

21.1

PLAN: EXIST V1		CRANKY CREEK		CRANKY	RS: 1000	PROFILE: 25 YR	
E.G. US. (FT)	1204.53	ELEMENT		INSIDE BR US		INSIDE BR DS	
W.S. US. (FT)	1204.03	E.G. ELEV (FT)		1204.50		1204.32	
Q TOTAL (CFS)	25662	W.S. ELEV (FT)		1203.97		1203.28	
Q BRIDGE (CFS)	25662	CRIT W.S. (FT)		1186.17		1191.43	
Q WEIR (CFS)		MAX CHL DPTH (FT)		32.19		29.91	
WEIR STA LFT (FT)		VEL TOTAL (FT/S)		5.48		7.48	
WEIR STA RGT (FT)		FLOW AREA (SQ FT)		4686.17		3429.93	
WEIR SUBMERG		FROUDE # CHL		0.21		0.34	
WEIR MAX DEPTH (FT)		SPECIF FORCE (CU FT)		62751.80		41318.45	
MIN EL WEIR FLOW (FT)	1215.67	HYDR DEPTH (FT)		17.35		11.31	
MIN EL PRS (FT)	1213.47	W.P. TOTAL (FT)		408.23		409.17	
DELTA EG (FT)	0.27	CONV. TOTAL (CFS)		1098487.00		693833.00	
DELTA WS (FT)	0.76	TOP WIDTH (FT)		270.15		303.19	
BR OPEN AREA (SQ FT)	6407.08	FRCTN LOSS (FT)		0.02		0.04	
BR OPEN VEL (FT/S)	7.48	C & E LOSS (FT)		0.16		0.03	
BR SLUICE COEF		SHEAR TOTAL (LB/SQ FT)		0.39		0.72	
BR SEL METHOD	ENERGY ONLY	POWER TOTAL (LB/FT S)		2.14		5.36	

21.2

PLAN: EXIST V1		CRANKY CREEK		CRANKY	RS: 1000	PROFILE: 100 YR	
E.G. US. (FT)	1212.20	ELEMENT		INSIDE BR US		INSIDE BR DS	
W.S. US. (FT)	1211.49	E.G. ELEV (FT)		1212.16		1212.01	
Q TOTAL (CFS)	44067	W.S. ELEV (FT)		1211.38		1210.81	
Q BRIDGE (CFS)	44067	CRIT W.S. (FT)		1191.30		1197.92	
Q WEIR (CFS)		MAX CHL DPTH (FT)		39.60		37.43	
WEIR STA LFT (FT)		VEL TOTAL (FT/S)		6.30		7.55	
WEIR STA RGT (FT)		FLOW AREA (SQ FT)		6992.49		5834.91	
WEIR SUBMERG		FROUDE # CHL		0.23		0.32	
WEIR MAX DEPTH (FT)		SPECIF FORCE (CU FT)		110565.00		81295.44	
MIN EL WEIR FLOW (FT)	1215.67	HYDR DEPTH (FT)		20.67		17.37	
MIN EL PRS (FT)	1213.47	W.P. TOTAL (FT)		564.90		535.44	
DELTA EG (FT)	0.28	CONV. TOTAL (CFS)		1693111.00		1231941.00	
DELTA WS (FT)	0.65	TOP WIDTH (FT)		338.34		335.84	
BR OPEN AREA (SQ FT)	6407.08	FRCTN LOSS (FT)		0.02		0.03	
BR OPEN VEL (FT/S)	7.55	C & E LOSS (FT)		0.13		0.06	
BR SLUICE COEF		SHEAR TOTAL (LB/SQ FT)		0.52		0.87	
BR SEL METHOD	ENERGY ONLY	POWER TOTAL (LB/FT S)		3.30		6.57	

21.1

PLAN: PROP V4		CRANKY CREEK		CRANKY	RS: 1000	PROFILE: 25 YR	
E.G. US. (FT)	1204.49	ELEMENT		INSIDE BR US		INSIDE BR DS	
W.S. US. (FT)	1203.99	E.G. ELEV (FT)		1204.47		1204.30	
Q TOTAL (CFS)	25662	W.S. ELEV (FT)		1203.96		1203.29	
Q BRIDGE (CFS)	25662	CRIT W.S. (FT)		1185.92		1191.26	
Q WEIR (CFS)		MAX CHL DPTH (FT)		32.18		29.92	
WEIR STA LFT (FT)		VEL TOTAL (FT/S)		5.40		7.31	
WEIR STA RGT (FT)		FLOW AREA (SQ FT)		4751.72		3511.12	
WEIR SUBMERG		FROUDE # CHL		0.21		0.26	
WEIR MAX DEPTH (FT)		SPECIF FORCE (CU FT)		63740.95		42092.21	
MIN EL WEIR FLOW (FT)	1215.22	HYDR DEPTH (FT)		16.76		11.05	
MIN EL PRS (FT)	1215.88	W.P. TOTAL (FT)		374.58		369.72	
DELTA EG (FT)	0.23	CONV. TOTAL (CFS)		1214979.00		807811.00	
DELTA WS (FT)	0.72	TOP WIDTH (FT)		283.55		317.82	
BR OPEN AREA (SQ FT)	7383.56	FRCTN LOSS (FT)		0.02		0.03	
BR OPEN VEL (FT/S)	7.31	C & E LOSS (FT)		0.15		0.01	
BR SLUICE COEF		SHEAR TOTAL (LB/SQ FT)		0.35		0.60	
BR SEL METHOD	ENERGY ONLY	POWER TOTAL (LB/FT S)		1.91		4.37	

21.2

PLAN: PROP V4		CRANKY CREEK		CRANKY	RS: 1000	PROFILE: 100 YR	
E.G. US. (FT)	1212.13	ELEMENT		INSIDE BR US		INSIDE BR DS	
W.S. US. (FT)	1211.41	E.G. ELEV (FT)		1212.11		1211.96	
Q TOTAL (CFS)	44067	W.S. ELEV (FT)		1211.37		1210.84	
Q BRIDGE (CFS)	44067	CRIT W.S. (FT)		1190.87		1197.27	
Q WEIR (CFS)		MAX CHL DPTH (FT)		39.58		37.47	
WEIR STA LFT (FT)		VEL TOTAL (FT/S)		6.13		7.27	
WEIR STA RGT (FT)		FLOW AREA (SQ FT)		7190.78		6062.03	
WEIR SUBMERG		FROUDE # CHL		0.19		0.25	
WEIR MAX DEPTH (FT)		SPECIF FORCE (CU FT)		112300.80		83012.74	
MIN EL WEIR FLOW (FT)	1215.22	HYDR DEPTH (FT)		20.01		17.00	
MIN EL PRS (FT)	1215.88	W.P. TOTAL (FT)		518.15		478.12	
DELTA EG (FT)	0.23	CONV. TOTAL (CFS)		1873903.00		1424512.00	
DELTA WS (FT)	0.56	TOP WIDTH (FT)		359.32		356.68	
BR OPEN AREA (SQ FT)	7383.56	FRCTN LOSS (FT)		0.03		0.03	
BR OPEN VEL (FT/S)	7.27	C & E LOSS (FT)		0.12		0.04	
BR SLUICE COEF		SHEAR TOTAL (LB/SQ FT)		0.48		0.76	
BR SEL METHOD	ENERGY ONLY	POWER TOTAL (LB/FT S)		2.94		5.51	

20.2

20.1

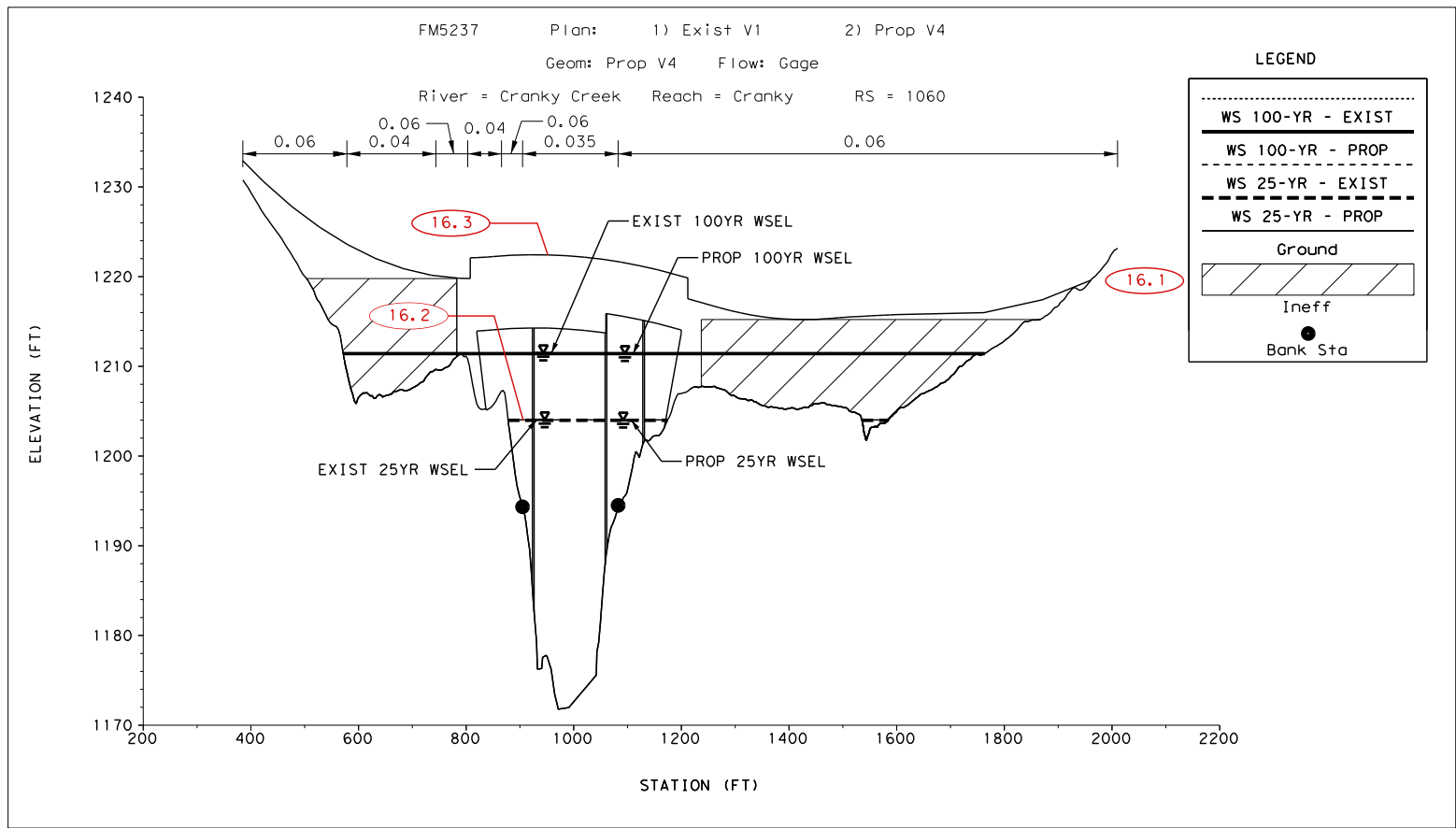
20.5

20.3

REACH	RIVER STA	PROFILE	PLAN	Q TOTAL (cfs)	MIN CH EL (ft)	W.S. ELEV (ft)	ΔW.S. (ft)	CRIT W.S. (ft)	E.G. ELEV (ft)	E.G. SLOPE (ft/ft)	VEL CHNL (ft/s)	ΔVEL CHNL (ft/s)	FLOW AREA (sq ft)	TOP WIDTH (ft)	FROUDE #
CRANKY	1559	25 YR	Exist V1	25662	1173.19	1204.38			1204.73	0.000242	5.36		5925.44	466.87	0.19
CRANKY	1559	25 YR	Prop V4	25662	1173.19	1204.35	-0.03		1204.70	0.000243	5.37	0.01	5909.17	465.03	0.19
CRANKY	1559	100 YR	Exist V1	44067	1173.19	1212.15			1212.45	0.000191	5.67		12964.40	1547.14	0.17
CRANKY	1559	100 YR	Prop V4	44067	1173.19	1212.08	-0.07		1212.38	0.000194	5.70	0.03	12850.44	1527.09	0.17
CRANKY	1302	25 YR	Exist V1	25662	1171.79	1204.41			1204.65	0.000206	4.50		6939.26	563.20	0.17
CRANKY	1302	25 YR	Prop V4	25662	1171.79	1204.37	-0.04		1204.61	0.000207	4.51	0.01	6919.66	555.98	0.17
CRANKY	1302	100 YR	Exist V1	44067	1171.79	1212.18			1212.39	0.000143	4.55		14512.07	1403.68	0.14
CRANKY	1302	100 YR	Prop V4	44067	1171.79	1212.11	-0.07		1212.32	0.000145	4.58	0.03	14409.42	1399.51	0.15
CRANKY	1158	25 YR	Exist V1	25662	1171.89	1204.36			1204.62	0.000173	4.79		7029.09	507.42	0.16
CRANKY	1158	25 YR	Prop V4	25662	1171.89	1204.32	-0.04		1204.58	0.000174	4.80	0.01	7011.33	506.17	0.16
CRANKY	1158	100 YR	Exist V1	44067	1171.89	1212.15			1212.37	0.000135	4.98		14948.92	1281.19	0.15
CRANKY	1158	100 YR	Prop V4	44067	1171.89	1212.08	-0.07		1212.30	0.000137	5.01	0.03	14855.09	1276.47	0.15
CRANKY	1060	25 YR	Exist V1	25662	1171.78	1204.03		1185.96	1204.53	0.000282	5.74		4886.68	346.29	0.20
CRANKY	1060	25 YR	Prop V4	25662	1171.78	1203.99	-0.04	1185.96	1204.49	0.000284	5.75	0.01	4876.01	345.32	0.20
CRANKY	1060	100 YR	Exist V1	44067	1171.78	1211.49		1190.89	1212.20	0.000300	7.06		7728.75	1193.94	0.22
CRANKY	1060	100 YR	Prop V4	44067	1171.78	1211.41	-0.08	1190.89	1212.13	0.000303	7.08	0.02	7746.66	1191.83	0.22
CRANKY	1000			BRIDGE											
CRANKY	925	25 YR	Exist V1	25662	1173.37	1203.27		1191.20	1204.26	0.000797	8.13		3626.06	459.56	0.33
CRANKY	925	25 YR	Prop V4	25662	1173.37	1203.26	-0.01	1191.26	1204.26	0.000798	8.13	0.00	3650.26	459.47	0.33
CRANKY	925	100 YR	Exist V1	44067	1173.37	1210.84		1197.39	1211.92	0.000611	8.90		6425.72	1012.99	0.30
CRANKY	925	100 YR	Prop V4	44067	1173.37	1210.85	0.01	1197.40	1211.90	0.000595	8.79	-0.11	6657.49	1013.34	0.30
CRANKY	806	25 YR	Exist V1	25662	1175.70	1202.90			1204.08	0.000909	9.04		3635.06	496.36	0.35
CRANKY	806	25 YR	Prop V4	25662	1175.70	1202.90	0.00		1204.08	0.000909	9.04	0.00	3635.18	496.37	0.35
CRANKY	806	100 YR	Exist V1	44067	1175.70	1210.89			1211.71	0.000514	8.47		8804.15	770.73	0.28
CRANKY	806	100 YR	Prop V4	44067	1175.70	1210.89	0.00		1211.71	0.000514	8.47	0.00	8804.15	770.73	0.28
CRANKY	579	25 YR	Exist V1	25662	1173.18	1203.20			1203.76	0.000424	6.38		5449.28	536.50	0.24
CRANKY	579	25 YR	Prop V4	25662	1173.18	1203.20	0.00		1203.76	0.000424	6.38	0.00	5449.35	536.51	0.24
CRANKY	579	100 YR	Exist V1	44067	1173.18	1210.99			1211.54	0.000316	6.77		10436.78	795.68	0.22
CRANKY	579	100 YR	Prop V4	44067	1173.18	1210.99	0.00		1211.54	0.000316	6.77	0.00	10436.78	795.68	0.22
CRANKY	288	25 YR	Exist V1	25662	1174.08	1202.91		1188.87	1203.62	0.000450	6.92		4188.08	264.96	0.26
CRANKY	288	25 YR	Prop V4	25662	1174.08	1202.91	0.00	1188.87	1203.62	0.000450	6.92	0.00	4188.08	264.96	0.26
CRANKY	288	100 YR	Exist V1	44067	1174.08	1210.41		1193.58	1211.39	0.000450	8.37		6503.61	427.50	0.27
CRANKY	288	100 YR	Prop V4	44067	1174.08	1210.41	0.00	1193.58	1211.39	0.000450	8.37	0.00	6503.61	427.50	0.27

20.3

REACH	RIVER STA	PROFILE	PLAN	Q TOTAL (cfs)	MIN CH EL (ft)	W.S. ELEV (ft)	ΔW.S. (ft)	CRIT W.S. (ft)	E.G. ELEV (ft)	E.G. SLOPE (ft/ft)	VEL CHNL (ft/s)	ΔVEL CHNL (ft/s)	FLOW AREA (sq ft)	TOP WIDTH (ft)	FROUDE #
CRANKY	1559	25 YR	Exist V1	25662	1173.19	1204.38			1204.73	0.000242	5.36		5925.44	466.87	0.19
CRANKY	1559	25 YR	Prop V4	25662	1173.19	1204.35	-0.03		1204.70	0.000243	5.37	0.01	5909.17	465.03	0.19
CRANKY	1559	100 YR	Exist V1	44067	1173.19	1212.15			1212.45	0.000191	5.67		12964.40	1547.14	0.17
CRANKY	1559	100 YR	Prop V4	44067	1173.19	1212.08	-0.07		1212.38	0.000194	5.70	0.03	12850.44	1527.09	0.17
CRANKY	1302	25 YR	Exist V1	25662	1171.79	1204.41			1204.65	0.000206	4.50		6939.26	563.20	0.17
CRANKY	1302	25 YR	Prop V4	25662	1171.79	1204.37	-0.04		1204.61	0.000207	4.51	0.01	6919.66	555.98	0.17
CRANKY	1302	100 YR	Exist V1	44067	1171.79	1212.18			1212.39	0.000143	4.55		14512.07	1403.68	0.14
CRANKY	1302	100 YR	Prop V4	44067	1171.79	1212.11	-0.07		1212.32	0.000145	4.58	0.03	14409.42	1399.51	0.15
CRANKY	1158	25 YR	Exist V1	25662	1171.89	1204.36			1204.62	0.000173	4.79		7029.09	507.42	0.16
CRANKY	1158	25 YR	Prop V4	25662	1171.89	1204.32	-0.04		1204.58	0.000174	4.80	0.01	7011.33	506.17	0.16
CRANKY	1158	100 YR	Exist V1	44067	1171.89	1212.15			1212.37	0.000135	4.98		14948.92	1281.19	0.15
CRANKY	1158	100 YR	Prop V4	44067	1171.89	1212.08	-0.07		1212.30	0.000137	5.01	0.03	14855.09	1276.47	0.15
CRANKY	1060	25 YR	Exist												



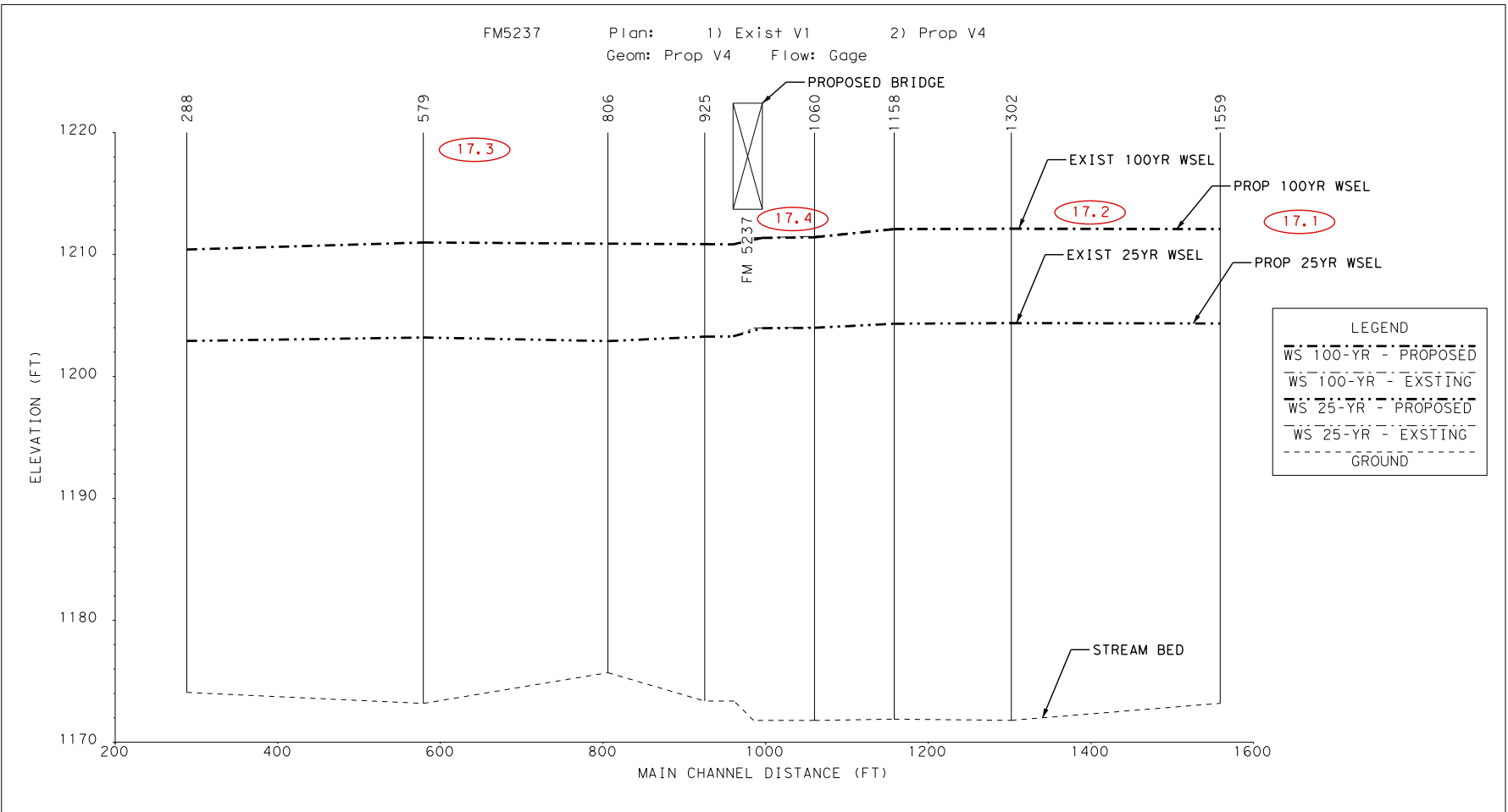
HEC-RAS CROSS SECTION PLOT 16

18 NOTE TO DESIGNER: INCLUDE DOWNSTREAM RATING CURVE (TAILWATER ELEVATION (FT) (Y-AXIS) VS DISCHARGE (CFS) (X-AXIS)) IF USED AS DOWNSTREAM BOUNDARY CONDITION.

NOTES:

- 29 30
- 22 23 27
- 31
- 24
- 26 *
- 20.4 25
- 32 33
1. WATER SURFACE ELEVATION COMPUTED USING HEC-RAS VERSION 5.0.7, STEADY STATE, 1D MODELING.
 2. TERRAIN DATA SOURCE: 2019 LIDAR DATA (1-METER WEST TEXAS LIDAR SET FROM TEXAS NATURAL RESOURCES INFORMATION SYSTEM (TNRIS). FIELD SURVEY OBTAINED MARCH 23, 2022. ALL ELEVATIONS BASED ON NAVD88 VERTICAL DATUM.
 3. THE TAILWATER WAS DETERMINED USING NORMAL DEPTH COMPUTATION WITH A SLOPE OF 0.00045 FT/FT. AT RS 288.
 4. AS SHOWN ON FEMA FIRM PANEL 48000C0000Z, THIS CROSSING IS NOT LOCATED IN A MAPPED FLOODPLAIN OR SPECIAL FLOOD HAZARD AREA.
 5. COORDINATION WITH THE BADLANDS COUNTY FLOODPLAIN ADMINISTRATOR WAS COMPLETED ON DECEMBER 24, 2023.
 6. BASED ON ANALYSIS OF EXISTING AND PROPOSED CONDITIONS, THERE ARE NO SIGNIFICANT ADVERSE IMPACTS ANTICIPATED AS A RESULT OF THE PROJECT.
 7. SEE DRAINAGE REPORT "HYDRAULIC ANALYSIS: FM 5237 AT CRANKY CREEK" DATED JULY 4, 2023 BY KRYPTON CONSULTANTS, FOR ADDITIONAL INFORMATION.

* MAY BE OMITTED IF OUTSIDE OF FEMA SPECIAL FLOOD HAZARD AREA.



HEC-RAS PROFILE PLOT 17

x REFERENCE ITEM ON PBLR H&H CHECKLIST

28 EXISTING NBI#: 99-255-0-9999-00-001
PROPOSED NBI#: 99-255-0-9999-00-101



FM 5237 AT
CRANKY CREEK
HYDRAULIC DATA

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FED. RD. DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	9999	99	9999	FM 5237
STATE	DISTRICT	COUNTY	SHEET No.	
TEXAS	DMY	BADLANDS		