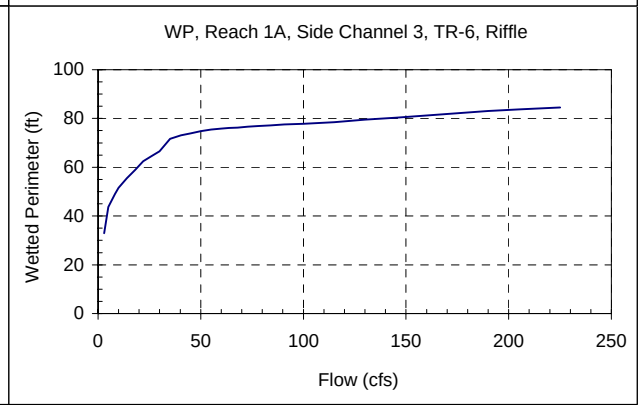


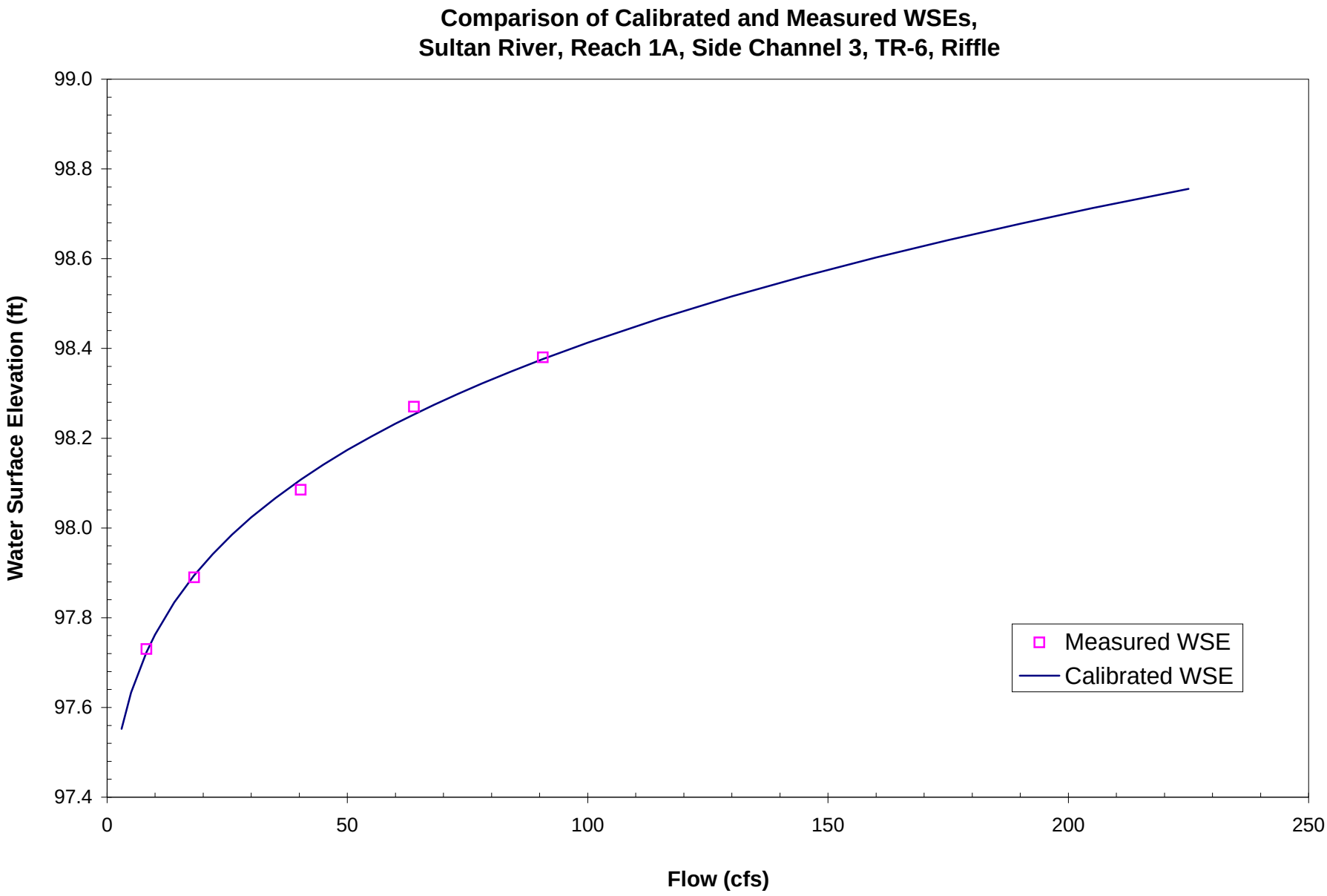











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel 3, TR-6, Riffle
Water Surface Elevation (ft)
99.0
98.8
98.6
98.4
98.2
98.0
97.8
97.6
97.4
0
50
100
150
200
250
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 3
Date: 7/17/2007 **Transect:** 5
Habitat: Run/Glide **Flow:** Bank Profile

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	5.40	105.40		100.00
BM2			3.57	101.83
BM3			5.59	99.81

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L						0.00	0.00	
5-R						0.00		

Ave Q=

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 7/18/2007
Habitat: Run/Glide **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	5.75	105.75		100.00
BM2			3.91	101.84
BM3			5.93	99.82

Comment: Photo #22, 23 looking u/s, #24 across transect right to left, #53 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L			105.75	6.46	0.00	99.29	99.29	36.9
5-R				6.47	0.00	99.28		

Ave Q= 36.9

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/19/2007
Habitat: Run/Glide **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	5.99	105.81		99.82
BM2			3.97	101.84
BM1			5.80	100.01

Comment: Photo #52, 53 looking u/s, #54 across transect right to left, #53 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L			105.81	6.80	0.00	99.01	99.01	15.9
5-R				6.80	0.00	99.01		

Ave Q= 15.9

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50		105.81	6.79	0.00	99.02
TR-5	0					99.01

Note:
WSE slope = 0.020%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/20/2007
Habitat: Run/Glide **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	5.51	105.51		100.00
BM2			3.68	101.83
BM3				

Comment: Photo #100, 101 looking u/s, #102 across transect right to left, #103 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L			105.51	6.69	0.00	98.82	98.82	4.3
5-R				6.70	0.00	98.81		

Ave Q= 4.3

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 8/21/2007
Habitat: Run/Glide **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	5.25	105.25		100.00
BM2			3.43	101.82
BM3				

Comment: Photo #4 looking d/s, #5 across transect right to left, #6 looking u/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L			105.25	6.60	1.07	99.72	99.72	90.7
5-R				6.26	0.72	99.71		

Ave Q= 90.7

Note: Prop Calib =175, Q taken at 930 am
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 4099-5A is used. See "data entry notes" for details.
Propeller ID: 5A
Calib #: 175

Date: 8/23/2007
Habitat: Run/Glide **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM2	3.47	105.30		101.83
BM1			5.31	99.99
BM3				

Comment: Photo #62 looking u/s, #63 across transect right to left, #6 looking d/s, #65 looking left to right

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L			105.31	6.37	0.60	99.54	99.54	63.8
5-R				6.35	0.57	99.53		

Ave Q= 63.8

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s			105.31	6.37	0.60	99.54
d/s			105.31	6.35	0.57	99.53

Note: Prop Calib =175
WSE slope = NA <--- No distance recorded.

(3) Meter and propeller ID for Velocity Correction

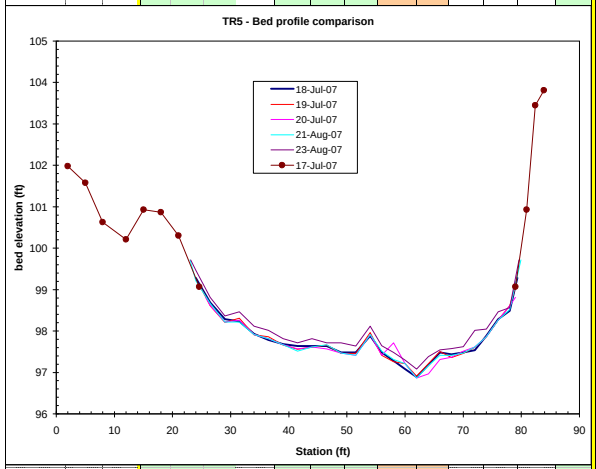
Meter ID: 3602 4099-5A is used. See "data entry notes" for details.
Propeller ID: 5A
Calib #: 175

Stream: Sultan R.
Site: Reach 1A, Side
Transect: 5
Habitat: Run/Glide

Survey	HI	Q
Date	(ft)	(cfs)
7/17/2007	105.40	
7/18/2007	105.75	36.9
7/19/2007	105.81	15.9
7/20/2007	105.51	4.3
8/21/2007	105.25	90.7
8/23/2007	105.31	63.8

17-Jul-07

Chann	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWP	2.0	3.42	101.98									11.9
	5.0	3.82	101.58									11.9
	8.0	4.77	100.63									11.9
	12.0	5.19	100.21									11.9
	15.0	4.47	100.93									11.9
	18.0	4.53	100.87									11.9
	21.0	5.10	100.30									11.9
RWE	24.6	6.33	99.07									21.8
LWE	79.0	6.33	99.07									11.9
	80.9	4.47	100.93									11.9
	82.4	1.95	103.45									11.9
LWP	83.9	1.59	103.81									11.9



18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	24.0		99.29	0.00	0.00		0.00		0.00		0.00	21.8
	26.5		98.69	0.60	0.00		0.00		0.00		0.00	21.9
	29.0		98.29	1.00	0.14		0.24		0.24		0.61	76.5
	31.5		98.24	1.05	0.17		0.27		0.27		0.70	76.6
	34.0		97.94	1.35	0.25		0.32		0.32		1.06	67.6
	36.5		97.79	1.50	0.28		0.33		0.33		1.25	65.6
	39.0		97.69	1.60	0.25		0.32		0.32		1.26	67.8
	41.5		97.64	1.65	0.28		0.33		0.33		1.37	78.8
	44.0		97.64	1.65	0.38		0.43		0.43		1.75	76.6
	46.5		97.64	1.65	0.41		0.45		0.45		1.86	67.5
	49.0		97.49	1.80	0.47		0.51		0.51		2.30	76.6
	51.5		97.49	1.80	0.56		0.61		0.61		2.73	78.6
	54.0		97.89	1.40	0.61		0.66		0.66		2.07	87.6
	56.0		97.49	1.80	0.67		0.72		0.72		2.59	87.5
	58.0		97.29	2.00	0.65		0.70		0.70		2.80	87.6
	60.0		97.09	2.20	0.50		0.54		0.54		2.39	87.6
	62.0		96.89	2.40	0.53		0.57		0.57		2.76	78.6
	64.0		97.19	2.10	0.42		0.46		0.46		1.92	78.6
	66.0		97.49	1.80	0.35		0.40		0.40		1.44	87.8
	68.0		97.44	1.85	0.53		0.57		0.57		2.12	87.6
	70.0		97.49	1.80	0.33		0.38		0.38		1.37	87.6
	72.0		97.54	1.75	0.19		0.28		0.28		0.98	87.8
	74.0		97.89	1.40	0.22		0.29		0.29		0.82	87.6
	76.0		98.29	1.00	0.13		0.24		0.24		0.47	76.8
	78.0		98.49	0.80	0.06		0.18		0.18		0.24	76.8
LWE	79.3		99.29	0.00	0.00		0.00		0.00		0.00	76.8

19-Jul-07

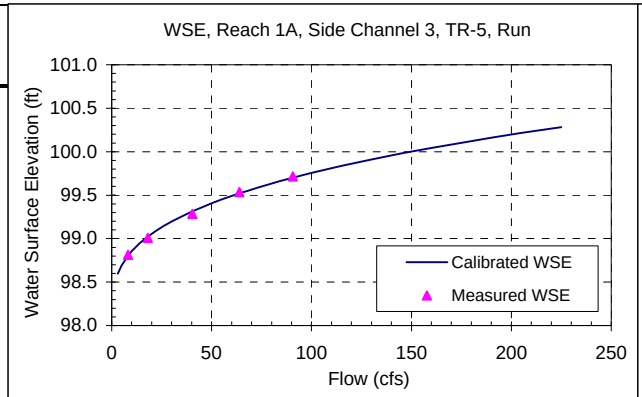
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	25.0		99.01	0.00	0.00		0.00		0.00		0.00	21.8
	26.5		98.61	0.40	0.00		0.00		0.00		0.00	21.9
	29.0		98.21	0.80	0.00		0.00		0.00		0.00	76.5
	31.5		98.31	0.70	0.01		0.04		0.04		0.06	76.6
	34.0		97.91	1.10	0.01		0.04		0.04		0.10	67.6
	36.5		97.86	1.15	0.12		0.23		0.23		0.65	65.6
	39.0		97.66	1.35	0.02		0.07		0.07		0.25	67.8
	41.5		97.56	1.45	0.11		0.21		0.21		0.78	78.8
	44.0		97.61	1.40	0.10		0.20		0.20		0.71	76.6
	46.5		97.66	1.35	0.15		0.25		0.25		0.85	67.5
	49.0		97.46	1.55	0.15		0.25		0.25		0.98	76.6
	51.5		97.46	1.55	0.26		0.32		0.32		1.25	78.6
	54.0		97.96	1.05	0.31		0.36		0.36		0.86	87.6
	56.0		97.41	1.60	0.32		0.37		0.37		1.19	87.5
	58.0		97.26	1.75	0.25		0.32		0.32		1.10	87.6
	60.0		97.21	1.80	0.37		0.42		0.42		1.50	87.6
	62.0		96.91	2.10	0.32		0.37		0.37		1.56	78.6
	64.0		97.21	1.80	0.22		0.29		0.29		1.05	78.6
	66.0		97.51	1.50	0.04		0.15		0.15		0.44	87.8
	68.0		97.36	1.65	0.26		0.32		0.32		1.06	87.6
	70.0		97.46	1.55	0.06		0.18		0.18		0.56	87.6
	72.0		97.61	1.40	0.05		0.17		0.17		0.47	87.8
	74.0		97.86	1.15	0.05		0.17		0.17		0.38	87.6
	76.0		98.26	0.75	0.01		0.04		0.04		0.05	76.8
	78.0		98.61	0.40	0.00		0.00		0.00		0.00	76.8
LWE	78.9		99.01	0.00	0.00		0.00		0.00		0.00	76.8

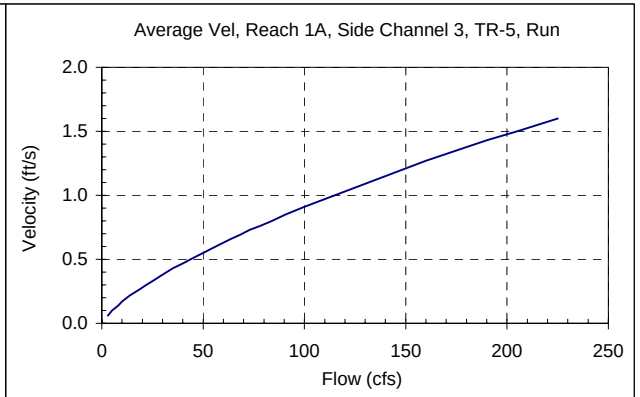
20-Jul-07

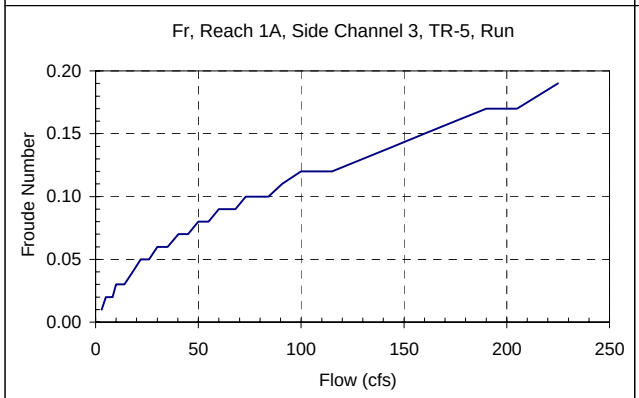
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	25.7		98.82	0.00	0.00		0.00		0.00		0.00	21.8
	26.5		98.62	0.20	0.00		0.00		0.00		0.00	21.9
	29.0		98.22	0.60	0.00		0.00		0.00		0.00	76.5
	31.5		98.27	0.55	0.00		0.00		0.00		0.00	76.6
	34.0		97.92	0.90	0.00		0.00		0.00		0.00	67.6
	36.5		97.82	1.00	0.01		0.04		0.04		0.09	65.6
	39.0		97.67	1.15	0.00		0.00		0.00		0.00	67.8
	41.5		97.57	1.25	0.01		0.04		0.04		0.11	78.8
	44.0		97.62	1.20	0.00		0.00		0.00		0.00	76.6
	46.5		97.57	1.25	0.01		0.04		0.04		0.11	67.5
	49.0		97.47	1.35	0.01		0.04		0.04		0.12	76.6
	51.5		97.42	1.40	0.03		0.11		0.11		0.38	78.6
	54.0		97.92	0.90	0.10		0.20		0.20		0.41	87.6
	56.0		97.42	1.40	0.01		0.04		0.04		0.10	87.5
	58.0		97.72	1.10	0.10		0.20		0.20		0.44	87.6
	60.0		97.22	1.60	0.14		0.24		0.24		0.78	87.6
	62.0		96.87	1.95	0.12		0.23		0.23		0.88	78.6
	64.0		96.97	1.85	0.01		0.04		0.04		0.14	78.6
	66.0		97.32	1.50	0.01		0.04		0.04		0.11	87.8
	68.0		97.37	1.45	0.08		0.19		0.19		0.56	87.6
	70.0		97.52	1.30	0.01		0.04		0.04		0.10	87.6
	72.0		97.62	1.20	0.00		0.00		0.00		0.00	87.8
	74.0		97.87	0.95	0.00		0.00		0.00		0.00	87.6
	76.0		98.27	0.55	0.00		0.00		0.00		0.00	76.8
	78.0		98.62	0.20	0.00		0.00		0.00		0.00	76.8
LWE	79.0		98.82	0.00	0.00		0.00		0.00		0.00	76.8

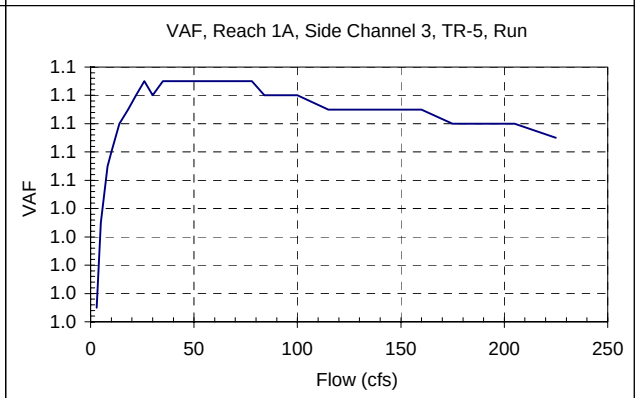
Stream: Sultan R.
Site: Reach 1A, Side Channel 3
Habitat: Run/Glide
Transect: 5

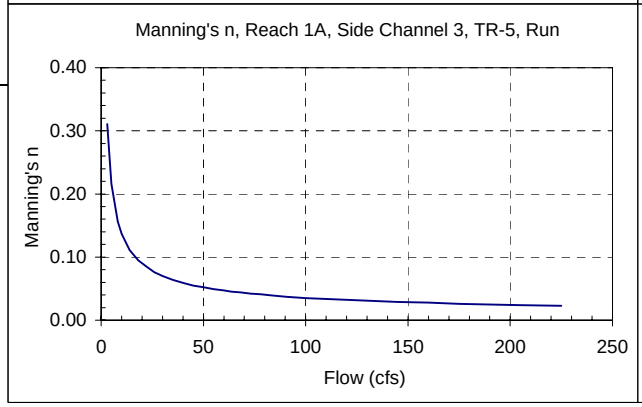
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
3	98.60	0.01	0.06	0.97	0.311	51.4
5	98.69	0.02	0.10	1.03	0.216	52.2
8.2	98.80	0.02	0.14	1.07	0.156	52.8
10	98.85	0.03	0.17	1.08	0.137	53.1
14	98.94	0.03	0.22	1.10	0.111	53.7
18.1	99.02	0.04	0.26	1.11	0.095	54.2
22	99.09	0.05	0.30	1.12	0.085	54.6
26	99.14	0.05	0.34	1.13	0.076	54.9
30	99.20	0.06	0.38	1.12	0.070	55.3
35	99.26	0.06	0.43	1.13	0.064	55.6
40.3	99.31	0.07	0.47	1.13	0.059	55.9
45	99.36	0.07	0.51	1.13	0.055	56.1
50	99.41	0.08	0.55	1.13	0.052	56.3
55	99.45	0.08	0.59	1.13	0.049	56.5
60	99.49	0.09	0.63	1.13	0.047	56.7
63.8	99.52	0.09	0.66	1.13	0.045	56.8
68	99.55	0.09	0.69	1.13	0.044	56.9
73	99.59	0.10	0.73	1.13	0.042	57.1
78	99.62	0.10	0.76	1.13	0.041	57.2
84	99.66	0.10	0.80	1.12	0.039	57.4
90.7	99.70	0.11	0.85	1.12	0.037	57.6
100	99.75	0.12	0.91	1.12	0.035	57.8
115	99.84	0.12	1.00	1.11	0.033	58.3
130	99.91	0.13	1.09	1.11	0.031	58.6
145	99.98	0.14	1.18	1.11	0.029	59.0
160	100.04	0.15	1.27	1.11	0.028	59.3
175	100.10	0.16	1.35	1.10	0.026	59.6
190	100.16	0.17	1.43	1.10	0.025	59.9
205	100.21	0.17	1.50	1.10	0.024	60.3
225	100.28	0.19	1.60	1.09	0.023	61.6

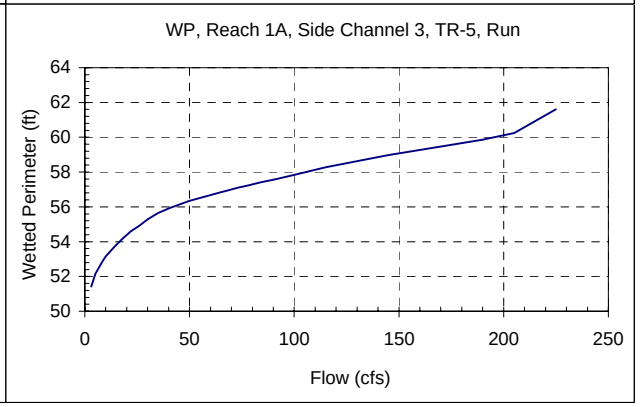


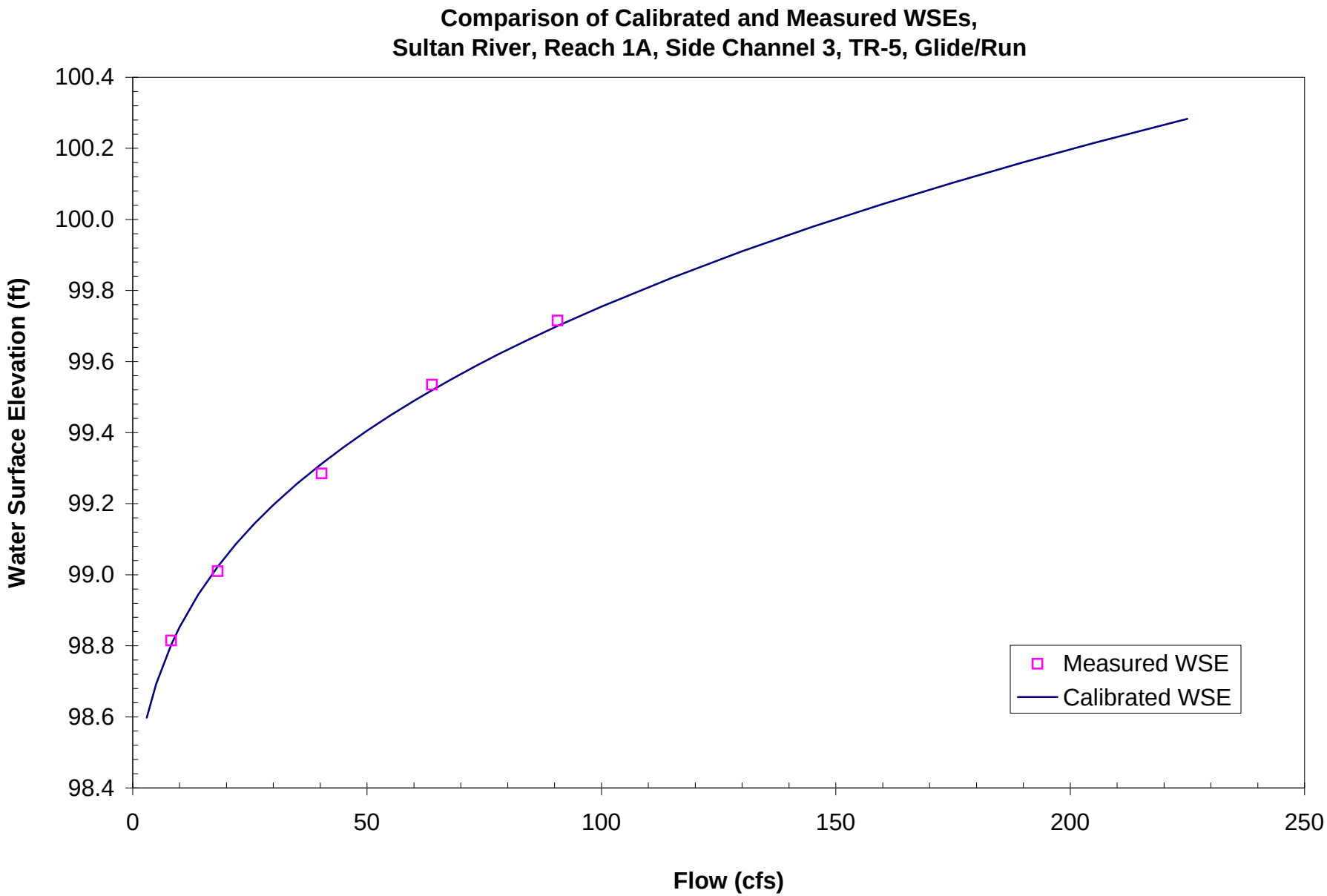











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel 3, TR-5, Glide/Run
Water Surface Elevation (ft)
100.4
100.2
100.0
99.8
99.6
99.4
99.2
99.0
98.8
98.6
98.4
0
50
100
150
200
250
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 3

Date: 7/17/2007 **Transect:** 4
Habitat: Pool **Flow:** Bank Profile

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	4.70	104.70		100.00
BM1			4.51	100.19
BM4			6.11	98.59

Comment: Photo # 19 looking u/s, #20 looking right to left, #21 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L						0.00	0.00	
4-R						0.00		

Ave Q=

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 7/18/2007
Habitat: Pool **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	4.85	104.85		100.00
BM4			6.26	98.59

Comment: Photo # 19 looking u/s, #20 looking right to left, #21 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L			104.85	5.40	0.00	99.45	99.45	38.7
4-R				5.41	0.00	99.44		

Ave Q= 38.7

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/19/2007
Habitat: Pool **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM4	6.28	104.87		98.59
BM3			4.87	100.00

Comment: Photo # 49 looking u/s, #50 looking right to left, #51 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L			104.87	5.68	0.00	99.19	99.19	17.6
4-R				5.69	0.00	99.18		

Ave Q= 17.6

(2.1) Longitudinal WSE Slope

Location	River Station	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
TR-4	0				99.19
d/s	-50	104.87	5.80	0.00	99.07

Note:
WSE slope = 0.230%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/20/2007
Habitat: Pool **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	4.57	104.57		100.00
BM4			5.99	98.58
BM1			4.38	100.19

Comment: Photo # 97 looking u/s, #98 looking right to left, #99 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L			104.57	5.58	0.00	98.99	98.99	8.3
4-R				5.58	0.00	98.99		

Ave Q= 8.3

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 8/21/2007
Habitat: Pool **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.53	104.72		100.19
BM3			4.72	100.00

Comment: Photo # 7 looking d/s, #8 looking right to left, #9 looking u/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L			104.72	5.92	1.07	99.87	99.87	
4-R				5.68	0.83	99.87		

Ave Q=

Note: No velocity and depth measurements taken
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 8/23/2007
Habitat: Pool **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.63	104.82		100.19
BM3			4.82	100.00

Comment: Photo #66 looking d/s, #67 looking right to left, #68 looking u/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L			104.82	5.62	0.51	99.71	99.70	
4-R				5.50	0.37	99.69		

Ave Q=

(2.1) Longitudinal WSE Slope

Location	River Station	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
TR-4	0				99.70
d/s	-40	104.82	5.38	0.00	99.44

Note: No velocity and depth measurements taken
WSE slope = 0.650%

(3) Meter and propeller ID for Velocity Correction

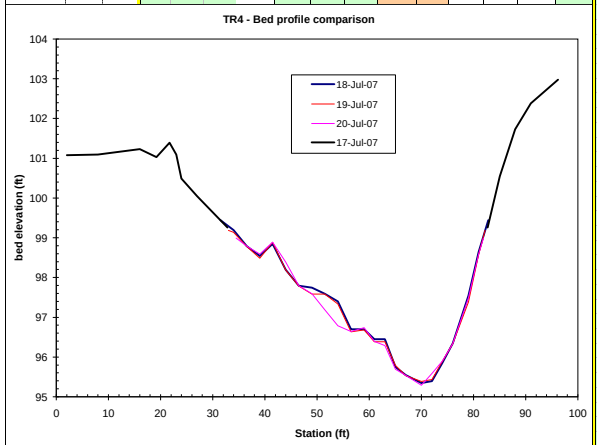
Meter ID: NA
Propeller ID: NA

Stream: Sultan R.
Site: Reach 1A, Side Channel 3
Transect: 4
Habitat: Pool

Survey Date	HI (ft)	Q (cfs)
7/17/2007	104.70	
7/18/2007	104.85	38.7
7/19/2007	104.87	17.6
7/20/2007	104.57	8.3
8/21/2007	104.72	
8/23/2007	104.82	

17-Jul-07

Chann	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWP	2.0	3.62	101.08									11.9
	8.0	3.61	101.09									11.9
	16.0	3.47	101.23									11.9
	19.2	3.67	101.03									11.9
	21.7	3.31	101.39									11.9
	23.0	3.61	101.09									11.9
	24.0	4.21	100.49									11.9
	27.0	4.65	100.05									11.9
RWE	32.8	5.44	99.26									72.6
LWE	82.7	5.44	99.26									72.8
	85.0	4.15	100.55									11.9
	88.0	2.97	101.73									11.9
	91.0	2.32	102.38									11.9
LWP	96.2	1.72	102.98									11.9



18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	31.5		99.45	0.00	0.00		0.00		0.00		0.00	72.6
	34.0		99.20	0.25	0.00		0.00		0.00		0.00	65.7
	36.5		98.80	0.65	0.00		0.00		0.00		0.00	76.5
	39.0		98.55	0.90	0.00		0.00		0.00		0.00	67.6
	41.5		98.85	0.60	0.06		0.18		0.18		0.27	76.6
	44.0		98.20	1.25	0.24		0.31		0.31		0.96	67.6
	46.5		97.80	1.65	0.20		0.28		0.28		1.17	76.6
	49.0		97.75	1.70	0.27		0.33		0.33		1.39	76.8
	51.5		97.60	1.85	0.35		0.40		0.40		1.85	87.6
	54.0		97.40	2.05	0.47		0.51		0.51		2.62	81.8
	56.5		96.70	2.75	0.28	0.64	0.33	0.69	0.51		3.52	87.5
	59.0		96.70	2.75	0.45	0.55	0.49	0.60	0.54		3.36	81.6
	61.0		96.45	3.00	0.35	0.69	0.40	0.74	0.57		3.42	87.6
	63.0		96.45	3.00	0.41	0.63	0.45	0.68	0.56		3.39	87.8
	65.0		95.75	3.70	0.20	0.39	0.28	0.43	0.36		2.66	87.8
	67.0		95.55	3.90	0.25	0.59	0.32	0.64	0.48		4.64	87.8
	70.0		95.35	4.10	0.22	0.53	0.29	0.57	0.43		4.44	87.8
	72.0		95.40	4.05	0.32	0.54	0.37	0.58	0.48		3.87	87.6
	74.0		95.85	3.60	0.00	0.26	0.00	0.32	0.16		1.16	76.8
	76.0		96.35	3.10	0.00	0.00	0.00	0.00	0.00		0.00	76.8
	79.0		97.55	1.90	0.00		0.00		0.00		0.00	78.6
	81.0		98.65	0.80	0.00		0.00		0.00		0.00	72.8
LWE	82.8		99.45	0.00	0.00		0.00		0.00		0.00	72.8

19-Jul-07

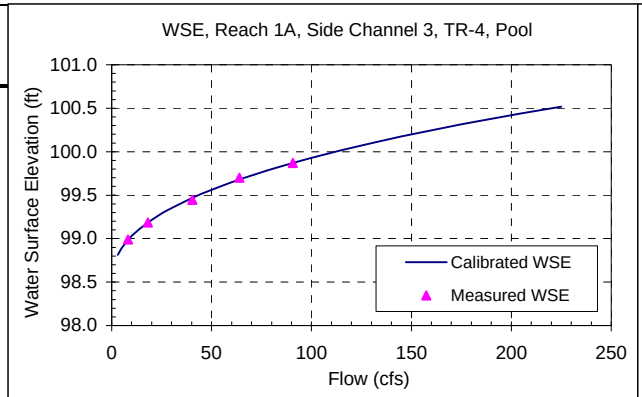
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	33.0		99.19	0.00	0.00		0.00		0.00		0.00	72.6
	34.0		99.14	0.05	0.00		0.00		0.00		0.00	65.7
	36.5		98.79	0.40	0.00		0.00		0.00		0.00	76.5
	39.0		98.49	0.70	0.00		0.00		0.00		0.00	67.6
	41.5		98.89	0.30	0.00		0.00		0.00		0.00	76.6
	44.0		98.19	1.00	0.00		0.00		0.00		0.00	67.6
	46.5		97.79	1.40	0.00		0.00		0.00		0.00	76.6
	49.0		97.59	1.60	0.01		0.04		0.04		0.15	76.8
	51.5		97.59	1.60	0.06		0.18		0.18		0.73	87.6
	54.0		97.34	1.85	0.14		0.24		0.24		1.13	81.8
	56.5		96.64	2.55	0.17		0.27		0.27		1.69	87.5
	59.0		96.69	2.50	0.27		0.33		0.33		1.84	81.6
	61.0		96.39	2.80	0.23	0.31	0.30	0.36	0.33		1.86	87.6
	63.0		96.39	2.80	0.18	0.38	0.27	0.43	0.35		1.95	87.8
	65.0		95.79	3.40	0.12	0.20	0.23	0.28	0.26		1.74	87.8
	67.0		95.54	3.65	0.08	0.26	0.19	0.32	0.26		2.34	87.8
	70.0		95.39	3.80	0.21	0.21	0.29	0.29	0.29		2.75	87.8
	72.0		95.44	3.75	0.00	0.29	0.00	0.34	0.17		1.29	87.6
	74.0		95.89	3.30	0.00	0.01	0.00	0.04	0.02		0.12	76.8
	76.0		96.34	2.85	0.00	0.00	0.00	0.00	0.00		0.00	76.8
	79.0		97.39	1.80	0.00		0.00		0.00		0.00	78.6
	81.0		98.59	0.60	0.00		0.00		0.00		0.00	72.8
LWE	82.2		99.19	0.00	0.00		0.00		0.00		0.00	72.8

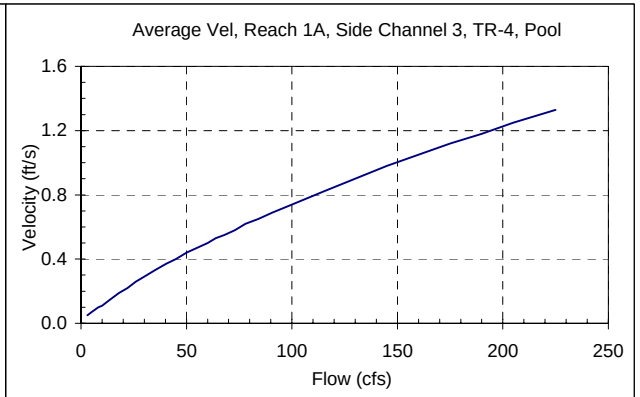
20-Jul-07

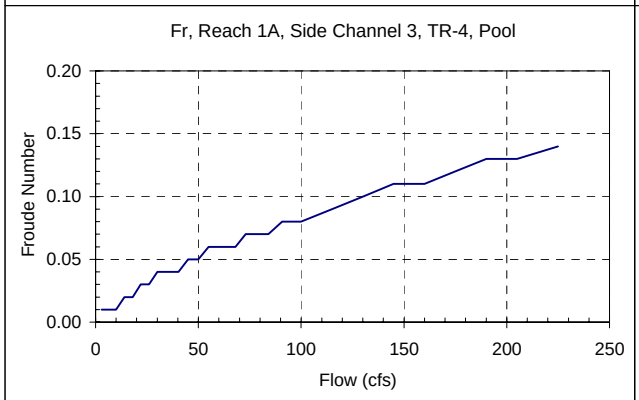
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	34.5		98.99	0.00	0.00		0.00		0.00		0.00	65.7
	36.5		98.79	0.20	0.00		0.00		0.00		0.00	76.5
	39.0		98.59	0.40	0.00		0.00		0.00		0.00	67.6
	41.5		98.89	0.10	0.00		0.00		0.00		0.00	76.6
	44.0		98.39	0.60	0.00		0.00		0.00		0.00	67.6
	46.5		97.79	1.20	0.00		0.00		0.00		0.00	76.6
	49.0		97.59	1.40	0.00		0.00		0.00		0.00	76.8
	51.5		97.19	1.80	0.00		0.00		0.00		0.00	87.6
	54.0		96.79	2.20	0.01		0.04		0.04		0.20	81.8
	56.5		96.64	2.35	0.01		0.04		0.04		0.22	87.5
	59.0		96.74	2.25	0.10		0.20		0.20		1.02	81.6
	61.0		96.39	2.60	0.05	0.14	0.17	0.24	0.21		1.07	87.6
	63.0		96.29	2.70	0.07	0.18	0.19	0.27	0.23		1.25	87.8
	65.0		95.69	3.30	0.05	0.09	0.17	0.19	0.18		1.17	87.8
	67.0		95.54	3.45	0.01	0.14	0.04	0.24	0.14		1.21	87.8
	70.0		95.29	3.70	0.07	0.07	0.19	0.19	0.19		1.76	87.8
	72.0		95.59	3.40	0.00	0.03	0.00	0.11	0.05		0.37	87.6
	74.0		95.89	3.10	0.00	0.00	0.00	0.00	0.00		0.00	76.8
	76.0		96.34	2.65	0.00	0.00	0.00	0.00	0.00		0.00	76.8
	79.0		97.49	1.50	0.00		0.00		0.00		0.00	78.6
	81.0		98.59	0.40	0.00		0.00		0.00		0.00	72.8
LWE	81.9		98.99	0.00	0.00		0.00		0.00		0.00	72.8

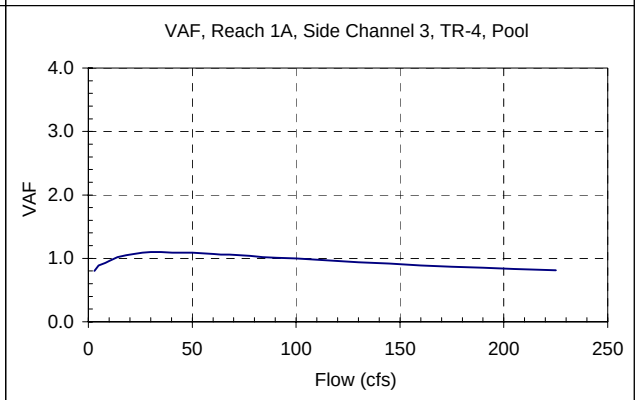
Stream: Sultan R.
Site: Reach 1A, Side Channel 3
Habitat: Pool
Transect: 4

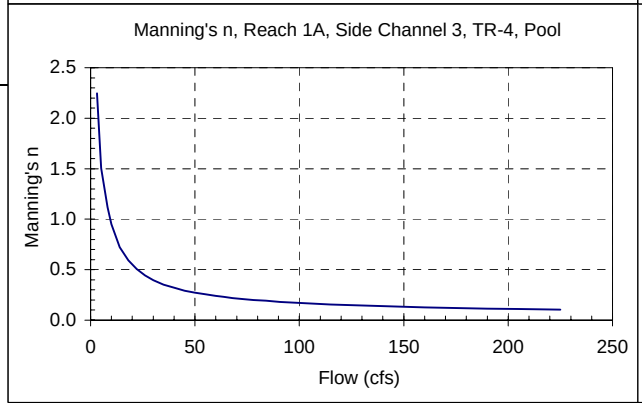
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
3	98.81	0.01	0.05	0.80	2.247	38.9
5	98.89	0.01	0.07	0.89	1.504	42.5
8.2	98.99	0.01	0.10	0.93	1.117	47.5
10	99.03	0.01	0.11	0.96	0.952	47.9
14	99.11	0.02	0.15	1.02	0.722	48.6
18.1	99.19	0.02	0.19	1.05	0.592	49.3
22	99.25	0.03	0.22	1.07	0.507	50.0
26	99.30	0.03	0.26	1.09	0.443	50.7
30	99.35	0.04	0.29	1.10	0.396	51.3
35	99.41	0.04	0.33	1.10	0.353	52.0
40.3	99.47	0.04	0.37	1.09	0.319	52.7
45	99.51	0.05	0.40	1.09	0.293	53.1
50	99.56	0.05	0.44	1.09	0.272	53.6
55	99.61	0.06	0.47	1.08	0.256	54.0
60	99.65	0.06	0.50	1.07	0.240	54.4
63.8	99.68	0.06	0.53	1.06	0.230	54.7
68	99.71	0.06	0.55	1.06	0.220	54.9
73	99.75	0.07	0.58	1.05	0.210	55.3
78	99.78	0.07	0.62	1.04	0.200	55.6
84	99.83	0.07	0.65	1.02	0.192	56.0
90.7	99.87	0.08	0.69	1.01	0.182	56.4
100	99.93	0.08	0.74	1.00	0.171	56.9
115	100.02	0.09	0.82	0.97	0.156	57.8
130	100.10	0.10	0.90	0.94	0.145	58.5
145	100.17	0.11	0.98	0.92	0.135	59.2
160	100.25	0.11	1.05	0.89	0.127	60.0
175	100.31	0.12	1.12	0.87	0.120	60.5
190	100.38	0.13	1.18	0.85	0.115	61.2
205	100.44	0.13	1.25	0.83	0.110	61.8
225	100.52	0.14	1.33	0.81	0.104	62.5

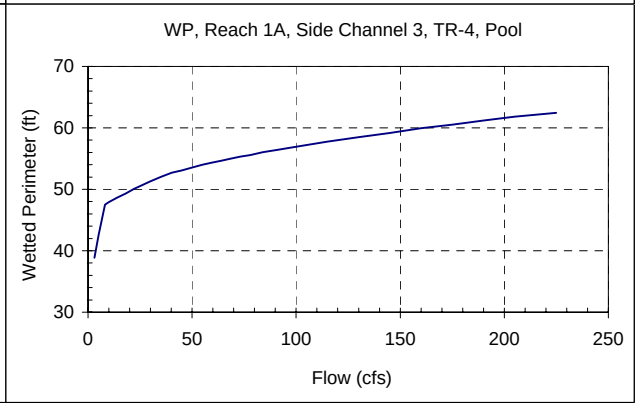


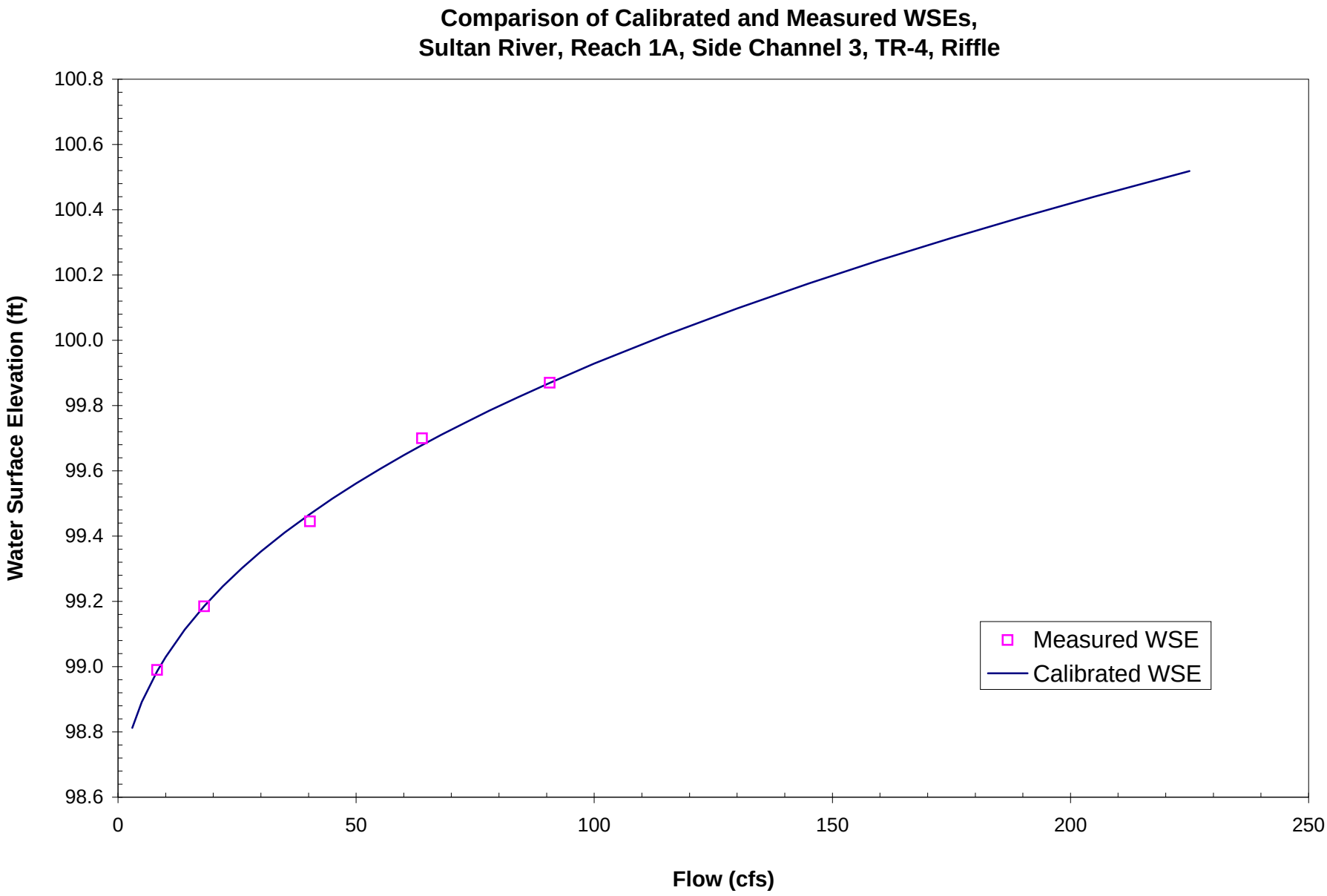











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel 3, TR-4, Riffle
Water Surface Elevation (ft)
100.8
100.6
100.4
100.2
100.0
99.8
99.6
99.4
99.2
99.0
98.8
98.6
0
50
100
150
200
250
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 3

Date: 7/17/2007 **Transect:** 3
Habitat: Riffle **Flow:** Bank Profile

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM4	4.63	104.63		100.00
BM3			3.21	101.42
BM4			4.63	100.00
BM				

Comment: Photo #16 looking u/s, #17 looking right to left, #18 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L						0.00	0.00	
3-R						0.00		

Ave Q=

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 7/18/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	2.85	104.27		101.42
BM4			4.27	100.00
BM5			4.33	99.94
BM6			0.92	103.35

Comment: Photo #16 looking u/s, #17 looking right to left, #18 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L			104.27	5.32	0.00	98.95	98.95	
3-R(L)	50		104.27	4.52	0.00	99.75	99.79	44.0
3-R(R)			104.27	4.45	0.00	99.82		

Note: a break in bathymetry
Ave Q= 44.0

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM5	4.64	104.58		99.94
BM4			4.59	99.99
BM3			3.18	101.40
BM				

Comment: Photo #46 looking u/s, #47 looking right to left, #48 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L			104.58	5.81	0.00	98.77	98.77	
3-R(L)	50		104.58	5.00	0.00	99.58	99.62	19.8
3-R(R)			104.58	4.92	0.00	99.66		

Ave Q= 19.8

(2.1) Longitudinal WSE Slope

Location	River Station	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50	104.58	4.20	0.00	100.38
d/s	-50	104.58	5.47	0.00	99.11

Note:
WSE slope = 1.270%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM4	4.24	104.24		100.00
BM5			4.30	99.94

Comment: Photo #94 looking u/s, #95 looking right to left, #96 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L			104.24	5.59	0.00	98.65	98.65	
3-R(L)	50		104.24	4.71	0.00	99.53	99.51	9.2
3-R(R)			104.24	4.75	0.00	99.49		

Ave Q= 9.2

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 8/21/2007
Habitat: Riffle **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	3.11	104.53		101.42
BM4			4.52	100.01

Comment: Photo #10 looking d/s, #11 looking right to left, #12 looking u/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L			104.53	5.51	0.22	99.24	99.24	
3-R(L)	50		104.53	4.88	0.20	99.85	99.97	
3-R(R)			104.53	4.77	0.33	100.09		

Ave Q=

Note: No velocity and depth measurements taken
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 8/23/2007
Habitat: Riffle **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	3.13	104.55		101.42
BM4			4.50	100.05

Comment: Photo #69 looking d/s, #70 looking right to left, #71 looking u/s#73 looking left to right

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L			104.55	5.48	0.00	99.07	99.07	
3-C			104.55	5.50	0.21	99.26	99.26	
3-R			104.55	4.74	0.16	99.97	99.97	

Ave Q=

(2.1) Longitudinal WSE Slope

Location	River Station	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
TR-3	0				99.26
d/s	-35	104.55	5.68	0.00	98.87

Note: No velocity and depth measurements taken
WSE slope = 1.114%

(3) Meter and propeller ID for Velocity Correction

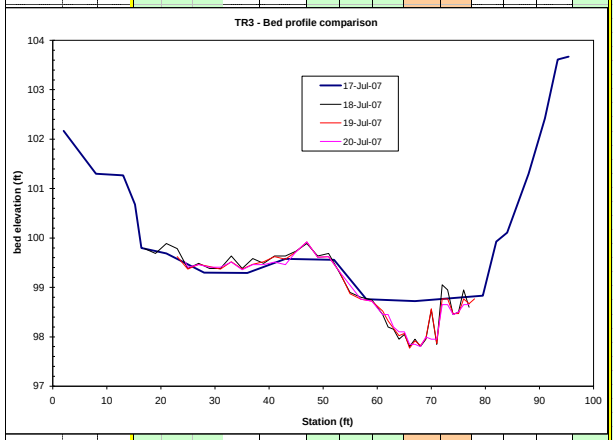
Meter ID: NA
Propeller ID: NA
Calib #: NA

Stream: Sultan R.
Site: Reach 1A, Side Channel
Transect: 3
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/17/2007	104.63	
7/18/2007	104.27	44.0
7/19/2007	104.58	19.8
7/20/2007	104.24	9.2
8/21/2007	104.53	
8/23/2007	104.55	

17-Jul-07

Chann	Sta (ft)	FS (ft)	Ground (ft)	Mod Ground	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
				0.84									
RWP	2.0	2.46	102.17	102.17									11.9
	8.0	3.33	101.30	101.30									11.9
	13.0	3.36	101.27	101.27									11.9
	15.2	3.95	100.68	100.68									11.9
RWE	16.4	4.83	99.80	99.80									11.9
	21.0	4.94	99.69	99.69									51.6
	28.0	5.33	99.30	99.30									61.6
	36.0	5.34	99.29	99.29									65.6
	43.0	5.05	99.58	99.58									76.5
LWE	52.0	5.07	99.56	99.87									76.6
RWE	58.0	5.87	98.76	99.28									76.6
	67.0	5.91	98.72	99.56									76.6
	79.5	5.80	98.83	99.67									76.8
	82.0	4.70	99.93	100.77									11.9
	84.0	4.52	100.11	100.95									11.9
	88.0	3.33	101.30	102.14									11.9
	91.0	2.21	102.42	103.26									11.9
	93.4	1.02	103.61	104.45									11.9
LWP	95.4	0.96	103.67	104.51									11.9

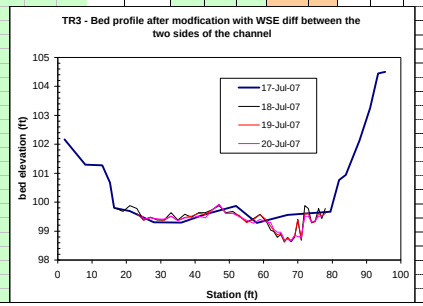


18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Mod Ground	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
				0.84									
RWE	17.0		99.79	99.79	0.00	0.00		0.00		0.00		0.00	51.6
	19.0		99.69	99.69	0.10	-0.10		-0.20		-0.20		-0.02	61.6
	21.0		99.89	99.89	-0.10								65.6
	23.0		99.79	99.79	0.00	0.00		0.00		0.00		0.00	76.5
	25.0		99.39	99.39	0.40	1.57		1.63		1.63		1.30	76.5
	27.0		99.49	99.49	0.30	1.31		1.36		1.36		0.82	67.6
	29.0		99.39	99.39	0.40	1.29		1.34		1.34		1.07	76.5
	31.0		99.39	99.39	0.40	1.42		1.47		1.47		1.18	75.6
	33.0		99.64	99.64	0.15	1.39		1.44		1.44		0.43	75.6
	35.0		99.39	99.39	0.40	1.20		1.25		1.25		1.00	65.6
	37.0		99.59	99.59	0.20	1.13		1.18		1.18		0.47	65.5
	39.0		99.49	99.49	0.30	0.17		0.27		0.27		0.16	65.5
	41.0		99.64	99.64	0.15	0.71		0.76		0.76		0.23	65.5
	43.0		99.64	99.64	0.15	0.87		0.92		0.92		0.28	65.8
	45.0		99.74	99.74	0.05	0.05		0.17		0.17		0.01	76.6
	47.0		99.89	99.89	-0.10								76.6
	49.0		99.64	99.64	0.15	1.07		1.12		1.12		0.17	76.6
	51.0		99.69	99.69	0.10	1.29		1.34		1.34		0.13	76.6
	53.0		99.30	99.51	-0.35								76.8
	55.0		98.90	99.32	0.05	1.24		1.29		1.29	45	0.05	76.6
	57.0		98.80	99.43	0.15	0.76		0.81		0.81	45	0.17	76.6
	59.0		98.75	99.59	0.20	0.52		0.56		0.56	45	0.16	67.6
	61.0		98.45	99.29	0.50	2.32		2.39		2.39		1.79	75.6
	62.0		98.20	99.04	0.75	2.39		2.46		2.46		1.85	76.6
	63.0		98.15	98.99	0.80	2.79		2.87		2.87		2.29	65.6
	64.0		97.95	98.79	1.00	3.73		3.81		3.81		3.81	65.6
	65.0		98.05	98.89	0.90	4.46		4.55		4.55		4.09	76.6
	66.0		97.80	98.64	1.15	3.93		4.01		4.01		4.61	76.6
	67.0		97.95	98.79	1.00	4.57		4.66		4.66		4.66	76.6
	68.0		97.80	98.64	1.15	4.82		4.92		4.92		5.65	76.6
	69.0		97.95	98.79	1.00	3.75		3.83		3.83		3.83	76.6
	70.0		98.55	99.39	0.40	2.98		3.06		3.06		1.22	87.6
	71.0		97.85	98.69	1.10	1.65		1.71		1.71		0.94	88.9
	72.0		99.05	99.89	-0.10								88.9
	73.0		98.95	99.79	0.00	0.00		0.00		0.00		0.00	88.9
	74.0		98.45	99.29	0.50	2.49		2.57		2.57		1.28	78.6
	75.0		98.50	99.34	0.45	0.42		0.46		0.46		0.21	76.6
	76.0		98.95	99.79	0.00	0.00		0.00		0.00		0.00	76.6
	77.0		98.60	99.44	0.35	0.22		0.29		0.29		0.10	76.6
LWE	78.0		98.95	99.79	0.00	0.00		0.00		0.00		0.00	76.8

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Mod Ground	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
				0.85									
RWE	23.0		99.62	99.62	0.00	0.00		0.00		0.00		0.00	76.5
	25.0		99.37	99.37	0.25	0.37		0.42		0.42		0.21	76.5
	27.0		99.47	99.47	0.15	0.35		0.40		0.40		0.12	67.6
	29.0		99.42	99.42	0.20	0.19		0.28		0.28		0.11	76.5
	31.0		99.37	99.37	0.25	0.23		0.30		0.30		0.15	75.6
	33.0		99.52	99.52	0.10	0.59		0.64		0.64		0.13	75.6
	35.0		99.37	99.37	0.25	0.52		0.56		0.56		0.28	65.6
	37.0		99.47	99.47	0.15	0.00		0.00		0.00		0.00	65.5
	39.0		99.52	99.52	0.10	0.37		0.42		0.42		0.08	65.5
	41.0		99.62	99.62	0.00	0.00		0.00		0.00		0.00	65.5
	43.0		99.57	99.57	0.05	0.45		0.49		0.49		0.02	65.8
	45.0		99.72	99.72	-0.10								76.6
	47.0		99.92	99.92	-0.30								76.6
	49.0		99.61	99.61	0.01	0.05		0.17		0.17		0.00	76.6
	51.0		99.62	99.62	0.00	0.00		0.00		0.00		0.00	76.6
	53.0		99.32	99.53	-0.55								76.8
	55.0		98.87	99.30	-0.10								76.8
	57.0		98.76	99.40	0.01	0.05		0.17		0.17		0.00	76.6
	59.0		98.72	99.57	0.05	0.10		0.20		0.20		0.02	67.6
	61.0		98.52	99.37	0.25	0.00		0.00		0.00		0.00	75.6
	62.0		98.32	99.17	0.45	1.40		1.45		1.45		0.65	76.6
	63.0		98.17	99.02	0.60	1.87		1.94		1.94		1.16	65.6
	64.0		98.02	98.87	0.75	2.26		2.33		2.33		1.75	65.6
	65.0		98.07	98.92	0.70	3.14		3.22		3.22		2.25	76.6
	66.0		97.77	98.62	1.00	3.34		3.42		3.42		3.42	76.6
	67.0		97.92	98.77	0.85	3.61		3.69		3.69		3.14	76.6
	68.0		97.82	98.67	0.95	2.57		2.65		2.65		2.51	76.6
	69.0		97.97	98.82	0.80	2.05		2.12		2.12		1.69	76.6
	70.0		98.57	99.42	0.20	1.64		1.70		1.70		0.34	87.6
	71.0		97.87	98.72	0.90	1.15		1.20		1.20		1.08	88.9
	72.0		98.77	99.62	0.00	0.00		0.00		0.00		0.00	88.9
	73.0		98.77	99.62	0.00	0.00		0.00		0.00		0.00	88.9
	74.0		98.47	99.32	0.30	0.69		0.74		0.74		0.22	78.6
	75.0		98.47	99.32	0.30	1.19		1.24		1.24		0.37	76.6
	76.0		98.77	99.62	0.00	0.00		0.00		0.00		0.00	76.6
	77.0		98.67	99.52	0.10	0.46		0.50		0.50		0.05	76.6
RWE	78.0		98.77	99.62	0.00	0.00		0.00		0.00		0.00	76.8



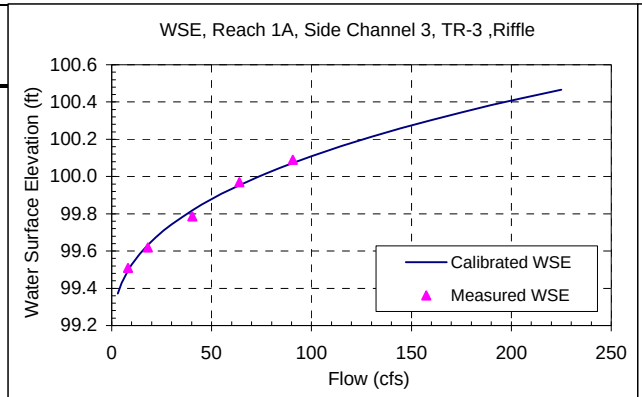
20-Jul-07

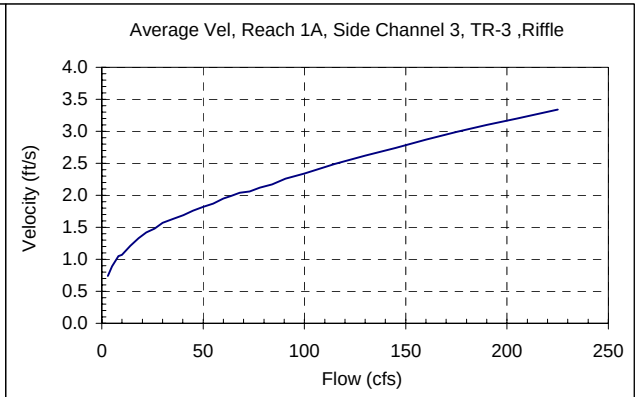
	Sta (ft)	FS (ft)	Ground (ft)	Mod Ground	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
				0.86									
RWE	24.5		99.51	99.51	0.00	0.00		0.00		0.00		0.00	76.5
	25.0		99.41	99.41	0.10	0.05		0.17		0.17		0.02	76.5
	27.0		99.46	99.46	0.05	0.05		0.18		0.18		0.02	67.6
	29.0		99.41	99.41	0.10	0.05		0.17		0.17		0.03	76.5
	31.0		99.41	99.41	0.10	0.73		0.78		0.78		0.16	75.6
	33.0		99.51	99.51	0.00	0.00		0.00		0.00		0.00	75.6
	35.0		99.36	99.36	0.15	0.11		0.21		0.21		0.06	65.6
	37.0		99.46	99.46	0.05	0.05		0.17		0.17		0.02	65.5
	39.0		99.46	99.46	0.05	0.05		0.17		0.17		0.02	65.5
	41.0		99.51	99.51	0.00	0.00		0.00		0.00		0.00	65.5
	43.0		99.46	99.46	0.05	0.01		0.04		0.04		0.00	65.8
	45.0		99.72	99.72									76.6
	47.0		99.92	99.92									76.6
	49.0		99.61	99.61									76.6
	51.0		99.62	99.62									76.6
	53.0		99.32	99.49									76.8
	57.0		98.76	99.28									76.6
	59.0		98.72	99.41									67.6
	61.0		98.45	99.31	0.20	0.24		0.31		0.31		0.03	75.6
	62.0		98.45	99.31	0.20	0.74		0.79		0.79		0.16	76.6
	63.0		98.20	99.06	0.45	1.00		1.05		1.05		0.47	65.6
	64.0		98.10	98.96	0.55	1.51		1.57		1.57		0.86	65.6
	65.0		98.10	98.96	0.55	1.98		2.05		2.05		1.13	76.6
	66.0		97.85	98.71	0.80	2.29		2.36		2.36		1.89	76.6
	67.0		97.85	98.71	0.80	0.96		1.01		1.01		0.81	76.6
	68.0		97.80	98.66	0.85	1.60		1.66		1.66		1.41	76.6
	69.0		98.00	98.86	0.65	1.27		1.32		1.32		0.86	76.6
	70.0		97.95	98.81	0.70	0.67		0.72		0.72		0.50	87.6
	71.0		97.95	98.81	0.70	0.71		0.76		0.76		0.53	88.9
	72.0		98.65	99.51	0.00	0.00		0.00		0.00		0.00	88.9
	73.0		98.65	99.51	0.00	0.00		0.00		0.00		0.00	88.9
	74.0		98.45	99.31	0.20	0.18		0.27		0.27		0.05	78.6
	75.0		98.50	99.36	0.15	0.96		1.01		1.01		0.15	76.6
	76.0		98.65	99.51	0.00	0.00		0.00		0.00		0.00	76.6
LWE	77.0		98.65	99.51	0.00	0.00		0.00		0.00		0.00	76.6

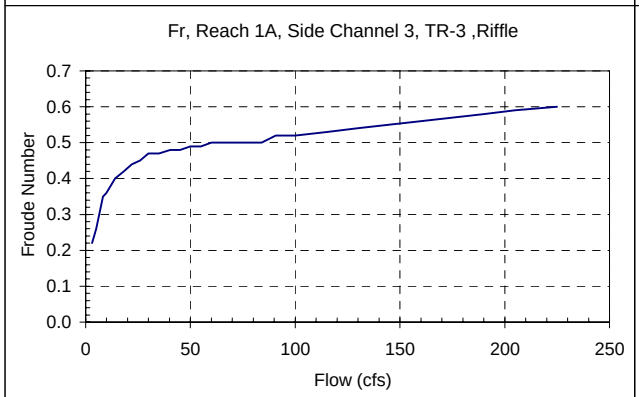
Stations 45 -59 out of water but no associated measuremnt recorded.

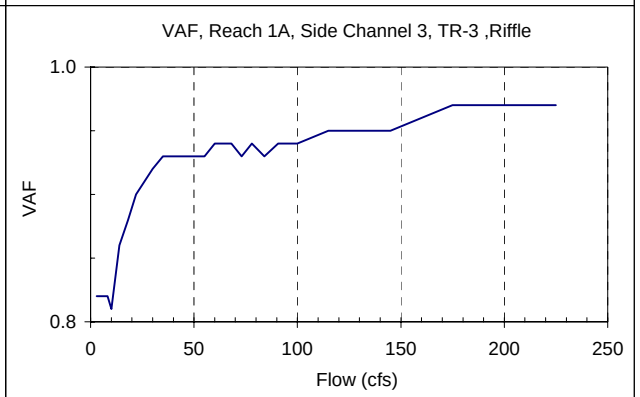
Stream: Sultan R.
Site: Reach 1A, Side Channel 3
Habitat: Riffle
Transect: 3

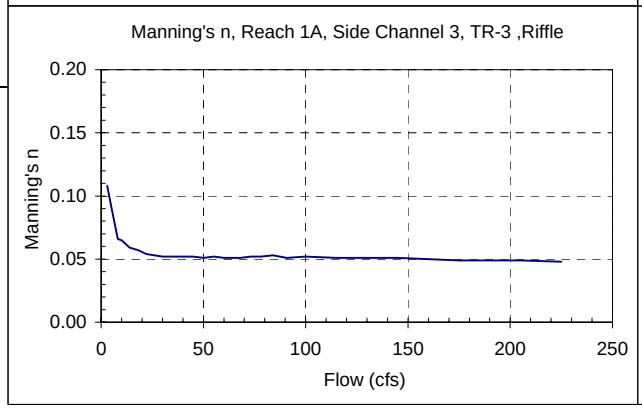
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
3	99.37	0.22	0.74	0.82	0.108	12.4
5	99.43	0.26	0.89	0.82	0.091	16.9
8.2	99.50	0.35	1.05	0.82	0.066	29.2
10	99.53	0.36	1.07	0.81	0.065	34.9
14	99.58	0.40	1.21	0.86	0.059	41.6
18.1	99.63	0.42	1.33	0.88	0.057	45.2
22	99.67	0.44	1.42	0.90	0.054	50.8
26	99.71	0.45	1.48	0.91	0.053	54.4
30	99.74	0.47	1.57	0.92	0.052	56.8
35	99.78	0.47	1.63	0.93	0.052	59.7
40.3	99.82	0.48	1.69	0.93	0.052	62.5
45	99.85	0.48	1.76	0.93	0.052	64.5
50	99.88	0.49	1.82	0.93	0.051	66.6
55	99.91	0.49	1.87	0.93	0.052	67.3
60	99.93	0.50	1.95	0.94	0.051	67.4
63.8	99.95	0.50	1.99	0.94	0.051	67.7
68	99.97	0.50	2.04	0.94	0.051	68.0
73	100.00	0.50	2.06	0.93	0.052	68.4
78	100.02	0.50	2.12	0.94	0.052	68.7
84	100.05	0.50	2.17	0.93	0.053	69.1
90.7	100.07	0.52	2.26	0.94	0.051	69.4
100	100.11	0.52	2.34	0.94	0.052	69.9
115	100.16	0.53	2.49	0.95	0.051	70.1
130	100.21	0.54	2.62	0.95	0.051	70.4
145	100.26	0.55	2.74	0.95	0.051	70.7
160	100.30	0.56	2.87	0.96	0.050	70.9
175	100.34	0.57	2.99	0.97	0.049	71.2
190	100.38	0.58	3.10	0.97	0.049	71.4
205	100.42	0.59	3.20	0.97	0.049	71.6
225	100.47	0.6	3.34	0.97	0.048	71.9

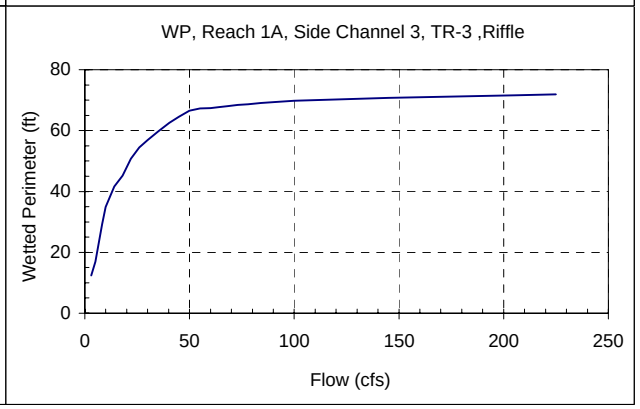


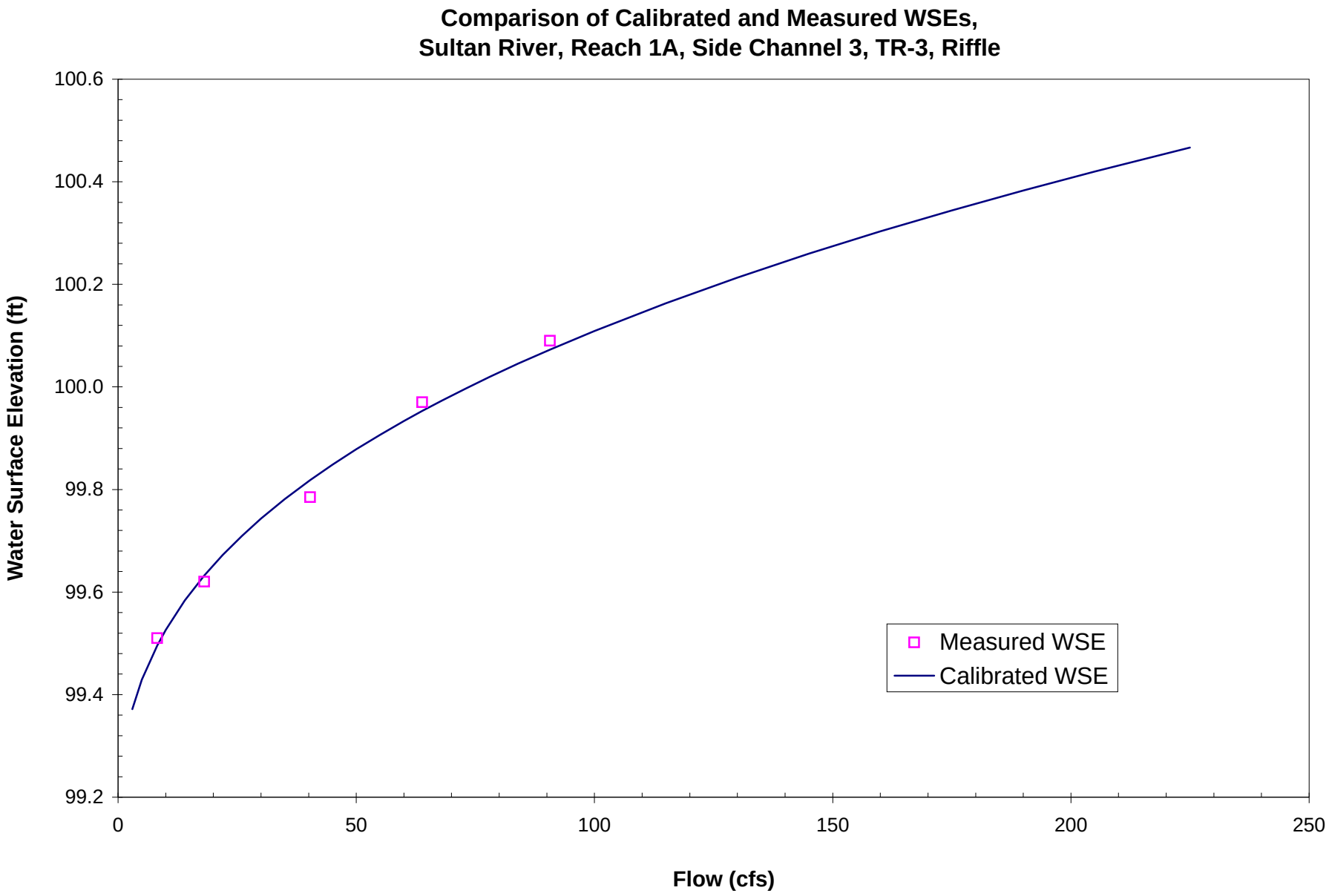











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel 3, TR-3, Riffle
Water Surface Elevation (ft)
100.6
100.4
100.2
100.0
99.8
99.6
99.4
99.2
0
50
100
150
200
250
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 3
Date: 7/17/2007 **Transect:** 2
Habitat: Pool **Flow:** Bank profile

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)	
BM4	4.63	104.68		100.05	
BM5			4.68	**100.00**	Set BM5=100.00
BM6			1.30	103.38	
TP BM6	1.97	105.35			
BM5			5.34	100.01	
BM					

Comment: Photo #13 looking u/s, #14 Right to left, #15 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L						0.00	0.00	
2-R						0.00		

Ave Q=

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/18/2007
Habitat: Pool **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM5	5.12	105.12		100.00
BM6			1.72	103.40
BM				

Comment: Photo #13 looking u/s, #14 Right to left, #15 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			105.12	6.43	0.00	98.69	98.69	41.1
2-R				6.44	0.00	98.68		

Ave Q= 41.1

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/19/2007
Habitat: Pool **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM5	4.79	104.79		100.00
BM6			1.40	103.39
BM				

Comment: Photo #42,43 looking u/s, #44 Right to left, #45 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			104.79	6.36	0.00	98.43	98.44	19.2
2-R				6.35	0.00	98.44		

Ave Q= 19.2

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
TR-2	0					98.44
d/s	-50		104.79	6.40	0.00	98.39

Note:
WSE slope = 0.090%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 7/20/2007
Habitat: Pool **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM5	4.62	104.62		100.00
BM6			1.23	103.39
HP2				
BM				

Comment: Photo #89,90 looking u/s, #91 Right to left, #92,93 looking d/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			104.62	6.37	0.00	98.25	98.25	7.8
2-R				6.37	0.00	98.25		

Ave Q= 7.8

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 167

Date: 8/21/2007
Habitat: Pool **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM5	4.10	104.10		100.00
BM6			0.70	103.40
HP2				
BM				

Comment: Photo #13 looking d/s, #14 Right to left, #15 looking u/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			104.10	6.64	1.70	99.16	99.15	
2-R				6.37	1.41	99.14		

Ave Q=

Note: No velocity and depth measurements taken
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 8/23/2007
Habitat: Pool **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM5	3.73	103.73		100.00
BM6			0.34	103.39
BM4			3.68	100.05
BM				

Comment: Photo #72 looking u/s, #74 Right to left, #75 looking left to right

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			103.73	4.77	0.00	98.96	98.94	
2-R				4.81	0.00	98.92		

Ave Q=

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
TR-2	0					98.94
d/s	-40		103.73	5.16	0.27	98.84

Note: No velocity and depth measurements taken
WSE slope = 0.250%

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Stream: Sultan R.
Site: Reach 1A, Side
Transect: 2
Habitat: Pool

Survey	HI	Q
Date	(ft)	(cfs)
7/17/2007	105.35	
7/18/2007	105.12	41.1
7/19/2007	104.79	19.2
7/20/2007	104.62	7.8
8/21/2007	104.10	
8/23/2007	103.73	

17-Jul-07

Chann	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWP	2.0	4.30	101.05									11.9
	8.0	4.80	100.55									11.9
	14.0	5.36	99.99									11.9
	19.0	5.86	99.49									11.9
	22.0	6.44	98.91									11.9
RWE	23.2	6.86	98.26									62.5
LWE	61.0	6.85	98.27									11.9
	61.5	6.00	99.12									11.9
	63.3	5.59	99.53									11.9
	63.8	5.20	99.92									11.9
	65.0	4.97	100.15									11.9
	68.0	5.03	100.09									11.9
	70.0	4.43	100.69									11.9
LWP	71.9	4.02	101.10									

18-Jul-07

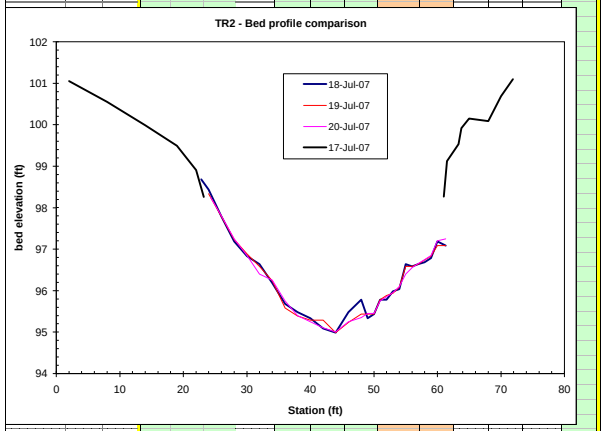
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	22.8		98.69	0.00	0.00		0.00		0.00		0.00	62.5
	24.0		98.44	0.25	-0.33		-0.38		-0.38		-0.15	62.5
	26.0		97.79	0.90	-0.32		-0.37		-0.37		-0.67	26.6
	28.0		97.19	1.50	-0.34		-0.39		-0.39		-1.17	52.8
	30.0		96.84	1.85	-0.32		-0.37		-0.37		-1.38	61.6
	32.0		96.64	2.05	-0.22		-0.29		-0.29		-1.20	61.6
	34.0		96.19	2.50	-0.01		-0.04		-0.04		-0.18	65.5
	36.0		95.69	3.00	0.00	0.00	0.00	0.00	0.00		0.00	51.5
	38.0		95.49	3.20	0.00	0.03	0.00	0.11	0.05		0.35	61.5
	40.0		95.34	3.35	0.10	0.02	0.20	0.07	0.14		0.92	56.5
	42.0		95.09	3.60	0.38	0.35	0.43	0.40	0.41		2.97	56.5
	44.0		94.99	3.70	0.47	0.51	0.51	0.55	0.53		3.94	65.6
	46.0		95.49	3.20	1.76	0.84	1.82	0.89	1.36		8.70	86.6
	48.0		95.79	2.90	0.82	1.02	0.87	1.07	0.97		4.23	87.6
	49.0		95.34	3.35	0.60	0.90	0.65	0.95	0.80		2.68	67.6
	50.0		95.44	3.25	0.62	1.00	0.67	1.05	0.86		2.80	87.6
	51.0		95.79	2.90	0.53	1.08	0.57	1.13	0.85		2.47	87.6
	52.0		95.79	2.90	0.78	1.17	0.83	1.22	1.03		2.97	76.5
	53.0		95.99	2.70	0.38	1.14	0.43	1.19	0.81		2.18	87.5
	54.0		96.04	2.65	0.68	1.09	0.73	1.14	0.94		2.48	87.5
	55.0		96.64	2.05	1.09		1.14		1.14		2.34	76.6
	56.0		96.59	2.10	0.93		0.98		0.98		2.07	76.6
	57.0		96.64	2.05	0.71		0.76		0.76		1.56	76.6
	58.0		96.69	2.00	0.45		0.49		0.49		0.98	76.6
	59.0		96.79	1.90	0.46		0.50		0.50		0.95	76.6
	60.0		97.19	1.50	0.62		0.67		0.67		1.15	76.6
LWE	61.3		97.09	1.60	0.03		0.11		0.11		0.11	76.6

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	23.5		98.44	0.00	0.00		0.00		0.00		0.00	62.5
	24.0		98.34	0.10	0.00		0.00		0.00		0.00	62.5
	26.0		97.79	0.65	-0.04		-0.15		-0.15		-0.19	26.6
	28.0		97.24	1.20	-0.14		-0.24		-0.24		-0.59	52.8
	30.0		96.89	1.55	-0.11		-0.21		-0.21		-0.67	61.6
	32.0		96.59	1.85	0.00		0.00		0.00		0.00	61.6
	34.0		96.24	2.20	0.00		0.00		0.00		0.00	65.5
	36.0		95.59	2.85	0.00	0.00	0.00	0.00	0.00		0.00	51.5
	38.0		95.39	3.05	0.00	0.00	0.00	0.00	0.00		0.00	61.5
	40.0		95.29	3.15	0.01	0.02	0.04	0.07	0.05		0.35	56.5
	42.0		95.29	3.15	0.00	0.05	0.00	0.17	0.08		0.53	56.5
	44.0		94.99	3.45	0.01	0.10	0.04	0.20	0.12		0.82	65.6
	46.0		95.24	3.20	0.20	0.20	0.28	0.28	0.28		1.82	86.6
	48.0		95.44	3.00	0.37	0.48	0.42	0.52	0.47		2.11	87.6
	49.0		95.44	3.00	0.40	0.53	0.44	0.57	0.51		1.52	67.6
	50.0		95.44	3.00	0.34	0.53	0.39	0.57	0.48		1.45	87.6
	51.0		95.79	2.65	0.42	0.70	0.46	0.75	0.60		1.60	87.6
	52.0		95.89	2.55	0.44	0.74	0.48	0.79	0.64		1.62	76.5
	53.0		95.94	2.50	0.68		0.73		0.73		1.83	87.5
	54.0		96.09	2.35	0.79		0.84		0.84		1.98	87.5
	55.0		96.59	1.85	0.66		0.71		0.71		1.31	76.6
	56.0		96.59	1.85	0.52		0.56		0.56		1.04	76.6
	57.0		96.64	1.80	0.36		0.41		0.41		0.73	76.6
	58.0		96.74	1.70	0.32		0.37		0.37		0.63	76.6
	59.0		96.84	1.60	1.41		1.46		1.46		2.34	76.6
	60.0		97.09	1.35	0.14		0.24		0.24		0.38	76.6
LWE	61.3		97.09	1.35	0.01		0.04		0.04		-1.48	76.6

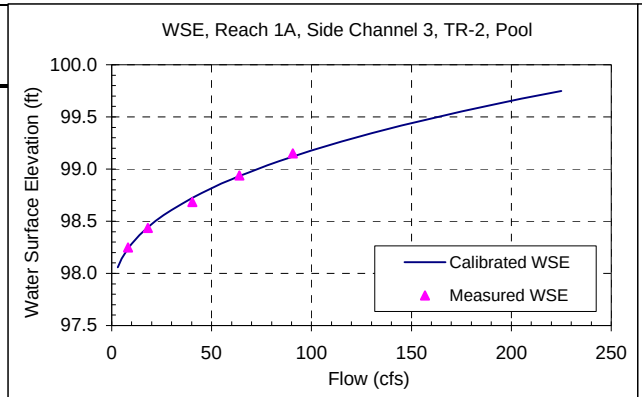
20-Jul-07

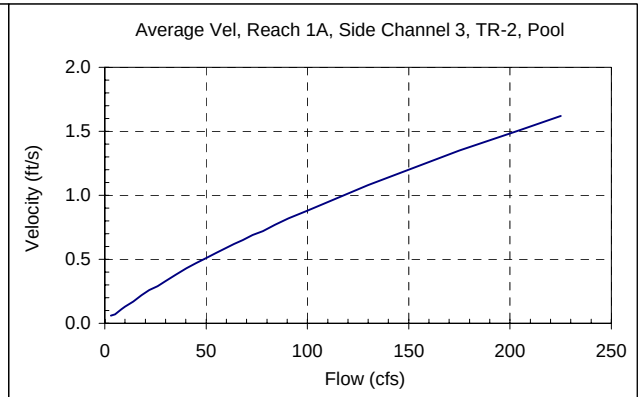
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	24.3		98.25	0.00	0.00		0.00		0.00		0.00	62.5
	26.0		97.80	0.45	0.00		0.00		0.00		0.00	26.6
	28.0		97.25	1.00	-0.11		-0.21		-0.21		-0.43	52.8
	30.0		96.85	1.40	-0.07		-0.19		-0.19		-0.53	61.6
	32.0		96.40	1.85	-0.01		-0.04		-0.04		-0.14	61.6
	34.0		96.25	2.00	0.00		0.00		0.00		0.00	65.5
	36.0		95.75	2.50	0.00		0.00		0.00		0.00	51.5
	38.0		95.40	2.85	0.00	0.00	0.00	0.00	0.00		0.00	61.5
	40.0		95.25	3.00	0.00	0.00	0.00	0.00	0.00		0.00	56.5
	42.0		95.10	3.15	0.00	0.00	0.00	0.00	0.00		0.00	56.5
	44.0		95.00	3.25	0.00	0.00	0.00	0.00	0.00		0.00	65.6
	46.0		95.25	3.00	0.09	0.01	0.19	0.04	0.11		0.67	86.6
	48.0		95.35	2.90	0.16	0.25	0.26	0.32	0.29		1.25	87.6
	49.0		95.45	2.80	0.14	0.27	0.24	0.33	0.29		0.80	67.6
	50.0		95.45	2.80	0.27	0.29	0.33	0.34	0.34		0.94	87.6
	51.0		95.75	2.50	0.33		0.38		0.38		0.95	87.6
	52.0		95.85	2.40	0.32		0.37		0.37		0.89	76.5
	53.0		95.95	2.30	0.47		0.51		0.51		1.18	87.5
	54.0		96.10	2.15	0.29		0.34		0.34		0.74	87.5
	55.0		96.40	1.85	0.29		0.34		0.34		0.63	76.6
	56.0		96.55	1.70	0.13		0.24		0.24		0.40	76.6
	57.0		96.65	1.60	0.01		0.04		0.04		0.06	76.6
	58.0		96.75	1.50	0.11		0.21		0.21		0.32	76.6
	59.0		96.85	1.40	0.01		0.04		0.04		0.05	76.6
	60.0		97.20	1.05	0.00		0.00		0.00		0.00	76.6
LWE	61.3		97.25	1.00	0.00		0.00		0.00		0.00	76.6

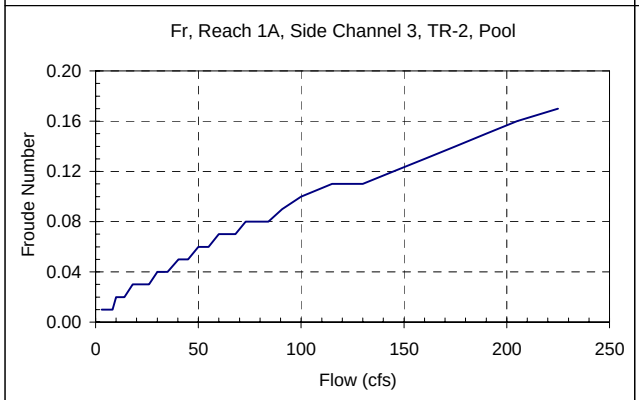


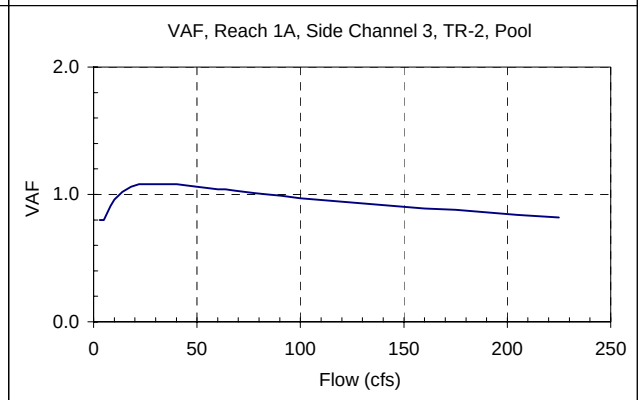
Stream: Sultan R.
Site: Reach 1A, Side Channel 3
Habitat: Pool
Transect: 2

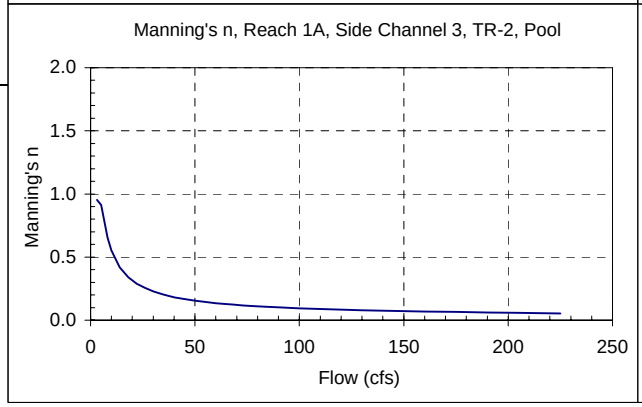
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
3	98.06	0.01	0.06	0.80	0.953	35.6
5	98.14	0.01	0.07	0.80	0.912	37.8
8.2	98.24	0.01	0.11	0.91	0.654	38.7
10	98.28	0.02	0.13	0.96	0.552	38.9
14	98.37	0.02	0.17	1.02	0.419	39.4
18.1	98.44	0.03	0.22	1.06	0.340	39.8
22	98.50	0.03	0.26	1.08	0.290	40.2
26	98.56	0.03	0.29	1.08	0.255	40.7
30	98.61	0.04	0.33	1.08	0.228	41.0
35	98.67	0.04	0.38	1.08	0.202	41.5
40.3	98.72	0.05	0.43	1.08	0.181	41.8
45	98.77	0.05	0.47	1.07	0.167	42.1
50	98.82	0.06	0.51	1.06	0.155	42.4
55	98.86	0.06	0.55	1.05	0.144	42.6
60	98.90	0.07	0.59	1.04	0.135	42.9
63.8	98.93	0.07	0.62	1.04	0.129	43.1
68	98.96	0.07	0.65	1.03	0.123	43.3
73	99.00	0.08	0.69	1.02	0.117	43.6
78	99.04	0.08	0.72	1.01	0.112	43.9
84	99.08	0.08	0.77	1.00	0.106	44.2
90.7	99.12	0.09	0.82	0.99	0.101	44.5
100	99.18	0.10	0.88	0.97	0.094	45.0
115	99.26	0.11	0.98	0.95	0.085	45.5
130	99.34	0.11	1.08	0.93	0.079	46.1
145	99.42	0.12	1.17	0.91	0.073	46.6
160	99.49	0.13	1.26	0.89	0.069	47.1
175	99.55	0.14	1.35	0.88	0.065	47.8
190	99.61	0.15	1.43	0.86	0.061	48.6
205	99.67	0.16	1.51	0.84	0.058	49.4
225	99.75	0.17	1.62	0.82	0.054	50.5

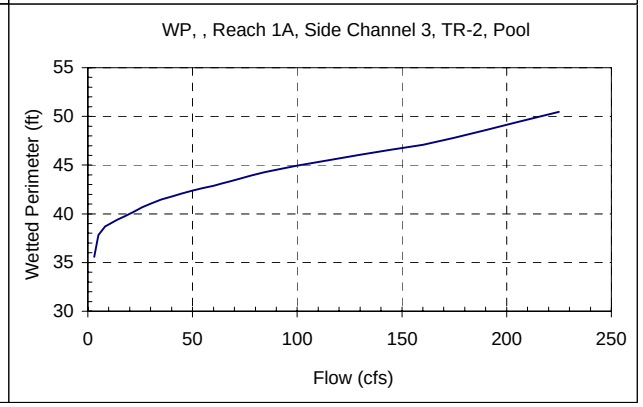


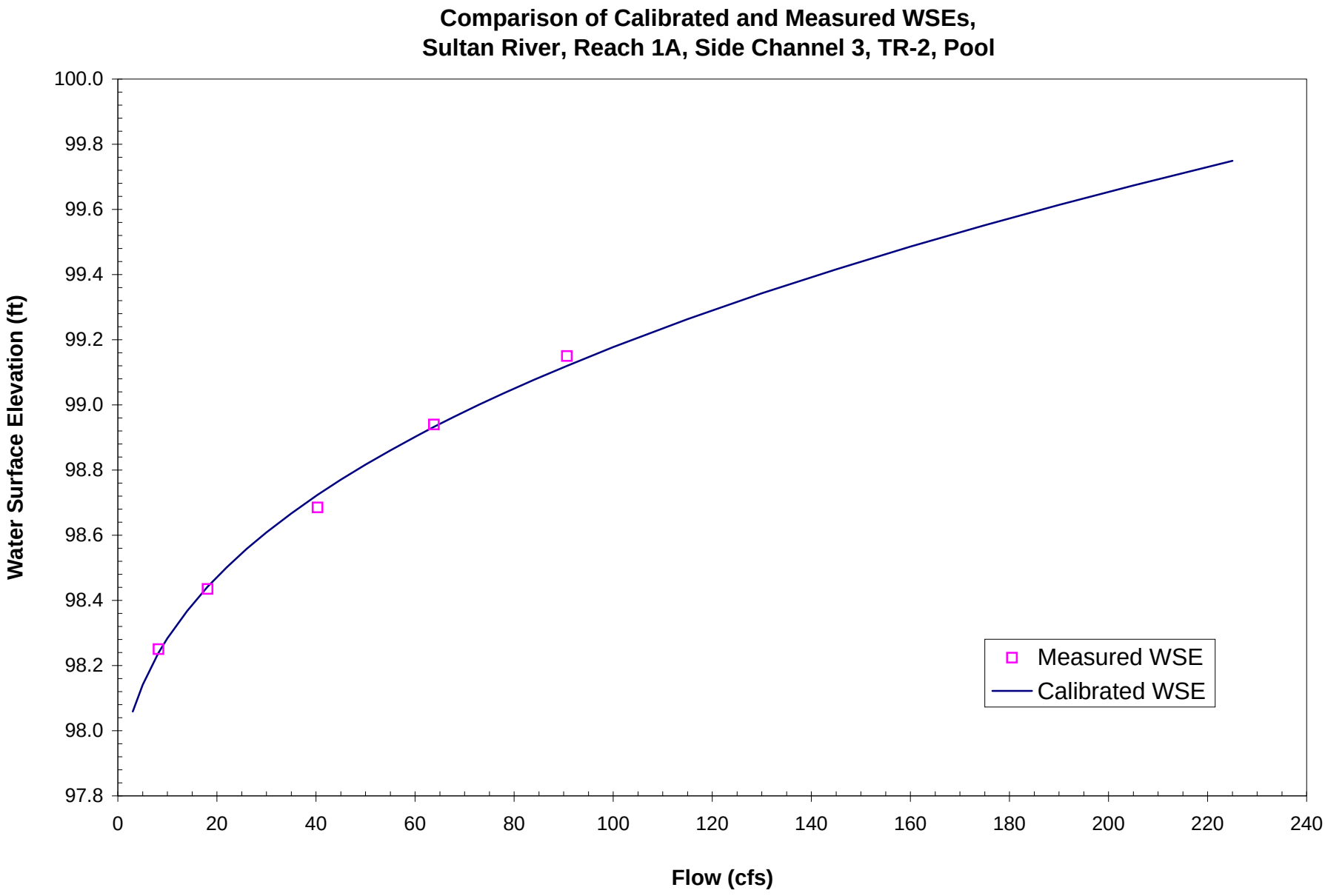











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel 3, TR-2, Pool
Water Surface Elevation (ft)
100.0
99.8
99.6
99.4
99.2
99.0
98.8
98.6
98.4
98.2
98.0
97.8
0
20
40
60
80
100
120
140
160
180
200
220
240
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 3

Date: 7/17/2007 **Transect:** 1
Habitat: Run **Flow:** Bank Profile

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.29	104.29		100.00
BM2			3.22	101.07
BM				

Comment: Photo #10 looking d/s, #11 left to rig

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L						0.00	0.00	
1-R						0.00		

Ave Q=

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 7/18/2007
Habitat: Run **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.65	104.65		100.00
BM2			3.59	101.06
BM				

Comment: Photo #10 looking d/s, #11 left to rig

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			104.65	5.17	0.00	99.48	99.47	38.8
1-R				5.19	0.00	99.46		

Ave Q= 38.8

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 0617

Date: 7/19/2007
Habitat: Run **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	5.09	105.09		100.00
BM2			4.03	101.06
BM				

Comment: Photo #39 looking d/s, #40 left to rig

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			105.09	5.88	0.00	99.21	99.21	17.6
1-R				5.89	0.00	99.20		

Ave Q= 17.6

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	50		105.09	6.21	0.44	99.32
d/s	-50		105.09	6.04	0.00	99.05

Note:
WSE slope = 0.270%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 0617

Date: 7/20/2007
Habitat: Run **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.44	104.44		100.00
BM2			3.37	101.07
BM				

Comment: Photo #109 looking u/s, #110 left to

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			104.44	5.45	0.00	98.99	99.00	6.7
1-R				5.44	0.00	99.00		

Ave Q= 6.7

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib #: 0617

Date: 8/21/2007
Habitat: Run **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.96	104.96		100.00
BM2			3.90	101.06
BM				

Comment: Photo #16 looking d/s, #17 left to rig

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			104.96	5.81	0.71	99.86	99.86	
1-R				5.76	0.66	99.86		

Ave Q=

Note: Small high flow side channel (< 1 % of total Q) u/s of TR 1; No depth and velocity measurements taken
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 8/23/2007
Habitat: Run **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	4.80	104.80		100.00
BM2			3.73	101.07
BM				

Comment: Photo #77 looking left to right, #78 l

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			104.80	5.10	0.00	99.70	99.70	
1-R				5.63	0.53	99.70		

Ave Q=

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	40		104.80	4.30	0.00	100.50
d/s	-40		104.80	5.36	0.00	99.44

Note: No depth and velocity measurements taken
WSE slope = 1.325%

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Stream: Sultan R.
Site: Reach 1A, Side Channel
Transect: 1
Habitat: Run

Survey	HI (ft)	Q (cfs)
Date		
7/17/2007	104.29	
7/18/2007	104.65	38.8
7/19/2007	105.09	17.6
7/20/2007	104.44	6.7
8/21/2007	104.96	
8/23/2007	104.80	

17-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWP	2.0	1.08	103.21									11.9
	3.5	2.48	101.81									35.6
	6.0	3.90	100.39									35.5
RWE	6.8	5.03	99.26									36.8
	37.0	5.05	99.24									87.8
	40.0	4.92	99.37									78.6
	43.4	4.86	99.43									72.8
	45.0	4.60	99.69									17.8
	50.0	4.65	99.64									87.8
	51.6	4.47	99.82									81.8
	52.4	3.80	100.49									87.8
	53.5	4.03	100.26									18.8
	57.0	4.02	100.27									11.9
	58.3	3.27	101.02									11.9
	59.6	3.08	101.21									11.9
	62.0	3.14	101.15									11.9
LWP	66.7	3.25	101.04									11.9

18-Jul-07

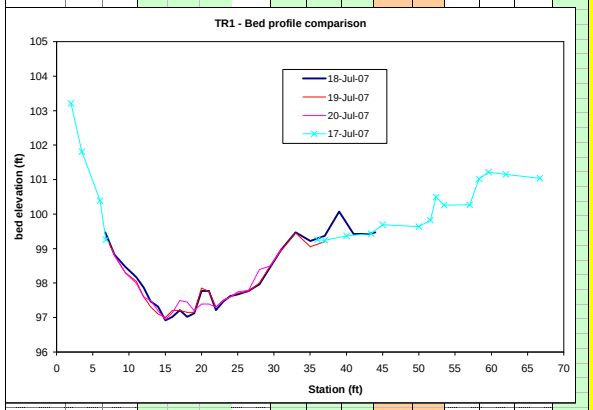
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	6.7		99.47	0.00	0.00		0.00		0.00		0.00	36.8
	8.0		98.82	0.65	-0.44		-0.48		-0.48		-0.44	56.6
	9.5		98.47	1.00	-0.48		-0.52		-0.52		-0.78	67.6
	11.0		98.17	1.30	0.34		0.39		0.39		0.63	76.6
	12.0		97.87	1.60	0.24		0.31		0.31		0.49	87.8
	13.0		97.47	2.00	0.25		0.32		0.32		0.63	87.8
	14.0		97.32	2.15	0.29		0.34		0.34		0.74	87.8
	15.0		96.92	2.55	2.38		2.45		2.45		6.26	76.6
	16.0		97.02	2.45	1.96		2.03		2.03		4.97	87.6
	17.0		97.22	2.25	2.21		2.28		2.28		5.13	87.8
	18.0		97.02	2.45	1.47		1.53		1.53		3.74	87.8
	19.0		97.12	2.35	1.20		1.25		1.25		2.93	87.8
	20.0		97.77	1.70	1.47		1.53		1.53		2.59	87.8
	21.0		97.77	1.70	1.17		1.22		1.22		2.07	87.8
	22.0		97.22	2.25	1.28		1.33		1.33		2.99	87.8
	23.0		97.47	2.00	1.02		1.07		1.07		2.14	87.8
	24.0		97.62	1.85	0.91		0.96		0.96		1.78	87.8
	25.0		97.67	1.80	0.56		0.61		0.61		1.36	87.8
	26.5		97.77	1.70	0.04		0.15		0.15		0.37	87.8
	28.0		97.97	1.50	0.36		0.41		0.41		0.92	87.8
	29.5		98.47	1.00	0.01		0.04		0.04		0.05	87.8
	31.0		98.97	0.50	0.19		0.28		0.28		0.24	87.8
	33.0		99.47	0.00	0.00		0.00		0.00		0.00	87.8
	35.0		99.22	0.25	0.00		0.00		0.00		0.00	87.8
	37.0		99.37	0.10	0.00		0.00		0.00		0.00	87.8
	39.0		100.07	-0.60								87.8
	41.0		99.42	0.05	-0.01		-0.04		-0.04		0.00	87.8
	43.0		99.42	0.05	-0.05		-0.17		-0.17		-0.01	78.6
LWE	44.0		99.47	0.00	0.00		0.00		0.00		0.00	72.8

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	7.2		99.21	0.00	0.00		0.00		0.00		0.00	36.8
	8.0		98.81	0.40	-0.02		-0.07		-0.07		-0.06	56.6
	9.5		98.31	0.90	-0.28		-0.33		-0.33		-0.37	67.6
	11.0		98.06	1.15	0.03		0.11		0.11		0.13	76.6
	12.0		97.61	1.60	0.00		0.00		0.00		0.00	87.8
	13.0		97.31	1.90	0.03		0.11		0.11		0.21	87.8
	14.0		97.11	2.10	0.26		0.32		0.32		0.68	87.8
	15.0		97.01	2.20	0.92		0.97		0.97		2.14	76.6
	16.0		97.21	2.00	1.23		1.28		1.28		2.56	87.6
	17.0		97.21	2.00	1.14		1.19		1.19		2.38	87.8
	18.0		97.16	2.05	1.13		1.18		1.18		2.42	87.8
	19.0		97.16	2.05	0.86		0.91		0.91		1.88	87.8
	20.0		97.86	1.35	0.53		0.57		0.57		0.78	87.8
	21.0		97.76	1.45	0.17		0.27		0.27		0.39	87.8
	22.0		97.31	1.90	0.55		0.60		0.60		1.13	87.8
	23.0		97.51	1.70	0.52		0.56		0.56		0.96	87.8
	24.0		97.61	1.60	0.17		0.27		0.27		0.53	87.8
	25.0		97.71	1.50	0.32		0.37		0.37		0.84	87.8
	26.5		97.76	1.45	0.10		0.20		0.20		0.44	87.8
	28.0		98.01	1.20	0.06		0.18		0.18		0.33	87.8
	29.5		98.51	0.70	0.03		0.11		0.11		0.13	87.8
	31.0		98.96	0.25	0.06		0.18		0.18		0.05	87.8
	33.0		99.46	-0.25								87.8
	35.0		99.06	0.15	-0.01		-0.04		-0.04		0.10	87.8
LWE	37.0		99.21	0.00	0.00		0.00		0.00		0.00	87.8

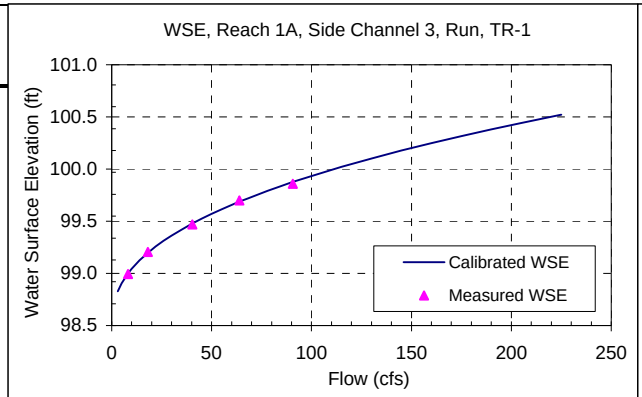
20-Jul-07

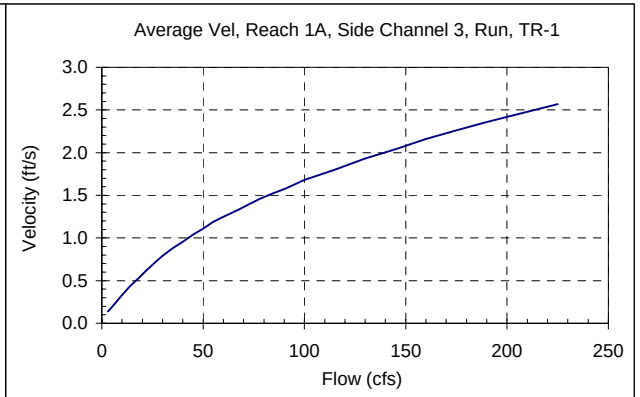
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	7.6		99.00	0.00	0.00		0.00		0.00		0.00	36.8
	8.0		98.80	0.20	0.00		0.00		0.00		0.00	56.6
	9.5		98.30	0.70	-0.01		-0.04		-0.04		-0.04	67.6
	11.0		98.00	1.00	0.00		0.00		0.00		0.00	76.6
	12.0		97.60	1.40	0.16		0.26		0.26		0.36	87.8
	13.0		97.50	1.50	0.00		0.00		0.00		0.00	87.8
	14.0		97.20	1.80	0.02		0.07		0.07		0.13	87.8
	15.0		96.95	2.05	0.27		0.33		0.33		0.67	76.6
	16.0		97.15	1.85	0.67		0.72		0.72		1.33	87.6
	17.0		97.50	1.50	0.84		0.89		0.89		1.34	87.8
	18.0		97.45	1.55	0.34		0.39		0.39		0.60	87.8
	19.0		97.20	1.80	0.03		0.11		0.11		0.20	87.8
	20.0		97.40	1.60	0.00		0.00		0.00		0.00	87.8
	21.0		97.40	1.60	0.12		0.23		0.23		0.36	87.8
	22.0		97.30	1.70	0.36		0.41		0.41		0.69	87.8
	23.0		97.50	1.50	0.11		0.21		0.21		0.32	87.8
	24.0		97.60	1.40	0.02		0.07		0.07		0.10	87.8
	25.0		97.75	1.25	0.31		0.36		0.36		0.57	87.8
	26.5		97.80	1.20	0.01		0.04		0.04		0.07	87.8
	28.0		98.40	0.60	0.01		0.04		0.04		0.03	87.8
	29.5		98.50	0.50	0.00		0.00		0.00		0.00	87.8
LWE	31.0		99.00	0.00	0.00		0.00		0.00		0.00	87.8

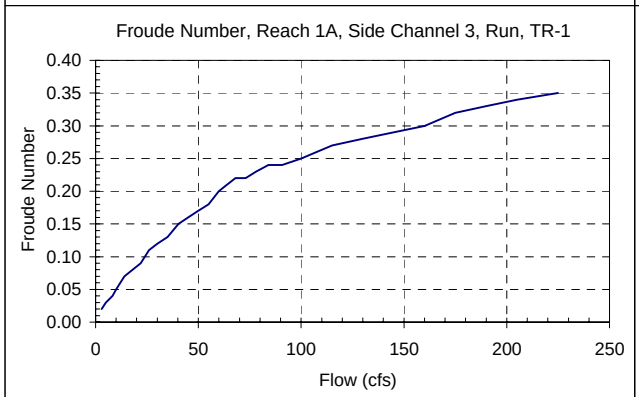


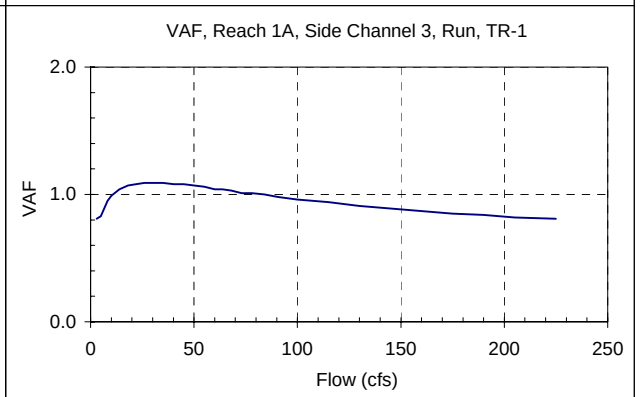
Stream: Sultan R.
Site: Reach 1A, Side Channel 3
Habitat: Run
Transect: 1

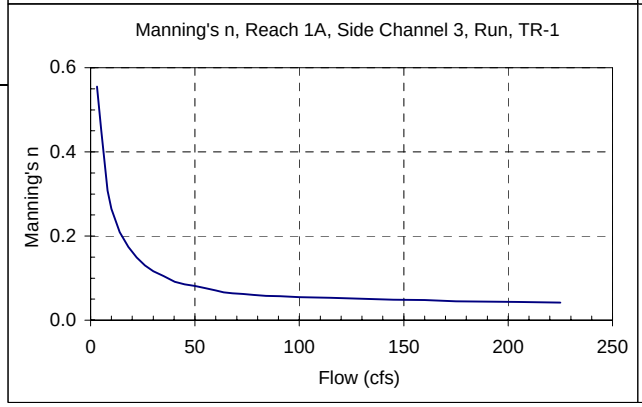
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
3	98.83	0.02	0.14	0.81	0.555	22.4
5	98.91	0.03	0.19	0.83	0.453	23.9
8.2	99.00	0.04	0.28	0.95	0.308	24.4
10	99.04	0.05	0.33	0.99	0.265	24.7
14	99.13	0.07	0.44	1.04	0.209	25.2
18.1	99.20	0.08	0.53	1.07	0.174	25.7
22	99.26	0.09	0.62	1.08	0.149	26.9
26	99.31	0.11	0.71	1.09	0.130	28.3
30	99.36	0.12	0.79	1.09	0.116	29.7
35	99.42	0.13	0.88	1.09	0.105	30.8
40.3	99.48	0.15	0.96	1.08	0.091	35.0
45	99.52	0.16	1.04	1.08	0.085	35.5
50	99.57	0.17	1.11	1.07	0.081	36.1
55	99.61	0.18	1.19	1.06	0.076	36.5
60	99.66	0.20	1.25	1.04	0.071	39.3
63.8	99.69	0.21	1.29	1.04	0.066	42.9
68	99.72	0.22	1.34	1.03	0.064	43.4
73	99.76	0.22	1.40	1.01	0.062	44.1
78	99.79	0.23	1.46	1.01	0.060	44.6
84	99.83	0.24	1.52	1.00	0.058	45.1
90.7	99.88	0.24	1.58	0.98	0.057	45.6
100	99.93	0.25	1.68	0.96	0.055	46.0
115	100.02	0.27	1.80	0.94	0.053	46.8
130	100.10	0.28	1.93	0.91	0.051	47.5
145	100.18	0.29	2.04	0.89	0.049	47.7
160	100.25	0.30	2.16	0.87	0.048	47.9
175	100.32	0.32	2.26	0.85	0.045	51.8
190	100.38	0.33	2.36	0.84	0.044	52.4
205	100.44	0.34	2.45	0.82	0.043	53.1
225	100.52	0.35	2.57	0.81	0.042	53.8

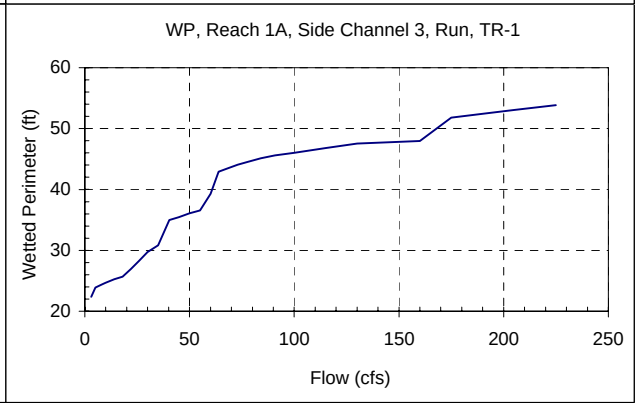


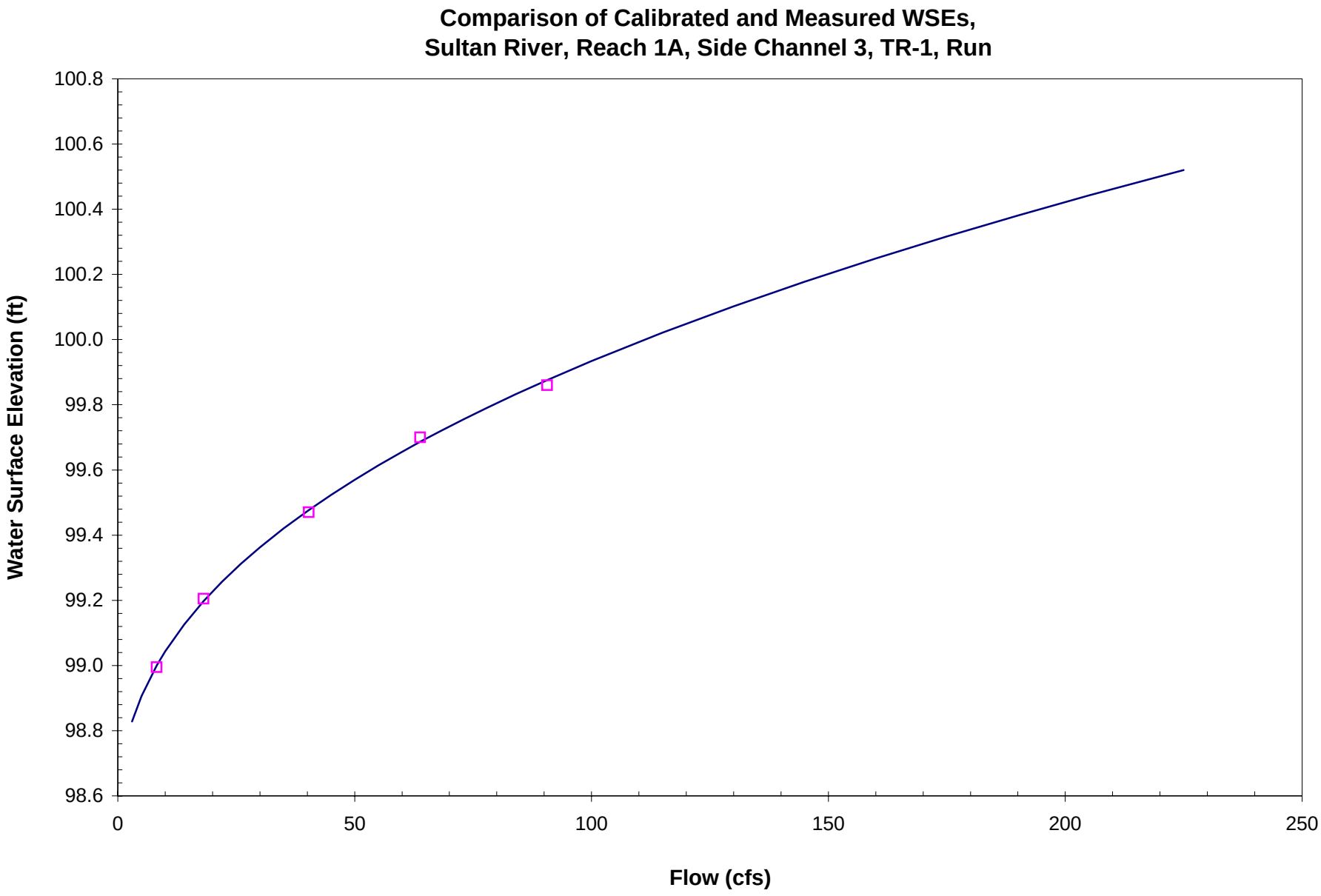











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel 3, TR-1, Run
Water Surface Elevation (ft)
100.8
100.6
100.4
100.2
100.0
99.8
99.6
99.4
99.2
99.0
98.8
98.6
0
50
100
150
200
250
Flow (cfs)

Stream: Sultan R.
Site: Reach 1A, Side Channel 2
Date: 7/18/2007 **Transect:** 6
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.22	104.22		100.00
BM2			3.32	100.90

Comment: Staff guage = 18.2 inches @ 930 a

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			104.22	5.06	0.00	99.16	99.12	3.14
6-R				5.15	0.00	99.07		

Ave Q= 3.14

Note: Photo #7 looking u/s, #8 across transect left to right, #9 looking d/s
WSE slope = NA

(3) Meter and propeller ID for Velocity Correctio

Meter ID: 5750
Propeller ID: 6A
Calib. # 167

(4) Level Loop for Bank Survey on 7/17/07

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	3.81	103.81		100.00
BM2			7.59	96.22

Comment:

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	3.69	103.69		100.00
BM2			2.80	100.89

Comment: Staff guage = 12.25 inches @ 825 a

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			103.69	4.98		98.71	98.71	
6-R								

Ave Q=

Note: Photo #37 looking u/s, #38 looking d/s (No WSE collected)
WSE slope = 0.833%

(3) Meter and propeller ID for Velocity Correctio

Meter ID: NA
Propeller ID: NA

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.24	104.24		100.00
BM2			3.35	100.89

Comment: Staff guage = 9.375 inches

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L						0.00	0.00	
6-R						0.00		

Ave Q=

Note: Photo #76 looking u/s, #77 across transect left to right, #78 looking d/s
WSE slope = NA

(3) Meter and propeller ID for Velocity Correctio

Meter ID: NA
Propeller ID: NA

Date: 8/21/2007
Habitat: Riffle **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.29	104.29		100.00
BM2			3.40	100.89

Comment: Photo #19 looking d/s, #20 right to

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			104.29	4.91	0.20	99.58	99.50	36.5
6-R				5.04	0.17	99.42		

Ave Q= 36.5

Note: Staff guage =23.88 inches @ 10.55 am
WSE slope = NA

(3) Meter and propeller ID for Velocity Correctio

Meter ID: 4099
Propeller ID: 5A
Calib. # 186

Date: 8/23/2007
Habitat: Riffle **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.30	104.30		100.00
BM2			3.40	100.90

Comment: Photo #81 side channel 2 staff gua

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			104.30	4.86	0.00	99.44	99.38	19.1
6-M				4.92	0.00	99.38		
6-R				4.97	0.00	99.33		

Ave Q= 19.1

Note: Staff guage =21.125 inches

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	45		104.30	4.97	0.55	99.88
d/s	-25			5.78	0.00	98.52

WSE slope = 1.943%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 5A
Calib. # 175

Stream: Sultan R.
Site: Reach 1A, Side Channe
Transect: 6
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/17/2007	103.81	
7/18/2007	104.22	3.1
7/19/2007	103.69	
7/20/2007	0.00	
8/21/2007	104.29	36.5
8/23/2007	104.30	19.1

18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWP	2.0	2.28	101.53									11.9
	4.0	3.02	100.79									11.9
	6.0	3.83	99.98									11.9
RWE	7.5		99.12	0.00	0.00		0.00		0.00		0.00	11.9
	8.0		99.07	0.05	0.69		0.74		0.74		0.03	84.6
	9.0		98.92	0.20	1.50		1.56		1.56		0.31	46.8
	10.0		98.97	0.15	1.66		1.72		1.72		0.26	56.6
	11.0		98.97	0.15	1.52		1.58		1.58		0.24	54.6
	12.0		98.97	0.15	0.44		0.48		0.48		0.07	56.8
	13.0		99.02	0.10	1.16		1.21		1.21		0.12	56.8
	14.0		98.77	0.35	1.68		1.74		1.74		0.61	56.6
	15.0		98.87	0.25	0.67		0.72		0.72		0.18	57.6
	16.0		98.97	0.15	1.14		1.19		1.19		0.18	56.6
	17.0		98.97	0.15	1.28		1.33		1.33		0.20	65.5
	18.0		99.32	-0.20	0.00		0.00		0.00		0.00	56.6
	19.0		98.92	0.20	0.54		0.58		0.58		0.12	65.6
	20.0		98.92	0.20	0.34		0.39		0.39		0.08	56.8
	21.0		99.07	0.05	0.15		0.25		0.25		0.01	56.6
	22.0		98.92	0.20	0.55		0.60		0.60		0.12	65.6
	23.0		98.92	0.20	0.00		0.00		0.00		0.00	76.5
	24.0		98.92	0.20	0.00		0.00		0.00		0.00	56.6
	25.0		98.87	0.25	0.35		0.40		0.40		0.10	56.8
	26.0		98.92	0.20	0.77		0.82		0.82		0.16	57.6
	27.0		98.87	0.25	0.44		0.48		0.48		0.12	65.8
	28.0		99.27	-0.15	0.00		0.00		0.00		0.00	76.8
	29.0		99.07	0.05	0.01		0.04		0.04		0.00	56.6
	30.0		99.07	0.05	0.00		0.00		0.00		0.00	65.6
	31.0		98.87	0.25	0.07		0.19		0.19		0.05	67.6
	32.0		99.22	-0.10	0.00		0.00		0.00		0.00	76.8
	33.0		98.87	0.25	0.24		0.31		0.31		0.08	67.8
	34.0		99.12	0.00	0.00		0.00		0.00		0.00	67.6
	35.0		98.92	0.20	0.48		0.52		0.52		0.10	65.5
LWE	36.0		99.12	0.00	0.00		0.00		0.00		0.00	65.6
	38.0	4.52	99.29									75.6
	40.0	4.43	99.38									76.6
	42.0	4.54	99.27									57.6
	44.0	4.56	99.25									57.8
	46.0	4.73	99.08									73.6
	48.0	4.32	99.49									17.8
	50.0	3.71	100.10									11.9
	51.0	3.46	100.35									11.9
	52.0	3.26	100.55									11.9
	54.0	0.68	103.13									11.9
	55.0	0.22	103.59									11.9
LWP	56.5											11.9

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

20-Jul-07

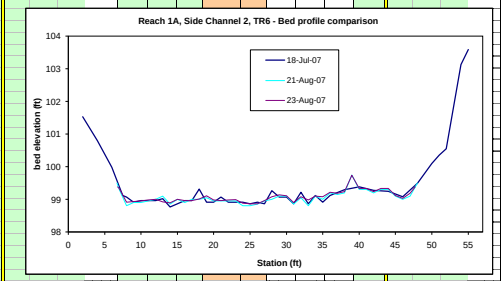
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

21-Aug-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	6.7		99.50	0.00	0.00		0.00		0.00		0.00	11.9
	7.0		99.30	0.20	0.00		0.00		0.00		0.00	11.9
	8.0		98.80	0.70	2.52		2.52		2.52		1.76	84.6
	9.0		98.90	0.60	2.66		2.66		2.66		1.60	46.8
	10.0		98.90	0.60	2.99		2.99		2.99		1.79	56.6
	11.0		98.95	0.55	3.30		3.30		3.30		1.82	54.6
	12.0		99.00	0.50	2.98		2.98		2.98		1.49	56.8
	13.0		99.10	0.40	3.09		3.09		3.09		1.24	56.8
	14.0		98.85	0.65	3.31		3.31		3.31		2.15	56.6
	15.0		99.00	0.50	2.8		2.80		2.80		1.40	57.6
	16.0		98.90	0.60	3.33		3.33		3.33		2.00	56.6
	17.0		99.00	0.50	3.16		3.16		3.16		1.58	65.5
	18.0		99.00	0.50	3.00		3.00		3.00		1.50	56.6
	19.0		99.05	0.45	2.40		2.40		2.40		1.08	65.6
	20.0		98.95	0.55	1.84		1.84		1.84		1.01	56.8
	21.0		98.95	0.55	2.00		2.00		2.00		1.10	56.6
	22.0		98.95	0.55	1.94		1.94		1.94		1.07	65.6
	23.0		98.95	0.55	1.86		1.86		1.86		1.02	76.5
	24.0		98.80	0.70	2.11		2.11		2.11		1.48	56.6
	25.0		98.80	0.70	1.48		1.48		1.48		1.04	56.8
	26.0		98.85	0.65	2.39		2.39		2.39		1.55	57.6
	27.0		98.95	0.55	2.94		2.94		2.94		1.62	65.8
	28.0		99.00	0.50	-0.19		-0.19		-0.19		-0.10	76.8
	29.0		99.10	0.40	2.52		2.52		2.52		1.01	56.6
	30.0		99.10	0.40	2.51		2.51		2.51		1.00	65.6
	31.0		98.85	0.65	2.21		2.21		2.21		1.44	67.6
	32.0		99.05	0.45	0.93		0.93		0.93		0.42	76.8
	33.0		98.80	0.70	1.38		1.38		1.38		0.97	67.8
	34.0		99.10	0.40	0.85		0.85		0.85		0.34	67.6
	35.0		99.00	0.50	1.44		1.44		1.44		0.72	65.5
	36.0		99.20	0.30	0.82		0.82		0.82		0.25	65.6
	37.0		99.15	0.35	1.10		1.10		1.10		0.39	75.6
	38.0		99.20	0.30	0.50		0.50		0.50		0.08	75.6
	39.0		99.75	-0.25								76.6
	40.0		99.30	0.20	0.22		0.22		0.22		0.02	76.6
	41.0		99.30	0.20	0.01		0.01		0.01		0.00	57.6
	42.0		99.20	0.30	0.21		0.21		0.21		0.06	57.6
	43.0		99.30	0.20	0.42		0.42		0.42		0.08	57.6
	44.0		99.30	0.20	0.55		0.55		0.55		0.11	57.8
	45.0		99.10	0.40	0.44		0.44		0.44		0.18	57.8
	46.0		99.00	0.50	0.28		0.28		0.28		0.14	73.6
	47.0		99.10	0.40	0.17		0.17		0.17		0.07	17.8
LWE	48.0		99.50	0.00	0.00		0.00		0.00		0.00	17.8

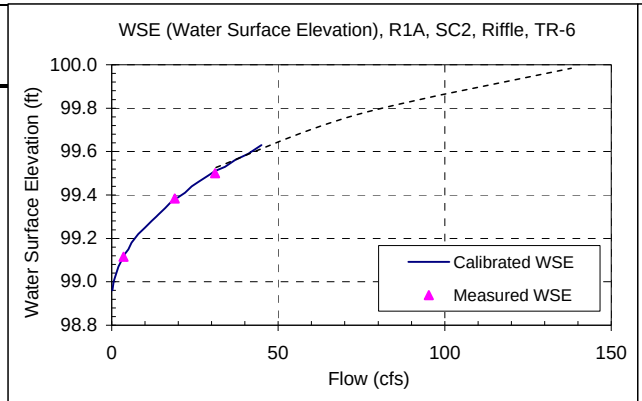
23-Aug-07

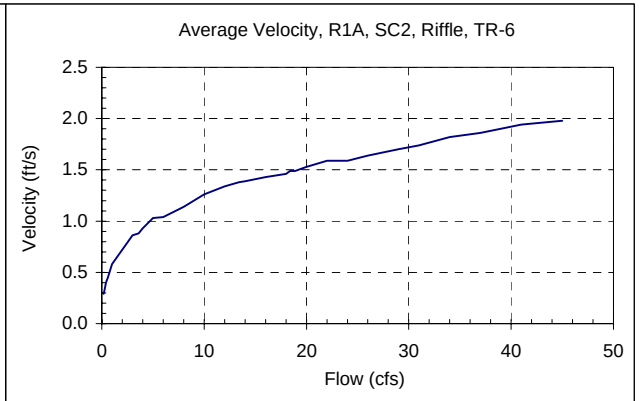
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	6.8		99.38	0.00	0.00		0.00		0.00		0.00	11.9
	7.0		99.33	0.05	0.01		0.01		0.01		0.00	11.9
	8.0		98.91	0.47	2.31		2.31		2.31		1.09	84.6
	9.0		98.93	0.45	2.30		2.30		2.30		1.04	46.8
	10.0		98.95	0.43	2.62		2.62		2.62		1.13	56.6
	11.0		98.98	0.40	2.62		2.62		2.62		1.05	54.6
	12.0		99.00	0.38	2.35		2.35		2.35		0.89	56.8
	13.0		98.92	0.46	2.32		2.32		2.32		1.07	56.8
	14.0		98.89	0.49	2.32		2.32		2.32		1.14	56.6
	15.0		99.00	0.38	2.09		2.09		2.09		0.79	57.6
	16.0		98.96	0.42	1.78		1.78		1.78		0.75	56.6
	17.0		98.96	0.42	2.10		2.10		2.10		0.88	65.5
	18.0		99.01	0.37	1.80		1.80		1.80		0.67	56.6
	19.0		99.10	0.28	2.82		2.82		2.82		0.79	65.6
	20.0		98.98	0.40	1.45		1.45		1.45		0.58	56.8
	21.0		98.96	0.42	1.26		1.26		1.26		0.53	56.6
	22.0		98.98	0.40	1.23		1.23		1.23		0.49	65.6
	23.0		98.99	0.39	1.19		1.19		1.19		0.46	76.5
	24.0		98.88	0.50	1.33		1.33		1.33		0.67	56.6
	25.0		98.86	0.52	1.15		1.15		1.15		0.60	56.8
	26.0		98.86	0.52	1.99		1.99		1.99		1.03	57.6
	27.0		98.96	0.42	0.65		0.65		0.65		0.27	65.8
	28.0		99.08	0.30	0.06		0.06		0.06		0.02	76.8
	29.0		99.13	0.25	0.94		0.94		0.94		0.24	56.6
	30.0		99.10	0.28	1.79		1.79		1.79		0.50	65.6
	31.0		98.90	0.48	1.50		1.50		1.50		0.72	67.6
	32.0		99.08	0.30	1.70		1.70		1.70		0.51	76.8
	33.0		98.98	0.40	1.42		1.42		1.42		0.57	67.8
	34.0		99.09	0.29	0.17		0.17		0.17		0.05	67.6
	35.0		99.08	0.30	0.78		0.78		0.78		0.23	65.5
	36.0		99.21	0.17	0.78		0.78		0.78		0.13	65.6
	37.0		99.18	0.20	0.68		0.68		0.68		0.14	75.6
	38.0		99.23	0.15	0.17		0.17		0.17		0.01	75.6
	39.0		99.73	-0.35								76.6
	40.0		99.33	0.05	0.00		0.00		0.00		0.00	76.6
	41.0		99.33	0.05	0.00		0.00		0.00		0.00	57.6
	42.0		99.23	0.15	0.00		0.00		0.00		0.00	57.6
	43.0		99.33	0.05	0.00		0.00		0.00		0.00	57.6
	44.0		99.33	0.05	0.00		0.00		0.00		0.00	57.8
	45.0		99.11	0.27	0.09		0.09		0.09		0.02	57.8
	46.0		99.03	0.35	0.13		0.13		0.13		0.05	73.6
	47.0		99.18	0.20	0.05		0.05		0.05		0.01	17.8
LWE	47.7		99.38	0.00	0.00		0.00		0.00		0.00	17.8

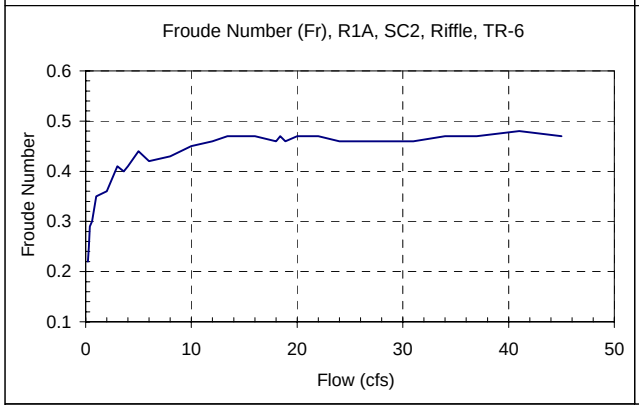


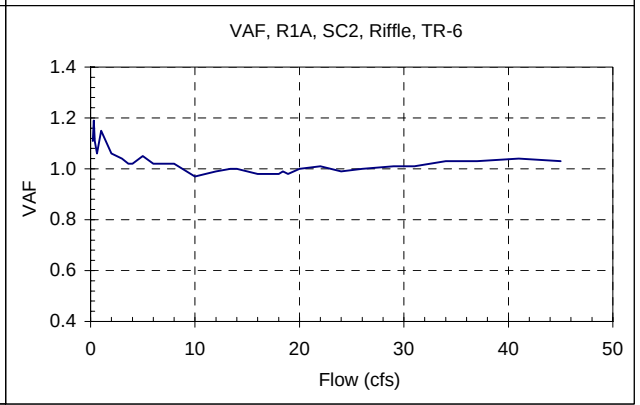
Stream: Sultan R.
Site: Reach 1A, Side Channel 2
Habitat: Riffle
Transect: 6

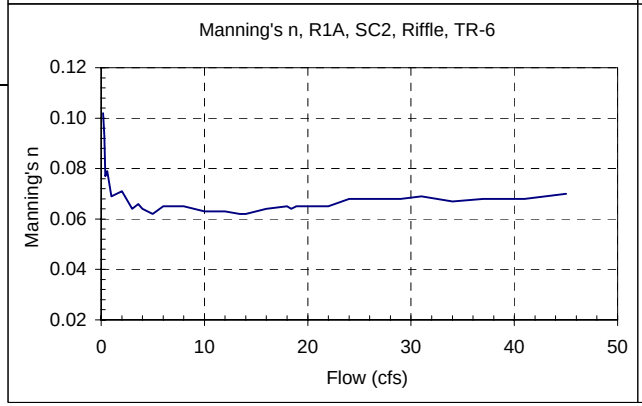
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.2	98.96	0.22	0.29	1.11	0.102	12.4
0.3	98.97	0.25	0.35	1.19	0.093	13.3
0.4	98.98	0.29	0.40	1.11	0.077	17.1
0.6	99.00	0.30	0.45	1.06	0.079	18.6
1	99.02	0.35	0.58	1.15	0.069	20.2
2	99.07	0.36	0.72	1.06	0.071	22.9
3	99.10	0.41	0.86	1.04	0.064	25.9
3.6	99.12	0.40	0.88	1.02	0.066	27.3
4	99.13	0.41	0.93	1.02	0.064	27.9
5	99.15	0.44	1.03	1.05	0.062	29.0
6	99.18	0.42	1.04	1.02	0.065	30.7
8	99.22	0.43	1.14	1.02	0.065	32.5
10	99.25	0.45	1.26	0.97	0.063	33.6
12	99.28	0.46	1.34	0.99	0.063	35.1
13.4	99.30	0.47	1.38	1.00	0.062	36.4
14	99.31	0.47	1.39	1.00	0.062	37.0
16	99.34	0.47	1.43	0.98	0.064	38.5
18	99.37	0.46	1.46	0.98	0.065	39.4
18.4	99.37	0.47	1.49	0.99	0.064	39.4
18.9	99.38	0.46	1.49	0.98	0.065	39.7
20	99.39	0.47	1.53	1.00	0.065	39.8
22	99.41	0.47	1.59	1.01	0.065	40.0
24	99.44	0.46	1.59	0.99	0.068	40.3
26	99.46	0.46	1.64	1.00	0.068	40.5
29	99.49	0.46	1.70	1.01	0.068	40.9
31	99.51	0.46	1.74	1.01	0.069	41.1
34	99.53	0.47	1.82	1.03	0.067	41.3
37	99.56	0.47	1.86	1.03	0.068	41.6
41	99.59	0.48	1.94	1.04	0.068	41.9
45.0	99.63	0.47	1.98	1.03	0.070	42.3

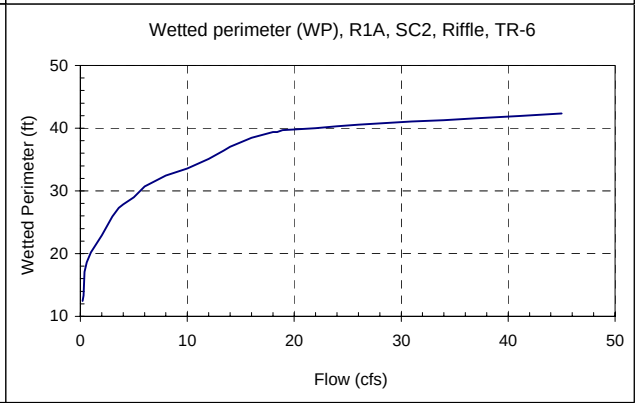


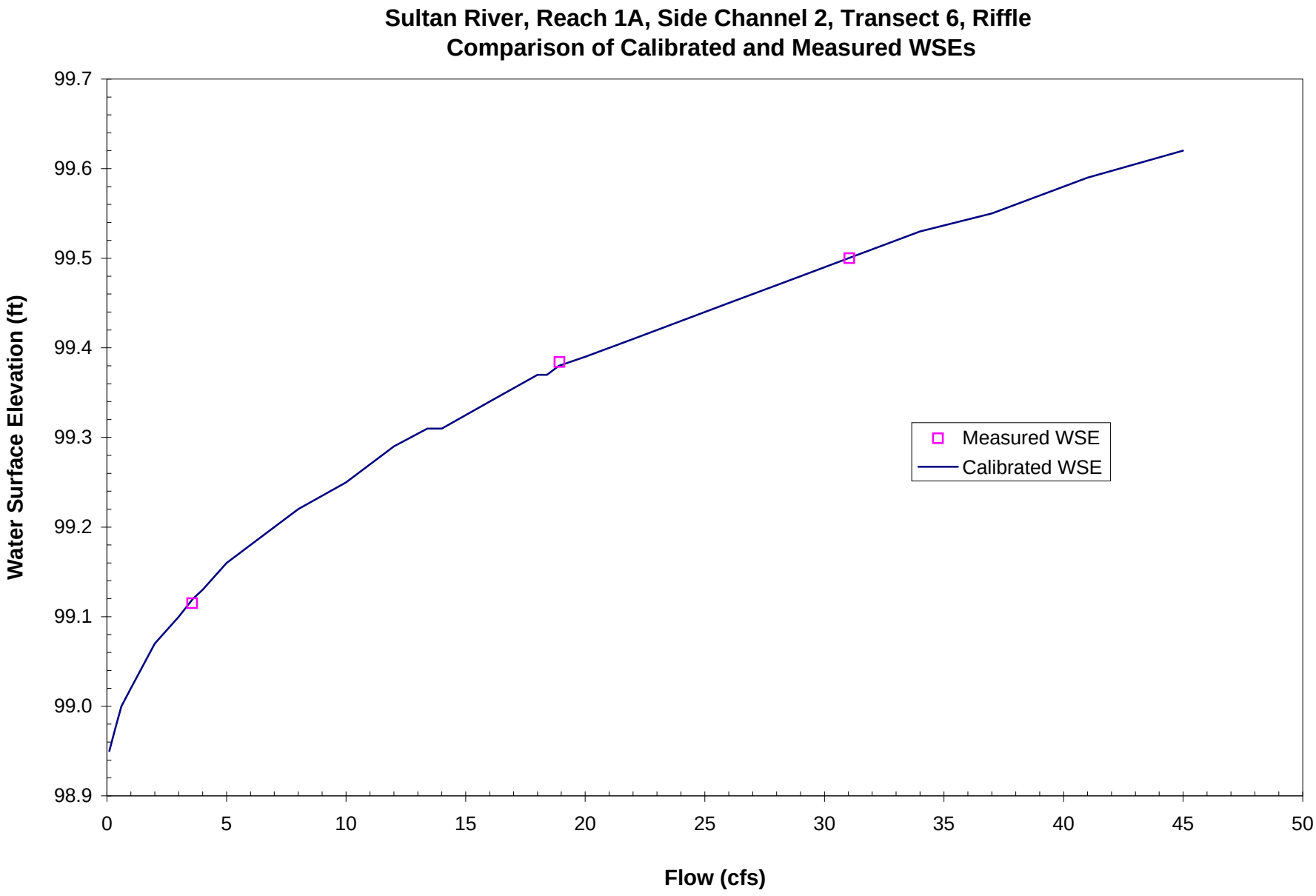











Sultan River, Reach 1A, Side Channel 2, Transect 6, Riffle
Comparison of Calibrated and Measured WSEs
Water Surface Elevation (ft)
99.7
99.6
99.5
99.4
99.3
99.2
99.1
99.0
98.9
0
5
10
15
20
25
30
35
40
45
50
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 2

Date: 7/18/2007 **Transect:** 5
Habitat: Pool **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	3.70	103.70		100.00
BM4			7.46	96.24

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			103.70	8.19	0.00	95.51	95.51	0.0
RWSE				8.19	0.00	95.51		

Ave Q= 0.0

Note: Photo #4 looking u/s, #5 across transect left to right, #6 looking d/s
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib. # 167

(4) Level Loop for Bank Survey on 7/17/07

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	3.81	103.81		100.00
BM4			7.59	96.22

Comment:

Date: 7/19/2007
Habitat: Pool **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3		100.00		100.00
BM4				100.00

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	River Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L						0.00	0.00	
1-R								

Ave Q=

Note: Photo #35 looking u/s, #36 looking d/s (No WSE collected)
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 7/20/2007
Habitat: Pool **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	2.92	102.92		100.00
BM4				102.92

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	River Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			101.94	7.10	0.00	94.84	94.84	
1-R				7.10	0.00	94.84		

Ave Q=

Note: Photo #73 looking u/s, #74 across transect left to right, #75 looking
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 8/21/2007
Habitat: Pool **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	3.71	103.71		100.00
BM4			7.46	96.25

Comment: Photo #22 lookng d/s, #23 looking left to right, #24 looking u/s

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			103.71	8.43	0.68	95.96	95.96	26.6
RWSE				8.37	0.62	95.96		

Ave Q= 26.6

Note: Prop calibration = 186
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib. # 186

Date: 8/23/2007
Habitat: Pool **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	3.91	103.91		100.00
BM4			7.67	96.24

Comment: Photo #86 lookng left to right, #87 looking right to left, #89 looking

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			103.91	8.13	0.00	95.78	95.78	17.7
RWS				8.93	0.80	95.78		

Ave Q= 17.7

Note: Prop calibration = 175

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	25		103.91	9.82	1.68	95.77
d/s	-30			9.53	1.41	95.79

WSE slope = -0.036%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 Counter 4099 was used in measuring velocity
Propeller ID: 5A
Calib. # 186

Stream: Sultan R.
Site: Reach 1A, Side Channe
Transect: 5
Habitat: Pool

Survey Date	HI (ft)	Q (cfs)
7/17/2007	103.81	0
7/18/2007	103.70	0.0
7/19/2007		
7/20/2007	101.94	
8/21/2007	103.71	26.6
8/23/2007	103.91	17.7

18-Jul-07

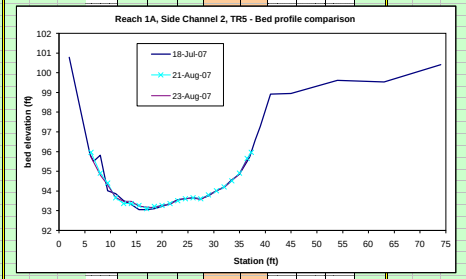
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWP	2.0	3.02	100.79									11.9
	6.0	7.96	95.85									81.6
RWE	6.7		95.51	0.00	0.00		0.00		0.00		0.00	85.6
	8.0		95.81	-0.30	0.00		0.00		0.00		0.00	85.6
	9.4		94.01	1.50	0.00		0.00		0.00		0.00	87.8
	11.0		93.86	1.65	0.00		0.00		0.00		0.00	78.6
	12.5		93.51	2.00	0.00		0.00		0.00		0.00	76.6
	14.0		93.31	2.20	0.00		0.00		0.00		0.00	76.6
	15.5		93.06	2.45	0.00		0.00		0.00		0.00	76.6
	17.0		93.06	2.45	0.00		0.00		0.00		0.00	76.6
	18.5		93.11	2.40	0.00		0.00		0.00		0.00	76.6
	20.0		93.21	2.30	0.00		0.00		0.00		0.00	76.6
	21.5		93.36	2.15	0.00		0.00		0.00		0.00	45.8
	23.0		93.56	1.95	0.00		0.00		0.00		0.00	43.6
	24.5		93.61	1.90	0.00		0.00		0.00		0.00	43.6
	26.0		93.66	1.85	0.00		0.00		0.00		0.00	37.8
	27.5		93.61	1.90	0.00		0.00		0.00		0.00	37.8
	29.0		93.76	1.75	0.00		0.00		0.00		0.00	27.8
	30.5		94.01	1.50	0.00		0.00		0.00		0.00	21.8
	32.0		94.21	1.30	0.00		0.00		0.00		0.00	12.5
	33.5		94.56	0.95	0.00		0.00		0.00		0.00	12.6
	35.0		94.86	0.65	0.00		0.00		0.00		0.00	12.8
LWE	36.5		95.51	0.00	0.00		0.00		0.00		0.00	11.9
	37.0	8.08	95.73									11.9
	38.0	7.24	96.57									11.9
	39.0	6.54	97.27									11.9
	41.0	4.90	98.91									11.9
	45.0	4.86	98.95									11.9
	54.0	4.20	99.61									11.9
	63.0	4.28	99.53									11.9
LWP	74.0	3.40	100.41									11.9

19-Jul-07

Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

20-Jul-07

Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.



21-Aug-07

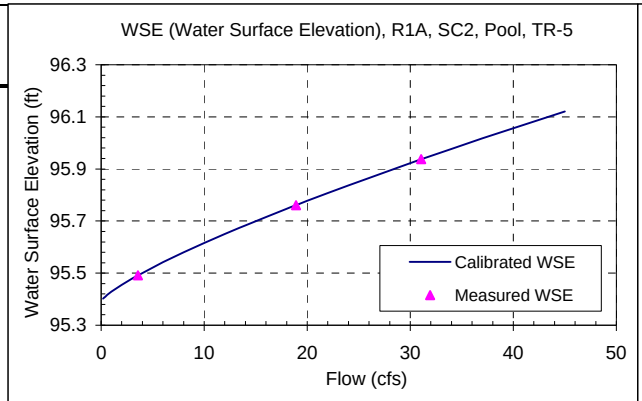
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	6.2		95.96	0.00	0.00		0.00		0.00		0.00	81.6
	8.0		94.91	1.05	0.00		0.00		0.00		0.00	85.6
	9.4		94.41	1.55	0.01		0.04		0.04		0.10	87.8
	11.0		93.66	2.30	0.00		0.00		0.00		0.00	78.6
	12.5		93.36	2.60	0.00	0.00	0.00	0.00	0.00		0.00	76.6
	14.0		93.36	2.60	0.16	0.42	0.22	0.48	0.35		1.37	76.6
	15.5		93.26	2.70	0.13	0.61	0.22	0.67	0.44		1.79	76.6
	17.0		93.11	2.85	0.35	0.53	0.41	0.59	0.50		2.14	76.6
	18.5		93.21	2.75	0.47	0.68	0.53	0.73	0.63		2.59	76.6
	20.0		93.26	2.70	0.57	0.81	0.63	0.86	0.74		3.01	76.6
	21.5		93.36	2.60	0.54	0.58	0.60	0.64	0.62		2.40	45.8
	23.0		93.51	2.45	0.51		0.57		0.57		2.08	43.6
	24.5		93.61	2.35	0.58		0.64		0.64		2.24	43.6
	26.0		93.66	2.30	0.63		0.68		0.68		2.36	37.8
	27.5		93.61	2.35	0.57		0.63		0.63		2.21	37.8
	29.0		93.81	2.15	0.78		0.83		0.83		2.67	27.8
	30.5		94.01	1.95	0.24		0.30		0.30		0.89	21.8
	32.0		94.21	1.75	0.16		0.22		0.22		0.58	12.5
	33.5		94.51	1.45	0.03		0.12		0.12		0.27	12.6
	35.0		94.91	1.05	0.03		0.12		0.12		0.15	12.8
	36.5		95.66	0.30	0.01		0.04		0.04		-0.22	11.9
LWE	37.3		95.96	0.00	0.00		0.00		0.00		0.00	11.9

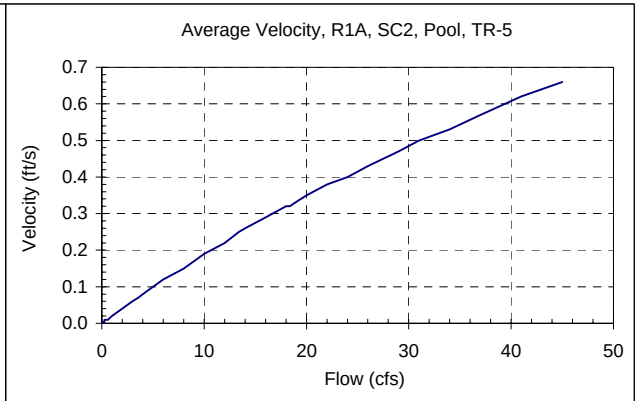
23-Aug-07

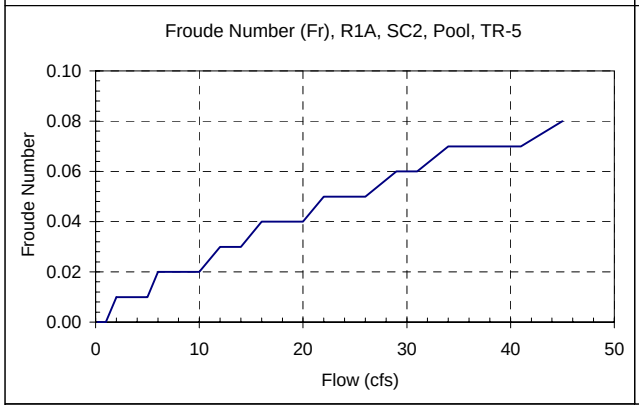
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	6.1		95.78	0.00	0.00		0.00		0.00		0.00	81.6
	8.0		94.81	0.97	0.05		0.11		0.11		0.18	85.6
	9.4		94.31	1.47	0.05		0.11		0.11		0.25	87.8
	11.0		93.68	2.10	0.05		0.11		0.11		0.37	78.6
	12.5		93.48	2.30	0.05		0.11		0.11		0.39	76.6
	14.0		93.48	2.30	0.15		0.23		0.23		0.81	76.6
	15.5		93.23	2.55	0.11	0.27	0.20	0.35	0.28		1.05	76.6
	17.0		93.18	2.60	0.32	0.06	0.40	0.14	0.27		1.05	76.6
	18.5		93.16	2.62	0.25	0.24	0.33	0.32	0.33		1.29	76.6
	20.0		93.28	2.50	0.45	0.25	0.53	0.33	0.43		1.62	76.6
	21.5		93.32	2.46	0.45		0.53		0.53		1.96	45.8
	23.0		93.56	2.22	0.43		0.51		0.51		1.71	43.6
	24.5		93.61	2.17	0.31		0.39		0.39		1.28	43.6
	26.0		93.65	2.13	0.33		0.41		0.41		1.32	37.8
	27.5		93.56	2.22	0.39		0.48		0.48		1.58	37.8
	29.0		93.80	1.98	0.30		0.38		0.38		1.14	27.8
	30.5		94.02	1.76	0.12		0.21		0.21		0.54	21.8
	32.0		94.18	1.60	0.10		0.19		0.19		0.45	12.5
	33.5		94.51	1.27	0.15		0.23		0.23		0.45	12.6
	35.0		94.88	0.90	0.08		0.16		0.16		0.22	12.8
	36.5		95.62	0.16	0.05		0.11		0.11		0.02	11.9
LWE	36.9		95.78	0.00	0.00		0.00		0.00		0.00	11.9

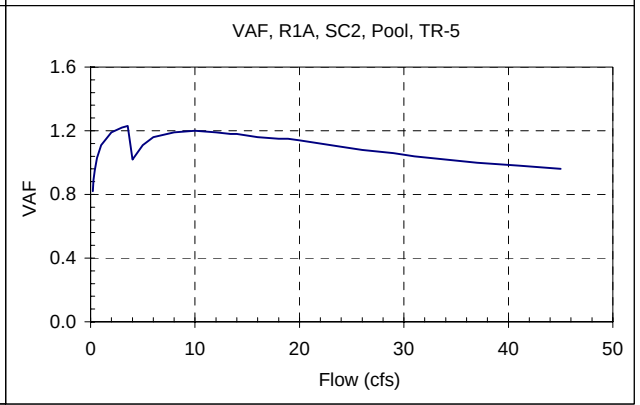
Stream: Sultan R.
Site: Reach 1A, Side Channel 2
Habitat: Pool
Transect: 5

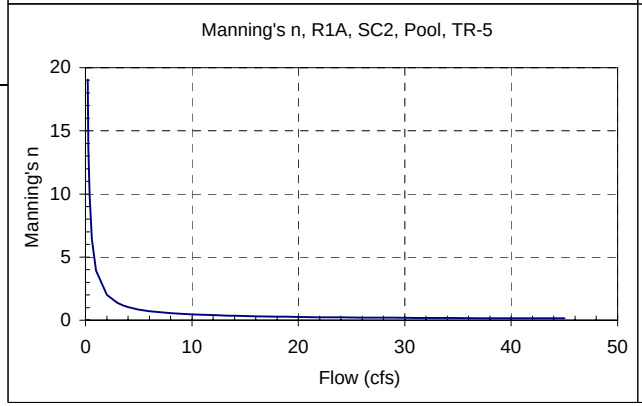
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.2	95.42	0.00	0.00	0.82	19.074	29.0
0.28	95.42	0.00	0.01	0.89	13.624	29.0
0.39	95.43	0.00	0.01	0.95	9.871	29.1
0.6	95.43	0.00	0.01	1.03	6.416	29.1
1	95.45	0.00	0.02	1.11	3.920	29.1
2	95.47	0.01	0.04	1.19	1.995	29.2
3	95.50	0.01	0.06	1.22	1.366	29.3
3.56	95.51	0.01	0.07	1.23	1.161	29.4
4	95.52	0.01	0.08	1.02	1.043	29.4
5	95.54	0.01	0.10	1.11	0.849	29.5
6	95.56	0.02	0.12	1.16	0.720	29.5
8	95.60	0.02	0.15	1.19	0.558	29.7
10	95.63	0.02	0.19	1.20	0.458	29.8
12	95.67	0.03	0.22	1.19	0.395	29.9
13.4	95.69	0.03	0.25	1.18	0.359	30.0
14	95.70	0.03	0.26	1.18	0.346	30.0
16	95.74	0.04	0.29	1.16	0.313	30.1
18	95.77	0.04	0.32	1.15	0.285	30.2
18.4	95.77	0.04	0.32	1.15	0.279	30.2
18.9	95.78	0.04	0.33	1.15	0.273	30.2
20	95.80	0.04	0.35	1.14	0.255	31.6
22	95.83	0.05	0.38	1.12	0.235	32.4
24	95.86	0.05	0.40	1.10	0.220	32.5
26	95.89	0.05	0.43	1.08	0.208	32.6
29	95.93	0.06	0.47	1.06	0.193	32.7
31	95.96	0.06	0.50	1.04	0.184	32.8
34	96.00	0.07	0.53	1.02	0.173	32.9
37	96.04	0.07	0.57	1.00	0.164	33.0
41	96.09	0.07	0.62	0.98	0.154	33.2
45.0	96.14	0.08	0.66	0.96	0.145	33.3

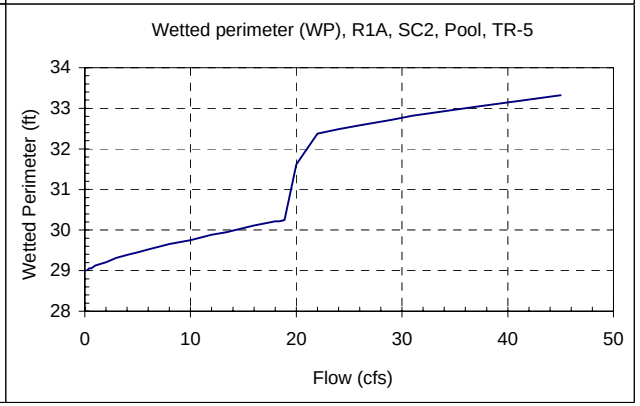


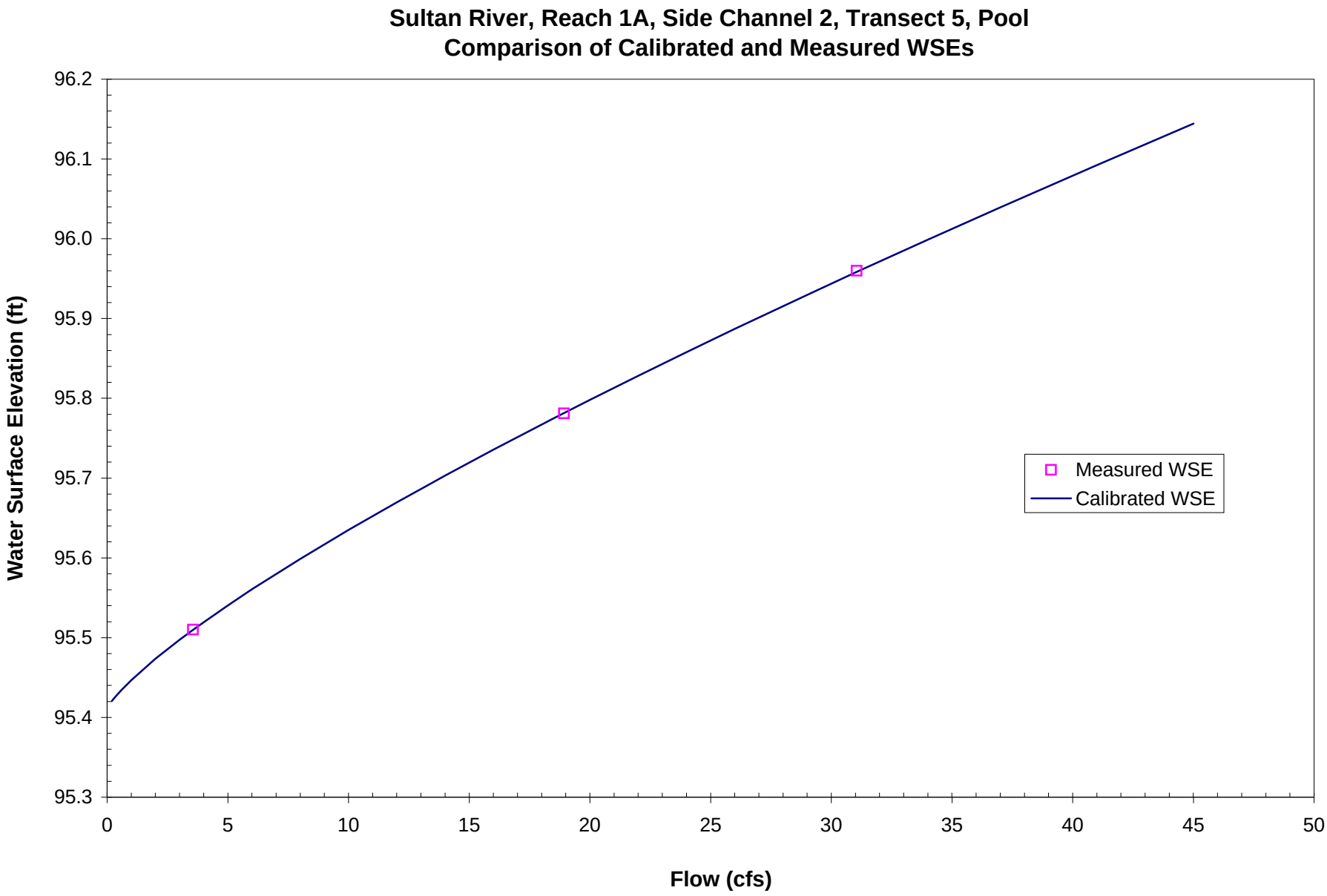











Sultan River, Reach 1A, Side Channel 2, Transect 5, Pool
Comparison of Calibrated and Measured WSEs
Water Surface Elevation (ft)
96.2
96.1
96.0
95.9
95.8
95.7
95.6
95.5
95.4
95.3
0
5
10
15
20
25
30
35
40
45
50
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 2
Date: 7/18/2007 **Transect:** 4
Habitat: Pool **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	4.11	104.11		100.00
BM4			3.31	100.80

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			104.11	7.60		96.51	96.51	3.9
1-R				7.60		96.51		

Ave Q= 3.9

Note: Photo #1 looking u/s, #2 across transect left to right, #3 looking d/s
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 5750
Propeller ID: 6A
Calib. # 167

(4) Level Loop for Bank Survey on 7/17/07

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	3.76	103.76		100.00
BM2			2.97	100.79

Comment:

Date: 7/19/2007
Habitat: Pool **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3		100.00		100.00
BM4				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L						0.00	0.00	
1-R								

Ave Q=

Note: Photo #33 looking u/s, #34 looking d/s (No WSE collected)
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 7/20/2007
Habitat: Pool **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	3.74	103.74		100.00
BM4			2.94	100.80

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			103.74	6.27		97.47	97.47	
1-R								

Ave Q=

Note: Photo #71 looking u/s, #72 across transect left to right, #73 looking d/s
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 8/21/2007
Habitat: Pool **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	3.60	103.60		100.00
BM4			2.81	100.79

Comment: Photo #25 looking d/s, #26 left to ri

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			103.60	6.78	0.44	97.26	97.26	24.8
RWSE				6.62	0.27	97.25		

Ave Q= 24.8

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib. # 186

Date: 8/23/2007
Habitat: Pool **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	3.85	103.85		100.00
BM4			3.06	100.79

Comment: Photo #90 left to right, #91 looking

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			103.85	6.89	0.00	96.96	96.96	17.2
RWS				7.55	0.65	96.95		

Ave Q= 17.2

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	25		103.85	6.89	0.00	96.96
d/s	-25			6.97	0.00	96.88

WSE slope = 0.160%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 Counter 4099 was used in measuring velocity
Propeller ID: 5A
Calib. # 175

Stream: Sultan R.
Site: Reach 1A, Side Channe
Transect: 4
Habitat: Pool

Survey	HI	Q
Date	(ft)	(cfs)
7/17/2007	103.76	
7/18/2007	104.11	3.9
7/19/2007		
7/20/2007	103.74	
8/21/2007	103.60	24.8
8/23/2007	103.85	17.2

18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWP	2.0	1.35	102.41									11.9
	5.0	3.60	100.16									11.9
	8.4	6.26	97.50									14.6
	10.0	7.00	96.76									14.6
RWE	10.7		96.51	0.00	0.00		0.00		0.00		0.00	14.6
	12.0		96.16	0.35	0.00		0.00		0.00		0.00	14.6
	13.0		96.01	0.50	0.00		0.00		0.00		0.00	31.8
	14.0		95.91	0.60	0.00		0.00		0.00		0.00	31.8
	15.0		95.71	0.80	-0.01		-0.04		-0.04		-0.03	13.6
	16.0		95.16	1.35	0.00		0.00		0.00		0.00	31.8
	17.0		94.91	1.60	-0.01		-0.04		-0.04		-0.06	43.5
	18.0		94.66	1.85	-0.01		-0.04		-0.04		-0.07	43.6
	19.0		94.31	2.20	-0.01		-0.04		-0.04		-0.08	43.6
	20.0		94.06	2.45	-0.01		-0.04		-0.04		-0.09	43.6
	21.0		93.86	2.65	-0.01		-0.04		-0.04		-0.10	65.8
	22.0		93.56	2.95	0.00		0.00		0.00		0.00	65.8
	23.0		93.61	2.90	0.00		0.00		0.00		0.00	65.8
	24.0		93.56	2.95	0.00		0.00		0.00		0.00	65.8
	25.0		93.66	2.85	0.01		0.04		0.04		0.10	65.8
	26.0		93.81	2.70	0.01		0.04		0.04		0.10	65.8
	27.0		93.76	2.75	0.15		0.25		0.25		0.69	65.8
	28.0		94.01	2.50	0.13		0.24		0.24		0.59	75.6
	29.0		94.16	2.35	0.13		0.24		0.24		0.55	75.6
	30.0		94.56	1.95	0.23		0.30		0.30		0.59	75.6
	31.0		94.66	1.85	0.23		0.30		0.30		0.56	75.6
	32.0		94.81	1.70	0.35		0.40		0.40		0.68	65.8
	33.0		95.21	1.30	0.15		0.25		0.25		0.33	65.8
	34.0		95.91	0.60	0.18		0.27		0.27		0.17	43.8
LWE	35.1		96.51	0.00	0.00		0.00		0.00		0.00	42.6
	36.0	6.84	96.92									42.6
	39.0	5.77	97.99									11.9
	42.0	5.08	98.68									11.9
	46.0	4.80	98.96									11.9
LWP	50.7	4.43	99.33									11.9

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

20-Jul-07

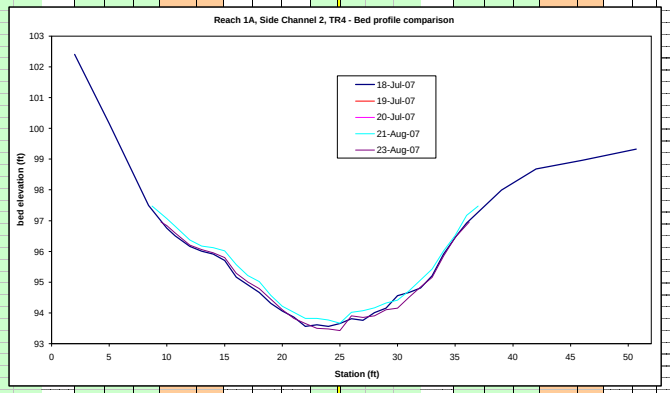
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

21-Aug-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	8.7		97.47	0.00	0.00		0.00		0.00		0.00	14.6
	10.0		97.07	0.40	-0.11		-0.25		-0.25		-0.10	14.6
	10.7		96.82	0.65	-0.46		-0.52		-0.52		-0.34	14.6
	12.0		96.37	1.10	-0.92		-0.97		-0.97		-1.23	14.6
	13.0		96.17	1.30	-0.85		-0.90		-0.90		-1.17	31.8
	14.0		96.12	1.35	-0.74		-0.79		-0.79		-1.06	31.8
	15.0		96.02	1.45	-0.44		-0.50		-0.50		-0.72	13.6
	16.0		95.57	1.90	-0.36		-0.42		-0.42		-0.81	31.8
	17.0		95.22	2.25	-0.34		-0.40		-0.40		-0.91	43.5
	18.0		95.02	2.45	-0.19		-0.26		-0.26		-0.63	43.6
	19.0		94.57	2.90	0.14	0.13	0.22	0.22	0.22		0.64	43.6
	20.0		94.22	3.25	0.29	0.37	0.35	0.43	0.39		1.28	43.6
	21.0		94.02	3.45	0.13	0.85	0.22	0.90	0.56		1.93	65.8
	22.0		93.82	3.65	0.44	1.27	0.50	1.33	0.91		3.33	65.8
	23.0		93.82	3.65	0.05	1.31	0.19	1.37	0.78		2.85	65.8
	24.0		93.77	3.70	1.03	1.64	1.08	1.70	1.39		5.15	65.8
	25.0		93.67	3.80	0.76	1.30	0.81	1.36	1.08		4.12	65.8
	26.0		94.02	3.45	0.69	1.28	0.74	1.34	1.04		3.59	65.8
	27.0		94.07	3.40	0.42	1.58	0.48	1.64	1.06		3.61	65.8
	28.0		94.17	3.30	0.41	1.00	0.47	1.05	0.76		2.51	75.6
	29.0		94.32	3.15	0.45	0.98	0.51	1.03	0.77		2.42	75.6
	30.0		94.42	3.05	0.23	0.58	0.29	0.64	0.47		1.42	75.6
	31.0		94.72	2.75	0.22	0.07	0.29	0.23	0.26		0.71	75.6
	32.0		95.07	2.40	0.31		0.37		0.37		0.89	65.8
	33.0		95.42	2.05	-0.60		-0.66		-0.66		-1.34	65.8
	34.0		96.02	1.45	-0.59		-0.65		-0.65		-0.94	43.8
	35.0		96.52	0.95	-0.31		-0.37		-0.37		-0.35	42.6
	36.0		97.17	0.30	-0.20		-0.27		-0.27		-0.08	42.6
LWE	37.0		97.47	0.00	0.00		0.00		0.00		0.00	42.6

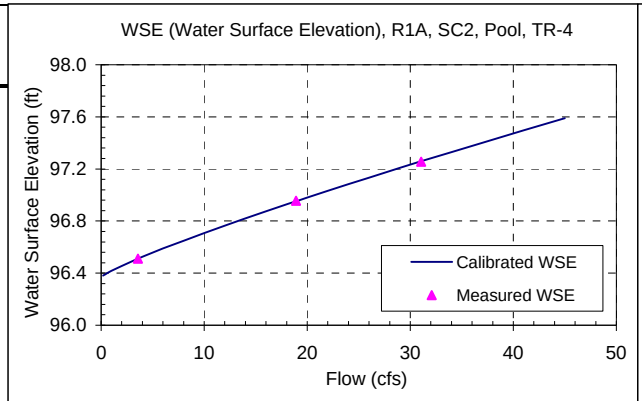
23-Aug-07

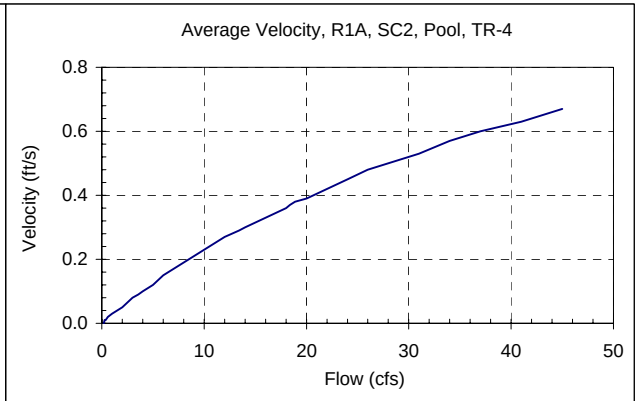
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
RWE	9.5		96.96	0.00	0.00		0.00		0.00		0.00	14.6
	10.0		96.84	0.12	-0.05		-0.11		-0.11		-0.01	14.6
	10.7		96.61	0.35	-0.05		-0.11		-0.11		-0.04	14.6
	12.0		96.21	0.75	-0.36		-0.44		-0.44		-0.38	14.6
	13.0		96.06	0.90	-0.40		-0.49		-0.49		-0.44	31.8
	14.0		95.96	1.00	-0.39		-0.48		-0.48		-0.48	31.8
	15.0		95.80	1.16	-0.39		-0.48		-0.48		-0.55	13.6
	16.0		95.29	1.67	-0.17		-0.25		-0.25		-0.42	31.8
	17.0		95.01	1.95	-0.31		-0.39		-0.39		-0.77	43.5
	18.0		94.79	2.17	-0.25		-0.33		-0.33		-0.72	43.6
	19.0		94.45	2.51	-0.20	-0.12	-0.28	-0.21	-0.24		-0.61	43.6
	20.0		94.11	2.85	-0.05	-0.14	-0.11	-0.23	-0.17		-0.48	43.6
	21.0		93.83	3.13	-0.06	0.00	-0.14	0.00	-0.07		-0.21	65.8
	22.0		93.66	3.30	0.05	0.02	0.11	0.05	0.08		0.26	65.8
	23.0		93.50	3.46	0.18	0.19	0.26	0.27	0.27	5	0.92	65.8
	24.0		93.48	3.48	0.08	0.29	0.16	0.37	0.27		0.94	65.8
	25.0		93.43	3.53	0.22	0.30	0.31	0.38	0.34		1.22	65.8
	26.0		93.91	3.05	0.48	0.60	0.56	0.67	0.62		1.88	65.8
	27.0		93.86	3.10	0.59	0.69	0.66	0.76	0.71		2.20	65.8
	28.0		93.91	3.05	0.66	0.69	0.73	0.76	0.74		2.26	75.6
	29.0		94.11	2.85	0.76	0.82	0.82	0.87	0.85		2.41	75.6
	30.0		94.16	2.80	0.68	0.76	0.74	0.82	0.78		2.19	75.6
	31.0		94.51	2.45	0.85		0.90		0.90		2.21	75.6
	32.0		94.85	2.11	1.02		1.07		1.07		2.26	65.8
	33.0		95.16	1.80	1.27		1.33		1.33		2.39	65.8
	34.0		95.86	1.10	0.94		0.99		0.99		1.09	43.8
	35.0		96.46	0.50	0.11		0.20		0.20		0.11	42.6
LWE	36.2		96.96	0.00	0.00		0.00		0.00		0.00	42.6

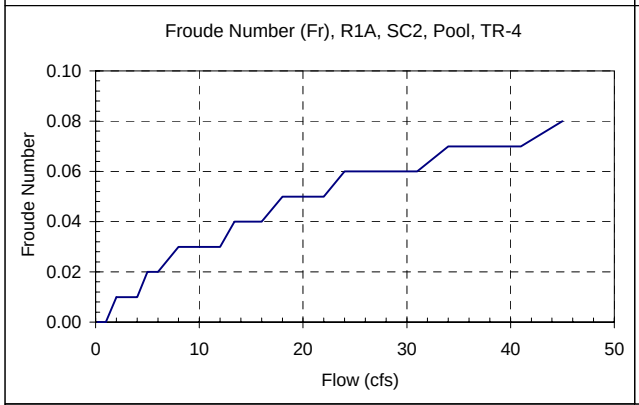


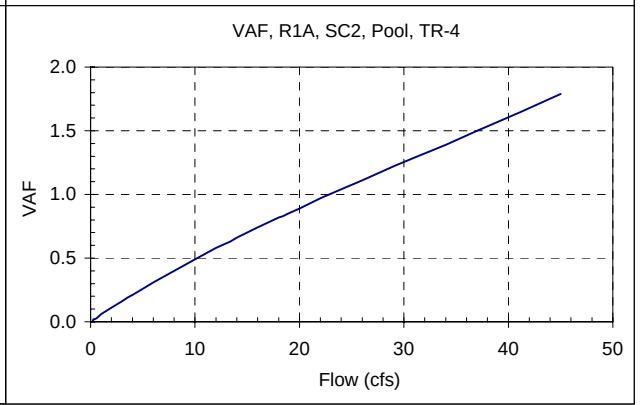
Stream: Sultan R.
Site: Reach 1A, Side Channel 2
Habitat: Pool
Transect: 4

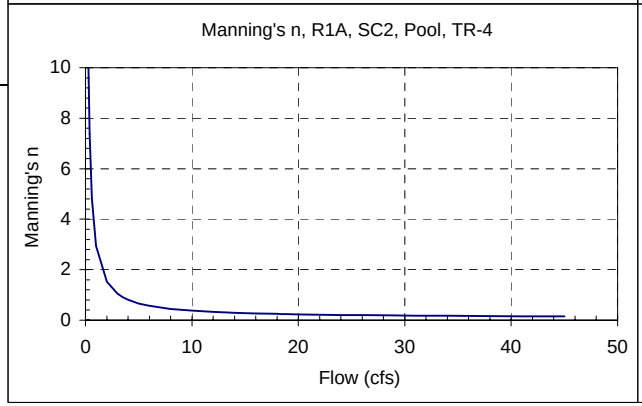
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.2	96.38	0.00	0.00	0.01	28.394	23.6
0.28	96.39	0.00	0.01	0.02	10.226	23.7
0.39	96.39	0.00	0.01	0.02	7.376	23.7
0.6	96.40	0.00	0.02	0.03	4.835	23.8
1	96.42	0.00	0.03	0.06	2.945	23.8
2	96.46	0.01	0.05	0.11	1.523	24.1
3	96.49	0.01	0.08	0.16	1.047	24.2
3.56	96.51	0.01	0.09	0.19	0.897	24.3
4	96.52	0.01	0.10	0.21	0.808	24.4
5	96.56	0.02	0.12	0.26	0.665	24.6
6	96.59	0.02	0.15	0.31	0.569	24.7
8	96.65	0.03	0.19	0.40	0.449	25.0
10	96.71	0.03	0.23	0.49	0.376	25.3
12	96.76	0.03	0.27	0.58	0.328	25.6
13.4	96.80	0.04	0.29	0.63	0.303	25.8
14	96.82	0.04	0.30	0.66	0.294	25.9
16	96.87	0.04	0.33	0.74	0.268	26.1
18	96.93	0.05	0.36	0.82	0.248	26.4
18.4	96.94	0.05	0.37	0.83	0.244	26.4
18.9	96.95	0.05	0.38	0.85	0.240	26.5
20	96.98	0.05	0.39	0.89	0.232	26.7
22	97.03	0.05	0.42	0.97	0.219	26.9
24	97.08	0.06	0.45	1.04	0.208	27.2
26	97.13	0.06	0.48	1.11	0.198	27.4
29	97.21	0.06	0.51	1.22	0.187	27.9
31	97.26	0.06	0.53	1.29	0.180	28.2
34	97.33	0.07	0.57	1.39	0.172	28.7
37	97.40	0.07	0.60	1.50	0.165	29.2
41	97.50	0.07	0.63	1.64	0.157	30.1
45.0	97.59	0.08	0.67	1.79	0.151	30.6

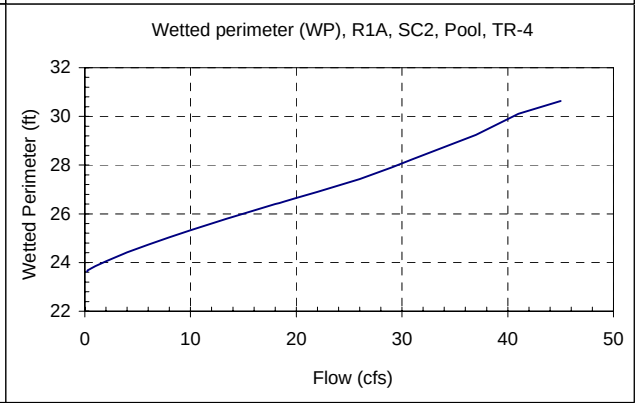


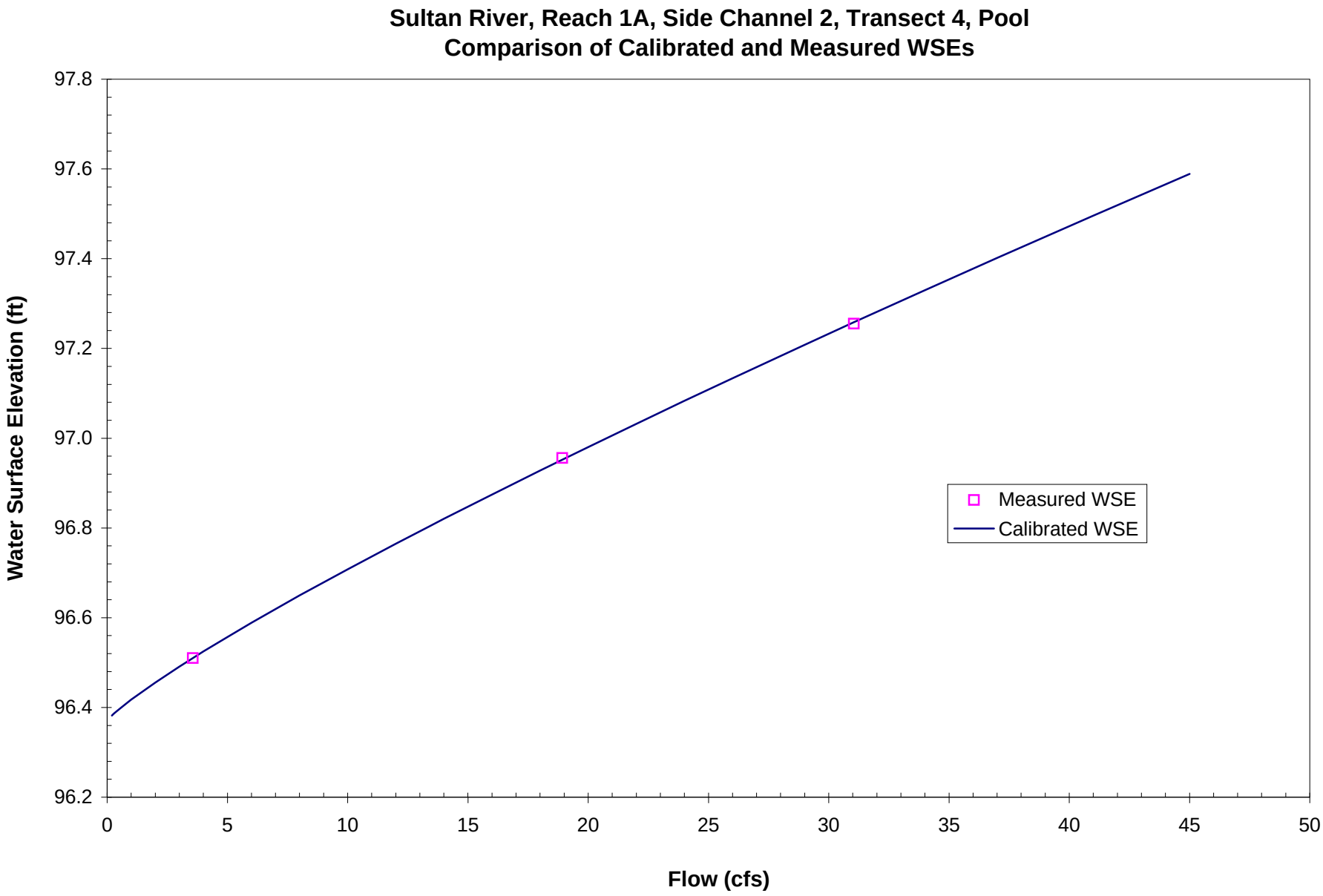











Sultan River, Reach 1A, Side Channel 2, Transect 4, Pool
Comparison of Calibrated and Measured WSEs
Water Surface Elevation (ft)
97.8
97.6
97.4
97.2
97.0
96.8
96.6
96.4
96.2
0
5
10
15
20
25
30
35
40
45
50
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 2
Date: 7/18/2007 **Transect:** 3
Habitat: Run **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.91	104.91		100.00
RWP			4.94	99.97

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			104.91	10.49		94.42	94.40	3.62
1-R				10.54		94.37		

Ave Q= 3.62

Note: Velocity measurements in meters/second
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA

Date: 7/19/2007
Habitat: Run **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.57	104.57		100.00
RWP			4.62	99.95

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			104.57	10.44		94.13	94.13	0.5
1-R				10.44		94.13		

Ave Q= 0.52

Note: Velocity measurements in meters/second
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA

Date: 7/20/2007
Habitat: Run **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.55	104.55		100.00
RWP			4.59	99.96

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			104.55	10.43		94.12	94.11	0.4
1-R				10.45		94.10		

Ave Q= 0.39

Note: Velocity measurements in meters/second
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA

Date: 8/21/2007
Habitat: Run **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	0.47	100.47		100.00
RWP			0.52	99.95

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			100.47	5.59	0.18	95.06	94.97	30.1
RWSE				6.21	0.62	94.88		

Ave Q= 30.1

Note: Photo #28 looking d/s, #29 right to left, #30 looking u/s
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib. # 186

Date: 8/23/2007
Habitat: Run **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	4.40	104.40		100.00
RWP			4.46	99.94

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	River Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			104.40	9.59	0.00	94.81	94.73	18.9
RWSE				9.76	0.00	94.64		

Ave Q= 18.9

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	25		104.40	9.38	0.00	95.02
d/s	-25			10.12	0.00	94.28

NOTE: no distance downstream (d/s) was indicated in field notes

Note: Photo #95 looking d/s, #94 right to left, #96 left to right, #97 looking
WSE slope = 1.480%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 Note: Counter 4099 was used in measuring flow.
Propeller ID: 5A
Calib. # 175

Stream: Sultan R.
Site: Reach 1A, Side Channel
Transect: 3
Habitat: Run

Survey Date	HI (ft)	Q (cfs)
7/17/2007	104.64	
7/18/2007	104.91	3.62
7/19/2007	104.57	0.52
7/20/2007	104.55	0.39
8/21/2007	100.47	30.1
8/23/2007	104.40	18.9

Bathymetry Survey

These stations are added to complete the bed profile for 7/18 survey.

17-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2(0.6)}$	$V_{0.8}$	$NV_{0.2(0.6)}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate
LWP	1.0	4.90	99.74									11.9
	3.0	5.39	99.25									11.9
	5.0	6.45	98.19									11.9
	7.0	9.49	95.15									11.9
	8.5	9.27	95.37									32.6
	10.0	9.81	94.83									43.6
	11.5	9.84	94.80									43.6
	13.0	10.09	94.55									43.6
	14.5	10.21	94.43									45.7
	16.0	10.43	94.21									45.6
	17.5	10.64	94.00									54.6
	19.0	10.71	93.93									54.7
	20.5	10.74	93.90									54.7
	22.0	10.79	93.85									54.6
	23.5	10.70	93.94									54.7
	25.0	10.49	94.15									54.6
	26.5	10.39	94.25									45.6
	28.0	10.29	94.35									45.6
	29.5	10.09	94.55									54.6
	31.0	10.17	94.47									45.6
	32.5	10.04	94.60									54.6
	34.0	10.06	94.58									45.6
	35.5	10.11	94.53									54.7
	37.0	10.35	94.29									54.6
	39.0	9.82	94.82									11.9
	41.0	9.44	95.20									11.9
	43.0	9.57	95.07									11.9
	45.0	8.95	95.69									11.9
	47.0	8.05	96.59									11.9
	49.0	7.12	97.52									11.9
	51.0	5.84	98.80									11.9
RWP	52.9	5.02	99.62									11.9

18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2(0.6)}$	$V_{0.8(0.6)}$	$V_{0.8}$	$NV_{0.2(0.6)}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	13.9		94.40	0.00	0.00	0.00		0.00			0.00	0.00	45.7
	14.5		94.38	0.02	0.10	0.33		0.42			0.42	0.01	45.7
	15.3		94.30	0.10	0.13	0.43		0.53			0.53	0.04	45.6
	16.0		94.25	0.15	0.12	0.39		0.49			0.49	0.05	45.6
	16.8		94.15	0.25	0.25	0.82		0.96			0.96	0.17	54.6
	17.5		94.00	0.40	0.29	0.95		1.11			1.11	0.33	54.6
	18.3		93.90	0.50	0.27	0.89		1.03			1.03	0.38	54.7
	19.0		93.90	0.50	0.38	1.25		1.45			1.45	0.54	54.7
	19.8		94.00	0.40	0.32	1.05		1.22			1.22	0.36	54.7
	20.5		94.10	0.30	0.41	1.35		1.56			1.56	0.35	54.7
	21.3		93.90	0.50	0.35	1.15		1.33			1.33	0.50	54.6
	22.0		93.90	0.50	0.28	0.92		1.07			1.07	0.40	54.6
	22.8		93.85	0.55	0.00	0.00		0.00			0.00	0.00	54.7
	23.5		94.00	0.40	0.00	0.00		0.00			0.00	0.00	54.7
	24.3		94.10	0.30	0.19	0.62		0.74			0.74	0.17	54.6
	25.0		94.10	0.30	0.26	0.85		1.00			1.00	0.22	54.6
	25.8		94.20	0.20	0.11	0.36		0.46			0.46	0.07	45.6
	26.5		94.25	0.15	0.02	0.07		0.10			0.10	0.01	45.6
	27.3		94.30	0.10	0.01	0.03		0.05			0.05	0.00	45.6
	28.0		94.38	0.02	0.01	0.03		0.05			0.05	0.00	45.6
	29.5		94.55										54.6
	31.0		94.47										45.6
	32.5		94.60										45.6
	34.0		94.58										54.7
	35.5		94.53										45.6
	37.0		94.29										54.6
	38.5		94.53										54.7
	37.8		94.29										54.6
	37.8		94.39	0.01	0.10	0.33		0.42			0.42	0.00	11.9
RWE	38.0		94.40	0.00	0.00	0.00		0.00			0.00	0.00	11.9

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2(0.6)}$	$V_{0.8(0.6)}$	$V_{0.8}$	$NV_{0.2(0.6)}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	16.4		94.13	0.00	0.00	0.00		0.00			0.00	0.00	45.6
	16.8		94.12	0.01	0.00	0.00		0.00			0.00	0.00	54.6
	17.5		93.98	0.15	0.06	0.20		0.28			0.28	0.03	54.6
	18.3		93.88	0.25	0.20	0.66		0.78			0.78	0.11	54.7
	19.0		93.91	0.22	0.17	0.56		0.67			0.67	0.11	54.7
	19.8		93.98	0.15	0.22	0.72		0.85			0.85	0.10	54.7
	20.5		94.08	0.05	0.16	0.52		0.63			0.63	0.02	54.7
	21.3		93.93	0.20	0.13	0.43		0.53			0.53	0.08	54.6
	22.0		93.88	0.25	-0.01	-0.03		-0.05			-0.05	-0.01	54.6
	22.8		93.83	0.30	-0.01	-0.03		-0.05			-0.05	-0.01	54.7
	23.5		93.98	0.15	0.13	0.43		0.53			0.53	0.04	54.7
	24.3		94.08	0.05	0.08	0.26		0.35			0.35	0.01	54.6
RWE	25.0		94.11	0.02	0.00	0.00		0.00			0.00	0.00	54.6

20-Jul-07

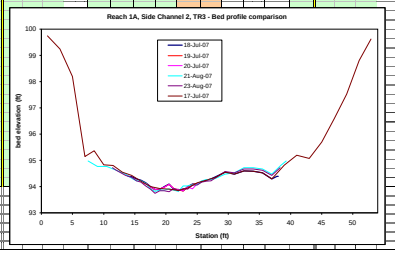
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2(0.6)}$	$V_{0.8(0.6)}$	$V_{0.8}$	$NV_{0.2(0.6)}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	16.5		94.11	0.00	0.00	0.00		0.00			0.00	0.00	54.6
	16.8		94.11	0.00	0.00	0.00		0.00			0.00	0.00	54.6
	17.5		93.99	0.12	0.10	0.33		0.42			0.42	0.04	54.6
	18.3		93.89	0.22	0.17	0.56		0.67			0.67	0.11	54.7
	19.0		93.91	0.20	0.20	0.66		0.78			0.78	0.12	54.7
	19.8		93.98	0.13	0.14	0.46		0.56			0.56	0.05	54.7
	20.5		94.09	0.02	0.19	0.62		0.74			0.74	0.01	54.7
	21.3		93.91	0.20	0.16	0.52		0.63			0.63	0.09	54.6
	22.0		93.88	0.23	-0.04	-0.13		-0.20			-0.20	-0.03	54.6
	22.8		93.84	0.27	-0.03	-0.10		-0.15			-0.15	-0.03	54.7
	23.5		93.99	0.12	0.08	0.26		0.35			0.35	0.03	54.7
	24.3		93.91	0.20	0.00	0.00		0.00			0.00	0.00	54.6
	25.0		94.11	0.00	0.00	0.00		0.00			0.00	0.00	54.6
RWE	25.3		94.11	0.00	0.00	0.00		0.00			0.00	0.00	45.6

21-Aug-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2(0.6)}$	$V_{0.8(0.6)}$	$V_{0.8}$	$NV_{0.2(0.6)}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	7.5		94.97	0.00	0.00	0.00		0.00			0.00	0.00	11.9
	9.0		94.77	0.20	0.01	0.04		0.04			0.04	0.01	32.6
	10.5		94.77	0.20	0.03	0.12		0.12			0.12	0.04	43.6
	12.0		94.62	0.35	0.10	0.25		0.25			0.25	0.13	43.6
	13.5		94.47	0.50	0.39	0.45		0.45			0.45	0.28	43.6
	14.5		94.32	0.65	0.58	0.64		0.64			0.64	0.36	45.7
	15.3		94.22	0.75	0.77	0.82		0.82			0.82	0.46	45.6
	16.0		94.22	0.75	0.90	0.95		0.95			0.95	0.53	45.6
	16.8		94.12	0.85	1.67	1.73		1.73			1.73	1.11	54.6
	17.5		93.92	1.05	1.32	1.38		1.38			1.38	1.09	54.6
	18.3		93.82	1.15	2.45	2.51		2.51	40		2.51	1.66	54.7
	19.0		93.87	1.10	2.45	2.51		2.51	40		2.51	1.59	54.7
	19.8		93.87	1.10	2.45	2.51		2.51	20		1.95	1.95	54.7
	20.5		93.92	1.05	3.68	3.70		3.70	40		2.23	2.23	54.7
	21.3		93.87	1.10	3.63	3.65		3.65	40		2.31	2.31	54.6
	22.0		93.82	1.15	2.99	3.04		3.04	40		2.01	2.01	54.6
	22.8		94.02	0.95	2.48	2.54		2.54	20		1.70	1.70	54.7
	23.5		94.02	0.95	2.43	2.49		2.49	20		1.67	1.67	54.7
	24.3		94.07	0.90	2.30	2.36		2.36	20		1.58	1.58	54.6
	25.0		94.07	0.90	2.38	2.44		2.44	20		1.55	1.55	54.6
	25.8		94.22	0.75	2.04	2.11		2.11	20		1.11	1.11	45.6
	26.5		94.27	0.70	2.01	2.08		2.08	10		1.07	1.07	45.6
	27.3		94.27	0.70	1.66	1.72		1.72			0.91	0.91	45.6
	28.0		94.32	0.65	1.41	1.47		1.47			1.08	0.85	45.6
	29.5		94.47	0.50	1.11	1.16		1.16			0.87	0.87	54.6
	31.0		94.52	0.45	1.20	1.26		1.26			0.85	0.85	45.6
	32.5		94.72	0.25	1.04	1.09		1.09			0.41	0.41	45.6
	34.0		94.72	0.25	1.38	1.44		1.44			0.54	0.54	54.7
	35.5		94.67	0.30	0.73	0.78		0.78			0.35	0.35	54.7
	37.0		94.47	0.50	0.88	0.93		0.93			0.70	0.70	54.6
	38.5		94.82	0.15	0.00	0.00		0.00			0.00	0.00	11.9
RWE	39.3		94.97	0.00	0.00	0.00		0.00			0.00	0.00	11.9

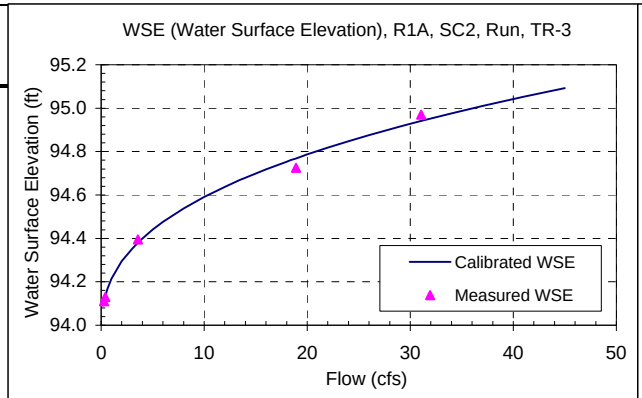
23-Aug-07

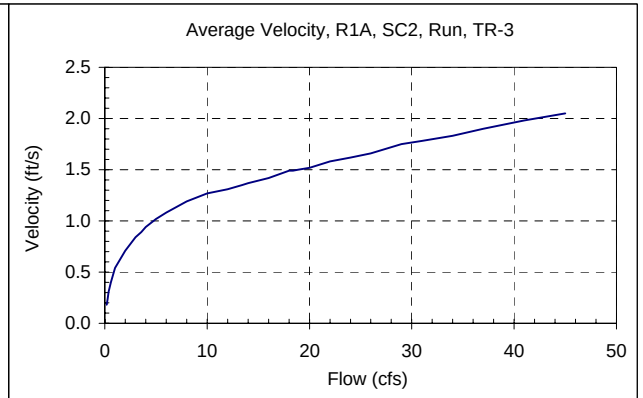
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2(0.6)}$	$V_{0.8(0.6)}$	$V_{0.8}$	$NV_{0.2(0.6)}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	11.4		94.73	0.00	0.00	0.00		0.00			0.00	0.00	43.6
	12.0		94.63	0.10	0.05	0.11		0.11			0.11	0.01	43.6
	13.5		94.43	0.30	0.05	0.11		0.11			0.11	0.04	43.6
	14.5		94.36	0.37	0.48	0.56		0.56			0.56	0.18	45.7
	15.3		94.23	0.50	0.68	0.74		0.74			0.74	0.28	45.6
	16.0		94.18	0.55	0.97	1.02		1.02	15		0.41	0.41	45.6
	16.8		94.03	0.70	1.41	1.47		1.47	15		0.75	0.75	54.6
	17.5		93.91	0.82	1.51	1.57		1.57	15		0.93	0.93	54.6
	18.3		93.75	0.98	1.55	1.61		1.61	15		1.14	1.14	54.7
	19.0		93.85	0.88	2.64	2.69		2.69	30		1.54	1.54	54.7
	19.8		93.85	0.88	3.08	3.11		3.11	30		1.78	1.78	54.7
	20.5		93.81	0.92	2.89	2.93		2.93	30		1.75	1.75	54.7
	21.3		93.91	0.80	3.12	3.15		3.15	30		1.64	1.64	54.6
	22.0		93.85	0.88	2.27	2.33		2.33	20		1.44	1.44	54.6
	22.8		93.93	0.80	2.29	2.35		2.35	20		1.32	1.32	54.7
	23.5		93.91	0.82	1.20	1.26		1.26	25		0.70	0.70	54.7
	24.3		94.06	0.67	1.86	1.93		1.93	25		0.88	0.88	54.6
	25.0		94.06	0.67	1.56	1.62		1.62	20		0.77	0.77	54.6
	25.8		94.18	0.55	1.76	1.83		1.83	15		0.73	0.73	45.6
	26.5		94.21	0.52	1.72	1.78		1.78	15		0.67	0.67	45.6
	27.3		94.23	0.50	1.10	1.15		1.15	10		0.43	0.43	45.6
	28.0		94.35	0.38	1.42	1.48		1.48	10		0.62	0.62	45.6
	29.5		94.58	0.15	1.02	1.07		1.07	15		0.23	0.23	54.6
	31.0		94.53	0.20	0.62	0.69		0.69			0.21	0.21	45.6
	32.5		94.68	0.05	0.35	0.43		0.43			0.03	0.03	45.6
	34.0		94.68	0.05	0.35	0.43		0.43			0.03	0.03	54.7
	35.5		94.63	0.10	0.42	0.50		0.50			0.08	0.08	54.7
	37.0		94.43	0.30	0.65	0.72		0.72			0.31	0.31	54.6
RWE	38.4		94.73	0.00	0.00	0.00		0.00			0.00	0.00	11.9

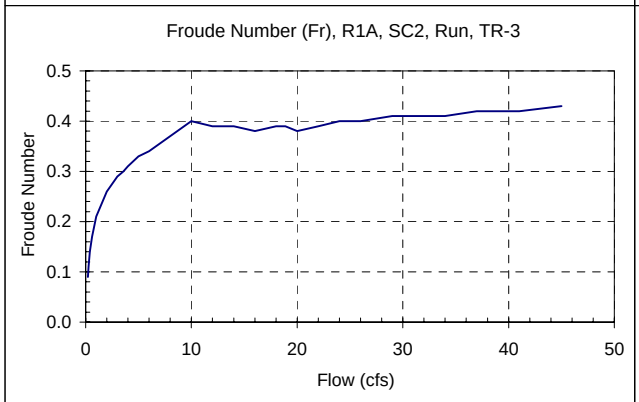


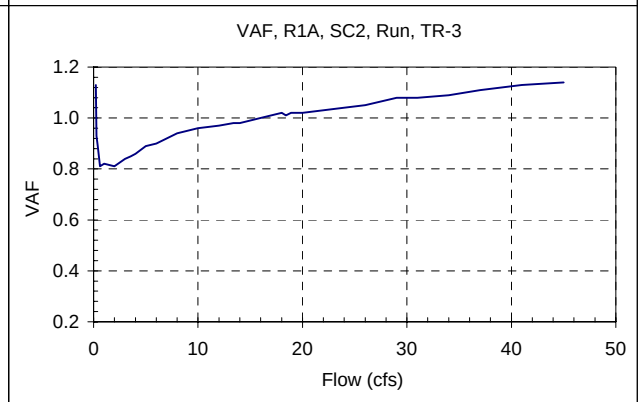
Stream: Sultan R.
Site: Reach 1A, Side Channel 2
Habitat: Run
Transect: 3

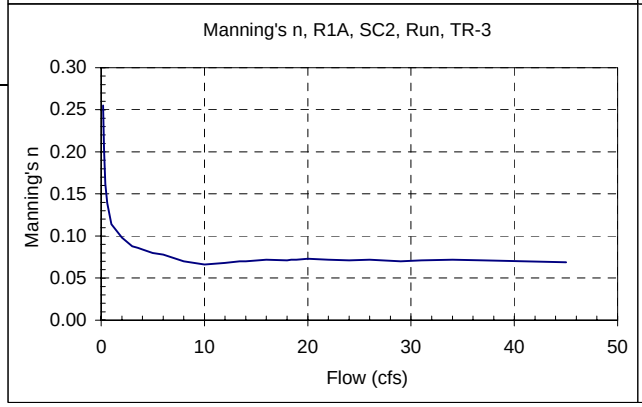
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.2	94.09	0.09	0.18	1.13	0.255	8.2
0.28	94.11	0.11	0.24	0.93	0.203	8.3
0.39	94.13	0.14	0.31	0.89	0.162	8.4
0.6	94.17	0.17	0.40	0.81	0.139	8.8
1	94.21	0.21	0.54	0.82	0.114	9.5
2	94.29	0.26	0.71	0.81	0.098	11.8
3	94.35	0.29	0.84	0.84	0.088	13.6
3.56	94.38	0.30	0.89	0.85	0.086	14.5
4	94.40	0.31	0.94	0.86	0.084	15.0
5	94.44	0.33	1.02	0.89	0.080	16.2
6	94.48	0.34	1.08	0.90	0.078	17.7
8	94.54	0.37	1.19	0.94	0.070	21.4
10	94.59	0.40	1.27	0.96	0.066	24.9
12	94.64	0.39	1.31	0.97	0.068	26.3
13.4	94.67	0.39	1.35	0.98	0.070	26.4
14	94.68	0.39	1.37	0.98	0.070	26.5
16	94.72	0.38	1.42	1.00	0.072	26.7
18	94.75	0.39	1.49	1.02	0.071	26.9
18.4	94.76	0.39	1.49	1.01	0.072	27.0
18.9	94.77	0.39	1.50	1.02	0.072	27.0
20	94.79	0.38	1.52	1.02	0.073	27.2
22	94.82	0.39	1.58	1.03	0.072	28.3
24	94.85	0.40	1.62	1.04	0.071	29.0
26	94.88	0.40	1.66	1.05	0.072	29.3
29	94.91	0.41	1.75	1.08	0.070	29.5
31	94.94	0.41	1.78	1.08	0.071	29.8
34	94.98	0.41	1.83	1.09	0.072	30.1
37	95.01	0.42	1.90	1.11	0.071	30.4
41	95.05	0.42	1.98	1.13	0.070	30.8
45.0	95.09	0.43	2.05	1.14	0.069	31.6

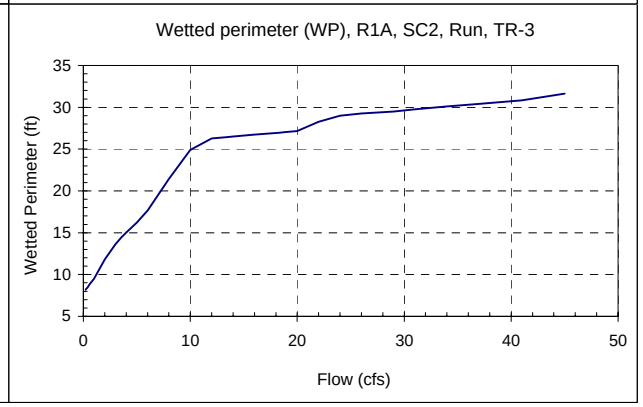


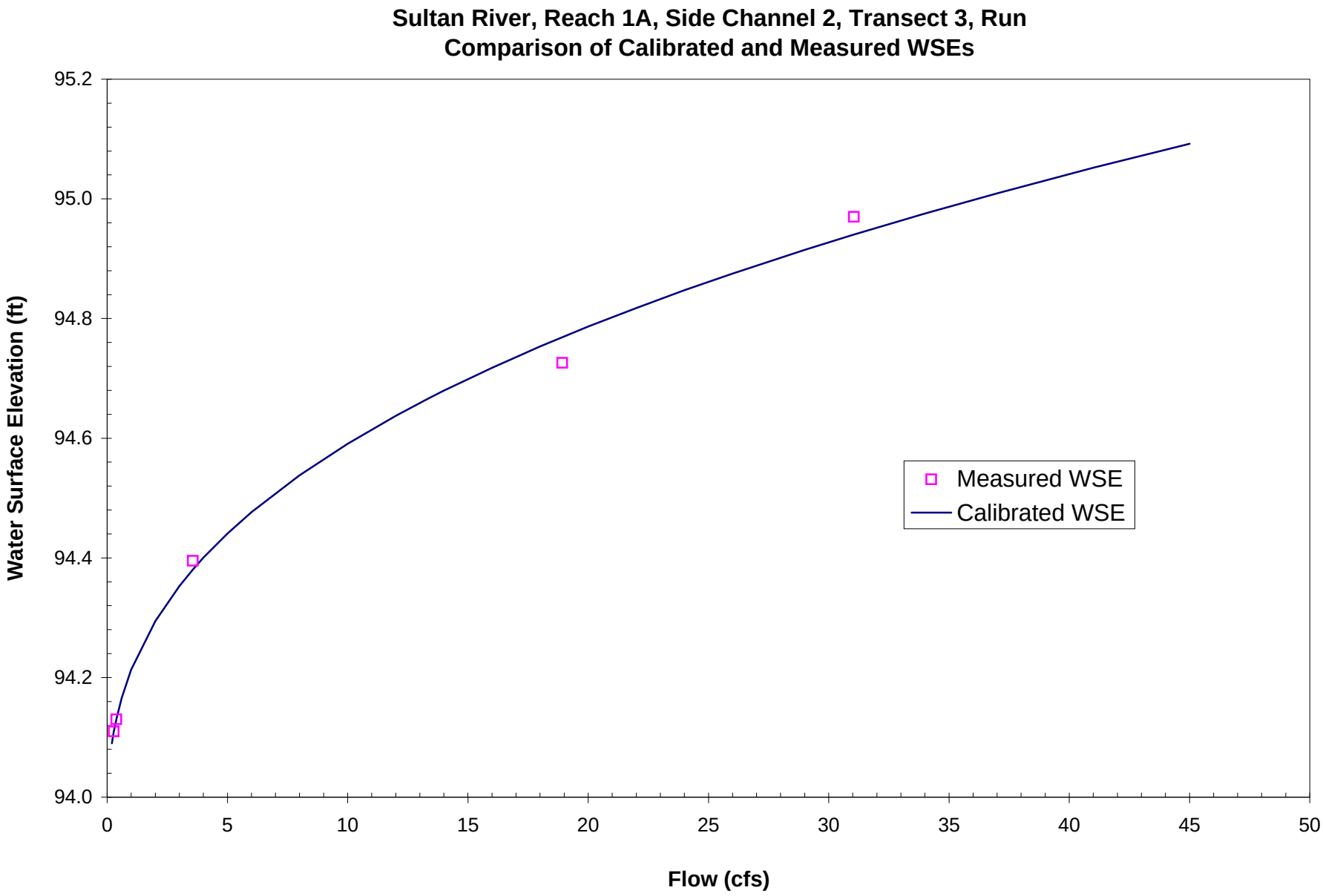











Sultan River, Reach 1A, Side Channel 2, Transect 3, Run
Comparison of Calibrated and Measured WSEs
Water Surface Elevation (ft)
95.2
95.0
94.8
94.6
94.4
94.2
94.0
0
5
10
15
20
25
30
35
40
45
50
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 2
Date: 7/18/2007 **Transect:** 2
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	3.21	103.21		100.00
RWP			4.42	98.79

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWE			103.21	8.29	0.00	94.92	94.93	3.36
RWE				8.28	0.00	94.93		
							Ave Q=	3.36

Note: Velocity measurements in meters/second

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA
Calib. # NA

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	2.94	102.94		100.00
RWP			4.14	98.80

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWE			102.94	8.17	0.00	94.77	94.80	0.42
RWE				8.12	0.00	94.82		
							Ave Q=	0.42

Note: Velocity measurements in meters/second

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA
Calib. # NA

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	3.06	103.06		100.00
RWP			4.26	98.80

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			103.06	8.31	0.00	94.75	94.78	0.45
RWS				8.26	0.00	94.80		
							Ave Q=	0.45

Note: Velocity measurements in meters/second

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA
Calib. # NA

Date: 8/21/2007
Habitat: Riffle **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	1.16	101.16		100.00
RWP			2.36	98.80

Comment: Photo #31 looking d/s, #32right to le

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			101.16	6.01	0.20	95.35	95.38	30.7
RWSE				6.10	0.35	95.41		
							Ave Q=	30.7

Note: Prop 7A Calibration =186

WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib. #

Date: 8/23/2007
Habitat: Riffle **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM1	1.38	101.38		100.00
RWP			2.58	98.80

Comment: Photo #98 right to left, #99 looking

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			101.38	6.22		95.16	95.17	21.7
1-R				6.21		95.17		
							Ave Q=	21.7

Note: Prop 5A Calibration =175

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	25		101.38	6.02	0.00	95.36
d/s	-30		101.38	6.33	0.00	95.05

WSE slope = 0.564%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 Note : use Counter 3602. See "data entry notes" for detalis.
Propeller ID: 5A
Calib. # 175

Stream: Sultan R.
Site: Reach 1A, Side Channel
Transect: 2
Habitat: Riffle

Survey	HI (ft)	Q (cfs)
7/17/2007	102.92	
7/18/2007	103.21	3.4
7/19/2007	102.94	0.42
7/20/2007	103.06	0.45
8/21/2007	101.16	30.7
8/23/2007	101.38	21.7

Bathymetry Survey

17-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2R-L}$	$V_{0.8R}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	5.39	97.53							23.6
	3.0	6.03	96.89							21.6
	5.0	6.77	96.15							16.8
	7.0	7.23	95.69							14.6
	9.0	7.63	95.29							14.9
	11.0	7.91	95.01							11.9
	12.5	8.23	94.69							11.9
	14.0	8.27	94.65							21.9
	15.5	8.18	94.74							23.6
	17.0	8.16	94.76							32.8
	18.5	8.12	94.80							34.6
	20.0	8.06	94.86							45.8
	21.5	8.22	94.70							43.7
	23.0	8.18	94.74							45.7
	24.5	8.24	94.68							54.6
	26.0	8.26	94.66							45.8
	27.5	8.20	94.72							45.6
	29.0	8.02	94.90							54.6
	30.5	8.10	94.82							46.6
	32.0	8.12	94.80							65.6
	33.5	8.15	94.77							45.7
	35.0	8.16	94.76							54.6
	36.5	8.18	94.74							54.6
	38.0	8.15	94.77							54.7
	39.5	8.06	94.86							54.8
	41.0	7.91	95.01							54.6
	43.0	7.12	95.80							51.6
	45.0	6.83	96.09							11.9
	47.0	6.72	96.20							11.9
	49.0	6.60	96.32							11.9
	51.0	6.47	96.45							11.9
	53.0	6.13	96.79							11.9
	55.0	5.90	97.02							11.9
	57.0	5.62	97.30							11.9
	59.0	5.29	97.63							11.9
	61.0	4.89	98.03							11.9
RWP	62.9	4.52	98.40							11.9

18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2R-L}$ (m/s)	$V_{0.2R-L}$	$V_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	12.2		94.93	0.00	0.00	0.00		0.00		0.00	11.9
	12.5		94.73	0.20	0.07	0.23		0.32	25	0.05	11.9
	14.0		94.63	0.30	0.13	0.43		0.53	20	0.22	21.9
	15.5		94.73	0.20	0.09	0.30		0.38	20	0.11	23.6
	17.0		94.73	0.20	0.08	0.26		0.35	70	0.04	32.8
	18.5		94.83	0.10	0.09	0.30		0.38	90	0.00	34.6
	20.0		94.83	0.10	0.10	0.33		0.42	90	0.00	45.8
	21.5		94.73	0.20	0.24	0.79		0.93	30	0.24	43.7
	23.0		94.73	0.20	0.11	0.36		0.46	20	0.13	45.7
	24.5		94.73	0.20	0.24	0.79		0.93	15	0.27	54.6
	26.0		94.73	0.20	0.33	1.08		1.26	15	0.36	45.8
	27.5		94.73	0.20	0.21	0.69		0.82	15	0.24	45.6
	29.0		94.88	0.05	0.25	0.82		0.96		0.07	54.6
	30.5		94.73	0.20	0.39	1.28		1.48		0.45	46.6
	32.0		94.73	0.20	0.30	0.98		1.15		0.34	65.6
	33.5		94.78	0.15	0.32	1.05		1.22		0.27	45.7
	35.0		94.73	0.20	0.23	0.75		0.89	10	0.26	54.6
	36.5		94.73	0.20	0.16	0.52		0.63		0.19	54.6
	38.0		94.83	0.10	0.18	0.59		0.70		0.11	54.7
	39.5		94.92	0.01	0.12	0.39		0.49		0.01	54.8
RWE	41.4		94.93	0.00	0.00	0.00		0.00		0.00	54.6

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2R-L}$ (m/s)	$V_{0.2R-L}$	$V_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	12.6		94.80	0.00	0.00	0.00		0.00		0.00	11.9
	14.0		94.70	0.10	0.05	0.16		0.24	45	0.04	21.9
	15.5		94.80	0.00	0.00	0.00		0.00		0.00	23.6
	17.0		94.79	0.01	0.00	0.00		0.00		0.00	32.8
	18.5		94.80	0.00	0.00	0.00		0.00		0.00	34.6
	20.0		94.79	0.01	0.05	0.16		0.24	90	0.00	45.8
	21.5		94.75	0.05	0.02	0.07		0.10		0.01	43.7
	23.0		94.70	0.10	0.03	0.10		0.15	35	0.02	45.7
	24.5		94.70	0.10	0.11	0.36		0.46	30	0.06	54.6
	26.0		94.70	0.10	0.17	0.56		0.67	30	0.09	45.8
	27.5		94.70	0.10	0.22	0.72		0.85	30	0.11	45.6
	29.0		94.90	-0.10	0.00	0.00		0.00		0.00	54.6
	30.5		94.70	0.10	0.12	0.39		0.49		0.07	46.6
	32.0		94.70	0.10	0.02	0.07		0.10		0.02	65.6
	33.5		94.78	0.02	0.03	0.10		0.15		0.00	45.7
	35.0		94.77	0.03	0.01	0.03		0.05		0.00	54.6
	36.5		94.75	0.05	0.02	0.07		0.10	25	0.01	54.6
	38.0		94.79	0.01	0.00	0.00		0.00		0.00	54.7
RWE	39.6		94.80	0.00	0.00	0.00		0.00		0.00	54.8

20-Jul-07

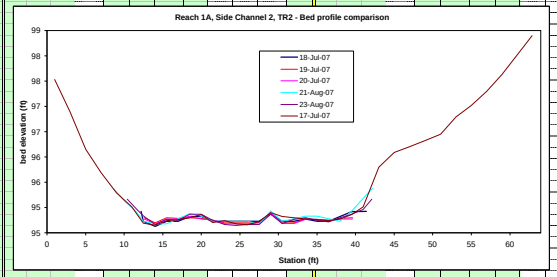
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2R-L}$ (m/s)	$V_{0.2R-L}$	$V_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	12.6		94.78	0.00	0.00	0.00		0.00		0.00	11.9
	14.0		94.68	0.10	0.02	0.07		0.10	30	0.01	21.9
	15.5		94.78	0.00	0.00	0.00		0.00		0.00	23.6
	17.0		94.78	0.00	0.00	0.00		0.00		0.00	32.8
	18.5		94.83	-0.05	0.00	0.00		0.00		0.00	34.6
	20.0		94.78	0.00	0.00	0.00		0.00		0.00	45.8
	21.5		94.76	0.02	0.05	0.16		0.24		0.01	43.7
	23.0		94.68	0.10	0.08	0.26		0.35	30	0.05	45.7
	24.5		94.68	0.10	0.13	0.43		0.53	30	0.07	54.6
	26.0		94.68	0.10	0.16	0.52		0.63	20	0.09	45.8
	27.5		94.70	0.08	0.08	0.26		0.35	20	0.04	45.6
	29.0		94.90	-0.12	0.00	0.00		0.00		0.00	54.6
	30.5		94.69	0.09	0.10	0.33		0.42		0.06	46.6
	32.0		94.69	0.09	0.19	0.62		0.74		0.10	65.6
	33.5		94.77	0.01	0.05	0.16		0.24		0.00	45.7
	35.0		94.77	0.01	0.11	0.36		0.46		0.01	54.6
	36.5		94.75	0.03	0.11	0.36		0.46		0.02	54.6
	38.0		94.78	0.00	0.00	0.00		0.00		0.00	54.7
RWE	39.6		94.78	0.00	0.00	0.00		0.00		0.00	54.8

21-Aug-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2R-L}$	$V_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	8.6		95.38	0.00	0.00		0.00		0.00	14.9
	10.0		95.13	0.25	0.10		0.25	20	0.09	14.9
	11.5		94.93	0.45	0.10		0.25		0.14	11.9
	12.5		94.73	0.65	0.19		0.26		0.21	11.9
	14.0		94.68	0.70	0.63		0.68		0.72	21.9
	15.5		94.68	0.70	0.98		1.03		1.08	23.6
	17.0		94.78	0.60	0.94		0.99		0.89	32.8
	18.5		94.88	0.50	1.17		1.22		0.92	34.6
	20.0		94.83	0.55	1.45		1.51		1.25	45.8
	21.5		94.73	0.65	1.38		1.44		1.40	43.7
	23.0		94.73	0.65	1.25		1.31		1.27	45.7
	24.5		94.73	0.65	1.90		1.97		1.92	54.6
	26.0		94.73	0.65	2.14		2.21		2.15	45.8
	27.5		94.68	0.70	2.08		2.15		2.25	45.6
	29.0		94.93	0.45	2.55		2.61		1.76	54.6
	30.5		94.73	0.65	2.91		2.96		2.89	46.6
	32.0		94.78	0.60	2.39		2.45		2.21	65.6
	33.5		94.83	0.55	2.69		2.75		2.27	45.7
	35.0		94.83	0.55	1.98		2.05		1.69	54.6
	36.5		94.78	0.60	2.17		2.24		2.01	54.6
	38.0		94.73	0.65	2.21		2.28		2.22	54.7
	39.5		94.93	0.45	1.36		1.42		1.34	54.8
RWE	42.2		95.38	0.00	0.00		0.00		0.00	54.6

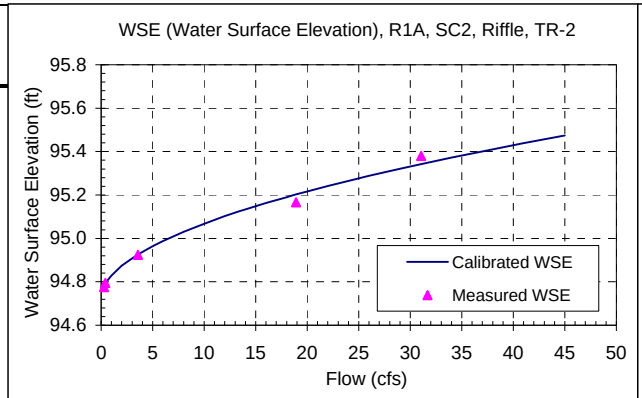
23-Aug-07

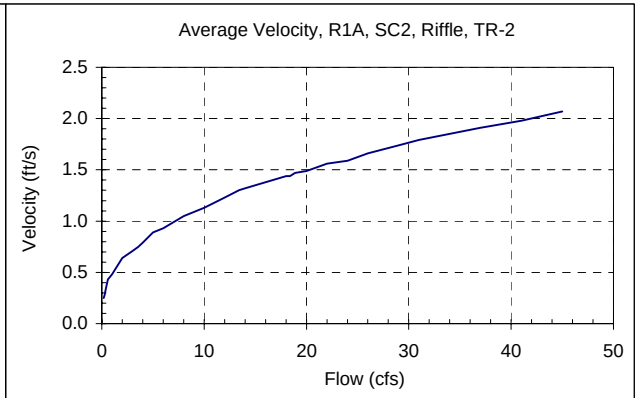
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2R-L}$	$V_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	10.4		95.17	0.00	0.00		0.00		0.00	11.9
	11.5		94.99	0.18	0.46		0.54		0.10	11.9
	12.5		94.84	0.33	0.38		0.47		0.19	11.9
	14.0		94.67	0.50	0.75		0.81	30	0.52	21.9
	15.5		94.77	0.40	0.66		0.73	20	0.41	23.6
	17.0		94.75	0.42	0.74		0.80	10	0.50	32.8
	18.5		94.87	0.30	1.19		1.24		0.56	34.6
	20.0		94.87	0.30	1.53		1.59		0.72	45.8
	21.5		94.75	0.42	1.61		1.67		1.05	43.7
	23.0		94.67	0.50	1.61		1.67		1.26	45.7
	24.5		94.65	0.52	2.37		2.43		1.89	54.6
	26.0		94.67	0.50	2.23		2.29		1.72	45.8
	27.5		94.67	0.50	2.04		2.10		1.58	45.6
	29.0		94.87	0.30	2.42		2.48		1.11	54.6
	30.5		94.69	0.48	2.63		2.68		1.93	46.6
	32.0		94.77	0.40	3.11		3.14		1.89	65.6
	33.5		94.80	0.37	3.02		3.06		1.70	45.7
	35.0		94.75	0.42	2.19		2.25		1.42	54.6
	36.5		94.72	0.45	1.50		1.56		1.05	54.6
	38.0		94.80	0.37	2.10		2.16		1.20	54.7
	39.5		94.87	0.30	1.33		1.39		0.62	54.8
	41.0		94.97	0.20	1.07		1.12		0.29	54.6
RWE	42.1		95.17	0.00	0.00		0.00		0.00	51.6

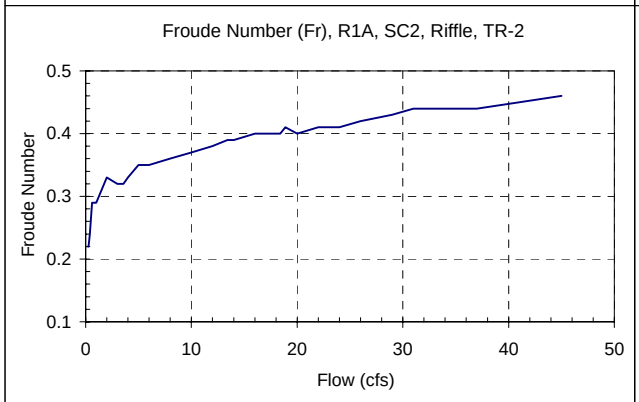


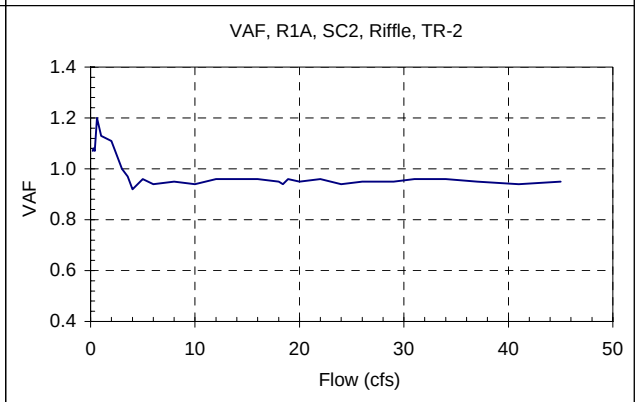
Stream: Sultan R.
Site: Reach 1A, Side Channel 2
Habitat: Riffle
Transect: 2

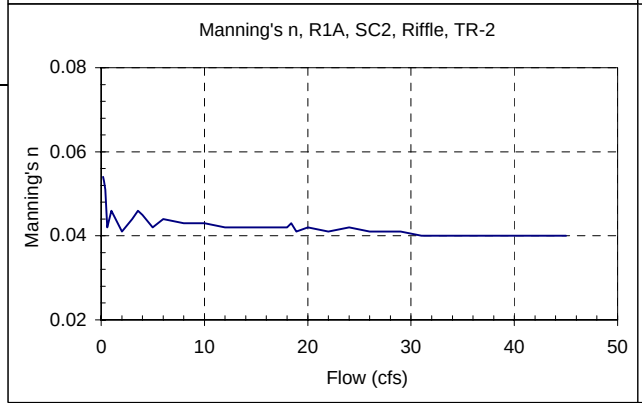
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.2	94.77	0.22	0.25	1.07	0.054	18.7
0.28	94.78	0.22	0.28	1.08	0.053	20.0
0.39	94.79	0.24	0.33	1.07	0.051	20.7
0.6	94.80	0.29	0.43	1.20	0.042	21.4
1	94.83	0.29	0.48	1.13	0.046	23.5
2	94.87	0.33	0.64	1.11	0.041	26.7
3	94.91	0.32	0.71	1.00	0.044	27.8
3.56	94.93	0.32	0.75	0.97	0.046	28.1
4	94.94	0.33	0.79	0.92	0.045	28.3
5	94.96	0.35	0.89	0.96	0.042	28.5
6	94.99	0.35	0.93	0.94	0.044	28.9
8	95.03	0.36	1.05	0.95	0.043	29.5
10	95.07	0.37	1.13	0.94	0.043	30.0
12	95.10	0.38	1.23	0.96	0.042	30.4
13.4	95.12	0.39	1.30	0.96	0.042	30.7
14	95.13	0.39	1.32	0.96	0.042	30.8
16	95.16	0.40	1.38	0.96	0.042	31.2
18	95.19	0.40	1.44	0.95	0.042	31.5
18.4	95.20	0.40	1.44	0.94	0.043	31.6
18.9	95.20	0.41	1.47	0.96	0.041	31.6
20	95.22	0.40	1.49	0.95	0.042	31.9
22	95.24	0.41	1.56	0.96	0.041	32.1
24	95.27	0.41	1.59	0.94	0.042	32.4
26	95.29	0.42	1.66	0.95	0.041	32.7
29	95.32	0.43	1.74	0.95	0.041	33.0
31	95.34	0.44	1.79	0.96	0.040	33.3
34	95.37	0.44	1.85	0.96	0.040	33.6
37	95.40	0.44	1.91	0.95	0.040	33.9
41	95.44	0.45	1.98	0.94	0.040	34.2
45.0	95.47	0.46	2.07	0.95	0.040	34.4

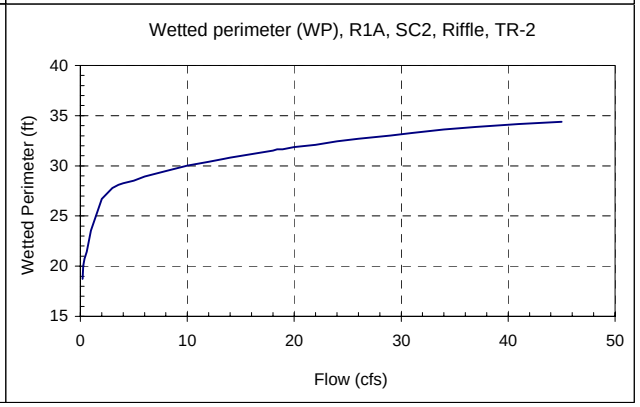


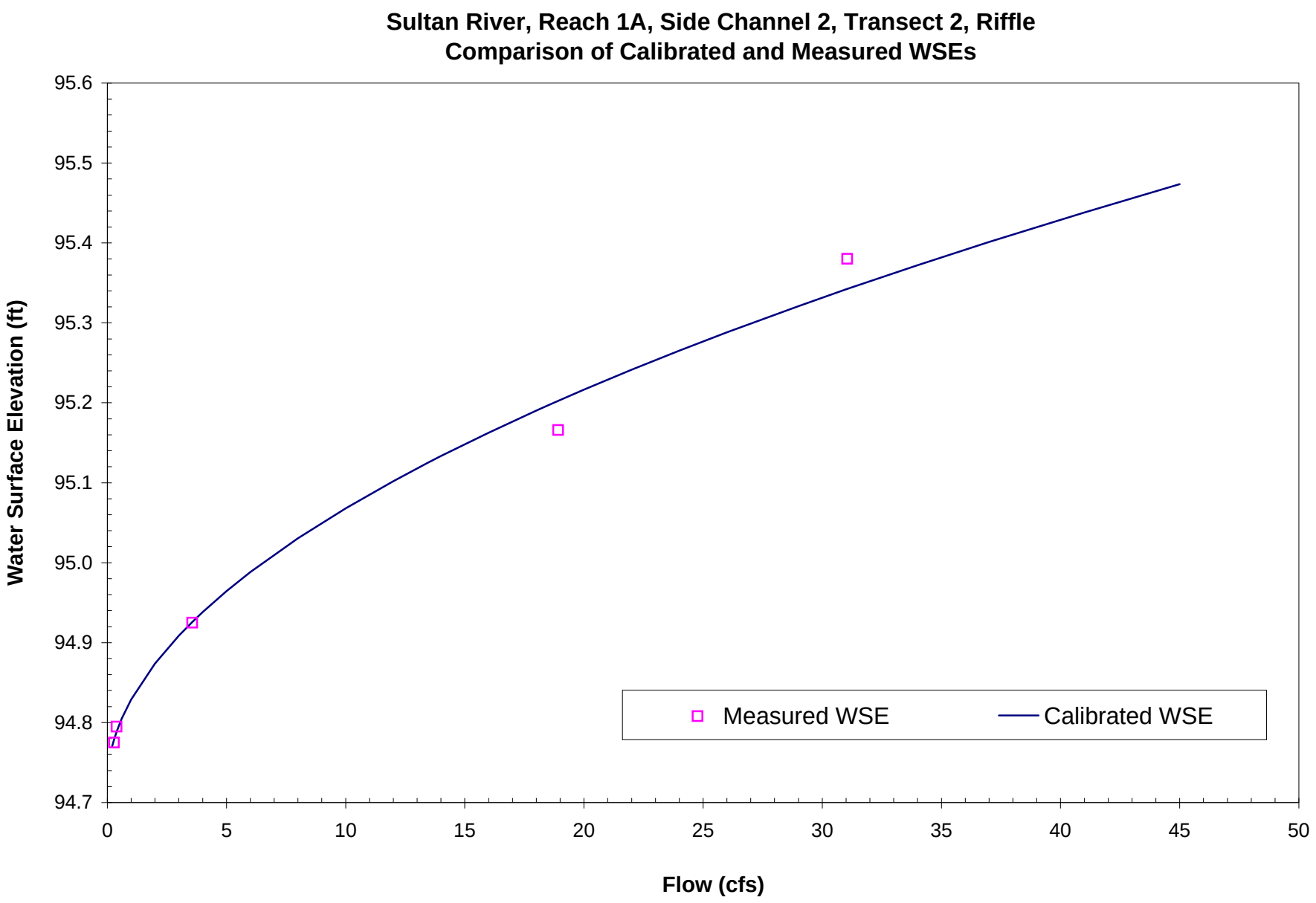











Sultan River, Reach 1A, Side Channel 2, Transect 2, Riffle
Comparison of Calibrated and Measured WSEs
Water Surface Elevation (ft)
95.6
95.5
95.4
95.3
95.2
95.1
95.0
94.9
94.8
94.7
0
5
10
15
20
25
30
35
40
45
50
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 2

Date: 7/18/2007 **Transect:** 1
Habitat: Run **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.71	102.71		100.00
RWP			2.05	100.66

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWE			102.71	8.50	0.00	94.21	94.21	3.8
RWE				8.50	0.00	94.21		
							Ave Q=	3.8

Note: Staff guage = 5-5/8" @ 1:30 pm
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib. # 186

Date: 7/19/2007
Habitat: Run **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.55	102.55		100.00
RWP			1.89	100.66

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWE			102.55	8.53	0.00	94.02	94.03	0.23
RWE				8.51	0.00	94.04		
							Ave Q=	0.23

Note: All velocity measurements in meters/second
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA
Calib. # NA

Date: 7/20/2007
Habitat: Run **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.84	102.84		100.00
RWP			2.18	100.66

Comment:

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			102.84	8.82	0.00	94.02	94.02	-0.2
RWS				8.83	0.00	94.01		
							Ave Q=	-0.2

Note: All velocity measurements in meters/second
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA
Calib. # NA

Date: 8/21/2007
Habitat: Run **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.09	103.09		100.00
RWP			2.44	100.65

Comment: Photo #34 looking d/s, #35 right to

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWSE			103.09	9.25	0.89	94.73	94.72	31.4
RWSE				9.32	0.94	94.71		
							Ave Q=	31.4

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib. # 186

Date: 8/24/2007
Habitat: Run **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.01	103.01		100.00
RWP			2.35	100.66

Comment: Photo #102 looking right to left, #10

(2) Water Surface Elevation (WSE) Survey

Location	TR Station Sta (ft)	TR Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
LWS			103.01	9.19	0.69	94.51	94.51	18.4
RWS				8.51		94.50		
							Ave Q=	18.4

Note:

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	25		103.01	8.17	0.00	94.84
d/s	-25		103.01	8.47	0.00	94.54

WSE slope = 0.600%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 Note : use Counter 3602. See "data entry notes" for detalis.
Propeller ID: 5A
Calib. # 175

Stream: Sultan R.
Site: Reach 1A, Side Channel
Transect: 1
Habitat: Run

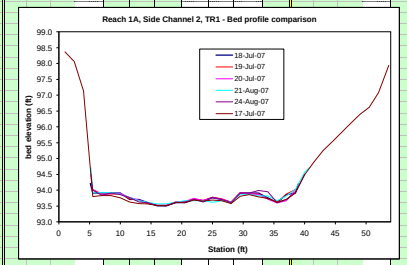
Survey Date	H1 (ft)	Q (cfs)
7/17/2007	102.64	
7/18/2007	102.71	3.77
7/19/2007	102.55	0.23
7/20/2007	102.84	-0.22
8/21/2007	103.09	31.4
8/24/2007	103.01	18.4

17-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	4.28	98.36							22.9
	2.5	4.58	98.06							22.9
	4.0	5.51	97.13							22.9
	5.5	8.84	93.80							43.6
	7.0	8.81	93.83							54.7
	8.5	8.81	93.83							56.6
	10.0	8.88	93.76							54.7
	11.5	9.01	93.63							54.7
	13.0	9.06	93.58							54.7
	14.5	9.07	93.57							54.8
	16.0	9.12	93.52							52.7
	17.5	9.13	93.51							54.7
	19.0	9.02	93.62							45.6
	20.5	9.03	93.61							54.7
	22.0	8.95	93.69							54.7
	23.5	8.98	93.66							54.7
	25.0	8.95	93.69							45.6
	26.5	8.97	93.67							45.7
	28.0	9.06	93.58							45.7
	29.5	8.83	93.81							58.6
	31.0	8.78	93.86							45.7
	32.5	8.85	93.79							54.6
	34.0	8.90	93.74							45.7
	35.5	9.02	93.62							48.6
	37.0	8.93	93.71							72.6
	38.5	8.72	93.92							72.7
	40.0	8.16	94.48							11.9
	41.5	7.75	94.89							11.9
	43.0	7.39	95.25							11.9
	44.5	7.10	95.54							11.9
	46.0	6.82	95.82							11.9
	47.5	6.53	96.11							11.9
	49.0	6.25	96.39							11.9
	50.5	6.02	96.62							11.9
	52.0	5.56	97.08							11.9
RWP	53.7	4.70	97.94							11.9

18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	subs.
LWE	5.1		94.21	0.00	0.00		0.00		0.00	43.6
	5.5		93.91	0.30	0.00		0.00		0.00	43.6
	7.0		93.91	0.30	0.00		0.00		0.00	54.7
	8.5		93.91	0.30	0.00		0.00		0.00	56.6
	10.0		93.91	0.30	0.10		0.25		0.11	54.7
	11.5		93.71	0.50	0.10		0.25		0.19	54.7
	13.0		93.71	0.50	0.00		0.00		0.00	54.7
	14.5		93.61	0.60	0.10		0.25		0.23	54.8
	16.0		93.51	0.70	0.16		0.22		0.23	52.7
	17.5		93.51	0.70	0.18		0.24		0.26	54.7
	19.0		93.61	0.60	0.24		0.30		0.27	45.6
	20.5		93.61	0.60	0.26		0.32		0.29	54.7
	22.0		93.71	0.50	0.34		0.40		0.30	54.7
	23.5		93.66	0.55	0.34		0.40	10	0.33	54.7
	25.0		93.76	0.45	0.15		0.22	5	0.15	45.6
	26.5		93.71	0.50	0.24		0.30		0.23	45.7
	28.0		93.61	0.60	0.02		0.08		0.07	45.7
	29.5		93.91	0.30	0.36		0.42		0.19	58.6
	31.0		93.91	0.30	0.40		0.46		0.21	45.7
	32.5		93.91	0.30	0.37		0.43		0.20	54.6
	34.0		93.76	0.45	0.30		0.36		0.24	45.7
	35.5		93.61	0.60	0.18		0.24		0.22	48.6
	37.0		93.86	0.35	0.02		0.08		0.04	72.6
	38.5		93.91	0.30	0.00		0.00		0.00	72.7
RWE	39.0		94.21	0.00	0.00		0.00		0.00	11.9



19-Jul-07

(m/s)

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	subs.
LWE	5.3		94.03	0.00	0.00	0.00		0.00	0.00	43.6
	5.5		94.02	0.01	0.00	0.00		0.00	0.00	43.6
	7.0		93.88	0.15	-0.01	-0.03		-0.06	-0.01	54.7
	8.5		93.88	0.15	-0.03	-0.10		-0.17	-0.04	56.6
	10.0		93.88	0.15	-0.03	-0.10		-0.17	-0.04	54.7
	11.5		93.73	0.30	-0.03	-0.10		-0.17	-0.07	54.7
	13.0		93.68	0.35	0.00	0.00		0.00	0.00	54.7
	14.5		93.58	0.45	0.00	0.00		0.00	0.00	54.8
	16.0		93.53	0.50	0.00	0.00		0.00	0.00	52.7
	17.5		93.53	0.50	0.00	0.00		0.00	0.00	54.7
	19.0		93.63	0.40	0.00	0.00		0.00	0.00	45.6
	20.5		93.63	0.40	0.00	0.00		0.00	0.00	54.7
	22.0		93.73	0.30	0.01	0.03		0.06	0.02	54.7
	23.5		93.68	0.35	0.02	0.07		0.11	0.06	54.7
	25.0		93.78	0.25	0.01	0.03		0.06	0.02	45.6
	26.5		93.73	0.30	0.02	0.07		0.11	0.05	45.7
	28.0		93.63	0.40	-0.02	-0.07		-0.11	-0.07	45.7
	29.5		93.93	0.10	-0.02	-0.07		-0.11	-0.02	58.6
	31.0		93.88	0.15	0.00	0.00		0.00	0.00	45.7
	32.5		93.88	0.15	-0.01	-0.03		-0.06	-0.01	54.6
	34.0		93.73	0.30	0.01	0.03		0.06	0.02	45.7
	35.5		93.63	0.40	0.00	0.00		0.00	0.00	48.6
	37.0		93.88	0.15	-0.02	-0.07		-0.11	0.31	72.6
RWE	38.6		94.03	0.00	0.00	0.00		0.00	0.00	72.7

20-Jul-07

(m/s)

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	subs.
LWE	5.5		94.02	0.00	0.00	0.00		0.00		0.00	43.6
	7.0		93.87	0.15	-0.02	-0.07		-0.11		-0.02	54.7
	8.5		93.89	0.13	0.00	0.00		0.00		0.00	56.6
	10.0		93.90	0.12	-0.05	-0.16		-0.27		-0.05	54.7
	11.5		93.77	0.25	-0.03	-0.10		-0.17		-0.06	54.7
	13.0		93.69	0.33	0.00	0.00		0.00		0.00	54.7
	14.5		93.60	0.42	0.00	0.00		0.00		0.00	54.8
	16.0		93.53	0.49	0.01	0.03		0.06		0.04	52.7
	17.5		93.53	0.49	0.00	0.00		0.00		0.00	54.7
	19.0		93.63	0.39	0.00	0.00		0.00		0.00	45.6
	20.5		93.65	0.37	-0.01	-0.03		-0.06		-0.03	54.7
	22.0		93.74	0.28	0.00	0.00		0.00		0.00	54.7
	23.5		93.68	0.34	0.00	0.00		0.00		0.00	54.7
	25.0		93.77	0.25	0.01	0.03		0.06		0.02	45.6
	26.5		93.72	0.30	0.01	0.03		0.06		0.02	45.7
	28.0		93.62	0.40	-0.01	-0.03		-0.06		-0.03	45.7
	29.5		93.92	0.10	-0.03	-0.10		-0.17		-0.02	58.6
	31.0		93.89	0.13	-0.02	-0.07		-0.11		-0.02	45.7
	32.5		93.87	0.15	0.00	0.00		0.00		0.00	54.6
	34.0		93.72	0.30	0.00	0.00		0.00		0.00	45.7
	35.5		93.60	0.42	-0.01	-0.03		-0.06		-0.03	48.6
	37.0		93.67	0.35	-0.01	-0.03		-0.06		-0.03	72.6
RWE	38.5		94.02	0.00	0.00	0.00		0.00		0.00	72.7

21-Aug-07

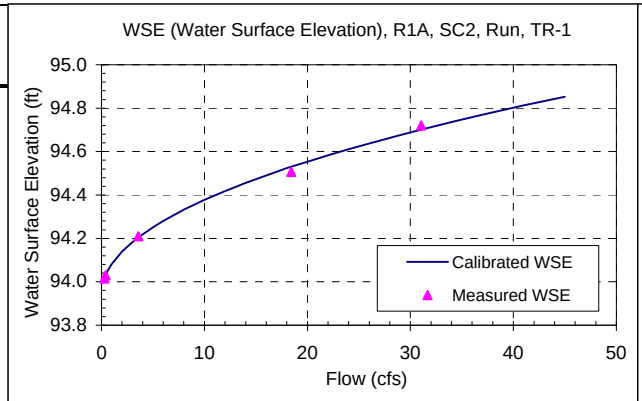
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	subs.
LWE	5.2		94.72	0.00	0.00		0.00		0.00	43.6
	5.5		93.92	0.80	0.01		0.04		0.03	43.6
	7.0		93.92	0.80	0.19		0.26		0.31	54.7
	8.5		93.92	0.80	0.14		0.22		0.27	56.6
	10.0		93.87	0.85	0.63		0.68		0.87	54.7
	11.5		93.77	0.95	0.82		0.87		1.24	54.7
	13.0		93.67	1.05	0.80		0.85		1.34	54.7
	14.5		93.62	1.10	0.74		0.79		1.30	54.8
	16.0		93.57	1.15	0.68		0.73		1.26	52.7
	17.5		93.57	1.15	0.75		0.80		1.38	54.7
	19.0		93.62	1.10	0.87		0.92		1.52	45.6
	20.5		93.67	1.05	0.93		0.98		1.54	54.7
	22.0		93.67	1.05	1.13		1.18		1.86	54.7
	23.5		93.67	1.05	1.25		1.31		2.06	54.7
	25.0		93.62	1.10	1.45		1.51		2.49	45.6
	26.5		93.67	1.05	1.74		1.80		2.84	45.7
	28.0		93.62	1.10	1.12		1.17		1.94	45.7
	29.5		93.87	0.85	1.32		1.38		1.76	58.6
	31.0		93.87	0.85	1.55		1.61		2.06	45.7
	32.5		93.82	0.90	1.40		1.46		1.97	54.6
	34.0		93.82	0.90	1.21		1.27		1.71	45.7
	35.5		93.67	1.05	0.67		0.72		1.14	48.6
	37.0		93.82	0.90	0.18		0.24		0.33	72.6
	38.5		94.02	0.70	0.05		0.19		0.20	72.7
	40.0		94.57	0.15	0.00		0.00		0.00	11.9
RWE	40.8		94.72	0.00	0.00		0.00		0.00	11.9

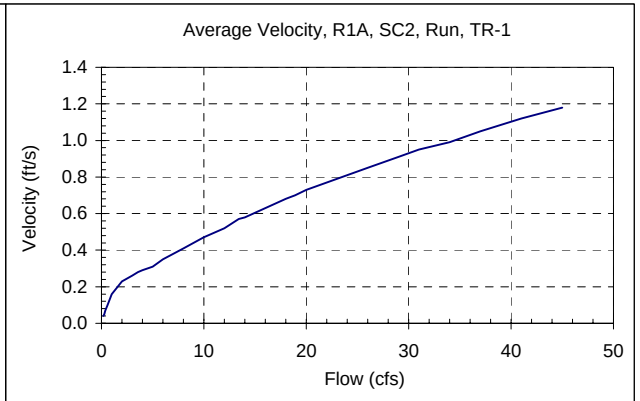
24-Aug-07

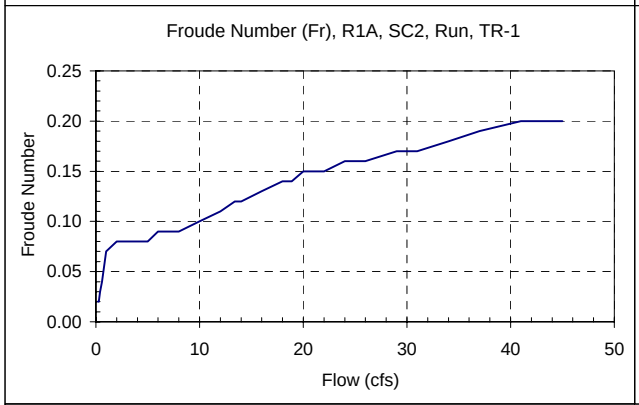
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	Vel (ft/s) $V_{0.8}$	Vel (ft/s) Ave	Angle (deg)	q (cfs)	subs.
LWE	5.2		94.51	0.00	0.00		0.00		0.00	43.6
	5.5		94.01	0.50	0.05		0.11		0.05	43.6
	7.0		93.84	0.67	0.11		0.20		0.20	54.7
	8.5		93.91	0.60	0.32		0.40		0.36	56.6
	10.0		93.86	0.65	0.45		0.53		0.52	54.7
	11.5		93.77	0.74	0.59		0.66		0.74	54.7
	13.0		93.63	0.88	0.48		0.56		0.74	54.7
	14.5		93.61	0.90	0.66		0.73		0.98	54.8
	16.0		93.52	0.99	0.60		0.67		1.00	52.7
	17.5		93.52	0.99	0.70		0.76		1.13	54.7
	19.0		93.61	0.90	0.81		0.86		1.17	45.6
	20.5		93.63	0.88	0.81		0.86		1.14	54.7
	22.0		93.71	0.80	0.99		1.04		1.25	54.7
	23.5		93.63	0.88	0.98		1.03		1.36	54.7
	25.0		93.78	0.73	1.22		1.28		1.40	45.6
	26.5		93.71	0.80	1.07		1.12		1.35	45.7
	28.0		93.61	0.90	0.76		0.82		1.10	45.7
	29.5		93.91	0.60	0.95		1.00		0.90	58.6
	31.0		93.91	0.60	0.93		0.98		0.88	45.7
	32.5		93.99	0.52	0.81		0.86		0.67	54.6
	34.0		93.95	0.56	0.57		0.65		0.54	45.7
	35.5		93.61	0.90	0.43		0.51		0.69	48.6
	37.0		93.71	0.80	0.05		0.11		0.14	72.6
	38.5		93.91	0.60	0.05		0.11		0.10	72.7
RWE	40.0		94.51	0.00	0.00		0.00		0.00	11.9

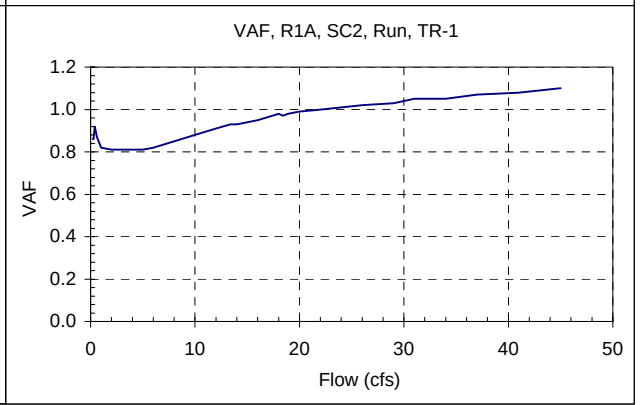
Stream: Sultan R.
Site: Reach 1A, Side Channel 2
Habitat: Run
Transect: 1

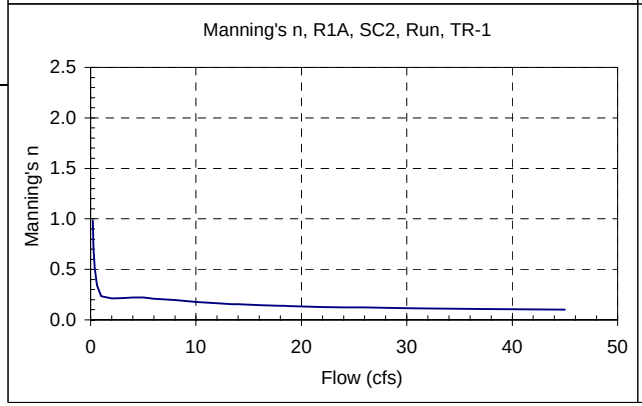
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.2	94.00	0.02	0.04	0.86	0.983	33.1
0.28	94.02	0.02	0.05	0.86	0.705	33.1
0.39	94.03	0.03	0.07	0.92	0.510	33.1
0.6	94.05	0.04	0.10	0.87	0.341	33.1
1	94.08	0.07	0.16	0.82	0.235	33.2
2	94.14	0.08	0.23	0.81	0.211	33.5
3	94.18	0.08	0.26	0.81	0.217	33.9
3.56	94.20	0.08	0.28	0.81	0.219	34.1
4	94.22	0.08	0.29	0.81	0.221	34.2
5	94.25	0.08	0.31	0.81	0.221	34.5
6	94.28	0.09	0.35	0.82	0.210	34.6
8	94.33	0.09	0.41	0.85	0.195	34.9
10	94.38	0.10	0.47	0.88	0.179	35.1
12	94.42	0.11	0.52	0.91	0.165	35.3
13.4	94.44	0.12	0.57	0.93	0.155	35.3
14	94.46	0.12	0.58	0.93	0.156	35.4
16	94.49	0.13	0.63	0.95	0.146	35.5
18	94.52	0.14	0.68	0.98	0.138	35.7
18.4	94.53	0.14	0.69	0.97	0.138	35.7
18.9	94.54	0.14	0.70	0.98	0.137	35.8
20	94.55	0.15	0.73	0.99	0.133	35.8
22	94.58	0.15	0.77	1.00	0.128	35.9
24	94.61	0.16	0.81	1.01	0.124	36.1
26	94.64	0.16	0.85	1.02	0.122	36.2
29	94.68	0.17	0.91	1.03	0.117	36.4
31	94.70	0.17	0.95	1.05	0.114	36.5
34	94.74	0.18	0.99	1.05	0.111	36.7
37	94.77	0.19	1.05	1.07	0.107	36.9
41	94.81	0.20	1.12	1.08	0.103	37.1
45.0	94.85	0.2	1.18	1.10	0.100	37.3

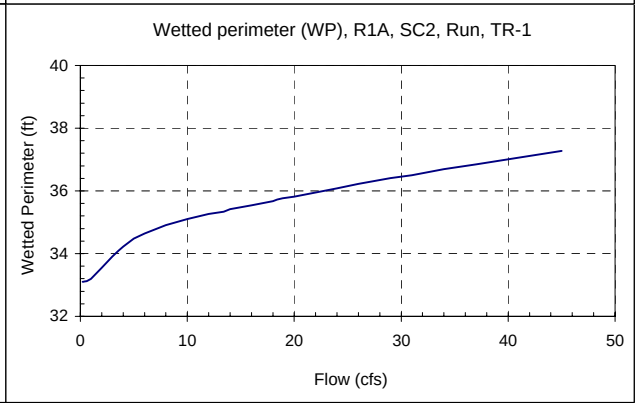


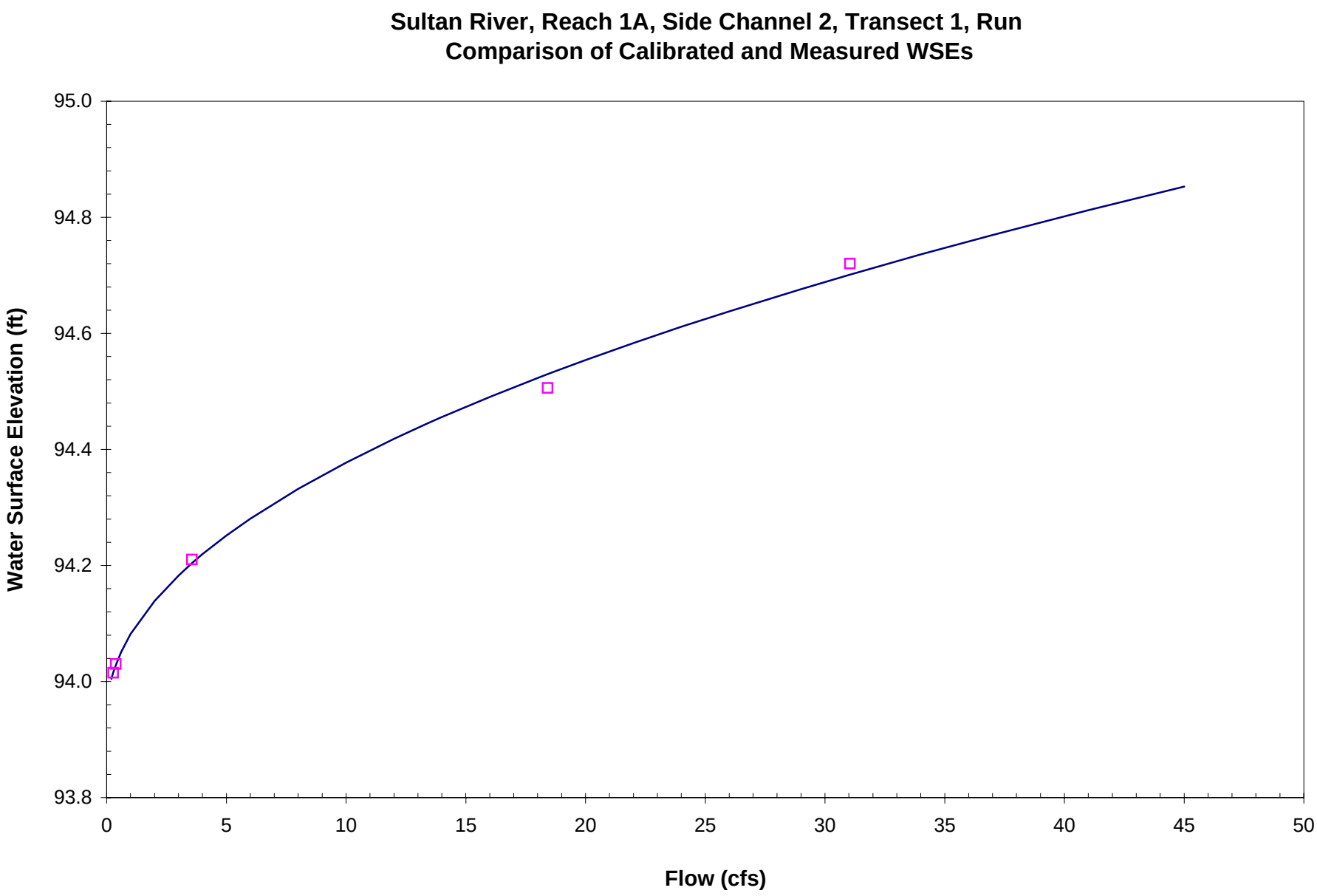











Sultan River, Reach 1A, Side Channel 2, Transect 1, Run
Comparison of Calibrated and Measured WSEs
Water Surface Elevation (ft)
95.0
94.8
94.6
94.4
94.2
94.0
93.8
0
5
10
15
20
25
30
35
40
45
50
Flow (cfs)

Stream: Sultan R.
Site: Reach 1A, Side Channel 1

Date: 7/17/2007 **Transect:** 6
Habitat: Riffle **Flow:** Bank Profile

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.44	102.44		100.00
RWP			2.95	99.49
BM				

Comment: Staff guage = 5.625 inches @ 900 a

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L						0.00	0.00	
6-R						0.00		

Ave Q=

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 7/18/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.76	102.76		100.00
RWP			3.26	99.50
BM				

Comment: Staff guage = 5.625 inches @ 900 am

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			102.76	7.40	0.00	95.36	95.42	1.0
6-R				7.28	0.00	95.48		

Ave Q= 1.0

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: NA ---????

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.63	102.63		100.00
RWP			3.13	99.50
BM				

Comment: Staff guage = 3.625 inches @ 830 am

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
Hydraulic Control	u/s from hydr. control		102.63	7.42		95.21	95.21	

Ave Q=

Note: No flow at entrance to side channel. A small tributary to side chann
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.44	100.44		100.00
RWP			0.94	99.50
BM				

Comment: Staff guage = 2.750 inches @ 830 am

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
			100.44	5.46		94.98	94.98	

Ave Q=

Note: No flow into side channel from mainstem. Some flow in tributary to
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA
Calib #: NA

Date: 8/21/2007
Habitat: Riffle **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM3	2.93	102.93		100.00
BM4			3.42	99.51
BM				

Comment: Photo #37 looking d/s, #38 right to left, #39 looking u/s (note Paul labeled the picture groups incorrectly in the field notebook). 1/2

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			102.93	7.23	0.30	96.00	96.00	9.1
6-R				7.47	0.54	96.00		

Ave Q= 9.1

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: 186

Date: 8/24/2007
Habitat: Riffle **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.97	103.97		100.00
RWP			4.47	99.50
BM				

Comment: Photo #125 looking looking right to left, #126 looking u/s, #127 looking d/s, #128 looking left to right. 1/2 level loop.

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
6-L			103.97	8.09	0.00	95.88	95.88	1.8
6-R				8.09	0.00	95.88		

Ave Q= 1.8

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	16		103.97	9.22	1.14	95.89
d/s	-20		103.97	9.01	0.92	95.88

Note:
WSE slope = 0.028%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4B
Calib #: 0125

Stream: Sultan R.
Site: Reach 1A, Side
Transect: 6
Habitat: Riffle

Survey Date	HI (ft)	Q (cfs)
7/17/2007	102.44	
7/18/2007	102.76	1.0
7/19/2007	102.63	
7/20/2007	100.44	
8/21/2007	102.93	9.1
8/24/2007	103.97	1.8

17-Jul-07

Chann	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.8}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	2.60	99.84									11.9
	2.0	2.65	99.79									11.9
	3.0	3.05	99.39									11.9
	4.0	3.61	98.83									11.9
	5.0	4.17	98.27									11.9
	6.0	4.75	97.69									11.9
	7.0	5.67	96.77									11.9
	8.0	6.05	96.39									22.9
	9.0	6.42	96.02									22.9
	10.0	6.64	95.80									22.9
	11.0	6.80	95.64									24.7
	12.0	7.00	95.44									42.6
	13.0	7.07	95.37									43.5
	14.0	7.10	95.34									54.6
	15.0	7.11	95.33									43.7
	16.0	7.21	95.23									43.7
	17.0	7.19	95.25									54.6
	18.0	6.97	95.47									86.6
	19.0	7.16	95.28									68.7
	20.0	7.08	95.36									45.7
	21.0	7.05	95.39									45.7
	22.0	6.91	95.53									54.6
	23.0	6.95	95.49									43.6
	24.0	6.91	95.53									43.6
	25.0	7.04	95.40									45.8
	26.0	6.72	95.72									24.9
	27.0	5.55	96.89									18.9
	28.0	5.13	97.31									11.9
	29.0	4.73	97.71									11.9
	30.0	4.33	98.11									11.9
	31.0	3.95	98.49									11.9
RWP	31.6	3.85	98.59									11.9

18-Jul-07

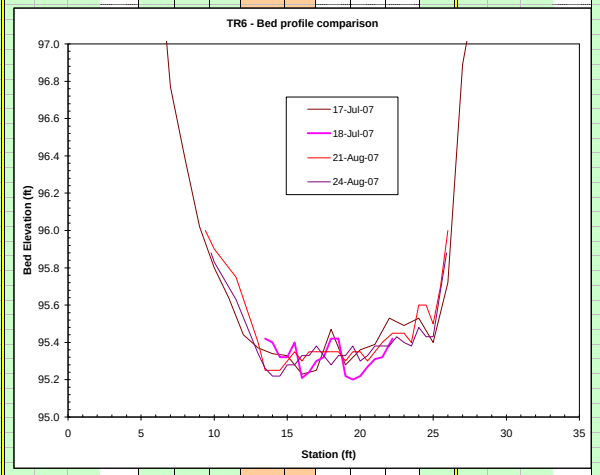
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.8}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	13.5		95.42	0.00	0.00		0.00		0.00		0.00	43.5
	14.0		95.40	0.02	0.20		0.27		0.27		0.00	54.6
	14.5		95.32	0.10	0.01		0.04		0.04	5	0.00	43.7
	15.0		95.32	0.10	0.77		0.82		0.82	5	0.04	43.7
	15.5		95.40	0.02	0.30		0.36		0.36		0.00	43.7
	16.0		95.21	0.21	1.89		1.96		1.96	5	0.20	43.7
	16.5		95.24	0.18	1.81		1.88		1.88	5	0.17	54.6
	17.0		95.30	0.12	2.16		2.23		2.23	25	0.12	54.6
	17.5		95.32	0.10	1.50		1.56		1.56	5	0.08	86.6
	18.0		95.42	0.00	0.00		0.00		0.00		0.00	86.6
	18.5		95.42	0.00	0.00		0.00		0.00		0.00	68.7
	19.0		95.22	0.20	0.72		0.77		0.77		0.08	68.7
	19.5		95.20	0.22	0.61		0.67		0.67		0.07	45.7
	20.0		95.22	0.20	0.94		0.99		0.99		0.10	45.7
	20.5		95.27	0.15	0.79		0.84		0.84		0.06	45.7
	21.0		95.31	0.11	0.74		0.79		0.79		0.04	45.7
	21.5		95.32	0.10	0.01		0.04		0.04		0.00	54.6
RWE	22.2		95.42	0.00	0.00		0.00		0.00		0.00	54.6

19-Jul-07

Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

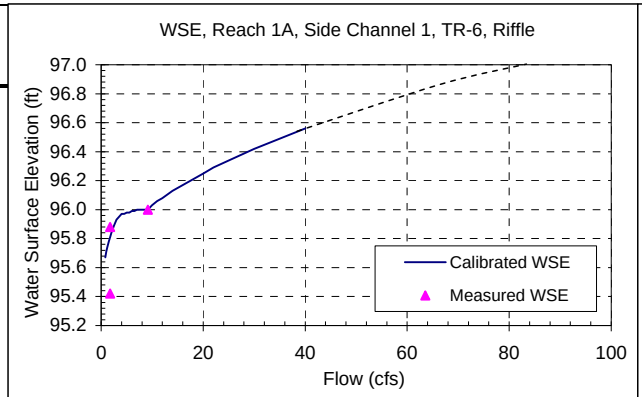
20-Jul-07

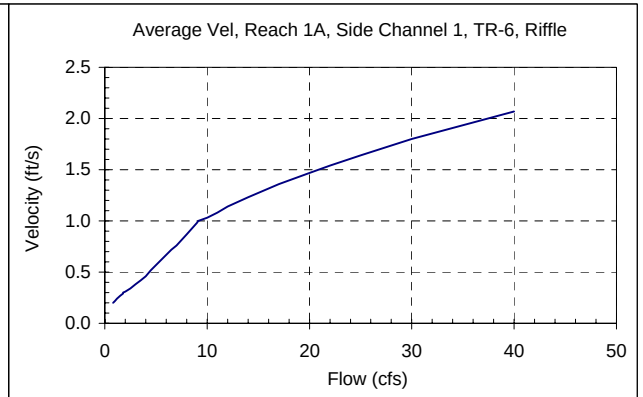
Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

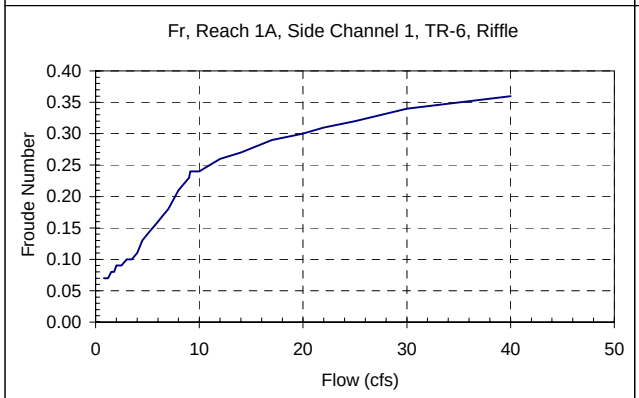


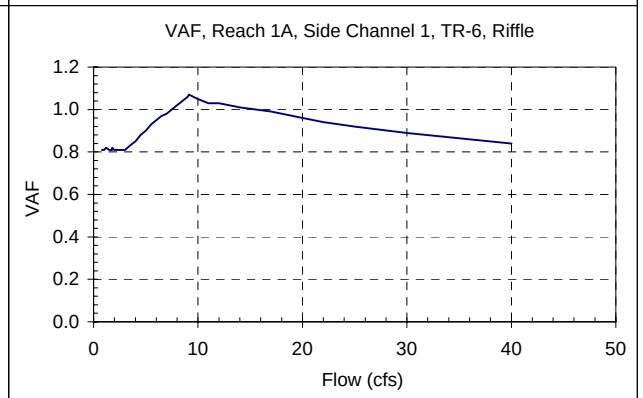
Stream: Sultan R.
Site: Reach 1A, Side Channel 1
Habitat: Riffle
Transect: 6

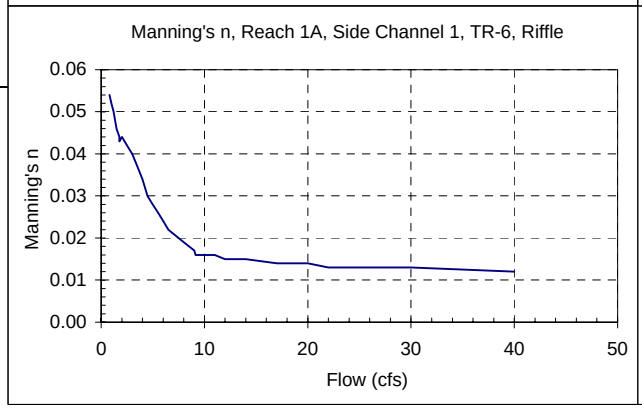
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.8	95.67	0.07	0.20	0.81	0.054	13.9
1	95.71	0.07	0.22	0.81	0.052	14.4
1.2	95.74	0.07	0.24	0.82	0.050	14.8
1.5	95.78	0.08	0.27	0.81	0.046	15.8
1.77	95.81	0.08	0.29	0.81	0.044	16.5
1.78	95.81	0.08	0.30	0.82	0.043	16.5
2	95.84	0.09	0.31	0.81	0.044	16.6
2.5	95.89	0.09	0.34	0.81	0.042	16.8
3	95.93	0.10	0.38	0.81	0.040	17.0
3.5	95.95	0.10	0.42	0.83	0.037	17.1
4	95.97	0.11	0.46	0.85	0.034	17.2
4.5	95.97	0.13	0.52	0.88	0.030	17.2
5	95.98	0.14	0.57	0.90	0.028	17.2
5.5	95.98	0.15	0.62	0.93	0.026	17.2
6	95.99	0.16	0.67	0.95	0.024	17.3
6.5	95.99	0.17	0.72	0.97	0.022	17.3
7	96.00	0.18	0.76	0.98	0.021	17.3
8	96.00	0.21	0.87	1.02	0.019	17.3
9	96.00	0.23	0.98	1.06	0.017	17.3
9.14	96.00	0.24	1.00	1.07	0.016	17.3
10	96.03	0.24	1.03	1.05	0.016	17.8
11	96.06	0.25	1.08	1.03	0.016	17.9
12	96.08	0.26	1.14	1.03	0.015	18.0
14	96.13	0.27	1.23	1.01	0.015	18.2
17	96.19	0.29	1.36	0.99	0.014	18.5
20	96.25	0.30	1.47	0.96	0.014	18.7
22	96.29	0.31	1.54	0.94	0.013	18.9
25	96.34	0.32	1.64	0.92	0.013	19.1
30	96.42	0.34	1.80	0.89	0.013	19.4
40	96.56	0.36	2.07	0.84	0.012	20.0

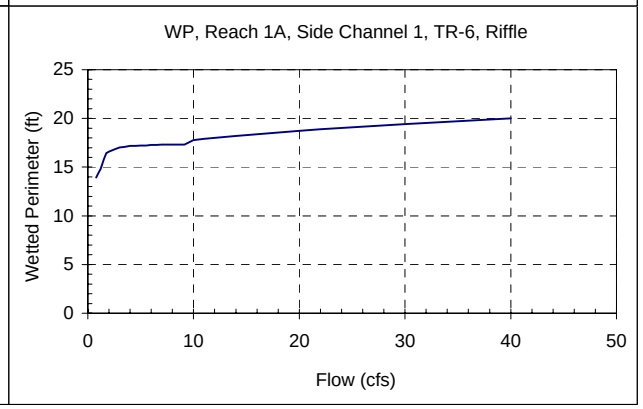


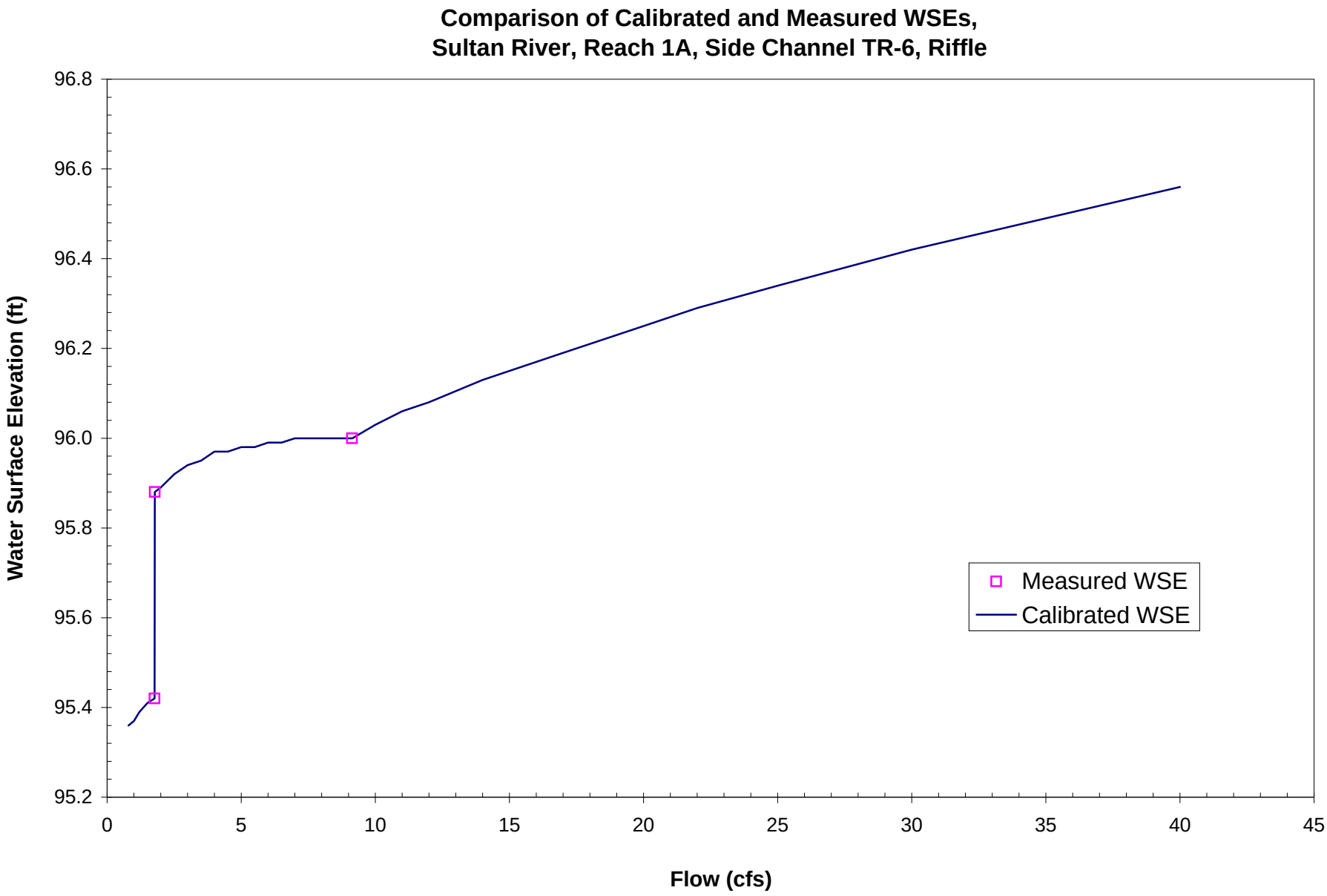











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel TR-6, Riffle
Water Surface Elevation (ft)
96.8
96.6
96.4
96.2
96.0
95.8
95.6
95.4
95.2
0
5
10
15
20
25
30
35
40
45
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 1

Date: 7/17/2007 **Transect:** 5
Habitat: Pool **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.55	100.55		100.00
RWP			2.92	97.63
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L			100.55	6.22		94.33	94.34	
5-R				6.21		94.34		

Ave Q=

Note: Note all velocity measurements are in meters/second
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 7/18/2007
Habitat: Pool **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.84	100.84		100.00
RWP			3.22	97.62
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L			100.84	6.22	0.00	94.62	94.63	-0.2
5-R				6.21	0.00	94.63		

Ave Q= -0.2

Note: Note all velocity measurements are in meters/second
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA

Date: 7/19/2007
Habitat: Pool **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM		100.00		100.00
RWP				100.00
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L						0.00	0.00	
5-R								

Ave Q=

Note: No measurements taken due to no flow entering channel
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 7/20/2007
Habitat: Pool **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM		100.00		100.00
RWP				100.00
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L						0.00	0.00	
5-R								

Ave Q=

Note: No measurements taken due to no flow entering channel
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 8/21/2007
Habitat: Pool **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.48	100.48		100.00
RWP			2.85	97.63
BM				

Comment: Photo #40 looking d/s, #41 left to right, #42 looking u/s (note Paul labeled the picture groups incorrectly in the field notebook). 1/2

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L			100.48	6.24	0.79	95.03	95.03	8.6
5-R				6.43	0.98	95.03		

Ave Q= 8.6

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602
Propeller ID: 5A
Calib #: 0175

Date: 8/24/2007
Habitat: Pool **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	0.35	100.35		100.00
RWP			2.72	97.63
BM				

Comment: Photo #122 looking looking right to left, #123 looking u/s, #124 lookingleft to right, #125 looking d/s. 1/2 level loop.

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
5-L			100.35	6.16	0.44	94.63	94.64	
5-R				6.45	0.74	94.64		

Ave Q=

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	12		100.35	6.20	0.48	94.63
d/s	-20		100.35	5.73	0.00	94.62

Note: No flolwing water/too slow to measure (<0.01 ft/sec) so no velocity and depth measurements taken
WSE slope = 0.031%

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Stream: Sultan R.
Site: Reach 1A, Side
Transect: 5
Habitat: Pool

Survey Date	HI (ft)	Q (cfs)
7/17/2007	100.55	
7/18/2007	100.84	-0.19
7/19/2007	0.00	
7/20/2007	0.00	
8/21/2007	100.48	8.6
8/24/2007	100.35	

17-Jul-07

Chann	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	3.32	97.23									21.9
	2.0	3.65	96.90									21.9
	3.0	4.07	96.48									21.9
	4.0	4.38	96.17									12.7
	5.0	4.75	95.80									11.9
	6.0	4.99	95.56									11.9
	7.0	5.35	95.20									11.9
	8.0	5.61	94.94									11.9
	9.0	5.91	94.64									11.9
	10.0	6.22	94.33									11.9
	11.0	6.31	94.24									11.9
	12.0	6.51	94.04									11.9
	13.0	6.63	93.92									11.9
	14.0	6.72	93.83									11.9
	15.0	6.88	93.67									11.9
	16.0	7.18	93.37									18.6
	17.0	7.32	93.23									15.6
	18.0	7.54	93.01									71.6
	19.0	7.58	92.97									15.6
	20.0	7.72	92.83									81.9
	21.0	7.85	92.70									71.7
	22.0	7.86	92.69									14.7
	23.0	7.42	93.13									13.8
	24.0	6.83	93.72									11.9
	25.0	6.33	94.22									11.9
	26.0	3.95	96.60									11.9
	27.0	3.63	96.92									11.9
RWP	28.0	3.36	97.19									11.9

18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (m/s)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	9.3		94.63	0.00	0.00	0.00		0.00		0.00		0.00	11.9
	10.0		94.43	0.20	-0.04	-0.13		-0.22		-0.22		-0.04	11.9
	11.0		94.28	0.35	-0.15	-0.49		-0.66		-0.66		-0.23	11.9
	12.0		94.13	0.50	-0.16	-0.52		-0.69		-0.69		-0.35	11.9
	13.0		93.93	0.70	-0.21	-0.69		-0.87		-0.87		-0.61	11.9
	14.0		93.88	0.75	-0.14	-0.46		-0.62		-0.62		-0.47	11.9
	15.0		93.73	0.90	-0.10	-0.33		-0.47		-0.47		-0.42	11.9
	16.0		93.43	1.20	-0.14	-0.46		-0.62		-0.62		-0.75	18.6
	17.0		93.33	1.30	-0.05	-0.16		-0.27		-0.27		-0.35	15.6
	18.0		93.18	1.45	0.16	0.52		0.69		0.69		1.01	71.6
	19.0		92.93	1.70	0.17	0.56		0.73		0.73		1.24	15.6
	20.0		92.93	1.70	0.17	0.56		0.73		0.73		1.24	81.9
	21.0		92.83	1.80	0.06	0.20		0.31		0.31		0.56	71.7
	22.0		92.73	1.90	-0.02	-0.07		-0.11		-0.11		-0.21	14.7
	23.0		93.03	1.60	-0.04	-0.13		-0.22		-0.22		-0.35	13.8
	24.0		93.68	0.95	-0.06	-0.20		-0.31		-0.31		-0.29	11.9
	25.0		93.73	0.90	-0.06	-0.20		-0.31		-0.31		-0.15	11.9
RWE	25.1		93.73	0.90	-0.06	-0.20		-0.31		-0.31		-0.01	11.9

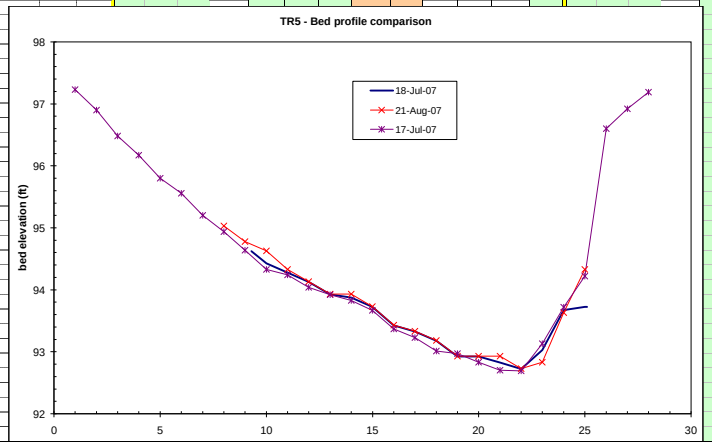
Most of the negative velocities should be associated with flow angles that were not recorded. It seemed not possible that the water was flowing straight back from sta=10.0 to sta=17 and from sta=22 to sta=25.1. The lack of flow angles may have caused the velocity components in the flow direction artificially larger than actual, and as the result, the negative flows become greater and the total net cross-sectional discharge less than zero.
cmh 2/25/08

19-Jul-07

Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

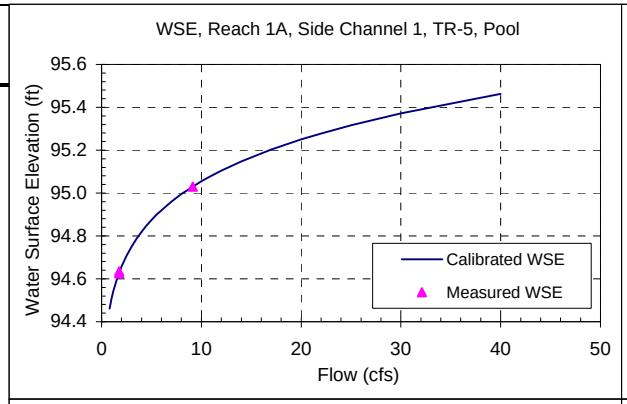
20-Jul-07

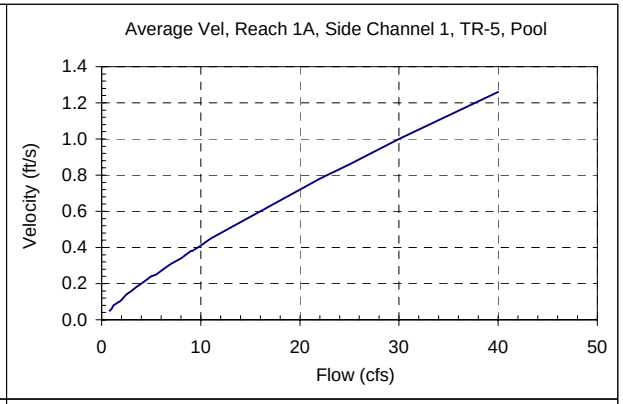
Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

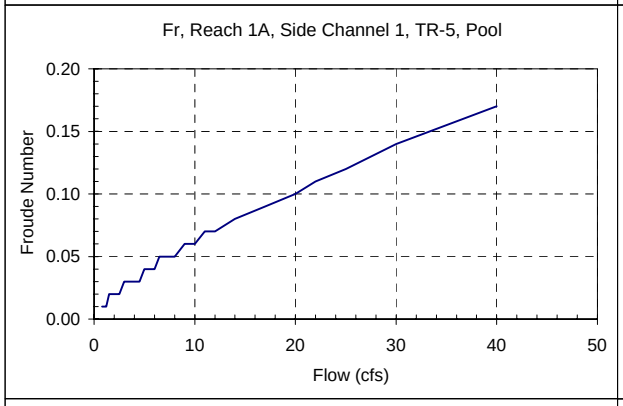


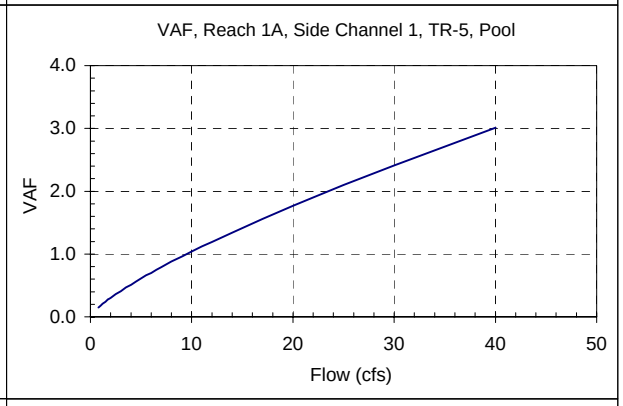
Stream: Sultan R.
Site: Reach 1A, Side Channel 1
Habitat: Pool
Transect: 5
Low: 900 cfs

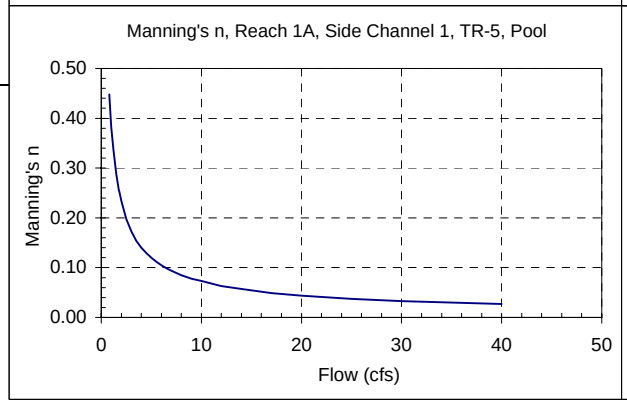
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.8	94.46	0.01	0.05	0.15	0.448	16.5
1	94.51	0.01	0.06	0.18	0.383	16.7
1.2	94.55	0.01	0.08	0.21	0.337	16.9
1.5	94.59	0.02	0.09	0.24	0.287	17.1
1.75	94.63	0.02	0.10	0.28	0.255	17.3
1.78	94.63	0.02	0.10	0.28	0.254	17.3
2	94.66	0.02	0.11	0.30	0.233	17.5
2.5	94.71	0.02	0.14	0.36	0.198	17.9
3	94.75	0.03	0.16	0.41	0.173	18.2
3.5	94.79	0.03	0.18	0.47	0.154	18.5
4	94.82	0.03	0.20	0.51	0.140	18.7
4.5	94.85	0.03	0.22	0.56	0.129	18.8
5	94.87	0.04	0.24	0.61	0.120	18.9
5.5	94.90	0.04	0.25	0.66	0.112	19.1
6	94.92	0.04	0.27	0.70	0.105	19.2
6.5	94.94	0.05	0.29	0.75	0.099	19.3
7	94.96	0.05	0.31	0.79	0.094	19.4
8	94.99	0.05	0.34	0.88	0.085	19.6
9	95.03	0.06	0.38	0.96	0.078	19.7
9.14	95.03	0.06	0.38	0.97	0.077	19.7
10	95.05	0.06	0.41	1.04	0.073	19.9
11	95.08	0.07	0.45	1.12	0.068	20.1
12	95.10	0.07	0.48	1.19	0.063	20.2
14	95.15	0.08	0.54	1.34	0.057	20.5
17	95.20	0.09	0.63	1.56	0.049	20.9
20	95.25	0.10	0.72	1.77	0.044	21.1
22	95.28	0.11	0.78	1.90	0.041	21.2
25	95.32	0.12	0.86	2.10	0.037	21.4
30	95.37	0.14	1.00	2.41	0.033	21.6
40	95.46	0.17	1.26	3.01	0.027	21.9

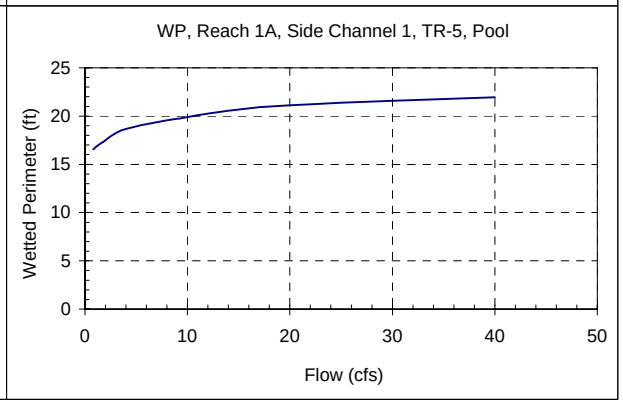


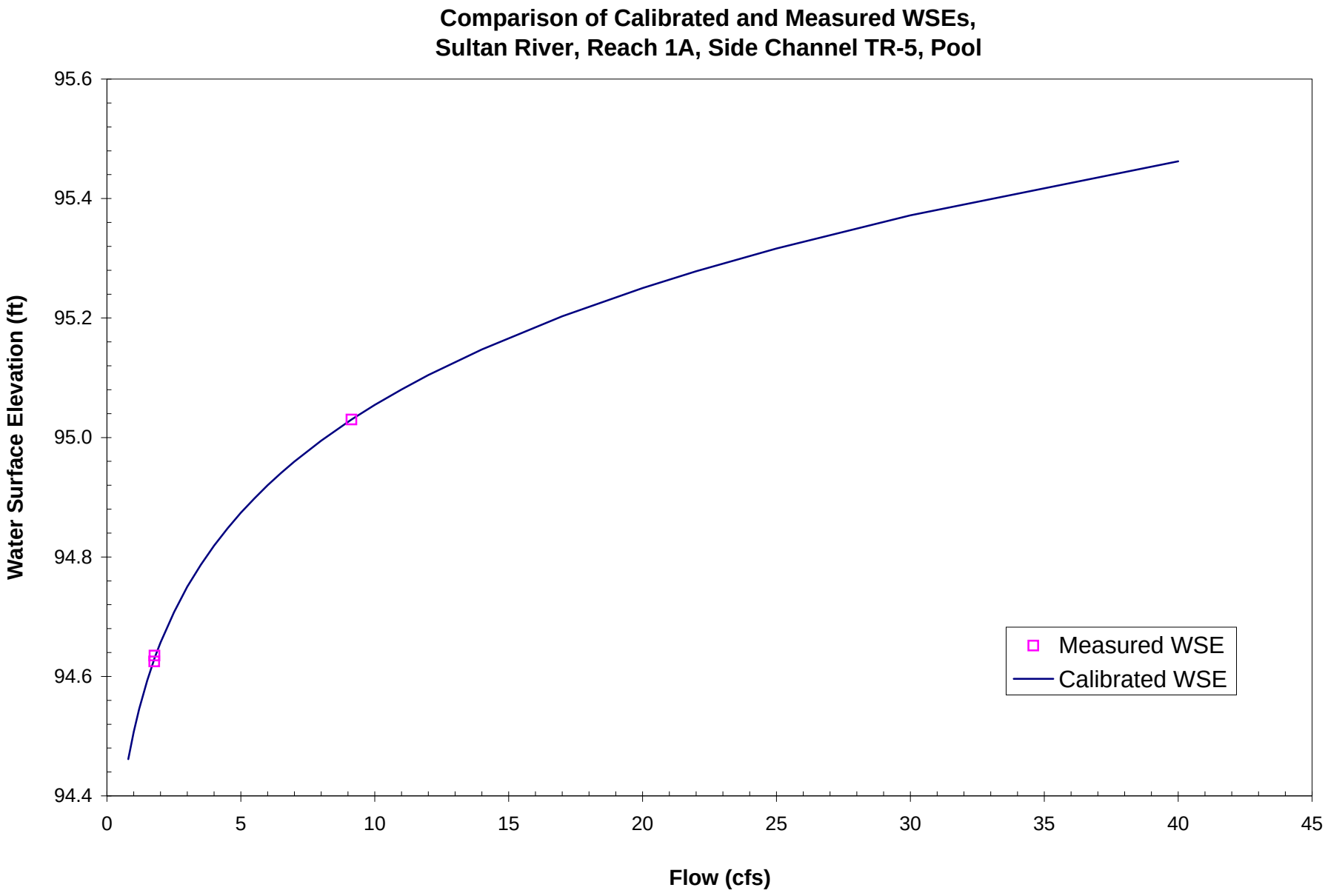











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel TR-5, Pool
Water Surface Elevation (ft)
95.6
95.4
95.2
95.0
94.8
94.6
94.4
0
5
10
15
20
25
30
35
40
45
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A, Side Channel 1

Date: 7/17/2007 **Transect:** 4
Habitat: Run **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.72	102.72		100.00
RWP			1.96	100.76
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L						0.00	0.00	
4-R						0.00		

Ave Q=

Note: All velocity measurements in meters/seconds
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 7/18/2007
Habitat: Run **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.00	103.00		100.00
RWP			2.24	100.76
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L			103.00	4.95		98.05	98.05	0.23
4-R				4.95		98.05		

Ave Q= 0.23

Note: All velocity measurements in meters/seconds
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA

Date: 7/19/2007
Habitat: Run **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM		100.00		100.00
RWP				100.00
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L						0.00	0.00	
4-R								

Ave Q=

Note: No measurements taken due to no flow entering channel
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 7/20/2007
Habitat: Run **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM		100.00		100.00
RWP				100.00
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L						0.00	0.00	
4-R						0.00		

Ave Q=

Note: No measurements taken due to no flow entering channel
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 8/21/2007
Habitat: Run **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.88	102.88		100.00
RWP			2.17	100.71
BM				

Comment: Photo #43 looking d/s, #44right to left, #45 looking u/s (note Paul labeled the picture groups incorrectly in the field notebook) 1/2

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L			102.88	4.43	0.00	98.45	98.45	9.4
4-R				4.43	0.00	98.45		

Ave Q= 9.4

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calin #: 0186

Date: 8/24/2007
Habitat: Run **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	3.97	103.97		100.00
RWP			3.26	100.71
BM				

Comment: Photo #118 looking looking right to left, #119 looking d/s, #120 looking left to right, #121 looking u/s. 1/2 level loop.

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
4-L			103.97	6.00	0.00	97.97	97.97	0.0
4-R				6.00	0.00	97.97		

Ave Q= 0.0

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	30		103.97	7.46	1.49	98.00
d/s	-25		103.97	5.99	0.00	97.98

Note: No flolwing water/too slow to measure (<0.01 ft/sec) so no velocity and depth measurements taken
WSE slope = 0.036%

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Stream: Sultan R.
Site: Reach 1A, Side Channe
Transect: 4
Habitat: Run

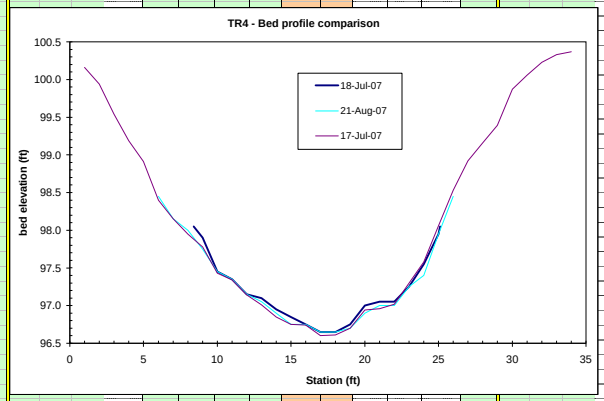
Survey Date	HI (ft)	Q (cfs)
7/17/2007	102.72	
7/18/2007	103.00	0.23
7/19/2007	0.00	
7/20/2007	0.00	
8/21/2007	102.88	9.4
8/24/2007	103.97	

17-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	2.56	100.16									21.7
	2.0	2.78	99.94									21.7
	3.0	3.18	99.54									21.7
	4.0	3.53	99.19									12.7
	5.0	3.81	98.91									12.9
	6.0	4.32	98.40									11.9
	7.0	4.57	98.15									11.9
	8.0	4.77	97.95									11.9
	9.0	4.94	97.78									11.9
	10.0	5.29	97.43									11.9
	11.0	5.38	97.34									14.9
	12.0	5.58	97.14									13.7
	13.0	5.71	97.01									31.6
	14.0	5.87	96.85									14.6
	15.0	5.97	96.75									43.6
	16.0	5.98	96.74									41.6
	17.0	6.12	96.60									34.7
	18.0	6.11	96.61									34.7
	19.0	6.02	96.70									64.7
	20.0	5.78	96.94									15.7
	21.0	5.76	96.96									15.8
	22.0	5.70	97.02									11.9
	23.0	5.42	97.30									11.9
	24.0	5.14	97.58									11.9
	25.0	4.66	98.06									11.9
	26.0	4.19	98.53									11.9
	27.0	3.80	98.92									11.9
	28.0	3.56	99.16									12.9
	29.0	3.33	99.39									12.6
	30.0	2.85	99.87									21.6
	31.0	2.66	100.06									21.7
	32.0	2.49	100.23									21.7
	33.0	2.39	100.33									21.7
RWP	34.0	2.35	100.37									21.7

18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (m/s)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	8.4		98.05	0.00	0.00	0.00		0.00		0.00		0.00	11.9
	9.0		97.90	0.15	-0.13	-0.43		-0.59		-0.59		-0.07	11.9
	10.0		97.45	0.60	-0.10	-0.33		-0.47		-0.47		-0.28	11.9
	11.0		97.35	0.70	-0.09	-0.30		-0.43		-0.43		-0.30	14.9
	12.0		97.15	0.90	-0.04	-0.13		-0.22		-0.22		-0.20	13.7
	13.0		97.10	0.95	0.01	0.03		0.06		0.06		0.05	31.6
	14.0		96.95	1.10	0.00	0.00		0.00		0.00		0.00	14.6
	15.0		96.85	1.20	0.03	0.10		0.17		0.17		0.20	43.6
	16.0		96.75	1.30	0.05	0.16		0.27		0.27		0.35	41.6
	17.0		96.65	1.40	0.04	0.13		0.22		0.22		0.31	34.7
	18.0		96.65	1.40	0.04	0.13		0.22		0.22		0.31	34.7
	19.0		96.75	1.30	0.05	0.16		0.27		0.27		0.35	64.7
	20.0		97.00	1.05	-0.01	-0.03		-0.06		-0.06		-0.06	15.7
	21.0		97.05	1.00	-0.01	-0.03		-0.06		-0.06		-0.06	15.8
	22.0		97.05	1.00	-0.01	-0.03		-0.06		-0.06		-0.06	11.9
	23.0		97.25	0.80	-0.04	-0.13		-0.22		-0.22		-0.18	11.9
	24.0		97.55	0.50	-0.04	-0.13		-0.22		-0.22		-0.11	11.9
	25.0		97.95	0.10	-0.09	-0.30		-0.43		-0.43		-0.02	11.9
RWE	25.1		98.05	0.00	0.00	0.00		0.00		0.00		0.00	11.9



19-Jul-07

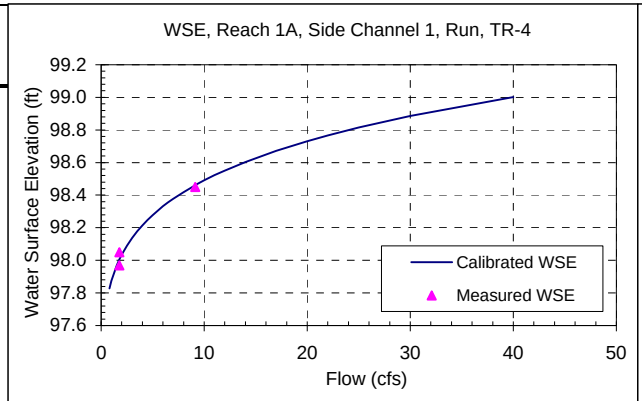
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

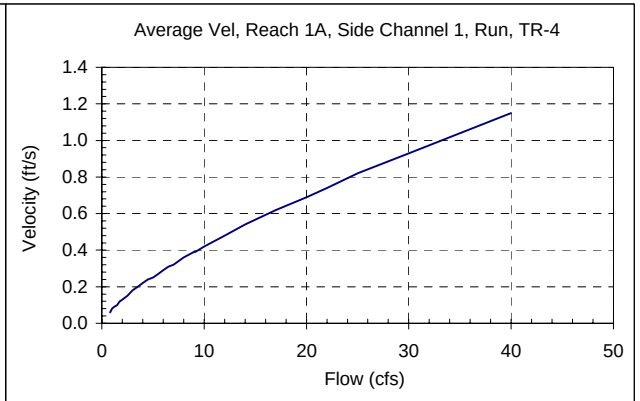
20-Jul-07

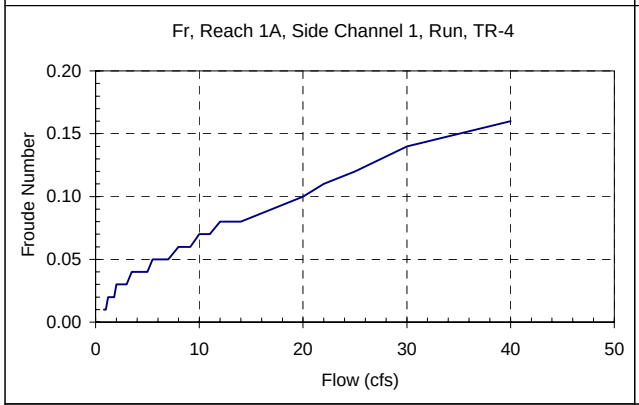
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

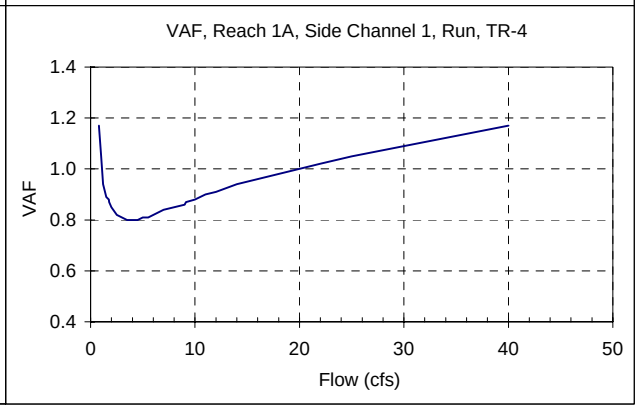
Stream: Sultan R.
Site: Reach 1A, Side Channel 1
Habitat: Run
Transect: 4

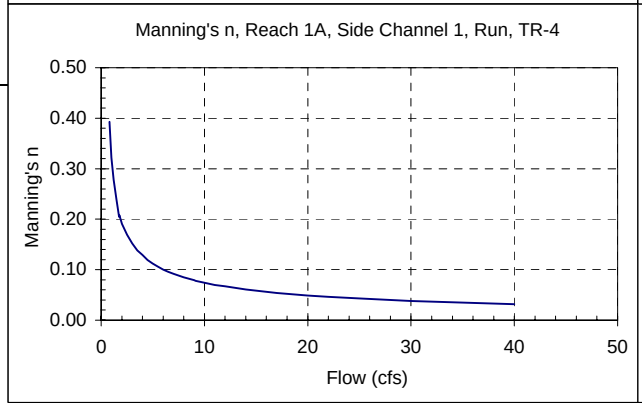
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.8	97.83	0.01	0.06	1.17	0.393	16.2
1	97.87	0.01	0.08	1.05	0.322	16.6
1.2	97.91	0.02	0.09	0.94	0.278	17.3
1.5	97.97	0.02	0.10	0.89	0.238	17.6
1.75	98.00	0.02	0.12	0.88	0.205	17.7
1.78	98.01	0.02	0.12	0.87	0.208	17.8
2	98.03	0.03	0.13	0.85	0.191	17.9
2.5	98.09	0.03	0.15	0.82	0.169	18.3
3	98.14	0.03	0.18	0.81	0.152	18.7
3.5	98.18	0.04	0.20	0.80	0.138	18.9
4	98.22	0.04	0.22	0.80	0.129	19.2
4.5	98.25	0.04	0.24	0.80	0.119	19.4
5	98.28	0.04	0.25	0.81	0.112	19.5
5.5	98.31	0.05	0.27	0.81	0.106	19.7
6	98.33	0.05	0.29	0.82	0.100	19.8
6.5	98.36	0.05	0.31	0.83	0.096	20.0
7	98.38	0.05	0.32	0.84	0.092	20.2
8	98.42	0.06	0.36	0.85	0.085	20.4
9	98.46	0.06	0.39	0.86	0.079	20.5
9.14	98.46	0.06	0.39	0.87	0.078	20.5
10	98.49	0.07	0.42	0.88	0.074	20.7
11	98.52	0.07	0.45	0.90	0.070	20.8
12	98.55	0.08	0.48	0.91	0.067	20.9
14	98.60	0.08	0.54	0.94	0.061	21.2
17	98.67	0.09	0.62	0.97	0.054	21.5
20	98.73	0.10	0.69	1.00	0.049	21.8
22	98.77	0.11	0.74	1.02	0.046	22.0
25	98.81	0.12	0.82	1.05	0.043	22.2
30	98.89	0.14	0.93	1.09	0.038	22.6
40	99.00	0.16	1.15	1.17	0.032	23.4

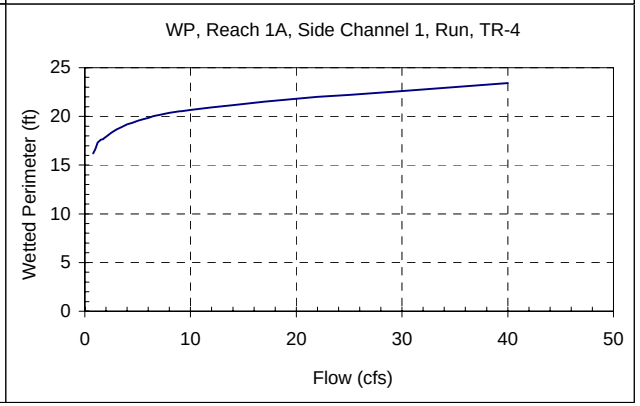


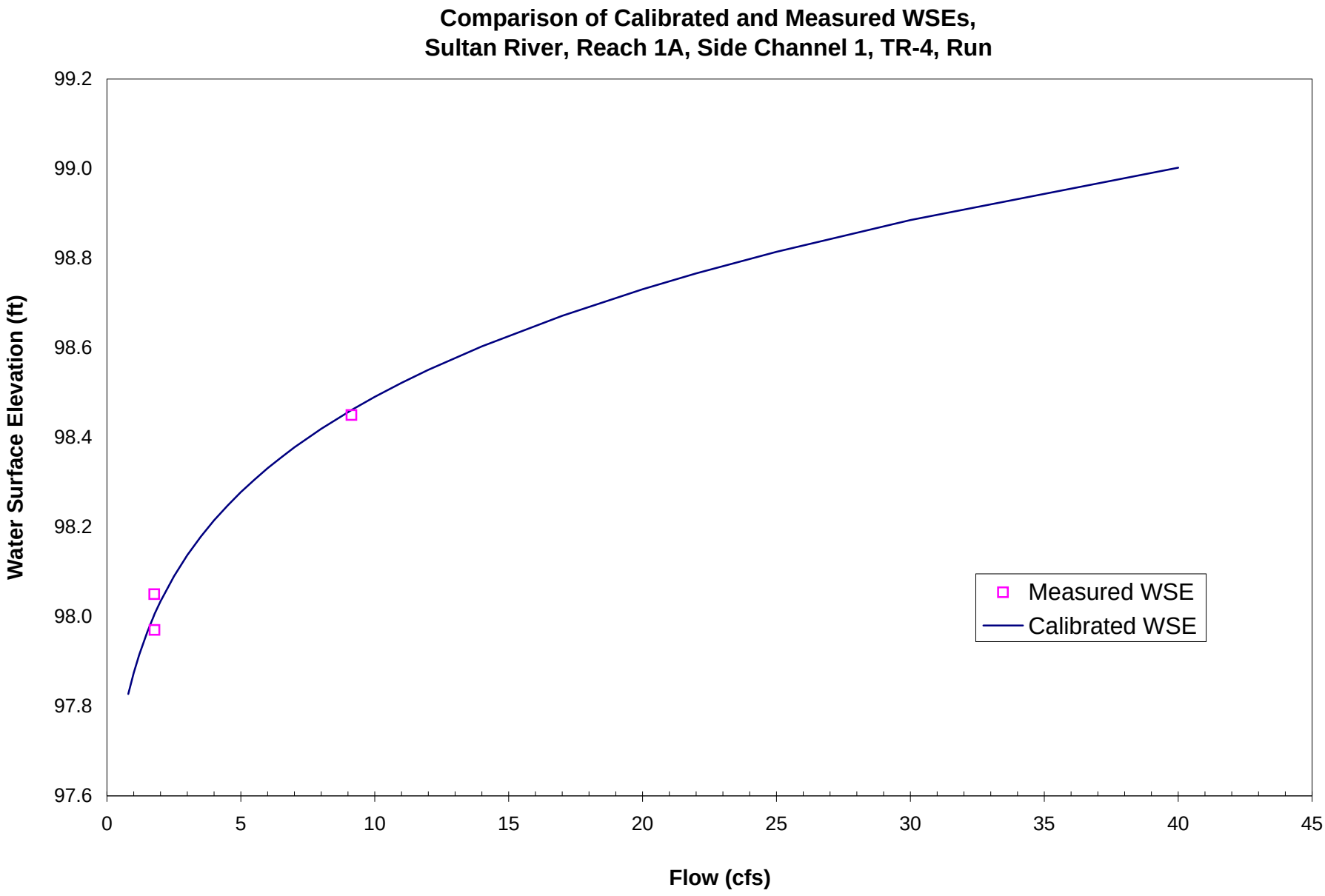











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel 1, TR-4, Run
Water Surface Elevation (ft)
99.2
99.0
98.8
98.6
98.4
98.2
98.0
97.8
97.6
0
5
10
15
20
25
30
35
40
45
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A Side Cahnnel 1

Date: 7/17/2007 **Transect:** 3
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.24	101.24		100.00
RWP			2.17	99.07
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L						0.00	0.00	
3-R						0.00		

Ave Q=

WSE slope = NA
Note: Velocity measurements in meters/seconds

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 7/18/2007
Habitat: Riffle **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.72	102.72		100.00
RWP			3.65	99.07
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L			102.72	6.40	0.00	96.32	96.32	2.7
3-R				6.41	0.00	96.31		

Ave Q= 2.7

WSE slope = NA
Note: Velocity measurements in meters/seconds

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA

Marsh McBirney

Date: 7/19/2007
Habitat: Riffle **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM		100.00		100.00
RWP				100.00
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L						0.00	0.00	
3-R								

Ave Q=

WSE slope = NA
Note: No measurements taken due to no flow entering channel

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 7/20/2007
Habitat: Riffle **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM		100.00		100.00
RWP				100.00
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L						0.00	0.00	
3-R								

Ave Q=

WSE slope = NA
Note: No measurements taken due to no flow entering channel

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 8/21/2007
Habitat: Riffle **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.63	102.63		100.00
RWP			3.56	99.07
BM				

Comment: Photo #46 looking d/s, #47 right to l

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L			102.63	6.32	0.35	96.66	96.68	9.1
3-R				6.28	0.34	96.69		

Ave Q= 9.1

WSE slope = NA
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 (see data entry notes of 2/25/08)
Propeller ID: 5A
Calib #: 0175

Date: 8/24/2007
Habitat: Riffle **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.78	102.78		100.00
RWP			3.71	99.07
BM				

Comment: Photo #114 looking looking d/s, #11

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
3-L			102.78	6.50		96.28	96.27	0.8
3-R				6.52		96.26		

Ave Q= 0.8

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	15		102.78	6.73	0.29	96.34
d/s	-16		102.78	7.17	0.53	96.14

WSE slope = 0.645%
Note:

(3) Meter and propeller ID for Velocity Correction

Meter ID: 3602 (see data entry notes of 2/25/08)
Propeller ID: 5A
Calib #: 175

Stream: Sultan R.
Site: Reach 1A Side Cahnnel 1
Transect: 3
Habitat: Riffle

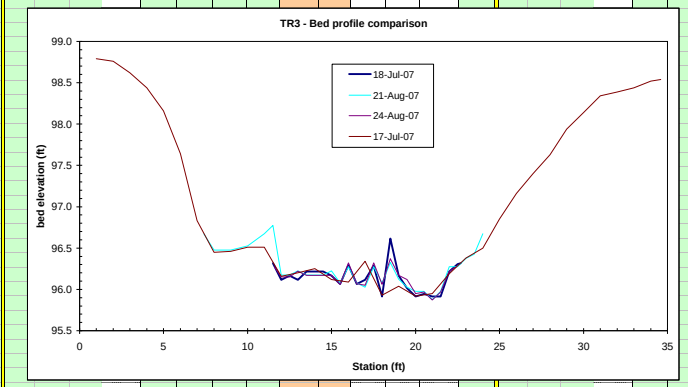
Survey Date	HI (ft)	Q (cfs)
7/17/2007	101.24	
7/18/2007	102.72	2.7
7/19/2007	0.00	
7/20/2007	0.00	
8/21/2007	102.63	9.1
8/24/2007	102.78	0.8

17-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	2.45	98.79									12.8
	2.0	2.48	98.76									12.8
	3.0	2.62	98.62									12.8
	4.0	2.80	98.44									12.8
	5.0	3.08	98.16									12.6
	6.0	3.60	97.64									12.6
	7.0	4.41	96.83									21.7
	8.0	4.79	96.45									21.9
	9.0	4.78	96.46									21.9
	10.0	4.73	96.51									32.6
	11.0	4.73	96.51									32.6
	12.0	5.08	96.16									64.7
	13.0	5.04	96.20									64.6
	14.0	4.99	96.25									23.9
	15.0	5.12	96.12									23.9
	16.0	5.15	96.09									74.6
	17.0	4.90	96.34									64.7
	18.0	5.31	95.93									73.8
	19.0	5.20	96.04									73.9
	20.0	5.32	95.92									32.6
	21.0	5.29	95.95									54.6
	22.0	5.05	96.19									63.7
	23.0	4.86	96.38									21.8
	24.0	4.74	96.50									12.7
	25.0	4.39	96.85									11.9
	26.0	4.08	97.16									11.9
	27.0	3.84	97.40									11.9
	28.0	3.61	97.63									11.9
	29.0	3.30	97.94									11.9
	30.0	3.10	98.14									11.9
	31.0	2.90	98.34									11.9
	32.0	2.85	98.39									11.9
	33.0	2.80	98.44									11.9
	34.0	2.72	98.52									11.9
RWP	34.6	2.70	98.54									11.9

18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	V (m/s)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	11.5		96.32	0.00	0.00	0.00		0.00		0.00		0.00	64.7
	12.0		96.12	0.20	0.37	1.21		1.47		1.47	5	0.15	64.7
	12.5		96.17	0.15	0.40	1.31		1.58		1.58	5	0.12	64.6
	13.0		96.12	0.20	0.17	0.56		0.73		0.73		0.07	64.6
	13.5		96.22	0.10	0.51	1.67		1.97		1.97		0.10	23.9
	14.0		96.22	0.10	-0.03	-0.10		-0.17		-0.17		-0.01	23.9
	14.5		96.22	0.10	-0.04	-0.13		-0.22		-0.22		-0.01	23.9
	15.0		96.17	0.15	0.07	0.23		0.35		0.35	20	0.02	23.9
	15.5		96.07	0.25	0.50	1.64		1.94		1.94	5	0.24	74.6
	16.0		96.30	0.02	0.40	1.31		1.58		1.58		0.02	74.6
	16.5		96.07	0.25	0.89	2.92		3.26		3.26		0.41	64.7
	17.0		96.12	0.20	0.84	2.76		3.08		3.08		0.31	64.7
	17.5		96.29	0.03	0.40	1.31		1.58		1.58		0.02	64.7
	18.0		95.92	0.40	0.45	1.48		1.76		1.76		0.18	73.8
	18.5		96.62	-0.30									73.9
	19.0		96.17	0.15	0.36	1.18		1.43		1.43		0.05	73.9
	19.5		96.02	0.30	-0.10	-0.33		-0.47		-0.47		-0.07	32.6
	20.0		95.92	0.40	0.37	1.21		1.47		1.47		0.29	32.6
	20.5		95.95	0.37	0.64	2.10		2.42		2.42		0.45	54.6
	21.0		95.92	0.40	0.50	1.64		1.94		1.94		0.39	54.6
	21.5		95.92	0.40	-0.05	-0.16		-0.27		-0.27		-0.05	63.7
	22.0		96.22	0.10	0.13	0.43		0.59		0.59		0.03	63.7
	22.5		96.31	0.01	0.00	0.00		0.00		0.00		0.00	21.8
RWE	22.7		96.32	0.00	0.00	0.00		0.00		0.00		0.00	21.8



19-Jul-07

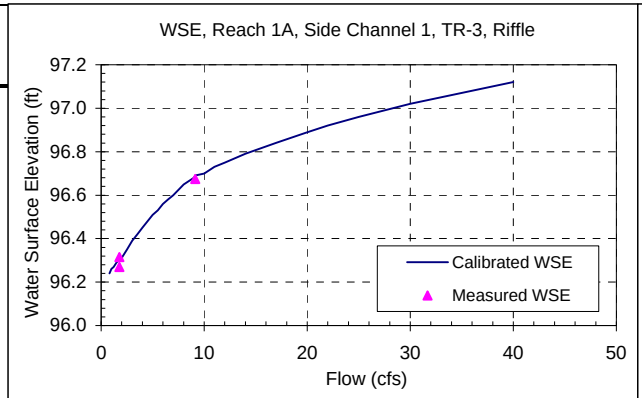
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

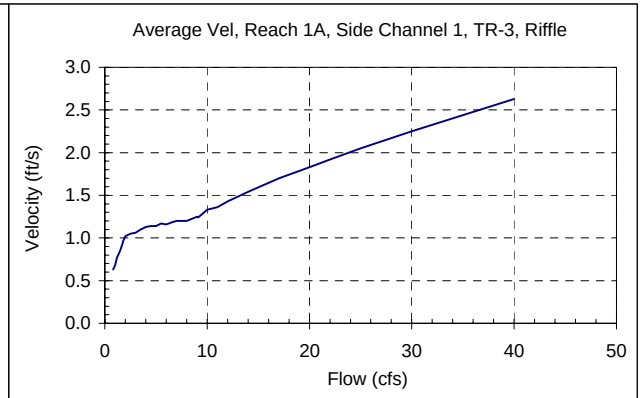
20-Jul-07

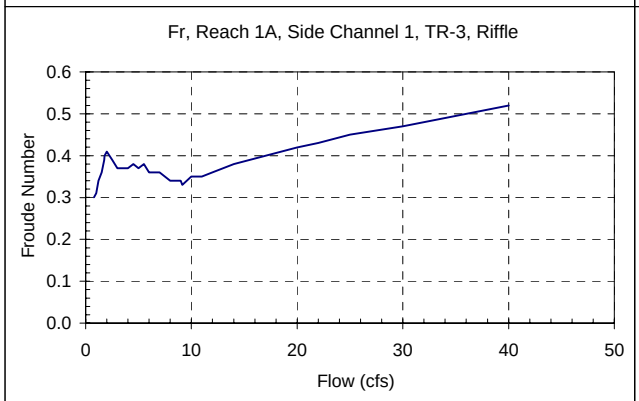
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (ft/s) $V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

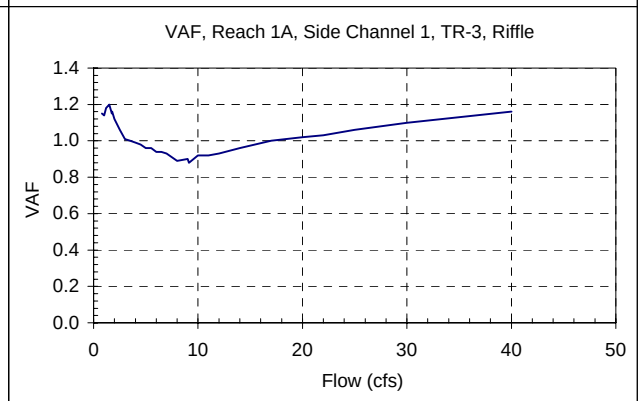
Stream: Sultan R.
Site: Reach 1A Side Cahnnel 1
Habitat: Riffle
Transect: 3

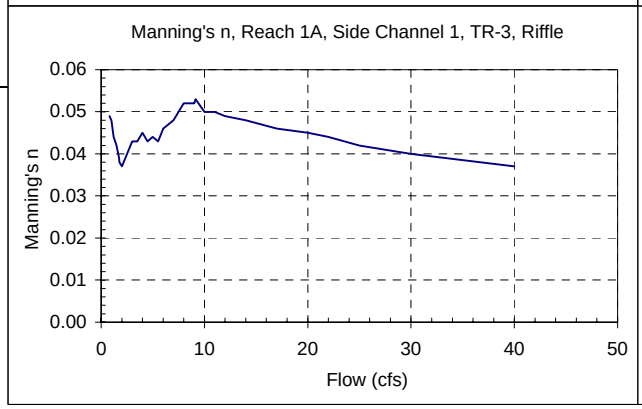
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.8	96.24	0.30	0.63	1.15	0.049	9.8
1	96.26	0.31	0.68	1.14	0.048	10.2
1.2	96.27	0.34	0.77	1.18	0.044	10.4
1.5	96.29	0.36	0.85	1.20	0.042	10.8
1.75	96.30	0.39	0.94	1.15	0.039	11.0
1.78	96.30	0.40	0.96	1.16	0.038	11.0
2	96.31	0.41	1.02	1.12	0.037	11.1
2.5	96.35	0.39	1.05	1.06	0.040	11.6
3	96.39	0.37	1.06	1.01	0.043	12.2
3.5	96.42	0.37	1.10	1.00	0.043	12.6
4	96.45	0.37	1.13	0.99	0.045	13.0
4.5	96.48	0.38	1.14	0.98	0.043	14.9
5	96.51	0.37	1.14	0.96	0.044	15.9
5.5	96.53	0.38	1.17	0.96	0.043	17.1
6	96.56	0.36	1.16	0.94	0.046	17.4
6.5	96.58	0.36	1.18	0.94	0.047	17.5
7	96.60	0.36	1.20	0.93	0.048	17.7
8	96.65	0.34	1.20	0.89	0.052	18.0
9	96.68	0.34	1.25	0.90	0.052	18.2
9.14	96.69	0.33	1.24	0.88	0.053	18.3
10	96.70	0.35	1.33	0.92	0.050	18.3
11	96.73	0.35	1.36	0.92	0.050	18.5
12	96.75	0.36	1.43	0.93	0.049	18.6
14	96.79	0.38	1.54	0.96	0.048	18.9
17	96.84	0.40	1.70	1.00	0.046	19.1
20	96.89	0.42	1.83	1.02	0.045	19.4
22	96.92	0.43	1.92	1.03	0.044	19.5
25	96.96	0.45	2.05	1.06	0.042	19.7
30	97.02	0.47	2.25	1.10	0.040	20.0
40	97.12	0.52	2.63	1.16	0.037	20.5

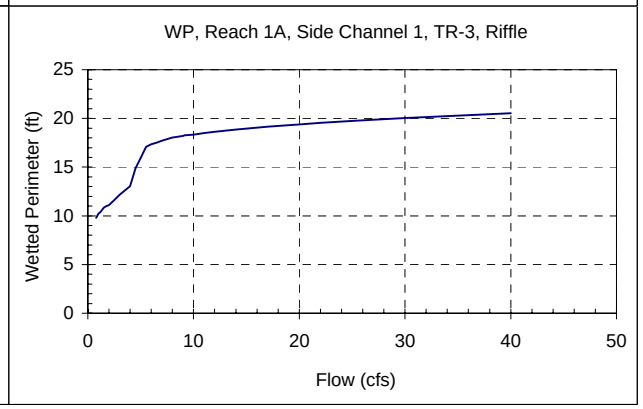


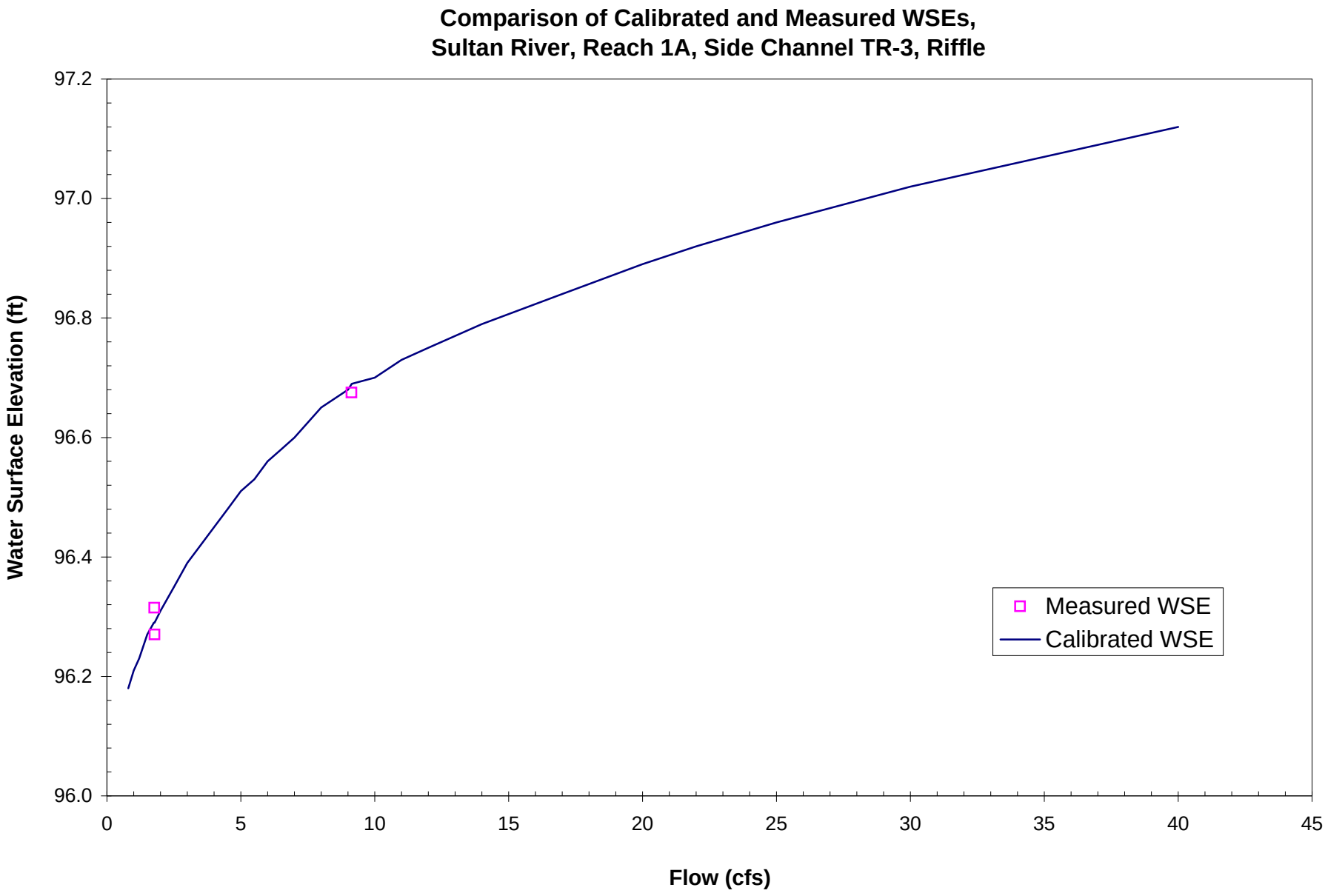











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel TR-3, Riffle
Water Surface Elevation (ft)
97.2
97.0
96.8
96.6
96.4
96.2
96.0
0
5
10
15
20
25
30
35
40
45
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A Side Channel 1

Date: 7/17/2007 **Transect:** 2
Habitat: Run **Flow:** Bank Profile

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.70	101.70		100.00
RWP			3.78	97.92
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L						0.00	0.00	
2-R						0.00		

Ave Q=

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 7/18/2007
Habitat: Run **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	1.98	101.98		100.00
RWP			4.06	97.92
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			101.98	6.21	0.00	95.77	95.78	3.17
2-R				6.20	0.00	95.78		

Ave Q= 3.17

Note: All velocity measurements in meters/seconds
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA

Date: 7/19/2007
Habitat: Run **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM		100.00		100.00
RWP				100.00
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			100.00			100.00	#####	
2-R								

Ave Q=

Note: No measurements taken due to no flow entering channel
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 7/20/2007
Habitat: Run **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM		100.00		100.00
RWP				100.00
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L						0.00	0.00	
1-R								

Ave Q=

Note: No measurements taken due to no flow entering channel
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 8/21/2007
Habitat: Run **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.22	102.22		100.00
RWP			4.29	97.93
BM				

Comment: Photo #49 looking d/s, #50 right to left, #51 looking u/s. 1/2 level loop.

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			102.22	5.98	0.50	96.74	96.74	9.0
2-R				6.07	0.58	96.73		

Ave Q= 9.0

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: 186

Date: 8/24/2007
Habitat: Run **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
BM	2.13	102.13		100.00
RWP			4.21	97.92
BM				

Comment: Photo #110 looking right to left, #111 looking d/s, #112 left to right, #113 looking u/s. 1/2 level loop.

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
2-L			102.13	6.30		95.83	95.83	0.8
2-R				6.31		95.82		

Ave Q= 0.8

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	18		102.13	6.29	0.00	95.84
d/s	-20		102.13	7.15	0.85	95.83

Note:
WSE slope = 0.026%

(3) Meter and propeller ID for Velocity Correction

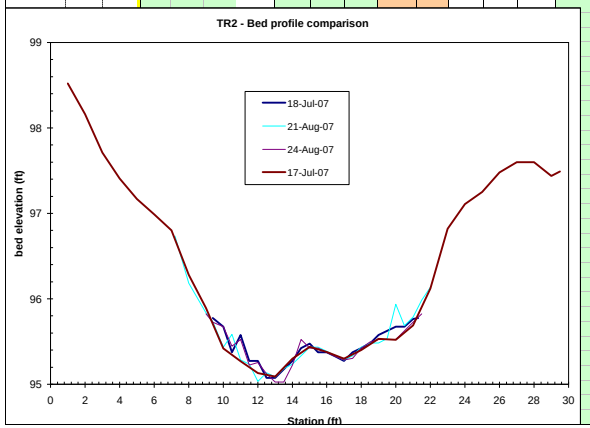
Meter ID: 3602 (see data entry notes of 2/23/08)
Propeller ID: 5A
Calib #: 175

Stream: Sultan R.
Site: Reach 1A Side Channe
Transect: 2
Habitat: Run

Survey Date	HI (ft)	Q (cfs)
7/17/2007	101.70	
7/18/2007	101.98	3.2
7/19/2007	100.00	
7/20/2007	0.00	
8/21/2007	102.22	9.0
8/24/2007	102.13	0.8

17-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	3.18	98.52									11.9
	2.0	3.54	98.16									11.9
	3.0	3.99	97.71									11.9
	4.0	4.29	97.41									11.9
	5.0	4.53	97.17									11.9
	6.0	4.71	96.99									11.9
	7.0	4.90	96.80									11.9
	8.0	5.42	96.28									11.9
	9.0	5.81	95.89									11.9
	10.0	6.28	95.42									16.7
	11.0	6.43	95.27									71.7
	12.0	6.57	95.13									67.7
	13.0	6.61	95.09									61.8
	14.0	6.40	95.30									21.7
	15.0	6.26	95.44									22.9
	16.0	6.32	95.38									22.9
	17.0	6.40	95.30									22.9
	18.0	6.30	95.40									22.9
	19.0	6.17	95.53									21.6
	20.0	6.18	95.52									21.6
	21.0	6.01	95.69									21.6
	22.0	5.58	96.12									12.6
	23.0	4.88	96.82									12.7
	24.0	4.59	97.11									11.9
	25.0	4.45	97.25									11.9
	26.0	4.22	97.48									11.9
	27.0	4.10	97.60									11.9
	28.0	4.10	97.60									11.9
	29.0	4.26	97.44									11.9
RWP	29.5	4.21	97.49									11.9



18-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	Vel (m/s)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	9.4		95.78	0.00	0.00	0.00		0.00		0.00		0.00	11.9
	10.0		95.68	0.10	-0.05	-0.16		-0.27		-0.27		-0.01	16.7
	10.5		95.38	0.40	0.13	0.43		0.59		0.59		0.12	71.7
	11.0		95.58	0.20	0.12	0.39		0.55		0.55		0.05	71.7
	11.5		95.28	0.50	0.15	0.49		0.66		0.66		0.16	67.7
	12.0		95.28	0.50	0.10	0.33		0.47		0.47		0.12	67.7
	12.5		95.08	0.70	0.18	0.59		0.76		0.76		0.27	61.8
	13.0		95.08	0.70	0.16	0.52		0.69		0.69		0.24	61.8
	13.5		95.18	0.60	0.26	0.85		1.05		1.05		0.32	21.7
	14.0		95.28	0.50	0.23	0.75		0.94		0.94		0.24	21.7
	14.5		95.43	0.35	0.06	0.20		0.31		0.31		0.05	22.9
	15.0		95.48	0.30	0.25	0.82		1.02		1.02		0.15	22.9
	15.5		95.38	0.40	0.29	0.95		1.17		1.17		0.23	22.9
	16.0		95.38	0.40	0.31	1.02		1.24		1.24		0.25	22.9
	16.5		95.33	0.45	0.29	0.95		1.17		1.17		0.26	22.9
	17.0		95.28	0.50	0.20	0.66		0.83		0.83		0.21	22.9
	17.5		95.38	0.40	0.19	0.62		0.80		0.80		0.16	22.9
	18.0		95.43	0.35	0.12	0.39		0.55		0.55		0.10	22.9
	18.5		95.48	0.30	0.14	0.46		0.62		0.62		0.09	21.6
	19.0		95.58	0.20	0.30	0.98		1.20		1.20		0.12	21.6
	19.5		95.63	0.15	0.10	0.33		0.47		0.47		0.04	21.6
	20.0		95.68	0.10	-0.03	-0.10		-0.17		-0.17		-0.01	21.6
	20.5		95.68	0.10	0.02	0.07		0.11		0.11		0.01	21.6
	21.0		95.77	0.01	0.06	0.20		0.31		0.31		0.00	21.6
RWE	21.3		95.78	0.00	0.00	0.00		0.00		0.00		0.00	21.6

19-Jul-07

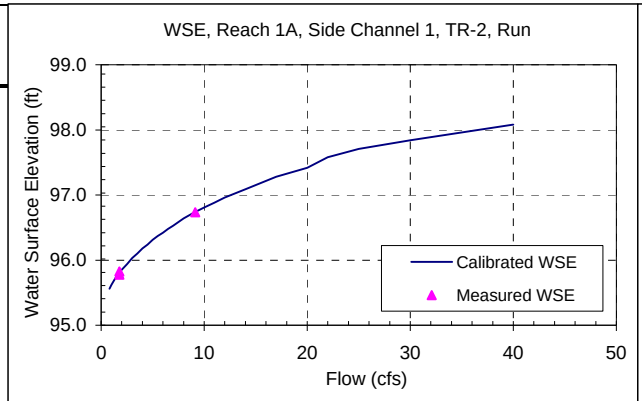
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

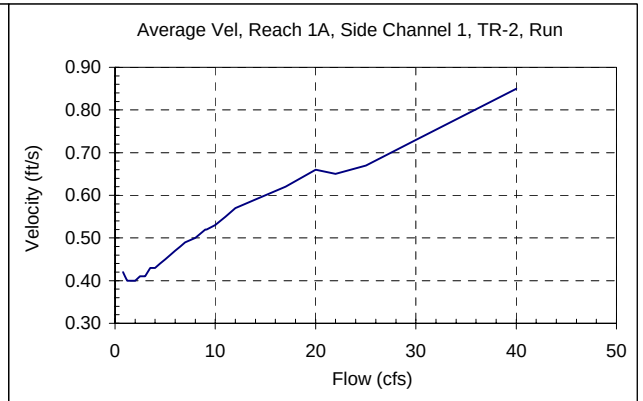
20-Jul-07

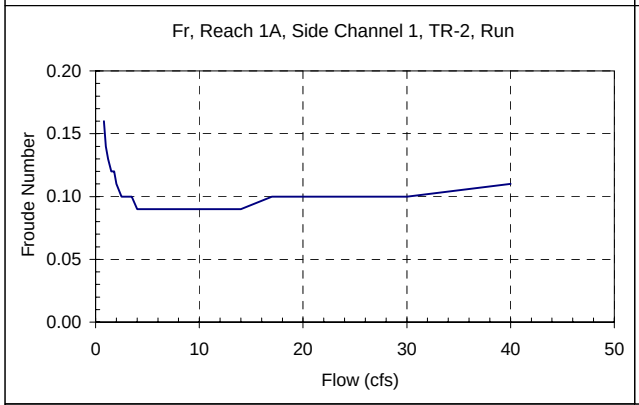
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.

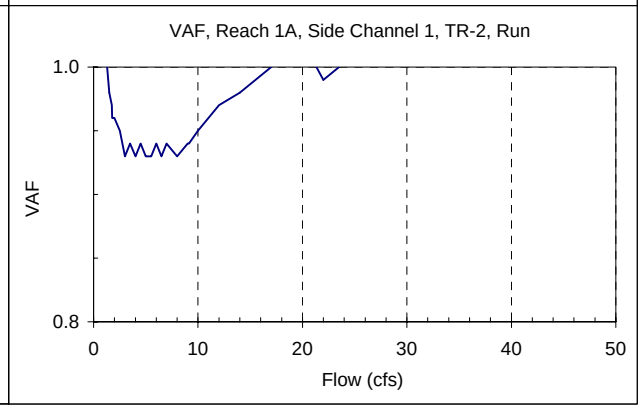
Stream: Sultan R.
Site: Reach 1A Side Channel 1
Habitat: Run
Transect: 2

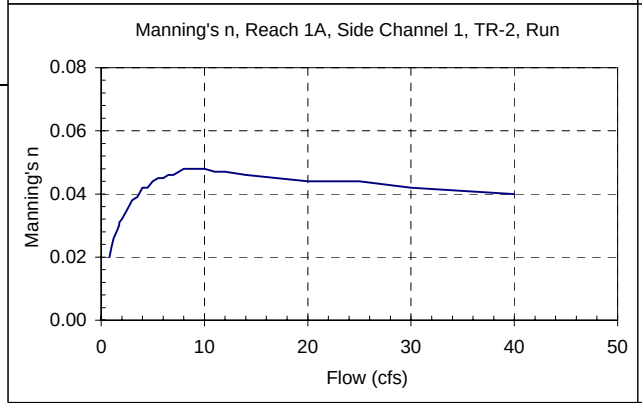
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.8	95.56	0.16	0.42	1.19	0.020	8.9
1	95.62	0.14	0.41	1.08	0.023	9.6
1.2	95.68	0.13	0.40	1.01	0.026	10.3
1.5	95.75	0.12	0.40	0.98	0.028	11.7
1.75	95.80	0.12	0.40	0.97	0.030	12.4
1.78	95.81	0.12	0.40	0.96	0.031	12.4
2	95.85	0.11	0.40	0.96	0.032	12.7
2.5	95.94	0.10	0.41	0.95	0.035	13.2
3	96.03	0.10	0.41	0.93	0.038	13.6
3.5	96.10	0.10	0.43	0.94	0.039	14.0
4	96.18	0.09	0.43	0.93	0.042	14.4
4.5	96.24	0.09	0.44	0.94	0.042	14.8
5	96.31	0.09	0.45	0.93	0.044	15.1
5.5	96.37	0.09	0.46	0.93	0.045	15.3
6	96.42	0.09	0.47	0.94	0.045	15.5
6.5	96.48	0.09	0.48	0.93	0.046	15.7
7	96.53	0.09	0.49	0.94	0.046	15.8
8	96.64	0.09	0.50	0.93	0.048	16.2
9	96.73	0.09	0.52	0.94	0.048	16.5
9.14	96.74	0.09	0.52	0.94	0.048	16.5
10	96.81	0.09	0.53	0.95	0.048	17.0
11	96.88	0.09	0.55	0.96	0.047	17.6
12	96.96	0.09	0.57	0.97	0.047	18.3
14	97.09	0.09	0.59	0.98	0.046	19.5
17	97.28	0.10	0.62	1.00	0.045	21.6
20	97.42	0.10	0.66	1.02	0.044	22.8
22	97.58	0.10	0.65	0.99	0.044	25.9
25	97.71	0.10	0.67	1.01	0.044	27.6
30	97.84	0.10	0.73	1.07	0.042	28.0
40	98.08	0.11	0.85	1.16	0.040	28.5

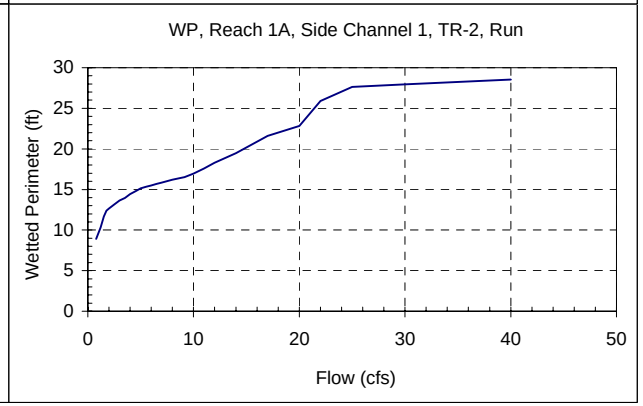


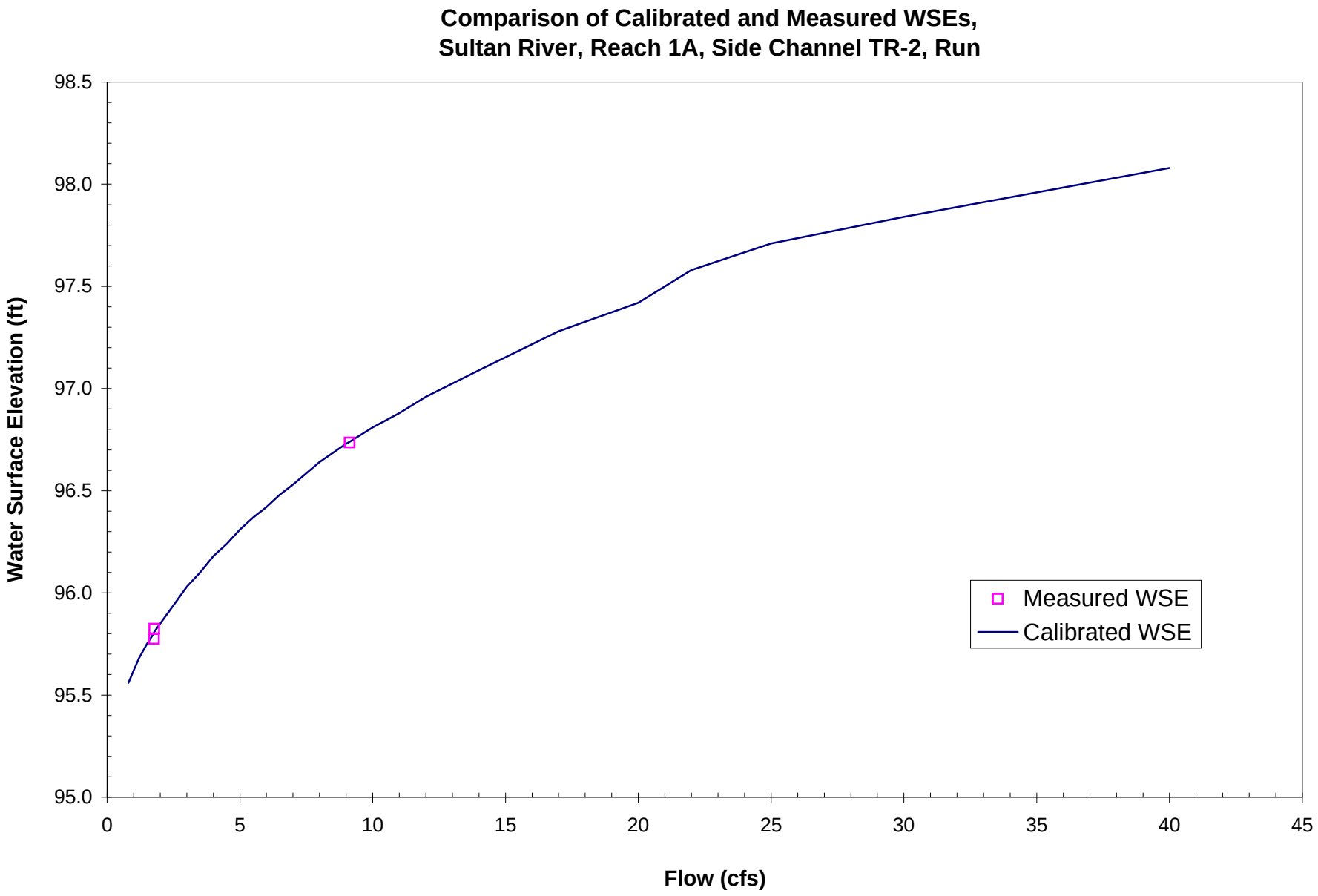











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel TR-2, Run
Water Surface Elevation (ft)
98.5
98.0
97.5
97.0
96.5
96.0
95.5
95.0
0
5
10
15
20
25
30
35
40
45
Flow (cfs)
Measured WSE
Calibrated WSE

Stream: Sultan R.
Site: Reach 1A Side Channel 1
Date: 7/17/2007 **Transect:** 1
Habitat: Pool **Flow:** Bank Profile

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP	4.39	104.39		100.00
RWP			3.32	101.07
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			#####	8.30	0.00	96.09	96.09	0.00
1-R				8.30	0.00	96.09		

Ave Q= 0.00

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA March McBirney
Propeller ID: NA

Date: 7/18/2007
Habitat: Pool **Flow:** High

(1) Level Loop Survey (BM & HP)

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP	4.35	104.35		100.00
RWP			3.27	101.08
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			#####	8.30	0.00	96.05	96.05	1.93
1-R				8.30	0.00	96.05		

Ave Q= 1.93

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 0068
Propeller ID: NA

Date: 7/19/2007
Habitat: Pool **Flow:** Mid

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP		100.00		100.00
RWP				100.00
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L						0.00	0.00	
1-R								

Ave Q=

Note: No measurements taken due to no flow entering channel
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 7/20/2007
Habitat: Pool **Flow:** Low

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP		100.00		100.00
RWP				100.00
BM				

Comment:

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L						0.00	0.00	
1-R								

Ave Q=

Note: No measurements taken due to no flow entering channel
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: NA
Propeller ID: NA

Date: 8/21/2007
Habitat: Pool **Flow:** 900 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP	6.11	106.11		100.00
RWP			5.04	101.07
BM				

Comment: Photo #52 looking d/s, #53 right to left, #54 looking u/s

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			106.11	10.62	0.96	96.45	96.45	7.44
1-R				9.94	0.28	96.45		

Ave Q= 7.44

Note:
WSE slope = NA

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4441
Propeller ID: 7A
Calib #: 186

Date: 8/24/2007
Habitat: Pool **Flow:** 700 cfs

(1) Level Loop Survey

BM/HP (ft)	BS (ft)	HI (ft)	FS (ft)	Elev (ft)
HP	6.62	106.62		100.00
RWP			5.57	101.05
BM				

Comment: Photo #106 right to left, #107 looking u/s, #108 looking d/s #109 left to right

(2) Water Surface Elevation (WSE) Survey

TR	Transect Station L/R bank (ft)	Transect Station Ave (ft)	HI (ft)	FS (ft)	Rod (ft)	WSE (ft)	Ave WSE (ft)	Q (cfs)
1-L			106.62	10.57	0.00	96.05	96.06	0.4
1-R				10.56	0.00	96.06		

Ave Q= 0.4

(2.1) Longitudinal WSE Slope

Location	River Station		HI (ft)	FS (ft)	Rod (ft)	WSE (ft)
u/s	25		106.62	10.91	0.35	96.06
d/s	-25		106.62	10.70	0.00	95.92

Note:
WSE slope = 0.280%

(3) Meter and propeller ID for Velocity Correction

Meter ID: 4099
Propeller ID: 4B
Calib #: 125

Stream: Sultan R.
Site: Reach 1A Side Channe
Transect: 1
Habitat: Pool

Survey Date	HI (ft)	Q (cfs)
7/17/2007	104.39	
7/18/2007	104.35	1.9
7/19/2007	0.00	
7/20/2007	0.00	
8/21/2007	106.11	7.4
8/24/2007	106.62	0.4

17-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWP	1.0	3.21	101.18									11.9
	3.0	3.52	100.87									11.9
	5.0	4.38	100.01									11.9
	7.0	8.23	96.16									54.7
	8.0	8.73	95.66									65.7
	9.0	9.02	95.37									54.8
	10.0	9.05	95.34									45.6
	11.0	9.19	95.20									45.8
	12.0	9.38	95.01									54.6
	13.0	9.55	94.84									54.8
	14.0	9.31	95.08									56.6
	15.0	9.26	95.13									56.6
	16.0	9.34	95.05									54.7
	17.0	9.38	95.01									54.6
	18.0	9.20	95.19									54.6
	19.0	9.05	95.34									52.6
	20.0	8.90	95.49									34.6
	21.0	8.64	95.75									32.7
	22.0	8.49	95.90									23.9
	23.0	8.33	96.06									22.9
	24.0	8.42	95.97									22.9
	25.0	8.48	95.91									22.9
	26.0	8.34	96.05									22.9
	27.0	8.01	96.38									22.9
	28.0	7.84	96.55									22.9
	29.0	7.66	96.73									22.9
	30.0	7.49	96.90									11.9
	32.0	6.53	97.86									11.9
	34.0	5.32	99.07									11.9
	36.0	4.34	100.05									11.9
RWP	39.3	3.84	100.55									11.9
												11.9
												11.9

18-Jul-07

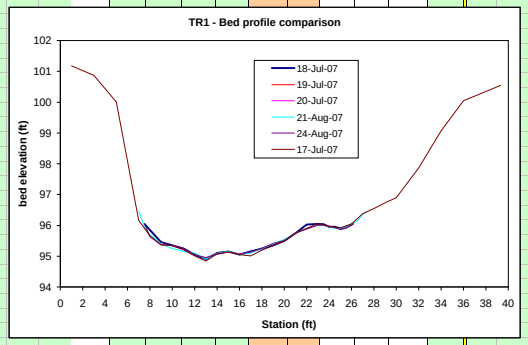
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	V(m/s)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	subs.
LWE	7.5		96.05	0.00	0.00	0.00		0.00		0.00		0.00	54.7
	8.0		95.85	0.20	-0.05	-0.16		-0.27		-0.27		-0.04	65.7
	9.0		95.45	0.60	-0.02	-0.07		-0.11		-0.11		-0.07	54.8
	10.0		95.35	0.70	0.04	0.13		0.22		0.22		0.15	45.6
	11.0		95.25	0.80	0.11	0.36		0.51		0.51		0.41	45.8
	12.0		95.05	1.00	0.09	0.30		0.43		0.43		0.43	54.6
	13.0		94.90	1.15	0.11	0.36		0.51		0.51		0.59	54.8
	14.0		95.10	0.95	0.06	0.20		0.31		0.31		0.29	56.6
	15.0		95.15	0.90	0.02	0.07		0.11		0.11		0.10	56.6
	16.0		95.05	1.00	0.02	0.07		0.11		0.11		0.11	54.7
	17.0		95.15	0.90	0.02	0.07		0.11		0.11		0.10	54.6
	18.0		95.25	0.80	0.01	0.03		0.06		0.06		0.04	54.6
	19.0		95.35	0.70	0.01	0.03		0.06		0.06		0.04	52.6
	20.0		95.50	0.55	-0.04	-0.13		-0.22		-0.22		-0.12	34.6
	21.0		95.75	0.30	-0.06	-0.20		-0.31		-0.31		-0.09	32.7
	22.0		96.03	0.02	-0.08	-0.26		-0.39		-0.39		-0.01	23.9
	23.0		96.05	0.00	0.00	0.00		0.00		0.00		0.00	22.9
	23.5		96.04	0.01	0.00	0.00		0.00		0.00		0.00	22.9
	24.0		95.95	0.10	0.00	0.00		0.00		0.00		0.00	22.9
	24.5		95.95	0.10	0.00	0.00		0.00		0.00		0.00	22.9
	25.0		95.90	0.15	-0.01	-0.03		-0.06		-0.06		0.00	22.9
	25.5		95.95	0.10	0.00	0.00		0.00		0.00		0.00	22.9
RWE	26.1		96.05	0.00	0.00	0.00		0.00		0.00		0.00	22.9

19-Jul-07

	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate

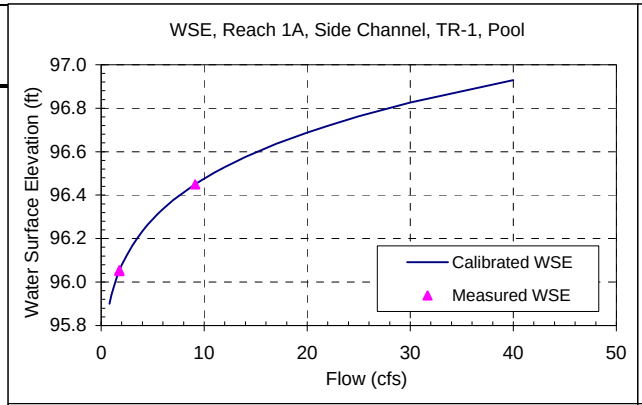
20-Jul-07

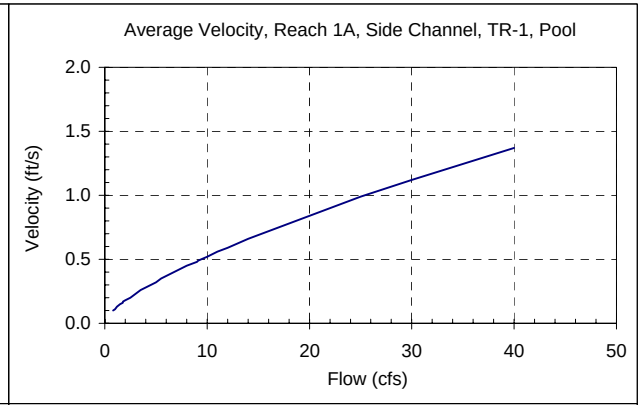
	Sta (ft)	FS (ft)	Ground (ft)	Depth (ft)	$V_{0.2/0.6}$	$V_{0.8}$	$NV_{0.2/0.6}$	$NV_{0.8}$	Ave	Angle (deg)	q (cfs)	substrate

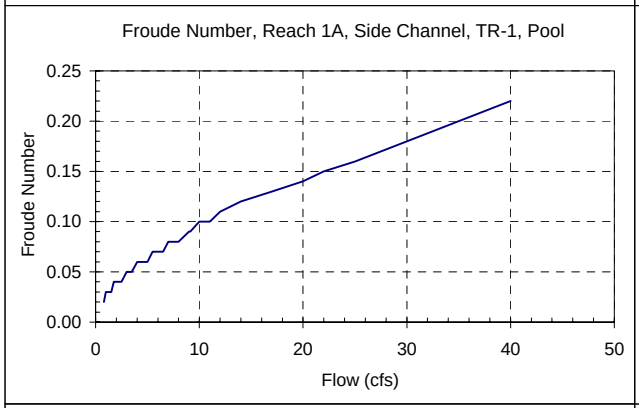


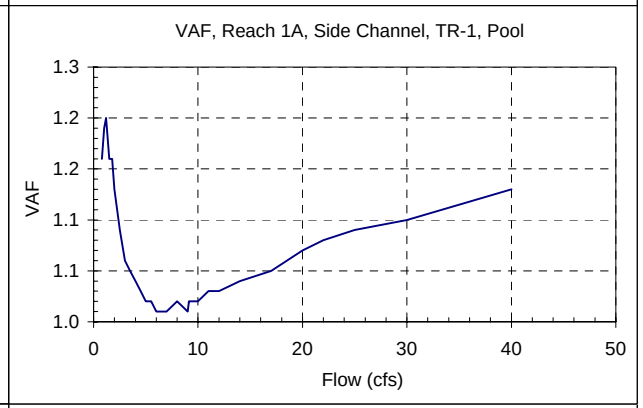
Stream: Sultan R.
Site: Reach 1A Side Channel 1
Habitat: Pool
Transect: 1

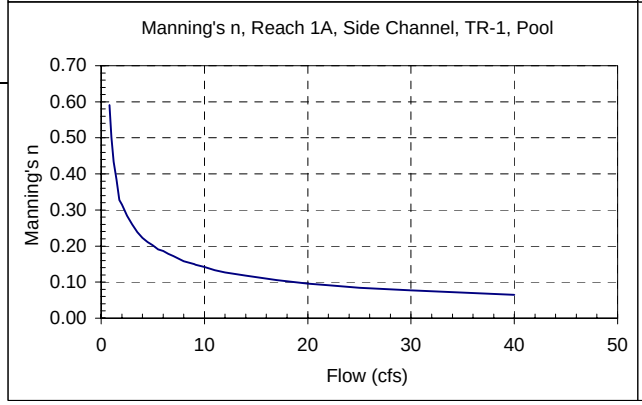
Q (cfs)	Calibrated WSE (ft)	Froude Number (Fr)	Average Velocity (ft/sec)	VAF	Manning's n	Wetted perimeter (ft)
0.8	95.90	0.02	0.10	1.16	0.591	13.9
1	95.94	0.03	0.11	1.19	0.502	15.0
1.2	95.97	0.03	0.13	1.20	0.434	16.1
1.5	96.02	0.03	0.15	1.16	0.384	17.0
1.75	96.05	0.04	0.16	1.16	0.333	18.9
1.78	96.05	0.04	0.17	1.16	0.327	18.9
2	96.08	0.04	0.18	1.13	0.315	19.1
2.5	96.13	0.04	0.20	1.09	0.284	19.5
3	96.17	0.05	0.23	1.06	0.260	19.8
3.5	96.20	0.05	0.26	1.05	0.239	19.9
4	96.23	0.06	0.28	1.04	0.223	20.0
4.5	96.26	0.06	0.30	1.03	0.211	20.1
5	96.29	0.06	0.32	1.02	0.202	20.3
5.5	96.31	0.07	0.35	1.02	0.191	20.3
6	96.34	0.07	0.37	1.01	0.186	20.5
6.5	96.36	0.07	0.39	1.01	0.178	20.5
7	96.38	0.08	0.41	1.01	0.172	20.6
8	96.41	0.08	0.45	1.02	0.158	20.8
9	96.45	0.09	0.48	1.01	0.150	21.0
9.14	96.45	0.09	0.49	1.02	0.148	21.0
10	96.48	0.10	0.52	1.02	0.142	21.3
11	96.50	0.10	0.56	1.03	0.133	21.4
12	96.53	0.11	0.59	1.03	0.127	21.7
14	96.58	0.12	0.66	1.04	0.118	22.0
17	96.64	0.13	0.75	1.05	0.106	22.4
20	96.69	0.14	0.84	1.07	0.096	22.8
22	96.72	0.15	0.90	1.08	0.091	23.0
25	96.76	0.16	0.99	1.09	0.084	23.3
30	96.83	0.18	1.12	1.10	0.077	23.8
40	96.93	0.22	1.37	1.13	0.065	24.4

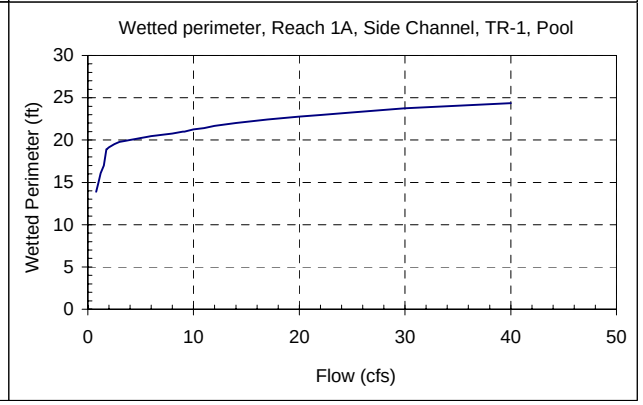


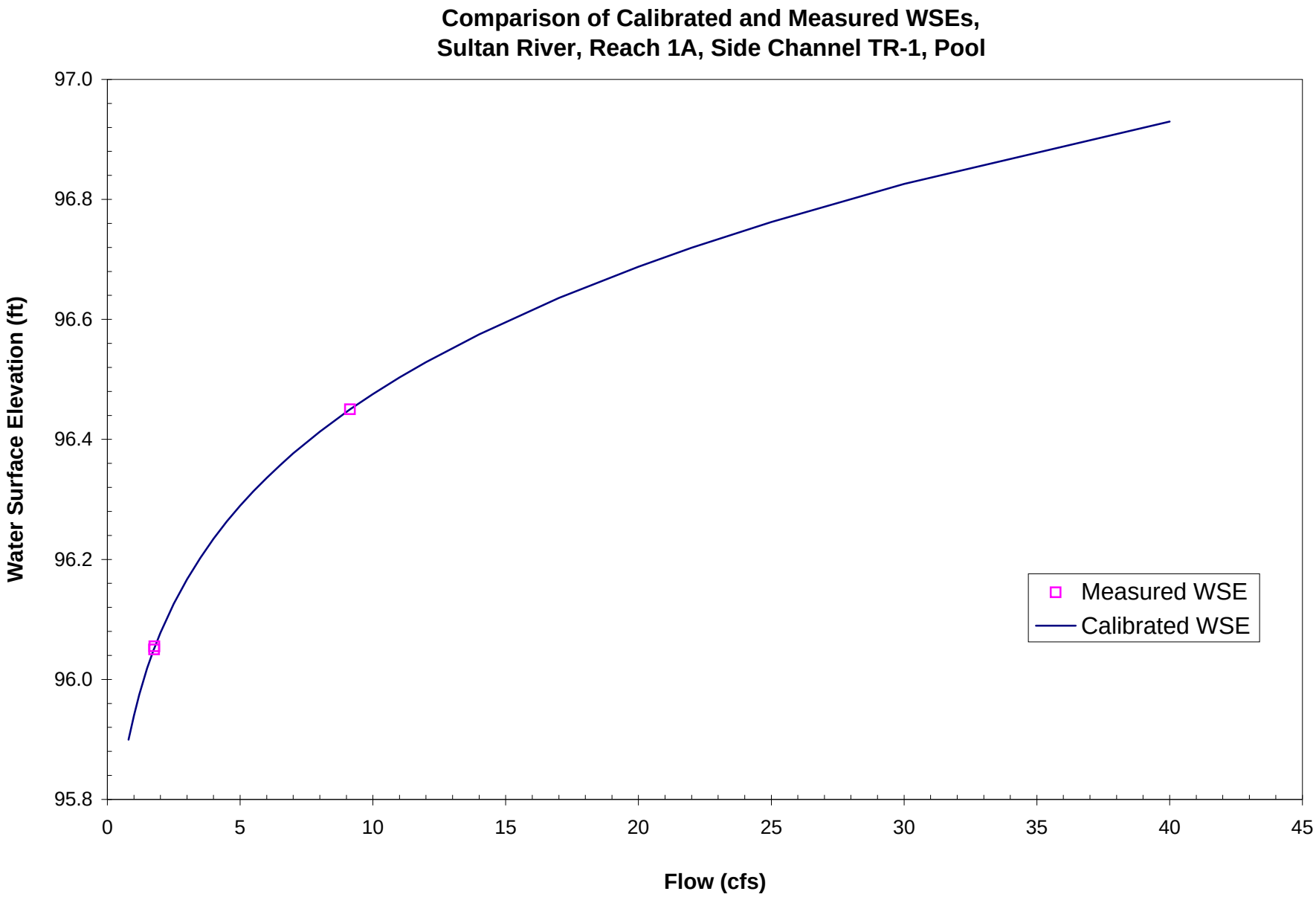











Comparison of Calibrated and Measured WSEs,
Sultan River, Reach 1A, Side Channel TR-1, Pool
Water Surface Elevation (ft)
97.0
96.8
96.6
96.4
96.2
96.0
95.8
0
5
10
15
20
25
30
35
40
45
Flow (cfs)
Measured WSE
Calibrated WSE