Spook Hill ADMP Update

Flood Control District of Maricopa County

Appendix A
Volume 4

Design Alternative Analysis
Level I
Concept Analysis & Cost Estimation

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Registered Professional Engineer (Civil)
CERTIFICATE NO.
28615
RICHARD L.
HINER
Date Signed 9-20-02
ARIZONA U.S.A.

Spook Hill Area Drainage Master Plan Update

Flood Control District of Maricopa County

List of Appendices

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Appendix A

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Volume 2	SCS TR-20 Hydrology Analysis
Volume 3	TR-20 Hydrology Analysis
Volume 4	Design Alternative Analysis – Level I
Volume 5	Design Alternative Analysis – Level II
Volume 6	No-Action/Non-Structural Alternative Analysis
Volume 7	Conveyance Material Analysis
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Appendix B

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Volume 7A	HEC-1 Modeling Output Files (Level II)
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Spook Hill ADMS Update

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Contract FCD XX-XX

June 14, 2000

W/P No. 99989

Design Alternative Analysis
Design Guidelines

Channel/Conduit	Flow Rate	Allowable Velocity	Depth	Froude Number	Max Side Slope, H:V	Min Freeboard	Mannings "n"
Concrete Lined	HEC-1	<15 fps (b)	N/A	(d)	Vertical	1' Sub, 2' Super	0.015
Dirt Channel	HEC-1	<5 fps (b)	N/A	<0.86	4:1	1' Sub, 2' Super (e)	0.025
RGRCP/Box	HEC-1	<15 fps	(c)	N/A	N/A	N/A	0.012

Note:

(a) - Based on model prepared by Wood/Patel.

(b) - Velocity for concrete channel from FCDMC, Hydraulics Manual, Table 6.3.

(c) - From open channel flow to slightly into pressure flow.

(d) - Subcritical flows <0.86, Supercritical flows 1.13<=Fr<=2.0.

(e) - Min FB = 1' for subcritical flow regime and 2' for supercritical. Freeboard at drops to be increased to 3.0'.

Spook Hill ADMS Update
Flood Control District of Maricopa County
FCD 99-43

May 3, 2001
W/P # 99989

Unit Costs for Preliminary Cost Analysis

ITEM	ITEM DESCRIPTION	UNIT	UNIT PRICE		
202-1	MOBILIZATION	LS	$222,664		
215-1	EARTHEN CHANNEL EXCAVATION	CY	$4		
215-2	BASIN EXCAVATION	CY	$4		
220-1	RIPRAP CONSTRUCTION (TYPE I)	CY	$40		
220-2	RIPRAP CONSTRUCTION (TYPE II)	CY	$75		
430-4	DECOMPOSED GRANITE	SY	$3.40		
430-5	CONCRETE HEADER	LF	$6		
505-14	CONCRETE LINED CHANNEL INCLUDING STEEL	CY	$310		
505-15	CONCRETE SIDEWALK	SF	$3		
525-1	PNEUMATICALLY PLACED MORTAR	SY	$20		
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (144")	LF	$418	$355	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (132")	LF	$385	$330	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (120")	LF	$300	$257	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (108")	LF	$225	$195	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (102")	LF	$215	$185	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (96")	LF	$205	$177	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (90")	LF	$185	$160	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (84")	LF	$178	$152	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (78")	LF	$167	$145	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (72")	LF	$162	$142	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (66")	LF	$152	$132	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (60")	LF	$122	$107	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (54")	LF	$112	$97	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (48")	LF	$92	$85	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (42")	LF	$85	$75	CMP Galvanized
	STORM DRAIN TRUNK LINE PIPE CMP ALT2 (36")	LF	$72	$65	CMP Galvanized
618-1	STORM DRAIN TRUNK LINE PIPE RGRCP (114")/CIPP (120")	LF	$373		
618-2	STORM DRAIN TRUNK LINE PIPE RGRCP (102")/CIPP (108")	LF	$325		
618-3	STORM DRAIN TRUNK LINE PIPE RGRCP (90")/CIPP (96")	LF	$310		
618-4	STORM DRAIN TRUNK LINE PIPE RGRCP (78")/CIPP (84")	LF	$285		
	STORM DRAIN TRUNK LINE PIPE RGRCP (132")	LF	$640		
	STORM DRAIN TRUNK LINE PIPE RGRCP (120")	LF	$560		
	STORM DRAIN TRUNK LINE PIPE RGRCP (108")	LF	$490		
618-5	STORM DRAIN TRUNK LINE PIPE RGRCP (102")	LF	$445		
	STORM DRAIN TRUNK LINE PIPE RGRCP (96")	LF	$390		
618-6	STORM DRAIN TRUNK LINE PIPE RGRCP (90")	LF	$335		
	STORM DRAIN TRUNK LINE PIPE RGRCP (84")	LF	$300		
618-7	STORM DRAIN TRUNK LINE PIPE RGRCP (78")	LF	$265		
	STORM DRAIN TRUNK LINE PIPE RGRCP (72")	LF	$240		
	STORM DRAIN TRUNK LINE PIPE RGRCP (66")	LF	$210		
618-8	STORM DRAIN TRUNK LINE PIPE RGRCP (60")	LF	$184		
	STORM DRAIN TRUNK LINE PIPE RGRCP (54")	LF	$160		
618-9	STORM DRAIN TRUNK LINE PIPE RGRCP (48")	LF	$136		
618-10	STORM DRAIN TRUNK LINE PIPE RGRCP (42")	LF	$115		
	STORM DRAIN LATERAL PIPE RGRCP (36")	LF	$95		
	STORM DRAIN LATERAL PIPE RGRCP (30")	LF	$80		
618-11	STORM DRAIN LATERAL PIPE RGRCP (24")	LF	$70		
618-12	STORM DRAIN LATERAL PIPE RGRCP (18")	LF	$60		
625-1	STORM DRAIN MANHOLE MAG 521 AND 522	EA	$6,000		
625-2	STORM DRAIN MANHOLE MAG 520 AND MAG 522	EA	$5,000		
625-3	STORM DRAIN MANHOLE COP P-1560 AND MAG 522	EA	$7,000		

Note: CMP costs are from Brian Roche at CONTECH 8/1/00
ALT2 - Aluminized Type 2 CMP
CMP Cost Installled with Cconcrete Paved Invert.

Table 1

McDowell Road Alignment

Level I Concept Analysis Opinion of Probable Costs

Option No.	Alternate Description	Opinion of Probable Costs Including Contingencies			Total Cost
		Major Elements	Additional Elements	Land Acquisitions Basins and R/W	
1A - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. No Basin at Oak St and Hawes Rd. No Storm Drain System in Oak Street. Two Basins	$6,034,446	$2,529,073	$3,357,189	**$11,920,708**
2A - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. No Basin at Oak St and Hawes Rd. No Storm Drain System in Oak Street. Two Basins	$6,924,193	$1,439,356	$3,217,953	**$11,581,502**
3A - CMP Pipe	CMP Pipe System to Sossaman Rd. Concrete Outfall Channel to West. No Basin at Oak St and Hawes Rd. No Storm Drain System in Oak Street. Two Basins	$3,108,156	$1,079,975	$632,843	**$4,820,974**
1B - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. Three Basins.	$8,748,571	$3,943,927	$4,722,630	**$17,415,128**
2B - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. Three Basins.	$10,587,920	$2,338,316	$4,513,496	**$17,439,732**
1C - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. Storm Drain in Oak St and McDowell Rd. Three Basins.	$10,204,589	$4,525,164	$5,463,975	**$20,193,727**
2C - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. Storm Drain in Oak St and McDowell Rd. Three Basins.	$13,374,506	$2,516,991	$5,224,796	**$21,116,293**
1D - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$10,379,312	$3,576,261	$7,112,528	**$21,068,101**
2D- Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$11,868,331	$1,939,335	$4,286,185	**$18,093,850**
1E - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. Storm Drain in Oak Street and Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$13,114,161	$4,420,501	$8,004,193	**$25,538,855**
2E - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. Storm Drain in Oak Street and Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$13,814,283	$1,783,847	$5,068,235	**$20,666,365**
1F - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. Southwest Channel from Oak St and Hawes Rd to McDowell west of Sossaman. Two Basins	$11,429,460	$3,922,652	$9,733,550	**$25,085,663**
1F - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. Southwest Channel from Oak St and Hawes Rd to McDowell west of Sossaman. Two Basins	$13,155,497	$1,691,803	$6,881,043	**$21,728,343**

Wood/Patel

Spook Hill ADMS Update July 25, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 1A - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	77,771	$311,084
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	15,345	$2,501,251
4	Splitter Structures	$60,000	EA	5	$300,000
5	Culverts	$310	CY	1,528	$473,680
6	Basin Excavation	$4.00	CY	173,433	$693,733
				SUBTOTAL MAJOR ELEMENTS	$4,279,749
		CONTINGENCIES:			
		Construction		35%	$1,497,912
		Construction Admin		6%	$256,785
				TOTAL MAJOR ELEMENTS	**$6,034,446**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	1,355,990	$1,491,589
2	Fence	$12	LF	24,340	$292,080
3	Utility Relocations	$5,000	EA	2	$10,000
				SUBTOTAL ADDITIONAL ELEMENTS	$1,793,669
		CONTINGENCIES:			
		Construction		35%	$627,784
		Construction Admin		6%	$107,620
				TOTAL ADDITIONAL ELEMENTS	**$2,529,073**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$293,110	AC	7.79	$2,283,327
2	Basin Land Acquisition	$28,280	AC	14.23	$402,424
				SUBTOTAL LAND ACQUISITION	$2,685,751
		CONTINGENCIES :		25%	$671,438
				TOTAL LAND ACQUISITION	**$3,357,189**
				TOTAL	***$11,920,708***

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Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 2A - Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	53,190	$212,760
2	Concrete Channel Lining	$310	CY	7,959	$2,467,290
3	Drop Structures	$163	SF	4,687	$763,932
4	Splitter Structures	$60,000	EA	5	$300,000
5	Culverts	$310	CY	1,526	$473,060
6	Basin Excavation	$4.00	CY	173,433	$693,733
		SUBTOTAL MAJOR ELEMENTS			$4,910,775
		CONTINGENCIES:			
		Construction		35%	$1,718,771
		Construction Admin		6%	$294,647
		TOTAL MAJOR ELEMENTS			**$6,924,193**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	653,400	$718,740
2	Fence	$12	LF	24,340	$292,080
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$1,020,820
		CONTINGENCIES:			
		Construction		35%	$357,287
		Construction Admin		6%	$61,249
		TOTAL ADDITIONAL ELEMENTS			**$1,439,356**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$430,940	AC	5.04	$2,171,938
2	Basin Land Acquisition	$28,280	AC	14.23	$402,424
		SUBTOTAL LAND ACQUISITION			$2,574,362
		CONTINGENCIES :		25%	$643,591
		TOTAL LAND ACQUISITION			**$3,217,953**
				TOTAL	***$11,581,502***

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FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 3A - CMP Pipe

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	16,255	$65,020
2	Concrete Channel Lining	$310	CY	1,708	$529,480
3	Drop Structures	$163	SF	2,795	$455,552
4	Splitter Structures	$60,000	EA	5	$300,000
5	Culverts	$310	CY	518	$160,580
6	Basin Excavation	$4.00	CY	173,433	$693,733
7	102" CMP Pipe	$250.00	LF	1,000	$250,000
8	90" CMP Pipe	$211.00	LF	5,280	$1,114,080
9	60" CMP Pipe	$130.00	LF	1,700	$221,000
10	42" CMP Pipe	$65.00	LF	2,140	$139,100
			SUBTOTAL MAJOR ELEMENTS		$2,204,366
		CONTINGENCIES:			
		Construction		35%	$771,528
		Construction Admin		6%	$132,262
			TOTAL MAJOR ELEMENTS		**$3,108,156**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	653,400	$718,740
2	Fence	$12	LF	3,100	$37,200
3	Utility Relocations	$5,000	EA	2	$10,000
			SUBTOTAL ADDITIONAL ELEMENTS		$765,940
		CONTINGENCIES:			
		Construction		35%	$268,079
		Construction Admin		6%	$45,956
			TOTAL ADDITIONAL ELEMENTS		**$1,079,975**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$43,560	AC	2.38	$103,850
2	Basin Land Acquisition	$28,280	AC	14.23	$402,424
			SUBTOTAL LAND ACQUISITION		$506,274
		CONTINGENCIES :		25%	$126,569
			TOTAL LAND ACQUISITION		**$632,843**
				TOTAL	***$4,820,974***

Spook Hill ADMS Update July 25, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 1B - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	167,134	$668,536
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	20,950	$3,414,801
4	Splitter Structures	$60,000	EA	7	$420,000
5	Culverts	$310	CY	1,689	$523,590
6	Basin Excavation	$4.00	CY	294,433	$1,177,733
		SUBTOTAL MAJOR ELEMENTS			$6,204,660
		CONTINGENCIES:			
		Construction		35%	$2,171,631
		Construction Admin		6%	$372,280
		TOTAL MAJOR ELEMENTS			**$8,748,571**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	2,124,210	$2,336,631
2	Fence	$12	LF	37,540	$450,480
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$2,797,111
		CONTINGENCIES:			
		Construction		35%	$978,989
		Construction Admin		6%	$167,827
		TOTAL ADDITIONAL ELEMENTS			**$3,943,927**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$247,200	AC	12.58	$3,109,776
2	Basin Land Acquisition	$28,295	AC	23.62	$668,328
		SUBTOTAL LAND ACQUISITION			$3,778,104
		CONTINGENCIES :		25%	$944,526
		TOTAL LAND ACQUISITION			**$4,722,630**
				TOTAL	***$17,415,128***

Wood/Patel

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FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 2B - Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	84,670	$338,680
2	Concrete Channel Lining	$310	CY	12,861	$3,986,910
3	Drop Structures	$163	SF	6,757	$1,101,310
4	Splitter Structures	$60,000	EA	7	$420,000
5	Culverts	$310	CY	1,563	$484,530
6	Basin Excavation	$4.00	CY	294,433	$1,177,733
		SUBTOTAL MAJOR ELEMENTS			$7,509,163
		CONTINGENCIES:			
		Construction		35%	$2,628,207
		Construction Admin		6%	$450,550
		TOTAL MAJOR ELEMENTS			**$10,587,920**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	1,089,000	$1,197,900
2	Fence	$12	LF	37,540	$450,480
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$1,658,380
		CONTINGENCIES:			
		Construction		35%	$580,433
		Construction Admin		6%	$99,503
		TOTAL ADDITIONAL ELEMENTS			**$2,338,316**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$351,970	AC	8.36	$2,942,469
2	Basin Land Acquisition	$28,295	AC	23.62	$668,328
		SUBTOTAL LAND ACQUISITION			$3,610,797
		CONTINGENCIES :		25%	$902,699
		TOTAL LAND ACQUISITION			**$4,513,496**
				TOTAL	***$17,439,732***

Spook Hill ADMS Update July 25, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 1C - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	213,923	$855,692
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	24,796	$4,041,732
4	Splitter Structures	$60,000	EA	7	$420,000
5	Culverts	$310	CY	2,394	$742,140
6	Basin Excavation	$4.00	CY	294,433	$1,177,733
		SUBTOTAL MAJOR ELEMENTS			$7,237,297
		CONTINGENCIES:			
		Construction		35%	$2,533,054
		Construction Admin		6%	$434,238
		TOTAL MAJOR ELEMENTS			**$10,204,589**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	2,383,760	$2,622,136
2	Fence	$12	LF	48,100	$577,200
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$3,209,336
		CONTINGENCIES:			
		Construction		35%	$1,123,268
		Construction Admin		6%	$192,560
		TOTAL ADDITIONAL ELEMENTS			**$4,525,164**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$28,295	AC	23.62	$668,328
2	Basin Land Acquisition	$211,350	AC	17.52	$3,702,852
		SUBTOTAL LAND ACQUISITION			$4,371,180
		CONTINGENCIES :		25%	$1,092,795
		TOTAL LAND ACQUISITION			**$5,463,975**
				TOTAL	***$20,193,727***

Spook Hill ADMS Update July 25, 2000
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FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 2C - Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	111,750	$447,000
2	Concrete Channel Lining	$310	CY	16,885	$5,234,350
3	Drop Structures	$163	SF	9,004	$1,467,652
4	Splitter Structures	$60,000	EA	7	$420,000
5	Culverts	$310	CY	2,383	$738,730
6	Basin Excavation	$4.00	CY	294,433	$1,177,733
		SUBTOTAL MAJOR ELEMENTS			$9,485,465
		CONTINGENCIES:			
		Construction		35%	$3,319,913
		Construction Admin		6%	$569,128
		TOTAL MAJOR ELEMENTS			**$13,374,506**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	1,089,000	$1,197,900
2	Fence	$12	LF	48,100	$577,200
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$1,785,100
		CONTINGENCIES:			
		Construction		35%	$624,785
		Construction Admin		6%	$107,106
		TOTAL ADDITIONAL ELEMENTS			**$2,516,991**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$286,420	AC	12.26	$3,511,509
2	Basin Land Acquisition	$28,295	AC	23.62	$668,328
		SUBTOTAL LAND ACQUISITION			$4,179,837
		CONTINGENCIES :		25%	$1,044,959
		TOTAL LAND ACQUISITION			**$5,224,796**
				TOTAL	***$21,116,293***

Spook Hill ADMS Update July 25, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 1D - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	231,815	$927,260
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	28,286	$4,610,634
4	Splitter Structures	$60,000	EA	5	$300,000
5	Culverts	$310	CY	2,572	$797,320
6	Basin Excavation	$4.00	CY	181,500	$726,000
		SUBTOTAL MAJOR ELEMENTS			$7,361,214
		CONTINGENCIES:			
		Construction		35%	$2,576,425
		Construction Admin		6%	$441,673
		TOTAL MAJOR ELEMENTS			**$10,379,312**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	1,924,250	$2,116,675
2	Fence	$12	LF	34,140	$409,680
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$2,536,355
		CONTINGENCIES:			
		Construction		35%	$887,724
		Construction Admin		6%	$152,181
		TOTAL ADDITIONAL ELEMENTS			**$3,576,261**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$408,342	AC	12.75	$5,206,361
2	Basin Land Acquisition	$33,611	AC	14.39	$483,662
		SUBTOTAL LAND ACQUISITION			$5,690,023
		CONTINGENCIES :		25%	$1,422,506
		TOTAL LAND ACQUISITION			**$7,112,528**
				TOTAL	***$21,068,101***

Spook Hill ADMS Update July 25, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 2D - Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	130,907	$523,628
2	Concrete Channel Lining	$310	CY	12,179	$3,775,490
3	Drop Structures	$163	SF	14,971	$2,440,208
4	Splitter Structures	$60,000	EA	5	$300,000
5	Culverts	$310	CY	2,103	$651,930
6	Basin Excavation	$4.00	CY	181,500	$726,000
		SUBTOTAL MAJOR ELEMENTS			$8,417,256
		CONTINGENCIES:			
		Construction		35%	$2,946,040
		Construction Admin		6%	$505,035
		TOTAL MAJOR ELEMENTS			**$11,868,331**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	868,850	$955,735
2	Fence	$12	LF	34,140	$409,680
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$1,375,415
		CONTINGENCIES:			
		Construction		35%	$481,395
		Construction Admin		6%	$82,525
		TOTAL ADDITIONAL ELEMENTS			**$1,939,335**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$384,502	AC	7.66	$2,945,285
2	Basin Land Acquisition	$33,611	AC	14.39	$483,662
		SUBTOTAL LAND ACQUISITION			$3,428,948
		CONTINGENCIES :		25%	$857,237
		TOTAL LAND ACQUISITION			**$4,286,185**
				TOTAL	***$18,093,850***

Spook Hill ADMS Update
Flood Control District of Maricopa County
FCD 99-43

July 25, 2000
W/P # 99989

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 1E - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	295,104	$1,180,416
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	36,012	$5,869,907
4	Splitter Structures	$60,000	EA	5	$300,000
5	Culverts	$310	CY	3,950	$1,224,500
6	Basin Excavation	$4.00	CY	181,500	$726,000
		SUBTOTAL MAJOR ELEMENTS			$9,300,823
		CONTINGENCIES:			
		Construction		35%	$3,255,288
		Construction Admin		6%	$558,049
		TOTAL MAJOR ELEMENTS			**$13,114,161**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	2,353,370	$2,588,707
2	Fence	$12	LF	44,700	$536,400
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$3,135,107
		CONTINGENCIES:			
		Construction		35%	$1,097,287
		Construction Admin		6%	$188,106
		TOTAL ADDITIONAL ELEMENTS			**$4,420,501**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$281,087	AC	21.06	$5,919,692
2	Basin Land Acquisition	$33,611	AC	14.39	$483,662
		SUBTOTAL LAND ACQUISITION			$6,403,355
		CONTINGENCIES :		25%	$1,600,839
		TOTAL LAND ACQUISITION			**$8,004,193**
				TOTAL	***$25,538,855***

Spook Hill ADMS Update July 25, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 2E - Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	129,034	$516,136
2	Concrete Channel Lining	$310	CY	17,837	$5,529,470
3	Drop Structures	$163	SF	10,998	$1,792,658
4	Splitter Structures	$60,000	EA	5	$300,000
5	Culverts	$310	CY	3,010	$933,100
6	Basin Excavation	$4.00	CY	181,500	$726,000
		SUBTOTAL MAJOR ELEMENTS			$9,797,364
		CONTINGENCIES:			
		Construction		35%	$3,429,077
		Construction Admin		6%	$587,842
		TOTAL MAJOR ELEMENTS			**$13,814,283**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	653,400	$718,740
2	Fence	$12	LF	44,700	$536,400
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$1,265,140
		CONTINGENCIES:			
		Construction		35%	$442,799
		Construction Admin		6%	$75,908
		TOTAL ADDITIONAL ELEMENTS			**$1,783,847**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$256,532	AC	13.92	$3,570,925
2	Basin Land Acquisition	$33,611	AC	14.39	$483,662
		SUBTOTAL LAND ACQUISITION			$4,054,588
		CONTINGENCIES :		25%	$1,013,647
		TOTAL LAND ACQUISITION			**$5,068,235**
				TOTAL	***$20,666,365***

Spook Hill ADMS Update July 25, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 1F - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	246,670	$986,680
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	31,255	$5,094,500
4	Splitter Structures	$60,000	EA	5	$300,000
5	Culverts	$310	CY	3,222	$998,820
6	Basin Excavation	$4.00	CY	181,500	$726,000
		SUBTOTAL MAJOR ELEMENTS			$8,106,000
		CONTINGENCIES:			
		Construction		35%	$2,837,100
		Construction Admin		6%	$486,360
		TOTAL MAJOR ELEMENTS			**$11,429,460**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	2,091,730	$2,300,903
2	Fence	$12	LF	39,260	$471,120
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$2,782,023
		CONTINGENCIES:			
		Construction		35%	$973,708
		Construction Admin		6%	$166,921
		TOTAL ADDITIONAL ELEMENTS			**$3,922,652**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$273,016	AC	26.75	$7,303,178
2	Basin Land Acquisition	$33,611	AC	14.39	$483,662
		SUBTOTAL LAND ACQUISITION			$7,786,840
		CONTINGENCIES :		25%	$1,946,710
		TOTAL LAND ACQUISITION			**$9,733,550**
				TOTAL	***$25,085,663***

Spook Hill ADMS Update July 25, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 2F - Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	110,839	$443,356
2	Concrete Channel Lining	$310	CY	15,382	$4,768,420
3	Drop Structures	$163	SF	12,918	$2,105,634
4	Splitter Structures	$60,000	EA	5	$300,000
5	Culverts	$310	CY	3,183	$986,730
6	Basin Excavation	$4.00	CY	181,500	$726,000
		SUBTOTAL MAJOR ELEMENTS			$9,330,140
		CONTINGENCIES:			
		Construction		35%	$3,265,549
		Construction Admin		6%	$559,808
		TOTAL MAJOR ELEMENTS			**$13,155,497**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	653,400	$718,740
2	Fence	$12	LF	39,260	$471,120
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$1,199,860
		CONTINGENCIES:			
		Construction		35%	$419,951
		Construction Admin		6%	$71,992
		TOTAL ADDITIONAL ELEMENTS			**$1,691,803**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$232,570	AC	21.59	$5,021,186
2	Basin Land Acquisition	$33,610	AC	14.39	$483,648
		SUBTOTAL LAND ACQUISITION			$5,504,834
		CONTINGENCIES :		25%	$1,376,209
		TOTAL LAND ACQUISITION			**$6,881,043**
				TOTAL	***$21,728,343***

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99959 SHEET NO. 1 OF

CALCULATED BY KT DATE 7/11 CHECKED BY DATE

McDowell Road OPTION 1A - DIRT

① BASIN - SAME AS OPTION 1C $870K - 435K

② channel - " " " " $490K - 119K

④ BASIN - " " " " $100K

③a channel

Q= 450, n= 0.025, SS = 4:1, bottom = 15, S= 0.0025, V= 4.96, fn= 0.59, d= 3.23

26-3.1 Drops, L= 4280, Top width (1' fb) = 49 + 16 = 65

1	EX	2978 CY @ $4/CY	=	$119K
3	Drops	26 EA @ $163/SF	=	$631K
4	Fence	8500 LF @ $12/LF	=	$103K
	RW 65x4280	287200 SF @ $1/SF	=	$287K
6	culverts @ 2-6x3 = (220+5.7+6.1)x2	472 CY @ $310/CY	=	$146K
7	L/S 49x4280	SF @ $0.28/SF	=	$59K
				$1,345K - 287K

③b channel

Q= 900, n= 0.025, SS= 4:1, bottom= 25, S= 0.0016, V= 4.95, fn= 0.5, d= 4.31

5-2.9' Drops, L= 1000, Top width (1' fb) = 68 + 16 = 84

1	EX	12229 CY @ $4/CY	=	$49K
3	Drops	5 EA @ $163/SF	=	$162K
4	Fence	2000 LF @ $12/LF	=	$24K
5	RW 84x1000	84000 SF @ $1/SF	=	$84K
6	Culverts (1) 2-10x4 = 20+68+15	229 CY @ $310/CY	=	$71K
7	L/S 68x1000	68000 SF @ $0.28/SF	=	$19K
				$409K - 84K

(10) BASIN SAME AS OPTION 1C $544K - 218K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Speck Hill

PROJECT NO. 99989 SHEET NO. 2 OF 2

CALCULATED BY JGT DATE 7/11 CHECKED BY _____ DATE _____

McDowell Rd Option 1A - Dirt

(11) channel

Q = 2050, n = 0.025, SS = 4:1, bottom = 98, S = 0.0015, V = 5, Fr = 0.99, d = 3.64

20-3 Drops, Length = 1550, Top width = 135 + 16 = 151

✓1. Exc		39092	cy @ $4/cy	= $156 K
✓3. Drops		20	EA @ $67/SF	= 1,337 K
✓4. Fence		3100	LF @ $12/LF	= $37 K
5. RW	151 x 1550	234050	SF @ $1/SF	= $234 K
6. Culverts (1)	5-10x4 = 403+72.5+22.5	518	cy @ $310/cy	= $161 K
✓7. LS	135 x 1550	209,250	SF @ $0.28/SF	= $59 K
				$1,964 K - 234 K

(12) channel - same as option 1C $313 K - 60 K

(13) channel - same as option 1C $256 K - 71 K

Subtraction for RW = 1,509 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 2

CALCULATED BY JJT DATE 7/11 CHECKED BY _____ DATE _____

McDonnell RD Option 1A - Concrete Channel

✓ ① BASIN - same as option 1c $870 K -436K

② channel - " " " " $657 K -81K

✓ ②a Basin - " " " " $100 K

③ channel

Q = 450, n = 0.015, SS = 2:1, bottom = 8, S = 0.011, V = 11.5, Fr = 1.93, d = 2.42

14 - 3.1 Drops, L = 4280, top width (2' fb) = 26 + 16 = 42

✓ 1	Ex	16187	cy @ $4/cy	= $65 K
✓ 2	Conc	2676	cy @ $310/cy	= $830 K
✓ 3	Drops	14	EA @ $163/SF	= $180 K
✓ 4	Fence	8560	LF @ $12/LF	= $103 K
✓ 5	RW 42 x 4280	179760	SF @ $1/SF	= $180 K
✓ 6	Culvert (2) 2-6-3	472	cy @ $310/cy	= $146 K
				$1,504 K -180K

③b channel

Q = 966, n = 0.015, SS = 2:1, bottom = 15, S = 0.0082, V = 14.96, Fr = 1.75, d = 2.89

3-26' Drops, L = 1000, top width = 35 + 16 = 51

✓ 1	Ex	5842	cy @ $4/cy	= $23 K
✓ 2	Conc	794	cy @ $310/cy	= $246 K
✓ 3	Drops	3	EA @ $163/SF	= $44 K
✓ 4	fence	2000	LF @ $12/LF	= $24 K
✓ 5	RW 51 x 1000	51000	SF @ $1/SF	= $51 K
✓ 6	Culvert (1) 2-6x3	236	cy @ $310/cy	= $73 K
				$461 K -51K

✓ ⑩ BASIN - same as option 1c $544K -218K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT: Spook Hill

PROJECT NO. 99969 SHEET NO. 2 OF 2

CALCULATED BY: JBS DATE: 7/11 CHECKED BY: _____ DATE: _____

McDowell RD Option 1A - Concrete

(1) channel

Q = 2650, n = 0.045, SS = 2:1, bottom = 27, S = 0.0051, V = 14.95, Fn = 1.42, d = 3.93

17-3.2 drops, L = 1550, Top width = 51 + 16 = 67

1. Ex		16275 cy @ $4/cy	= $65K	
2. conc		1708 cy @ $310/cy	= $530K	
✓3. Drops		17 EA @ $160/EA	= $456K	
✓4. Fence		3100 LF @ $12/LF	= $37K	
5. R/W	67 x 1550	103850 SF @ $1/SF	= $104K	
6. culverts	5-10x4	518 cy @ $310/cy	= $160K	
			$1,353K	-104K

(1) channel - same as option 1c $431K -61K

(1) channel - same as option 1c $338K -49K

Subtraction for R/W = 1,180K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT: SPGOK HILL
PROJECT NO. 99989 SHEET NO. 1 OF
CALCULATED BY: KGT DATE 7/17/2000 CHECKED BY DATE

McDowell Road — Option 3A Pipe

CMP PIPE

OPTIONS

A - Stand Alone

DEF - comparable

BC - All others comparable

① Basin

② Q pipe = 110, Exist Slope = 0.0247, L = 2140'
S = 0.0247, d = 42", V = 11.97, fn = 0.98, n = 0.02

②a Basin Exist

③a channel - pipe
Q = 564 cfs, Exist Slope = 0.021 ft/ft, L = 4280'
S = 0.021, d = 90", V = 16.1, fn = 1.23, n = 0.023

Add 1/2" to pipe

Create matrix for McDowell
Simplify Elliot - several columns
Add column for which option
addresses all drainage issues.

③ channel - pipe
Q = 900 cfs, Exist slope = 0.023 ft/ft, L = 1000'
S = 0.023, d = 96", V = 16.9 fps, fn = 1.05, n = 0.023

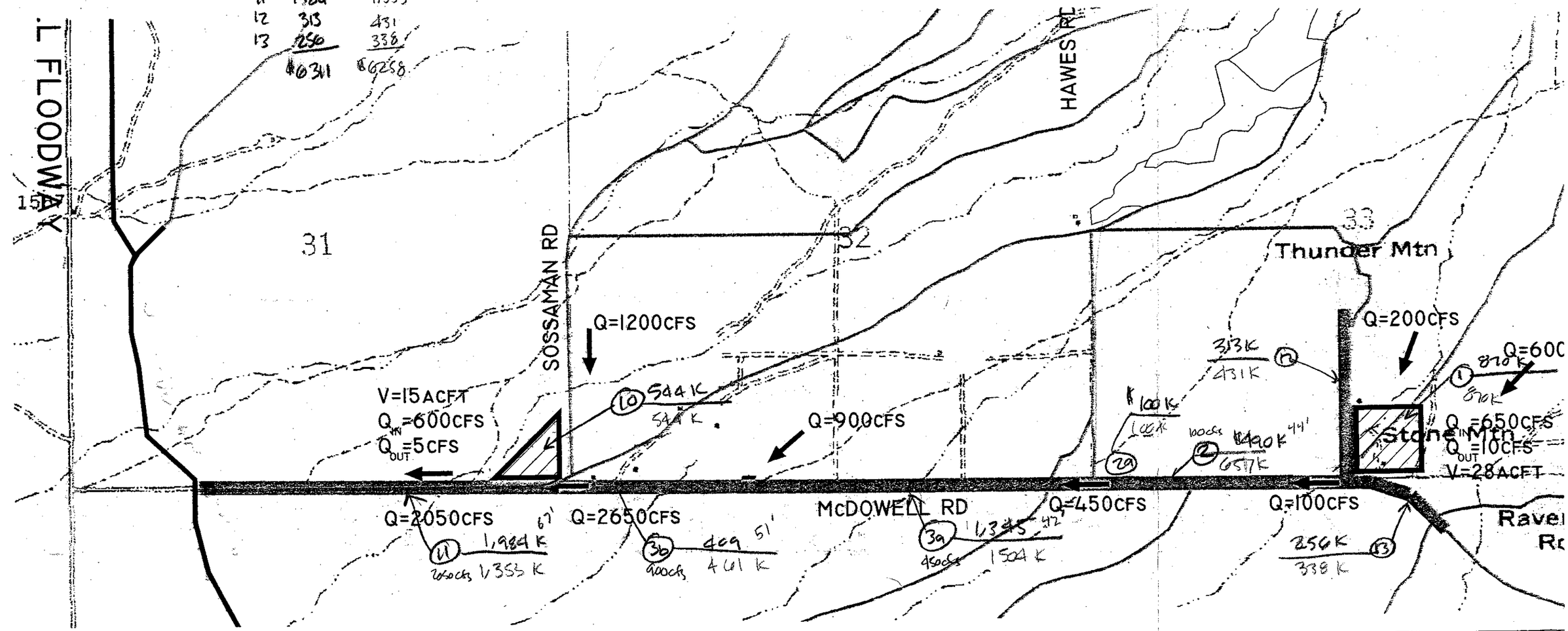
④ Basin

⑪ channel - pipe
Q = 2050, S = 0.01 ft/ft, L = 1550
S = 0.018 MAX
CMP will not work, to steep in this Reach

⑫ channel - pipe
Q = 200 cfs, S = 0.014, L = 1700'
S = 0.014, d = 60", V = 11.02, fn = 0.83, n = 0.021

⑬ channel - pipe
Q = 600 cfs, S = 0.0089, L = 1000'
S = 0.0089, d = 102", V = 11.42, fn = 0.66, n = 0.023

	DIRT	
1	870	870
2	490	657
29	100	100
39	1345	1504
36	409	461
10	500	544
11	1984	1,353
12	313	431
13	256	338
	6311	6258



OPTION 1A – DIRT
– Concrete

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spock Hill
PROJECT NO. 99989 SHEET NO. 1 OF 2
CALCULATED BY JOT DATE 7/16 CHECKED BY _____ DATE _____

McDonell Road Options Option 1B Dirt

✓ ① BASIN - SAME AS OPTION 1C 870 K - 436K

✓ ② CHANNEL - SAME AS OPTION 1C 490 K - 119K

✓ ②a EXIST BASIN - SPLITTER ST. 100 K

✓ ③a channel - SAME AS option 1C } SEE Attached ~~1,022 K~~ - 304 K

✓ ③b channel " " " " ~~346K~~ - 26 K

④ Channel
Q = 150 cfs, n = 0.025, SS = 4:1, bottom = 8, S = 0.0052, V = 5, fn = 0.78, d = 1.91
Ø Drops, Top width (1'fb) = 31 + 16 = 47 L = 2040

✓ 1. EX		9038	CY	@ $4/CY	=	$36 K
✓ 3 DROPS		Ø	SF	@ $103/SF	=	—
✓ 4 FENCE		5280	LF	@ $12/LF	=	$63 K
✓ 5 R/W	47 x 2040	124,080	SF	@ $1/SF	=	$124 K
✓ 6 Culverts (1)	8x3 = 84.1 + 5.1 + 9.1	98.3	CY	@ $310/CY	=	$30 K
✓ 7 VS	31 x 2040	81840	SF	@ $0.28/SF	=	$23 K
						$276 K - 124 K

✓ ⑤ Channel - SAME AS option 1C $1,323 K - 195K

✓ ⑥ BASIN - " " " " $857 K - 436K

✓ ⑦ Channel - " " " " $196 K - 59K

✓ ⑧ BASIN - " " " " $544 K - 218K

⑪ Channel Q = 1700, n = 0.025, SS = 4:1, bottom = 75', S = 0.0015, V = 5, fn = 0.79, d = 3.77
20 - 3' drops, Top width (1'fb) = 113' + 16 = 129', L = 1550

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 2 OF 2

CALCULATED BY JST DATE 7/10 CHECKED BY _____ DATE _____

OPTION 1B DIRT

✓ 1	EX		32,764	CY	@ $4/CY	= $131 K
✓ 3	DROPS		20	EA	@ $ 163/SF	= $1,122 K
✓ 4	FENCE		3100	LF	@ $ 12/LF	= $37 K
✓ 5	RW	129 x 1550	199950	SF	@ $ 1/SF	= $200 K
✓ 6	CULVERTS	(1) 5-10x4 = 483 + 11 + 225	517	CY	@ $ 310/CY	= $160 K
✓ 7	L/S	113 x 1550	175,150	SF	@ $0.28/SF	= $175 K
						$ 1,825 K — 200K

(12) SAME AS OPTION 1C — 313 K — 60K

(13) SAME AS OPTION 1C — 265 K — 71K

Subtraction for R/W = 2,297K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Eastside Hills

PROJECT NO. 99969 SHEET NO. 1 OF 5

CALCULATED BY VJT DATE ____ CHECKED BY 7/7 DATE ____

McDowell Road Option 1b - DIRT CHANNEL

① BASIN

1. EX. 28 Acft x 1.3 @ $4/cy = $234 K
2. LAND 10 AC @ $1/SF = $436 K
3. Splitter St 2 EA @ $100 K = $200 K

$870 K

② channel

Q = ~~110~~ 85 cfs, n = 0.025, SS = 4:1, bottom = ~~8'~~ 1', S = 0.0065, V = ~~4.98~~ 4.8, fn = 0.65, d = 1.54 0.63 d = 1.94

15 - 3' Drops, L = 2640', TOP WIDTH (1' FB) = 28' + 16 = 44'

1. EX 7670 @ $4/cy = $31 K
3. Drops 15 @ $163/SF = $208 K
4. FENCE 5280 @ $12/LF = $63 K
5. R/W 45 x 2640 @ $1/SF = $119 K
6. culverts (2) HW 17.4 6x3', 0.64 cy/LF @ $310/cy = $48 K (85th St. & Sub. Ent.)
7. LANDSCAPING 28 x 2640 @ 0.28/SF = $21 K

$490 K

②a EXIST BASIN

3. SPLITTER ST. 1 EA @ $100 K = $100 K

③a CHANNEL

Q = ~~550~~ 700 cfs, n = 0.025, SS = 4:1, bottom = ~~20'~~ 30', S = 0.0027, V = ~~4.6~~ 4.69, fn = 0.56, d = ~~3.33~~ 0.54 3.31

27 - 3' drops, L = 4280', TOP WIDTH (1' FB) = ~~65'~~ 65' + 16 = ~~79'~~ 81'

1. EX 43130 37553 @ $4/cy = $150 K
3. Drops 194.5 27 @ $168/SF = $728 K
4. FENCE 85600 @ $12/SF = $103 K
5. RW 71' x 4280 @ $1/SF = $304 K
6. Culverts (2) HW = 17.4 = ~~3.31~~ 0.64 2-6x3', 1.48 cy/LF @ $310/cy = $102 K
7. LANDSCAPING 55 x 4280 @ 0.28/SF = $235 K

$1,622 K

ATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

SPCOK HILL

PROJECT NO. 99989 SHEET NO. 2 OF 5

CALCULATED BY JST DATE 7/7 CHECKED BY _____ DATE _____

OPTION ~~X~~ 1b - DIRT

(3b) CHANNEL

Q = ~~700~~ 1100 cfs, n = 0.025, SS = 4:1, bottom = ~~20~~ 60, S = 0.002, V = 5, fn = 0.53, d = 3.9

4-3.5' Drops, L = 1000', Top width (1'FB) = ~~25~~ 93 + 16' Road = ~~135~~ 109

✓ 1. EX	~~15000~~	9,716 cy	@ $4/cy	=	$39K
✓ 3. Drops	383.4	4 EA	@ $163/SF	=	$157K
✓ 4. FENCE		2000	@ $12/SF	=	$24K
✓ 5. R/W	75x1000		@ $1/SF	=	$75K
✓ 6. CULVERTS	(1) HW = 18.7 cy EA culv	8x4, 1.56 cy/LF = ~~133~~ 132/4	@ $310/cy	=	$54K
✓ 7. LANDSCAPE		59x1000	@ $0.28/SF	=	$17K
					$346K

(5) channel

Q = 800 cfs, n = 0.025, SS = 4:1, bottom = 30', S = 0.002, V = 5, fn = 0.55, d = 3.51'

24-3' drops, L = 2640, Top width (1'FB) = 58 + 16' = 74'

✓ 1. EX		28039	cy	@ $4/cy	= $112K
✓ 3. Drops		24	EA	@ $163/SF	= $776K
✓ 4. FENCE		5280	LF	@ $12/SF	= $63K
✓ 5. R/W	74x2640		SF	@ $1/SF	= $195K
6. Culverts HW = 13.4 cy	(1500 cfs) 6x3', 0.69 cy/LF	= 77	cy	@ $310/cy	= $24K
✓ 7. L/S		58x2640	SF	@ $0.28/SF	= $153K
					$1,323K

(6) Channel

Q = 100 cfs, n = 0.025, SS = 4:1, bottom = 10', S = 0.0062, V = 4.7, fn = 0.82, d = 1.38

6-2.7' Drops, L = 1320', Top width (1'FB) = 29' + 16' = 45'

✓ 1. EX		5691	cy	@ $4/cy	= $16K
✓ 3. Drops		6	EA	@ $163/SF	= $78K
✓ 4. FENCE		2640	LF	@ $12/SF	= $32K
5. R/W	45x1320		SF	@ $1/SF	= $59K
7. L/S		29x1320	SF	@ $0.28/SF	= $11K
					$196K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 2

CALCULATED BY JOT DATE 7/10 CHECKED BY _____ DATE _____

OPTION 1B - CONC CHANNEL

✓ ① BASIN SAME AS OPTION 1C - CONC CHAN $870 K -436K

② " " " " " " $657 K - 81K

✓ ②a BASIN " " " " " $100 K

③a " " " " " " $1,991 K -231K

③b SAME AS OPTION 1C - CONC CHAN $430 K -52K

④ Channel

Q=150cfs, n=0.015, SS=2:1, S=0.0053, bottom=4', V=8.6 fps, Fr=1.28, d=2.13

Ø Drops, L=2640, Top width (1'fb) = 17 + 16 = 33'

1.	EX	7129 cy @ $4/cy	=	$29 K
✓ 2.	CONC	1390 cy @ $310/cy	=	$431 K
✓ 3.	DROPS	— EA @ $163/EF	=	—
✓ 4.	FENCE	5280 LF @ $12/LF	=	$63 K
✓ 5.	RW 33x2640	87120 SF @ $1/SF	=	$87 K
✓ 6.	CULVERTS ① 6x3 = 63.5+4.8+8.6	77 cy @ $310/cy	=	$24 K
				$634 K -87K

⑤ SAME AS OPTION 1C - CONC CHAN $1266K -140K

✓ ⑥ BASIN " " " " " " $867 K -436K

⑦ CHAN - " " " " " " $322 K - 48K

⑧ BASIN " " " " $544 K - 218K

WOOD/PATEL

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PROJECT Sopack Hill

PROJECT NO. 99989 SHEET NO. 2 OF 2

CALCULATED BY VST DATE 7/10 CHECKED BY _____ DATE _____

OPTION 1B- conc Channel

(11) channel

Q = 1700 cfs, n = 0.05, SS = 2:1, bottom = 21, S = 0.0054, V = 14.95, Fn = 1.49, d = 3.94

18-3' Drops, L = 1550, top width (2'fb) = 45 + 16 = 61

✓ 1. EX	13896	cy @ $4/cy	=	$56K
2. Conc	1537	cy @ $310/cy	=	$477 K
✓ 3. Drops	18	EA @ $163/SF	=	$399 K
✓ 4. Fence	3100	LF @ $12/LF	=	$37 K
✓ 5. R/W 61 × 1550	94550	SF @ $1/SF	=	$95 K
6. Culverts (1) 4-10xd = 391 + 11.2 + 20	422	cy @ $310/cy	=	$130 K
			$1,194	−95K

Same As option 1c — 431 K −61K

(13) " " " " — 338 K −45K

Subtraction for R/W = 1,930K

WOOD/PATEL

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PROJECT Speak Hill

PROJECT NO. 99989 SHEET NO. 1 OF 5

CALCULATED BY JCT DATE 7/7 CHECKED BY _____ DATE _____

McDowell Road Option 1b - Concrete Channel

① BASIN

1. EX	28Ac x1.3		@ $4/cy	= $234K
2. LAND		10Ac	@ $1/SF	= $436K
3. SPLITTER ST.		2EA	@ $100K/EA	= $200 K
				$870K

② CHANNEL

Q=110 cfs, n=0.015 SS=2:1, bottom=10', S=0.0145, V=10, fn=1.98, d=0.92'

8-3.1' Drops, Top width (2'fb) = 22+16 = 38', L=2140

1. Ex		5543	@ $4/cy	= $22K
2. concrete		1152	@ $310/cy	= $357K
3. Drops		8	@ $163/SF	= $78K
4. FENCE		5260	@ $12/LF	= $71K
5. R/W	38 x 2140		@ $1/SF	= $81K
6. culverts (2)	6x3, 0.64 cy/LF HW=13.4 cy/culv	155 cy	@ $310/cy	= $48K
				$657K

②a Exist Basin

3. SPLITTER ST		1EA	@ $100K/EA	= $100K

③a Channel

Q=~~550~~ 700 cfs, n=0.015, SS=2:1, bottom=~~20'~~ 15', S=0.0098, V=14.6, fn=1.85, d=2.56

24-2' Drops, Top width (2'fb) = 38+16 = ~~54~~ 49, L=4280

1. Ex		~~22085~~ 27,696	33 @ $4/cy	= 110K	
2. concrete		3224	3691	@ $310/cy	= $1,144K
3. Drops	24	65.3	24	@ $163/SF	= $301K
4. FENCE			8560	@ $12/LF	= $103K
5. R/W		54x4280		@ $1/SF	= $231K
6. Culverts (2)	2-8x3'		329	@ $310/cy	= 102K
	10(197+8.2)		224		$1,991K
	2P(+12				

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WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99969 SHEET NO. 2 OF 5

CALCULATED BY JCT DATE 7/1 CHECKED BY _____ DATE _____

Option ~~Pc~~ 1b - Concrete Channel

(3b) Channel

Q = ~~700~~ 1109 cfs, n = 0.015, SS = 2:1, bottom = ~~20~~ 24, S = 0.011, V = ~~14.5~~ 14.94, fn = ~~1.96~~ 1.98, d = 1.99 1.94

2-2.5' drops, L = 1000', Top width (2'fb) = ~~36~~ 37' + 16 = ~~52~~ 53'

1. EX	8028 ~~5465~~	@ $4/cy		= $22 K
2. Concrete	1067	804	@ $310/cy	= $249 K
3. Drops	2	124.4	2	@ $163/SF = $29 K
4. FENCE		2000	@ $12/LF	= $24 K
5. R/W	52 x 1000		@ $1/SF	= $52 K
6. Culverts (1)	2-8'x4'	~~175~~ 253	@ $310/cy	= $54 K
	225 + 10 + 18			$430 K

(5) Channel

Q = 800 cfs, n = 0.015, SS = 2:1, bottom = 20', S = 0.0098, V = 14.5, fn = 1.87, d = 2.21'

17-3' drops, L = 2640, Top width (2'fb) = 37' + 16 = 53'

1. Ex	15497	@ $4/cy	= $62 K
2. Concrete	2192	@ $310/cy	= $679 K
3. Drops	17	@ $163/SF	= $300 K
4. fence	5280	@ $12/LF	= $63 K
5. R/W	53 x 2640	@ $1/SF	= $140 K
6. Culverts (1) 6'x3'	77	@ $310/cy	= $24 K
			$1,268 K

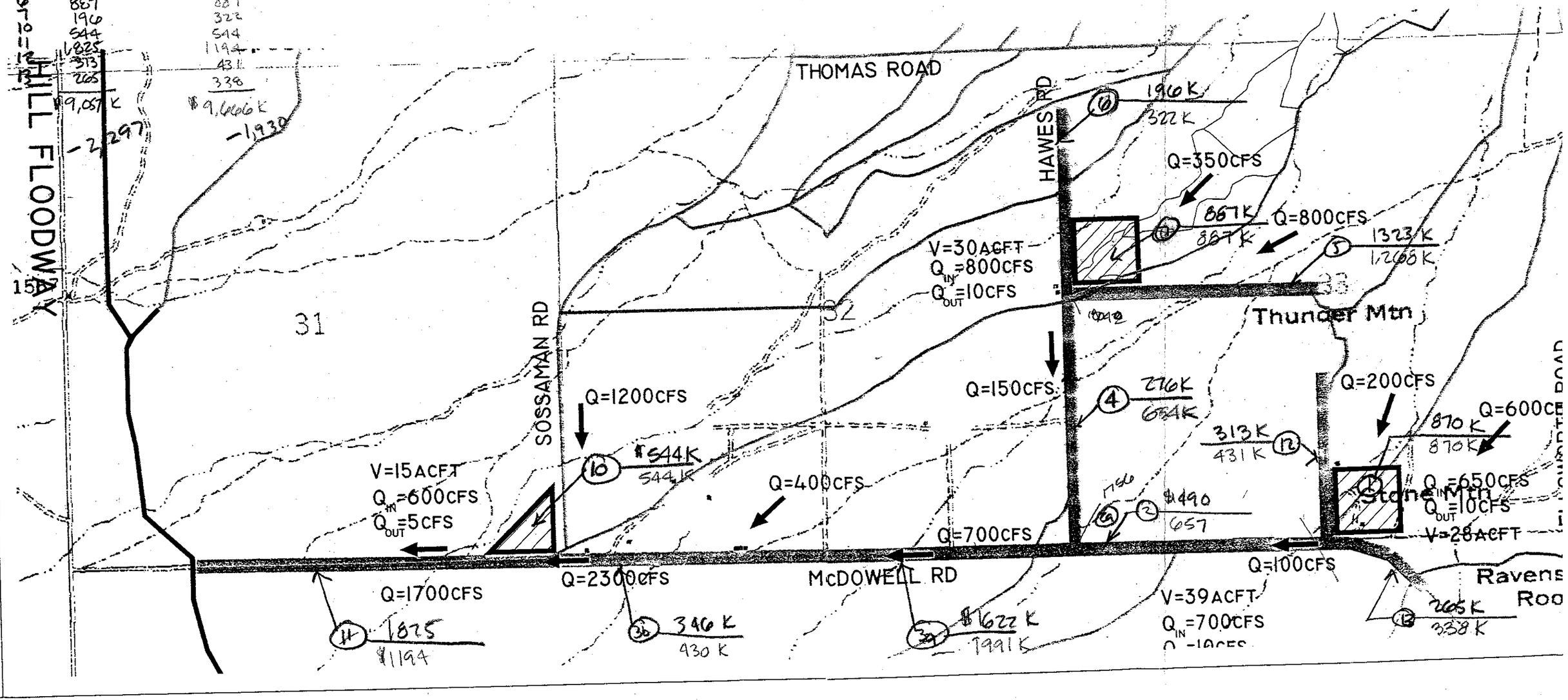
(6) Channel

Q = 100 cfs, n = 0.015, SS = 2:1, bottom = 8', S = 0.0139, V = 10.1, fn = 1.95, d = 1'

3-2.2' Drops, L = 1320', Top width (2'fb) = 20' + 16 = 36'

1. EX	3129	@ $4/cy	= $12 K
2. Concrete	670	@ $310/cy	= $208 K
3. Drops	3	@ $163/SF	= $22 K
4. FENCE	2640	@ $12/LF	= $32 K
5. R/W	36 x 1320	@ $1/SF	= $48 K
			$322 K

	Dirt	Conc
1	870	870
2	490	657
2a	100	100
3a	1622	1991
3b	346	430
4	276	634
5	1323	1268
6	887	887
7	196	322
10	544	544
11	1875	1194
12	313	431
13	265	338
	9,057 K	9,666 K
	-2,297	-1,930



OPTION 1B

OPTION 1B -DIRT
-CONCRETE

WOOD/PATEL

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PROJECT Crisis Hill

PROJECT NO. 99959 SHEET NO. 1 OF 5

CALCULATED BY JST DATE CHECKED BY 7/7 DATE

McDowell Road option 1G - DIRT CHANNEL

① BASIN

✓ 1. EX. 28 Acft x 1.3 @ $4/cy = $234K
✓ 2. LAND 10 AC @ $1/SF = $436K
✓ 3. Splitter St 2 EA @ $100K = $200K
$870K

② channel

Q=116 cfs, n=0.025, SS=4:1, bottom=8', S=0.0065, V=4.98, fn=0.65, d=1.54
15-3' Drops, L=2640', Top width (1' FB) = 28' + 16 = 44'

✓ 1. EX 7670 @ $4/cy = $31 K
✓ 3. Drops 15 @ $13.8/SF = $208 K
✓ 4. FENCE 5280 @ $12/LF = $63 K
✓ 5. R/W 45 x 2640 @ $1/SF = $119 K
✓ 6. culverts (2) 6x3', 0.64 cy/LF HW 13.4/cuw @ $310/cy = $45 K
(85th St. & Sub. Ent.)
✓ 7. LANDSCAPING 28 x 2640 @ 0.28/SF = $21 K
$490 K

②a ✓ EXIST BASIN
3. SPLITTER ST. 1 EA @ $100K = $100 K

③a CHANNEL
Q = ~~520~~ 660 cfs, n=0.025, SS=4:1, bottom=26'. S=0.0022, V=4.96, fn=0.56, d=3.39
27-3' drops, L=4280', Top width (1' FB) = 45' + 16 = 71'

✓ 1. EX 37553 @ $4/cy = $150K
✓ 3. Drops 27 @ $13.8/SF = $726 K
✓ 4. FENCE 8560 @ $12/SF = $103 K
✓ 5. RW 71' x 4280 @ $1/SF = $304 K
✓ 6. culverts (2) 2-8x3', 1.48 cy/LF HW = 17.4 = 331 @ $310/cy = $102 K
✓ 7. LANDSCAPING 55 x 4280 @ 0.28/SF = $235 K
$1,622 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Sopcok Hill

PROJECT NO. 99989 SHEET NO. 2 OF 5

CALCULATED BY JT DATE 7/7 CHECKED BY _____ DATE _____

OPTION 1C - DIRT

(3b) CHANNEL

Q = 700 cfs, n = 0.025, SS = 4:1, bottom = 20', S = 0.002, V = 5, fn = 0.53, d = 3.9'

4-3.5' Drops, L = 1000', TOP WIDTH (1'FB) = 59+16 ROAD = 75'

✓ 1. EX		9,718 cy	@ $4/cy	=	$39K
✓ 3. Drops		4 EA	@ $163/SF	=	$137K
✓ 4. FENCE		2000	@ $12/SF	=	$24K
✓ 5. R/W	75x1000		@ $1/SF	=	$75K
✓ 6. CULVERTS	2-8x4, 1.56 cy/LF (1) HW = 18.7 cy EA culv	= 175	@ $310/cy	=	$54K
✓ 7. LANDSCAPE		59x1000	@ $0.28/SF	=	$17K
					$346K

(5) channel

Q = 800 cfs, n = 0.025, SS = 4:1, bottom = 30', S = 0.002, V = 5, fn = 0.55, d = 3.51'

24-3' drops = L = 2640, Top WIDTH (1'FB) = 58 + 16' = 74'

✓ 1. EX		28039	cy	@ $4/cy	= $112K
✓ 3. Drops		24	EA	@ $163/SF	= $776K
✓ 4. FENCE		5280	LF	@ $12/SF	= $63K
✓ 5. R/W	74x2640		SF	@ $1/SF	= $195K
6. Culverts	(150 cfs) 6x3; 0.164 cy/LF HW = 13.4 cy	= 77	cy	@ $310/cy	= $24K
✓ 7. L/S		58x2640	SF	@ $0.28/SF	= $153K
					$1,323K

(6) Channel

Q = 100 cfs, n = 0.025, SS = 4:1, bottom = 10', S = 0.0062, V = 4.7, fn = 0.82, d = 1.38

6-2.7' Drops, L = 1320', Top WIDTH (1'FB) = 29' + 16' = 45'

✓ 1. EX		5691	cy	@ $4/cy	= $16K
✓ 3. Drops		6	EA	@ $163/SF	= $78K
✓ 4. FENCE		2640	LF	@ $12/SF	= $32K
✓ 5. R/W	45x1320		SF	@ $1/SF	= $59K
✓ 7. L/S		29x1320	SF	@ $0.28/SF	= $11K
					$196K

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99969 SHEET NO. 3 OF 5

CALCULATED BY JGT DATE 7/1 CHECKED BY _____ DATE _____

OPTION 1C DIRT

(7) BASIN

✓ 1. EX	304ft x 1.3	CY	@ $4/CY	=	$251 K
✓ 2. LAND	10 AC	SF	@ $1/SF	=	$436 K
3. SPLITTER ST.	2	EA	@ $100K/EA	=	$200 K
					$887 K

(8a) Q = 264 cfs, n = 0.025, SS = 4:1, bottom = 15', S = 0.004, V = 5, fn = 0.71, d = 2.2'

16 - 3.25' Drops, L = 2400', Top width (1'FB) = 40' + 16 = 56'

✓ 1. EX	11,872	CY	@ $4/CY	=	$48 K
✓ 3. Drops	16	EA	@ $163/SF	=	$347 K
✓ 4. FENCE	4800	LF	@ $12/SF	=	$58 K
✓ 5. R/W	56x2400	SF	@ $1/SF	=	$134 K
✓ 6. Culverts (3)	6x4, 0.7 CY/LF HW = 18 CY/CULV = 264'	CY	@ $310/CY	=	$82 K
✓ 7. L/S	40x2400	SF	@ $0.28/SF	=	$27 K
					$696 K

(8b) Q = 300, n = 0.025, SS = 4:1, bottom = 20', S = 0.0038, V = 5, fn = 0.7 d = 2.11

12 - 3.3' drops, L = 2200, TOP WIDTH (1'FB) = 45 + 16 = 61

✓ 1. EX	12,100	CY	@ $4/CY	=	$49 K
✓ 3. Drops	12	EA	@ $163/SF	=	$290 K
✓ 4. FENCE	4400	LF	@ $12/SF	=	$53 K
✓ 5. R/W	61x2200	SF	@ $1/SF	=	$134 K
✓ 6. Culverts (1)	6x4, 0.7 CY/LF HW = 18 CY EA CULV = 88	CY	@ $310/CY	=	$27 K
✓ 7. L/S	45x2200	SF	@ $0.28/SF	=	$28 K
					$581 K

(8c) Q = 990 cfs, n = 0.025, SS = 4:1, bottom = 45', S = 0.002, V = 5, fn = 0.55, d = 3.15'

4 - 3.2' Drops, L = 680', TOP WIDTH (1'FB) = 78' + 16 = 94'

✓ 1. EX	8400	CY	@ $4/CY	=	$34 K
✓ 3. Drops	4	EA	@ $163/SF	=	$100 K
✓ 4. FENCE	1360	LF	@ $12/LF	=	$16 K
5. R/W	94x680	SF	@ $1/SF	=	$36 K
✓ 6. Culverts (1)	4-6x4, 7.33 CY/LF HW = 25 CY/EA CULV = 258	CY	@ $310/CY	=	$80 K
✓ 7. L/S	78x680	SF	@ $0.28/SF	=	$15 K
					$341 K

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 4 OF 5

CALCULATED BY DGT DATE 7/7 CHECKED BY _____ DATE _____

OPTION 1C DIRT

(9) CHANNEL

Q=1350 cfs, n=0.025, SS=4:1, bottom=45', S=0.0015, V=5, Fn=0.49, d=4.06'

9-2.9' Drops, L=2640, Top WIDTH (1'FB) = 85' + 16 = 101'

✓ 1. EX		42,044	CY	@ $4/CY	= $168 K
✓ 3. Drops		9	EA	@ $163/SF	= $366 K
✓ 4 FENCE		5280	LF	@ $12/LF	= $ 63 K
✓ 5. R/W	101×2640		SF	@ $1/SF	= $ 267 K
✓ 6. Culverts (2)	4-8×4, 2.95 cy/LF HW=28 cy EA CULV	= 642	CY	@ $310/CY	= $ 199 K
✓ 7 L/S	85×2640		SF	@ $0.28/SF	= $ 224 K
					$1,287 K

(10) BASIN

✓ 1. EX	5 Acft x 1.3		CY	@ $4/CY	= $126 K
2. LAND		5 AC	SF	@ $1/SF	= $218 K
✓ 3. SPLITTER		2 EA	EA	@ $100 K/EA	= $200 K
					$544 K

(11) CHANNEL

Q=1230, n=0.025, SS=4:1, bottom=30', S=0.0013, V=4.9, Fn=0.46, d=4.99'

20-3' Drops, L=1550, Top WIDTH (1'FB) = 78' + 16 = 94'

✓ 1. EX		24,774	CY	@ $4/CY	= $100 K
✓ 3. Drops		20	EA	@ $163/SF	= $189 K
✓ 4. FENCE		3100	LF	@ $12/LF	= $ 37 K
✓ 5. R/W	94×1550		SF	@ $1/SF	= $146 K
✓ 6. Culverts (1)	3-8×4, 2.25 cy/LF HW=25 cy EA CULV.	= 250 cy	CY	@ $310/CY	= $ 78 K
✓ 7. L/S	78×1550		SF	@ $0.28/SF	= $121 K
					$1,271 K

(13) channel

Q=600, n=0.0025, SS=4:1, bottom=15, S=0.002, V=4.96, Fn=0.59, d=3.99'

5-2.3' Drops, L=1000', Top WIDTH (1'FB) = 55 + 16 = 71

1 EX		87	CY	$35 K
✓3. Drops		3	EA	$63 K
✓4 Fence		2000	LF	$24 K
✓5. R/W	71×1000	71000	SF	$71 K
✓6. Culvert (1)	2-6×5 = 132, HW = 9.3	154	CY	$48 K
✓7. L/S	55×1000	55000	SF	$15 K
				$256 K

WOOD/PATEL

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PROJECT Spook Wall

PROJECT NO. 99989 SHEET NO. 5 OF 5

CALCULATED BY JRT DATE 7/1 CHECKED BY _____ DATE _____

OPTION 1C DIRT

(2) Q = 200, n = 0.025, ss = 4:1, bottom = 10', S = 0.0043, V = 4.98, fn = 0.72, d = 2.16'

6-2.8' Drops, L = 1700, top width (1'fb) = 35' + 16' = 51'

✓ 1. Exc		7057	@ $4/cy	= $28 K
✓ 3. Drops		6	@ $163/SF	= $97 K
✓ 4. Fence		3400	@ $12/LF	= $41 K
✓ 5. RW	35 x 1700	59,500	@ $1/SF	= $60 K
6. Culvert	—	—	@ $30/cy	= —
✓ 7. US	51 x 1700	86700	@ $0.36/SF	= $87 K
				$313 K

WOOD/PATEL

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PROJECT Speck Hill

PROJECT NO. 99989 SHEET NO. 1 OF 5

CALCULATED BY JCT DATE 7/7 CHECKED BY _____ DATE _____

McDowell Road Option 1C - Concrete Channel

① BASIN

✓ 1. Ex	28Ac x1.3		@ $4/cy	= $234K
✓ 2. LAND		10Ac	@ $1/SF	= $436K
✓ 3. SPLITTER ST.		2EA	@ $100K/EA	= $200 K
				$870K

② CHANNEL

Q = 110 cfs, n = 0.015 SS = 2:1, bottom = 10', S = 0.0145, V = 10, fn = 1.95, d = 0.92'

8-3.1' Drops, Top width (2'fb) = 22' + 16 = 38', L = 2140

✓ 1. Ex		5543	@ $4/cy	= $22 K
✓ 2. concrete		1152	@ $310/cy	= $357 K
✓ 3. Drops		8	@ $163/SF	= $78 K
4. FENCE		5280	@ $12/LF	= $71 K
✓ 5. R/W	38 x 2140		@ $1/SF	= $81 K
✓ 6. culverts (2)	6x3, 0.64 cy/LF HW = 13.4 cy/culv	155 cy	@ $310/cy	= $48 K
				$657 K

②a Exist Basin

✓ 3. SPLITTER ST		1EA	@ $100K/EA	= $100 K

③a Channel

Q = ~~540~~ 440 cfs, n = 0.015, SS = 2:1, bottom = ~~38~~ 30', S = 0.0098, V = 14.6, fn = 1.85, d = 2.56

24-2' Drops, Top width (2'fb) = ~~38~~ 28 + 16 = ~~54~~ 44, L = 4280

✓ 1. Ex	16619	~~27,696~~	@ $4/cy	= 110K
✓ 2. concrete		3691	@ $310/cy	= $1,144 K
✓ 3. Drops	9609	24	@ $163/SF	= $301 K
✓ 4. FENCE		8560	@ $12/LF	= $103 K
✓ 5. R/W	54 x 4280		@ $1/SF	= $231 K
✓ 6. Culverts (2)	2-8'x3'	329	@ $310/cy	= 102 K
				$1,991 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spock Hill

PROJECT NO. 99989 SHEET NO. 2 OF 5

CALCULATED BY JGT DATE 7/7 CHECKED BY _____ DATE _____

OPTION 1C - Concrete Channel

(3b) channel

Q=700 cfs, n=0.015, SS=2:1, bottom=20, S=0.011, V=14.5, Fn=1.96, d=1.99

2-2.5' drops, L=1000', Top width (2'fb) = 36'+16 = 52'

✓ 1. EX		5406	@ $4/cy	= $22 K
✓ 2. Concrete		804	@ $310/cy	= $249 K
✓ 3. Drops		2	@ $163/SF	= $29 K
✓ 4. FENCE		2000	@ $12/LF	= $24 K
✓ 5. R/W	52x1000		@ $1/SF	= $52 K
✓ 6. Culverts (1)	2-8'x4'	175	@ $310/cy	= $54 K
				$430 K

(5) channel

Q=800 cfs, n=0.015, SS=2:1, bottom=20', S=0.0098, V=14.5, Fn=1.87, d=2.21'

17-3' drops, L=2640, Top width (2'fb) = 37'+16 = 53'

✓ 1. Ex		15497	@ $4/cy	= $62 K
✓ 2. Concrete		2192	@ $310/cy	= $679 K
✓ 3. Drops		17	@ $163/SF	= $300 K
✓ 4. fence		5280	@ $12/LF	= $63 K
✓ 5. R/W	53x2640		@ $1/SF	= $140 K
✓ 6. Culverts (1)	6'x3'	77	@ $310/cy	= $24 K
				$1,268 K

(6) channel

Q=100 cfs, n=0.015, SS=2:1, bottom=8', S=0.0139, V=10.1, Fn=1.95, d=1'

3-2.2' Drops, L=1320', Top width (2'fb) = 20'+16 = 36'

✓ 1. Ex		3129	@ $4/cy	= $12 K
✓ 2. Concrete		670	@ $310/cy	= $208 K
✓ 3. Drops		3	@ $163/SF	= $22 K
✓ 4. Fence		2640	@ $12/LF	= $32 K
✓ 5. R/W	36x1320		@ $1/SF	= $48 K
				$322 K

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 3 OF 5

CALCULATED BY JGT DATE 7/7 CHECKED BY _____ DATE _____

OPTION 1C - concrete Channel

(7) BASIN

✓ 1. EX	30 Acft x 1.3	CY	@ $4/CY	= $251 K
✓ 2. LAND	10 AC	SF	@ $1/SF	= $436 K
✓ 3. SPLITTER	2	EA	@ $100 K/EA	= $200 K
				$887 K

(8a) Q=264 cfs, n=0.015, SS=2:1, bottom=10' S=0.012, V=12.5, Fn=1.94, d=1.6'
11-3' drops, length=2400, top width (2' fb) = 24.4 + 16 = 40.4

✓ 1. Ex	7851 cy	@ $4/cy	= $31 K	
✓ 2. concrete	1427 cy	@ $310/cy	= $442 K	
✓ 3. drops	11	@ $163/SF	= $132 K	
✓ 4. fence	4800	@ $12/LF	= $58 K	
✓ 5. RW	40.4 x 2400	@ $1/SF	= $97 K	
6. culverts 3-6x4	264 cy	@ $310/cy	= $82 K	
			$842 K	

(8b) Q=300, n=0.015, SS=2:1, bottom=15', S=0.012, V=12.0, Fn=1.93, d=1.4'
7-3.1' drops, L=2200', top width = 29 + 16 = 45'

✓ 1. EX	8533 cy	@ $4/cy	= $34 K	
✓ 2. concrete	1475 cy	@ $310/cy	= $457 K	
✓ 3. drops	7 EA	@ $163/SF	= $101 K	
✓ 4. fence	4400 LF	@ $12/LF	= $53 K	
✓ 5. RW	45 x 2200	@ $1/SF	= $99 K	
✓ 6. culverts 1-6'x4'	98 cy	@ $310/SF	= $27 K	
			$771 K	

(8c) Q=990 cfs, n=0.015, SS=2:1, bottom=20', S=0.006, V=13.2, Fn=1.52, d=2.9'
3-3.3' drops, L=680', top width (2' fb) = 40 + 16 = 56'

✓ 1. EX	4210	CY	@ $4/cy	= $17 K
✓ 2. Concrete	576	CY	@ $310/cy	= $179 K
✓ 3. Drops	3	EA	@ $163/SF	= $61 K
4. fence	1360	LF	@ $12/LF	= $16 K
✓ 5. RW	56 x 680	SF	@ $1/SF	= $38 K
✓ 6. culverts (1)	258 cy	CY	@ $310/SF	= $80 K
				$391 K

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 4 OF 5

CALCULATED BY JCT DATE 7/1 CHECKED BY _____ DATE _____

OPTION 1C - Concrete Channel

(9) CHANNEL

Q = 1350cfs, n = 0.05, SS = 2:1, bottom = 20', S = 0.006, V = 14.6 fps, Fn = 1.55, d = 3.45'

5-2.8' drops, L = 2640', Top width (2' fb) = 42 + 16 = 58

✓ 1. Ex		20,749	@ $4/cy	= $83 K
✓ 2. concrete		2,463	@ $310/cy	= $763 K
✓ 3. drops		5	@ $163/SF	= $97 K
✓ 4 fence		5280	@ $12/LF	= $63 K
✓ 5. R/W	58x2640		@ $1/SF	= $153 K
✓ 6. culvert	(2) 4-8'x4	612	@ $310/cy	= $199 K
				$1,358 K

(10) BASIN

1. Ex	15 Acft x1.3	@ $4/cy	= $126 K
2. LAND	5 Ac	@ $1/SF	= $218 K
✓ 3. SPLITTER	2 EA	@ $100K/EA	= $200 K
			$544 K

(11) CHANNEL

Q = 1230cfs, n = 0.05, SS = 2:1, bottom = 30', S = 0.0055, V = 14.8, Fn = 1.8, d = 2.4'

18-3 Drops, L = 1550', Top width (2' fb) = 48' + 16 = 64'

✓ 1. Ex		1268	@ $4/cy	= $51 K
✓ 2. Concrete		1598	@ $310/cy	= $495 K
✓ 3. Drops		18	@ $163/SF	= $419 K
✓ 4. fence		3100	@ $12/LF	= $37 K
✓ 5. R/W	64x1550		@ $1/SF	= $99 K
✓ 6. culverts	(1) 3-8'x4'	250cy	@ $310/cy	= $78 K
				$1,179 K

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 5 OF 5

CALCULATED BY JST DATE 7/7 CHECKED BY _____ DATE _____

OPTION 1C – concrete Channel

(12) channel

Q = 200, n = 0.015, ss = 2:1, bottom = 10, s = 0.013, v = 11.8, Gn = 1.97, d = 1.34

1 – 1.9 Drops, L = 1700', top width (1'fb) = 20' + 16 = 36'

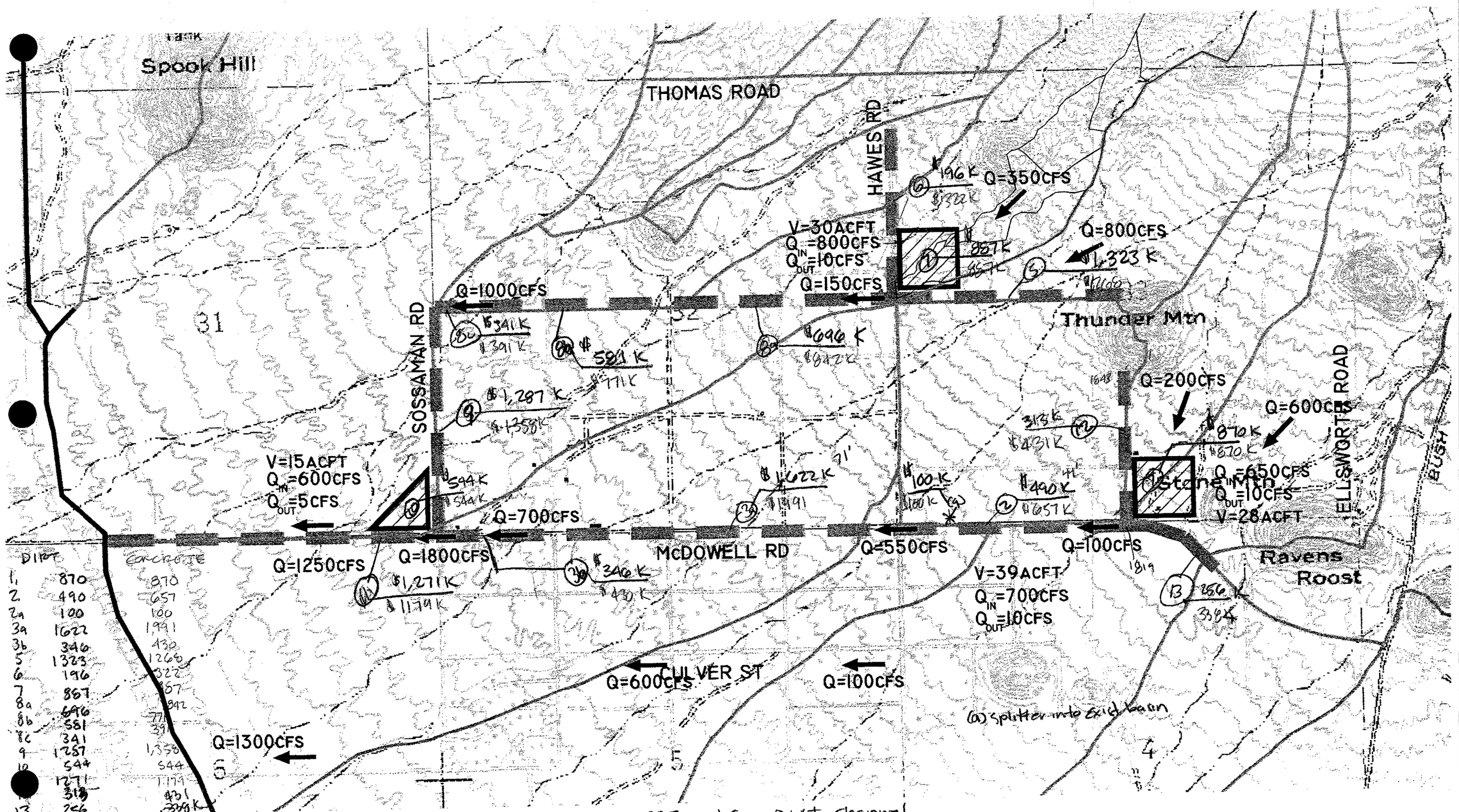
✓ 1. EX		510 cy	@ $4/cy	= $20 K
✓ 2. conc		974	@ $310/cy	= $302 K
✓ 3. Drops		1	@ $310/cy	= 7 K
✓ 4 fence		3400	@ $12/LF	= $41 K
✓ 5. R/W	36 x 1700	61200	@ $1/SF	= 61 K
✓ 6 culvert		—	@ $310/cy	= —
				$431 K

(13) channel

Q = 600, n = 0.015, ss = 2:1, bottom = 6, s = 0.009, v = 14.8, Gn = 1.78, d = 3.25

1. EX		4259	@ $4/cy	= $17K
✓ 2. conc		655	@ $310/cy	= $203K
✓ 3. Drops		—	@ $310/cy	= —
✓ 4. fence		2000	@ $12/LF	= $24 K
✓ 5 R/W	49 x 1000	49000	@ $1/SF	= $49 K
✓ 6. culvert (1) 2-6x4 = 125+7.24+12.95		145	@ $310/cy	= $45 K
				338 K

✓ Ø Drops, L = 1000, top width (1'fb) = 23 + 16 = 49



	DIRT	CONCRETE
1	870	870
2	490	657
2a	100	100
3a	1622	1,991
3b	346	430
5	1323	1268
6	196	322
7	867	867
8a	696	842
8b	581	771
8c	341	391
9	1287	1,358
10	544	544
12	1271	1,179
	313	431
13	256	398 K
	$11,123K	$12,379

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 1 OF 2

CALCULATED BY JBT DATE 7/11 CHECKED BY _____ DATE _____

McDowell Road OPTION 1d Dirt

① Channel - Same As option 1F $205 K — 72K

② channel " " " " $1433 K — 251K

2a Basin " " " " $100 K

3a Channel

Q = 1400 cfs, n = 0.025, SS = 4:1, bottom = 55, S = 0.0015, V = 5, fn = 0.49, d = 3.96

28-3' Drops, Length = 4280, Top width (1'fb) 95 + 16 = 111'

1.	Ex	75907	cy	@ $4/cy	=	$303 K
3.	Drops	28	EA	@ $163/SF	=	$1,300 K
4.	Fence	8560	LF	@ $12/LF	=	$103 K
5.	RW 111 x 4280	475080	SF	@ $1/SF	=	$475 K
6.	Culverts (2) 5-6'x4' (287+952+176) x 2	698	cy	@ $310/cy	=	$195 K
7.	L/S 95 x 4280	406,600	SF	@ $0.28/SF	=	$114 K
						$2,490 K — 175K

3b Channel

Q = 1650, n = 0.025, SS = 4:1, bottom = 72, S = 0.0015, V = 5, fn = 0.49, d = 3.79

5-2.9 Drops, length = 1000, Top width (1'fb) = 111 + 16 = 127'

1.	Ex	20600	cy	@ $4/cy	=	$82 K
3.	Drops	5	EA	@ $163/SF	=	$262 K
4.	Fence	2000	LF	@ $12/LF	=	$24 K
5.	RW 127 x 1000	127000	SF	@ $1/SF	=	$127 K
6.	Culverts (1) 6-6x4 = 341+10.7+19.2 = 371 cy			@ $310/cy	=	$115 K
7.	L/S 111 x 1000	111 000	SF	@ $0.28/SF	=	$111 K
						$721 K — 127K

4 Channel - Same As Option 1B $276 K — 124K

5 Channel - Same As Option 1C $1323 K — 195K

7 Basin - Same As Option 1C $887 K — 436K

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 2 OF 2

CALCULATED BY JGT DATE 7/11 CHECKED BY _____ DATE _____

McDowell Road OPTION 1D DIRT

✓ (10) channel - same as option 1c $196 K -59K

✓ (10) basin - same as option 1c $544 K -218K

✓ (11) channel - same as option 1E $2050 K -240K

R/W -2,197

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 2

CALCULATED BY JGT DATE 7/11 CHECKED BY _____ DATE _____

McDowell Road — Option 1d - Concrete

① channel - Same as option 1F — $346K — -44K

② channel - " " " " — $1226K — -124K

2a Basin - same as option 1K — $100 K

3a channel

Q = 1400 cfs, n = 0.015, SS = 2:1, bottom = 25, S = 0.007, V = 14.97, Fr = 1.06, d = 3.'

20-3 Drops, L = 4280, Top width (2'fb) = 45 + 16' = 61

1. Exc	35191	cy @ $4/cy	=	$141 K
2 Conc	4229	cy @ $310/cy	=	$1,311 K
3 Drops	20	ea @ $63/SF	=	$421 K
4 Fences	8560	LF @ $12/LF	=	$103 K
5 R/W 61 × 4280	261080	SF @ $1/SF	=	$261 K
6 culverts (2) 4×10×3 = (37.4+9.6+17.2)×2	401	CY @ $310/cy	=	$124 K
				$2,361 K — -261K

3b Channel

Q = 1650, n = 0.04, SS = 2:1, bottom = 31, S = 0.0067, V = 14.91, Fr = 1.64, d = 2.99

3-3.1 Drops, L = 1000, Top width (2'fb) = 51 + 16 = 67'

1. Exc	9556	cy @ $4/cy	=	$38 K
2. Conc	1099	cy @ $310/cy	=	$341 K
3. Drops	3	ea @ $63/SF	=	$77 K
4. Fence	2000	LF @ $12/LF	=	$24 K
5. R/W 67 × 1000		SF @ $1/SF	=	$67 K
6. culverts (1) 6×3 41+10.7+19.2	441	cy @ $310/cy	=	$137 K
				$684 K — -67K

④ channel - Same as option 1B — $634K — -87K

channel - Same as option 1C — $1,268 K — -195K

Basin - Same as option 1C — $887 K — -436K

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 2 OF 2

CALCULATED BY JOT DATE 7/11 CHECKED BY ____ DATE ____

McDonald Road Option 1-D - Concrete

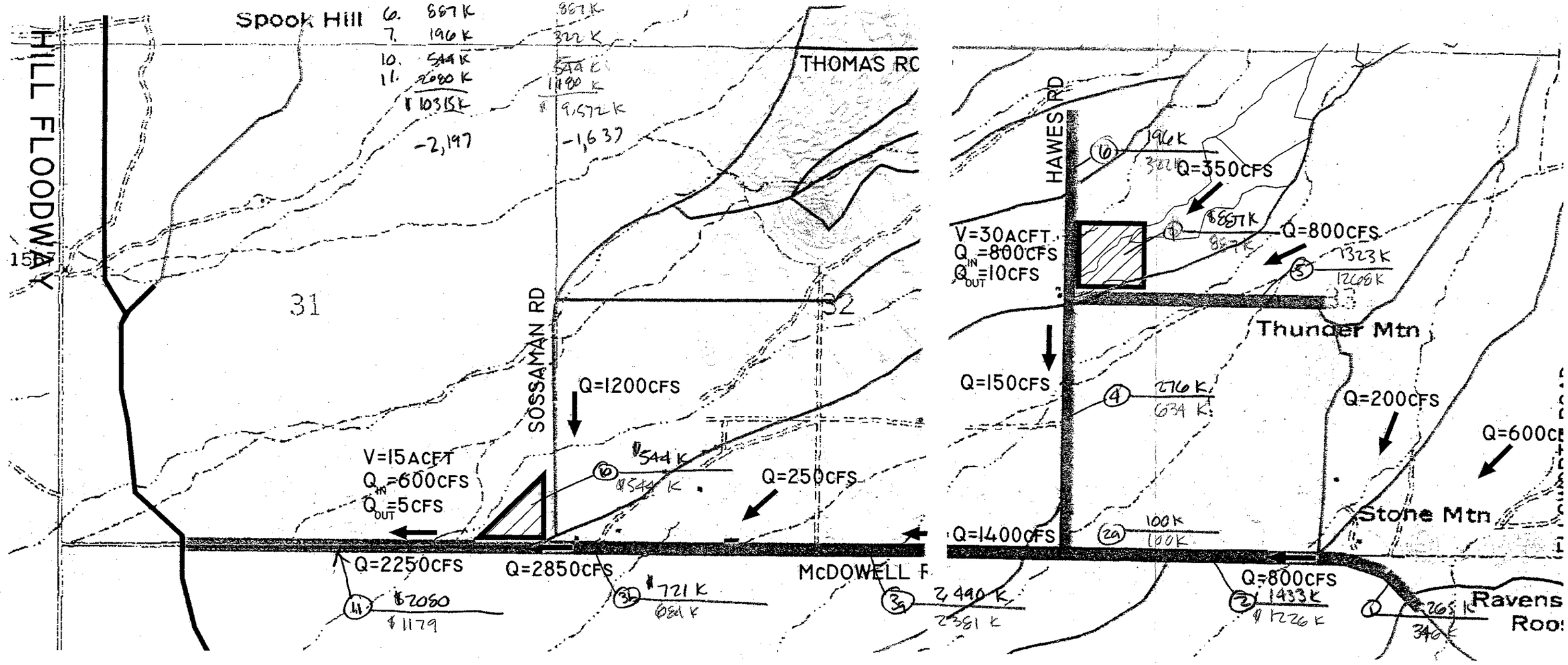
(8) Channel - Same as option 1C $322K -59K

(10) Drain - Same as option 1C $544K -218K

(11) channel - Same as option 1F $1179K -146K

R/W - 1,637

	DIRT	Concrete
1.	265 K	340 K
2.	1,433 K	1226 K
2a.	100 K	100 K
3a.	2490 K	2381 K
3b.	721 K	681 K
4.	276 K	634 K
5.	1323 K	1268 K
6.	887 K	887 K
7.	196 K	322 K
10.	544 K	544 K
11.	2080 K	1180 K
	10315 K	9,572 K
	-2,197	-1,637



OPTION 1D - DIRT
- concrete

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 2

CALCULATED BY JGT DATE 7/11 CHECKED BY _____ DATE _____

McDowell Road OPTION 1E - Dirt Channel

① channel - Same as option 1F	$2 65 K
② channel - " " " "	$1 433 K
②a Basin - " " " "	$ 100 K
③a channel - " " " "	$ 2080 K
③b channel - Same as option 1F	$695 K
⑤ channel - Same as option 1C	$1323 K
⑥ channel - " " " "	$ 196 K
⑦ Basin - " " " "	$ 887 K
⑧a channel - " " " "	$ 696 K
⑧b channel - " " " "	$ 581 K
⑧c channel - " " " "	$ 341 K
⑨ channel - " " " "	$ 1257 K
⑩ Basin - Same as option 1C	$ 544 K
⑪ channel - Same as option 1F	$ 2080 K

WOOD/PATEL

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PROJECT Sopock Hill

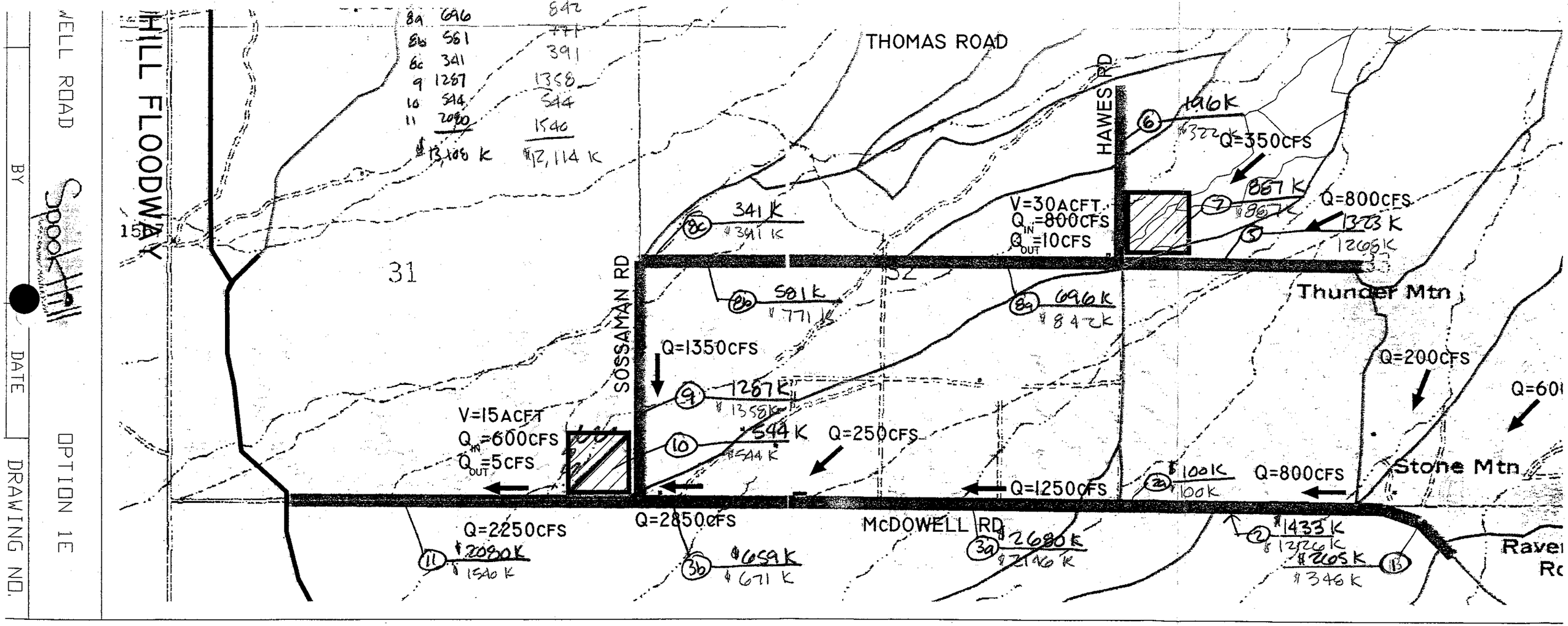
PROJECT NO. 99989 SHEET NO. 2 OF 2

CALCULATED BY KJ DATE 7/10 CHECKED BY _____ DATE _____

McDowell Ranch Option 1E - Concrete Channel

1	channel - Same as option 1F	348K
2	channel " " " "	1226 K
2a	Basin " " " "	100 K
3a	channel " " " "	2146 K
3b	channel - Same as option 1F	671 K
5	channel - Same as option 1C	1268 K
6	channel - " " " "	322 K
7	Basin - " " " "	887 K
8a	channel - " " " "	842 K
8b	channel - " " " "	771 K
8c	channel - " " " "	391 K
9	channel - " " " "	1358 K
10	Basin - Same as option 1C	544 K
11	channel - Same as option 1F	1540 K

	DIRT	concrete
1	2605	348
2	1433	1226
2a	100	100
3a	2680	2146
3b	695	671
5	1323	1268
6	196	322
7	867	867
8a	696	842
8b	581	771
8c	341	391
9	1287	1358
10	544	544
11	2090	1540
	13,108 K	12,114 K



DATE	BY

DRAWING NO.

OPTION 1E

Spook Hill

OPTION 1E - DIRT
- concrete

WOOD/PATEL

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PROJECT Sopook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 3

CALCULATED BY JCT DATE 7/10 CHECKED BY _____ DATE _____

OPTION 1F - DIRT

① Q = 600 cfs, n = 0.025, ss = 4:1, bottom = 20, V = 4.96, fn = 0.55, s = 0.0021, d = 3.54

3-2.3' Drops, L = 1000', Top width (1' fb) = 50' + 16' = 72'

✓1	Ex		8651	CY	@ $4/CY	= $35 K
✓3	Drop		3	EA	@ $163/SF	= $163 K
✓4	Fence		2000	LF	@ $12/LF	= $24 K
✓5	R/W	72 x 1000	72000	SF	@ $1/SF	= $72 K
6	Culvert (1)	2-8x4 = 150 + 7.8 + 14 = 178	178	CY	@ $310/CY	= $55 K
✓7	L/S	50 x 1000	50000	SF	@ $0.28/SF	= $16 K
						$265 K

② Q = 800 cfs, n = 0.025, SS = 4:1, bottom = 50', V = 4.98, fn = 0.58, d = 2.65, s = 0.0024

20 - 2.9' Drops, L = 2640', Top width (1' fb) = 79' + 16 = 95'

✓1.	Ex		31617	CY	@ $4/CY	= $126 K
✓3.	Drops		20		@ $163/SF	= $148 K
✓4.	Fence		5280	LF	@ $12/LF	= $63 K
5.	R/W	95 x 2640	250,800	SF	@ $1/SF	= $251 K
6.	Culverts (2)	4-8x3x100 = 279 ? 8.48 } 302 15.2	605	CY	@ $310/CY	= $187 K
✓7.	L/S	79 x 2640	208560	SF	@ $0.28/SF	= $58 K
						$1,433 K

3a Q = 1250 cfs, n = 0.025, SS = 4:1, bottom = 73', V = 4.99, fn = 0.55, d = 2.95, s = 0.002

27 - 3' drops, L = 4280, Top width (1' fb) = 104' + 16 = 120

✓1.	Ex		73711	CY	@ $4/CY	= $295 K
✓3.	Drops		27	EA	@ $163/SF	= $1,394 K
✓4.	Fence		8560	LF	@ $12/LF	= $103 K
✓5.	R/W	120 x 4280	513600	SF	@ $1/SF	= $514 K
✓6.	Culverts	(2) 4-10x3 = 374 ? 9.6 } 401 17.2	802	CY	@ $310/CY	= $249 K
✓7.	L/S	104 x 4280	445,120	SF	@ 0.28/SF	= 125 K
						$2,680 K

(2a) Exist Basin Splitter St 100K

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 2 OF 3

CALCULATED BY JGT DATE 7/7 CHECKED BY _____ DATE _____

OPTION - 1F DIVOT

(3b) Channel

Q = 1650, n = 0.025, SS = 4:1, bottom = 73, S = 0.0015, V = 4.98, Fn = 0.49, d = 3.76

5-2.9' Drops, L = 1000', Top width (1'fb) = 111 + 16 = 127'

V1	Exp		20649	CY	@ $4/CY	= $83 K
V3	Drops		5	EA	@ $163/SF	= $263 K
V4	Fence		2000	LF	@ $12/LF	= $24 K
V5	R/W	127x1000	127000	SF	@ $1/SF	= $127 K
V6	Culverts (1)	4-10'x4' = 39 HW 11.2 HW 20.1	422	CY	@ $310/CY	= $131 K
V7	L/S	111x1000	111000	SF	@ $0.28/SF	= $31 K
						$659 K

(5) Same as option 1C $1,323 K

(10) Same as option 1C $887 K

(10) Same as option 1C $196 K

(9) Q = 1200, n = 0.025, SS = 4:1, bottom = 60', S = 0.0018, V = 4.97, Fn = 0.52, d = 3.3'

9-2.8' Drops, L = 2640, Top width (1'fb) = 94 + 16 = 110'

V1	Exp		42650	CY	@ $4/CY	= $168 K
V3	Drops		9	EA	@ $163/SF	= $389 K
V4	Fence		5280	LF	@ $12/LF	= $64 K
V5	R/W	110x2640	290,400	SF	@ $1/SF	= $291 K
V6	Culverts (2)	4-10x3 = 37.4 HW 9.6 HW 17.2	x2 602	CY	@ $310/CY	= $248 K
V7	L/S	94x2640	248,160	SF	@ 0.28/SF	= $69 K
						$1,229 K

(16) Same as option K $544 K

WOOD/PATEL

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PROJECT: SOPOK HILL

PROJECT NO. 99989 SHEET NO. 3 OF 3

CALCULATED BY: JOT DATE: 7/10 CHECKED BY: _____ DATE: _____

OPTION 1F DIRT

(8a) Q=212 cfs, n=0.025, SS=4:1, bottom=8', V=4.98, Fr=0.71, d=2.41, S=0.004
8-2.9' Drops, L=2800', Top width (1'fb) = 35'+16' = 51

✓1. Exc		117726	CY	@ $4/CY	= $471 K
✓3. Drops		8	EA	@ $163/SF	= $131 K
✓4. Fence		5600	LF	@ $12/LF	= $67 K
5. RW	51 x 2800	142800	SF	@ $1/SF	= $143 K
✓6. Culverts (3)	1-8x3 = 80cy, HW: 5.03, HW: 8.12 = 94 x 3 =	282	CY	@ $310/CY	= $88 K
✓7. L/S	35 x 2800	98000	SF	@ $0.28/SF	= $27 K
					$503 K

(8b) Q=340 cfs, n=0.025, SS=4:1, bottom=20, V=5, Fr=0.67, S=0.0034, d=2.32
11-3.1' Drops, L=2400, Top width (1'fb) = 47'+16' = 63'

✓1. Exc		143116	CY	@ $4/CY	= $571 K
Drops		14	EA	@ $163/SF	= $257 K
Fence		9600	LF	@ $12/LF	= $88 K
5. RW	63 x 2400	151200	SF	@ $1/SF	= $151 K
6. Culverts (2)	10x3 = 102, HW: 6.8, HW: 12.2 } 212	242	CY	@ $310/CY	= $75 K
✓7. L/S	47 x 2400	112800	SF	@ $0.28/SF	= $32 K
					$630 K

(11) Q=2250, n=0.025, SS=4:1, bottom=100', V=5, Fr=0.98, S=0.0014, d=3.88'
20-3' Drops, L=1550, Top width (1'fb) = 139'+16 = 155'

11. Exc		422770	CY	@ $4/SF	= $1,69 K
✓3. Drops		20	EA	@ $163/SF	= $1,384 K
✓4. Fence		3100	LF	@ $12/LF	= $37 K
5. RW	155 x 1550	240,250	SF	@ $1/SF	= $240 K
6. Culverts (1)	6-10x9 = 575, HW = 14, HW = 25 }	614	CY	@ $310/CY	= $190 K
✓7. L/S	139 x 1550	215,450	SF	@ $0.28/SF	= $60 K
					$2,080 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Stock Hill

PROJECT NO. 99989 SHEET NO. 1 OF 3

CALCULATED BY JGT DATE 7/10 CHECKED BY _____ DATE _____

OPTION 1F - Concrete

① Q=6000 cfs, n=0.015, SS=2:1, bottom=8', V=14.94, fn=1.95, S=0.009, d=2.95'
Ø Drops, L=1000, top width (2'fb) = 28 + 16 = 44'

✓ 1. Ex	4385	cy @ $4/cy	=	$18 K
✓ 2. Conc	669	cy @ $310/cy	=	$207 K
✓ 3. Drop	—	EA @ $163/SF	=	—
✓ 4. Fence	2000	LF @ $12/LF	=	$24 K
✓ 5. R/W 44x1000	44000	SF @ $1/SF	=	$44K
✓ 6. Culvert (1) 2-8'x4'	178	cy @ $310/cy	=	$55 K
				$348 K

② Q=800 cfs, n=0.015, SS=2:1, bottom=10, V=14.92, fn=1.72, S=0.008, d=3.25
14-3.1' drops, L=2640, top width (2'fb) = 31 + 16 = 47

Ex	13750	cy @ $4/cy	=	$55 K
✓ 2. Conc	1930	cy @ $310/cy	=	$598 K
✓ 3. Drop	14	EA @ $163/SF	=	$217
✓ 4. Fence	5280	LF @ $12/LF	=	$63K
✓ 5. R/W 47x2640	~~195x60~~	SF @ $1/SF	=	~~$196 K~~ NA
✓ 6. Culvert (2) 6x5 = 132+9.3+16 x2	315	cy @ $310/cy	=	$97 K
				$1,226 K NA

③ Q=1250 cfs, n=0.015, SS=2:1, bottom=20, V=14.8, fn=1.70, S=0.0075, d=2.77
19-3' drops, L=4280, top width (2'fb) = 39 + 16 = 55

✓ 1. Ex	28846	cy @ $4/cy	=	$115K
✓ 2. Conc	3752	cy @ $310/cy	=	$1,163 K
✓ 3. Drop	19	EA @ $163/SF	=	$309K
✓ 4. Fence	8560	LF @ $12/LF	=	$103 K
✓ 5. R/W 55x4280	235,400	SF @ $1/SF	=	$236K
✓ 6. Culvert (2) Abbl 6x4 = 233 HW+HW=25 5x2	516	cy @ $310/cy	=	$160K
				$2,146 K

✓ ⑤ Exist Basin Splitter Structure 100 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Sopris Hill

PROJECT NO. 99969 SHEET NO. 2 OF 3

CALCULATED BY JGT DATE 7/10 CHECKED BY _____ DATE _____

OPTION 1F - Concrete

(3b) channel

Q=1650, n=0.015, SS=2:1, bottom=30', S=0.0067, V=15, Fn=1.64, d=3.05

3-3.1' Drops, L=1000', Top width (2'fb) = 50 + 16 = 66

✓ 1. Ex	9434	cy	@ $4/cy	= $38K
✓ 2. Conc	1085	cy	@ $310/cy	= $336K
✓ 3. Drops	3	EA	@ $163/SF	= $76 K
✓ 4. Fence	2000	LF	@ $12/LF	= $24 K
✓ 5. R/W 66x1000	66000	SF	@ $1/SF	= $66 K
6. culverts (1) 4-10x4 = 391+11.2+20 =	422	cy	@ $310/cy	= $131 K
				$671 K

(5) channel - same as 1C - concrete 1,208 K

(8) Basin - " " " " 857 K

(6) channel - " " " " 322 K

(9) channel

Q=1200, n=0.015, SS=2:1, bottom=20, S=0.0072, V=19.97, Fn=1.67, d=3.07

4-2.7 Drops, L=2640, Top width (2'fb) = 40 + 16 = 56

✓ 1. Ex	8008	cy	@ $4/cy	= $76 K
✓ 2. Conc	2380	cy	@ $310/cy	= $738 K
✓ 3. Drops	4	EA	@ $163/SF	= $72 K
✓ 4. Fence	5280	LF	@ $12/LF	= $63 K
✓ 5. R/W 56x2640	147800	SF	@ $1/SF	= $148 K
6. Culvert (2) 4-8x3 = 293+85+15.2 x 2	633	cy	@ $310/cy	= $196 K
				$1,293 K

✓ (10) BASIN - SAME AS 1C $544 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill LC

PROJECT NO. 99989 SHEET NO. 3 OF 3

CALCULATED BY JST DATE 7/16 CHECKED BY _____ DATE _____

Channel OPTION 1F - Concrete

(5a) Q = 212 cfs, n = 0.015, SS = 2:1, bottom = 8, S = 0.0121, V = 12.07, Fn = 1.92, d = 1.57

drops, L = 2800', Top width (2' fb) = 23 + 16 = 39

✓ 1. Ex	8205	CY	@ $4/CY	=	$33 K
✓ 2. Conc	1561	CY	@ $310/CY	=	$464
✓ 3. Drops	Ø	EA	@ $163/SF	=	—
✓ 4. Fence	5600	LF	@ $12/LF	=	$67 K
✓ 5. RW 39 x 2800	109200	SF	@ $1/SF	=	$109 K
✓ 6. Culverts (3) 1-8x3	282	CY	@ $310/CY	=	$88 K
					$781 K

(5b) Channel

Q = 340 cfs, n = 0.015, SS = 2:1, bottom = 12, S = 0.012, V = 13.1, Fn = 1.96, d = 1.7

4-3.3' drops, L = 2400', Top width (2' fb) = 27 + 16 = 43'

✓ 1. Ex	8940	CY	@ $4/CY	=	$36 K
2. Conc	1535	CY	@ $310/CY	=	$476 K
✓ 3. Drops	4	EA	@ $163/SF	=	$56 K
✓ 4. Fence	4800	LF	@ $12/LF	=	$58 K
✓ 5. RW 43 x 2400	103200	SF	@ $1/SF	=	$103 K
✓ 6. Culverts (2) 10'x3'	242	CY	@ $310/CY	=	$75 K
					806 K

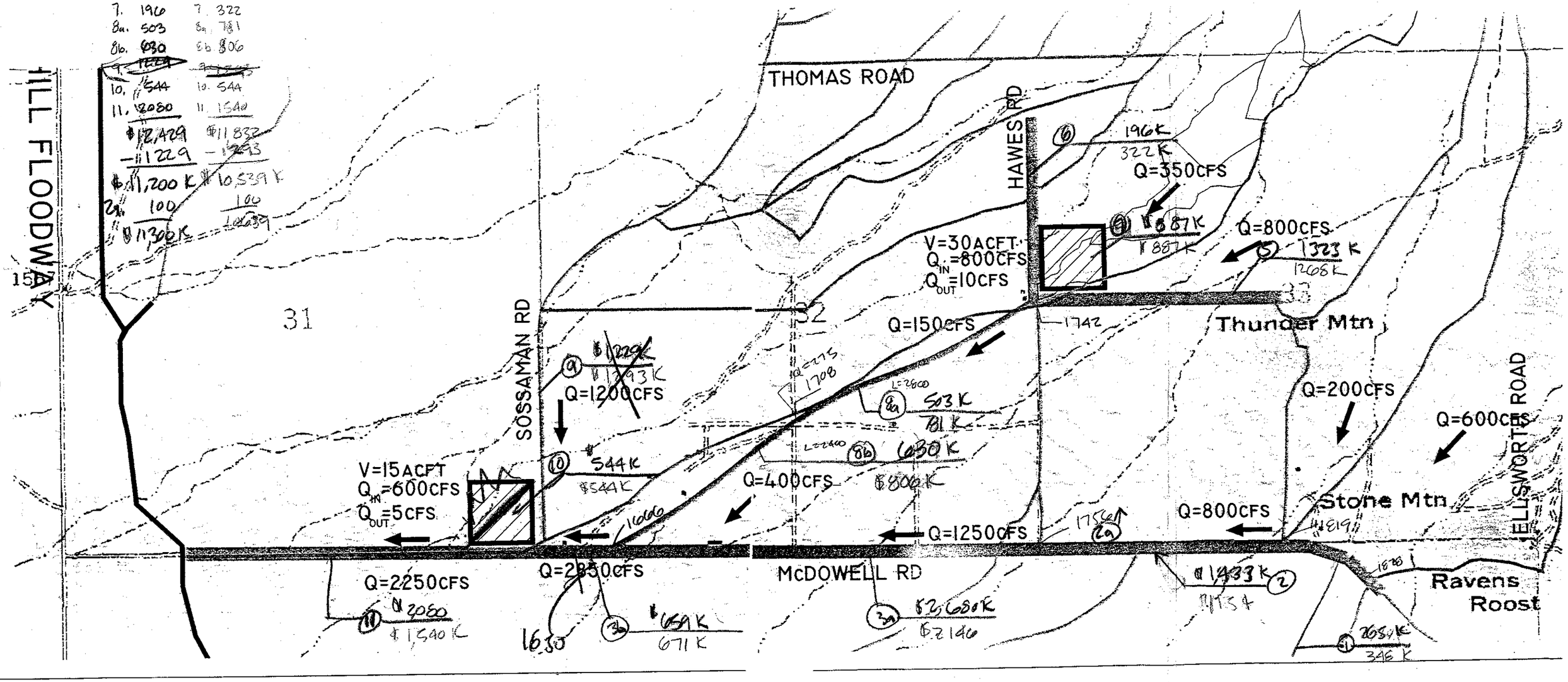
(11) Channel

Q = 2250 cfs, n = 0.015, SS = 2:1, bottom = 40, S = 0.006, V = 15, Fn = 1.58, d = 3.22

18-3 drops, Length = 1550, Top width (2' fb) = 61 + 16 = 77

✓ 1. Ex	18651	CY	@ $4/CY	=	$75
✓ 2. Conc	1988	CY	@ $310/CY	=	$616 K
✓ 3. Drops	18	EA	@ $163/SF	=	$532 K
✓ 4. Fence	3100	LF	@ $12/LF	=	$37 K
✓ 5. RW 77 x 1550	119350	SF	@ $1/SF	=	$119 K
✓ 6. Culverts (1) 5-10x4 = 463 + 22.5F 12.5 =	518	CY	@ $310/CY	=	$161 K
					$1,540 K

Dirt	Conc
1. 2605	1. 346
2. 1433	2. ~~1226~~ 1154
3a. 2680	3a. 2146
3b. 659	3b. 671
5. 1323	5. 1268
6. 887	6. 887
7. 196	7. 322
8a. 503	8a. 781
8b. 630	8b. 806
~~9. 1229~~	~~9. 1193~~
10. 544	10. 544
11. 2080	11. 1540
$12,429	$11,832
−1229	−1293
$11,200 K	$10,539 K
2a. 100	100
$11,300 K	10,639



OPTION 1F - DIRT CHANNELS
- CONC CHANNELS

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT: SPOOK HILL

PROJECT NO. 99989 SHEET NO. 1 OF 1

CALCULATED BY: KGT DATE: 6/00 CHECKED BY: _____ DATE: _____

MCKINNEY AVE

(2a.) From 88th street to Ex. BASIN EAST OF HAWES RD

US NG = 1819 Inv = NG-3 = 1816

DS NG = 1706 Inv = NG-3 = 1763

length = 2140 NG slope = 0.0247

Q = 109.85

1. Dirt channel

CALC slope, n = 0.025, SS = 4:1, bottom = 8'

13-3' Drops = (39') + 2140 x slope = (1816-1763), slope = 0.00654

V = 4.98 fps < 5 fps ∴ OK

Fn = 0.85 < 0.86 ∴ OK

d = 1.54'

* Drops @ approx. every 150'

EX =	7093 ◻	= $28,371
Drops =	13 EA	= $81,051
Fence =		$51,360
		$260,800
Splitter St		50,000
		$310,800

2. Conc Channel

CALC slope, n = 0.015, 2:1, bottom = 6'

MAX slope = 0.0147

8-2.75 Drops = (22') + 2140 x S = (1816-1763), S = 0.0145

V = 10 fps < 15 ∴ OK

Fn = 1.98 < 2 ∴ OK SUPERCRITICAL

d = 0.92'

* Drops @ approx. every 270'

EX =	4500	$17,970
Conc	934	$302,050
Drop	8	$63,300
Fence	4280	$51,360
		$434,700
SPLITTER ST.		50,000
		$484,700

3. PIPE Assume 5' pipe w/ 5' cover

US INV = 1816 - 10 = 1806

DS INV 1763 - 10 = 1753

53'

CMP, S = 0.0247, d = 4', V = 12.3, Fn = 1.4

S = 0.0247 ft/ft, USE S = 0.0135 ft/ft

n = 0.012, V = 15 fps = max ∴ OK

2140 x 0.0135 = 29' 53 - 29 = 24' of vert fall not made up in pipe slope

* pipe will be excessively deep.

CMP may be AN OPTION HERE

PIPE	= 2140 @ $184	$393,760
MH	= 5 EA @ $6K	$30,000
		$423,760
Splitter St.		$50,000
		$473,800

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 1

CALCULATED BY JCT DATE 6/00 CHECKED BY _____ DATE _____

McDowell Alternates

(2b) From Basin East of Hawes Road to Hawes RD (500'±)

US Nq 1766 Inv = 1766 - 4 = 1762
DS Nq 1756 Inv = 1756 - 4 = 1752
length = 500'
10' fall
Q = 4603 cfs S = 0.02'/ft

1. Dirt channel
Calc Slope, n = 0.025, SS = 4:1, bottom = 20'
S = 0.00260, d = 2.93', V = 4.98 < Scrit : ok, fn = 0.6 < 0.83 : ok
3 - 2.9' Drops
*Drops every 170'±

Ex	3823	$15,292
Drops	3	$72,607
Fence	1000	$12,000
		$99,900

2. Conc Channel
calc Slope, n = 0.015, 2:1, bottom = 10'
MAX slope = 0.00758'/ft, d = 1.98, V = 13.07 < 15 : ok, fn = 1.97 < 2 : ok
2 - 3.125' Drops
*Drops every 250'

Ex	1553	$6,211
Conc	273	$8,600
Drops	2	$21,600
Fence	1000	$12,000
		$124,400

3. PIPE
Assume MIN 5' cover, Inv = Nq 1766 - 5 - 7.2 = 1753
Inv = Nq 1756 - 5 - 7.2 = 1743
S = 0.006'/ft, n = 0.012, V = 15 : ok, 78" pipe
0.006 x 500 = 3', *7' of vert drop not made up in pipe slope
* CMP would help here

PIPE	500 @ 240	$120,000
mH	1	6000
		$126,000

CMP, S = 0.02'/ft, d = 84", V = 15.04, fn = 1.18, n = 0.023

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Brook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 1

CALCULATED BY JOT DATE 6/23 CHECKED BY _____ DATE _____

McDowell Alternates

(3a) From HAWES RD to 1000' EAST of SOSSOMAN RD. (67th Street)

US NG 1756 - Inv = 1756 - 5 = 1751

DS NG 1666 Inv = 1666 - 5 1661

length = 4280 90'/4280 = 0.021'/ft

Q = 564 cfs

1. Dirt channel

Calc Slope, n = 0.025, SS = 4:1, bottom = 20'

MAX S = 0.0022'/ft, V = 4.96 < 5 ∴ ok, fn = 0.56 < 0.83 ∴ ok, d = 3.39'

4280 × 0.0022 − (1751 − 1661) = 80.6 ≈ 27-3' drops

27-3' drops, S = 0.0021, V = 4.9 < 5 ∴ ok, fn = 0.55 < 0.83 ∴ ok, d = 3.43'

*Drop every 160' ±

EX	37553	$150,211
Drops	27	$727,857
Fence	8560	$102,720
		$980,788

2. Concrete Channel

Calc Slope, n = 0.015

MAX S = 0.01'/ft

4280 × 0.01 − (1751 − 1661) = 47.2 ≈ 24-2' drops

S = 0.0098'/ft, V = 14.55 fps < 15 ∴ ok, fn = 1.85 < 2 ∴ ok, d = 2.86

Flow is supercritical

*Drop Every 180 ±'

Ex	25300 cy	$101,168
Conc	3562 cy	$1,104,291
Drops	24	$289,387
Fence		$102,720
		$2,204,640

3. Pipe

Assume min 5' cover, Inv = NG 1756 − 5 − 7.7 = 1743

Inv = NG 1666 − 5 − 7.7 = 1653

S = 0.01'/ft, n = 0.012, V = 20 fps ∴ ok 84" pipe

0.01 × 4280 = 42.8', 90' fall @ NG ∴ 47' of vert drop not made up in pipe slope

*CMP would help here

NOTE: RCP may not be feasible

CMP, S = 0.021, d = 90", V = 16.1, fn = 1.23, n = 0.023

Pipe	4280 @ 300	$1,284,000
Mat	3 mm	6000
		$1,290,000

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 1

CALCULATED BY KT DATE 7/5 CHECKED BY _____ DATE _____

McDonell Alternatives

(3b) From 1000' East of Sosoman Rd to Sosoman Rd.

US NG = 16660 inv = 16660 - 5 = 1661

DS NG = 1650 inv = 1650 - 5 = 1645

length = 1000'

Q = 690 cfs

16/690 = 0.023

1. Dirt channel

n = 0.025, SS = 4:1, bottom = 20'

MAX S = 0.002, V = 5 fps ∴ ok Fn = 0.53 < 0.83 ∴ ok, d = 3.9'

1000 x 0.002 = (1661 - 1645) = 14 = 4 = 3.5 drops

*Drop every 330' ±

Ex	9718 cy	$38,872
Drops	4 EA	$136,485
Fence		$24,000
		$199,357

2. Concrete Channel

n = 0.015

MAX S = 0.011 ft/ft

1000 x 0.011 = (1661 - 1645) = 5 2-2.5 Drops

S = 0.011, V = 14.49 fps < 15 ∴ ok Fn = 1.96 < 2 ∴ ok, d = 1.99

Ex	4351	$17,403
Conc	742	$235,148
Drops	2	$26,571
Fence		$24,000
		$298,122

3. PIPE

Assume 5' cover Inv = 1666 - 5 - 7.7 = 1653

Inv = 1650 - 5 - 7.7 = 1637

S = 0.009, n = 0.012, V = 19.3 fps < 20 ∴ ok 84" pipe

0.009 x 1000 = 9', 7' vert fall not made up in pipe slope

*cmp would help here

CMP, S = 0.023, d = 90", V = 16.9, Fn = 1.05, n = 0.023

PIPE	1000 @ $300	$300,000
MH	2	$12,000
		$312,000

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 1

CALCULATED BY KJT DATE 7/5 CHECKED BY CBT DATE

McDowell Road Options

(5) OAK Street From 86th Street to Hawes Road

US NG = 1880 Inv = 1880-5 = 1875

DS NG = 1804 Inv = 1804-5 = 1799

length = 2640' 0.029

Q = 782 cfs

a1. Dirt Channel

MAX S= 0.002, n=0.035, SS=4:1, bottom = 30',

V=5 fps ∴ ok, Fn = 0.546 < 0.86 ∴ ok, d = 3.51'

2640 x 0.002 - (1875 - 1799) = 71' ≈ 24 - 3' Drops

S=0.0015, V=4.57, Fn=0.48, d=3.79'

* Drop every 110'±

EX	280137	$112,147
Drops		$775,946
Fence		$63,360
		$951,453

a2. Concrete Channel

Calc Slope, n=0.015, SS=2:1, bottom=20'

MAX S= 0.01 YET.

2640 x 0.01 - (1875 - 1799) = 50', 17 - 3' Drops

S=0.0098, V=10.5 fps < 15 ∴ ok, Fn=1.67 < 2 ∴ ok, d=2.21'

*Drop Every 155'

EX	13985	$52,339
Conc		$637,162
Drops		$280,061
Fence		$63,360
		$1,032,922

a3. Pipe

Assume 5' cover, Inv = 1880 - 5 - 8.2 = 1867

Inv = 1804 - 5 - 8.2 = 1791

S=0.0087, n=0.012, V=20 fps ∴ ok 90" pipe

0.0087 x 2640 = 21', 76' fall, 76-21 = 55' of vert drop not made up in pipe slope

CMP would help here

RCP may not be feasible,

CMP, S=0.029, d=7.5, V=19.01, Fn=1.40, n=0.023

PIPE		$884,400
MH	3	$18000
		$902,400

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Sopcook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 1

CALCULATED BY JGT DATE 7/6 CHECKED BY JGT DATE

(6) Hames Road from Ranger Rupert Trail to Oak Street Basin (1/8 mile)

US NG 1829 Inv = 1829 − 3 = 1826

DS NG 1814 Inv = 1804 − 3 = 1801

Length = 1320 25/1320 = 0.019

Q = 100 cfs (Estimated)

9¹. Dirt channel

MAX S = 0.0065, n = 0.025, SS = 4:1, bottom = 10'

V = 4.8 fps, fn = 0.84, d = 1.4

1320 × 0.0065 = (1820 − 1801) = 16.4 ≈ 6-2.7' Drops

S = 0.0062, V = 4.7, fn = 0.82, d = 1.38

Drop Every 220' ±

Ex	15691
Drops	78153
Fence	31680
	$125,524

9². Conc Channel

MAX S = 0.014, n = 0.015, SS 2:1 bottom = 8

V = 10.1 < 15 ∴ ok, fn = 1.95 < 2 ∴ ok, d = 1'

1320 × 0.014 − (1826 − 1801) = 6.5, 3 − 2.2' Drops

S = 0.0139, V = 10.1 fps, fn = 1.95 d = 1'

* Drop every 440'

Ex	12,516
Conc	209,775
Drops	17,348
Fence	31,680

9³ Pipe

Assume 5' cover, Inv = 1829 − 5 − 3.9 = 1820

Inv = 1814 − 5 − 3.9 = 1805

S = 0.0113, n = 0.012, V = 13.6 fps < 20 ∴ ok 42" pipe

0.0113 × 1320 = 15', fall = 15'

CMP, S = 0.019, d = 4, V = 11.3, Fn = 1.31, n = 0.025

Pipe		$151,800
MH	2	$12,000
		$163,800

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 1

CALCULATED BY JOT DATE 7/5 CHECKED BY _____ DATE _____

McDowell Road Alternatives

(8a) OAK Street, Hames Rd to 1/2 mile ± west.

US NG = 1804 Inv = 1804 - 4 = 1800

DS NG = 1742 Inv = 1742 - 4 = 1738

length = 2400' 62/2400 = 0.026

Q = 264 cfs

1. Dirt Channel

MAX S = 0.004, n = 0.025, SS = 4:1, bottom = 15'

V = 5 fps, Fn = 0.71, d = 2.2

2400 x 0.004 - (1800 - 1738) = 52' ≈ 16 - 3.25' Drops

* Drop every 150' ±

Ex	$47,485
Drops	$346,773
Fence	$57,600
	$451,861

2. Conc Channel

MAX S = 0.012, n = 0.015, SS = 2:1, bottom = 10'

V = 12.5 fps, Fn = 1.94, d = 1.6'

2400 x 0.012 - (1800 - 1738) = 33.2 ≈ 11 - 3' Drops

* Drops every 220' ±

Ex	$22,044
Drops	$110,466
Conc	$380,845
Fence	$57,600
	$570,956

3. Pipe

Assume 5' cover, Inv = 1804 - 5 - 5.5 = 1793

Inv = 1742 - 5 - 5.5 = 1731

S = 0.008, n = 0.012, V = 14.6, 60" Pipe

0.008 x 2400 = 19.2', 62' fall, 43' fall not made up in pipe slope

RCP may not be feasible

CMP would help here

CMP, S = 0.026, d = 60", V = 15.09, Fn = 1.23, n = 0.021

Pipe		$241,600
MH	2 MH	$12000
		$453,600

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. ____ OF ____

CALCULATED BY JBT DATE 7/5 CHECKED BY ____ DATE ____

McDowell Road Alternatives

(8b) OAK Street west of segment 8A

US rim = 1742 Inv = 1742 − 3 = 1739

DS rim = 1694 Inv = 1694 − 3 = 1691

length = 2200 48/2200 = 0.022'/ft

Q = 300 cfs

1. Dirt Channel

MAX S = 0.0038, n = 0.025, SS = 4:1, bottom = 20'

V = 5 fps, fn = 0.7, d = 2.11

2200 x 0.0038 − (1739−1691) = 39.64 ≈ 12 - 3.3' drops

* Drop every 183' ±

Ex	$ 48641
Drops	$ 289 467
fence	$ 52800
	$ 390,908

2. Conc Channel

MAX S = 0.012, n = 0.015, SS = 2:1, bottom = 15'

V = 12.05 fps, fn = 1.93, d = 1.4'

2200 x 0.012 − (1739 − 1691) = 21.6 ≈ 7 - 3.1'

* Drops every 314'

Ex	$ 24158
Drops	$ 86612
Conc	$ 400 776
Fence	$ 52800
	$ 564,347

3. PIPE

Assume 5' cover, Inv = 1742 − 5 − 5.5 = 1731.5

Inv = 1691 − 5 − 5.5 = 1680.5

S = 0.015'/ft, n = 0.012, V = 19.8 fps 60" pipe

0.015 x 2200 = 33', 46' fall, 13' fall not made up in pipe slope

RCP Not feasible

CMP would help here

Pipe	404,800
MH 2	12 000
	$ 416,800

CMP, S = 0.022, d = 78", V = 14.8, fn = 1.46, n = 0.022

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. _____ OF _____

CALCULATED BY JGT DATE 7/5 CHECKED BY _____ DATE _____

McDowell Road Alternatives

(8c) Oak Street East of Sossaman Road (680'±)

USNG 1694 Inv = 1694 - 4 = 1690

DSNG 1680 Inv = 1680 - 4 = 1676

length = 680'

14/680 = 0.021

Q = 990 cfs

1. Dirt Channel

max S = 0.002, n = 0.025, SS = 4:1, bottom = 45'

V = 5 fps, fn = 0.55, d = 3.15

680 × 0.002 - (1690 - 1676) = 12.76 ≈ 4 - 3.2' Drops

S = 0.0017, V = 4.7, fn = 0.51

* Drop every 170'±

Ex	33601
Drops	160293
Fence	16320
	$210,214

2. Concrete Channel

max S = 0.006, n = 0.015, SS = 2:1, bottom = 20', d = 2.9, V = 13.2, fn = 1.52

680 × 0.006 - (1690 - 1676) = 9.92 = 3 - 3.3' Drops

* Drop every 227'±

Ex	13462
Drops	55507
Conc	164031
Fence	16320
	$249,320

3. Pipe

Assume 5' cover, Inv = 1694 - 5 - =

Inv = 1680 - 5 - =

Not Feasible

Cmp, S = 0.021, d = 108", V = 18.3, fn = 1.18, n = 0.023

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Speck Hill

PROJECT NO. 99591 SHEET NO. _____ OF _____

CALCULATED BY JBT DATE 7/5 CHECKED BY _____ DATE _____

McDowell RD Alternatives

(9) Bossoman RD, McDowell RD to Oak Street

US NG = 1680 Inv = 1680 - 5 = 1675

DS NG = 1650 Inv = 1650 - 5 = 1645

length = 2640 30/2640 = 0.011

Q = 1350 cfs

1. Art channel

max S = 0.0015, n = 0.025, SS = 4:1, bottom = 45'

V = 5.5fps, fn = 0.49, d = 4.06'

2640 x 0.0015 - (1675-1645) = 26.04 = 9 - 2.9' Drops

* Drop every 293' ±

EX	168176
Drops	366581
Fence	63360
	$596,117

2. Cove Channel

max S = 0.006, n = 0.015, SS = 2:1, bottom = 20'

V = 14.6fps, fn = 1.55, d = 3.45'

2640 x 0.006 - (1675-1645) = 14.2' = 5 - 2.8' Drops

* Drop every 528'

EX	77482
Drops	93597
Fence	63360
cove	742281
	$976,720

3. Pipe 30' fall in ½ mile pipe slope > 1% not feasible w/ RCP

CMP, S = 0.011, d = 132", V = 19.9', fn = 0.7, n = 0.023

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 1

CALCULATED BY JCT DATE 7/15 CHECKED BY _____ DATE _____

McDowell Alternatives

(1b) From Sessarano to 100' west to (Los Sendas Basin)

US NG = 1650 - 5 = 1645 Inv

DS NG = 1640 - 5 = 1643 Inv

length = 100' 2/100 = 0.02

Q = 1812 cfs

1. Dirt Channel

Use conc Channel adjacent to drop

2. Conc Channel

n = 0.015

MAX S = 0.0060 V/FT, V = 14.9 fps, fn = 1.57, d = 3.3'

100 x 0.0060 = 0.6', Require 1 - 1.4' Drop

Ex =	930	$3720
Conc =	1084	$33462
Drops =		$11395
Fence =		$2400
		$50,977

3. Pipe

Assume 5' cover Inv = 1650 - 5 - 12' = 1633

Inv = 1648 - 5 - 12' = 1631

S = 0.0054, n = 0.012, V = 20 = 20: ok, 132" pipe

100 x 0.0054 = 0.54' Require 1.46' drop not made up in pipe slope

CMP would fail here

Pipe = $56,000

CMP, S = 0.02, d = 132", V = 20.2 fps, Fn = 0.96, n = 0.023

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 1

CALCULATED BY KSI DATE ____ CHECKED BY TJS DATE ____

McDowell Alternatives

(11b) From (Las Sendas Basins) to FRS

US NG = 1648 Inv = 1648 - 6 = 1642

DS NG = 1580 Inv = 1580 (Outlet inv)

Length = 1550' 62'/1550 = 0.04 ft/ft

Q = 1230 cfs

1. Dirt channel

n = 0.025, SS = 4:1, Bottom = 30

max S = 0.0013 ft/ft, V = 4.9 fps, Fn = 0.46, d = 4.99'

1550' × 0.0013 = (1642 - 1580) = 60', 20 - 3' drops

1 drop every 77' ±

Ex	24974	$ 99,895
Drops		$ 788,649
Fence		$ 37,200
		$ 925,744

2. Conc Channel

n = 0.015, SS = 2:1, Bottom = 30'

max S = 0.0055, V = 14.8 < 15 ok, Fn = 1.8 < 2 ok, d = 2.4'

1550 × 0.0055 = 8.5' - (1642 - 1580) = 53.5, 18 - 3' drops

S = 0.0052 ft/ft, V = 14.51, Fn = 1.75, d = 2.43'

Ex	40,433
Conc	460,093
Drops	387,728
Fence	37,200
	$ 925,454

3. Pipe

Assume 5' cover Inv = 1648 - 5 - 12 = 1631

Inv = 1580 outlet = 1580

S = 0.006, n = 0.012, V = 19.95 < 20 ok, 120" pipe

1550 × 0.006 = 9.3', 41.3' of drop not made up in pipe slope

RCP may not be feasible

CMP would Help here

Pipe		868,000
mtt	2	12,000
HW		12,700
		$ 892,700

max slope

CMP, S = 0.021, d = 12', V = 20, Fn = 1.56, n = 0.025

CMP will not work max S = 0.021

Read Slope = 0.04

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 3

CALCULATED BY JGT DATE 6/00 CHECKED BY _____ DATE _____

McDowell Alt.

(12) From North to East Basin

US NG = 1843 Inv = NG - 3 = 1840

DS NG = 1831 Inv = NG - 3 = 1828

length = 6600' 12/6000 = 0.018'/ft

Q = 182 cfs

a1. Dirt Channel

S = 0.018'/ft, n = 0.025, SS = 4:1, bottom = 8'

V = 8.28 fps > 5 fps ∴ won't work

d = 1.55

Fn = 1.41, supercritical ∴ won't work

Add 3-3' Drops

S = 0.0045'/ft

V = 5 fps = 5 fps ∴ ok

Fn = 0.74 < 0.86 ∴ ok

d = 2'

Ex 2628cy @ $4 = $10,512

Drops 3 EA = $47,100

Fence 2460'/ft = $15,800

$73,412

a2. Conc Channel

S = 0.018'/ft, 2:1, 10' bottom, n = 0.015

V = 13.4 fps < 15 fps ∴ ok

Fn = 2.3 supercritical > 2.0 ∴ won't work

SUBCRITICAL

Add 3-3.5' Drops

S = 0.0021'/ft

V = 16 fps

Fn = 0.84

d = 2.11'

Ex 2114·4 = $8457

Conc 3660·310 = $113,319

Drops 3 = $39,000

Fence 1320/12 = $15,840

$176,616

SUPERCRITICAL

Max S = 0.0125'/ft, use 2-2' Drops,

S = 0.0121'/ft, V = 11.14 < 15 ∴ ok, Fn = 1.89 < 2 ∴ ok

d = 1.3', Supercritical flow

Ex $8,974

Conc 116,540

Drops 15,179

Fence 15,840

$156,500

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 2 OF 3

CALCULATED BY JGT DATE 6/00 CHECKED BY _____ DATE _____

12a3 Pipe

US NG = 1843, use 4' pipe w/ 4' cover INV = 43 - 8.3 = 1834.7

DS NG = 1831 31 - 8.3 = 1822.7 *

* will require drop from INV to basin bottom @ 1813 ± 12'

S = 0.01 '/ft

n = 0.012

d = 54"

V = 15 fps = 15 fps max ∴ ok

* can only make up ½ total NG slope in pipe, will require drops or deeper burial.

1600 LF 54" @ $160/LF = $105.6k

HEADWALLS = $4.4

SPLITTER ST $110,000

$50,000

$160,000

CMP may be option here

CMP, s = 0.018, d = , V = , fn = , n =

12b1. Channel from N to S end of basin - dirt (25 cfs)

US NG = 1831 INV = NG - 3 = 1828

DS NG = 1819 INV = NG - 3 = 1816

length = 660

Q = 25 cfs

ADD 3 - 3' drops

S = 0.0045 '/ft, n = 0.025, ss 4:1, bottom = 8'

V = 3.85 fps ∴ ok

d = 0.8' deep

Fn = 0.64

Ex	1500 cy @ $4 =	$6,204
Drops		$32,970
Fence		$15,800
		$55,000

12b2. Conc Channel, n = 0.015, ss 2:1, bottom 10'

SUBCRITICAL

ADD 3 - 3.5' drops

S = 0.003

V = 6.06 fps

Fn = 0.85

d = 0.67

Ex	1200	$4894
conc	2840	$88072
Drops		28512
Fence		15800
		$137,278

SUPERCRITICAL

max s = 0.019, use 0.0182 (no drops req'd)

V = 6.4 < 15 ∴ ok, fn = 1.95 < 2 ∴ ok, d = 0.36'

Ex	1090	$4361
conc	270	$83,607
Fence	1320	$15,840
		$103,900

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 2 OF 3

CALCULATED BY JST DATE 6/00 CHECKED BY _____ DATE _____

1263 Pipe Q=25 cfs

Use ng 1531 Use 24" pipe w 4' cover 31 - 6 = 25.

19 - 6 = 14.

Keep Velocity below 15 fps (25-19)/1060 = 0.017 ft/ft

S = 0.017

n = 0.012

d = 24"

V = 11.26 fps < 15 ∴ OK

1060 LF 24" pipe $46,200

Headwalls $2,200

$48,400

Land Takes
McDowell Road Option 1a Earthen Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	N					0.00%	$232,000	$0	
2	Channel	219-24-049	N					0.00%	$279,500	$0	
2	Channel	219-24-050	N					0.00%	$62,000	$0	
2	Channel	219-24-051	N					0.00%	$62,000	$0	
2	Channel	219-24-052	N					0.00%	$62,000	$0	
2	Channel	219-24-053	N					0.00%	$254,500	$0	
2	Channel	219-24-054	N					0.00%	$62,000	$0	
2	Channel	219-24-055	N					0.00%	$62,000	$0	
2	Channel	219-24-056	N					0.00%	$65,000	$0	
2	Channel	219-24-057	N					0.00%	$264,000	$0	
2	Channel	219-24-058	N					0.00%	$268,500	$0	
2	Channel	219-24-059	N					0.00%	$62,000	$0	
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	65	0.49	10.48%	$439,109	$46,006	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	65	0.49	10.48%	$187,500	$19,645	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	65	0.30	10.48%	$158,500	$16,606	
3a	Channel	219-23-029C	P	1.88	132	65	0.20	10.48%	$64,500	$6,758	
3a	Channel	219-23-030A	P	2.34	165	65	0.25	10.52%	$172,500	$18,150	
3a	Channel	219-23-031A	P	2.35	165	65	0.25	10.48%	$134,500	$14,092	$1,340,946
3b	Channel	219-22-012C	P	2.35	165	84	0.32	13.54%	$70,200	$9,505	
3b	Channel	219-22-012B	P	2.35	165	84	0.32	13.54%	$150,000	$20,309	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	84	0.59	28.97%	$104,500	$30,277	
3b	Channel	219-22-021A	P	4.20	330	84	0.64	15.15%	$111,500	$16,894	
3b	Channel	219-22-020C	P	4.48	420	84	0.81	18.08%	$89,560	$16,191	
3b	Channel	219-22-019H	P	1.81	190	84	0.37	20.24%	$63,000	$12,753	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	84	0.25	13.26%	$216,000	$28,650	$726,079
1	Basin	219-33-027A	P	19.28	609	660	9.23	47.86%	$385,600	$184,545	$184,545
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,785	$217,785
12	Channel	219-33-027A	P	19.28	1246	51	1.46	7.57%	$385,600	$29,176	$29,176
13	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
13	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
13	Channel	219-31-004C	P	7.81	660	71	1.08	13.77%	$169,000	$23,278	$187,778
						Total (ac)	22.02				$2,686,310
						Basin (ac)	14.23				$402,330
						Channel (ac)	7.79				$2,283,980

Land Takes
McDowell Road Option 1a Concrete Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	N					0.00%	$232,000	$0	
2	Channel	219-24-049	N					0.00%	$279,500	$0	
2	Channel	219-24-050	N					0.00%	$62,000	$0	
2	Channel	219-24-051	N					0.00%	$62,000	$0	
2	Channel	219-24-052	N					0.00%	$62,000	$0	
2	Channel	219-24-053	N					0.00%	$254,500	$0	
2	Channel	219-24-054	N					0.00%	$62,000	$0	
2	Channel	219-24-055	N					0.00%	$62,000	$0	
2	Channel	219-24-056	N					0.00%	$65,000	$0	
2	Channel	219-24-057	N					0.00%	$264,000	$0	
2	Channel	219-24-058	N					0.00%	$268,500	$0	
2	Channel	219-24-059	N					0.00%	$62,000	$0	
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	42	0.32	6.77%	$439,109	$29,727	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	42	0.32	6.77%	$187,500	$12,693	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	42	0.19	6.77%	$158,500	$10,730	
3a	Channel	219-23-029C	P	1.88	132	42	0.13	6.77%	$64,500	$4,367	
3a	Channel	219-23-030A	P	2.34	165	42	0.16	6.80%	$172,500	$11,728	
3a	Channel	219-23-031A	P	2.35	165	42	0.16	6.77%	$134,500	$9,105	$1,298,040
3b	Channel	219-22-012C	P	2.35	165	51	0.19	8.22%	$70,200	$5,771	
3b	Channel	219-22-012B	P	2.35	165	51	0.19	8.22%	$150,000	$12,331	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	51	0.36	17.59%	$104,500	$18,382	
3b	Channel	219-22-021A	P	4.20	330	51	0.39	9.20%	$111,500	$10,257	
3b	Channel	219-22-020C	P	4.48	420	51	0.49	10.98%	$89,560	$9,830	
3b	Channel	219-22-019H	P	1.81	190	51	0.22	12.29%	$63,000	$7,743	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	51	0.15	8.05%	$216,000	$17,395	$673,209
1	Basin	219-33-027A	P	19.28	609	660	9.23	47.86%	$385,600	$184,545	$184,545
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
12	Channel	219-33-027A	P	19.28	1246	36	1.03	5.34%	$385,600	$20,595	$20,595
13	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
13	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
13	Channel	219-31-004C	P	7.81	660	49	0.74	9.51%	$169,000	$16,065	$180,565
						Total	19.27				$2,574,753
						Basin	14.23				$402,343
						Channel	5.04				$2,172,409

Land Takes
McDowell Road Option 1b Earthen Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	N					0.00%	$232,000	$0	
2	Channel	219-24-049	N					0.00%	$279,500	$0	
2	Channel	219-24-050	N					0.00%	$62,000	$0	
2	Channel	219-24-051	N					0.00%	$62,000	$0	
2	Channel	219-24-052	N					0.00%	$62,000	$0	
2	Channel	219-24-053	N					0.00%	$254,500	$0	
2	Channel	219-24-054	N					0.00%	$62,000	$0	
2	Channel	219-24-055	N					0.00%	$62,000	$0	
2	Channel	219-24-056	N					0.00%	$65,000	$0	
2	Channel	219-24-057	N					0.00%	$264,000	$0	
2	Channel	219-24-058	N					0.00%	$268,500	$0	
2	Channel	219-24-059	N					0.00%	$62,000	$0	
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	81	0.61	13.06%	$439,109	$57,330	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	81	0.61	13.06%	$187,500	$24,480	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	81	0.37	13.06%	$158,500	$20,694	
3a	Channel	219-23-029C	P	1.88	132	81	0.25	13.06%	$64,500	$8,421	
3a	Channel	219-23-030A	P	2.34	165	81	0.31	13.11%	$172,500	$22,618	
3a	Channel	219-23-031A	P	2.35	165	81	0.31	13.06%	$134,500	$17,560	$1,370,794
3b	Channel	219-22-012C	P	2.35	165	109	0.41	17.57%	$70,200	$12,334	
3b	Channel	219-22-012B	P	2.35	165	109	0.41	17.57%	$150,000	$26,354	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	109	0.76	37.60%	$104,500	$39,288	
3b	Channel	219-22-021A	P	4.20	330	109	0.83	19.66%	$111,500	$21,922	
3b	Channel	219-22-020C	P	4.48	420	109	1.05	23.46%	$89,560	$21,010	
3b	Channel	219-22-019H	P	1.81	190	109	0.48	26.27%	$63,000	$16,548	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	109	0.33	17.21%	$216,000	$37,177	$766,133
1	Basin	219-33-027A	P	19.28	609	660	9.23	47.86%	$385,600	$184,545	$184,545
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
12	Channel	219-33-027A	P	19.28	1246	51	1.46	7.57%	$385,600	$29,176	$29,176
13	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
13	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
13	Channel	219-31-004C	P	7.81	660	71	1.08	13.77%	$169,000	$23,278	$187,778
6	Channel	219-24-003M	P	4.70	330	45	0.34	7.25%	$322,000	$23,356	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	45	0.66	1.73%	$720,000	$12,462	
6	Channel	219-24-001Q	P	8.90	625	45	0.65	7.25%	$256,500	$18,608	$247,926
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	74	0.56	11.21%	$191,000	$21,415	
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	

5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	
5	Channel	219-24-004G	P	10.00	659.68	74	1.12	11.21%	$200,000	$22,413	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$507,829
						Total (ac)	36.20				$3,777,979
						Basin (ac)	23.62				$668,343
						Channel (ac)	12.58				$3,109,636

Land Takes
McDowell Road Option 1b Concrete Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	N					0.00%	$232,000	$0	
2	Channel	219-24-049	N					0.00%	$279,500	$0	
2	Channel	219-24-050	N					0.00%	$62,000	$0	
2	Channel	219-24-051	N					0.00%	$62,000	$0	
2	Channel	219-24-052	N					0.00%	$62,000	$0	
2	Channel	219-24-053	N					0.00%	$254,500	$0	
2	Channel	219-24-054	N					0.00%	$62,000	$0	
2	Channel	219-24-055	N					0.00%	$62,000	$0	
2	Channel	219-24-056	N					0.00%	$65,000	$0	
2	Channel	219-24-057	N					0.00%	$264,000	$0	
2	Channel	219-24-058	N					0.00%	$268,500	$0	
2	Channel	219-24-059	N					0.00%	$62,000	$0	
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	49	0.37	7.90%	$439,109	$34,681	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	49	0.37	7.90%	$187,500	$14,809	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	49	0.22	7.90%	$158,500	$12,519	
3a	Channel	219-23-029C	P	1.88	132	49	0.15	7.90%	$64,500	$5,094	
3a	Channel	219-23-030A	P	2.34	165	49	0.19	7.93%	$172,500	$13,682	
3a	Channel	219-23-031A	P	2.35	165	49	0.19	7.90%	$134,500	$10,623	$1,311,099
3b	Channel	219-22-012C	P	2.35	165	66	0.25	10.64%	$70,200	$7,468	
3b	Channel	219-22-012B	P	2.35	165	66	0.25	10.64%	$150,000	$15,957	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	66	0.46	22.76%	$104,500	$23,789	
3b	Channel	219-22-021A	P	4.20	330	66	0.50	11.90%	$111,500	$13,274	
3b	Channel	219-22-020C	P	4.48	420	66	0.64	14.20%	$89,560	$12,722	
3b	Channel	219-22-019H	P	1.81	190	66	0.29	15.90%	$63,000	$10,020	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	66	0.20	10.42%	$216,000	$22,511	$697,241
1	Basin	219-33-027A	P	19.28	609	660	9.23	47.86%	$385,600	$184,545	$184,545
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
12	Channel	219-33-027A	P	19.28	1246	36	1.03	5.34%	$385,600	$20,595	$20,595
13	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
13	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
13	Channel	219-31-004C	P	7.81	660	49	0.74	9.51%	$169,000	$16,065	$180,565
6	Channel	219-24-003M	P	4.70	330	36	0.27	5.80%	$322,000	$18,685	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	36	0.52	1.38%	$720,000	$9,970	
6	Channel	219-24-001Q	P	8.90	625	36	0.52	5.80%	$256,500	$14,886	$237,041
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	53	0.40	8.03%	$191,000	$15,338	

5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	
5	Channel	219-24-004G	P	10.00	659.68	53	0.80	8.03%	$200,000	$16,053	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$495,391
						Total (ac)	31.98				$3,610,275
						Basin (ac)	23.62				$668,343
						Channel (ac)	8.36				$2,941,931

Land Takes
McDowell Road Option 1c Earthen Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	N					0.00%	$232,000	$0	
2	Channel	219-24-049	N					0.00%	$279,500	$0	
2	Channel	219-24-050	N					0.00%	$62,000	$0	
2	Channel	219-24-051	N					0.00%	$62,000	$0	
2	Channel	219-24-052	N					0.00%	$62,000	$0	
2	Channel	219-24-053	N					0.00%	$254,500	$0	
2	Channel	219-24-054	N					0.00%	$62,000	$0	
2	Channel	219-24-055	N					0.00%	$62,000	$0	
2	Channel	219-24-056	N					0.00%	$65,000	$0	
2	Channel	219-24-057	N					0.00%	$264,000	$0	
2	Channel	219-24-058	N					0.00%	$268,500	$0	
2	Channel	219-24-059	N					0.00%	$62,000	$0	
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	71	0.54	11.44%	$439,109	$50,253	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	71	0.54	11.44%	$187,500	$21,458	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	71	0.32	11.44%	$158,500	$18,139	
3a	Channel	219-23-029C	P	1.88	132	71	0.22	11.44%	$64,500	$7,382	
3a	Channel	219-23-030A	P	2.34	165	71	0.27	11.49%	$172,500	$19,826	
3a	Channel	219-23-031A	P	2.35	165	71	0.27	11.44%	$134,500	$15,392	$1,352,139
3b	Channel	219-22-012C	P	2.35	165	75	0.28	12.09%	$70,200	$8,486	
3b	Channel	219-22-012B	P	2.35	165	75	0.28	12.09%	$150,000	$18,133	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	75	0.53	25.87%	$104,500	$27,033	
3b	Channel	219-22-021A	P	4.20	330	75	0.57	13.53%	$111,500	$15,084	
3b	Channel	219-22-020C	P	4.48	420	75	0.72	16.14%	$89,560	$14,456	
3b	Channel	219-22-019H	P	1.81	190	75	0.33	18.07%	$63,000	$11,386	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	75	0.22	11.84%	$216,000	$25,580	$711,660
1	Basin	219-33-027A	P	19.28	609	660	9.23	47.86%	$385,600	$184,545	$184,545
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
12	Channel	219-33-027A	P	19.28	1246	51	1.46	7.57%	$385,600	$29,176	$29,176
13	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
13	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
13	Channel	219-31-004C	P	7.81	660	71	1.08	13.77%	$169,000	$23,278	$187,778
6	Channel	219-24-003M	P	4.70	330	45	0.34	7.25%	$322,000	$23,356	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	45	0.66	1.73%	$720,000	$12,462	
6	Channel	219-24-001Q	P	8.90	625	45	0.65	7.25%	$256,500	$18,608	$247,926
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	74	0.56	11.21%	$191,000	$21,415	

5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	
5	Channel	219-24-004G	P	10.00	659.68	74	1.12	11.21%	$200,000	$22,413	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$507,829
8a	Channel	219-21-8B	P	2.25	297	56	0.38	16.97%	$104,500	$17,733	
8a	Channel	219-21-19B	T					100.00%	$249,000	$249,000	
8a	Channel	219-21-17C	T					100.00%	$192,500	$192,500	
8a	Channel	219-21-15	P	2.27	300	56	0.39	16.97%	$80,500	$13,659	
8a	Channel	219-21-13	P	4.41	630	56	0.81	18.36%	$204,000	$37,457	
8a	Channel	219-21-11B	P	2.14	305	56	0.39	18.36%	$187,500	$34,419	
8a	Channel	219-21-10C	P	2.14	305	56	0.39	18.36%	$197,000	$36,163	$580,932
8b	Channel	219-20-4	P	20.00	660	61	0.92	4.62%	$300,000	$13,864	
8b	Channel	219-20-3	P	20.00	660	61	0.92	4.62%	$300,000	$13,864	
8b	Channel	219-20-2H	P	3.00	426.43	61	0.60	19.91%	$157,500	$31,351	
8b	Channel	219-20-2G	P	6.10	214.5	61	0.30	4.92%	$91,500	$4,503	$63,581
8c	Channel	219-20-2G	P	6.10	680	94	1.47	24.04%	$91,500	$21,997	$21,997
						Total (ac)	41.14				$4,371,361

Land Takes
McDowell Road Option 1c Concrete Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	N					0.00%	$232,000	$0	
2	Channel	219-24-049	N					0.00%	$279,500	$0	
2	Channel	219-24-050	N					0.00%	$62,000	$0	
2	Channel	219-24-051	N					0.00%	$62,000	$0	
2	Channel	219-24-052	N					0.00%	$62,000	$0	
2	Channel	219-24-053	N					0.00%	$254,500	$0	
2	Channel	219-24-054	N					0.00%	$62,000	$0	
2	Channel	219-24-055	N					0.00%	$62,000	$0	
2	Channel	219-24-056	N					0.00%	$65,000	$0	
2	Channel	219-24-057	N					0.00%	$264,000	$0	
2	Channel	219-24-058	N					0.00%	$268,500	$0	
2	Channel	219-24-059	N					0.00%	$62,000	$0	
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	44	0.33	7.09%	$439,109	$31,142	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	44	0.33	7.09%	$187,500	$13,298	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	44	0.20	7.09%	$158,500	$11,241	
3a	Channel	219-23-029C	P	1.88	132	44	0.13	7.09%	$64,500	$4,574	
3a	Channel	219-23-030A	P	2.34	165	44	0.17	7.12%	$172,500	$12,286	
3a	Channel	219-23-031A	P	2.35	165	44	0.17	7.09%	$134,500	$9,539	$1,301,771
3b	Channel	219-22-012C	P	2.35	165	52	0.20	8.38%	$70,200	$5,884	
3b	Channel	219-22-012B	P	2.35	165	52	0.20	8.38%	$150,000	$12,573	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	52	0.36	17.94%	$104,500	$18,743	
3b	Channel	219-22-021A	P	4.20	330	52	0.39	9.38%	$111,500	$10,458	
3b	Channel	219-22-020C	P	4.48	420	52	0.50	11.19%	$89,560	$10,023	
3b	Channel	219-22-019H	P	1.81	190	52	0.23	12.53%	$63,000	$7,895	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	52	0.16	8.21%	$216,000	$17,736	$674,811
1	Basin	219-33-027A	P	19.28	609	660	9.23	47.86%	$385,600	$184,545	$184,545
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
12	Channel	219-33-027A	P	19.28	1246	36	1.03	5.34%	$385,600	$20,595	$20,595
13	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
13	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
13	Channel	219-31-004C	P	7.81	660	49	0.74	9.51%	$169,000	$16,065	$180,565
6	Channel	219-24-003M	P	4.70	330	36	0.27	5.80%	$322,000	$18,685	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	36	0.52	1.38%	$720,000	$9,970	
6	Channel	219-24-001Q	P	8.90	625	36	0.52	5.80%	$256,500	$14,886	$237,041
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	53	0.40	8.03%	$191,000	$15,338	

5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	
5	Channel	219-24-004G	P	10.00	659.68	53	0.80	8.03%	$200,000	$16,053	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$495,391
4	Channel	219-24-018	N					0.00%	$271,500	$0	
4	Channel	219-24-017	N					0.00%	$282,000	$0	
4	Channel	219-24-016	N					0.00%	$244,000	$0	
4	Channel	219-24-015	N					0.00%	$240,000	$0	
4	Channel	219-24-014	N					0.00%	$64,000	$0	
4	Channel	219-24-013	N					0.00%	$311,500	$0	
4	Channel	219-24-012	N					0.00%	$270,000	$0	
4	Channel	219-24-066	N					0.00%	$60,000	$0	
4	Channel	219-24-065	N					0.00%	$78,500	$0	
4	Channel	219-24-064	N					0.00%	$64,000	$0	
4	Channel	219-24-063	N					0.00%	$243,000	$0	
4	Channel	219-24-062	N					0.00%	$310,000	$0	
4	Channel	219-24-061	N					0.00%	$244,000	$0	$0
8a	Channel	219-21-8B	P	2.25	297	40.4	0.28	12.24%	$104,500	$12,793	
8a	Channel	219-21-19B	T					100.00%	$249,000	$249,000	
8a	Channel	219-21-17C	T					100.00%	$192,500	$192,500	
8a	Channel	219-21-15	P	2.27	300	40.4	0.28	12.24%	$80,500	$9,854	
8a	Channel	219-21-13	P	4.41	630	40.4	0.58	13.25%	$204,000	$27,023	
8a	Channel	219-21-11B	P	2.14	305	40.4	0.28	13.24%	$187,500	$24,831	
8a	Channel	219-21-10C	P	2.14	305	40.4	0.28	13.24%	$197,000	$26,089	$542,090
8b	Channel	219-20-4	P	20.00	660	45	0.68	3.41%	$300,000	$10,227	
8b	Channel	219-20-3	P	20.00	660	45	0.68	3.41%	$300,000	$10,227	
8b	Channel	219-20-2H	P	3.00	426.43	45	0.44	14.68%	$157,500	$23,128	
8b	Channel	219-20-2G	P	6.10	214.5	45	0.22	3.63%	$91,500	$3,322	$46,904
8c	Channel	219-20-2G	P	6.10	680	56	0.87	14.32%	$91,500	$13,104	$13,104
						Total (ac)	35.88				$4,180,616

Land Takes
McDowell Road Option 1d Earthen Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	T					100.00%	$232,000	$232,000	
2	Channel	219-24-049	T					100.00%	$279,500	$279,500	
2	Channel	219-24-050	T					100.00%	$62,000	$62,000	
2	Channel	219-24-051	T					100.00%	$62,000	$62,000	
2	Channel	219-24-052	T					100.00%	$62,000	$62,000	
2	Channel	219-24-053	T					100.00%	$254,500	$254,500	
2	Channel	219-24-054	T					100.00%	$62,000	$62,000	
2	Channel	219-24-055	T					100.00%	$62,000	$62,000	
2	Channel	219-24-056	T					100.00%	$65,000	$65,000	
2	Channel	219-24-057	T					100.00%	$264,000	$264,000	
2	Channel	219-24-058	T					100.00%	$268,500	$268,500	
2	Channel	219-24-059	T					100.00%	$62,000	$62,000	
2	Channel	219-24-060	T					100.00%	$305,000	$305,000	$2,040,500
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	111	0.84	17.89%	$439,109	$78,564	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	111	0.84	17.89%	$187,500	$33,547	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	111	0.50	17.89%	$158,500	$28,358	
3a	Channel	219-23-029C	P	1.88	132	111	0.34	17.89%	$64,500	$11,540	
3a	Channel	219-23-030A	P	2.34	165	111	0.42	17.97%	$172,500	$30,995	
3a	Channel	219-23-031A	P	2.35	165	111	0.42	17.89%	$134,500	$24,064	$1,426,759
3b	Channel	219-22-012C	P	2.35	165	127	0.48	20.47%	$70,200	$14,370	
3b	Channel	219-22-012B	P	2.35	165	127	0.48	20.47%	$150,000	$30,706	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	127	0.89	43.80%	$104,500	$45,776	
3b	Channel	219-22-021A	P	4.20	330	127	0.96	22.91%	$111,500	$25,542	
3b	Channel	219-22-020C	P	4.48	420	127	1.22	27.33%	$89,560	$24,479	
3b	Channel	219-22-019H	P	1.81	190	127	0.55	30.60%	$63,000	$19,281	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	127	0.38	20.05%	$216,000	$43,316	$794,971
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
1	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
1	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
1	Channel	219-31-004C	P	7.81	660	72	1.09	13.97%	$169,000	$23,606	$188,106
6	Channel	219-24-003M	P	4.70	330	45	0.34	7.25%	$322,000	$23,356	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	45	0.66	1.73%	$720,000	$12,462	
6	Channel	219-24-001Q	P	8.90	625	45	0.65	7.25%	$256,500	$18,608	$247,926
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	74	0.56	11.21%	$191,000	$21,415	
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	
5	Channel	219-24-004G	P	10.00	659.68	74	1.12	11.21%	$200,000	$22,413	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	

5	Channel	219-24-004D	T			100.00%	$74,020	$74,020	$507,829
				Total (ac)	27.14				$5,689,888

Land Takes
McDowell Road Option 1d Concrete Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	N					0.00%	$232,000	$0	
2	Channel	219-24-049	N					0.00%	$279,500	$0	
2	Channel	219-24-050	N					0.00%	$62,000	$0	
2	Channel	219-24-051	N					0.00%	$62,000	$0	
2	Channel	219-24-052	N					0.00%	$62,000	$0	
2	Channel	219-24-053	N					0.00%	$254,500	$0	
2	Channel	219-24-054	N					0.00%	$62,000	$0	
2	Channel	219-24-055	N					0.00%	$62,000	$0	
2	Channel	219-24-056	N					0.00%	$65,000	$0	
2	Channel	219-24-057	N					0.00%	$264,000	$0	
2	Channel	219-24-058	N					0.00%	$268,500	$0	
2	Channel	219-24-059	N					0.00%	$62,000	$0	
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	61	0.46	9.83%	$439,109	$43,175	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	61	0.46	9.83%	$187,500	$18,436	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	61	0.28	9.83%	$158,500	$15,584	
3a	Channel	219-23-029C	P	1.88	132	61	0.18	9.83%	$64,500	$6,342	
3a	Channel	219-23-030A	P	2.34	165	61	0.23	9.87%	$172,500	$17,033	
3a	Channel	219-23-031A	P	2.35	165	61	0.23	9.83%	$134,500	$13,225	$1,333,485
3b	Channel	219-22-012C	P	2.35	165	67	0.25	10.80%	$70,200	$7,581	
3b	Channel	219-22-012B	P	2.35	165	67	0.25	10.80%	$150,000	$16,199	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	67	0.47	23.11%	$104,500	$24,149	
3b	Channel	219-22-021A	P	4.20	330	67	0.51	12.09%	$111,500	$13,475	
3b	Channel	219-22-020C	P	4.48	420	67	0.65	14.42%	$89,560	$12,914	
3b	Channel	219-22-019H	P	1.81	190	67	0.29	16.15%	$63,000	$10,172	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	67	0.20	10.58%	$216,000	$22,852	$698,843
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
1	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
1	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
1	Channel	219-31-004C	P	7.81	660	44	0.67	8.54%	$169,000	$14,426	$178,926
6	Channel	219-24-003M	P	4.70	330	36	0.27	5.80%	$322,000	$18,685	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	36	0.52	1.38%	$720,000	$9,970	
6	Channel	219-24-001Q	P	8.90	625	36	0.52	5.80%	$256,500	$14,886	$237,041
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	53	0.40	8.03%	$191,000	$15,338	
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	
5	Channel	219-24-004G	P	10.00	659.68	53	0.80	8.03%	$200,000	$16,053	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	

5	Channel	219-24-004D	T			100.00%	$74,020	$74,020	$495,391
				Total (ac)	22.05				$3,427,483

Land Takes
McDowell Road Option 1e Earthen Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	T					100.00%	$232,000	$232,000	
2	Channel	219-24-049	T					100.00%	$279,500	$279,500	
2	Channel	219-24-050	T					100.00%	$62,000	$62,000	
2	Channel	219-24-051	T					100.00%	$62,000	$62,000	
2	Channel	219-24-052	T					100.00%	$62,000	$62,000	
2	Channel	219-24-053	T					100.00%	$254,500	$254,500	
2	Channel	219-24-054	T					100.00%	$62,000	$62,000	
2	Channel	219-24-055	T					100.00%	$62,000	$62,000	
2	Channel	219-24-056	T					100.00%	$65,000	$65,000	
2	Channel	219-24-057	T					100.00%	$264,000	$264,000	
2	Channel	219-24-058	T					100.00%	$268,500	$268,500	
2	Channel	219-24-059	T					100.00%	$62,000	$62,000	
2	Channel	219-24-060	T					100.00%	$305,000	$305,000	$2,040,500
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	120	0.91	19.34%	$439,109	$84,934	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	120	0.91	19.34%	$187,500	$36,267	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	120	0.55	19.34%	$158,500	$30,658	
3a	Channel	219-23-029C	P	1.88	132	120	0.36	19.34%	$64,500	$12,476	
3a	Channel	219-23-030A	P	2.34	165	120	0.45	19.43%	$172,500	$33,508	
3a	Channel	219-23-031A	P	2.35	165	120	0.45	19.34%	$134,500	$26,015	$1,443,548
3b	Channel	219-22-012C	P	2.35	165	127	0.48	20.47%	$70,200	$14,370	
3b	Channel	219-22-012B	P	2.35	165	127	0.48	20.47%	$150,000	$30,706	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	127	0.89	43.80%	$104,500	$45,776	
3b	Channel	219-22-021A	P	4.20	330	127	0.96	22.91%	$111,500	$25,542	
3b	Channel	219-22-020C	P	4.48	420	127	1.22	27.33%	$89,560	$24,479	
3b	Channel	219-22-019H	P	1.81	190	127	0.55	30.60%	$63,000	$19,281	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	127	0.38	20.05%	$216,000	$43,316	$794,971
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
12	Channel	219-33-027A	P	19.28	1246	51	1.46	7.57%	$385,600	$29,176	$29,176
1	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
1	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
1	Channel	219-31-004C	P	7.81	660	72	1.09	13.97%	$169,000	$23,606	$188,106
6	Channel	219-24-003M	P	4.70	330	45	0.34	7.25%	$322,000	$23,356	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	45	0.66	1.73%	$720,000	$12,462	
6	Channel	219-24-001Q	P	8.90	625	45	0.65	7.25%	$256,500	$18,608	$247,926
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	74	0.56	11.21%	$191,000	$21,415	
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	
5	Channel	219-24-004G	P	10.00	659.68	74	1.12	11.21%	$200,000	$22,413	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	

5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$507,829
8a	Channel	219-21-8B	P	2.25	297	56	0.38	16.97%	$104,500	$17,733	
8a	Channel	219-21-19B	T					100.00%	$249,000	$249,000	
8a	Channel	219-21-17C	T					100.00%	$192,500	$192,500	
8a	Channel	219-21-15	P	2.27	300	56	0.39	16.97%	$80,500	$13,659	
8a	Channel	219-21-13	P	4.41	630	56	0.81	18.36%	$204,000	$37,457	
8a	Channel	219-21-11B	P	2.14	305	56	0.39	18.36%	$187,500	$34,419	
8a	Channel	219-21-10C	P	2.14	305	56	0.39	18.36%	$197,000	$36,163	$580,932
8b	Channel	219-20-4	P	20.00	660	61	0.92	4.62%	$300,000	$13,864	
8b	Channel	219-20-3	P	20.00	660	61	0.92	4.62%	$300,000	$13,864	
8b	Channel	219-20-2H	P	3.00	426.43	61	0.60	19.91%	$157,500	$31,351	
8b	Channel	219-20-2G	P	6.10	214.5	61	0.30	4.92%	$91,500	$4,503	$63,581
8c	Channel	219-20-2G	P	6.10	680	94	1.47	24.04%	$91,500	$21,997	$21,997
						Total (ac)	35.45				$6,402,363

Land Takes
McDowell Road Option 1e Concrete Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	N					0.00%	$232,000	$0	
2	Channel	219-24-049	N					0.00%	$279,500	$0	
2	Channel	219-24-050	N					0.00%	$62,000	$0	
2	Channel	219-24-051	N					0.00%	$62,000	$0	
2	Channel	219-24-052	N					0.00%	$62,000	$0	
2	Channel	219-24-053	N					0.00%	$254,500	$0	
2	Channel	219-24-054	N					0.00%	$62,000	$0	
2	Channel	219-24-055	N					0.00%	$62,000	$0	
2	Channel	219-24-056	N					0.00%	$65,000	$0	
2	Channel	219-24-057	N					0.00%	$264,000	$0	
2	Channel	219-24-058	N					0.00%	$268,500	$0	
2	Channel	219-24-059	N					0.00%	$62,000	$0	
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	55	0.42	8.87%	$439,109	$38,928	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	55	0.42	8.87%	$187,500	$16,622	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	55	0.25	8.87%	$158,500	$14,051	
3a	Channel	219-23-029C	P	1.88	132	55	0.17	8.87%	$64,500	$5,718	
3a	Channel	219-23-030A	P	2.34	165	55	0.21	8.90%	$172,500	$15,358	
3a	Channel	219-23-031A	P	2.35	165	55	0.21	8.87%	$134,500	$11,924	$1,322,292
3b	Channel	219-22-012C	P	2.35	165	66	0.25	10.64%	$70,200	$7,468	
3b	Channel	219-22-012B	P	2.35	165	66	0.25	10.64%	$150,000	$15,957	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	66	0.46	22.76%	$104,500	$23,789	
3b	Channel	219-22-021A	P	4.20	330	66	0.50	11.90%	$111,500	$13,274	
3b	Channel	219-22-020C	P	4.48	420	66	0.64	14.20%	$89,560	$12,722	
3b	Channel	219-22-019H	P	1.81	190	66	0.29	15.90%	$63,000	$10,020	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	66	0.20	10.42%	$216,000	$22,511	$697,241
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
12	Channel	219-33-027A	P	19.28	1246	51	1.46	7.57%	$385,600	$29,176	$29,176
1	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
1	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
1	Channel	219-31-004C	P	7.81	660	72	1.09	13.97%	$169,000	$23,606	$188,106
6	Channel	219-24-003M	P	4.70	330	36	0.27	5.80%	$322,000	$18,685	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	36	0.52	1.38%	$720,000	$9,970	
6	Channel	219-24-001Q	P	8.90	625	36	0.52	5.80%	$256,500	$14,886	$237,041
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	53	0.40	8.03%	$191,000	$15,338	
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	
5	Channel	219-24-004G	P	10.00	659.68	53	0.80	8.03%	$200,000	$16,053	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$495,391

8a	Channel	219-21-8B	P	2.25	297	40.4	0.28	12.24%	$104,500	$12,793	
8a	Channel	219-21-19B	T					100.00%	$249,000	$249,000	
8a	Channel	219-21-17C	T					100.00%	$192,500	$192,500	
8a	Channel	219-21-15	P	2.27	300	40.4	0.28	12.24%	$80,500	$9,854	
8a	Channel	219-21-13	P	4.41	630	40.4	0.58	13.25%	$204,000	$27,023	
8a	Channel	219-21-11B	P	2.14	305	40.4	0.28	13.24%	$187,500	$24,831	
8a	Channel	219-21-10C	P	2.14	305	40.4	0.28	13.24%	$197,000	$26,089	$542,090
8b	Channel	219-20-4	P	20.00	660	45	0.68	3.41%	$300,000	$10,227	
8b	Channel	219-20-3	P	20.00	660	45	0.68	3.41%	$300,000	$10,227	
8b	Channel	219-20-2H	P	3.00	426.43	45	0.44	14.68%	$157,500	$23,128	
8b	Channel	219-20-2G	P	6.10	214.5	45	0.22	3.63%	$91,500	$3,322	$46,904
8c	Channel	219-20-2G	P	6.10	680	56	0.87	14.32%	$91,500	$13,104	$13,104
						Total (ac)	28.32				$4,055,143

Land Takes
McDowell Road Option 1f Earthen Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	T					100.00%	$232,000	$232,000	
2	Channel	219-24-049	T					100.00%	$279,500	$279,500	
2	Channel	219-24-050	T					100.00%	$62,000	$62,000	
2	Channel	219-24-051	T					100.00%	$62,000	$62,000	
2	Channel	219-24-052	T					100.00%	$62,000	$62,000	
2	Channel	219-24-053	T					100.00%	$254,500	$254,500	
2	Channel	219-24-054	T					100.00%	$62,000	$62,000	
2	Channel	219-24-055	T					100.00%	$62,000	$62,000	
2	Channel	219-24-056	T					100.00%	$65,000	$65,000	
2	Channel	219-24-057	T					100.00%	$264,000	$264,000	
2	Channel	219-24-058	T					100.00%	$268,500	$268,500	
2	Channel	219-24-059	T					100.00%	$62,000	$62,000	
2	Channel	219-24-060	T					100.00%	$305,000	$305,000	$2,040,500
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	120	0.91	19.34%	$439,109	$84,934	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	120	0.91	19.34%	$187,500	$36,267	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	120	0.55	19.34%	$158,500	$30,658	
3a	Channel	219-23-029C	P	1.88	132	120	0.36	19.34%	$64,500	$12,476	
3a	Channel	219-23-030A	P	2.34	165	120	0.45	19.43%	$172,500	$33,508	
3a	Channel	219-23-031A	P	2.35	165	120	0.45	19.34%	$134,500	$26,015	$1,443,548
3b	Channel	219-22-012C	P	2.35	165	127	0.48	20.47%	$70,200	$14,370	
3b	Channel	219-22-012B	P	2.35	165	127	0.48	20.47%	$150,000	$30,706	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	127	0.89	43.80%	$104,500	$45,776	
3b	Channel	219-22-021A	P	4.20	330	127	0.96	22.91%	$111,500	$25,542	
3b	Channel	219-22-020C	P	4.48	420	127	1.22	27.33%	$89,560	$24,479	
3b	Channel	219-22-019H	P	1.81	190	127	0.55	30.60%	$63,000	$19,281	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	127	0.38	20.05%	$216,000	$43,316	$794,971
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
12	Channel	219-33-027A	P	19.28	1246	51	1.46	7.57%	$385,600	$29,176	$29,176
1	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
1	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
1	Channel	219-31-004C	P	7.81	660	72	1.09	13.97%	$169,000	$23,606	$188,106
6	Channel	219-24-003M	P	4.70	330	45	0.34	7.25%	$322,000	$23,356	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	45	0.66	1.73%	$720,000	$12,462	
6	Channel	219-24-001Q	P	8.90	625	45	0.65	7.25%	$256,500	$18,608	$247,926
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	74	0.56	11.21%	$191,000	$21,415	
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	

5	Channel	219-24-004G	P	10.00	659.68	74	1.12	11.21%	$200,000	$22,413	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$507,829
8a	Channel	219-23-6F	T					100.00%	$159,500	$159,500	
8a	Channel	219-23-6D	T					100.00%	$164,500	$164,500	
8a	Channel	219-23-6C	T					100.00%	$142,500	$142,500	
8a	Channel	219-23-5D	P	5	330	330	2.50	50.00%	$137,500	$68,750	
8a	Channel	219-23-5B	P	2.273	300	50	0.34	15.15%	$180,000	$27,269	
8a	Channel	219-23-11D	P	2.273	300	50	0.34	15.15%	$222,500	$33,708	
8a	Channel	219-23-13C	T					100.00%	$57,000	$57,000	
8a	Channel	219-23-14D	T					100.00%	$201,000	$201,000	
8a	Channel	219-23-14G	T					100.00%	$29,000	$29,000	
8a	Channel	219-23-14H	T					100.00%	$29,000	$29,000	
8a	Channel	219-23-16F	T					100.00%	$63,000	$63,000	
8a	Channel	219-23-16C	P	2.893	220	50	0.25	8.73%	$300,000	$26,187	
8a	Channel	219-23-17A	P	7.045	330	330	2.50	35.49%	$298,500	$105,926	$1,107,340
8b	Channel	219-22-14E	P	2.559	168.8	330.16	1.28	50.00%	$87,500	$43,747	
8b	Channel	219-22-15	P	4.72	400	50	0.46	9.73%	$132,000	$12,840	
8b	Channel	219-22-13B	T					100.00%	$169,500	$169,500	
8b	Channel	219-22-13A	T					100.00%	$21,700	$21,700	
8b	Channel	219-22-10B	P	1.72	297.06	50	0.34	19.82%	$67,000	$13,282	
8b	Channel	219-22-21A	P	4.46	296.95	330	2.25	50.44%	$111,500	$56,241	
8b	Channel	219-22-20C	P	4.478	420	207.5	2.00	44.68%	$89,560	$40,014	
8b	Channel	219-22-19H	T					100.00%	$63,000	$63,000	
8b	Channel	219-22-18Q	T					100.00%	$122,500	$122,500	
8b	Channel	219-22-18L	T					100.00%	$124,500	$124,500	
8b	Channel	219-22-24B	T					100.00%	$61,000	$61,000	
8b	Channel	219-22-24D	T					100.00%	$216,000	$216,000	$944,324
						Total (ac)	41.15				$7,787,518

Land Takes
McDowell Road Option 1f Concrete Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	N					0.00%	$232,000	$0	
2	Channel	219-24-049	N					0.00%	$279,500	$0	
2	Channel	219-24-050	N					0.00%	$62,000	$0	
2	Channel	219-24-051	N					0.00%	$62,000	$0	
2	Channel	219-24-052	N					0.00%	$62,000	$0	
2	Channel	219-24-053	N					0.00%	$254,500	$0	
2	Channel	219-24-054	N					0.00%	$62,000	$0	
2	Channel	219-24-055	N					0.00%	$62,000	$0	
2	Channel	219-24-056	N					0.00%	$65,000	$0	
2	Channel	219-24-057	N					0.00%	$264,000	$0	
2	Channel	219-24-058	N					0.00%	$268,500	$0	
2	Channel	219-24-059	N					0.00%	$62,000	$0	
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	55	0.42	8.87%	$439,109	$38,928	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	55	0.42	8.87%	$187,500	$16,622	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	55	0.25	8.87%	$158,500	$14,051	
3a	Channel	219-23-029C	P	1.88	132	55	0.17	8.87%	$64,500	$5,718	
3a	Channel	219-23-030A	P	2.34	165	55	0.21	8.90%	$172,500	$15,358	
3a	Channel	219-23-031A	P	2.35	165	55	0.21	8.87%	$134,500	$11,924	$1,322,292
3b	Channel	219-22-012C	P	2.35	165	66	0.25	10.64%	$70,200	$7,468	
3b	Channel	219-22-012B	P	2.35	165	66	0.25	10.64%	$150,000	$15,957	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	66	0.46	22.76%	$104,500	$23,789	
3b	Channel	219-22-021A	P	4.20	330	66	0.50	11.90%	$111,500	$13,274	
3b	Channel	219-22-020C	P	4.48	420	66	0.64	14.20%	$89,560	$12,722	
3b	Channel	219-22-019H	P	1.81	190	66	0.29	15.90%	$63,000	$10,020	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	66	0.20	10.42%	$216,000	$22,511	$697,241
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
12	Channel	219-33-027A	P	19.28	1246	51	1.46	7.57%	$385,600	$29,176	$29,176
1	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
1	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
1	Channel	219-31-004C	P	7.81	660	72	1.09	13.97%	$169,000	$23,606	$188,106
6	Channel	219-24-003M	P	4.70	330	36	0.27	5.80%	$322,000	$18,685	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	36	0.52	1.38%	$720,000	$9,970	
6	Channel	219-24-001Q	P	8.90	625	36	0.52	5.80%	$256,500	$14,886	$237,041
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	53	0.40	8.03%	$191,000	$15,338	
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	

5	Channel	219-24-004G	P	10.00	659.68	53	0.80	8.03%	$200,000	$16,053	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$495,391
8a	Channel	219-23-6F	T					100.00%	$159,500	$159,500	
8a	Channel	219-23-6D	T					100.00%	$164,500	$164,500	
8a	Channel	219-23-6C	T					100.00%	$142,500	$142,500	
8a	Channel	219-23-5D	P	5	330	330	2.50	50.00%	$137,500	$68,750	
8a	Channel	219-23-5B	P	2.273	300	50	0.34	15.15%	$180,000	$27,269	
8a	Channel	219-23-11D	P	2.273	300	50	0.34	15.15%	$222,500	$33,708	
8a	Channel	219-23-13C	T					100.00%	$57,000	$57,000	
8a	Channel	219-23-14D	T					100.00%	$201,000	$201,000	
8a	Channel	219-23-14G	T					100.00%	$29,000	$29,000	
8a	Channel	219-23-14H	T					100.00%	$29,000	$29,000	
8a	Channel	219-23-16F	T					100.00%	$63,000	$63,000	
8a	Channel	219-23-16C	P	2.893	220	50	0.25	8.73%	$300,000	$26,187	
8a	Channel	219-23-17A	P	7.045	330	330	2.50	35.49%	$298,500	$105,926	$1,107,340
8b	Channel	219-22-14E	P	2.559	168.8	330.16	1.28	50.00%	$87,500	$43,747	
8b	Channel	219-22-15	P	4.72	400	50	0.46	9.73%	$132,000	$12,840	
8b	Channel	219-22-13B	T					100.00%	$169,500	$169,500	
8b	Channel	219-22-13A	T					100.00%	$21,700	$21,700	
8b	Channel	219-22-10B	P	1.72	297.06	50	0.34	19.82%	$67,000	$13,282	
8b	Channel	219-22-21A	P	4.46	296.95	330	2.25	50.44%	$111,500	$56,241	
8b	Channel	219-22-20C	P	4.478	420	207.5	2.00	44.68%	$89,560	$40,014	
8b	Channel	219-22-19H	T					100.00%	$63,000	$63,000	
8b	Channel	219-22-18Q	T					100.00%	$122,500	$122,500	
8b	Channel	219-22-18L	T					100.00%	$124,500	$124,500	
8b	Channel	219-22-24B	T					100.00%	$61,000	$61,000	
8b	Channel	219-22-24D	T					100.00%	$216,000	$216,000	$944,324
						Total (ac)	35.98				$5,504,708

Land Takes
McDowell Road Option 1b Earthen Channel Pass Mt Diversion in Place

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)		
2	Channel	219-24-048	N					0.00%	$232,000	$0		
2	Channel	219-24-049	N					0.00%	$279,500	$0		
2	Channel	219-24-050	N					0.00%	$62,000	$0		
2	Channel	219-24-051	N					0.00%	$62,000	$0		
2	Channel	219-24-052	N					0.00%	$62,000	$0		
2	Channel	219-24-053	N					0.00%	$254,500	$0		
2	Channel	219-24-054	N					0.00%	$62,000	$0		
2	Channel	219-24-055	N					0.00%	$62,000	$0		
2	Channel	219-24-056	N					0.00%	$65,000	$0		
2	Channel	219-24-057	N					0.00%	$264,000	$0		
2	Channel	219-24-058	N					0.00%	$268,500	$0		
2	Channel	219-24-059	N					0.00%	$62,000	$0		
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0	
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000		
3a	Channel	219-23-026E	P	4.70	330	81	0.61	13.06%	$439,109	$57,330		
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500		
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000		
3a	Channel	219-23-027B	P	4.70	330	81	0.61	13.06%	$187,500	$24,480		
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500		
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690		
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000		
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000		
3a	Channel	219-23-029B	P	2.82	198	81	0.37	13.06%	$158,500	$20,694		
3a	Channel	219-23-029C	P	1.88	132	81	0.25	13.06%	$64,500	$8,421		
3a	Channel	219-23-030A	P	2.34	165	81	0.31	13.11%	$172,500	$22,618		
3a	Channel	219-23-031A	P	2.35	165	81	0.31	13.06%	$134,500	$17,560	$1,370,794	
3b	Channel	219-22-012C	P	2.35	165	97	0.37	15.64%	$70,200	$10,976		
3b	Channel	219-22-012B	P	2.35	165	97	0.37	15.64%	$150,000	$23,453		
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000		
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500		
3b	Channel	219-22-022G	P	2.03	305	97	0.68	33.46%	$104,500	$34,963		
3b	Channel	219-22-021A	P	4.20	330	97	0.73	17.50%	$111,500	$19,508		
3b	Channel	219-22-020C	P	4.48	420	97	0.94	20.88%	$89,560	$18,697		
3b	Channel	219-22-019H	P	1.81	190	97	0.42	23.38%	$63,000	$14,726		
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500		
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500		
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000		
3b	Channel	219-22-024D	P	1.89	130	97	0.29	15.32%	$216,000	$33,084	$746,907	
1	Basin	219-33-027A	P	19.28	609	660	9.23	47.86%	$385,600	$184,545	$184,545	
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798	
12	Channel	219-33-027A	P	19.28	1246	51	1.46	7.57%	$385,600	$29,176	$29,176	
13	Channel	219-31-004E	T					100.00%	$16,000	$16,000		
13	Channel	219-31-004F	T					100.00%	$148,500	$148,500		
13	Channel	219-31-004C	P	7.81	660	63	0.95	12.22%	$169,000	$20,655	$185,155	
6	Channel	219-24-003M	P	4.70	330	45	0.34	7.25%	$322,000	$23,356		
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500		
6	Channel	219-24-001H	P	37.90	635	45	0.66	1.73%	$720,000	$12,462		
6	Channel	219-24-001Q	P	8.90	625	45	0.65	7.25%	$256,500	$18,608	$247,926	
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000	
5	Channel	219-24-003R	P	5.00	330	59	0.45	8.94%	$191,000	$17,074		
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500		
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500		
5	Channel	219-24-004G	P	10.00	659.68	59	0.89	8.94%	$200,000	$17,870		
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980		
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$498,944	
						Total (ac)	35.27				$3,747,247	
						Basin (ac)	23.62				$668,343	28294.2
						Channel (ac)	11.65				$3,078,903	264336.6

Land Takes
McDowell Road Option 1b Concrete Channel Pass Mt Diversion in Place

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)		
2	Channel	219-24-048	N					0.00%	$232,000	$0		
2	Channel	219-24-049	N					0.00%	$279,500	$0		
2	Channel	219-24-050	N					0.00%	$62,000	$0		
2	Channel	219-24-051	N					0.00%	$62,000	$0		
2	Channel	219-24-052	N					0.00%	$62,000	$0		
2	Channel	219-24-053	N					0.00%	$254,500	$0		
2	Channel	219-24-054	N					0.00%	$62,000	$0		
2	Channel	219-24-055	N					0.00%	$62,000	$0		
2	Channel	219-24-056	N					0.00%	$65,000	$0		
2	Channel	219-24-057	N					0.00%	$264,000	$0		
2	Channel	219-24-058	N					0.00%	$268,500	$0		
2	Channel	219-24-059	N					0.00%	$62,000	$0		
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0	
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000		
3a	Channel	219-23-026E	P	4.70	330	45	0.34	7.25%	$439,109	$31,850		
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500		
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000		
3a	Channel	219-23-027B	P	4.70	330	45	0.34	7.25%	$187,500	$13,600		
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500		
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690		
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000		
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000		
3a	Channel	219-23-029B	P	2.82	198	45	0.20	7.25%	$158,500	$11,497		
3a	Channel	219-23-029C	P	1.88	132	45	0.14	7.25%	$64,500	$4,678		
3a	Channel	219-23-030A	P	2.34	165	45	0.17	7.28%	$172,500	$12,566		
3a	Channel	219-23-031A	P	2.35	165	45	0.17	7.25%	$134,500	$9,756	$1,303,637	
3b	Channel	219-22-012C	P	2.35	165	60	0.23	9.67%	$70,200	$6,789		
3b	Channel	219-22-012B	P	2.35	165	60	0.23	9.67%	$150,000	$14,507		
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000		
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500		
3b	Channel	219-22-022G	P	2.03	305	60	0.42	20.70%	$104,500	$21,626		
3b	Channel	219-22-021A	P	4.20	330	60	0.45	10.82%	$111,500	$12,067		
3b	Channel	219-22-020C	P	4.48	420	60	0.58	12.91%	$89,560	$11,565		
3b	Channel	219-22-019H	P	1.81	190	60	0.26	14.46%	$63,000	$9,109		
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500		
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500		
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000		
3b	Channel	219-22-024D	P	1.89	130	60	0.18	9.47%	$216,000	$20,464	$687,628	
1	Basin	219-33-027A	P	19.28	609	660	9.23	47.86%	$385,600	$184,545	$184,545	
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798	
12	Channel	219-33-027A	P	19.28	1246	36	1.03	5.34%	$385,600	$20,595	$20,595	
13	Channel	219-31-004E	T					100.00%	$16,000	$16,000		
13	Channel	219-31-004F	T					100.00%	$148,500	$148,500		
13	Channel	219-31-004C	P	7.81	660	30	0.45	5.82%	$169,000	$9,836	$174,336	
6	Channel	219-24-003M	P	4.70	330	36	0.27	5.80%	$322,000	$18,685		
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500		
6	Channel	219-24-001H	P	37.90	635	36	0.52	1.38%	$720,000	$9,970		
6	Channel	219-24-001Q	P	8.90	625	36	0.52	5.80%	$256,500	$14,886	$237,041	
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000	
5	Channel	219-24-003R	P	5.00	330	38	0.29	5.76%	$191,000	$10,997		
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500		
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500		
5	Channel	219-24-004G	P	10.00	659.68	38	0.58	5.75%	$200,000	$11,510		
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980		
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$486,507	
						Total (ac)	31.00				$3,578,087	
						Basin (ac)	23.62				$668,343	$28,294.20

Channel (ac)	7.37	$2,909,743	394604.29

Land Takes
McDowell Road Option 1c Earthen Channel Pass Mt Diversion in Place

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	N					0.00%	$232,000	$0	
2	Channel	219-24-049	N					0.00%	$279,500	$0	
2	Channel	219-24-050	N					0.00%	$62,000	$0	
2	Channel	219-24-051	N					0.00%	$62,000	$0	
2	Channel	219-24-052	N					0.00%	$62,000	$0	
2	Channel	219-24-053	N					0.00%	$254,500	$0	
2	Channel	219-24-054	N					0.00%	$62,000	$0	
2	Channel	219-24-055	N					0.00%	$62,000	$0	
2	Channel	219-24-056	N					0.00%	$65,000	$0	
2	Channel	219-24-057	N					0.00%	$264,000	$0	
2	Channel	219-24-058	N					0.00%	$268,500	$0	
2	Channel	219-24-059	N					0.00%	$62,000	$0	
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	74	0.56	11.93%	$439,109	$52,376	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	74	0.56	11.93%	$187,500	$22,365	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	74	0.34	11.93%	$158,500	$18,906	
3a	Channel	219-23-029C	P	1.88	132	74	0.22	11.93%	$64,500	$7,693	
3a	Channel	219-23-030A	P	2.34	165	74	0.28	11.98%	$172,500	$20,663	
3a	Channel	219-23-031A	P	2.35	165	74	0.28	11.93%	$134,500	$16,043	$1,357,736
3b	Channel	219-22-012C	P	2.35	165	82	0.31	13.22%	$70,200	$9,279	
3b	Channel	219-22-012B	P	2.35	165	82	0.31	13.22%	$150,000	$19,826	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	82	0.57	28.28%	$104,500	$29,556	
3b	Channel	219-22-021A	P	4.20	330	82	0.62	14.79%	$111,500	$16,492	
3b	Channel	219-22-020C	P	4.48	420	82	0.79	17.65%	$89,560	$15,806	
3b	Channel	219-22-019H	P	1.81	190	82	0.36	19.76%	$63,000	$12,449	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	82	0.24	12.95%	$216,000	$27,968	$722,875
1	Basin	219-33-027A	P	19.28	609	660	9.23	47.86%	$385,600	$184,545	$184,545
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
12	Channel	219-33-027A	P	19.28	1246	51	1.46	7.57%	$385,600	$29,176	$29,176
13	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
13	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
13	Channel	219-31-004C	P	7.81	660	66	1.00	12.80%	$169,000	$21,639	$186,139
6	Channel	219-24-003M	P	4.70	330	45	0.34	7.25%	$322,000	$23,356	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	45	0.66	1.73%	$720,000	$12,462	
6	Channel	219-24-001Q	P	8.90	625	45	0.65	7.25%	$256,500	$18,608	$247,926
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	59	0.45	8.94%	$191,000	$17,074	
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	
5	Channel	219-24-004G	P	10.00	659.68	59	0.89	8.94%	$200,000	$17,870	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$498,944
8a	Channel	219-21-8B	P	2.25	297	56	0.38	16.97%	$104,500	$17,733	
8a	Channel	219-21-19B	T					100.00%	$249,000	$249,000	
8a	Channel	219-21-17C	T					100.00%	$192,500	$192,500	
8a	Channel	219-21-15	P	2.27	300	56	0.39	16.97%	$80,500	$13,659	
8a	Channel	219-21-13	P	4.41	630	56	0.81	18.36%	$204,000	$37,457	

8a	Channel	219-21-11B	P	2.14	305	56	0.39	18.36%	$187,500	$34,419		
8a	Channel	219-21-10C	P	2.14	305	56	0.39	18.36%	$197,000	$36,163	$580,932	
8b	Channel	219-20-4	P	20.00	660	61	0.92	4.62%	$300,000	$13,864		
8b	Channel	219-20-3	P	20.00	660	61	0.92	4.62%	$300,000	$13,864		
8b	Channel	219-20-2H	P	3.00	426.43	61	0.60	19.91%	$157,500	$31,351		
8b	Channel	219-20-2G	P	6.10	214.5	61	0.30	4.92%	$91,500	$4,503	$63,581	
8c	Channel	219-20-2G	P	6.10	680	81	1.26	20.72%	$91,500	$18,955	$18,955	
						Total (ac)	40.89				$4,374,607	$106,992.12
						Basin (ac)	23.62				$668,343	$28,294.20
						Channel (ac)	17.27				$3,706,263	$214,657.06

Land Takes
McDowell Road Option 1c Concrete Channel Pass Mt Diversion in Place

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	N					0.00%	$232,000	$0	
2	Channel	219-24-049	N					0.00%	$279,500	$0	
2	Channel	219-24-050	N					0.00%	$62,000	$0	
2	Channel	219-24-051	N					0.00%	$62,000	$0	
2	Channel	219-24-052	N					0.00%	$62,000	$0	
2	Channel	219-24-053	N					0.00%	$254,500	$0	
2	Channel	219-24-054	N					0.00%	$62,000	$0	
2	Channel	219-24-055	N					0.00%	$62,000	$0	
2	Channel	219-24-056	N					0.00%	$65,000	$0	
2	Channel	219-24-057	N					0.00%	$264,000	$0	
2	Channel	219-24-058	N					0.00%	$268,500	$0	
2	Channel	219-24-059	N					0.00%	$62,000	$0	
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	44	0.33	7.09%	$439,109	$31,142	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	44	0.33	7.09%	$187,500	$13,298	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	44	0.20	7.09%	$158,500	$11,241	
3a	Channel	219-23-029C	P	1.88	132	44	0.13	7.09%	$64,500	$4,574	
3a	Channel	219-23-030A	P	2.34	165	44	0.17	7.12%	$172,500	$12,286	
3a	Channel	219-23-031A	P	2.35	165	44	0.17	7.09%	$134,500	$9,539	$1,301,771
3b	Channel	219-22-012C	P	2.35	165	52	0.20	8.38%	$70,200	$5,884	
3b	Channel	219-22-012B	P	2.35	165	52	0.20	8.38%	$150,000	$12,573	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	52	0.36	17.94%	$104,500	$18,743	
3b	Channel	219-22-021A	P	4.20	330	52	0.39	9.38%	$111,500	$10,458	
3b	Channel	219-22-020C	P	4.48	420	52	0.50	11.19%	$89,560	$10,023	
3b	Channel	219-22-019H	P	1.81	190	52	0.23	12.53%	$63,000	$7,895	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	52	0.16	8.21%	$216,000	$17,736	$674,811
1	Basin	219-33-027A	P	19.28	609	660	9.23	47.86%	$385,600	$184,545	$184,545
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
12	Channel	219-33-027A	P	19.28	1246	36	1.03	5.34%	$385,600	$20,595	$20,595
13	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
13	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
13	Channel	219-31-004C	P	7.81	660	42	0.64	8.15%	$169,000	$13,770	$178,270
6	Channel	219-24-003M	P	4.70	330	36	0.27	5.80%	$322,000	$18,685	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	36	0.52	1.38%	$720,000	$9,970	
6	Channel	219-24-001Q	P	8.90	625	36	0.52	5.80%	$256,500	$14,886	$237,041
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	40	0.30	6.06%	$191,000	$11,576	
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	
5	Channel	219-24-004G	P	10.00	659.68	40	0.61	6.06%	$200,000	$12,115	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$487,691
4	Channel	219-24-018	N					0.00%	$271,500	$0	
4	Channel	219-24-017	N					0.00%	$282,000	$0	
4	Channel	219-24-016	N					0.00%	$244,000	$0	
4	Channel	219-24-015	N					0.00%	$240,000	$0	
4	Channel	219-24-014	N					0.00%	$64,000	$0	

4	Channel	219-24-013	N					0.00%	$311,500	$0		
4	Channel	219-24-012	N					0.00%	$270,000	$0		
4	Channel	219-24-066	N					0.00%	$60,000	$0		
4	Channel	219-24-065	N					0.00%	$78,500	$0		
4	Channel	219-24-064	N					0.00%	$64,000	$0		
4	Channel	219-24-063	N					0.00%	$243,000	$0		
4	Channel	219-24-062	N					0.00%	$310,000	$0		
4	Channel	219-24-061	N					0.00%	$244,000	$0	$0	
8a	Channel	219-21-8B	P	2.25	297	39	0.27	11.82%	$104,500	$12,350		
8a	Channel	219-21-19B	T					100.00%	$249,000	$249,000		
8a	Channel	219-21-17C	T					100.00%	$192,500	$192,500		
8a	Channel	219-21-15	P	2.27	300	39	0.27	11.82%	$80,500	$9,512		
8a	Channel	219-21-13	P	4.41	630	39	0.56	12.79%	$204,000	$26,086		
8a	Channel	219-21-11B	P	2.14	305	39	0.27	12.78%	$187,500	$23,970		
8a	Channel	219-21-10C	P	2.14	305	39	0.27	12.78%	$197,000	$25,185	$538,604	
8b	Channel	219-20-4	P	20.00	660	40	0.61	3.03%	$300,000	$9,091		
8b	Channel	219-20-3	P	20.00	660	40	0.61	3.03%	$300,000	$9,091		
8b	Channel	219-20-2H	P	3.00	426.43	40	0.39	13.05%	$157,500	$20,558		
8b	Channel	219-20-2G	P	6.10	214.5	40	0.20	3.23%	$91,500	$2,953	$41,692	
8c	Channel	219-20-2G	P	6.10	680	47	0.73	12.02%	$91,500	$10,998	$10,998	
						Total (ac)	35.06				$4,159,818	$118,655.54
						Basin (ac)	23.62				$668,343	$28,294.20
						Channel (ac)	11.44				$3,491,474	$305,286.46

Land Takes
McDowell Road Option 1d Earthen Channel Pass Mt Diversion in Place

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
2	Channel	219-24-048	T					100.00%	$232,000	$232,000	
2	Channel	219-24-049	T					100.00%	$279,500	$279,500	
2	Channel	219-24-050	T					100.00%	$62,000	$62,000	
2	Channel	219-24-051	T					100.00%	$62,000	$62,000	
2	Channel	219-24-052	T					100.00%	$62,000	$62,000	
2	Channel	219-24-053	T					100.00%	$254,500	$254,500	
2	Channel	219-24-054	T					100.00%	$62,000	$62,000	
2	Channel	219-24-055	T					100.00%	$62,000	$62,000	
2	Channel	219-24-056	T					100.00%	$65,000	$65,000	
2	Channel	219-24-057	T					100.00%	$264,000	$264,000	
2	Channel	219-24-058	T					100.00%	$268,500	$268,500	
2	Channel	219-24-059	T					100.00%	$62,000	$62,000	
2	Channel	219-24-060	T					100.00%	$305,000	$305,000	$2,040,500
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000	
3a	Channel	219-23-026E	P	4.70	330	89	0.67	14.35%	$439,109	$62,993	
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000	
3a	Channel	219-23-027B	P	4.70	330	89	0.67	14.35%	$187,500	$26,898	
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500	
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690	
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000	
3a	Channel	219-23-029B	P	2.82	198	89	0.40	14.35%	$158,500	$22,738	
3a	Channel	219-23-029C	P	1.88	132	89	0.27	14.35%	$64,500	$9,253	
3a	Channel	219-23-030A	P	2.34	165	89	0.34	14.41%	$172,500	$24,852	
3a	Channel	219-23-031A	P	2.35	165	89	0.34	14.35%	$134,500	$19,295	$1,385,718
3b	Channel	219-22-012C	P	2.35	165	98	0.37	15.80%	$70,200	$11,089	
3b	Channel	219-22-012B	P	2.35	165	98	0.37	15.80%	$150,000	$23,694	
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000	
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500	
3b	Channel	219-22-022G	P	2.03	305	98	0.69	33.80%	$104,500	$35,323	
3b	Channel	219-22-021A	P	4.20	330	98	0.74	17.68%	$111,500	$19,710	
3b	Channel	219-22-020C	P	4.48	420	98	0.94	21.09%	$89,560	$18,890	
3b	Channel	219-22-019H	P	1.81	190	98	0.43	23.62%	$63,000	$14,878	
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500	
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500	
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000	
3b	Channel	219-22-024D	P	1.89	130	98	0.29	15.47%	$216,000	$33,425	$748,509
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798
1	Channel	219-31-004E	T					100.00%	$16,000	$16,000	
1	Channel	219-31-004F	T					100.00%	$148,500	$148,500	
1	Channel	219-31-004C	P	7.81	660	72	1.09	13.97%	$169,000	$23,606	$188,106
6	Channel	219-24-003M	P	4.70	330	45	0.34	7.25%	$322,000	$23,356	
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500	
6	Channel	219-24-001H	P	37.90	635	45	0.66	1.73%	$720,000	$12,462	
6	Channel	219-24-001Q	P	8.90	625	45	0.65	7.25%	$256,500	$18,608	$247,926
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000
5	Channel	219-24-003R	P	5.00	330	74	0.56	11.21%	$191,000	$21,415	
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500	
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500	
5	Channel	219-24-004G	P	10.00	659.68	74	1.12	11.21%	$200,000	$22,413	
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980	
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$507,829
						Total (ac)	25.34			$5,602,386	$221,075.43
						Basin (ac)	14.39			$483,798	$33,611.22
						Channel (ac)	10.95			$5,118,588	$467,554.54

Land Takes
McDowell Road Option 1d Concrete Channel Pass Mt Diversion in Place

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)		
2	Channel	219-24-048	N					0.00%	$232,000	$0		
2	Channel	219-24-049	N					0.00%	$279,500	$0		
2	Channel	219-24-050	N					0.00%	$62,000	$0		
2	Channel	219-24-051	N					0.00%	$62,000	$0		
2	Channel	219-24-052	N					0.00%	$62,000	$0		
2	Channel	219-24-053	N					0.00%	$254,500	$0		
2	Channel	219-24-054	N					0.00%	$62,000	$0		
2	Channel	219-24-055	N					0.00%	$62,000	$0		
2	Channel	219-24-056	N					0.00%	$65,000	$0		
2	Channel	219-24-057	N					0.00%	$264,000	$0		
2	Channel	219-24-058	N					0.00%	$268,500	$0		
2	Channel	219-24-059	N					0.00%	$62,000	$0		
2	Channel	219-24-060	N					0.00%	$305,000	$0	$0	
3a	Channel	219-23-025G	T					100.00%	$138,000	$138,000		
3a	Channel	219-23-026E	P	4.70	330	48	0.36	7.74%	$439,109	$33,974		
3a	Channel	219-23-027G	T					100.00%	$180,500	$180,500		
3a	Channel	219-23-027D	T					100.00%	$154,000	$154,000		
3a	Channel	219-23-027B	P	4.70	330	48	0.36	7.74%	$187,500	$14,507		
3a	Channel	219-23-028L	T					100.00%	$180,500	$180,500		
3a	Channel	219-23-028N	T					100.00%	$208,690	$208,690		
3a	Channel	219-23-028E	T					100.00%	$179,000	$179,000		
3a	Channel	219-23-028J	T					100.00%	$179,000	$179,000		
3a	Channel	219-23-029B	P	2.82	198	48	0.22	7.74%	$158,500	$12,263		
3a	Channel	219-23-029C	P	1.88	132	48	0.15	7.74%	$64,500	$4,990		
3a	Channel	219-23-030A	P	2.34	165	48	0.18	7.77%	$172,500	$13,403		
3a	Channel	219-23-031A	P	2.35	165	48	0.18	7.74%	$134,500	$10,406	$1,309,233	
3b	Channel	219-22-012C	P	2.35	165	57	0.22	9.19%	$70,200	$6,450		
3b	Channel	219-22-012B	P	2.35	165	57	0.22	9.19%	$150,000	$13,781		
3b	Channel	219-22-023C	T					100.00%	$127,000	$127,000		
3b	Channel	219-22-023E	T					100.00%	$156,500	$156,500		
3b	Channel	219-22-022G	P	2.03	305	57	0.40	19.66%	$104,500	$20,545		
3b	Channel	219-22-021A	P	4.20	330	57	0.43	10.28%	$111,500	$11,464		
3b	Channel	219-22-020C	P	4.48	420	57	0.55	12.27%	$89,560	$10,987		
3b	Channel	219-22-019H	P	1.81	190	57	0.25	13.74%	$63,000	$8,654		
3b	Channel	219-22-018Q	T					100.00%	$122,500	$122,500		
3b	Channel	219-22-018L	T					100.00%	$124,500	$124,500		
3b	Channel	219-22-024B	T					100.00%	$61,000	$61,000		
3b	Channel	219-22-024D	P	1.89	130	57	0.17	9.00%	$216,000	$19,441	$682,822	
10	Basin	219-19-8K	P	32.56	660	330	5.00	15.36%	$1,418,300	$217,798	$217,798	
1	Channel	219-31-004E	T					100.00%	$16,000	$16,000		
1	Channel	219-31-004F	T					100.00%	$148,500	$148,500		
1	Channel	219-31-004C	P	7.81	660	44	0.67	8.54%	$169,000	$14,426	$178,926	
6	Channel	219-24-003M	P	4.70	330	36	0.27	5.80%	$322,000	$18,685		
6	Channel	219-24-003P	T					100.00%	$193,500	$193,500		
6	Channel	219-24-001H	P	37.90	635	36	0.52	1.38%	$720,000	$9,970		
6	Channel	219-24-001Q	P	8.90	625	36	0.52	5.80%	$256,500	$14,886	$237,041	
7	Basin	219-24-003N	T	9.39	620	660	9.39	100.00%	$266,000	$266,000	$266,000	
5	Channel	219-24-003R	P	5.00	330	53	0.40	8.03%	$191,000	$15,338		
5	Channel	219-24-003V	T					100.00%	$170,500	$170,500		
5	Channel	219-24-003U	T					100.00%	$193,500	$193,500		
5	Channel	219-24-004G	P	10.00	659.68	53	0.80	8.03%	$200,000	$16,053		
5	Channel	219-24-004F	T					100.00%	$25,980	$25,980		
5	Channel	219-24-004D	T					100.00%	$74,020	$74,020	$495,391	
						Total (ac)	21.26				$3,387,210	$159,290.06
						Basin (ac)	14.39				$483,798	$33,611.22
						Channel (ac)	6.87				$2,903,412	$422,592.46

Table 1

McDowell Road Alignment with Pass Mountain Diversion

Level I Concept Analysis Opinion of Probable Costs

Option No.	Alternate Description	Opinion of Probable Costs Including Contingencies			Total Cost
		Major Elements	Additional Elements	Land Acquisitions Basins and R/W	
1B - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. Three Basins.	$3,091,218	$3,790,442	$4,640,760	**$11,522,420**
2B - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. Three Basins.	$8,622,415	$2,338,316	$4,468,010	**$15,428,741**
1C - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. Storm Drain in Oak St and McDowell Rd. Three Basins.	$8,214,000	$4,179,477	$5,383,222	**$17,776,700**
2C - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. Storm Drain in Oak St and McDowell Rd. Three Basins.	$10,909,736	$2,516,991	$5,157,827	**$18,584,554**
1D - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$7,482,409	$3,281,218	$4,219,112	**$14,982,739**
2D- Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$9,144,252	$1,605,172	$4,249,541	**$14,998,965**

Wood/Patel

Spook Hill ADMS Update July 26, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment with Pass Mountain Diversion
Level I Concept Analysis Opinion of Probable Costs
Option 1B - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	111,474	$445,895
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	313	$51,031
4	Splitter Structures	$60,000	EA	7	$420,000
5	Culverts	$310	CY	1,356	$420,360
6	Basin Excavation	$4.00	CY	213,767	$855,067
		SUBTOTAL MAJOR ELEMENTS			$2,192,353
		CONTINGENCIES:			
		Construction		35%	$767,324
		Construction Admin		6%	$131,541
		TOTAL MAJOR ELEMENTS			**$3,091,218**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	2,025,252	$2,227,777
2	Fence	$12	LF	37,540	$450,480
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$2,688,257
		CONTINGENCIES:			
		Construction		35%	$940,890
		Construction Admin		6%	$161,295
		TOTAL ADDITIONAL ELEMENTS			**$3,790,442**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$276,000	AC	11.03	$3,044,280
2	Basin Land Acquisition	$28,295	AC	23.62	$668,328
		SUBTOTAL LAND ACQUISITION			$3,712,608
		CONTINGENCIES :		25%	$928,152
		TOTAL LAND ACQUISITION			**$4,640,760**
				TOTAL	***$11,522,420***

Spook Hill ADMS Update July 26, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment with Pass Mountain Diversion
Level I Concept Analysis Opinion of Probable Costs
Option 2B - Concrete Channel

MAJOR ELEMENTS:

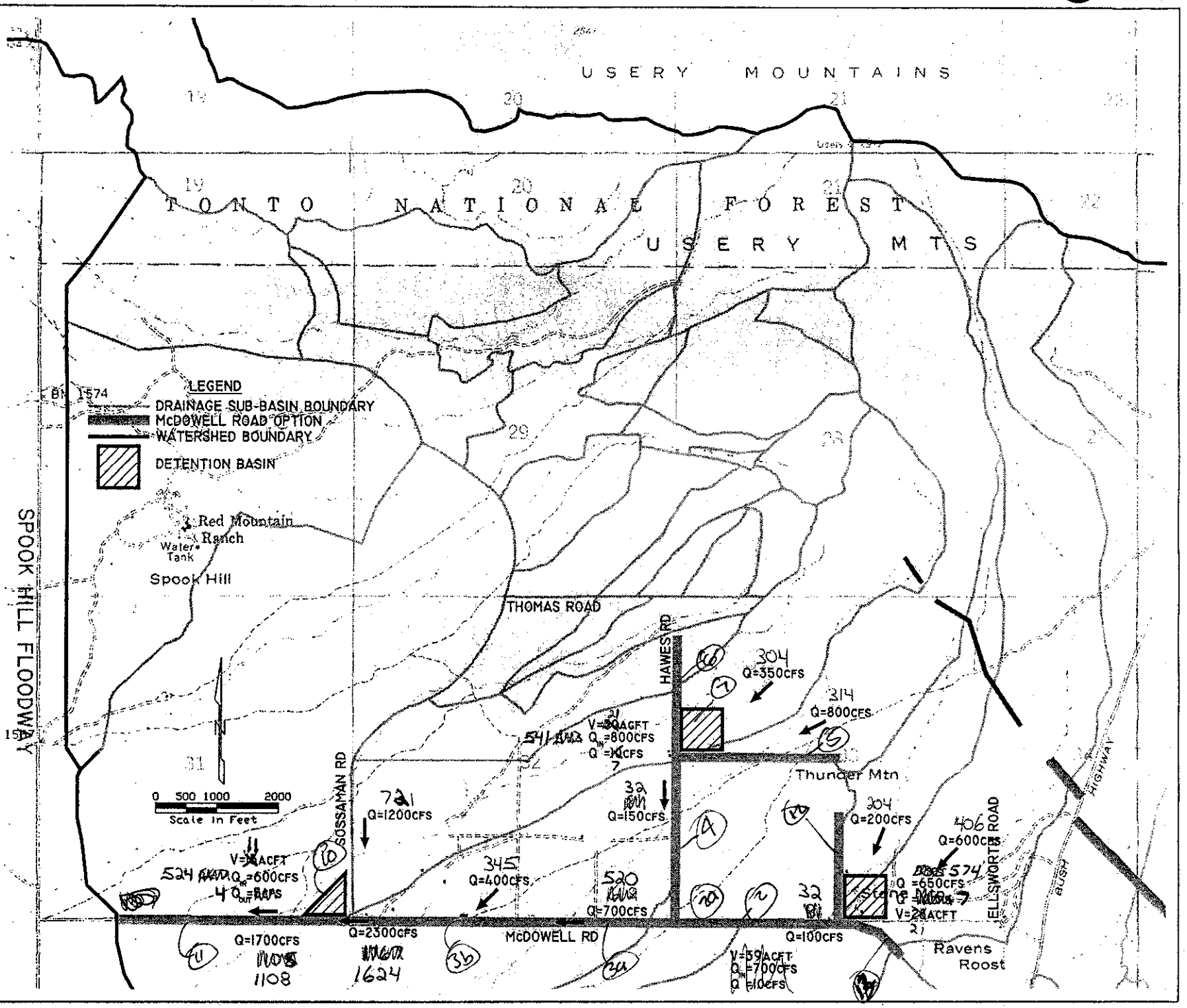
ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	62,314	$249,255
2	Concrete Channel Lining	$310	CY	10,802	$3,348,480
3	Drop Structures	$163	SF	5,043	$822,026
4	Splitter Structures	$60,000	EA	7	$420,000
5	Culverts	$310	CY	1,356	$420,360
6	Basin Excavation	$4.00	CY	213,767	$855,067
		SUBTOTAL MAJOR ELEMENTS			$6,115,188
		CONTINGENCIES:			
		Construction		35%	$2,140,316
		Construction Admin		6%	$366,911
		TOTAL MAJOR ELEMENTS			**$8,622,415**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	1,089,000	$1,197,900
2	Fence	$12	LF	37,540	$450,480
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$1,658,380
		CONTINGENCIES:			
		Construction		35%	$580,433
		Construction Admin		6%	$99,503
		TOTAL ADDITIONAL ELEMENTS			**$2,338,316**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$389,555	AC	7.46	$2,906,080
2	Basin Land Acquisition	$28,295	AC	23.62	$668,328
		SUBTOTAL LAND ACQUISITION			$3,574,408
		CONTINGENCIES :		25%	$893,602
		TOTAL LAND ACQUISITION			**$4,468,010**
				TOTAL	***$15,428,741***



SPOOK HILL A.D.M.P. UPDATE
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

McDOWELL ROAD

OPTION 1B-b

	BY	DATE
DESIGNED	R. HINER	08/00
DRAWN	S. CAMPBELL	08/00
CHECKED	A. PATEL	08/00

DRAWING NO. spkh1-mcdowell1B-b.dwg

SHEET 1 OF 1

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spock Hill

PROJECT NO. 99969 SHEET NO. 1 OF 2

CALCULATED BY JGT DATE 7/16 CHECKED BY _____ DATE _____

McDowell Road Options Option 1B Dirt

① BASIN - SAME AS OPTION 1C 870 K

② CHANNEL - SAME AS OPTION 1C 490 K

②a EXIST BASIN - SPLITTER ST. 100 K

③a channel - Same as option 1c 1,622 K

③b channel " " " " 346 K

④ Channel

Q = ~~450~~ 61 cfs, n = 0.025, SS = 4:1, bottom = ~~8~~ 12, S = 0.0052, V = ~~5~~ 4.4, fn = ~~0.76~~ 0.75, d = ~~1.91~~ 2.12

Ø Drops, Top width (1'fb) = ~~31~~ 31 + 16 = ~~47~~ 43 L = 2640

1. EX		9038	CY	@ $4/CY	=	$36 K
3 Drops		Ø	SF	@ $100/SF	=	—
4 Fence		5280	LF	@ $12/LF	=	$63 K
5 R/W	47 x 2640	124,080	SF	@ $1/SF	=	$124 K
6 Culverts (1)	8x3 = 24.1+5.1+9.1	98.3	CY	@ $310/CY	=	$30 K
7 VS	31 x 2640	81840	SF	@ $0.28/SF	=	$23 K
						$276 K

⑤ Channel - Same as option 1c $1,323 K

⑥ BASIN - " " " " $857 K

⑦ Channel - " " " " $196 K

⑧ BASIN - 1105 " " " $574 K

⑪ Channel Q = ~~1700~~, n = 0.025, SS = 4:1, bottom = ~~75'~~ 40, S = 0.0015, V = ~~5'~~ 4.9, fn = ~~0.49~~ 0.49, d = ~~3.77~~ 4'

20 - 3' drops, Top width (1'fb) = ~~113'~~ 80 + ~~16~~ 16 = ~~129'~~ 96, L = 1550

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK HILL

PROJECT NO. 99959 SHEET NO. 2 OF 2

CALCULATED BY JST DATE 7/10 CHECKED BY _____ DATE _____

OPTION 1B DIRT

1	EX		32,764	CY	@ $4/CY	= $131 K
3	DROPS		20	EA	@ $163/SF	= $1,122 K
4	FENCE		3100	LF	@ $12/LF	= $37 K
5	RW	129 X 1550	199950	SF	@ $1/SF	= $200 K
6	CULVERTS	(3) 10X4: 483 + 11 + 225	517 2546	CY	@ $310/CY	= $160 K
7	L/S	113 X 1550	175,150	SF	@ $0.28/SF	= $175 K
						$1,825 K

(12) SAME AS OPTION 1C 313 K

(13) SAME AS OPTION 1C 265 K

2247 K

SUBT

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Cross Hill

PROJECT NO. 99959 SHEET NO. 1 OF 5

CALCULATED BY JGT DATE ____ CHECKED BY 7/7 DATE ____

McDowell Road Option 16 - DIRT CHANNEL

① BASIN

✓ 1. EX. 28 Acft x 1.3 @ $4/cy = $234 K
✓ 2. LAND 10 AC @ $1/SF = $436 K
✓ 3. Splitter St 2 EA @ $100 K = $200 K
$870 K

② channel 32

Q = ~~110~~ 82 cfs, n = 0.025, SS = 4:1, bottom = ~~8~~ 1', S = 0.0065, V = ~~4.98~~ 3.8, fn = 0.65, d = 1.54 ~~8.83~~ 8.79 d = ~~1.94~~ 1.33

15 - 3' Drops, L = 2640', TOP WIDTH (1' FB) = ~~20~~ 24 + 16 = ~~44~~ 41 36

✓ 1. EX 7670 @ $4/cy = $ ~~31~~ 30 K
✓ 3. Drops 15 @ $163/SF = $ 208 K
✓ 4. FENCE 5280 @ $12/LF = $ 63 K
5. R/W 45 x 2640 @ $1/SF = $ 119 K
✓ 6. culverts (2) HW 13.4/cfs 6x3', 0.04 cy/LF @ $310/cy = $ 48 K
(88th St. & Sub. Ent.)
✓ 7. LANDSCAPING 28 x 2640 @ 0.28/SF = $ 21 K
$ 490 K

2a ✓ EXIST BASIN
3. SPLITTER ST. 1 EA @ $100 K = $100 K

3a CHANNEL ~~4640~~ 5320

Q = ~~550~~ 100 cfs, n = 0.025, SS = 4:1, bottom = ~~20~~ 30 ft, S = 0.003, V = ~~4.96~~ 4.52, fn = 0.56, d = 3.37 3.91

27 - 3' drops, L = 4280', TOP WIDTH (1' FB) = ~~55~~ 42 + 16 = ~~71~~ 68

✓ 1. EX 37553 @ $4/cy = $ 150 K
✓ 3. Drops 27 @ $168/SF = $ 728 K
✓ 4. FENCE 8560 @ $12/SF = $ 103 K
5. R/W 71' x 4280 @ $1/SF = $ 304 K
✓ 6. culverts (2) HW = 17.4 = 331 2-8x3', 1.48 cy/LF @ $310/cy = $ 102 K
✓ 7. LANDSCAPING 55 x 4280 @ 0.28/SF = $ 235 K
$1,622 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Sopeak Hill

PROJECT NO. 99989 SHEET NO. 2 OF 5

CALCULATED BY JT DATE 7/7 CHECKED BY _____ DATE _____

OPTION 1C - DIRT

(3b) CHANNEL ~~860~~

Q = ~~1100~~ cfs, n = 0.025, SS = 4:1, bottom = ~~30~~ 40, S = 0.002, V = 5 ✓, fn = 0.53 0.55, d = 3.9' 3.26

4-3.5 Drops, L = 1000', TOP WIDTH (1' FB) = ~~57~~ + 16' Rend = ~~75'~~ ~~1.67~~

✓ 1. EX	9,718 cy	@ $4/cy		= $39K
✓ 3. Drops	4 EA	@ $163/SF		= $137K
✓ 4. FENCE	2000	@ $12/SF		= $24K
✓ 5. R/W	75x1000	@ $1/SF		= $75K
✓ 6. CULVERTS	(1) HW = 18.7 cy EA culv	@ $310/cy		= $54K
✓ 7. LANDSCAPE	59x1000	@ $0.28/SF		= $17K
				$346K

(5) channel 3.14

Q = ~~800~~ cfs, n = 0.025, SS = 4:1, bottom = ~~30~~ 8', S = 0.002, V = ~~5~~ 4.28, fn = ~~0.55~~ 0.52, d = ~~3.51~~ 3.4

24-3' drops, L = 2640, Top width (1' FB) = ~~58~~ 43 + 16' = ~~74~~ 59

✓ 1. EX	28039	cy	@ $4/cy	= $112K
✓ 3. Drops	24	EA	@ $163/SF	= $776K
✓ 4. FENCE	5280	LF	@ $12/SF	= $63K
✓ 5. R/W	74x2640	SF	@ $1/SF	= $195K
6. Culverts	(150 cfs) HW = ~~13.4~~ 6.7 + 12	cy	@ $310/cy	= $24K
✓ 7. L/S	58x2640	SF	@ $0.28/SF	= $153K
				$1,323K

(6) ✓ channel ✓

Q = 100 cfs, n = 0.025, SS = 4:1, bottom = 10', S = 0.0062, V = 4.7, fn = 0.82, d = 1.38

6-2.7' Drops, L = 1320', Top width (1' FB) = 29' + 16' = 45'

✓ 1. EX	5691	cy	@ $4/cy	= $16K
✓ 3. Drops	6	EA	@ $163/SF	= $78K
✓ 4. FENCE	2640	LF	@ $12/SF	= $32K
5. R/W	45x1320	SF	@ $1/SF	= $59K
7. L/S	29x1320	SF	@ $0.28/SF	= $11K
				$196K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK HILL

PROJECT NO. 99959 SHEET NO. 3 OF 5

CALCULATED BY JGT DATE 7/1 CHECKED BY _____ DATE _____

OPTION 1C DIRT

(7) BASIN

1. EX 30 4ft x 1.3 CY @ $4/CY = $251 K
2. LAND 10 AC SF @ $1/SF = $436 K
3. SPLITTER ST. 2 EA @ $100 K/EA = $200 K

$887 K

(8a) Q = 264 cfs, n = 0.025, SS = 4:1, bottom = 15', S = 0.04, V = 5, fn = 0.71, d = 2.2'
16 - 3.25' Drops, L = 2400', Top width (1'FB) = 40' + 16 = 56'

1. EX 11,872 CY @ $4/CY = $48 K
3. Drops 16 EA @ $163/SF = $347 K
4. FENCE 4800 LF @ $12/SF = $58 K
5. R/W 56 x 2400 SF @ $1/SF = $134 K
6. Culverts (3) 6x4, 0.7 CY/LF HW = 18 CY/CULV = 264 CY @ $310/CY = $82 K
7. L/S 40 x 2400 SF @ $0.28/SF = $27 K

$696 K

(8b) Q = 300, n = 0.025, SS = 4:1, bottom = 20', S = 0.0038, V = 5, fn = 0.7 d = 2.11
12 - 3.3' drops, L = 2200, TOP WIDTH (1'FB) = 45 + 16 = 61

1. EX 12,100 CY @ $4/CY = $49 K
3. Drops 12 EA @ $163/SF = $290 K
4. FENCE 4400 LF @ $12/SF = $53 K
5. R/W 61 x 2200 SF @ $1/SF = $134 K
6. Culverts (1) 6x4, 0.7 CY/LF HW = 18 CY EA CULV = 88 CY @ $310/CY = $27 K
7. L/S 45 x 2200 SF @ $0.28/SF = $28 K

$561 K

(8c) Q = 990 cfs, n = 0.025, SS = 4:1, bottom = 45', S = 0.002, V = 5, fn = 0.55, d = 3.15'
4 - 3.2' Drops, L = 680', TOP WIDTH (1'FB) = 78' + 16 = 94'

1. EX 8,400 CY @ $4/CY = $34 K
3. Drops 4 EA @ $163/SF = $160 K
4. FENCE 13600 LF @ $12/LF = $16 K
5. R/W 94 x 680 SF @ $1/SF = $300 K
6. Culverts (1) 4-6x4, 2.33 CY/LF HW = 25 CY/EA CULV = 258 CY @ $310/CY = $80 K
7. L/S 78 x 680 SF @ $0.28/SF = $15 K

$341 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 4 OF 5

CALCULATED BY JGT DATE 7/7 CHECKED BY _____ DATE _____

OPTION 1C DIRT

(9) CHANNEL

Q=1350 cfs, n=0.025, SS=4:1, bottom=45', S=0.0015, V=5, Fn=0.49, d=4.06'

9-2.9' Drops, L=2640, Top WIDTH (1'FB) = 85' + 16 = 101'

1. EX	42,044	CY	@ $4/CY	= $168 K
3. Drops	9	EA	@ $163/SF	= $366 K
4. FENCE	5280	LF	@ $12/LF	= $63 K
5. R/W	101×2640	SF	@ $1/SF	= $267 K
6. Culverts (2)	3-8'×4', 2.93 CY/LF HW=28 CY EA CULV = 642	CY	@ $310/CY	= $199 K
7. L/S	85×2640	SF	@ $0.28/SF	= $224 K
				$1,287 K

(10) BASIN

1. EX	5 Ac ft × 1.3	CY	@ $9/CY	= $126 K
2. LAND	5 AC	SF	@ $1/SF	= $218 K
3. SPLITTER	2 EA	EA	@ $100 K/EA	= $200 K
				$544 K

(11) CHANNEL

Q=~~1230~~, n=0.025, SS=4:1, bottom=30', S=0.0013, V=4.9, Fn=0.46, d=4.99'

20-3' Drops, L=1550, Top WIDTH (1'FB) = 78' + 16 = 94'

1. EX	24,974	CY	@ $4/CY	= $100 K
3. Drops	20	EA	@ $163/SF	= $789 K
4. FENCE	3100	LF	@ $12/LF	= $37 K
5. R/W	94×1550	SF	@ $1/SF	= $146 K
6. Culverts (1)	3-8'×4', 2.25 CY/LF HW=25 CY EA CULV. = 250 CY	CY	@ $310/CY	= $78 K
7. L/S	78×1550	SF	@ $0.28/SF	= $121 K
				$1,271 K

3 channel

Q=~~[illegible]~~, n=0.0025, SS=4:1, bottom=~~15~~ 10, S=0.002, V=~~4.96~~ 4.52, Fn=~~0.54~~ 0.53, d=~~3.94~~ 3.61'

2.3' Drops, L=1000', Top WIDTH (1'FB) = 55 + 16 = 71

EX	87 KS	CY		$35 K
3. Drops	3	EA		$63 K
4 Fence	2000	LF		$24 K
5. R/W	71000	SF		$71 K
6. Culvert (1)	154 CY			$48 K
7. L/S	55000	SF		$15 K
				$256 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 5 OF 5

CALCULATED BY JCT DATE 7/1 CHECKED BY _____ DATE _____

O.K OPTION 1C DIRT

(2) Q= ~~200~~, n = 0.025, ss = 4:1, bottom = 10', S=0.0043, V=4.98, Fn=0.72, d=2.16'

6-2.8' Drops, L=1700, TOP WIDTH (1'fb) = 35' + 16' = 51'

1. EX		7067	@ $4/CY	= $28 K
3. Drops		6	@ $16.3/SF	= $97 K
4. Fence		3400	@ $12/LF	= $41 K
5. RW	35 x 1700	59,500	@ $1/SF	= $60 K
6. Culvert	–	–	@ $30/CY	= –
7. U/S	51 x 1700	86700	@ $0.28/SF	= $87 K
				$313 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 2

CALCULATED BY JOT DATE 7/10 CHECKED BY _____ DATE _____

OPTION 1B - CONC CHANNEL

① Below SAME AS OPTION 1C - CONC Chan $870 K

② " " " " " " $657 K

②a Basin " " " " " $100 K

③a " " " " " " $1,991 K

③b SAME AS OPTION 1C - CONC chan $430 K

④ Channel 8

Q=~~150~~ cfs, n=0.05, SS=2:1, S=0.0053, bottom = ~~4~~ 2', V=~~8.6~~ 7.4 fps, Fr=~~1.28~~ 1.22, d=~~2.12~~ 1.99

Ø Drops, L=2640, Top WIDTH (1'fb) = 17 + 16 = 33'

	EX	7129 cy @ $4/cy	=	$29 K
2.	CONC	1390 cy @ $310/cy	=	$431 K
3.	DROPS	— EA @ $163/SF	=	—
4.	FENCE	5280 LF @ $12/LF	=	$63 K
5.	RW 33 x 2640	87120 SF @ $1/SF	=	$87 K
6.	CULVERTS ① 6x3 = 63.5+48+8.6	77 cy @ $310/cy	=	$24 K
				$634 K

⑤ SAME AS OPTION 1C - CONC Chan $1266K

⑤' Basin " " " " " " $857 K

⑥ Chan - " " " " " $322 K

⑥ Basin " " " " $544 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Speck Hill

PROJECT No. 99989 SHEET No. 2 OF 2

CALCULATED BY VST DATE 7/10 CHECKED BY _____ DATE _____

OPTION 1B- conc Channel

(11) channel ~~1100~~ 1105

Q = ~~1700~~ cfs, n=0.05, SS=2:1, bottom = ~~34~~ 12, S=0.0054, V=~~14.95~~ 13.97, Fn=~~1.49~~ 1.46, d=~~3.94~~ 3.97

18-3' Drops, L=1550, Top width (2'FB) = 45 + 16 = 61

1. EX	13896	cy	@ $4/cy	= $56K
2. Conc	1537	cy	@ $310/cy	= $477 K
3. Drops	18	EA	@ $163/SF	= $399 K
4. Fence	3100	LF	@ $12/LF	= $37 K
5. R/W 61 x 1550	94550	SF	@ $1/SF	= $95 K
6. culverts (1) 4-10x4 = 391 + 11.2 + 20	422	cy	@ $310/cy	= $130 K
				$1,194

(12) Same As option 1c — 431 K

(13) " " " " — 338 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 5

CALCULATED BY JCT DATE 7/7 CHECKED BY _____ DATE _____

McDowell Road Option 1C - Concrete Channel

① BASIN

1. Ex	28ac x1.3	@ $4/cy	= $234K
2. Land	10AC	@ $1/SF	= $436K
3. Splitter St.	2EA	@ $100K/EA	= $200 K
			$870K

② CHANNEL

Q = ~~110~~ 81 cfs, n = 0.015 SS = 2:1, bottom = ~~10~~ 12, S = 0.0195, V = 10.8 10, fn = 1.98 1.97, d = 0.92 1.5

8-3.1' Drops, Top width (2'fb) = 22' + 16 = 38', L = 2140

1. Ex	5543	@ $4/cy	= $22K
2. Concrete	1152	@ $310/cy	= $357K
3. Drops	8	@ $163/SF	= $78K
4. Fence	5280	@ $12/LF	= $71K
5. R/W	38 x 2140	@ $1/SF	= $81K
6. Culverts (2) 6x3, 0.64 cy/LF HW = 13.9 cy/culv	= 155 cy	@ $310/cy	= $48K
			$657K

②a Exist. Basin

3. Splitter St	1EA	@ $100K/EA	= $100 K

③a Channel

Q = ~~550~~ 618 cfs, n = 0.015, SS = 2:1, bottom = ~~20~~ 12, S = 0.0098, V = ~~12.6~~ 11.92, fn = ~~1.85~~ 1.86, d = ~~3.56~~ 2.09

24-2' Drops, Top width (2'fb) = ~~38~~ + 16 = ~~54~~ 44, L = 4280

1. Ex	27,696 29	@ $4/cy 0.5	= 110K
2. Concrete	3691	@ $310/cy	= $1,144 K
3. Drops	24	@ $163/SF	= $301 K
4. Fence	8560	@ $12/LF	= $103 K
5. R/W	54 x 4280	@ $1/SF	= $231 K
6. Culverts (2) 2-8'x3'	329	@ $310/cy	= 102 K
			$1,991 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spock Hill

PROJECT NO. 99989 SHEET NO. 2 OF 5

CALCULATED BY JCT DATE 7/1 CHECKED BY _____ DATE _____

OPTION 1C - Concrete Channel

(3b) channel 250

Q=~~700~~ cfs, n=0.015, SS=2:1, bottom=~~30~~ 28, S=0.011, V=~~14.5~~ 14.93, fn=~~1.96~~ 1.98, d=1.99

2-2.5' drops, L=1000', Top width (2'fb) = 36'+16 = ~~52'~~ 40

1. EX		5406	@ $4/cy	= $22 K
2. Concrete		804	@ $310/cy	= $249 K
3. Drops		2	@ $163/SF	= $29 K
4. FENCE		2000	@ $12/LF	= $24 K
5. R/W	52x1000		@ $1/SF	= $52 K
6. Culverts (1)	2-8'x4'	175	@ $310/cy	= $54 K
				$430 K

(5) channel 314

Q=~~800~~ cfs, n=0.015, SS=2:1, bottom=~~30'~~ 2, S=0.0098, V=~~14.5~~ 13.15, fn=~~1.87~~ 1.77, d=~~3.21~~ 2.99

17-3' drops, L=2640, Top width (2'fb) = ~~37'~~ 31'+16 = ~~53'~~ 48

1. Ex		15497	@ $4/cy	= $62 K
2. Concrete		2192	@ $310/cy	= $679 K
3. Drops		17	@ $163/SF	= $300 K
4. fence		5280	@ $12/LF	= $63 K
5. R/W	53x2640		@ $1/SF	= $140 K
6. Culverts (1) 6'x3'		77	@ $310/cy	= $24 K
				$1,268 K

(6) channel

Q=100 cfs, n=0.015, SS=2:1, bottom=8', S=0.0139, V=10.1, fn=1.95, d=1'

3-2.2' Drops, L=1320', Top width (2'fb) = 20'+16 = 36'

1. Ex		3129	@ $4/cy	= $12 K
2. Concrete		670	@ $310/cy	= $208 K
3. Drops		3	@ $163/SF	= $22 K
4. Fence		2640	@ $12/LF	= $32 K
5. R/W	36x1320		@ $1/SF	= $48 K
				$322 K

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 5 OF 5

CALCULATED BY JST DATE 7/7 CHECKED BY _____ DATE _____

714 694 3811

OPTION 16 - concrete Channel

(12) channel

Q = 200, n = 0.0015, SS = 2:1, bottom = 10, s = 0.013, V = 11.8, Fn = 1.97, d = 1.34.

1 - 1.9 Drops, L = 1700', Top width (1'fb) = 20' + 16 = 36

1. Ex		5104	@ $4/cy	= $20 K
2. conc		974	@ $310/cy	= $302 K
3. Drops		1	@ $310/cy	= 7 K
4 fence		3400	@ $12/LF	$41 K
5. RW	36 x 1700	61200	@ $1/SF	= 61 K
6 culvert		—	@ $310/cy	= —
				$431 K

(13) channel

Q = ~~600~~ 200, n = 0.015, SS = 2:1, bottom = ~~10~~ 2, s = 0.009, V = ~~14.8~~ 13.5, Fn = ~~1.78~~ 1.73, d = ~~3.35~~ 3.38

1. Ex		4259	@ $4/cy	= $17 K
2. conc		655	@ $310/cy	= $203 K
3. Drops		—	@ $310/cy	= —
4. fence		2000	@ $12/LF	= $24 K
5. RW	49 x 1000	49000	@ $1/SF	= $49 K
6. culvert (1) 2-6x4 = 125+7.24+12.95		145	@ $310/cy	= $45 K
				338 K

Ø Drops, L = 1000, Top width (1'fb) = ~~25~~ + 16 = 49

BA + 16 = 20

Spook Hill ADMS Update July 26, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment with Pass Mountain Diversion
Level I Concept Analysis Opinion of Probable Costs
Option 1C - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	155,801	$623,206
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	20,225	$3,296,693
4	Splitter Structures	$60,000	EA	7	$420,000
5	Culverts	$310	CY	1,930	$598,300
6	Basin Excavation	$4.00	CY	221,833	$887,333
			SUBTOTAL MAJOR ELEMENTS		$5,825,532
		CONTINGENCIES:			
		Construction		35%	$2,038,936
		Construction Admin		6%	$349,532
			TOTAL MAJOR ELEMENTS		**$8,214,000**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	2,160,880	$2,376,968
2	Fence	$12	LF	48,100	$577,200
3	Utility Relocations	$5,000	EA	2	$10,000
			SUBTOTAL ADDITIONAL ELEMENTS		$2,964,168
		CONTINGENCIES:			
		Construction		35%	$1,037,459
		Construction Admin		6%	$177,850
			TOTAL ADDITIONAL ELEMENTS		**$4,179,477**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$231,000	AC	15.75	$3,638,250
2	Basin Land Acquisition	$28,295	AC	23.62	$668,328
			SUBTOTAL LAND ACQUISITION		$4,306,578
		CONTINGENCIES :		25%	$1,076,644
			TOTAL LAND ACQUISITION		**$5,383,222**
				TOTAL	***$17,776,700***

Spook Hill ADMS Update July 26, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment with Pass Mountain Diversion
Level I Concept Analysis Opinion of Probable Costs
Option 2C - Concrete Channel

MAJOR ELEMENTS:

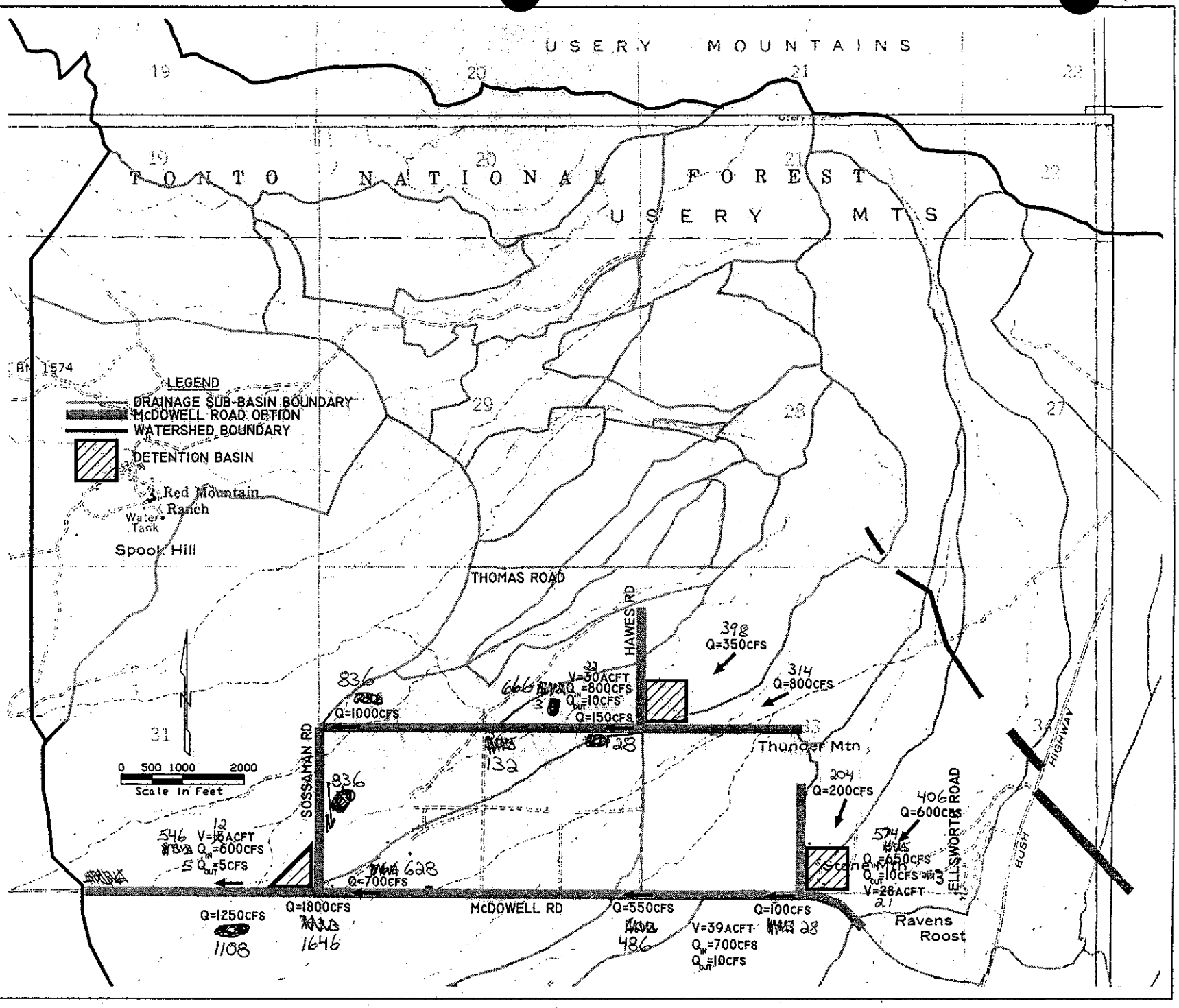
ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	84,245	$336,980
2	Concrete Channel Lining	$310	CY	14,175	$4,394,380
3	Drop Structures	$163	SF	6,751	$1,100,408
4	Splitter Structures	$60,000	EA	7	$420,000
5	Culverts	$310	CY	1,930	$598,300
6	Basin Excavation	$4.00	CY	221,833	$887,333
		SUBTOTAL MAJOR ELEMENTS			$7,737,402
		CONTINGENCIES:			
		Construction		35%	$2,708,091
		Construction Admin		6%	$464,244
		TOTAL MAJOR ELEMENTS			**$10,909,736**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	1,089,000	$1,197,900
2	Fence	$12	LF	48,100	$577,200
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$1,785,100
		CONTINGENCIES:			
		Construction		35%	$624,785
		Construction Admin		6%	$107,106
		TOTAL ADDITIONAL ELEMENTS			**$2,516,991**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$324,080	AC	10.67	$3,457,934
2	Basin Land Acquisition	$28,295	AC	23.62	$668,328
		SUBTOTAL LAND ACQUISITION			$4,126,262
		CONTINGENCIES :		25%	$1,031,565
		TOTAL LAND ACQUISITION			**$5,157,827**
				TOTAL	***$18,584,554***



SPOOK HILL A.D.M.P. UPDATE
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

McDOWELL ROAD

OPTION 1C-b

	BY	DATE
DESIGNED	R. HINER	08/00
DRAWN	S. CAMPBELL	08/00
CHECKED	A. PATEL	08/00

DRAWING NO. spwh1-mcdone11c-b.dwg

SHEET 1 OF 1

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT ~~ERISK HWY~~

PROJECT NO. 99959 SHEET NO. 1 OF 5

CALCULATED BY VGT DATE ____ CHECKED BY 7/7 DATE ____

McDowell Road Option 1G - DIRT CHANNEL W/ PASS MIT IN PLACE

① BASIN

✓ 1. EX. ~~3~~ 21 Acft x 1.3 @ $4/cy = $234K
✓ 2. LAND 10 AC @ $1/SF = $436K
✓ 3. Splitter St 2 EA @ $100K = $200K
$870K

② channel ~~16~~ 28

Q = ~~16~~ cfs, n = 0.025, SS = 4:1, bottom = ~~2~~ 4, S = 0.0065, V = ~~4.96~~ 3.56 ~~4.0~~, fn = ~~0.55~~ 0.78 ~~0.85~~, d = ~~1.54~~ 0.99' ~~1.25~~

15-3' Drops, L = 2640', Top width (1' FB) = ~~20~~ 35 + ~~16~~ 16 = ~~44~~ 51

✓ 1. EX 7670 @ $4/cy = $31K
✓ 3. Drops 15 @ $163/SF = $208K
✓ 4. FENCE 5280 @ $12/LF = $63K
5. R/W 45 x 2640 @ $1/SF = $119K
✓ 6. culverts (2) HW13.4/cy @ $310/cy = $48K
6'x3', 0.64 cy/LF
(85th St. & Sub. Ent.)
✓ 7. LANDSCAPING 28 x 2640 @ 0.28/SF = $21K
$490K

2a ✓ EXIST BASIN
3. SPLITTER ST. 1 EA @ $100K = $100K

3a CHANNEL ~~1,003~~ 486

Q = ~~3,600~~ cfs, n = 0.025, SS = 4:1, bottom = ~~3~~ 16', S = 0.0022, V = ~~4.96~~ 4.85 ~~4.99~~, fn = ~~0.56~~ 0.56 ~~0.46~~, d = ~~3.27~~ 3.10 ~~3.13~~

27-3' drops, L = 4280', Top width (1' FB) = ~~55~~ 35 + ~~16~~ 16 = ~~71~~ 51 ~~67~~

✓ 1. EX 37553 @ $4/cy = $150K
✓ 3. Drops 27 @ $163/SF = $726K
✓ 4. FENCE 8560 @ $12/SF = $103K
5. R/W 71' x 4280 @ $1/SF = $304K
✓ 6. Culverts (2) HW = 17.4 = 331 @ $310/cy = $102K
2-8'x3', 1.48 cy/LF
✓ 7. LANDSCAPING 55 x 4280 @ 0.28/SF = $235K
$1,622K

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 2 OF 5

CALCULATED BY JJT DATE 7/7 CHECKED BY _____ DATE _____

OPTION 1C - DIRT

(3b) CHANNEL ~~106~~ 98

Q = 700 cfs, n = 0.025, SS = 4:1, bottom = ~~30~~ 25', S = 0.002, V = 5, fn = ~~0.53~~ 0.54, d = ~~3.9~~ 3.37'

4-3.5' Drops, L = 1000', Top width (1' FB) = ~~59~~ + 16' Road = ~~75~~ ~~82~~ 76

✓ 1. EX	9,716 cy	@ $4/cy		= $39K
✓ 3. Drops	4 EA	@ $163/SF		= $137K
✓ 4. FENCE	2000	@ $12/SF		= $24K
✓ 5. R/W	75x1000	@ $1/SF		= $75K
✓ 6. CULVERTS	2-8x4, 1.56 cy/LF (1) HW = 18.7 cy EA culv	= 175	@ $310/cy	= $54K
✓ 7. LANDSCAPE	59x1000	@ $0.28/SF		= $17K
				$346K

(5) channel ~~24~~ 24

Q = 800 cfs, n = 0.025, SS = 4:1, bottom = ~~30~~ 25, S = 0.0062, V = ~~8~~ 4.3, fn = ~~0.55~~ 0.52, d = ~~3.51~~ 3.59'

24-3' drops, L = 2640, Top width (1' FB) = ~~74~~ 59

1. EX	28039	cy	@ $4/cy	= $112K
✓ 3. Drops	24	EA	@ $163/SF	= $776K
✓ 4. FENCE	5280	LF	@ $12/SF	= $63K
✓ 5. R/W	74x2640	SF	@ $1/SF	= $195K
6. Culverts	(1500 cfs) 6x3', 0.109 cy/LF HW = 13.4 cy	= 77 cy	@ $310/cy	= $24K
✓ 7. L/S	58x2640	SF	@ $0.28/SF	= $153K
				$1,323K

(6) channel ✓

Q = 100 cfs, n = 0.025, SS = 4:1, bottom = 10', S = 0.0062, V = 4.7, fn = 0.82, d = 1.38

6-2.7' Drops, L = 1320', Top width (1' FB) = 29' + 16' = 45'

✓ 1. EX	5691	cy	@ $4/cy	= $16K
✓ 3. Drops	6	EA	@ $163/SF	= $98K
✓ 4. FENCE	2640	LF	@ $12/SF	= $32K
5. R/W	45x1320	SF	@ $1/SF	= $59K
7. L/S	29x1320	SF	@ $0.28/SF	= $11K
				$196K

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 3 OF 5

CALCULATED BY JGT DATE 7/4 CHECKED BY _____ DATE _____

OPTION 1C DIRT

(7) BASIN 22

1. EX ~~30~~ 4ft x 1.3 CY @ $4/CY = $251 K
2. LAND 10 AC SF @ $1/SF = $436 K
3. SPLITTER ST. 2 EA @ $100K/EA = $200 K

$887 K

(8a) Q = 264 cfs, n = 0.025, SS = 4:1, bottom = ~~12~~ 4, S = 0.004, V = ~~5~~ 3.45, fn = 0.66, d = ~~3.2~~ 1.81'

16 - 3.25' Drops, L = 2400', Top width (1'FB) = ~~40~~ 27 + 16 = ~~56'~~ 43

1. EX 11,872 CY @ $4/CY = $48 K
3. Drops 16 EA @ $163/SF = $347 K
4. FENCE 4800 LF @ $12/SF = $58 K
5. R/W 56 x 2400 SF @ $1/SF = $134 K
6. Culverts (3) 6x4, 0.7 CY/LF HW = 18 CY/CUV = 264 CY @ $310/CY = $82 K
7. L/S 40 x 2400 SF @ $0.28/SF = $27 K

$696 K

(8b) Q = ~~300~~ 132, n = 0.025, SS = 4:1, bottom = ~~30'~~ 4, S = 0.0038, V = ~~5~~ 4.39, fn = ~~0.57~~ 0.67, d = ~~3.1~~ 2.29

12 - 3.3' drops, L = 2200, TOP WIDTH (1'FB) = ~~45~~ 31 + 16 = ~~61~~ 47

1. EX 12,160 CY @ $4/CY = $49 K
3. Drops 12 EA @ $163/SF = $290 K
4. FENCE 4400 LF @ $12/SF = $53 K
5. R/W 61 x 2200 SF @ $1/SF = $134 K
6. Culverts (1) 6x4, 0.7 CY/LF HW = 18 CY EA CUV = 88 CY @ $310/CY = $27 K
7. L/S 45 x 2200 SF @ $0.28/SF = $28 K

$561 K

(8c) Q = ~~720~~ 836 cfs, n = 0.025, SS = 4:1, bottom = ~~35'~~ 38, S = 0.002, V = ~~5~~ 4.49, fn = ~~0.55~~ 0.59, d = ~~3.5~~ 3.28'

4 - 3.2' Drops, L = 680', TOP WIDTH (1'FB) = ~~78'~~ 68 + 16 = ~~94'~~ 84 ~~88~~

1. EX 8400 CY @ $4/CY = $34 K
3. Drops 4 EA @ $163/SF = $160 K
4. FENCE 1360 LF @ $12/LF = $16 K
5. R/W 90 x 680 SF @ $1/SF = $60 K
6. Culverts (1) 4-6x4, 2.33 CY/LF HW = 25 CY/EA CUV = 258 CY @ $310/CY = $80 K
7. L/S 78 x 4680 SF @ $0.28/SF = $15 K

$341 K

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 4 OF 5

CALCULATED BY JCT DATE 7/7 CHECKED BY _____ DATE _____

OPTION 1C DIRT

(9) CHANNEL ~~1330~~ 1320

Q = ~~1350~~ cfs, n = 0.025, SS = 4:1, bottom = ~~25~~ 29, S = 0.0015, V = ~~4.6~~ 4.7, Fn = ~~0.49~~ 0.40, d = ~~4.06~~ 3.98'

9 - 2.9' Drops, L = 2640, Top WIDTH (1'Fb) = ~~85~~ 69 + 16 = ~~101'~~ 85'

1. EX	42,044	CY	@ $4/CY	= $168 K
3. Drops	9	EA	@ $163/SF	= $366 K
4 FENCE	5280	LF	@ $12/LF	= $ 63 K
5. R/W	101 × 2640	SF	@ $1/SF	= $ 267 K
6. Culverts (2)	4-8 × 4, 2.93 CY/LF HW = 28 CY EA CULV = 642	CY	@ $310/CY	= $ 199 K
7 L/S	85 × 2640	SF	@ $0.28/SF	= $ 224 K
				$1,287 K

(10) BASIN

1. EX	~~1~~ 12 Acft × 1.3	CY	@ $9/CY	= $126 K
2. LAND	5 AC	SF	@ $1/SF	= $218 K
3. SPLITTER	2 EA	EA	@ $100 K/EA	= $200 K
				$544 K

(11) CHANNEL 1108

Q = 12~~0~~, n = 0.025, SS = 4:1, bottom = ~~30~~ 26, S = 0.0013, V = ~~4.9~~ 4.85, Fn = ~~0.46~~ 0.46, d = ~~4.99~~ 4.97

20 - 3' Drops, L = 1550, Top WIDTH (1'Fb) = ~~78~~ 74 + 16 = ~~94~~ 90'

1. EX	24,974	CY	@ $4/CY	= $100 K
3. Drops	20	EA	@ $163/SF	= $789 K
4. FENCE	3100	LF	@ $12/LF	= $ 37 K
5. R/W	94 × 1550	SF	@ $1/SF	= $146 K
6. Culverts (1)	3-8'×4', 2.25 CY/LF HW = 25 CY EA CULV. = 250 CY	CY	@ $310/CY	= $ 78 K
7. L/S	78 × 1550	SF	@ $0.28/SF	= $121 K
				$1,271 K

3 channel

Q = ~~900~~ 400, n = 0.0025, SS = 4:1, bottom = ~~15~~ 10, S = 0002, V = ~~4.6~~ 4.52, Fn = ~~0.51~~ 0.53, d = ~~3.99~~ 3.61

2.3' Drops, L = 1000', Top WIDTH (1'Fb) = ~~55~~ 50 + 16 = ~~71~~ 66

1. ~~X~~	87 KS	CY	$35 K
3. Drops	3	EA	$63 K
4 Fence	2000	LF	$24 K
5. R/W	71 × 1000	SF	$71 K
6. Culvert (1)	2-6 × 5 = 132, HW = 9.3	154 CY	$48 K
7. L/S	55 × 1000	55000 SF	$15 K
			$ [illegible]

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 5 OF 5

CALCULATED BY JCT DATE 7/4 CHECKED BY _____ DATE _____

OPTION 1C DIRT

(2) Q = 200 cfs, n = 0.025, SS = 4:1, bottom = 10', S = 0.0043, V = 4.98, fn = 0.72, d = 2.16'

6 - 2.8' Drops, L = 1700, TOP WIDTH (1'fb) = 35' + 16' = 51'

1. Ex		7057	@ $4/cy	= $28 K
3. Drops		6	@ $16.3/SF	= $97 K
4. Fence		3400	@ $12/LF	= $41 K
5. RW	35 x 1700	59,500	@ $1/SF	= $60 K
6. Culvert	–	–	@ $30/cy	= –
7. US	51 x 1700	86700	@ $0.98/SF	= $87 K
				$313 K

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 5

CALCULATED BY JCT DATE 7/7 CHECKED BY _____ DATE _____

McDowell Road Option 1C - Concrete Channel w/pass mtl in place

① BASIN

1. Ex	~~3~~ 21 AC x 1.3		@ $4/cy	= $234K
2. Land		10AC	@ $1/SF	= $436K
3. Splitter St.		2EA	@ $100K/EA	= $200 K
				$870K

② CHANNEL 160

Q = ~~[illegible]~~ cfs, n = 0.015 SS = 2:1, bottom = ~~[illegible]~~ 2, S = 0.0145, V = ~~10~~ 8.2, fn = ~~1.99~~ 1.85, d = ~~0.92~~ 0.9

8-3.1' Drops, Top width (2'fb) = ~~22'~~ 24' + 16 = ~~38'~~ 40', L = 2140

1. Ex		5543	@ $4/cy	= $22 K
2. Concrete		1152	@ $310/cy	= $357 K
3. Drops		8	@ $163/SF	= $78 K
4. Fence		5280	@ $12/LF	= $71 K
5. R/W	38 x 2140		@ $1/SF	= $81 K
6. Culverts (2)	6x3, 0.64 cy/LF HW = 13.4 cy/culv =	155 cy	@ $310/cy	= $48 K
				$657 K

②a Exist Basin

3. Splitter St		1EA	@ $100K/EA	= $100 K

③a Channel 463 468

Q = ~~[illegible]~~ cfs, n = 0.015, SS = 2:1, bottom = ~~[illegible]~~ 8', S = 0.0098, V = ~~14.0~~ 14.1, fn = 1.85 ~~1.86~~, d = 2.56 ~~2.77~~

24-2' Drops, Top width (2'fb) = ~~38~~ 40 + 16 = ~~54~~ 56, L = 4280

1. Ex	16619	~~27,696~~ 18	@ $4/cy 42	= 110K
2. Concrete		3691	27 @ $310/cy	= $1,144 K
3. Drops	969	24	@ $163/SF	= $301 K
4. Fence		8560	@ $12/LF	= $103 K
5. R/W	54 x 4280		@ $1/SF	= $231 K
6. Culverts (2)	2-8' x 3'	329	@ $310/cy	= 102 K
				$1,991 K

WOOD/PATEL

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PROJECT Spock Hill

PROJECT NO. 99969 SHEET NO. 2 OF 5

CALCULATED BY JCT DATE 7/1 CHECKED BY _____ DATE _____

OPTION 1C - Concrete Channel

(3b) channel ~~700~~ 628

Q=~~700~~ cfs, n=0.015, SS=2:1, bottom=~~20~~ 15', S=0.011, V=~~15.5~~ 11.84, fn=~~1.96~~ 1.97, d=~~2.11~~ 2.18

2-2.5' drops, L=1000', Top width (2'fb) = ~~36'~~ 32' + 16 = ~~52'~~ 48

1. EX	5406	@ $4/cy	= $22 K
2. Concrete	804	@ $310/cy	= $249 K
3. Drops	2	@ $163/SF	= $29 K
4. FENCE	2000	@ $12/LF	= $24 K
5. R/W	52 x 1000	@ $1/SF	= $52 K
6. Culverts (1)	2-8'x4'	175	@ $310/cy = $54 K
			$430 K

(5) channel A

Q=~~800~~ cfs, n=0.015, SS=2:1, bottom=~~20~~ 8', S=0.0098, V=~~13.5~~ 12.6, fn=~~1.87~~ 1.79, d=~~2.21~~ 2.06

17-3' drops, L=2640, Top width (2'fb) = 37' + 16 = ~~53'~~ 40

1. Ex	15,497	@ $4/cy	= $62 K
2. Concrete	2192	@ $310/cy	= $679 K
3. Drops	17	@ $163/SF	= $300 K
4. fence	5280	@ $12/LF	= $63 K
5. R/W	53 x 2640	@ $1/SF	= $140 K
6. Culverts (1) 6'x3'	77	@ $310/cy	= $24 K
			$1,268 K

(6) channel

Q=100 cfs, n=0.015, SS=2:1, bottom=8', S=0.0139, V=10.1, fn=1.95, d=1'

3-2.2' Drops, L=1320', Top width (2'fb) = 20' + 16 = 36'

1. Ex	3129	@ $4/cy	= $12 K
2. Concrete	670	@ $310/cy	= $208 K
3. Drops	3	@ $163/SF	= $22 K
4. FENCE	2640	@ $12/LF	= $32 K
5. R/W	36 x 1320	@ $1/SF	= $48 K
			$322 K

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 3 OF 5

CALCULATED BY JGT DATE 7/1 CHECKED BY _____ DATE _____

OPTION 1C - concrete Channel

(7) BASIN

1. EX	~~30~~ 12 Acft x 1.3	CY	@ $4/CY	= $251 K
2. LAND	10 AC	SF	@ $1/SF	= $436 K
3. SPLITTER	2	EA	@ $100K/EA	= $200 K
				$887 K

(8a) Q = ~~280~~ 264 cfs, n = 0.015, SS = 2:1, bottom = ~~4~~ 2', S = 0.012, V = ~~12.5~~ 10.5, fn = ~~1.4~~ 1.9, d = ~~1.6~~ 1.76

11 - 3' drops, length = 2400, top width (2' fb) = ~~24.4~~ 23.4 + 16 = ~~40.4~~ 39

1. Ex	7851 cy	@ $4/cy		= $31 K 32
2. concrete	1427 cy	@ $310/cy		= $442 K
3. drops	11	@ $163/SF		= $132 K
4. fence	4800	@ $12/LF		= $58 K
5. RW	40.4 x 2400	@ $1/SF		= $97 K
6. culverts 3-6x4	264 cy	@ $310/cy		= $82 K
				$842 K

(8b) Q = ~~300~~ 132, n = 0.015, SS = 2:1, bottom = ~~8~~ 2', S = 0.012, V = ~~12.0~~ 11.4, fn = ~~1.93~~ 1.86, d = ~~1.4~~ 1.96

7-3.1' drops, L = 2200', top width = ~~28.7~~ 28.7 + 16 = ~~44~~ 40

1. Ex	8533 cy	@ $4/cy		= $34 K
2. concrete	1475 cy	@ $310/cy		= $457 K
3. drops	7 EA	@ $163/SF		= $101 K
4. fence	4400 LF	@ $12/LF		= $53 K
5. RW	45 x 2200	@ $1/SF		= $99 K
6. culverts 1-6' x 4'	88 cy	@ $310/SF		= $27 K
				$771 K

(8c) Q = ~~900~~ 836 cfs, n = 0.015, SS = 2:1, bottom = ~~20~~ 8', S = 0.006, V = ~~13.2~~ 13.4, fn = ~~1.87~~ 1.51, d = ~~2.9~~ 3.86

3-3.3' drops, L = 680', TOP WIDTH (2' fb) = ~~40~~ 37.4 + 16 = ~~56~~ 53.4

1. Ex	4210	CY	@ $4/cy	= $17 K
2. Concrete	576	CY	@ $310/cy	= $179 K
3. Drops	3	EA	@ $163/SF	= $61 K
4. fence	1360	LF	@ $12/LF	= $16 K
5 RW	56 x 680	SF	@ $1/SF	= $38 K
6. culverts (1) 2-8x4	258 cy	CY	@ $310/SF	= $80 K
15 + 7.8 + 14				$391 K

WOOD/PATEL

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PROJECT Speck Hill

PROJECT NO. 99989 SHEET NO. 4 OF 5

CALCULATED BY JCT DATE 7/1 CHECKED BY _____ DATE _____

OPTION 1C - Concrete Channel

(9) CHANNEL

Q = 1350cfs, n = 0.05, SS = 2:1, bottom = 20', S = 0.006, V = 14.6 fps, fn = 1.55, d = 3.45'

5-2.8' Drops, L = 2040', Top width (2' fb) = 36 + 16 = 56

1. Ex		20,749	@ $4/cy	= $83K
2. concrete		2,463	@ $310/cy	= $763K
3. Drops		5	@ $163/SF	= $97K
4. fence		5280	@ $12/LF	= $63K
5. R/W	58x2640		@ $1/SF	= $153K
6. culvert	(2) 4-8'x4'	642	@ $310/cy	= $199K
	2-8'x4'	356		$1,358K

(10) BASIN

1. Ex	12 Acft x1.3	@ $4/cy	= $126K
2. LAND	5 Ac	@ $1/SF	= $218K
3. SPLITTER	2 EA	@ $100K/EA	= $200K
			$544K

(11) CHANNEL

Q = 1105cfs, n = 0.05, SS = 2:1, bottom = 12', S = 0.0055, V = 14.1, fn = 1.5, d = 3.95'

18-3' Drops, L = 1550', Top width (2' fb) = 36 + 16 = 52

1. Ex	1264	@ $4/cy	= $51K
2. Concrete	1598	@ $310/cy	= $495K
3. Drops	18	@ $163/SF	= $419K
4. fence	3100	@ $12/LF	= $37K
5. R/W	62x1550	@ $1/SF	= $99K
6. Culverts	(1) 3-8'x4'	250cy	@ $310/cy = $78K
			$1,179K

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 5 OF 5

CALCULATED BY JST DATE 7/7 CHECKED BY _____ DATE _____

OPTION 1C - concrete Channel

(12) channel ✓ OK

Q = 200, n = 0.0015, ss = 2:1, bottom = 10, s = 0.013, v = 11.8, Fr = 1.97, d = 1.34

1 = 1.9 Drops, L = 1700', Top width (1'fb) = 20' + 16 = 36

1. EX		5104	@ $4/cy	= $20 K
2. conc		974	@ $310/cy	= $302 K
3. Drops		1	@ $310/cy	= 7 K
4. fence		3400	@ $12/LF	$41 K
5. RW	36 x 1700	61200	@ $1/SF	= 61 K
6. culvert		—	@ $310/cy	= —
				$431 K

(13) channel ✓

Q = 400, n = 0.015, ss = 2:1, bottom = 8, s = 0.009, v = 13.1 (~~14.8~~), Fr = 1.74 (~~1.88~~), d = 2.4 (~~3.25~~)

1. EX		4259	@ $4/cy	= $17K
2. conc		655	@ $310/cy	= $203K
3. Drops		—	@ $310/cy	= —
4. fence		2000	@ $12/LF	= $24 K
5. RW	49 x 1000	49000	@ $1/SF	= $49 K
6. culvert (1)	~~2 x 2 x 2~~ [- 10x3] 125+7.24+12.95 102+5.9+9.7	145	@ $310/cy	= $45 K
				338 K

Ø Drops, L = 1000, Top width (1'fb) = ~~23~~ 26 + 16 = ~~39~~ 42

Spook Hill ADMS Update July 26, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment with Pass Mountain Diversion
Level I Concept Analysis Opinion of Probable Costs
Option 1D - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	149,430	$597,719
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	19,977	$3,256,204
4	Splitter Structures	$60,000	EA	5	$300,000
5	Culverts	$310	CY	1,845	$571,950
6	Basin Excavation	$4.00	CY	145,200	$580,800
		SUBTOTAL MAJOR ELEMENTS			$5,306,673
		CONTINGENCIES:			
		Construction		35%	$1,857,335
		Construction Admin		6%	$318,400
		TOTAL MAJOR ELEMENTS			**$7,482,409**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	1,734,023	$1,907,425
2	Fence	$12	LF	34,140	$409,680
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$2,327,105
		CONTINGENCIES:			
		Construction		35%	$814,487
		Construction Admin		6%	$139,626
		TOTAL ADDITIONAL ELEMENTS			**$3,281,218**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$449,711	AC	6.43	$2,891,642
2	Basin Land Acquisition	$33,610	AC	14.39	$483,648
		SUBTOTAL LAND ACQUISITION			$3,375,290
		CONTINGENCIES :		25%	$843,822
		TOTAL LAND ACQUISITION			**$4,219,112**
				TOTAL	***$14,982,739***

Wood/Patel

Spook Hill ADMS Update July 26, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McDowell Road Alignment with Pass Mountain Diversion
Level I Concept Analysis Opinion of Probable Costs
Option 2D - Concrete Channel

MAJOR ELEMENTS:

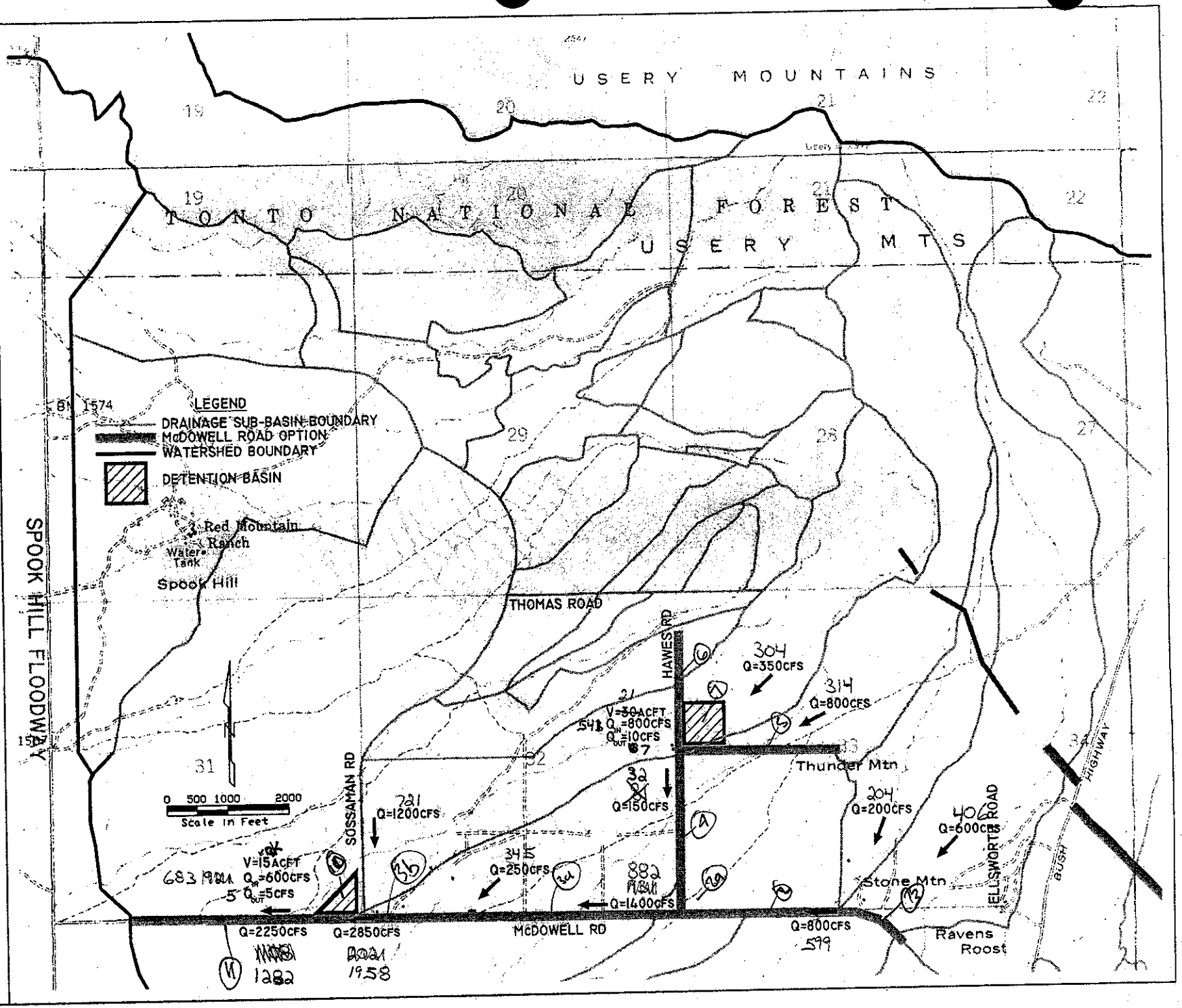
ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	76,770	$307,080
2	Concrete Channel Lining	$310	CY	11,705	$3,628,583
3	Drop Structures	$163	SF	6,729	$1,096,873
4	Splitter Structures	$60,000	EA	5	$300,000
5	Culverts	$310	CY	1,845	$571,950
6	Basin Excavation	$4.00	CY	145,200	$580,800
		SUBTOTAL MAJOR ELEMENTS			$6,485,285
		CONTINGENCIES:			
		Construction		35%	$2,269,850
		Construction Admin		6%	$389,117
		TOTAL MAJOR ELEMENTS			**$9,144,252**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	653,400	$718,740
2	Fence	$12	LF	34,140	$409,680
3	Utility Relocations	$5,000	EA	2	$10,000
		SUBTOTAL ADDITIONAL ELEMENTS			$1,138,420
		CONTINGENCIES:			
		Construction		35%	$398,447
		Construction Admin		6%	$68,305
		TOTAL ADDITIONAL ELEMENTS			**$1,605,172**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$415,975	AC	7.01	$2,915,985
2	Basin Land Acquisition	$33,610	AC	14.39	$483,648
		SUBTOTAL LAND ACQUISITION			$3,399,633
		CONTINGENCIES :		25%	$849,908
		TOTAL LAND ACQUISITION			**$4,249,541**
				TOTAL	***$14,998,965***



SPOOK HILL A.D.M.P. UPDATE
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

McDOWELL ROAD OPTION 1D-b

	BY	DATE
DESIGNED	R. HINER	08/00
DRAWN	S. CAMPBELL	08/00
CHECKED	A. PATEL	08/00

DRAWING NO. pphi-mcdowell1D-b.dwg

SHEET 1 OF 1

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 2

CALCULATED BY JGT DATE 7/11 CHECKED BY _____ DATE _____

McDonell Road — Option 1d - Concrete W/PASS MT. DIVERSION

① channel - SAME AS option 1F — $346K SAME AS 1b W/PASS MT Except 2, 3a, 3b

② channel - " " " " — $1226K

②a Basin - SAME AS option 1K — $100 K

③a channel 982

Q= ~~1400~~ cfs, n=0.015, SS=2:1, bottom= ~~8~~ 8, S=0.007, V= ~~14.97~~ 14.78, Fn= 1.06 1.63, d= 3' 3.82 ~~3.92~~

20-3 Drops, L= 4280, Top width (2'fb)= ~~45~~ 42 + 16' = ~~61~~ 58

1. Ex	35191	cy @ $4/cy	=	$141 K
2 Conc	4229	cy @ $310/cy	=	$1,311 K
3 Drops	20	Ea @ $63/SF	=	$421 K
4 Fence	8560	LF @ $12/LF	=	$103 K
5 R/W	61 x 4280	SF @ $1/SF	=	$261 K
6 culverts (2) ~~3x8x3~~ =(374+9.6+17.2)x2	~~401~~	cy @ $310/cy	=	$124 K
214+7.4+15.2 = 237 x2 = 473				$2,361 K

③b Channel 1226 1222

Q= ~~1050~~, n=0.015, SS=2:1, bottom= ~~10~~ 18, S=0.0067, V= ~~15~~ 14.93, Fn= 1.64 1.63, d= 2.99 ~~3.32~~ 3.33

3-3/1 Drops, L= 1000, Top width (2'fb)= ~~51+16~~ = ~~67'~~ 57

1. Ex	9556	cy @ ~~$4~~ $4/cy	~~$40~~ $38 K	
2. Conc	1099	cy @ $310/cy	=	$341 K
3. Drops	3	Ea @ $63/SF	=	$77 K
4. Fence	2000	LF @ $12/LF	=	$24 K
5. R/W	67 x 1000	SF @ $1/SF	=	$67 K
6. culverts (1) ~~3x8x3~~ 411+8.7+17.2	441	cy @ $310/cy	=	$137 K
4-10x3 374+9.6+17.2 = 401				$684 K

④ channel - Same as option 1B Q=232 S=0.0053, V=5, d=0.68 Fn=1.15 — $634 K

channel - Same as option 1C Q=314 S=0.0098 — $1,268 K

⑦ Basin - Same as option 1c — $887 K

|| Q=1282, n=0.015, 2:1, b=14, S=0.0059, V=, Fn= , d=

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 3

CALCULATED BY JGT DATE 7/10 CHECKED BY _____ DATE _____

OPTION 1F - Concrete

(1) Q=~~800~~ 1000 cfs, n=0.015, ss= 2:1, bottom = 8', V= 14.94, fn=1.95, s=0.009, d=2.95'
Ø Drops, L=1000, top width (2'fb) = 28 + 16 = 44'

1. Ex		4365	cy @ $4/cy	= $18 K
2. Conc		669	cy @ $310/cy	= $207 K
3. Drop		—	EA @ $163/SF	= —
4. Fence		2000	LF @ $12/LF	= $24 K
5. R/W	44 x 1000	44000	SF @ $1/SF	= $44 K
6. Culvert (1) 2-8'x4'		178	cy @ $310/cy	= $55 K
				$348 K

(2) Q=~~900~~ 599 cfs, n= 0.015, SS - 2:1, bottom = ~~10~~ 8, V= ~~14.92~~ 13.98, fn = 1.72 ~~1.7~~, S-0.008, d= ~~3.25~~ 3.04
14 - 3.1' drops, L= 2640, top width (2'fb) = ~~28~~ 16 + 16 = ~~39~~ 32

1. Ex		13750	cy @ $4/cy	= $55 K
2. Conc		1930	cy @ $310/cy	= $598 K
3. Drop		14	EA @ $168/SF	= $217
4. Fence		5280	LF @ $12/LF	= $63 K
5. R/W	47x2640	~~195360~~	SF @ $1/SF	= $196 K
6. Culvert (2) ~~2x5~~ 2.8x3	-132 + 9.3 + 16 x 2 (140 + 6.2 + 1.1) x2	315 330	cy @ $310/cy	= $97 K
				$1,226 K

(3) Q=1250 cfs, n=0.015, SS=2:1, bottom=20, V= 14.8, fn=1.70, s=0.0075, d=2.77
19 - 3' drops, L= 4280, top width (2'fb) = 39 + 16 = 55

1. Ex		28846	cy @ $4/cy	= $115 K
2. Conc		3752	cy @ $310/cy	= $1,163 K
3. Drop		19	EA @ $163/SF	= $309 K
4. Fence		8560	LF @ $12/LF	= $103 K
5. R/W	55 x 4280	235,400	SF @ $1/SF	= $236 K
6. Culvert (2) Abbl 6x4 = 233 HWH HW = 25	5x2	516	cy @ $310/cy	= $160 K
				$2,146 K

(4) Exist Basin Splitter Structure 100 K

WOOD/PATEL

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PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 2

CALCULATED BY JGT DATE 7/11 CHECKED BY _____ DATE _____

McDowell Road — OPTION 1d Dirt

W/PASS ~~PAST~~ MT DIVERSION

① Channel : Same As OPTION 1F ~~SAME AS~~ 1b w/PASS MT $205 K
except 2, 3a, 3b

② channel " " " " $1433 K

2a Basin " " " " $100 K

3a channel 882

Q= ~~1400~~ 1881, n = 0.025, SS= 4:1, bottom= ~~30~~ 36, S= 0.0015, V= ~~5~~ 4.73, fn= ~~0.46~~ 0.46, d= ~~4~~ 4.04

28-3' Drops, Length=4280, Top width (1'FB) ~~98~~ 71 +16 = ~~114~~ 86

1. Ex		75907	cy	@ $4/cy	$303 K
3. Drops		28	EA	@ $163/SF	= $1,300 K
4. Fence		8560	LF	@ $12/LF	= $103 K
5. ROW	111 X 4280	475080	SF	@ $1/SF	= $475 K
6. Culverts	(2) 5-6'x4' (287+982+1767)x2	6928	cy	@ $310/cy	= $195 K
7. L/S	95 X 4280	406,600	SF	@ $0.28/SF	= $114 K
					$2,490 K

3b channel ~~1240~~ 1227

Q= ~~1600~~, n=0.025, SS= 4:1, bottom= ~~70~~ 50, S= 0.0015, V= ~~5~~ 4.93, fn= ~~0.49~~ 0.49, d= ~~3.94~~ 4.05

5-2.9 Drops, length: 1000, Top width (1'FB) = ~~114~~ 98 + 16 = ~~130~~ 114 102

1. Ex		20600	cy	@ $4/cy	= $82 K
3. Drops		5	EA	@ $163/SF	= $262 K
4. Fence		2000	LF	@ $12/LF	= $24 K
5. ROW	127 X 1000	127000	SF	@ $1/SF	= $127 K
6. Culverts	(1) 6-6x4 = 341+10.7+19.2 = 371cy			@ $310/cy	= $115 K
7. L/S	111 x 1000	111 000	SF	@ $0.28/SF	= $111 K
					$721 K — 127K

④ channel Q=31 n=0.025 4:1 bot=2 S=0.0053, V=3.47, fn=0.71, d=1.27
SAME AS OPTION 1B Top width = 21 +16 = 37 $276 K

⑤ channel 314 n=0.025 4:1 bot= 8, S=0.003, V=4.28, fn=0.52, d=3.4'
SAME AS OPTION 1C TW = 44+16 = 60' $1,323 K — 1.5K

6 channel TW= +16=

⑦ Basin - SAME AS OPTION 1C $887 K
Q=1282, n=0.025 4:1 bottom=50, S=0.0015 V=4.44 fn=0.49, d=3.95
TW= 56 +16 = 72

11 channel - SAME AS 1F

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 3

CALCULATED BY JCT DATE 7/10 CHECKED BY _____ DATE _____

OPTION 8 1 F - DIRT

(1B) Q = ~~600~~ 406 cfs, n = 0.025, SS = 4:1, bottom = ~~30~~, V = ~~4.96~~ 4.65, fn = ~~0.55~~ 0.54, s = 0.0021, d = ~~3.54~~ 3.78

3-2.3' Drops, L = 1000', Top width (1' FB) = ~~56~~ 47 + 16 = ~~72~~ 62'

1	Ex	8651	CY	@ $4/CY	= $35 K
3	Drop	3	EA	@ $163/SF	= $63 K
4	Fence	2000	LF	@ $12/LF	= $24 K
5	R/W 72 x 1000	72000	SF	@ $1/SF	= $72 K
6	Culverts (1) 2-8x4 = 150 + 28 = 14 = 178	178	CY	@ $310/CY	= $55 K
7	L/S 56 x 1000	56000	SF	@ $0.28/SF	= $16 K
					$265 K

(2) Q = ~~800~~ 599 cfs, n = 0.025, SS = 4:1, bottom = ~~50~~ 30, V = 4.98, fn = 0.58, d = ~~3.65~~ 2.9, s = 0.0024

20-2.9' Drops, L = 2640', Top width (1' FB) = ~~74~~ 61 + 16 = ~~90~~ 77'

1.	Ex	31617	CY	@ $4/CY	= $126 K
3.	Drops	20		@ $163/SF	= $148 K
4.	Fence	5280	LF	@ $12/LF	= $63 K
5.	R/W 95 x 2640	250,800	SF	@ $1/SF	= $251 K
6.	Culverts (2) 4-8x3x100 = 279 + 8.48 + 15.2 } 302	605	CY	@ $310/CY	= $187 K
7.	L/S 79 x 2640	208560	SF	@ $0.28/SF	= $58 K
					$1,433 K

(3a) Q = 1250 cfs, n = 0.025, SS = 4:1, bottom = 73', V = 4.99, fn = 0.55, d = 2.95, s = 0.002

27-3' drops, L = 4280, Top width (1' FB) = 104' + 16 = 120

1.	Ex	73711	CY	@ $4/CY	= $295 K
3.	Drops	27	EA	@ $163/SF	= $1,394 K
4.	Fence	8560	LF	@ $12/LF	= $103 K
5.	R/W 120 x 4280	513600	SF	@ $1/SF	= $514 K
6.	Culverts (2) 4-10x3 = 374 + 9.6 + 17.2 } 401	802	CY	@ $310/CY	= $249 K
7.	L/S 104 x 4280	445,280	SF	@ 0.28/SF	= 125 K
					$2,680 K

(2a) Exist Basin Splitter St 100 K

2a 85.2
3a 95.1
3b 110.3
4 44.2
5a 67.2
6 53
11 119.3
13 70.4

Basin 14.37 Ac @ 53010
Clam 11.13 Ac @ 400,390

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill ADMP — Revised McKellips Costs (Channel Removed From State Lands)

PROJECT NO. 99989 SHEET NO. ____ OF ____

CALCULATED BY RLH DATE 1/15/01 CHECKED BY ____ DATE ____

McKellips 1A – subtract 2a – 2g — Earthen Channel

74,417 CY Ex.	@	$4.00/CY
11,200 Ft Fence	@	$12.00/LF
6,707 SF Drop Str.	@	$163.00/SF
636,250 SF Landscaping	@	$1.10/SF
14.61 acres R/W	@	$19,840/acre
		$2,515,046.00

McKellips 2A – subtract 2a – 2d

27,561 CY Ex	@	$4.00/CY
11,200 Ft Fence	@	$12.00/LF
3,953 CY concrete	@	$310.00/CY
764 SF Drop Str	@	$163.00/SF
255,250 SF Landscaping	@	$1.10/SF
5.86 acres R/W	@	$19,840/acre
		$1,875,381.00

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT _____

PROJECT NO. _____ SHEET NO. _____ OF _____

CALCULATED BY RLH DATE 1/15/01 CHECKED BY _____ DATE _____

McKellips 1B – (subtract 2a to 2h)

45,766 CY Ex. @ $4.00/CY

8,400 LF Fence @ $12.00/LF

4,139 SF Drop Str. @ $163.00/SF

444,750 SF Landscaping @ $1.10/SF

10.21 acres R/W @ $19,840/acre

$1,649,904

McKellips 2B – (subtract 2a to 2d)

19,701 CY Ex @ $4.00/CY

8,400 LF Fence @ $12.00/LF

2,864 CY Concrete @ $310.00/CY

563.5 SF Drop Str. @ $163.00/SF

141,500 SF Landscaping @ $1.10/SF

3.25 acres R/W @ $19,840/acre

$1,379,294

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT _____

PROJECT NO. _____ SHEET NO. _____ OF _____

CALCULATED BY RLH DATE 1/15/01 CHECKED BY _____ DATE _____

McKellips 1C – (subtract 1b to 1g)

85,651 CY Ex @ $4.00/CY

9,600 LF Fence @ $12.00/LF

7,570 SF Drop Str @ $163.00/SF

766,250 SF Landscaping @ $1.10/SF

17.59 acre R/W @ $19,840/acre

$2,883,575

McKellips 2C – (subtract 1b to 1e)

31,637 CY Ex @ $4.00/CY

9,600 LF Fence @ $12.00/LF

4,101 CY Concrete @ $310.00/CY

1,007 SF Drop Str. @ $163.00/SF

185,250 SF Landscaping @ $1.10/SF

4.25 acre R/W @ $19,840/acre

1,965,294

Table 1

McKellips Road Alignment

Level I Concept Analysis Opinion of Probable Costs

Option No.	Alternate Description	Opinion of Probable Costs Including Contingencies			Total Cost
		Major Elements	Additional Elements	Land Acquisitions Basins and R/W	
1A - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. Basin at the NE corner of Ellsworth and McKellips Rd. One Basin	$6,725,750	$3,854,553	$1,195,612	**$11,775,915**
2A - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. Basin at the NE corner of Ellsworth and McKellips Rd. One Basin	$5,824,493	$1,064,776	$384,083	**$7,273,352**
1B - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. Two Basins.	$6,078,335	$3,677,860	$1,241,066	**$10,997,261**
2B - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. Two Basins.	$4,677,414	$1,740,391	$584,661	**$7,002,467**
1C - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. Basin at Hawes Rd. One Basin.	$6,965,153	$3,636,120	$1,294,429	**$11,895,702**
2C - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. Basin at Hawes Rd. One Basin.	$6,620,208	$1,064,776	$562,220	**$8,247,204**

Spook Hill ADMS Update July 19, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McKellips Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 1A - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	245,798	$983,192
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	20,029	$3,264,743
4	Splitter Structures	$60,000	EA	1	$60,000
5	Culverts	$310	CY	710	$220,100
6	Basin Excavation	$4.00	CY	60500	$242,000
		SUBTOTAL MAJOR ELEMENTS			$4,770,035
		CONTINGENCIES:			
		Construction		35%	$1,669,512
		Construction Admin		6%	$286,202
		TOTAL MAJOR ELEMENTS			**$6,725,750**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	2,234,296	$2,457,726
2	Fence	$12	LF	23000	$276,000
3	Utility Relocations	$5,000	EA	0	$0
		SUBTOTAL ADDITIONAL ELEMENTS			$2,733,726
		CONTINGENCIES:			
		Construction		35%	$956,804
		Construction Admin		6%	$164,024
		TOTAL ADDITIONAL ELEMENTS			**$3,854,553**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$19,840	AC	45.69	$906,490
2	Basin Land Acquisition	$5,000	AC	10.00	$50,000
		SUBTOTAL LAND ACQUISITION			$956,490
		CONTINGENCIES :		25%	$239,122
		TOTAL LAND ACQUISITION			**$1,195,612**
				TOTAL	***$11,775,915***

Spook Hill ADMS Update July 19, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McKellips Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 2A - Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	74,624	$298,496
2	Concrete Channel Lining	$310	CY	9,446	$2,928,276
3	Drop Structures	$163	SF	2,343	$381,974
4	Splitter Structures	$60,000	EA	1	$60,000
5	Culverts	$310	CY	710	$220,100
6	Basin Excavation	$4.00	CY	60,500	$242,000
		SUBTOTAL MAJOR ELEMENTS			$4,130,846
		CONTINGENCIES:			
		Construction		35%	$1,445,796
		Construction Admin		6%	$247,851
		TOTAL MAJOR ELEMENTS			**$5,824,493**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	435,600	$479,160
2	Fence	$12	LF	23,000	$276,000
3	Utility Relocations	$5,000	EA	0	$0
		SUBTOTAL ADDITIONAL ELEMENTS			$755,160
		CONTINGENCIES:			
		Construction		35%	$264,306
		Construction Admin		6%	$45,310
		TOTAL ADDITIONAL ELEMENTS			**$1,064,776**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$16,630	AC	15.47	$257,266
2	Basin Land Acquisition	$5,000	AC	10.00	$50,000
		SUBTOTAL LAND ACQUISITION			$307,266
		CONTINGENCIES :		25%	$76,817
		TOTAL LAND ACQUISITION			**$384,083**
				TOTAL	***$7,273,352***

Spook Hill ADMS Update July 19, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McKellips Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 1B - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	171,844	$687,375
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	14,210	$2,316,264
4	Splitter Structures	$60,000	EA	2	$120,000
5	Culverts	$310	CY	447	$138,570
6	Basin Excavation	$4.00	CY	262,167	$1,048,667
		SUBTOTAL MAJOR ELEMENTS			$4,310,876
		CONTINGENCIES:			
		Construction		35%	$1,508,806
		Construction Admin		6%	$258,653
		TOTAL MAJOR ELEMENTS			**$6,078,335**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	2,140,010	$2,354,011
2	Fence	$12	LF	21,200	$254,400
3	Utility Relocations	$5,000	EA	0	$0
		SUBTOTAL ADDITIONAL ELEMENTS			$2,608,411
		CONTINGENCIES:			
		Construction		35%	$912,944
		Construction Admin		6%	$156,505
		TOTAL ADDITIONAL ELEMENTS			**$3,677,860**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$16,500	AC	45.90	$757,350
2	Basin Land Acquisition	$12,330	AC	19.10	$235,503
		SUBTOTAL LAND ACQUISITION			$992,853
		CONTINGENCIES :		25%	$248,213
		TOTAL LAND ACQUISITION			**$1,241,066**
				TOTAL	***$10,997,261***

Spook Hill ADMS Update
Flood Control District of Maricopa County
FCD 99-43

July 19, 2000
W/P # 99989

McKellips Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 2B - Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	59,614	$238,458
2	Concrete Channel Lining	$310	CY	8,366	$2,593,463
3	Drop Structures	$163	SF	1,392	$226,824
4	Splitter Structures	$60,000	EA	2	$120,000
5	Culverts	$310	CY	447	$138,570
6	Basin Excavation	$4	CY	0	$0
		SUBTOTAL MAJOR ELEMENTS			$3,317,315
		CONTINGENCIES:			
		Construction		35%	$1,161,060
		Construction Admin		6%	$199,039
		TOTAL MAJOR ELEMENTS			**$4,677,414**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	871,200	$958,320
2	Fence	$12	LF	23,000	$276,000
3	Utility Relocations	$5,000	EA	0	$0
		SUBTOTAL ADDITIONAL ELEMENTS			$1,234,320
		CONTINGENCIES:			
		Construction		35%	$432,012
		Construction Admin		6%	$74,059
		TOTAL ADDITIONAL ELEMENTS			**$1,740,391**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$15,630	AC	14.57	$227,729
2	Basin Land Acquisition	$12,000	AC	20.00	$240,000
		SUBTOTAL LAND ACQUISITION			$467,729
		CONTINGENCIES :		25%	$116,932
		TOTAL LAND ACQUISITION			**$584,661**
				TOTAL	***$7,002,467***

Spook Hill ADMS Update July 19, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McKellips Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 1C - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	223,469	$893,877
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	18,592	$3,030,481
4	Splitter Structures	$60,000	EA	1	$60,000
5	Culverts	$310	CY	480	$148,800
6	Basin Excavation	$4.00	CY	201,667	$806,667
				SUBTOTAL MAJOR ELEMENTS	$4,939,825
		CONTINGENCIES:			
		Construction		35%	$1,728,939
		Construction Admin		6%	$296,390
				TOTAL MAJOR ELEMENTS	**$6,965,153**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	2,093,462	$2,302,808
2	Fence	$12	LF	23,000	$276,000
3	Utility Relocations	$5,000	EA	0	$0
				SUBTOTAL ADDITIONAL ELEMENTS	$2,578,808
		CONTINGENCIES:			
		Construction		35%	$902,583
		Construction Admin		6%	$154,728
				TOTAL ADDITIONAL ELEMENTS	**$3,636,120**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$16,810	AC	50.30	$845,543
2	Basin Land Acquisition	$19,000	AC	10.00	$190,000
				SUBTOTAL LAND ACQUISITION	$1,035,543
		CONTINGENCIES :		25%	$258,886
				TOTAL LAND ACQUISITION	**$1,294,429**
				TOTAL	***$11,895,702***

Spook Hill ADMS Update
Flood Control District of Maricopa County
FCD 99-43

July 19, 2000
W/P # 99989

McKellips Road Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 2C - Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	75,251	$301,004
2	Concrete Channel Lining	$310	CY	9,717	$3,012,193
3	Drop Structures	$163	SF	2,249	$366,520
4	Splitter Structures	$60,000	EA	1	$60,000
5	Culverts	$310	CY	480	$148,800
6	Basin Excavation	$4.00	CY	201,667	$806,667
		SUBTOTAL MAJOR ELEMENTS			$4,695,183
		CONTINGENCIES:			
		Construction		35%	$1,643,314
		Construction Admin		6%	$281,711
		TOTAL MAJOR ELEMENTS			**$6,620,208**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	435,600	$479,160
2	Fence	$12	LF	23,000	$276,000
3	Utility Relocations	$5,000	EA	0	$0
		SUBTOTAL ADDITIONAL ELEMENTS			$755,160
		CONTINGENCIES:			
		Construction		35%	$264,306
		Construction Admin		6%	$45,310
		TOTAL ADDITIONAL ELEMENTS			**$1,064,776**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$15,840	AC	16.40	$259,776
2	Basin Land Acquisition	$19,000	AC	10.00	$190,000
		SUBTOTAL LAND ACQUISITION			$449,776
		CONTINGENCIES :		25%	$112,444
		TOTAL LAND ACQUISITION			**$562,220**
				TOTAL	***$8,247,204***

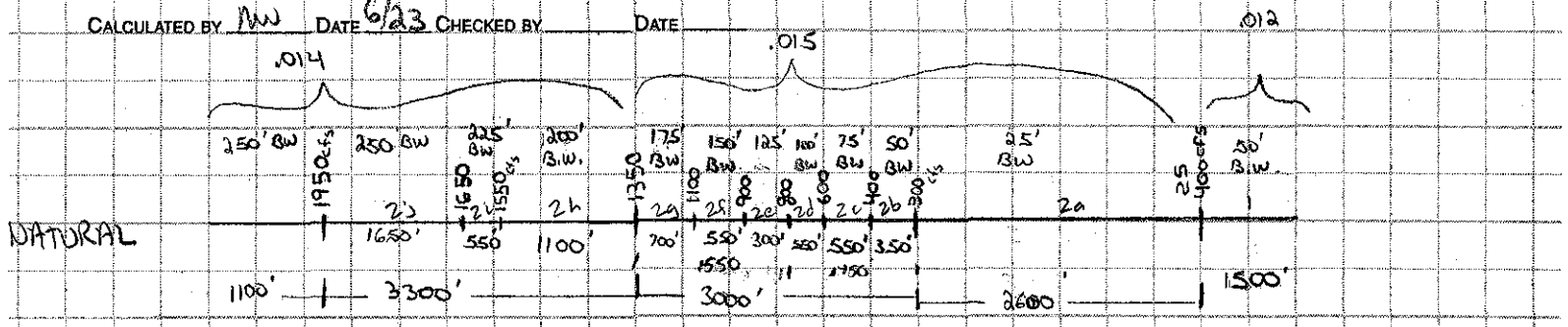
WOOD/PATEL

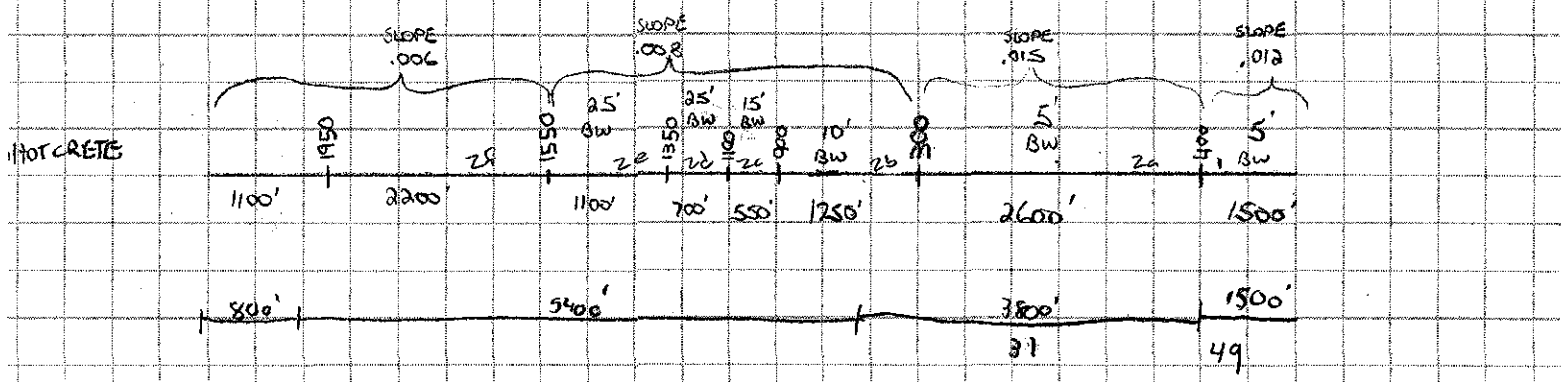
CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK HILL — McKELLIPS OPTION "A"

PROJECT NO. 99989 SHEET NO. ____ OF ____

CALCULATED BY MW DATE 6/23 CHECKED BY ____ DATE ____





WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. ____ OF ____

CALCULATED BY MW DATE 6/23 CHECKED BY ____ DATE ____

McKELLIPS NATURAL CHANNEL OPTION A REACH 1

GIVEN:

McKELLIPS

OPTION "A"

NATURAL

GTH = 1500'

S = .012

V = 5.9 F

F_n = .97

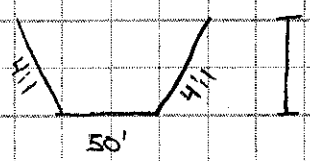
ADD D

.012 SLOPE ⇒ ΔEL = 18'

.003 SLOPE ⇒ ΔEL = 4.5'

DIFFERENCE 13.5' USE 7 DROPS; 6 @ 2' AND 1 @ 1.5' = 13.5

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.8' < 4 fps O.K.; d = 1.9'



2.9' CHANNEL 3.9' @ DROPS

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. ____ OF ____

CALCULATED BY MW DATE 6/23 CHECKED BY ____ DATE ____

McKELLIPS NATURAL CHANNEL OPTION A REACH 2j

GIVEN: Q = 1950 USNG = 1624.3 DSNG = 1585.8 LENGTH = 2750'

S = .014 n = .03 S.S. 4:1 B.W. = 250'

V = 6.5 fps > 4 fps ∴ WILL NOT WORK

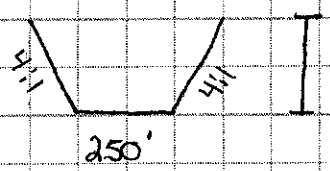
F_n = 1.06 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

ADD DROPS

.014 SLOPE ⇒ ΔEL = 23.1'
.003 SLOPE ⇒ ΔEL = 5'

DIFFERENCE 18.1' USE 8 DROPS; 7 @ 2.5' AND 1 @ .6' = 18.1'

USING .003 SLOPE ⇒ F_n = .53 < .86 O.K.; V = 4 fps ≤ 4 fps O.K.; d = 1.9'



2.9' CHANNEL 4.9' @ DROPS

Mckellips A Natural Channel Reach 1
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips A Natural R1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

LENGTH = 1500'

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	50.00	ft
Discharge	400.00	cfs

Results		
Depth	1.85	ft
Flow Area	106.4	ft²
Wetted Perimeter	65.29	ft
Top Width	64.83	ft
Critical Depth	1.22	ft
Critical Slope	0.012724	ft/ft
Velocity	3.76	ft/s
Velocity Head	0.22	ft
Specific Energy	2.07	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips A Natural Channel Reach 2a
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips A Natural R2a	LENGTH 2600'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	25.00	ft
Discharge	300.00	cfs

Results		
Depth	2.24	ft
Flow Area	76.1	ft²
Wetted Perimeter	43.48	ft
Top Width	42.93	ft
Critical Depth	1.51	ft
Critical Slope	0.012284	ft/ft
Velocity	3.94	ft/s
Velocity Head	0.24	ft
Specific Energy	2.48	ft
Froude Number	0.52	
Flow Type	Subcritical	

USNG = 1731.6
DSNG = 1692.6

NATURAL
.015 SLOPE ⇒ ΔEL = 39'
.003 SLOPE ⇒ ΔEL = 7.8'
DIFFERENCE 31.2' USE 13 DROPS; 12 @ 2.5' AND 1 @ 1.2' = 31.2'

3.3' CHANNEL 5.3' @ DROPS

Mckellips A Natural Channel Reach 2b
Worksheet for Trapezoidal Channel

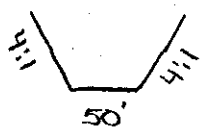
Project Description		
Worksheet	Mckellips A Natural R2b	LENGTH = 350'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	50.00	ft
Discharge	400.00	cfs

Results		
Depth	1.85	ft
Flow Area	106.4	ft²
Wetted Perimeter	65.29	ft
Top Width	64.83	ft
Critical Depth	1.22	ft
Critical Slope	0.012724	ft/ft
Velocity	3.76	ft/s
Velocity Head	0.22	ft
Specific Energy	2.07	ft
Froude Number	0.52	
Flow Type	Subcritical	

USNG = 1692.6
DSNG = 1687.3

NATURAL
.015 SLOPE ⇒ ΔEL = 5.3'
.003 SLOPE ⇒ ΔEL = 1.1'
DIFFERENCE 4.2' USE 2 DROPS; 1 @ 2.5' AND 1 @ 1.7' = 4.2'



2.9' CHANNEL 4.9' @ DROPS

Mckellips A Natural Channel Reach 2c
Worksheet for Trapezoidal Channel

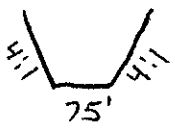
Project Description		
Worksheet	Mckellips A Natural R2c	LENGTH = 550'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	75.00	ft
Discharge	600.00	cfs

Results		
Depth	1.87	ft
Flow Area	154.7	ft²
Wetted Perimeter	90.46	ft
Top Width	90.00	ft
Critical Depth	1.23	ft
Critical Slope	0.012547	ft/ft
Velocity	3.88	ft/s
Velocity Head	0.23	ft
Specific Energy	2.11	ft
Froude Number	0.52	
Flow Type	Subcritical	

USNG = 1687.3
DSNG = 1679.0

NATURAL
.015 SLOPE ⇒ ΔEL = 8.3'
.003 SLOPE ⇒ ΔEL = 1.7'
DIFFERENCE 6.6' USE 3 DROPS; 2 @ 2.5' AND 1 @ 1.6' = 6.6'



2.9' CHANNEL 4.9' @ DROPS

Mckellips A Natural Channel Reach 2d
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips A Natural R2d	LENGTH = 550
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	100.00	ft
Discharge	800.00	cfs

Results		
Depth	1.89	ft
Flow Area	202.7	ft²
Wetted Perimeter	115.54	ft
Top Width	115.08	ft
Critical Depth	1.24	ft
Critical Slope	0.012453	ft/ft
Velocity	3.95	ft/s
Velocity Head	0.24	ft
Specific Energy	2.13	ft
Froude Number	0.52	
Flow Type	Subcritical	

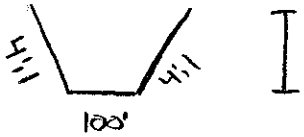
USNG = 1679.0
DSNG = 1670.7

NATURAL

.015 SLOPE ⇒ ΔEL = 8.3

.003 SLOPE ⇒ ΔEL = 1.7

DIFFERENCE 6.6' USE 3 DROPS; 2 @ 2.5' AND 1 @ 1.6' = 6.6'



2.9' CHANNEL 4.9' @ DROPS

Mckellips A Natural Channel Reach 2e
Worksheet for Trapezoidal Channel

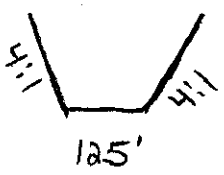
Project Description		
Worksheet	Mckellips A Natural R2e	LENGTH = 300'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	125.00	ft
Discharge	900.00	cfs

Results		
Depth	1.78	ft
Flow Area	234.7	ft²
Wetted Perimeter	139.65	ft
Top Width	139.21	ft
Critical Depth	1.16	ft
Critical Slope	0.012673	ft/ft
Velocity	3.83	ft/s
Velocity Head	0.23	ft
Specific Energy	2.01	ft
Froude Number	0.52	
Flow Type	Subcritical	

USWG = 1670.7
DSWG = 1666.2

NATURAL
.015 SLOPE ⇒ ΔEL = 4.5'
.003 SLOPE ⇒ ΔEL = .9'
DIFFERENCE 3.6' USE 2 DROPS; 1 @ 2.5' AND 1 @ 1.1' = 3.6'



2.8' CHANNEL 4.8' @ DROPS

Mckellips A Natural Channel Reach 2f
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips A Natural R2f
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

LENGTH = 550'

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	150.00	ft
Discharge	1,100.00	cfs

Results		
Depth	1.80	ft
Flow Area	282.9	ft²
Wetted Perimeter	164.84	ft
Top Width	164.40	ft
Critical Depth	1.17	ft
Critical Slope	0.012586	ft/ft
Velocity	3.89	ft/s
Velocity Head	0.23	ft
Specific Energy	2.03	ft
Froude Number	0.52	
Flow Type	Subcritical	

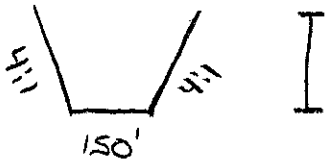
USNG = 1666.2
DSNG = 1657.9

NATURAL

.015 SLOPE ⇒ ΔEL = 8.3'

.003 SLOPE ⇒ ΔEL = 1.7'

DIFFERENCE 6.6' USE 3 DROPS; 2@2.5' AND 1@1.6' = 6.6'



2.8' CHANNEL 4.8' @ DROPS

Mckellips A Natural Channel Reach 2g
Worksheet for Trapezoidal Channel

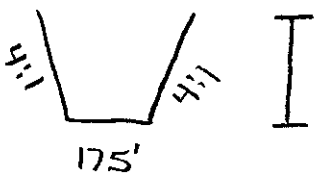
Project Description		
Worksheet	Mckellips A Natural R2g	LENGTH = 700'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	175.00	ft
Discharge	1,350.00	cfs

Results		
Depth	1.86	ft
Flow Area	338.8	ft²
Wetted Perimeter	190.31	ft
Top Width	189.86	ft
Critical Depth	1.22	ft
Critical Slope	0.012423	ft/ft
Velocity	3.98	ft/s
Velocity Head	0.25	ft
Specific Energy	2.10	ft
Froude Number	0.53	
Flow Type	Subcritical	

USNG = 1657.9
DSNG = 1647.4

NATURAL
.015 SLOPE ⇒ ΔEL = 10.5'
.003 SLOPE ⇒ ΔEL = 2.1'
DIFFERENCE 8.4' USE 4 DROPS; 3 @ 2' AND 1 @ 2.4' = 8.4'



2.9' CHANNEL 4.9' @ DROPS

Mckellips A Natural Channel Reach 2h
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips A Natural R2h
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

LENGTH = 1100'

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	200.00	ft
Discharge	1,550.00	cfs

Results		
Depth	1.86	ft
Flow Area	386.7	ft²
Wetted Perimeter	215.37	ft
Top Width	214.91	ft
Critical Depth	1.22	ft
Critical Slope	0.012390	ft/ft
Velocity	4.01	ft/s
Velocity Head	0.25	ft
Specific Energy	2.11	ft
Froude Number	0.53	
Flow Type	Subcritical	

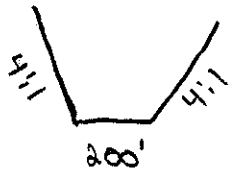
USNG = 1647.4
DSNG = 1632

NATURAL

.014 SLOPE ⇒ ΔEL = 15.4'

.003 SLOPE ⇒ ΔEL = 3.3'

DIFFERENCE 12.1' USE 5 DROPS; 4 @ 2.5' AND 1 @ 2.1' = 12.1



2.9' CHANNEL 4.9' @ DROPS

Mckellips A Natural Channel Reach 2i
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips A Natural R2i
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

LENGTH = 550'

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	225.00	ft
Discharge	1,650.00	cfs

Results		
Depth	1.81	ft
Flow Area	419.2	ft²
Wetted Perimeter	239.89	ft
Top Width	239.44	ft
Critical Depth	1.18	ft
Critical Slope	0.012521	ft/ft
Velocity	3.94	ft/s
Velocity Head	0.24	ft
Specific Energy	2.05	ft
Froude Number	0.52	
Flow Type	Subcritical	

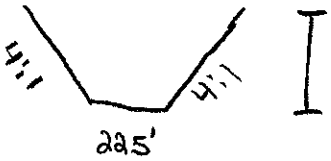
USNG = 1632
DSNG = 1624.3

NATURAL

.014 SLOPE ⇒ ΔEL = 7.7'

.003 SLOPE ⇒ ΔEL = 1.6'

DIFFERENCE 6.1' USE 3 DROPS; 2 @ 2' AND 1 @ 2.1' = 6.1'



2.8' CHANNEL 4.8' @ DROPS

Mckellips A Natural Channel Reach 2j
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips A Natural R2j
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

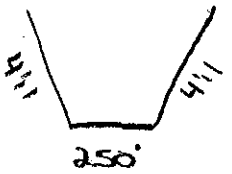
LENGTH = 2750'

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	250.00	ft
Discharge	1,950.00	cfs

Results		
Depth	1.87	ft
Flow Area	482.6	ft²
Wetted Perimeter	265.45	ft
Top Width	264.99	ft
Critical Depth	1.23	ft
Critical Slope	0.012343	ft/ft
Velocity	4.04	ft/s
Velocity Head	0.25	ft
Specific Energy	2.13	ft
Froude Number	0.53	
Flow Type	Subcritical	

USNG = 1624.3
DSNG = 1585.8

NATURAL
.014 SLOPE ⇒ ΔEL = 38.5'
.003 SLOPE ⇒ ΔEL = 8.3'
DIFFERENCE 30.3' USE 12 DROPS; 11 @ 2.5' AND 1 @ 2.8'



2.9' CHANNEL 4.9' @ DROPS

Mckellips A Concrete Lined Channel Reach 1
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips A Lined R1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

LENGTH = 1,500'

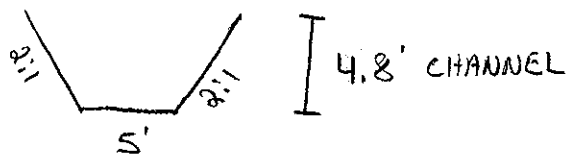
Input Data		
Mannings Coefficient	0.017	
Slope	0.012000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	5.00	ft
Discharge	400.00	cfs

MCKELLIPS OPTION A

SHOTCRETE

Results		
Depth	2.79	ft
Flow Area	29.5	ft²
Wetted Perimeter	17.46	ft
Top Width	16.15	ft
Critical Depth	3.72	ft
Critical Slope	0.003558	ft/f
Velocity	13.57	ft/s
Velocity Head	2.86	ft
Specific Energy	5.65	ft
Froude Number	1.77	
Flow Type	Supercritical	

USNG = 1748
DSNG = 1731.6



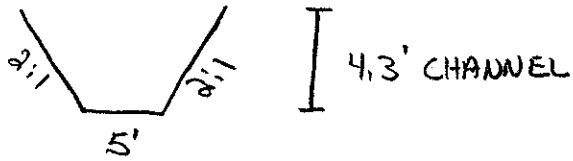
Mckellips A Concrete Lined Channel Reach 2a
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips A Lined R2a	LENGTH = 2600
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.017	
Slope	0.015000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	5.00	ft
Discharge	300.00	cfs

Results		
Depth	2.29	ft
Flow Area	22.0	ft²
Wetted Perimeter	15.25	ft
Top Width	14.17	ft
Critical Depth	3.22	ft
Critical Slope	0.003690	ft/ft
Velocity	13.65	ft/s
Velocity Head	2.90	ft
Specific Energy	5.19	ft
Froude Number	1.93	
Flow Type	Supercritical	

USNG = 1731.6
DSNG = 1692.6



Mckellips A Concrete Lined Channel Reach 2b
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips A Lined R2b	LENGTH = 1750'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

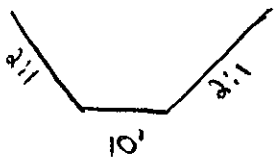
Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	10.00	ft
Discharge	900.00	cfs

Results		
Depth	3.68	ft
Flow Area	63.9	ft²
Wetted Perimeter	26.47	ft
Top Width	24.73	ft
Critical Depth	4.65	ft
Critical Slope	0.003175	ft/ft
Velocity	14.08	ft/s
Velocity Head	3.08	ft
Specific Energy	6.76	ft
Froude Number	1.54	
Flow Type	Supercritical	

USNG = 1692.6
DSNG = 1666.4

NATURAL
.015 SLOPE ⇒ ΔEL = 26.3
.008 SLOPE ⇒ ΔEL = 14.0'

DIFFERENCE 12.3' USE 5 DROPS; 4 @ 2.5' AND 1 @ 2.3' = 12.3'



5.7' CHANNEL 6.7' @ DROPS

Mckellips A Concrete Lined Channel Reach 2c
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips A Lined R2c	LENGTH = 550'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	15.00	ft
Discharge	1,100.00	cfs

Results		
Depth	3.48	ft
Flow Area	76.4	ft²
Wetted Perimeter	30.56	ft
Top Width	28.92	ft
Critical Depth	4.48	ft
Critical Slope	0.003086	ft/ft
Velocity	14.40	ft/s
Velocity Head	3.22	ft
Specific Energy	6.70	ft
Froude Number	1.56	
Flow Type	Supercritical	

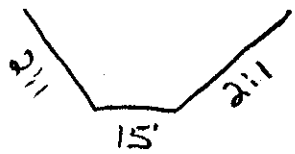
USNG = 1666.4
DSNG = 1658.1

NATURAL

.015 SLOPE ⇒ ΔEL = 8.3'

.008 SLOPE ⇒ ΔEL = 4.4'

DIFFERENCE 3.9' USE 2 DROPS; 1 @ 2' AND 1 @ 1.9' = 3.9'



5.5' CHANNEL 6.5' @ DROPS

Mckellips A Concrete Lined Channel Reach 2d
Worksheet for Trapezoidal Channel

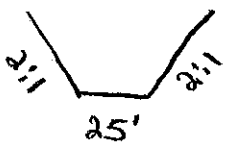
Project Description		
Worksheet	Mckellips A Lined R2d	LENGTH = 700
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	1,350.00	cfs

Results		
Depth	3.05	ft
Flow Area	94.9	ft²
Wetted Perimeter	38.64	ft
Top Width	37.20	ft
Critical Depth	4.01	ft
Critical Slope	0.003026	ft/ft
Velocity	14.23	ft/s
Velocity Head	3.15	ft
Specific Energy	6.20	ft
Froude Number	1.57	
Flow Type	Supercritical	

USNG = 1658.1
DSNG = 1647.6

NATURAL
.015 SLOPE ⇒ ΔEL = 10.5'
.008 SLOPE ⇒ ΔEL = 5.6'
DIFFERENCE 4.9' USE 2 DROPS; 1 @ 2.5' AND 1 @ 2.4' = 4.9



5.1' CHANNEL 6.1' @ DROPS

Mckellips A Concrete Lined Channel Reach 2e
Worksheet for Trapezoidal Channel

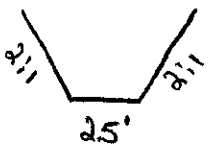
Project Description		
Worksheet	Mckellips A Lined R2e	LENGTH = 1100'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	1,550.00	cfs

Results		
Depth	3.30	ft
Flow Area	104.3	ft²
Wetted Perimeter	39.76	ft
Top Width	38.20	ft
Critical Depth	4.36	ft
Critical Slope	0.002965	ft/ft
Velocity	14.87	ft/s
Velocity Head	3.43	ft
Specific Energy	6.73	ft
Froude Number	1.59	
Flow Type	Supercritical	

USNG = 1647.6
DSNG = 1632.2

NATURAL
.014 SLOPE ⇒ ΔEL = 15.4'
.006 SLOPE ⇒ ΔEL = 6.6'
DIFFERENCE 8.8' USE 4 DROPS; 3 @ 2.5' AND 1 @ 1.3' = 8.8



5.3' CHANNEL 6.3' @ DROPS

Mckellips A Concrete Lined Channel Reach 2f
Worksheet for Trapezoidal Channel

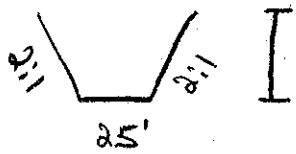
Project Description		
Worksheet	Mckellips A Lined R2f	LENGTH = 3300
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.017	
Slope	0.006000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	1,950.00	cfs

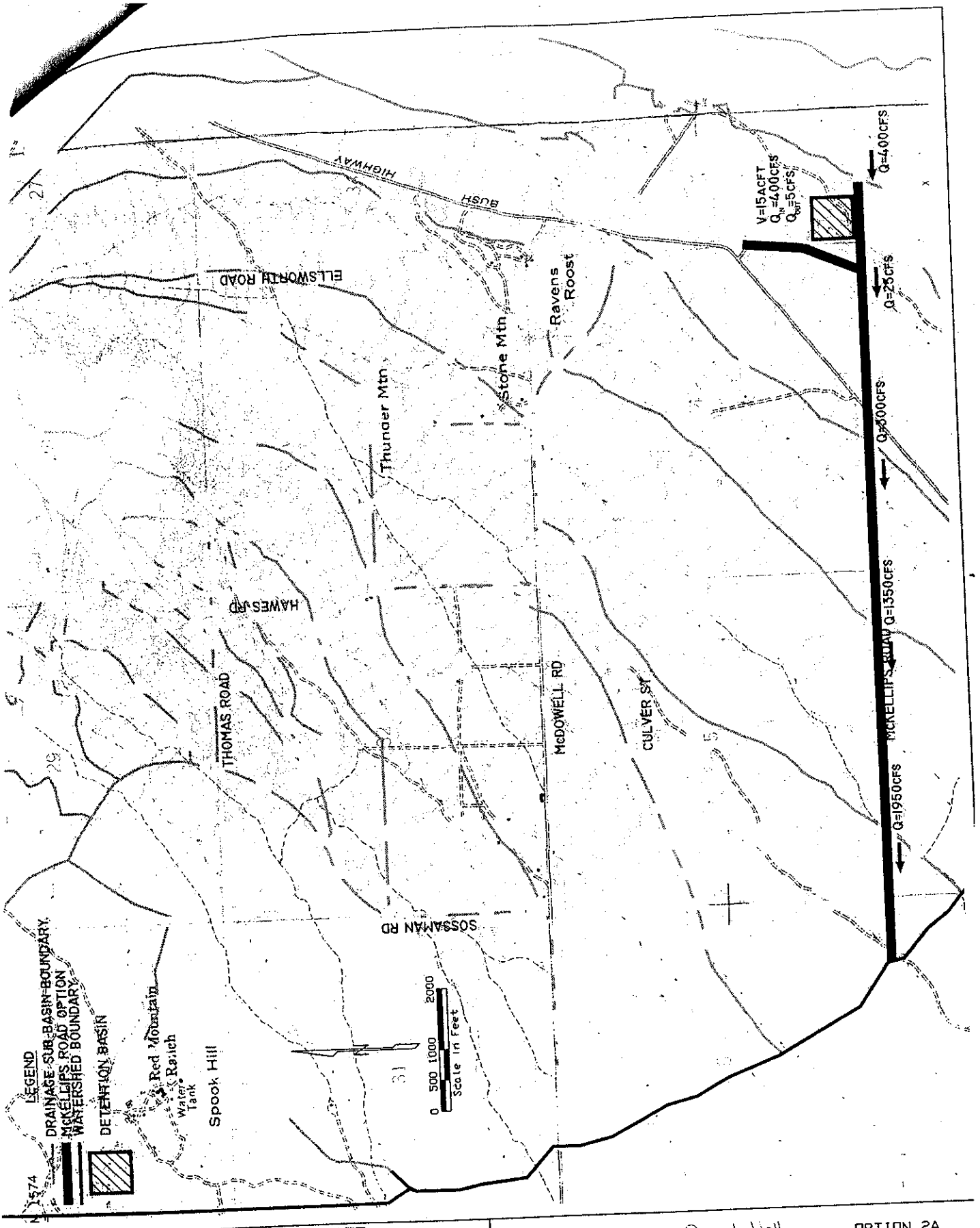
Results		
Depth	4.07	ft
Flow Area	134.8	ft²
Wetted Perimeter	43.20	ft
Top Width	41.28	ft
Critical Depth	4.99	ft
Critical Slope	0.002868	ft/ft
Velocity	14.46	ft/s
Velocity Head	3.25	ft
Specific Energy	7.32	ft
Froude Number	1.41	
Flow Type	Supercritical	

USNG = 1632.2
DSNG = 1586.0

NATURAL
.014 SLOPE ⇒ ΔEL = 46.2'
.006 SLOPE ⇒ ΔEL = 19.8'
DIFFERENCE 26.4' USE 11 DROPS; 10 @ 2.5' AND 1 @ 1.4' = 26.4'



6.1' CHANNEL 7.1' @ DROPS



SPOOK HILL A.D.M.P. UPDATE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	McKELLIPS ROAD Spook Hill			OPTION 2A
		BY	DATE	DRAWING NO spkhl-mckellip2A.e
WOOD, PATEL & ASSOCIATES, INC. 2051 WEST NORTHERN, SUITE 100 PHOENIX, ARIZONA (602) 335-8500	DESIGNED	R. HINER	06/00	SHEET OF
	DRAWN	S. CAMPBELL	06/00	1 1
	CHECKED	A. PATEL	06/00	

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 1 OF 8

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

OPTION B

MCKELLIPS CONCRETE LINED CHANNEL REACH 1

GIVEN: Q = 420 USNG = 1748 LENGTH = 1100

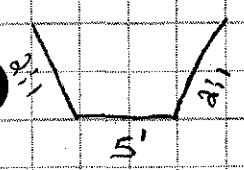
DSNG = 1734.3

ASSUME SHOTCRETE THICKNESS = 6"

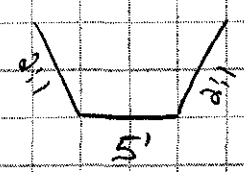
S = .012 n = .017 S.S. 2:1 B.W. = 5'

V = 13.8 < 15 fps O.K. d = 2.9' (420 cfs) V = 11.3 < 15 fps O.K. d = 2' (200 cfs)

F_n = 1.78 < 2 O.K. F_n = 1.7 < 2 O.K.



4.9' CHANNEL 420 cfs TO 200 cfs



MCKELLIPS OPTION B

CONC LINED

Mckellips Concrete Lined Channel Reach 1
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Lined R1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.012000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	5.00	ft
Discharge	420.00	cfs

Results		
Depth	2.85	ft
Flow Area	30.6	ft^2
Wetted Perimeter	17.76	ft
Top Width	16.41	ft
Critical Depth	3.81	ft
Critical Slope	0.003536	ft/ft
Velocity	13.75	ft/s
Velocity Head	2.94	ft
Specific Energy	5.79	ft
Froude Number	1.78	
Flow Type	Supercritical	

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 2 OF 8

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

OPTION B

MCKELLIPS CONCRETE LINED CHANNEL REACH 2a

GIVEN: Q = 300 USNG = 1730 LENGTH = 2600'

DSNG = 1691

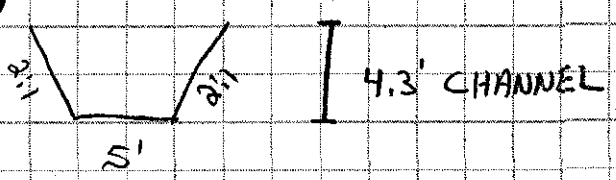
ASSUME SHOTCRETE THICKNESS = 6"

S = .015 n = .017 S.S. 2:1 B.W. = 5'

V = 13.7 fps < 15 fps O.K.

d = 2.3'

F_n = 1.93 < 2.0 O.K.



WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 3 OF 8

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

OPTION B
REACH 2b

McKELLIPS CONCRETE LINED CHANNEL

GIVEN: Q = 900 USNG = 1691 LENGTH = 900'
DSNG = 1677.5

ASSUME SHOTCRETE THICKNESS = 6"

S = .015 n = .017 S.S. 2:1 B.W. = 10'

V = 18.2 fps > 15 fps ∴ WILL NOT WORK

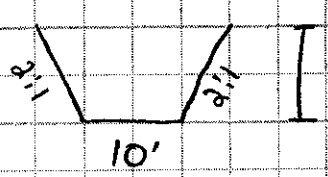
F_n = 2.06 > 2.0 ∴ WILL NOT WORK

ADD DROPS

.015 SLOPE ⇒ ΔEL = 13.5'
.008 SLOPE ⇒ ΔEL = 7.2'

DIFFERENCE 6.3' USE 3 DROPS; 2 @ 2.5' AND 1 @ 1.3' = 6.3'

USING .008 SLOPE ⇒ F_n = 1.54 < 2.0 O.K.; V = 14.4 fps < 15 fps O.K.; d = 4.5'



6.5' CHANNEL 7.5' @ DROPS

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 4 OF 8

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

OPTION B

McKELLIPS CONCRETE LINED CHANNEL REACH 2c

GIVEN: Q = 1100 cfs USNG = 1677.5 LENGTH = 300'

DSNG = 1673

ASSUME SHOTCRETE THICKNESS = 6"

S = .015 n = .017 S.S. 2:1 B.W. = 15'

V = 18 fps > 15 fps ∴ WILL NOT WORK

F_n = 2.09 > 2.0 ∴ WILL NOT WORK

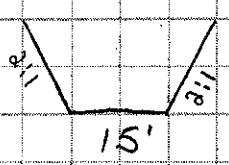
ADD DROPS

.015 SLOPE ⇒ ΔEL = 4.5'

.008 SLOPE ⇒ ΔEL = 2.4'

2.1' USE 1 DROP

USING .008 SLOPE ⇒ F_n = 1.56 < 2.0 O.K.; V = 14.4 < 15 fps O.K.; d = 3.5'



5.5' CHANNEL 6.5' @ DROP

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 5 OF 8

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

OPTION B

MCKELLIPS CONCRETE LINED CHANNEL REACH 2d

GIVEN: Q = 1350 USNG = 1673 LENGTH = 400'

DSNG = 1667

ASSUME SHOTCRETE THICKNESS = 6"

S = .015 n = .017 SS. 2:1 B.W. = 25'

V = 17.6 fps > 15 fps ∴ WILL NOT WORK

F_n = 2.1 > 2.0 ∴ WILL NOT WORK

ADD DROPS

.015 SLOPE ⇒ ΔEL = 6'

.008 SLOPE ⇒ ΔEL = 3.2'

DIFFERENCE 2.8' USE 1 DROP

USING .008 SLOPE ⇒ F_n = 1.57 < 2.0 O.K.; V = 14.3 fps < 15 fps O.K.; d = 3.1'

5.1' CHANNEL 6.1' @ DROP

Mckellips Concrete Lined Channel Reach 2a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Lined R2a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.015000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	5.00	ft
Discharge	300.00	cfs

Results		
Depth	2.29	ft
Flow Area	22.0	ft²
Wetted Perimeter	15.25	ft
Top Width	14.17	ft
Critical Depth	3.22	ft
Critical Slope	0.003690	ft/ft
Velocity	13.65	ft/s
Velocity Head	2.90	ft
Specific Energy	5.19	ft
Froude Number	1.93	
Flow Type	Supercritical	

Mckellips Concrete Lined Channel Reach 2b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Lined R2b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	5.00	ft
Discharge	900.00	cfs

Results		
Depth	4.48	ft
Flow Area	62.5	ft²
Wetted Perimeter	25.03	ft
Top Width	22.92	ft
Critical Depth	5.50	ft
Critical Slope	0.003211	ft/ft
Velocity	14.39	ft/s
Velocity Head	3.22	ft
Specific Energy	7.70	ft
Froude Number	1.54	
Flow Type	Supercritical	

Mckellips Concrete Lined Channel Reach 2c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Lined R2c
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	15.00	ft
Discharge	1,100.00	cfs

Results		
Depth	3.48	ft
Flow Area	76.4	ft²
Wetted Perimeter	30.56	ft
Top Width	28.92	ft
Critical Depth	4.48	ft
Critical Slope	0.003086	ft/ft
Velocity	14.40	ft/s
Velocity Head	3.22	ft
Specific Energy	6.70	ft
Froude Number	1.56	
Flow Type	Supercritical	

Mckellips Concrete Lined Channel Reach 2d
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Lined R2d
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	1,350.00	cfs

Results		
Depth	3.05	ft
Flow Area	94.9	ft²
Wetted Perimeter	38.64	ft
Top Width	37.20	ft
Critical Depth	4.01	ft
Critical Slope	0.003026	ft/ft
Velocity	14.23	ft/s
Velocity Head	3.15	ft
Specific Energy	6.20	ft
Froude Number	1.57	
Flow Type	Supercritical	

WOOD/PATEL

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PROJECT SPOOK HILL
PROJECT NO. 99989 SHEET NO. 6 OF 8
CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

McKELLIPS CONCRETE LINED CHANNEL REACH 3a

GIVEN: Q = 900 cfs USNG = 1660 LENGTH = 3000'
DSNG = 1630.6

ASSUME SHOTCRETE THICKNESS = 6"

S = .014 n = .017 S.S. 2:1 B.W. = 5'

V = 17.7 fps > 15 fps ∴ WILL NOT WORK

F_n = 2 ≥ 2.0 ∴ WILL NOT WORK

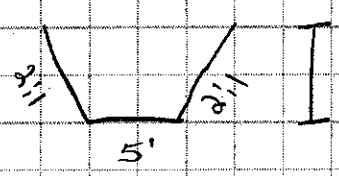
ADD DROPS

.014 SLOPE ⇒ ΔEL = 29.4'
.008 SLOPE ⇒ ΔEL = 16.8'

DIFFERENCE 12.6' USE 5 DROPS; 4 @ 2.5' AND 1 @ 2.6' = 12.6'

USING .008 SLOPE ⇒ F_n = 1.54 < 2.0 O.K.; V = 14.4 < 15 fps O.K.; d = 4.5' TO 3.8'
600 TO 900 cfs

USING .008 SLOPE ⇒ F_n = 1.5 < 2.0 O.K.; V = 13 < 15 fps O.K.; d = 3.8' TO 3.1'
400 TO 600 cfs



6.5' CHANNEL 7.5' @ DROPS 600 TO 900 cfs

5.8' CHANNEL 6.8' @ DROPS 400 TO 600 cfs

WOOD/PATEL

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PROJECT SPOOR HILL

PROJECT NO. 99989 SHEET NO. 7 OF 8

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

MCKELLIPS CONCRETE LINED CHANNEL REACH 3b

GIVEN: Q = 1100 cfs USNG = 1630.6 LENGTH = 1000'
DSNG = 1616.6

ASSUME SHOTCRETE THICKNESS = 6"

S = .014 n = .017 S.S. 2:1 B.W. = 15'

V = 17.6 fps > 15 fps ∴ WILL NOT WORK

F_n = 2.03 > 2.0 ∴ WILL NOT WORK

ADD DROPS

.014 SLOPE ⇒ ΔEL = 14'
.008 SLOPE ⇒ ΔEL = 8'

DIFFERENCE 6' USE 3 DROPS @ 2'

USING .008 SLOPE ⇒ F_n = 1.56 < 2.0 O.K.; V = 14.4 fps < 15 fps O.K.; d = 3.5'

5.5' CHANNEL 6.5' @ DROPS

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOR HILL

PROJECT NO. 99989 SHEET NO. 8 OF 8

CALCULATED BY NW DATE 6/22 CHECKED BY _____ DATE _____

MCKELLIPS CONCRETE LINED CHANNEL REACH 3C

GIVEN: Q = 1350 cfs USNG = 1616.6 LENGTH = 2200
DSNG = 1585.8

S = .014 n = .017 S.S. 2:1 B.W. = 25' ASSUME SHOTCRETE THICKNESS = 6"

V = 17.2 fps > 15 fps ∴ WILL NOT WORK

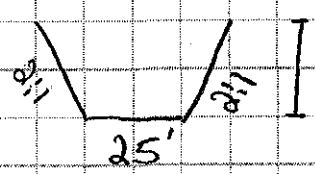
F_n = 2.04 > 2.0 ∴ WILL NOT WORK

ADD DROPS

.014 SLOPE ⇒ ΔEL = 30.8
.008 SLOPE ⇒ ΔEL = 17.6'

DIFFERENCE 13.2' USE 6 DROPS; 5 @ 2.5' AND 1 @ .7' = 13.2'

USING .008 SLOPE ⇒ F_n = 1.57 < 2 O.K.; V = 14.2 fps < 15 fps O.K.; d = 3.1'



5.1' CHANNEL 6.1' @ DROPS

Mckellips Concrete Lined Channel Reach 3a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Lined R3a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	5.00	ft
Discharge	400.00	cfs

Results		
Depth	3.07	ft
Flow Area	34.2	ft²
Wetted Perimeter	18.74	ft
Top Width	17.29	ft
Critical Depth	3.72	ft
Critical Slope	0.003558	ft/ft
Velocity	11.68	ft/s
Velocity Head	2.12	ft
Specific Energy	5.19	ft
Froude Number	1.46	
Flow Type	Supercritical	

Mckellips Concrete Lined Channel Reach 3b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Lined R3b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	15.00	ft
Discharge	1,100.00	cfs

Results		
Depth	3.48	ft
Flow Area	76.4	ft²
Wetted Perimeter	30.56	ft
Top Width	28.92	ft
Critical Depth	4.48	ft
Critical Slope	0.003086	ft/ft
Velocity	14.40	ft/s
Velocity Head	3.22	ft
Specific Energy	6.70	ft
Froude Number	1.56	
Flow Type	Supercritical	

Mckellips Concrete Lined Channel Reach 3c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Lined R3c
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	1,350.00	cfs

Results		
Depth	3.05	ft
Flow Area	94.9	ft²
Wetted Perimeter	38.64	ft
Top Width	37.20	ft
Critical Depth	4.01	ft
Critical Slope	0.003026	ft/ft
Velocity	14.23	ft/s
Velocity Head	3.15	ft
Specific Energy	6.20	ft
Froude Number	1.57	
Flow Type	Supercritical	

WOOD/PATEL

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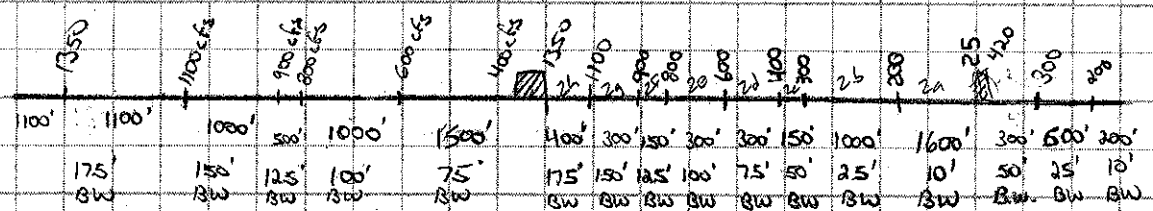
PROJECT SPOOK HILL McKELLIPS OPTION "B"

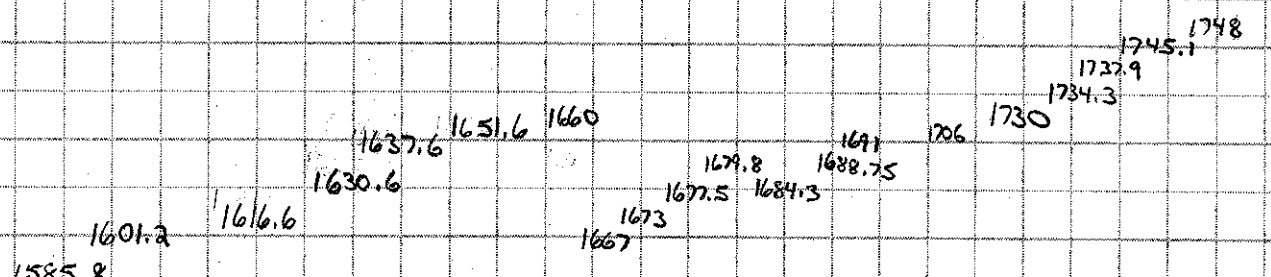
PROJECT NO. 99929 SHEET NO. _____ OF _____

CALCULATED BY MW DATE _____ CHECKED BY _____ DATE _____

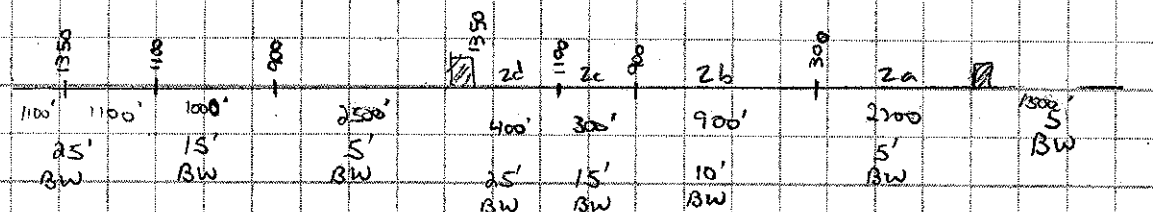
.014 SLOPE .015 SLOPE .012 SLOPE

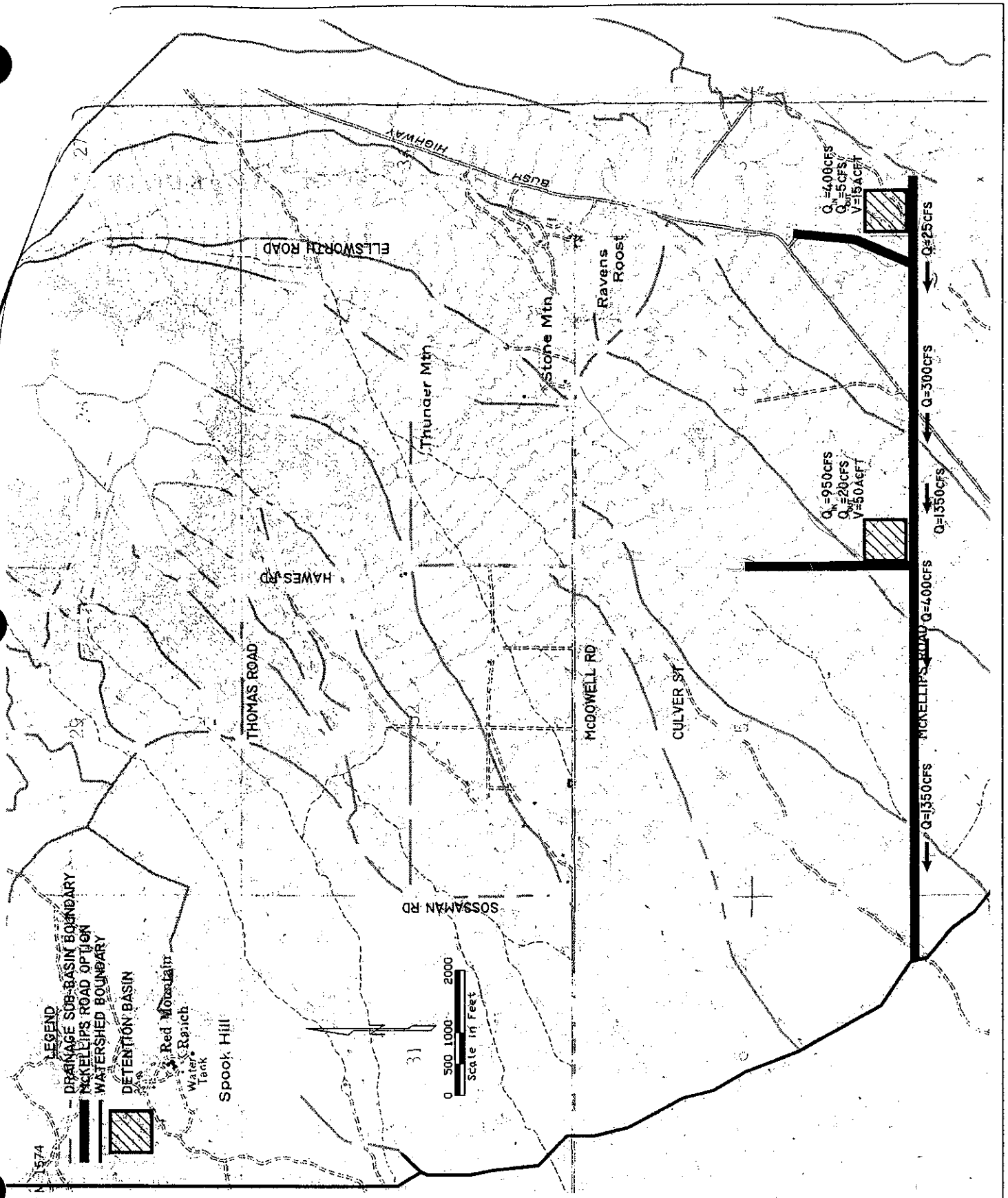
NATURAL





SHOTCRETE





SPOOK HILL A.D.M.P. UPDATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

McKELLIPS ROAD Spook Hill OPTION 2B

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

	BY	DATE	DRAWING NO.
DESIGNED	R. HINER	06/00	spkhl-mckellip2B.dwg
DRAWN	S. CAMPBELL	06/00	SHEET OF
CHECKED	A. PATEL	06/00	1

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOR HILL

PROJECT NO. 99989 SHEET NO. 1 OF 16

CALCULATED BY IWW DATE 6/22 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B REACH 1A

GIVEN: Q = 200 cfs USNG = 1748 DSNG = 1745.1 LENGTH = 200'

S = .012 n = .03 S.S. 4:1 B.W. = 10'

V = 6.3 fps > 4 fps ∴ WILL NOT WORK

F_n = .99 > .86 ∴ WILL NOT WORK

ADD DROPS

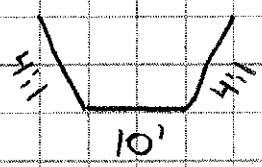
McKELLIPS OPTION 2b

OPTION B NATURAL

.012 SLOPE ⇒ ΔEL
.003 SLOPE ⇒ ΔEL

DIFFERENCE

USING .003 SLOPE ⇒ d = 2.6'



3.6' CHANNEL 5.6' @ DROP

WOOD/PATEL

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PROJECT SPOOK HILL
PROJECT NO. 99989 SHEET NO. 2 OF 16
CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B REACH 16

GIVEN: Q = 300 cfs USNG = 1745.1 DSNG = 1737.9 LENGTH = 600

S = .012 n = .03 S.S. 4:1 B.W. = 25'

V = 6.3 fps > 4 fps ∴ WILL NOT WORK

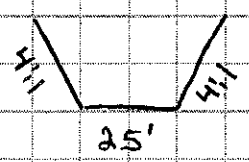
F_n = .99 > .86 ∴ WILL NOT WORK

ADD DROPS

.012 SLOPE ⇒ ΔEL = 7.2'
.003 SLOPE ⇒ ΔEL = 1.8'

DIFFERENCE 5.4' USE 2 DROPS; 1 @ 2.5' AND 1 @ 2.9' = 5.4

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.9 fps < 4 fps O.K.; d = 2.3



3.3' CHANNEL 5.3' @ DROPS

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 3 OF 16

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B REACH 1C

GIVEN: Q = 420 cfs USNG = 1737.9 DSNG = 1734.3 LENGTH = 300'

S = .012 n = .03 SS 4:1 B.W. = 50'

V = 6 fps > 4 fps ∴ WILL NOT WORK

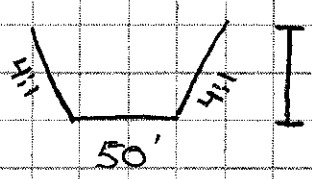
F_n = .98 > .86 ∴ WILL NOT WORK

ADD DROPS

.012 SLOPE ⇒ ΔEL = 3.6'
.003 SLOPE ⇒ ΔEL = .9'

DIFFERENCE 2.7' USE 1 DROP

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.8 fps < 4 fps O.K.; d = 1.9'



2.9' CHANNEL 4.9' @ DROPS

Mckellips Natural Channel Reach 1a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R1a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	10.00	ft
Discharge	200.00	cfs

Results		
Depth	2.58	ft
Flow Area	52.3	ft²
Wetted Perimeter	31.24	ft
Top Width	30.61	ft
Critical Depth	1.81	ft
Critical Slope	0.012388	ft/ft
Velocity	3.82	ft/s
Velocity Head	0.23	ft
Specific Energy	2.80	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 1b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R1b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	25.00	ft
Discharge	300.00	cfs

Results		
Depth	2.24	ft
Flow Area	76.1	ft²
Wetted Perimeter	43.48	ft
Top Width	42.93	ft
Critical Depth	1.51	ft
Critical Slope	0.012284	ft/ft
Velocity	3.94	ft/s
Velocity Head	0.24	ft
Specific Energy	2.48	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 1c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R1c
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	50.00	ft
Discharge	420.00	cfs

Results		
Depth	1.91	ft
Flow Area	109.9	ft²
Wetted Perimeter	65.73	ft
Top Width	65.26	ft
Critical Depth	1.25	ft
Critical Slope	0.012604	ft/ft
Velocity	3.82	ft/s
Velocity Head	0.23	ft
Specific Energy	2.13	ft
Froude Number	0.52	
Flow Type	Subcritical	

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 4 OF 16

CALCULATED BY MW DATE 6/02 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B REACH 2A

GIVEN: Q = 200 USNG = 1730 DSNG = 1706 LENGTH = 1600'

S = .015 n = .03 S.S. 4:1 B.W. = 10'

V = 6.9 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.09 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

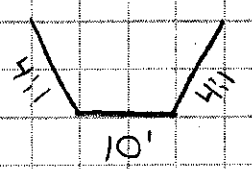
ADD DROPS

.015 SLOPE ⇒ ΔEL = 24'

.003 SLOPE ⇒ ΔEL = 4.8'

DIFFERENCE 19.2' USE 8 DROPS; 7 @ 2.5' AND 1 @ 1.7' = 19.2'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.8 fps < 4 fps O.K.; d = 2.6'



2.6' CHANNEL 5.6' @ DROPS

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 5 OF 16

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B REACH 2b

GIVEN: Q = 300 USNG = 1706 DSNG = 1691 LENGTH = 1000'

S = .015 n = .03 SS 4:1 B.W. = 25'

V = 6.8 fps > 4 fps ∴ WILL NOT WORK

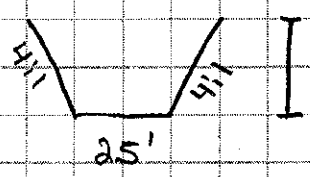
F_n = 1.1 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

ADD DROPS

.015 SLOPE ⇒ ΔEL = 15'
.003 SLOPE ⇒ ΔEL = 3'

DIFFERENCE 12' USE 6 DROPS @ 2'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.9 < 4fps O.K.; d = 2.3'



3.3' CHANNEL 5.3 @ DROPS

WOOD/PATEL

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PROJECT SPOOR HILL

PROJECT NO. 99989 SHEET NO. 6 OF 16

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

MCKELLIPS NATURAL CHANNEL OPTION B REACH 2c

GIVEN: Q = 400 cfs USNG = 1691 DSNG = 1688.7 LENGTH = 150'

S = .015 n = .03 S.S. 4:1 B.W. = 50'

V = 6.3 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.08 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

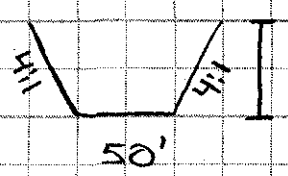
ADD DROPS

.015 SLOPE ⇒ ΔEL = 2.3'

.003 SLOPE ⇒ ΔEL = .5'

DIFFERENCE 1.8' USE 1 DROP @ 1.8'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.8 < 4 fps O.K.; d = 1.9'



2.9' CHANNEL 4.9' @ DROPS

7304

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 7 OF 16

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

MCKELLIPS NATURAL CHANNEL OPTION B REACH 2d

GIVEN: Q = 600 cfs USNG = 1688.8 DSNG = 1684.3 LENGTH = 300'

S = .015 n = .03 S.S. 4:1 B.W. = 75'

V = 6.5 fps > 4 fps ∴ WILL NOT WORK

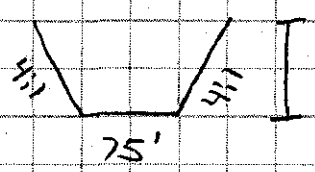
F_n = 1.08 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

ADD DROPS

.015 SLOPE ⇒ ΔEL = 4.5'
.003 SLOPE ⇒ ΔEL = .9'

DIFFERENCE 3.6' USE 2 DROPS; 1 @ 2' AND 1 @ 1.6' = 3.6'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.9 < 4 fps O.K.; d = 1.9'



2.9' CHANNEL 4.9' @ DROPS

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PROJECT SPOOR HILL

PROJECT NO. 99989 SHEET NO. 8 OF 16

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

MCKELLIPS NATURAL CHANNEL OPTION B REACH 2e

GIVEN: Q = 800 USNG = 1684.3 DSNG = 1679.8 LENGTH = 300'

S = .015 n = .03 S.S. 4:1 B.W. = 100'

V = 6.5 fps > 4 fps ∴ WILL NOT WORK

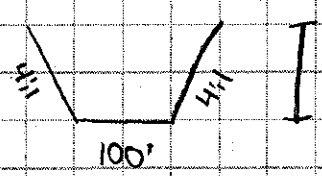
F_n = 1.09 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

ADD DROPS

.015 SLOPE ⇒ ΔEL = 4.5'
.003 SLOPE ⇒ ΔEL = .9'

DIFFERENCE 3.6' USE 2 DROPS; 1 @ 2' AND 1 @ 1.6' = 3.6'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.9 fps < 4 fps O.K.; d = 1.9'



2.9' CHANNEL 4.9' @ DROPS

WOOD/PATEL

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PROJECT SPOOR HILL

PROJECT NO. 99989 SHEET NO. 9 OF 16

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B REACH 2f

GIVEN: Q = 900 cfs USNG = 1679.8 DSNG = 1677.5 LENGTH = 150'

S = .015 n = .03 S.S. 4:1 B.W. = 12.5'

V = 6.3 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.08 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

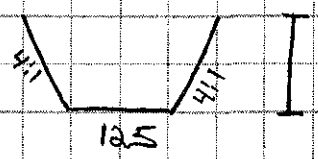
ADD DROPS

.015 SLOPE ⇒ ΔEL = 2.3'

.003 SLOPE ⇒ ΔEL = .5'

DIFFERENCE 1.8' USE 1 DROP @ 1.8'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.8 < 4 fps O.K.; d = 1.8'



2.8' CHANNEL 4.8' @ DROPS

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 10 OF 16

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B REACH 2G

GIVEN: Q = 1100 cfs USNG = 1677.5' DSNG = 1673 LENGTH = 300'

S = .015 n = .03 S.S. 4:1 B.W. = 150'

V = 6.4 fps > 4 fps ∴ WILL NOT WORK

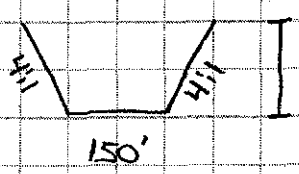
F_n = 1.08 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

ADD DROPS

.015 SLOPE ⇒ ΔEL = 4.5'
.003 SLOPE ⇒ ΔEL = .9'

DIFFERENCE 3.6' USE 2 DROPS; 1 @ 2' AND 1 @ 1.6' = 3.6'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.9 fps < 4 fps O.K.; d = 1.8'



2.8' CHANNEL 4.8' @ DROPS

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 11 OF 16

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B REACH 2H

GIVEN: Q = 1350 USNG = 1673 DSNG = 1667 LENGTH = 400'

S = .015 n = .03 S.S. 4:1 B.W. = 175'

V = 6.5 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.09 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

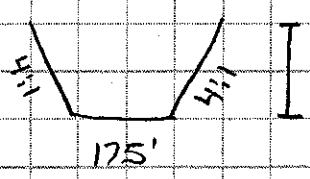
ADD DROPS

.5 SLOPE ⇒ ΔEL = 6'

.003 SLOPE ⇒ ΔEL = 1.2'

DIFFERENCE 4.8' USE 2 DROPS; 1 @ 2.5' AND 1 @ 2.3' = 4.8'

USING .003 SLOPE ⇒ F_n = .53 < .86 O.K.; V = 4 fps ≤ 4 fps O.K.; d = 1.9'



2.9' CHANNEL 4.9' @ DROPS

Mckellips Natural Channel Reach 2a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R2a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	10.00	ft
Discharge	200.00	cfs

Results		
Depth	2.58	ft
Flow Area	52.3	ft²
Wetted Perimeter	31.24	ft
Top Width	30.61	ft
Critical Depth	1.81	ft
Critical Slope	0.012388	ft/ft
Velocity	3.82	ft/s
Velocity Head	0.23	ft
Specific Energy	2.80	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 2b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	*Mckellips Natural R2b*
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	25.00	ft
Discharge	300.00	cfs

Results		
Depth	2.24	ft
Flow Area	76.1	ft^2
Wetted Perimeter	43.48	ft
Top Width	42.93	ft
Critical Depth	1.51	ft
Critical Slope	0.012284	ft/ft
Velocity	3.94	ft/s
Velocity Head	0.24	ft
Specific Energy	2.48	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 2c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R2c
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	50.00	ft
Discharge	400.00	cfs

Results		
Depth	1.85	ft
Flow Area	106.4	ft²
Wetted Perimeter	65.29	ft
Top Width	64.83	ft
Critical Depth	1.22	ft
Critical Slope	0.012724	ft/ft
Velocity	3.76	ft/s
Velocity Head	0.22	ft
Specific Energy	2.07	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 2d
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R2d
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	75.00	ft
Discharge	600.00	cfs

Results		
Depth	1.87	ft
Flow Area	154.7	ft²
Wetted Perimeter	90.46	ft
Top Width	90.00	ft
Critical Depth	1.23	ft
Critical Slope	0.012547	ft/ft
Velocity	3.88	ft/s
Velocity Head	0.23	ft
Specific Energy	2.11	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 2e
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R2e
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	100.00	ft
Discharge	800.00	cfs

Results		
Depth	1.89	ft
Flow Area	202.7	ft²
Wetted Perimeter	115.54	ft
Top Width	115.08	ft
Critical Depth	1.24	ft
Critical Slope	0.012453	ft/ft
Velocity	3.95	ft/s
Velocity Head	0.24	ft
Specific Energy	2.13	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 2f
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R2f
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	125.00	ft
Discharge	900.00	cfs

Results		
Depth	1.78	ft
Flow Area	234.7	ft²
Wetted Perimeter	139.65	ft
Top Width	139.21	ft
Critical Depth	1.16	ft
Critical Slope	0.012673	ft/ft
Velocity	3.83	ft/s
Velocity Head	0.23	ft
Specific Energy	2.01	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 2g
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R2g
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	150.00	ft
Discharge	1,100.00	cfs

Results		
Depth	1.80	ft
Flow Area	282.9	ft²
Wetted Perimeter	164.84	ft
Top Width	164.40	ft
Critical Depth	1.17	ft
Critical Slope	0.012586	ft/ft
Velocity	3.89	ft/s
Velocity Head	0.23	ft
Specific Energy	2.03	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 2h
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R2h
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	175.00	ft
Discharge	1,350.00	cfs

Results		
Depth	1.86	ft
Flow Area	338.8	ft²
Wetted Perimeter	190.31	ft
Top Width	189.86	ft
Critical Depth	1.22	ft
Critical Slope	0.012423	ft/ft
Velocity	3.98	ft/s
Velocity Head	0.25	ft
Specific Energy	2.10	ft
Froude Number	0.53	
Flow Type	Subcritical	

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 12 OF 16

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

MCKELLIPS NATURAL CHANNEL OPTION B REACH 3A

GIVEN: Q = 600 USNG = 1660 DSNG = 1651.6 LENGTH = 600'

S = .014 n = .03 S.S. 4:1 B.W. = 75'

V = 6.3 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.05 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

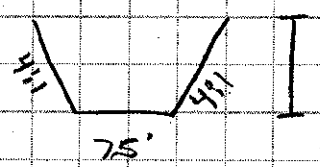
ADD DROPS

4 SLOPE ⇒ ΔEL = 8.4'

.003 SLOPE ⇒ ΔEL = 1.8'

DIFFERENCE 6.6' USE 3 DROPS; 2 @ 2.5' AND 1 @ 1.6' = 6.6'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.9 fps < 4 fps O.K.; d = 1.9'



2.9' CHANNEL 4.9' @ DROPS

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 13 OF 16

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B REACH 3B

GIVEN: Q = 800 cfs USNG = 1651.6 DSNG = 1637.6 LENGTH = 1000'

S = .014 n = .03 S.S. 4:1 B.W. 100'

V = 6.4 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.05 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

ADD DROPS

.014 SLOPE ⇒ ΔEL = 14'

.003 SLOPE ⇒ ΔEL = 3'

DIFFERENCE 11' USE 5 DROPS; 4@ 2.5' AND 1@ 1' = 11'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.9 fps < 4 fps O.K.; d = 1.9'

2.9' CHANNEL 4.9' @ DROPS

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 14 OF 16

CALCULATED BY MW DATE 6/22 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B REACH 3C

GIVEN: Q = 900 cfs USNG = 1637.6 DSNG = 1630.6 LENGTH = 500'

S = .014 n = .03 S.S. 4:1 B.W. = 125'

V = 6.2 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.05 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

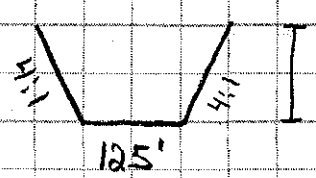
ADD DROPS

.014 SLOPE ⇒ ΔEL = 7'

.003 SLOPE ⇒ ΔEL = 1.5'

DIFFERENCE 5.5' USE 3 DROPS; 2 @ 2' AND 1 @ 1.5' = 5.5'

DSNG .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.8 fps < 4 fps O.K.; d = 1.8'



2.8' CHANNEL 4.8' @ DROPS

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 15 OF 16

CALCULATED BY NW DATE 6/22 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B CONT. REACH 3D

GIVEN: Q = 1100 USNG = 1630.6 DSNG = 1616.6 LENGTH = 1000'

S = .014 n = .03 SS 4:1 BW = 150'

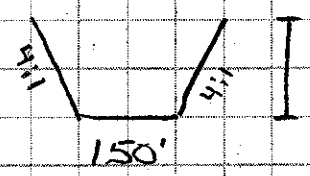
V = 6.3 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.05 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

ADD DROPS

.014 SLOPE ⇒ ΔEL = 14'
.003 SLOPE ⇒ ΔEL = 3'
DIFFERENCE 11' USE 5 DROPS; 4 @ 2.5' AND 1 @ 1' = 11'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.9 fps < 4 fps O.K.; d = 1.8'



2.8' CHANNEL 4.8' @ DROPS

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 16 OF 16

CALCULATED BY MW DATE 6/21 CHECKED BY _____ DATE _____

McKELLIPS NATURAL CHANNEL OPTION B REACH 3E

GIVEN: Q = 1350 USNG = 1616.6 DSNG = 1585.8 LENGTH = 2200'

S = .014 n = .03 SS 4:1 B.W. 17.5'

V = 6.4 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.06 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

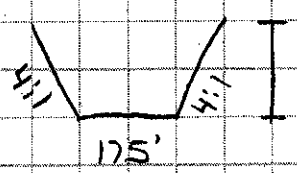
ADD DROPS

.014 SLOPE ⇒ ΔEL = 30.8'

.003 SLOPE ⇒ ΔEL = 3.3'

DIFFERENCE 27.5' USE 11 DROPS @ 2.5' = 27.5'

USING .003 SLOPE ⇒ F_n = .53 < .86 O.K.; V = 4 fps ≤ 4 fps OK; d = 1.9'



2.9' CHANNEL 4.9' @ DROPS

Mckellips Natural Channel Reach 3a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R3a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	75.00	ft
Discharge	600.00	cfs

Results		
Depth	1.87	ft
Flow Area	154.7	ft^2
Wetted Perimeter	90.46	ft
Top Width	90.00	ft
Critical Depth	1.23	ft
Critical Slope	0.012547	ft/ft
Velocity	3.88	ft/s
Velocity Head	0.23	ft
Specific Energy	2.11	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 3b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R3b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	100.00	ft
Discharge	800.00	cfs

Results		
Depth	1.89	ft
Flow Area	202.7	ft²
Wetted Perimeter	115.54	ft
Top Width	115.08	ft
Critical Depth	1.24	ft
Critical Slope	0.012453	ft/ft
Velocity	3.95	ft/s
Velocity Head	0.24	ft
Specific Energy	2.13	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 3c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R3c
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	125.00	ft
Discharge	900.00	cfs

Results		
Depth	1.78	ft
Flow Area	234.7	ft²
Wetted Perimeter	139.65	ft
Top Width	139.21	ft
Critical Depth	1.16	ft
Critical Slope	0.012673	ft/ft
Velocity	3.83	ft/s
Velocity Head	0.23	ft
Specific Energy	2.01	ft
Froude Number	0.52	
Flow Type	Subcritical	

Mckellips Natural Channel Reach 3d
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R3d
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	150.00	ft
Discharge	1,100.00	cfs

Results		
Depth	1.80	ft
Flow Area	282.9	ft²
Wetted Perimeter	164.84	ft
Top Width	164.40	ft
Critical Depth	1.17	ft
Critical Slope	0.012586	ft/ft
Velocity	3.89	ft/s
Velocity Head	0.23	ft
Specific Energy	2.03	ft
Froude Number	0.52	
Flow Type	Subcritical	

McKellips Natural Channel Reach 3e
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips Natural R3e
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	175.00	ft
Discharge	1,350.00	cfs

Results		
Depth	1.86	ft
Flow Area	338.8	ft²
Wetted Perimeter	190.31	ft
Top Width	189.86	ft
Critical Depth	1.22	ft
Critical Slope	0.012423	ft/ft
Velocity	3.98	ft/s
Velocity Head	0.25	ft
Specific Energy	2.10	ft
Froude Number	0.53	
Flow Type	Subcritical	

Mckellips C Natural Channel Reach 1a
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Natural R1a	LENGTH = 1500'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	50.00	ft
Discharge	400.00	cfs

MCKELLIPS OPTION C

NATURAL

Results		
Depth	1.85	ft
Flow Area	106.4	ft²
Wetted Perimeter	65.29	ft
Top Width	64.83	ft
Critical Depth	1.22	ft
Critical Slope	0.012724	ft/ft
Velocity	3.76	ft/s
Velocity Head	0.22	ft
Specific Energy	2.07	ft
Froude Number	0.52	
Flow Type	Subcritical	

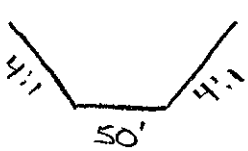
USNG = 1748
DSNG = 1730

NATURAL

.012 SLOPE ⇒ ΔEL = 18'

.003 SLOPE ⇒ ΔEL = 4.5'

DIFFERENCE 13.5' USE 6 DROPS; 5 @ 2.5' AND 1 @ 1' = 13.5'



2.9' CHANNEL 4.9 @ DROPS

Mckellips C Natural Channel Reach 1b
Worksheet for Trapezoidal Channel

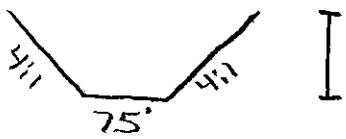
Project Description		
Worksheet	Mckellips C Natural R1b	LENGTH = 2700'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	75.00	ft
Discharge	600.00	cfs

Results		
Depth	1.87	ft
Flow Area	154.7	ft²
Wetted Perimeter	90.46	ft
Top Width	90.00	ft
Critical Depth	1.23	ft
Critical Slope	0.012547	ft/ft
Velocity	3.88	ft/s
Velocity Head	0.23	ft
Specific Energy	2.11	ft
Froude Number	0.52	
Flow Type	Subcritical	

USNG = 1730
DSNG = 1689.5

NATURAL
.015 SLOPE ⇒ ΔEL = 40.5'
.003 SLOPE ⇒ ΔEL = 8.1'
DIFFERENCE 32.4' USE 13 DROPS; 12 @ 2.5' AND 1 @ 2.4' = 32.4'



2.9' CHANNEL 4.9' @ DROPS

Mckellips C Natural Channel Reach 1c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips C Natural R1c
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

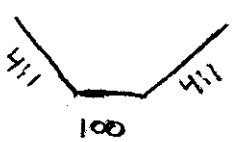
LENGTH = 450'

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	100.00	ft
Discharge	800.00	cfs

Results		
Depth	1.89	ft
Flow Area	202.7	ft²
Wetted Perimeter	115.54	ft
Top Width	115.08	ft
Critical Depth	1.24	ft
Critical Slope	0.012453	ft/ft
Velocity	3.95	ft/s
Velocity Head	0.24	ft
Specific Energy	2.13	ft
Froude Number	0.52	
Flow Type	Subcritical	

USNG = 1689.5
DSNG = 1682.7

NATURAL
.015 SLOPE ⇒ ΔEL = 6.8'
.003 SLOPE ⇒ ΔEL = 1.4'
DIFFERENCE 5.4' USE 2 DROPS; 1 @ 2.5' AND 1 @ 2.9' = 5.4'



2.9' CHANNEL 4.9' @ DROPS

Mckellips C Natural Channel Reach 1d
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips C Natural R1d
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

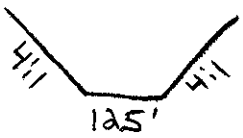
LENGTH = 200'

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	125.00	ft
Discharge	900.00	cfs

Results		
Depth	1.78	ft
Flow Area	234.7	ft²
Wetted Perimeter	139.65	ft
Top Width	139.21	ft
Critical Depth	1.16	ft
Critical Slope	0.012673	ft/ft
Velocity	3.83	ft/s
Velocity Head	0.23	ft
Specific Energy	2.01	ft
Froude Number	0.52	
Flow Type	Subcritical	

USNG = 1682.7
DSNG = 1679.7

NATURAL
.015 SLOPE ⇒ ΔEL = 3'
.003 SLOPE ⇒ ΔEL = .6'
DIFFERENCE 2.4' USE 1 DROP



2.8' CHANNEL 4.8' @ DROPS

Mckellips C Natural Channel Reach 1e
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	*Mckellips C Natural R1e*
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

LENGTH = 450'

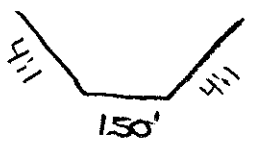
Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	150.00	ft
Discharge	1,100.00	cfs

Results		
Depth	1.80	ft
Flow Area	282.9	ft²
Wetted Perimeter	164.84	ft
Top Width	164.40	ft
Critical Depth	1.17	ft
Critical Slope	0.012586	ft/ft
Velocity	3.89	ft/s
Velocity Head	0.23	ft
Specific Energy	2.03	ft
Froude Number	0.52	
Flow Type	Subcritical	

USNG = 1679.7
DSNG = 1672.9

NATURAL
.015 SLOPE ⇒ ΔEL = 6.8'
.003 SLOPE ⇒ ΔEL = 1.4'

DIFFERENCE 5.4' USE 2 DROPS; 1 @ 2.5' AND 1 @ 2.9' = 5.4



2.8' CHANNEL 4.8' @ DROPS

Mckellips C Natural Channel Reach 1f
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Natural R1f	LENGTH = 550'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

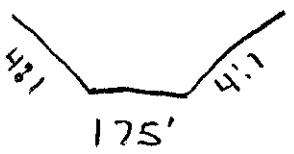
Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	175.00	ft
Discharge	1,350.00	cfs

Results		
Depth	1.86	ft
Flow Area	338.8	ft²
Wetted Perimeter	190.31	ft
Top Width	189.86	ft
Critical Depth	1.22	ft
Critical Slope	0.012423	ft/ft
Velocity	3.98	ft/s
Velocity Head	0.25	ft
Specific Energy	2.10	ft
Froude Number	0.53	
Flow Type	Subcritical	

USNG = 1672.9
DSNG = 1664.6

NATURAL
.015 SLOPE ⇒ ΔEL = 8.3'
.003 SLOPE ⇒ ΔEL = 1.7'

DIFFERENCE 6.6' USE 3 DROPS; 2 @ 2.5' AND 1 @ 1.6' = 6.6



2.9' CHANNEL 4.9' @ DROPS

Mckellips C Natural R1g
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Natural R1g	LENGTH = 450'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	200.00	ft
Discharge	1,520.00	cfs

Results		
Depth	1.84	ft
Flow Area	382.1	ft²
Wetted Perimeter	215.19	ft
Top Width	214.74	ft
Critical Depth	1.21	ft
Critical Slope	0.012442	ft/ft
Velocity	3.98	ft/s
Velocity Head	0.25	ft
Specific Energy	2.09	ft
Froude Number	0.53	
Flow Type	Subcritical	

NATURAL

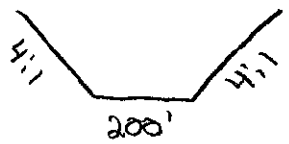
USNG = 1664.6

DSNG = 1657.8

.015 SLOPE ⇒ ΔEL = 6.8'

.003 SLOPE ⇒ ΔEL = 1.4'

DIFFERENCE 5.4' USE 2 DROPS; 1 @ 2.5' AND 1 @ 2.9' = 5.4'



2.9' CHANNEL 4.9' @ DROPS

Mckellips C Natural Channel Reach 2a
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Natural R2a	LENGTH = 450
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	75.00	ft
Discharge	600.00	cfs

Results		
Depth	1.87	ft
Flow Area	154.7	ft²
Wetted Perimeter	90.46	ft
Top Width	90.00	ft
Critical Depth	1.23	ft
Critical Slope	0.012547	ft/ft
Velocity	3.88	ft/s
Velocity Head	0.23	ft
Specific Energy	2.11	ft
Froude Number	0.52	
Flow Type	Subcritical	

USNG = 1657.8

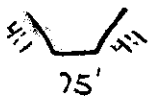
DSNG = 1651.5

NATURAL

.014 SLOPE ⇒ ΔEL = 6.3

.003 SLOPE ⇒ ΔEL = 1.4

DIFFERENCE 5' USE 2 DROPS @ 2.5'



I 2.9' CHANNEL 4.9' @ DROPS

Mckellips C Natural Channel Reach 2b
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Natural R2b	LENGTH = 850'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	100.00	ft
Discharge	800.00	cfs

Results		
Depth	1.89	ft
Flow Area	202.7	ft²
Wetted Perimeter	115.54	ft
Top Width	115.08	ft
Critical Depth	1.24	ft
Critical Slope	0.012453	ft/ft
Velocity	3.95	ft/s
Velocity Head	0.24	ft
Specific Energy	2.13	ft
Froude Number	0.52	
Flow Type	Subcritical	

NATURAL

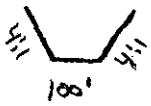
.014 SLOPE ⇒ ΔEL = 11.9'

.003 SLOPE ⇒ ΔEL = 2.6'

DIFFERENCE 9.4' USE 4 DROPS; 3 @ 2.5' AND 1 @ 1.9' = 9.4'

USNG = 1651.5

DSNG = 1639.6



I 2.9' CHANNEL 4.9' @ DROPS

Mckellips C Natural Channel Reach 2c
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Natural R2c	LENGTH = 450'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

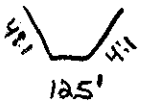
Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	125.00	ft
Discharge	900.00	cfs

Results		
Depth	1.78	ft
Flow Area	234.7	ft²
Wetted Perimeter	139.65	ft
Top Width	139.21	ft
Critical Depth	1.16	ft
Critical Slope	0.012673	ft/ft
Velocity	3.83	ft/s
Velocity Head	0.23	ft
Specific Energy	2.01	ft
Froude Number	0.52	
Flow Type	Subcritical	

USNG = 1639.6
DSNG = 1633.3

NATURAL
.014 SLOPE ⇒ ΔEL = 6.3'
.003 SLOPE ⇒ ΔEL = 1.4'

DIFFERENCE 4.9' USE 2 DROPS; 1 @ 2.5' AND 1 @ 2.4' = 4.9'



2.8' CHANNEL 4.8' @ DROPS

Mckellips C Natural Channel Reach 2d
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Natural R2d	LENGTH = 850'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	150.00	ft
Discharge	1,100.00	cfs

Results		
Depth	1.80	ft
Flow Area	282.9	ft²
Wetted Perimeter	164.84	ft
Top Width	164.40	ft
Critical Depth	1.17	ft
Critical Slope	0.012586	ft/ft
Velocity	3.89	ft/s
Velocity Head	0.23	ft
Specific Energy	2.03	ft
Froude Number	0.52	
Flow Type	Subcritical	

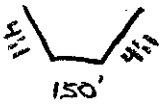
USNG = 1633.3
DSNG = 1621.4

NATURAL

.014 SLOPE ⇒ ΔEL = 11.9'

.003 SLOPE ⇒ ΔEL = 2.6'

DIFFERENCE 9.3' USE 4 DROPS; 3 @ 2.5' AND 1 @ 1.8' = 9.3'



2.8' CHANNEL 4.8' @ DROPS

Mckellips C Natural Channel Reach 2e
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips C Natural R2e
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

LENGTH = 1100'

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	175.00	ft
Discharge	1,350.00	cfs

Results		
Depth	1.86	ft
Flow Area	338.8	ft²
Wetted Perimeter	190.31	ft
Top Width	189.86	ft
Critical Depth	1.22	ft
Critical Slope	0.012423	ft/ft
Velocity	3.98	ft/s
Velocity Head	0.25	ft
Specific Energy	2.10	ft
Froude Number	0.53	
Flow Type	Subcritical	

NATURAL

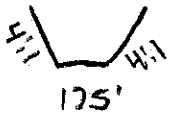
.014 SLOPE ⇒ ΔEL = 15.4

.003 SLOPE ⇒ ΔEL = 3.3

USNG = 1621.4

DSNG = 1606.0

DIFFERENCE 12.1' USE 5 DROPS; 4 @ 2.5' AND 1 @ 2.1' = 12.1'



2.9' CHANNEL 4.9' @ DROPS

Mckellips C Natural Channel Reach 2f
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Natural R2f	LENGTH = 1500
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	200.00	ft
Discharge	1,450.00	cfs

Results		
Depth	1.79	ft
Flow Area	371.2	ft²
Wetted Perimeter	214.77	ft
Top Width	214.33	ft
Critical Depth	1.17	ft
Critical Slope	0.012568	ft/ft
Velocity	3.91	ft/s
Velocity Head	0.24	ft
Specific Energy	2.03	ft
Froude Number	0.52	
Flow Type	Subcritical	

USNG = 1606.0

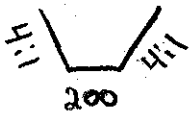
DSNG = 1585.0

NATURAL

.014 SLOPE ⇒ ΔEL = 21.0'

.003 SLOPE ⇒ ΔEL = 4.5'

DIFFERENCE 16.5' USE 7 DROPS; 6 @ 2.5' AND 1 @ 1.5' = 16.5'



2.8' CHANNEL 4.8' @ DROPS

Mckellips C Concrete Lined Channel Reach 1a
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Lined R1a	LENGTH = 1,500'
Flow Element	*Trapezoidal Channel*	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.017	
Slope	*0.012000*	*ft/ft*
Left Side Slope	2.00	H : \
Right Side Slope	2.00	H : \
Bottom Width	10.00	ft
Discharge	400.00	cfs

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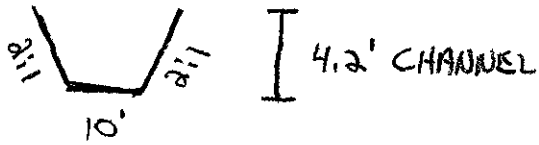
Results		
Depth	2.16	ft
Flow Area	30.9	ft²
Wetted Perimeter	19.65	ft
Top Width	18.63	ft
Critical Depth	2.99	ft
Critical Slope	0.003531	ft/f
Velocity	12.95	ft/s
Velocity Head	2.60	ft
Specific Energy	4.76	ft
Froude Number	1.77	
Flow Type	Supercritical	

USNG = 1748

DSNG = 1730



Mckellips C Concrete Lined Channel Reach 1b
Worksheet for Trapezoidal Channel

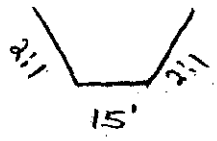
Project Description		
Worksheet	Mckellips C Lined R1b	LENGTH = 3350
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.017	
Slope	0.010000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	15.00	ft
Discharge	900.00	cfs

Results		
Depth	2.94	ft
Flow Area	61.3	ft²
Wetted Perimeter	28.13	ft
Top Width	26.74	ft
Critical Depth	4.00	ft
Critical Slope	0.003170	ft/ft
Velocity	14.69	ft/s
Velocity Head	3.35	ft
Specific Energy	6.29	ft
Froude Number	1.71	
Flow Type	Supercritical	

USNG = 1730
DSNG = 1679.7

NATURAL
.015 SLOPE ⇒ ΔEL = 50.3'
.01 SLOPE ⇒ ΔEL = 33.5
DIFFERENCE 16.8' USE 7 DROPS; 6 @ 2.5' AND 1 @ 1.8' = 16.8'



5' CHANNEL 6' @ DROPS

Mckellips C Concrete Lined Channel Reach 1c
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Lined R1c	LENGTH = 450'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.017	
Slope	0.010000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	1,100.00	cfs

Results		
Depth	2.55	ft
Flow Area	76.6	ft²
Wetted Perimeter	36.39	ft
Top Width	35.18	ft
Critical Depth	3.55	ft
Critical Slope	0.003121	ft/ft
Velocity	14.36	ft/s
Velocity Head	3.20	ft
Specific Energy	5.75	ft
Froude Number	1.72	
Flow Type	Supercritical	

USNG = 1679.7

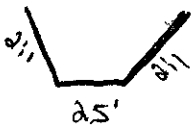
DSNG = 1672.9

NATURAL

.015 SLOPE ⇒ ΔEL = 6.8'

.010 SLOPE ⇒ ΔEL = 4.5'

DIFFERENCE 2.3' USE 1 DROP



5.6' CHANNEL 6.6' @ DROPS

Mckellips C Concrete Lined Channel Reach 1d
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Lined R1d	LENGTH = 550'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	1,350.00	cfs

Results		
Depth	3.05	ft
Flow Area	94.9	ft²
Wetted Perimeter	38.64	ft
Top Width	37.20	ft
Critical Depth	4.01	ft
Critical Slope	0.003026	ft/ft
Velocity	14.23	ft/s
Velocity Head	3.15	ft
Specific Energy	6.20	ft
Froude Number	1.57	
Flow Type	Supercritical	

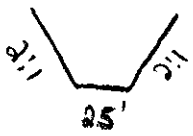
USDG = 1672.9
DSDG = 1664.6

NATURAL

.015 SLOPE ⇒ ΔEL = 8.3'

.008 SLOPE ⇒ ΔEL = 4.4'

DIFFERENCE 3.9' USE 2 DROPS; 1 @ 2' AND 1 @ 1.9' = 3.9'



5.1' CHANNEL 6.1' @ DROPS

Mckellips C Concrete Lined Channel Reach 1e
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips C Lined R1e
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

LENGTH = 450'

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	1,520.00	cfs

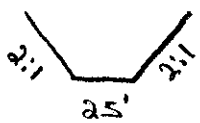
Results		
Depth	3.26	ft
Flow Area	102.9	ft²
Wetted Perimeter	39.59	ft
Top Width	38.05	ft
Critical Depth	4.31	ft
Critical Slope	0.002974	ft/ft
Velocity	14.78	ft/s
Velocity Head	3.39	ft
Specific Energy	6.66	ft
Froude Number	1.58	
Flow Type	Supercritical	

USNG = 1664.6
DSNG = 1657.8

NATURAL

.015 SLOPE ⇒ ΔEL = 6.8'
.008 SLOPE ⇒ ΔEL = 3.6'

DIFFERENCE 3.2' USE 2 DROPS; 1 @ 2' AND 1 @ 1.2' = 3.2'



[5.3' CHANNEL 6.3' @ DROPS

Mckellips C Concrete Lined Channel Reach 2a
Worksheet for Trapezoidal Channel

Project Description		
Worksheet	Mckellips C Lined R2a	LENGTH = 1750'
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Channel Depth	

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	10.00	ft
Discharge	900.00	cfs

Results		
Depth	3.68	ft
Flow Area	63.9	ft²
Wetted Perimeter	26.47	ft
Top Width	24.73	ft
Critical Depth	4.65	ft
Critical Slope	0.003175	ft/ft
Velocity	14.08	ft/s
Velocity Head	3.08	ft
Specific Energy	6.76	ft
Froude Number	1.54	
Flow Type	Supercritical	

USNG = 1657.8

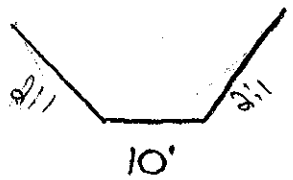
DSNG = 1633.3

NATURAL

.014 SLOPE ⇒ ΔEL = 24.5'

.008 SLOPE ⇒ ΔEL = 14.0'

DIFFERENCE 10.5' USE 4 DROPS; 3 @ 2.5' AND 1 @ 3' = 10.5'



5.7' CHANNEL 6.7' @ DROPS

Mckellips C Concrete Lined Channel Reach 2b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips C Lined R2b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

LENGTH = 850'

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	15.00	ft
Discharge	1,100.00	cfs

Results		
Depth	3.48	ft
Flow Area	76.4	ft²
Wetted Perimeter	30.56	ft
Top Width	28.92	ft
Critical Depth	4.48	ft
Critical Slope	0.003086	ft/ft
Velocity	14.40	ft/s
Velocity Head	3.22	ft
Specific Energy	6.70	ft
Froude Number	1.56	
Flow Type	Supercritical	

USNG = 1633.3

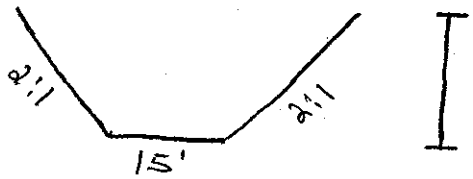
DSNG = 1621.4

NATURAL

.014 SLOPE ⇒ ΔEL = 11.9'

.008 SLOPE ⇒ ΔEL = 6.8'

DIFFERENCE 5.1' USE 2 DROPS; 1 @ 2.5' AND 1 @ 2.6' = 5.1'



5.5' CHANNEL 6.5' @ DROPS

Mckellips C Concrete Lined Channel Reach 2c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips C Lined R2c
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

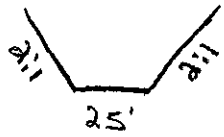
LENGTH = 1100'

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	1,350.00	cfs

Results		
Depth	3.05	ft
Flow Area	94.9	ft²
Wetted Perimeter	38.64	ft
Top Width	37.20	ft
Critical Depth	4.01	ft
Critical Slope	0.003026	ft/ft
Velocity	14.23	ft/s
Velocity Head	3.15	ft
Specific Energy	6.20	ft
Froude Number	1.57	
Flow Type	Supercritical	

USNG = 1621.4
DSNG = 1606.0

NATURAL
.014 SLOPE ⇒ ΔEL = 15.4'
.008 SLOPE ⇒ ΔEL = 8.8'
DIFFERENCE 6.6' USE 3 DROPS; 2 @ 2' AND 1 @ 2.6'



5.1' CHANNEL 6.1' @ DROPS

Mckellips C Concrete Lined Channel Reach 2d
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mckellips C Lined R2d
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

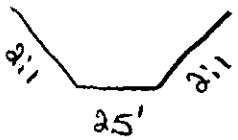
LENGTH = 1500'

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	1,450.00	cfs

Results		
Depth	3.18	ft
Flow Area	99.6	ft²
Wetted Perimeter	39.21	ft
Top Width	37.71	ft
Critical Depth	4.19	ft
Critical Slope	0.002994	ft/ft
Velocity	14.56	ft/s
Velocity Head	3.29	ft
Specific Energy	6.47	ft
Froude Number	1.58	
Flow Type	Supercritical	

USNG = 1606
DSNG = 1585.0

NATURAL
.014 SLOPE ⇒ ΔEL = 21'
.008 SLOPE ⇒ ΔEL = 12'
DIFFERENCE 9 USE 4 DROPS; 3 @ 2.5' AND 1 @ 1.5' = 9.5'



[5.2' CHANNEL 6.2' @ DROPS

WOOD/PATEL

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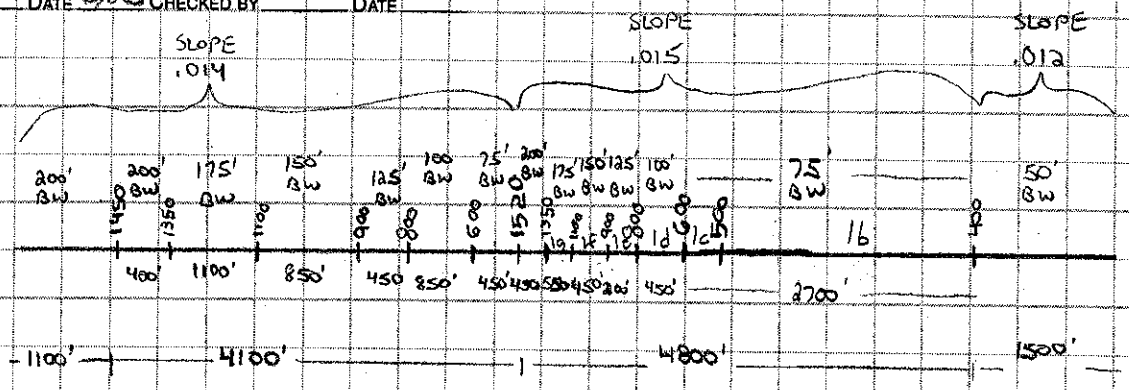
PROJECT SPOOK HILL

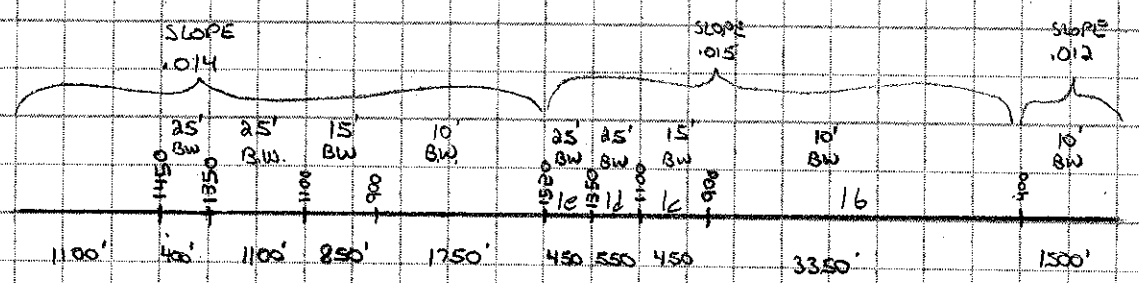
PROJECT NO. 99989 SHEET NO. _____ OF _____

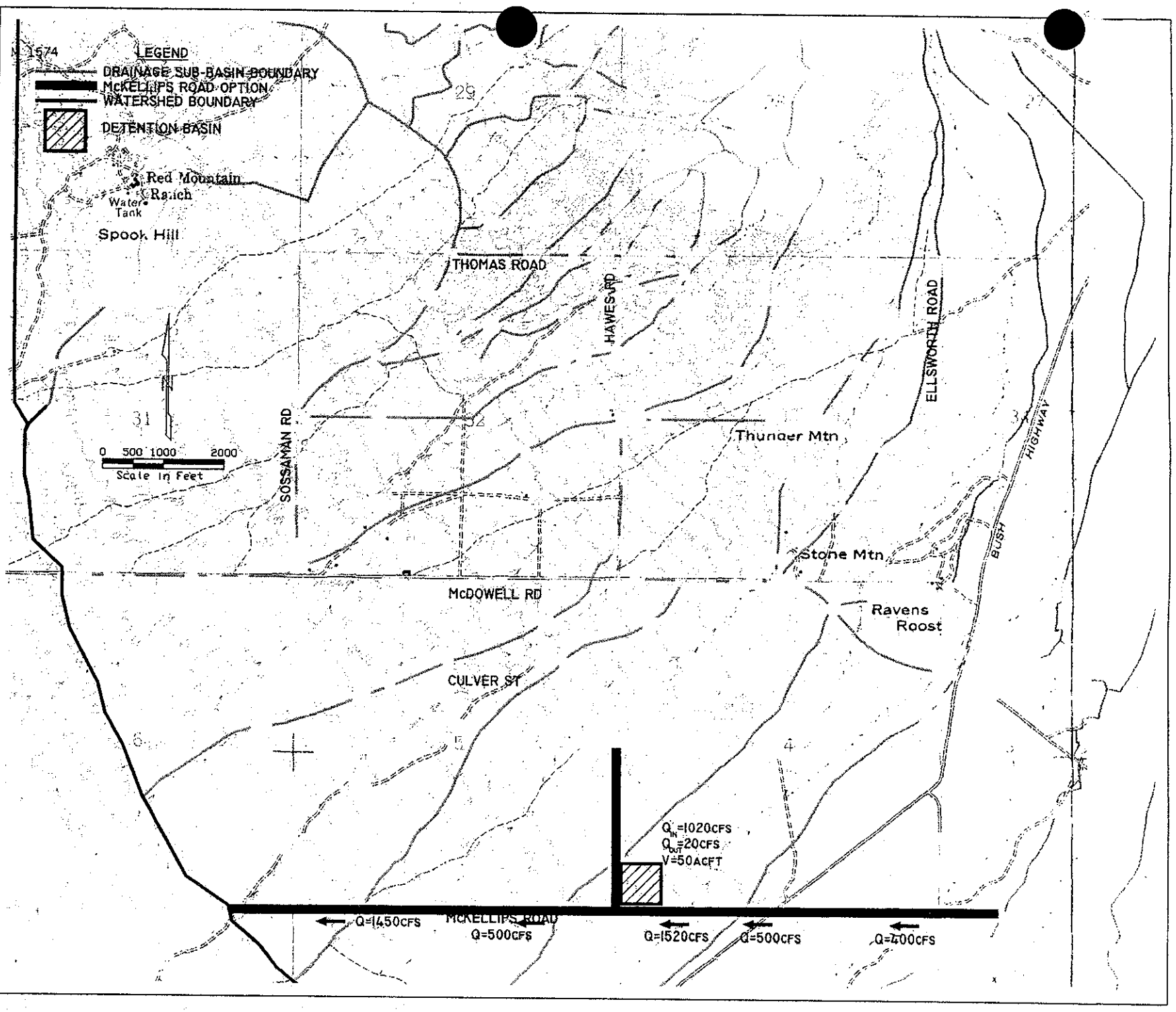
CALCULATED BY JWW DATE 6/23 CHECKED BY _____ DATE _____

NATURAL CHANNEL



SHOTCRETE





SPOOK HILL A.D.M.P. UPDATE
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

McKELLIPS ROAD

Spook Hill

OPTION 2C

	BY	DATE
DESIGNED	R. HINER	06/00
DRAWN	S. CAMPBELL	06/00
CHECKED	A. PATEL	06/00

DRAWING NO. spkhl-mckellipt2c.dwg

SHEET OF

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill

PROJECT NO. 99989 SHEET NO. 1 OF 1

CALCULATED BY JGT DATE 7/13 CHECKED BY _____ DATE _____

McKellips Road Alternates - Culverts

OPTION 2A

1.- Culvert Hawes RD 1350 cfs, 1350/12 = 113 SF, 5-6'x4' = 120 SF
100' Long = 287 cy + 9.8 + 17.6 = 314 cy

2.- Culverts @ Sossaman RD & East of Sossaman 1950 cfs, 1950/12 = 162 SF
100' Long = 362 cy + 13.26 + 20.52 = 396 cy
5-8'x4 = 160 SF

OPTION 2B

1- Culvert Hawes RD 400 cfs, 400/12 = 33 SF, 2-6x3 = 36 SF
100 Long = 117 + 5.7 + 10.13 = 133 cy

2 - Culverts @ Sossaman & East of Sossaman 1350 cfs, 1350/12 = 113 SF, 5-6'x4'
100' Long = 287 + 9.8 + 17.6 = 314 cy
120 SF

OPTION 2C

1- Culvert @ Hawes RD 500 cfs, 500/12 = 42 SF, 2-8'x3' = 48 SF
100' Long = 148 cy + 6.2 + 11.2 = 166 cy

2- culverts @ Sossaman and East of Sossaman, 1450 cfs, 1450/12 = 120 SF, 5-6'x4'
100' Long = 287 + 9.8 + 17.6 = 314 cy
120 SF

Mckellips Road Option 1a Earthen Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
50' B/W	Channel	219-49-2H	P	75.22	1500	89.2	3.07	4.08%	$376,100	$15,358	
25'B/W	Channel	219-31-45	P	9.56	600	67.4	0.93	9.71%	$191,140	$18,567	
	Channel	219-31-44	P	7.51	456.5	67.4	0.71	9.41%	$150,120	$14,127	
	Channel	219-31-67	P	171.26	600.8	67.4	0.93	0.54%	$85,632	$465	
	Channel	219-31-43	P	7.99	719.3	67.4	1.11	13.94%	$159,720	$22,259	
	Channel	219-31-42	P	12.82	641.3	67.4	0.99	7.74%	$256,380	$19,846	
	Channel	219-31-67	P	171.26	810	67.4	1.25	0.73%	$85,632	$627	
75'B/W	Channel	219-31-67	P	171.26	1055.1	114.2	2.77	1.62%	$85,632	$1,383	
	Channel	219-31-40	P	12.10	670.3	114.2	1.76	14.52%	$242,040	$35,146	
	Channel	219-26-7A	P	36.88	250	114.2	0.66	1.78%	$700,500	$12,450	
150' B/W	Channel	219-26-7A	P	38.88	1030	188.4	4.45	11.46%	$700,500	$80,267	
	Channel	219-26-6	P	38.03	520	188.4	2.25	5.91%	$722,500	$42,728	
250' B/W	Channel	219-26-6	P	38.03	800	289.2	5.31	13.97%	$722,500	$100,905	
	Channel	219-26-4B	P	38.03	1320	289.2	8.76	23.04%	$668,000	$153,934	
	Channel	219-26-3H	P	11.53	330.25	289.2	2.19	19.02%	$219,500	$41,741	
	Channel	219-26-107	P	2.38	330.25	289.2	2.19	91.97%	$145,000	$133,357	
	Channel	219-26-96E	P	3.77	620	289.2	4.12	109.13%	$98,000	$106,944	
	Channel	219-25-11R	P	14.98	800	289.2	5.31	35.46%	$299,540	$106,226	$906,328
	Basin	219-49-2H	P	75.22	660	660	10.00	13.29%	$376,100	$50,000	$50,000
						Total (ac)	55.69				$956,328

Land Takes
Mckellips Road Option 1a Concrete Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
5' B/W	Channel	219-49-2H	P	75.22	1500	40	1.38	1.83%	$376,100	$6,887	
5'B/W	Channel	219-31-45	P	9.56	600	38.2	0.53	5.51%	$191,140	$10,523	
	Channel	219-31-44	P	7.51	456.5	38.2	0.40	5.33%	$150,120	$8,007	
	Channel	219-31-67	P	171.26	600.8	38.2	0.53	0.31%	$85,632	$263	
	Channel	219-31-43	P	7.99	719.3	38.2	0.63	7.90%	$159,720	$12,616	
	Channel	219-31-42	P	12.82	641.3	38.2	0.56	4.39%	$256,380	$11,248	
	Channel	219-31-67	P	171.26	810	38.2	0.71	0.41%	$85,632	$355	
10'B/W	Channel	219-31-67	P	171.26	1055.1	48.8	1.18	0.69%	$85,632	$591	
	Channel	219-31-40	P	12.10	670.3	48.8	0.75	6.21%	$242,040	$15,019	
	Channel	219-26-7A	P	36.88	550	48.8	0.62	1.67%	$700,500	$11,704	
25' B/W	Channel	219-26-7A	P	38.88	730	65.4	1.10	2.82%	$700,500	$19,748	
	Channel	219-26-6	P	38.03	1320	65.4	1.98	5.21%	$722,500	$37,651	
	Channel	219-26-4B	P	38.03	1320	65.4	1.98	5.21%	$668,000	$34,811	
	Channel	219-26-3H	P	11.53	330.25	65.4	0.50	4.30%	$219,500	$9,439	
	Channel	219-26-107	P	2.38	330.25	65.4	0.50	20.80%	$145,000	$30,157	
	Channel	219-26-96E	P	3.77	620	65.4	0.93	24.68%	$98,000	$24,184	
	Channel	219-25-11R	P	14.98	800	65.4	1.20	8.02%	$299,540	$24,022	$257,226
	Basin	219-49-2H	P	75.22	660	660	10.00	13.29%	$376,100	$50,000	$50,000
						Total (ac)	25.47				$307,226

Mckellips Road Option 1b Earthen Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
25' B/W	Channel	219-49-2H	P	75.22	1500	67	2.31	3.07%	$376,100	$11,536	
10'B/W	Channel	219-31-45	P	9.56	600	62.8	0.87	9.05%	$191,140	$17,300	
	Channel	219-31-44	P	7.51	456.5	62.8	0.66	8.77%	$150,120	$13,163	
	Channel	219-31-67	P	171.26	600.8	62.8	0.87	0.51%	$85,632	$433	
50' B/W	Channel	219-31-43	P	7.99	719.3	105.2	1.74	21.75%	$159,720	$34,743	
	Channel	219-31-42	P	12.82	641.3	105.2	1.55	12.08%	$256,380	$30,976	
150' B/W	Channel	219-31-67	P	171.26	1865.1	204.4	8.75	5.11%	$85,632	$4,376	
	Channel	219-31-40	P	12.10	670.3	204.4	3.15	25.99%	$242,040	$62,906	
100' B/W	Channel	219-26-7A	P	36.88	1280	155.2	4.56	12.37%	$700,500	$86,627	
	Channel	219-26-6	P	38.03	1320	155.2	4.70	12.37%	$722,500	$89,349	
	Channel	219-26-4B	P	38.03	400	155.2	1.43	3.75%	$668,000	$25,033	
175' B/W	Channel	219-26-4B	P	38.03	920	221.9	4.69	12.32%	$668,000	$82,320	
	Channel	219-26-3H	P	11.53	330.25	221.9	1.68	14.59%	$219,500	$32,027	
	Channel	219-26-107	P	2.38	330.25	221.9	1.68	70.57%	$145,000	$102,323	
	Channel	219-26-96E	P	3.77	620	221.9	3.16	83.73%	$98,000	$82,057	
	Channel	219-25-11R	P	14.98	800	221.9	4.08	27.21%	$299,540	$81,506	$756,675
	Basin	219-49-2H	P	75.22	660	600	9.09	12.09%	$376,100	$45,455	$45,455
	Basin	219-26-7A	P	36.88	660	660	10.00	27.12%	$700,500	$189,951	$189,951
						Total (ac)	64.94				$992,080

Land Takes
Mckellips Road Option 1b Concrete Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
5' B/W	Channel	219-49-2H	P	75.22	1500	40.4	1.39	1.85%	$376,100	$6,956	
5'B/W	Channel	219-31-45	P	9.56	600	38.2	0.53	5.51%	$191,140	$10,523	
	Channel	219-31-44	P	7.51	456.5	38.2	0.40	5.33%	$150,120	$8,007	
	Channel	219-31-67	P	171.26	600.8	38.2	0.53	0.31%	$85,632	$263	
	Channel	219-31-43	P	7.99	719.3	38.2	0.63	7.90%	$159,720	$12,616	
	Channel	219-31-42	P	12.82	323.4	38.2	0.28	2.21%	$256,380	$5,672	
15' B/W	Channel	219-31-42	P	12.82	317.9	53	0.39	3.02%	$85,632	$2,584	
	Channel	219-31-67	P	171.26	1865.1	53	2.27	1.33%	$85,632	$1,135	
	Channel	219-31-40	P	12.10	670.3	53	0.82	6.74%	$242,040	$16,311	
5' B/W	Channel	219-26-7A	P	36.88	1280	47	1.38	3.75%	$700,500	$26,234	
	Channel	219-26-6	P	38.03	1320	47	1.42	3.75%	$722,500	$27,058	
15' B/W	Channel	219-26-4B	P	38.03	1320	53	1.61	4.22%	$668,000	$28,211	
25' B/W	Channel	219-26-3H	P	11.53	330.25	61.2	0.46	4.02%	$219,500	$8,833	
	Channel	219-26-107	P	2.38	330.25	61.2	0.46	19.46%	$145,000	$28,221	
	Channel	219-26-96E	P	3.77	620	61.2	0.87	23.09%	$98,000	$22,631	
	Channel	219-25-11R	P	14.98	800	61.2	1.12	7.50%	$299,540	$22,479	$227,734
	Basin	219-49-2H	P	75.22	660	660	10.00	13.29%	$376,100	$50,000	$50,000
	Basin	219-26-7A	P	36.88	660	660	10.00	27.12%	$700,500	$189,951	$189,951
						Total (ac)	34.57				$467,684

Land Takes
Option * - XXX Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)		
25' B/W	Channel	219-49-2H	P	75.22	1500	42.7	1.47	1.95%	$376,100	$7,352		
10'B/W	Channel	219-31-45	P	9.56	600	30.4	0.42	4.38%	$191,140	$8,375		
	Channel	219-31-44	P	7.51	455.5	30.4	0.32	4.24%	$150,120	$6,372		
	Channel	219-31-67	P	171.26	600.8	30.4	0.42	0.24%	$85,632	$210		
50' B/W	Channel	219-31-43	P	7.99	719.3	36.3	0.60	7.51%	$159,720	$11,988		
	Channel	219-31-42	P	12.82	641.3	36.3	0.53	4.17%	$256,380	$10,688		
150' B/W	Channel	219-31-67	P	171.26	1865.1	60.4	2.59	1.51%	$85,632	$1,293		
	Channel	219-31-40	P	12.10	670.3	60.4	0.93	7.68%	$242,040	$18,589		
100' B/W	Channel	219-26-7A	P	36.88	1280	48.1	1.41	3.83%	$700,500	$26,848		
	Channel	219-26-6	P	38.03	1320	48.1	1.46	3.83%	$722,500	$27,691		
	Channel	219-26-4B	P	38.03	400	48.1	0.44	1.16%	$668,000	$7,758		
175' B/W	Channel	219-26-4B	P	38.03	920	71.9	1.52	3.99%	$668,000	$26,673		
	Channel	219-26-3H	P	11.53	330.25	71.9	0.55	4.73%	$219,500	$10,377		
	Channel	219-26-107	P	2.38	330.25	71.9	0.55	22.87%	$145,000	$33,155		
	Channel	219-26-96E	P	3.77	620	71.9	1.02	27.13%	$98,000	$26,588		
	Channel	219-25-11R	P	14.98	800	71.9	1.32	8.82%	$299,540	$26,410	$250,367	
	Basin	219-49-2H	P	75.22	660	600	9.09	12.09%	$376,100	$45,455	$45,455	
	Basin	219-26-7A	P	36.88	660	660	10.00	27.12%	$700,500	$189,951	$189,951	
						Total (ac)	34.63				$485,772	$14,026.44
						Basins	19.09				$235,405	$12,330.75
						Channels	15.54				$250,367	$16,109.38

Land Takes
Mckellips Road Option 2b Concrete Channel Pass Mt Diversion in Place

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)		
8' B/W	Channel	219-49-2H	P	75.22	1500	23.4	0.81	1.07%	$376,100	$4,029		
8' B/W	Channel	219-31-45	P	9.56	600	23.4	0.32	3.37%	$191,140	$6,446		
	Channel	219-31-44	P	7.51	456.5	23.4	0.25	3.27%	$150,120	$4,905		
	Channel	219-31-67	P	171.26	600.8	23.4	0.32	0.19%	$85,632	$161		
	Channel	219-31-43	P	7.99	719.3	23.4	0.39	4.84%	$159,720	$7,728		
	Channel	219-31-42	P	12.82	323.4	23.4	0.17	1.36%	$256,380	$3,475		
8' B/W	Channel	219-31-42	P	12.82	317.9	27.2	0.20	1.55%	$85,632	$1,326		
	Channel	219-31-67	P	171.26	1865.1	27.2	1.16	0.68%	$85,632	$582		
	Channel	219-31-40	P	12.10	670.3	27.2	0.42	3.46%	$242,040	$8,371		
8' B/W	Channel	219-26-7A	P	36.88	1280	27.2	0.80	2.17%	$700,500	$15,182		
	Channel	219-26-6	P	38.03	1320	27.2	0.82	2.17%	$722,500	$15,659		
8' B/W	Channel	219-26-4B	P	38.03	1320	28.4	0.86	2.26%	$668,000	$15,117		
8' B/W	Channel	219-26-3H	P	11.53	330.25	29.8	0.23	1.96%	$219,500	$4,301		
	Channel	219-26-107	P	2.38	330.25	29.8	0.23	9.48%	$145,000	$13,741		
	Channel	219-26-96E	P	3.77	620	29.8	0.42	11.24%	$98,000	$11,020		
	Channel	219-25-11R	P	14.98	800	29.8	0.55	3.65%	$299,540	$10,946	$122,989	
	Basin	219-49-2H	P	75.22	660	660	10.00	13.29%	$376,100	$50,000	$50,000	
	Basin	219-26-7A	P	36.88	660	660	10.00	27.12%	$700,500	$189,951	$189,951	
						Total (ac)	27.95				$362,940	$12,987.51
						Basins	20.00				$239,951	$11,997.53
						Channels	7.95				$122,989	$15,479.50

Land Takes

Mckellips Road Option 1b Earthen Channel Pass Mt Diversion in Place no Channel in State Land Parcel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)		
	Channel	219-26-7A	P	36.88	1280	46	1.35	3.67%	$700,500	$25,676		
	Channel	219-26-6	P	38.03	1320	46	1.39	3.67%	$722,500	$26,482		
	Channel	219-26-4B	P	38.03	400	46	0.42	1.11%	$668,000	$7,420		
	Channel	219-26-4B	P	38.03	920	50.5	1.07	2.80%	$668,000	$18,734		
	Channel	219-26-3H	P	11.53	330.25	50.5	0.38	3.32%	$219,500	$7,289		
	Channel	219-26-107	P	2.38	330.25	50.5	0.38	16.06%	$145,000	$23,287		
	Channel	219-26-96E	P	3.77	620	50.5	0.72	19.06%	$98,000	$18,675		
	Channel	219-25-11R	P	14.98	800	50.5	0.93	6.19%	$299,540	$18,549	$146,111	
	Basin	219-49-2H	P	75.22	660	600	9.09	12.09%	$376,100	$45,455	$45,455	
	Basin	219-26-7A	P	36.88	660	660	10.00	27.12%	$700,500	$189,951	$189,951	
						Total (ac)	25.74				$381,516	$14,823.36
						Basins	19.09				$235,405	$12,330.75
						Channels	6.65				$146,111	$21,982.87

Land Takes

Mckellips Road Option 2b Concrete Channel Pass Mt Diversion in Place no Channel in State Land Parcel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)		
8' B/W	Channel	219-26-7A	P	36.88	1280	35.4	1.04	2.82%	$700,500	$19,759		
	Channel	219-26-6	P	38.03	1320	35.4	1.07	2.82%	$722,500	$20,380		
	Channel	219-26-4B	P	38.03	1320	36.5	1.11	2.91%	$668,000	$19,428		
8' B/W	Channel	219-26-3H	P	11.53	330.25	37.7	0.29	2.48%	$219,500	$5,441		
	Channel	219-26-107	P	2.38	330.25	37.7	0.29	11.99%	$145,000	$17,384		
	Channel	219-26-96E	P	3.77	620	37.7	0.54	14.23%	$98,000	$13,941		
	Channel	219-25-11R	P	14.98	800	37.7	0.69	4.62%	$299,540	$13,848	$110,181	
	Basin	219-49-2H	P	75.22	660	660	10.00	13.29%	$376,100	$50,000	$50,000	
	Basin	219-26-7A	P	36.88	660	660	10.00	27.12%	$700,500	$189,951	$189,951	
						Total (ac)	25.02				$350,132	$13,994.29
						Basins	20.00				$239,951	$11,997.53
						Channels	5.02				$110,181	$21,950.11

Land Takes
Mckellips Road Option 1c Earthen Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
50' B/W	Channel	219-49-2H	P	75.22	1500	89.2	3.07	4.08%	$376,100	$15,358	
75' B/W	Channel	219-31-45	P	9.56	600	114.2	1.57	16.46%	$191,140	$31,460	
	Channel	219-31-44	P	7.51	456.5	114.2	1.20	15.94%	$150,120	$23,936	
	Channel	219-31-67	P	171.26	600.8	114.2	1.58	0.92%	$85,632	$788	
	Channel	219-31-43	P	7.99	719.3	114.2	1.89	23.61%	$159,720	$37,715	
	Channel	219-31-42	P	12.82	641.3	114.2	1.68	13.12%	$256,380	$33,626	
	Channel	219-31-67	P	171.26	282.1	114.2	0.74	0.43%	$85,632	$370	
150' B/W	Channel	219-31-67	P	171.26	1583	188.4	6.85	4.00%	$85,632	$3,423	
	Channel	219-31-40	P	12.10	670.3	188.4	2.90	23.96%	$242,040	$57,982	
100' B/W	Channel	219-26-7A	P	36.88	1280	139.2	4.09	11.09%	$700,500	$77,697	
	Channel	219-26-6	P	38.03	470	139.2	1.50	3.95%	$722,500	$28,534	
200' B/W	Channel	219-26-6	P	38.03	850	238.4	4.65	12.23%	$722,500	$88,379	
	Channel	219-26-4B	P	38.03	1320	238.4	7.22	19.00%	$668,000	$126,894	
	Channel	219-26-3H	P	11.53	330.25	238.4	1.81	15.68%	$219,500	$34,409	
	Channel	219-26-107	P	2.38	330.25	238.4	1.81	75.81%	$145,000	$109,932	
	Channel	219-26-96E	P	3.77	620	238.4	3.39	89.96%	$98,000	$88,159	
	Channel	219-25-11R	P	14.98	800	238.4	4.38	29.23%	$299,540	$87,567	$846,227
	Basin	219-26-7A	P	36.88	660	660	10.00	27.12%	$700,500	$189,951	$189,951
						Total (ac)	60.32				$1,036,177

Land Takes
Mckellips Road Option 2c Concrete Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
10' B/W	Channel	219-49-2H	P	75.22	1500	42.8	1.47	1.96%	$376,100	$7,369	
15' B/W	Channel	219-31-45	P	9.56	600	51	0.70	7.35%	$191,140	$14,050	
	Channel	219-31-44	P	7.51	456.5	51	0.53	7.12%	$150,120	$10,689	
	Channel	219-31-67	P	171.26	600.8	51	0.70	0.41%	$85,632	$352	
	Channel	219-31-43	P	7.99	719.3	51	0.84	10.55%	$159,720	$16,843	
	Channel	219-31-42	P	12.82	641.3	51	0.75	5.86%	$256,380	$15,017	
	Channel	219-31-67	P	171.26	608.7	51	0.71	0.42%	$85,632	$356	
25' B/W	Channel	219-31-67	P	171.26	1256.4	62.2	1.79	1.05%	$85,632	$897	
	Channel	219-31-40	P	12.10	670.3	62.2	0.96	7.91%	$242,040	$19,143	
10' B/W	Channel	219-26-7A	P	36.88	1280	48.8	1.43	3.89%	$700,500	$27,238	
	Channel	219-26-6	P	38.03	470	48.8	0.53	1.38%	$722,500	$10,003	
25' B/W	Channel	219-26-6	P	38.03	850	61.4	1.20	3.15%	$722,500	$22,762	
	Channel	219-26-4B	P	38.03	1320	61.4	1.86	4.89%	$668,000	$32,682	
	Channel	219-26-3H	P	11.53	330.25	61.4	0.47	4.04%	$219,500	$8,862	
	Channel	219-26-107	P	2.38	330.25	61.4	0.47	19.53%	$145,000	$28,313	
	Channel	219-26-96E	P	3.77	620	61.4	0.87	23.17%	$98,000	$22,705	
	Channel	219-25-11R	P	14.98	800	61.4	1.13	7.53%	$299,540	$22,553	$259,834
	Basin	219-26-7A	P	36.88	660	660	10.00	27.12%	$700,500	$189,951	$189,951
						Total (ac)	26.42				$449,785

Table 1

McKellips Road Alignment with Pass Mountain Diversion in Place

Level I Concept Analysis Opinion of Probable Costs

Option No.	Alternate Description	Opinion of Probable Costs Including Contingencies			Total Cost
		Major Elements	Additional Elements	Land Acquisitions Basins and R/W	
1B - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. Two Basins.	$3,619,732	$2,573,700	$607,161	**$6,800,593**
2B - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. Two Basins.	$5,452,120	$1,740,391	$453,833	**$7,646,344**
1B - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. No Channel Across State Land. Two Basins.	$2,287,232	$1,530,583	$476,933	**$4,294,748**
2B - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. No Channel Across State Land. Two Basins.	$3,348,160	$1,561,039	$437,736	**$5,346,936**

Spook Hill ADMS Update July 21, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McKellips Road Alignment with Pass Mountain Diversion
Level I Concept Analysis Opinion of Probable Costs
Option 1B - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	73,217	$292,869
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	6,226	$1,014,820
4	Splitter Structures	$60,000	EA	2	$120,000
5	Culverts	$310	CY	293	$90,830
6	Basin Excavation	$4.00	CY	262,167	$1,048,667
		SUBTOTAL MAJOR ELEMENTS			$2,567,186
		CONTINGENCIES:			
		Construction		35%	$898,515
		Construction Admin		6%	$154,031
		TOTAL MAJOR ELEMENTS			**$3,619,732**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	1,428,108	$1,570,919
2	Fence	$12	LF	21,200	$254,400
3	Utility Relocations	$5,000	EA	0	$0
		SUBTOTAL ADDITIONAL ELEMENTS			$1,825,319
		CONTINGENCIES:			
		Construction		35%	$638,862
		Construction Admin		6%	$109,519
		TOTAL ADDITIONAL ELEMENTS			**$2,573,700**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$16,110	AC	15.54	$250,349
2	Basin Land Acquisition	$12,330	AC	19.09	$235,380
		SUBTOTAL LAND ACQUISITION			$485,729
		CONTINGENCIES :		25%	$121,432
		TOTAL LAND ACQUISITION			**$607,161**
				TOTAL	***$6,800,593***

Spook Hill ADMS Update July 21, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McKellips Road Alignment with Pass Mountain Diversion
Level I Concept Analysis Opinion of Probable Costs
Option 2B - Concrete Channel

MAJOR ELEMENTS:

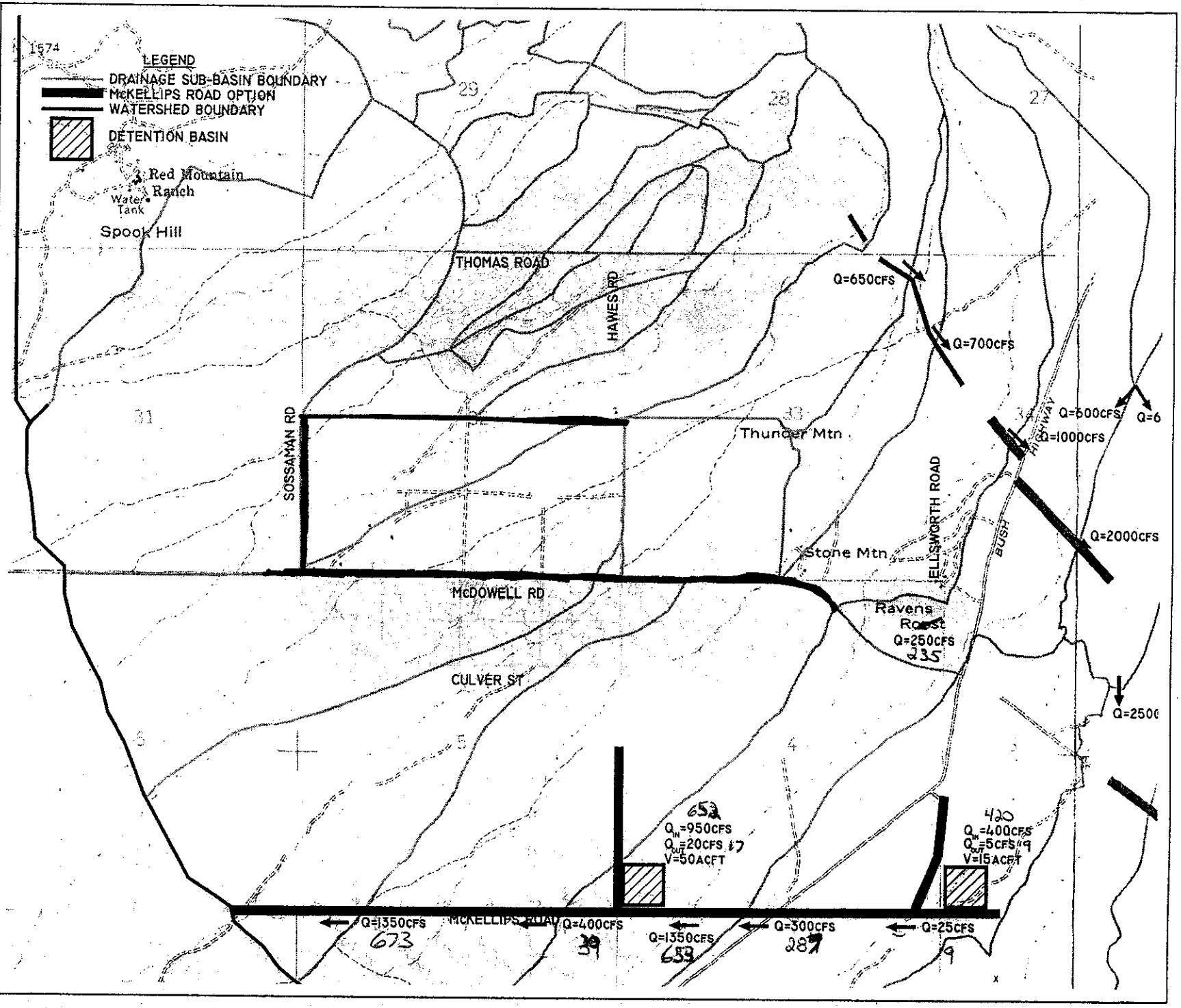
ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	45,433	$181,731
2	Concrete Channel Lining	$310	CY	7,297	$2,262,135
3	Drop Structures	$163	SF	1,002	$163,389
4	Splitter Structures	$60,000	EA	2	$120,000
5	Culverts	$310	CY	293	$90,830
6	Basin Excavation	$4	CY	262,167	$1,048,667
			SUBTOTAL MAJOR ELEMENTS		$3,866,752
		CONTINGENCIES:			
		Construction		35%	$1,353,363
		Construction Admin		6%	$232,005
			TOTAL MAJOR ELEMENTS		**$5,452,120**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	871,200	$958,320
2	Fence	$12	LF	23,000	$276,000
3	Utility Relocations	$5,000	EA	0	$0
			SUBTOTAL ADDITIONAL ELEMENTS		$1,234,320
		CONTINGENCIES:			
		Construction		35%	$432,012
		Construction Admin		6%	$74,059
			TOTAL ADDITIONAL ELEMENTS		**$1,740,391**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$15,480	AC	7.95	$123,066
2	Basin Land Acquisition	$12,000	AC	20.00	$240,000
			SUBTOTAL LAND ACQUISITION		$363,066
		CONTINGENCIES :		25%	$90,767
			TOTAL LAND ACQUISITION		**$453,833**
				TOTAL	***$7,646,344***



SPOOK HILL A.D.M.P. UPDATE
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

McKELLIPS ROAD

OPTION 2B-b

	BY	DATE
DESIGNED	R. HINER	08/00
DRAWN	S. CAMPBELL	08/00
CHECKED	A. PATEL	08/00

DRAWING NO. spkhl-mckellipsb-b.dwg

SHEET 1 OF 1

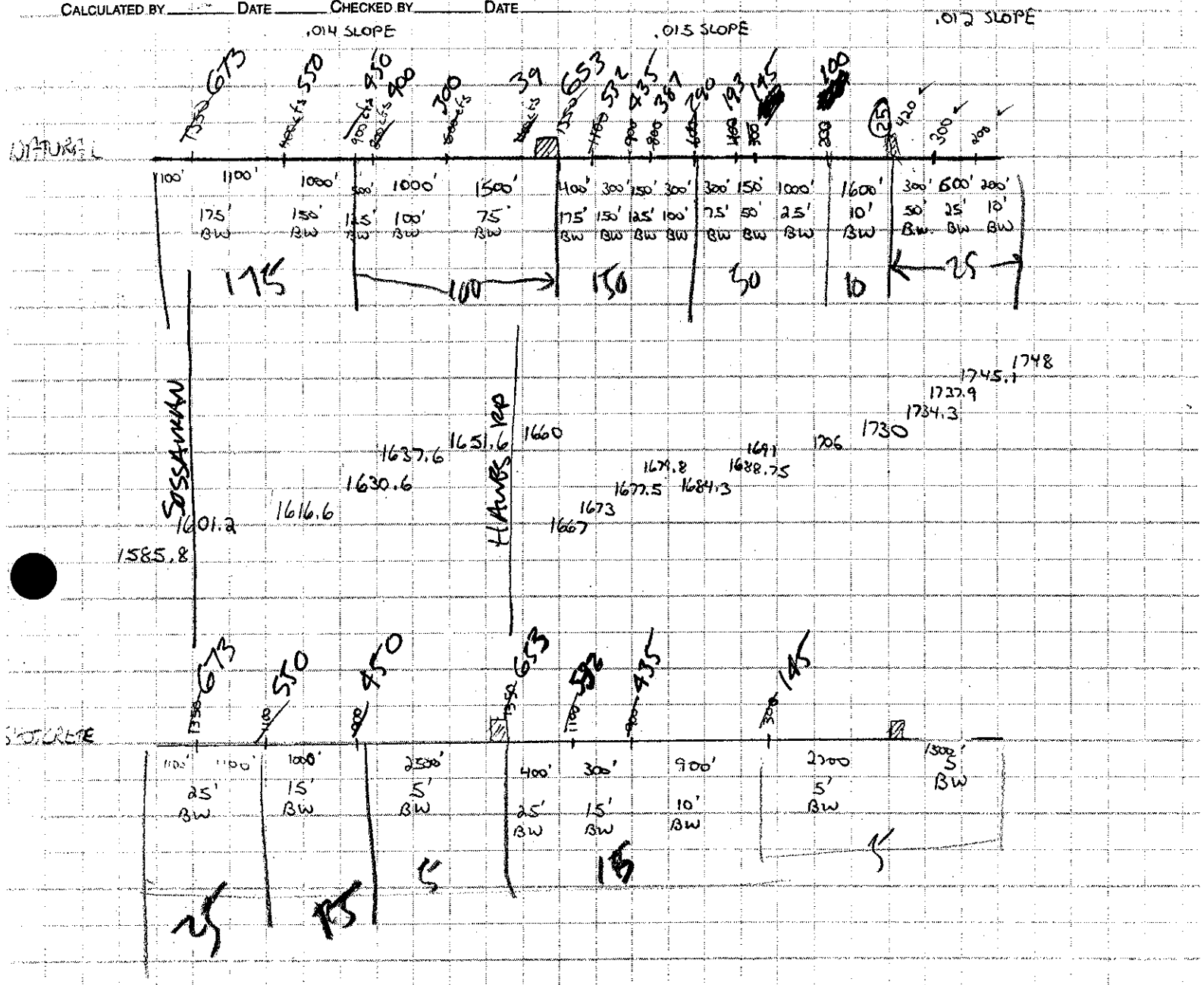
WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK — McKELLIPS OPTION "B"

PROJECT NO. 00-74 SHEET NO. _____ OF _____

CALCULATED BY _____ DATE _____ CHECKED BY _____ DATE _____



MASTER SHEET -- CHANNELS

*****Do not add, delete, or move lines or columns*****

	Preliminary Plan Section No.	Area	Priority	Sheet No.	I.D.	AVG HEC-1 Flow I.D.	OLD BW	Design Q100 (cfs)	Comp. Capacity (cfs)	Downstream Invert Elevation (ft)	Upstream Invert Elevation (ft)	Length (ft.)	Computed Invert. Slope (ft./ft.)	Design Invert Slope (ft./ft.)	No. of Drops	Vertical Drop (ft.)	Material Type	Manning's "n" Value	Bottom Width, W (ft.)	Depth of Flow(ft.)	Sideslope (H:1) Left (HL)	Sideslope (H:1) Right (HR)	Area (sf.)	Perimeter (ft.)	Flow Top Width (ft)	Hydraulic Depth (ft)	Froude Number	Type of Flow	Velocity (fps)	Freeboard (ft.)	Design Depth (ft)	Channel Topwidth (ft)
McKellips Road Option B					1a		10	200	200	1741.1	1744.0	200	0.0145	0.0030	1	2.3	e	0.0250	8.0	2.5	4	4	45.3	28.7	28.1	1.6	0.61	Sub	4.4	1.0	3.5	36.1
W/Pass Mountain Diversion			133		1b		25	300	299	1733.9	1741.1	600	0.0120	0.0030	2	2.7	e	0.0250	8.0	3.0	4	4	61.0	33.0	32.2	1.9	0.63	Sub	4.9	1.0	4.0	40.2
and McDowell Rd Option					1c		50	420	419	1730.3	1733.9	300	0.0120	0.0030	1	2.7	e	0.0250	24.0	2.5	4	4	84.1	44.5	43.8	1.9	0.63	Sub	5.0	1.0	3.5	51.8
	Earthen Channel		8		2a		10	100	100	1702.0	1726.0	1600	0.0150	0.0030	8	2.4	e	0.0250	8.0	1.8	4	4	27.4	22.8	22.4	1.2	0.59	Sub	3.7	1.0	2.8	30.4
					2b		25	145	145	1687.0	1702.0	1000	0.0150	0.0030	6	2.0	e	0.0250	8.0	2.2	4	4	35.7	25.7	25.2	1.4	0.60	Sub	4.0	1.0	3.2	33.2
			8		2c		50	193	193	1684.7	1687.0	150	0.0153	0.0030	1	1.8	e	0.0250	8.0	2.5	4	4	44.2	28.4	27.8	1.6	0.61	Sub	4.4	1.0	3.5	35.8
					2d		75	290	290	1680.3	1684.8	300	0.0150	0.0030	2	1.8	e	0.0250	8.0	3.0	4	4	59.7	32.7	31.9	1.9	0.63	Sub	4.9	1.0	4.0	39.9
					2e		100	387	386	1675.8	1680.3	300	0.0150	0.0030	2	1.8	e	0.0250	19.0	2.6	4	4	77.2	40.6	40.0	1.9	0.63	Sub	5.0	1.0	3.6	48.0
					2f		125	435	435	1673.5	1675.8	150	0.0153	0.0030	1	1.8	e	0.0250	26.0	2.4	4	4	87.3	46.1	45.5	1.9	0.63	Sub	5.0	1.0	3.4	53.5
			33.7		2g		150	532	530	1669.0	1673.5	300	0.0150	0.0030	2	1.8	e	0.0250	37.0	2.3	4	4	106.3	56.0	55.4	1.9	0.64	Sub	5.0	1.0	3.3	63.4
					2h		175	653	653	1663.0	1669.0	400	0.0150	0.0030	2	2.4	e	0.0250	51.0	2.2	4	4	130.9	69.1	68.5	1.9	0.64	Sub	5.0	1.0	3.2	76.5
					3a		75	300	299	1647.6	1656.0	600	0.0140	0.0030	3	2.2	e	0.0250	8.0	3.0	4	4	61.0	33.0	32.2	1.9	0.63	Sub	4.9	1.0	4.0	40.2
			18.7		3b		100	400	399	1633.6	1647.6	1000	0.0140	0.0030	5	2.2	e	0.0250	21.0	2.6	4	4	80.0	42.1	41.5	1.9	0.63	Sub	5.0	1.0	3.6	49.5
					3c		125	450	449	1626.6	1633.6	500	0.0140	0.0030	3	1.8	e	0.0250	27.0	2.4	4	4	89.7	47.1	46.5	1.9	0.63	Sub	5.0	1.0	3.4	54.5
					3d		150	550	552	1612.6	1626.6	1000	0.0140	0.0030	5	2.2	e	0.0250	39.0	2.3	4	4	110.3	57.9	57.3	1.9	0.64	Sub	5.0	1.0	3.3	65.3
			26		3e		175	673	671	1581.8	1612.6	2200	0.0140	0.0030	11	2.2	e	0.0250	53.0	2.2	4	4	134.5	71.0	70.4	1.9	0.64	Sub	5.0	1.0	3.2	78.4
	Shotcrete Channel				1		5	420	419	1730.4	1744.0	1100	0.0124	0.0124	0	0.0	s	0.0170	8.0	2.4	2	2	30.9	18.8	17.6	1.8	1.81	Sup	13.6	2.0	4.4	25.6
			8		2a		5	145	145	1687.0	1726.0	2600	0.0150	0.0150	0	0.0	s	0.0170	8.0	1.3	2	2	13.6	13.8	13.2	1.0	1.84	Sup	10.6	2.0	3.3	21.2
					2b		10	435	434	1673.5	1687.0	900	0.0150	0.0080	3	2.1	s	0.0170	8.0	2.8	2	2	37.1	20.3	19.0	2.0	1.47	Sup	11.7	1.2	4.0	23.9
			8		2c		15	532	531	1669.0	1673.5	300	0.0150	0.0080	1	2.1	s	0.0170	8.0	3.1	2	2	43.0	21.6	20.2	2.1	1.49	Sup	12.4	2.0	5.1	28.2
					2d		25	653	651	1663.0	1669.0	400	0.0150	0.0080	1	2.8	s	0.0170	8.0	3.4	2	2	49.9	23.1	21.5	2.3	1.51	Sup	13.1	2.0	5.4	29.5
					3a		5	450	450	1626.6	1656.0	3000	0.0098	0.0080	2	2.7	s	0.0170	8.0	2.8	2	2	38.1	20.5	19.2	2.0	1.48	Sup	11.8	2.0	4.8	27.2
			8		3b		15	550	549	1612.6	1626.6	1000	0.0140	0.0080	3	2.0	s	0.0170	8.0	3.1	2	2	44.0	21.9	20.4	2.2	1.50	Sup	12.5	2.0	5.1	28.4
					3c		25	673	675	1581.8	1612.6	2200	0.0140	0.0080	6	2.2	s	0.0170	8.0	3.4	2	2	51.2	23.4	21.8	2.4	1.51	Sup	13.2	2.0	5.4	29.8

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McKellips Road Alignment with Pass Mountain Diversion No Channel Across State Land
Level I Concept Analysis Opinion of Probable Costs
Option 1B - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	21,124	$84,495
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163	SF	1,971	$321,248
4	Splitter Structures	$60,000	EA	2	$120,000
5	Culverts	$310	CY	154	$47,740
6	Basin Excavation	$4.00	CY	262,167	$1,048,667
		SUBTOTAL MAJOR ELEMENTS			$1,622,150
		CONTINGENCIES:			
		Construction		35%	$567,753
		Construction Admin		6%	$97,329
		TOTAL MAJOR ELEMENTS			**$2,287,232**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	871,200	$958,320
2	Fence	$12	LF	10,600	$127,200
3	Utility Relocations	$5,000	EA	0	$0
		SUBTOTAL ADDITIONAL ELEMENTS			$1,085,520
		CONTINGENCIES:			
		Construction		35%	$379,932
		Construction Admin		6%	$65,131
		TOTAL ADDITIONAL ELEMENTS			**$1,530,583**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$21,980	AC	6.65	$146,167
2	Basin Land Acquisition	$12,330	AC	19.09	$235,380
		SUBTOTAL LAND ACQUISITION			$381,547
		CONTINGENCIES :		25%	$95,387
		TOTAL LAND ACQUISITION			**$476,933**
				TOTAL	***$4,294,748***

Spook Hill ADMS Update July 24, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

McKellips Road Alignment with Pass Mountain Diversion No Channel Across State Land
Level I Concept Analysis Opinion of Probable Costs
Option 2B - Concrete Channel

MAJOR ELEMENTS:

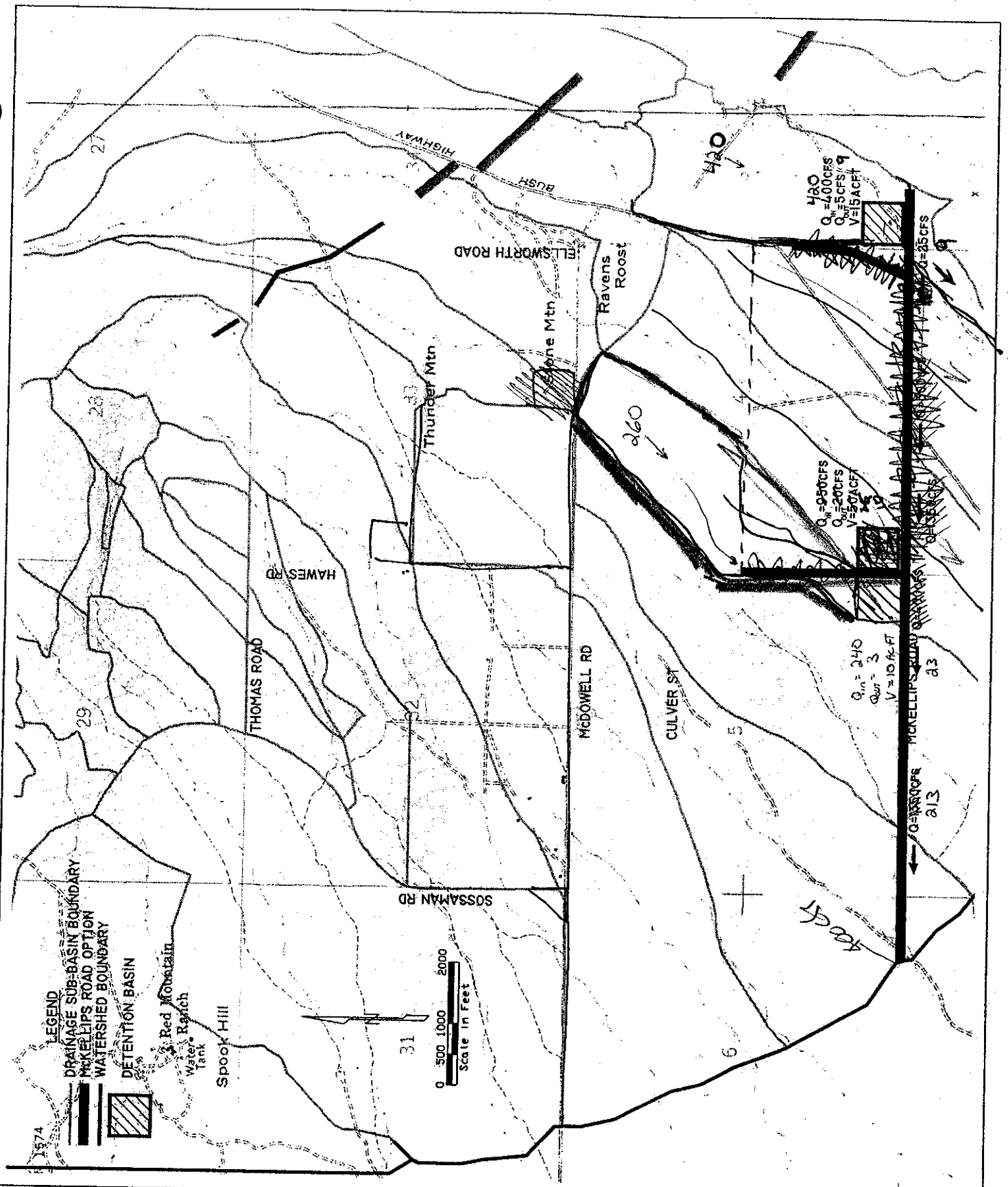
ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	16,637	$66,548
2	Concrete Channel Lining	$310	CY	3,251	$1,007,876
3	Drop Structures	$163	SF	514	$83,752
4	Splitter Structures	$60,000	EA	2	$120,000
5	Culverts	$310	CY	154	$47,740
6	Basin Excavation	$4	CY	262,167	$1,048,667
		SUBTOTAL MAJOR ELEMENTS			$2,374,582
		CONTINGENCIES:			
		Construction		35%	$831,104
		Construction Admin		6%	$142,475
		TOTAL MAJOR ELEMENTS			**$3,348,160**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	871,200	$958,320
2	Fence	$12	LF	12,400	$148,800
3	Utility Relocations	$5,000	EA	0	$0
		SUBTOTAL ADDITIONAL ELEMENTS			$1,107,120
		CONTINGENCIES:			
		Construction		35%	$387,492
		Construction Admin		6%	$66,427
		TOTAL ADDITIONAL ELEMENTS			**$1,561,039**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$21,950	AC	5.02	$110,189
2	Basin Land Acquisition	$12,000	AC	20.00	$240,000
		SUBTOTAL LAND ACQUISITION			$350,189
		CONTINGENCIES :		25%	$87,547
		TOTAL LAND ACQUISITION			**$437,736**
				TOTAL	***$5,346,936***



SPOOK HILL A.D.M.P. UPDATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

McKELLIPS ROAD Spook Hill OPTION 2B-b

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

	BY	DATE
DESIGNED	R. HINER	08/00
DRAWN	S. CAMPBELL	08/00
CHECKED	A. PATEL	08/00

DRAWING NO. spkhl-mckellip2B-b.dwg

SHEET 1 OF 1

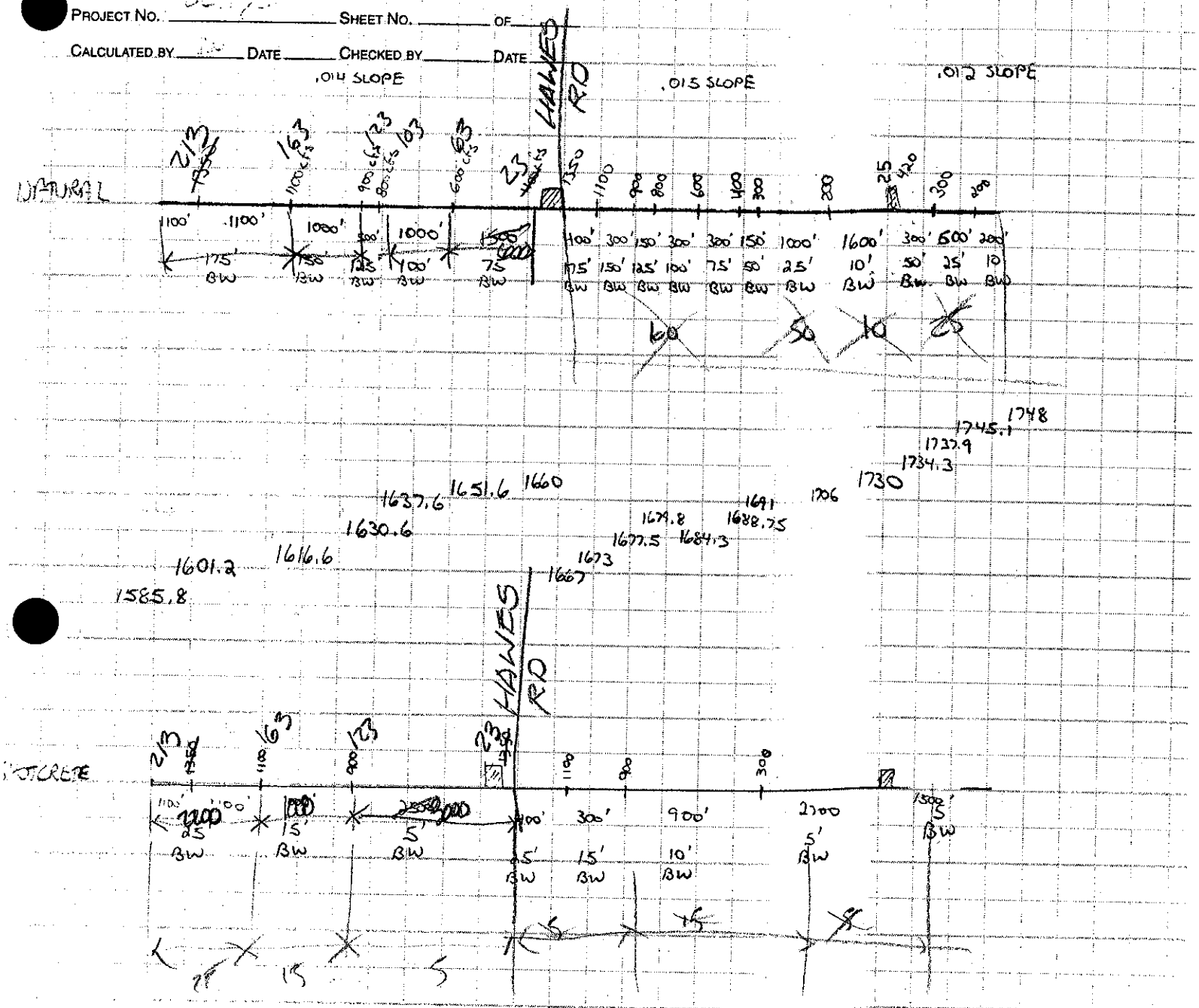
WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK — McKELLIPS OPTION "B"

PROJECT NO. _____ SHEET NO. _____ OF _____

CALCULATED BY _____ DATE _____ CHECKED BY _____ DATE _____



Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)		
8' B/W	Channel	219-49-2H	P	75.22	1500	23.4	0.81	1.07%	$376,100	$4,029		
8' B/W	Channel	219-31-45	P	9.56	600	23.4	0.32	3.37%	$191,140	$6,446		
	Channel	219-31-44	P	7.51	456.5	23.4	0.25	3.27%	$150,120	$4,905		
	Channel	219-31-67	P	171.26	600.8	23.4	0.32	0.19%	$85,632	$161		
	Channel	219-31-43	P	7.99	719.3	23.4	0.39	4.84%	$159,720	$7,723		
	Channel	219-31-42	P	12.82	320.4	23.4	0.17	1.36%	$256,380	$3,475		
8' B/W	Channel	219-31-42	P	12.82	317.9	27.2	0.20	1.55%	$85,632	$1,326		
	Channel	219-31-67	P	171.26	1865.1	27.2	1.16	0.68%	$85,632	$582		
	Channel	219-31-40	P	12.10	670.3	27.2	0.42	3.46%	$242,040	$8,374		
8' B/W	Channel	219-26-7A	P	36.88	1280	27.2	0.80	2.17%	$700,500	$15,182		
	Channel	219-26-6	P	38.03	1320	27.2	0.82	2.17%	$722,500	$15,659		
8' B/W	Channel	219-26-4B	P	38.03	1320	28.4	0.86	2.26%	$668,000	$15,117		
8' B/W	Channel	219-26-3H	P	11.53	330.25	29.8	0.23	1.96%	$219,500	$4,301		
	Channel	219-26-107	P	2.38	330.25	29.8	0.23	9.48%	$145,000	$13,741		
	Channel	219-26-96E	P	3.77	620	29.8	0.42	11.24%	$98,000	$11,020		
	Channel	219-25-11R	P	14.98	800	29.8	0.55	3.65%	$299,540	$10,946	$122,989	
	Basin	219-49-2H	P	75.22	660	660	10.00	13.29%	$376,100	$50,000	$50,000	
	Basin	219-26-7A	P	36.88	660	660	10.00	27.12%	$700,500	$189,951	$189,951	
						Total (ac)	27.95				$362,940	$12,987.51
						Basins	20.00				$239,951	$11,997.53
						Channels	7.95				$122,989	$15,479.50

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)		
25' B/W	Channel	219-49-2H	P	75.22	1500	42.7	1.47	1.95%	$376,100	$7,352		
10'B/W	Channel	219-31-45	P	9.56	600	30.4	0.42	4.38%	$191,140	$8,375		
	Channel	219-31-44	P	7.51	456.5	30.4	0.32	4.24%	$150,120	$6,372		
	Channel	219-31-67	P	171.26	600.8	30.4	0.42	0.24%	$85,632	$210		
50' B/W	Channel	219-31-43	P	7.99	719.3	36.3	0.60	7.51%	$159,720	$11,988		
	Channel	219-31-42	P	12.82	641.3	36.3	0.53	4.17%	$256,380	$10,688		
150' B/W	Channel	219-31-67	P	171.26	1865.1	60.4	2.59	1.51%	$85,632	$1,293		
	Channel	219-31-40	P	12.10	670.3	60.4	0.93	7.68%	$242,040	$18,589		
100' B/W	Channel	219-26-7A	P	36.88	1280	48.1	1.41	3.83%	$700,500	$26,848		
	Channel	219-26-6	P	38.03	1320	48.1	1.46	3.83%	$722,500	$27,691		
	Channel	219-26-4B	P	38.03	400	48.1	0.44	1.16%	$668,000	$7,758		
175' B/W	Channel	219-26-4B	P	38.03	920	71.9	1.52	3.99%	$668,000	$26,673		
	Channel	219-26-3H	P	11.53	330.25	71.9	0.55	4.73%	$219,500	$10,377		
	Channel	219-26-107	P	2.38	330.25	71.9	0.55	22.87%	$145,000	$33,155		
	Channel	219-26-96E	P	3.77	620	71.9	1.02	27.13%	$98,000	$26,588		
	Channel	219-25-11R	P	14.98	800	71.9	1.32	8.82%	$299,540	$26,410	$250,367	
	Basin	219-49-2H	P	75.22	660	600	9.09	12.09%	$376,100	$45,455	$45,455	
	Basin	219-26-7A	P	36.88	660	660	10.00	27.12%	$700,500	$189,951	$189,951	
						Total (ac)	34.63				$485,772	$14,026.44
						Basins	19.09				$235,405	$12,330.75
						Channels	15.54				$250,367	$16,109.38

Table 1

Culver Street Alignment

Level I Concept Analysis Option Opinion of Probable Costs

Option No.	Alternate Description	Opinion of Probable Costs Including Contingencies			Total Cost
		Major Elements	Additional Elements	Land Acquisitions Basins and R/W	
1A - Earthen Channel	Trapezoidal Earthen Channel with Vertical Drops. Basin at Hawes Rd. One Basin.	$10,505,909	$4,277,673	$4,992,409	**$19,775,991**
2A - Concrete Channel	Trapezoidal Concrete Channel with Vertical Drops. Basin at Hawes Rd. One Basin.	$9,591,931	$1,132,456	$1,317,969	**$12,042,356**
1B - Concrete Pipe	Concrete Pipe Along Entire Alignment. Basin at Hawes Rd. One Basin.	$3,596,734	$675,616	$237,375	**$4,509,724**

Spook Hill ADMS Update August 7, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

Culver Street Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 2A - Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	271,497	$1,085,989
2	Concrete Channel Lining	$310	CY	0	$0
3	Drop Structures	$163.00	SF	33,421	$5,447,650
4	Splitter Structures	$60,000	EA	1	$60,000
5	Culverts	$310	CY	736	$228,160
6	Basin Excavation	$4.00	CY	157,300	$629,200
		SUBTOTAL MAJOR ELEMENTS			$7,450,999
		CONTINGENCIES:			
		Construction		35%	$2,607,850
		Construction Admin		6%	$447,060
		TOTAL MAJOR ELEMENTS			**$10,505,909**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	2,463,464	$2,709,810
	Fence	$12	LF	27,000	$324,000
	Utility Relocations	$5,000	EA	0	$0
		SUBTOTAL ADDITIONAL ELEMENTS			$3,033,810
		CONTINGENCIES:			
		Construction		35%	$1,061,834
		Construction Admin		6%	$182,029
		TOTAL ADDITIONAL ELEMENTS			**$4,277,673**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$127,225	AC	29.9	$3,804,028
2	Basin Land Acquisition	$18,990	AC	10.0	$189,900
		SUBTOTAL LAND ACQUISITION			$3,993,928
		CONTINGENCIES :		25%	$998,482
		TOTAL LAND ACQUISITION			**$4,992,409**
				TOTAL	***$19,775,991***

Spook Hill ADMS Update July 19, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

Culver Street Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 2A - Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	118,374	$473,497
2	Concrete Channel Lining	$310	CY	13,998	$4,339,385
3	Drop Structures	$163.00	SF	6,580	$1,072,546
4	Splitter Structures	$60,000	EA	1	$60,000
5	Culverts	$310	CY	736	$228,160
6	Basin Excavation	$4.00	CY	157,300	$629,200
		SUBTOTAL MAJOR ELEMENTS			$6,802,788
		CONTINGENCIES:			
		Construction		35%	$2,380,976
		Construction Admin		6%	$408,167
		TOTAL MAJOR ELEMENTS			**$9,591,931**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	435,600	$479,160
	Fence	$12.00	LF	27,000	$324,000
	Utility Relocations	$5,000	EA	0	$0
		SUBTOTAL ADDITIONAL ELEMENTS			$803,160
		CONTINGENCIES:			
		Construction		35%	$281,106
		Construction Admin		6%	$48,190
		TOTAL ADDITIONAL ELEMENTS			**$1,132,456**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$57,250	AC	15.1	$864,475
2	Basin Land Acquisition	$18,990	AC	10.0	$189,900
		SUBTOTAL LAND ACQUISITION			$1,054,375
		CONTINGENCIES :		25%	$263,594
		TOTAL LAND ACQUISITION			**$1,317,969**
				TOTAL	***$12,042,356***

Spook Hill ADMS Update July 19, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

Culver Street Alignment
Level I Concept Analysis Opinion of Probable Costs
Option 1B - Pipe

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	48" RGRCP	$136	LF	450	$61,200
2	60" RGRCP	$184	LF	250	$46,000
3	72" RGRCP	$240	LF	500	$120,000
4	84" RGRCP	$300	LF	2,370	$711,000
5	90" RGRCP	$335	LF	1,935	$648,225
6	96" RGRCP	$390	LF	255	$99,450
7	108" RGRCP	$490	LF	1,500	$735,000
8	Manhole MAG 520/522	$5,000	EA	14	$70,000
9	Splitter Structures	$60,000	EA	1	$60,000
			SUBTOTAL MAJOR ELEMENTS		$2,550,875
		CONTINGENCIES:			
		Construction		35%	$892,806
		Construction Admin		6%	$153,053
			TOTAL MAJOR ELEMENTS		**$3,596,734**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	EA	435,600	$479,160
2	Fence	$12	LF	0	$0
3	Utility Relocations	$5,000	EA	0	$0
			SUBTOTAL ADDITIONAL ELEMENTS		$479,160
		CONTINGENCIES:			
		Construction		35%	$167,706
		Construction Admin		6%	$28,750
			TOTAL ADDITIONAL ELEMENTS		**$675,616**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$43,560	AC	0.00	$0
2	Basin Land Acquisition	$18,990	AC	10.00	$189,900
			SUBTOTAL LAND ACQUISITION		$189,900
		CONTINGENCIES :		25%	$47,475
			TOTAL LAND ACQUISITION		**$237,375**
				TOTAL	***$4,509,724***

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 1 OF 9

CALCULATED BY MW DATE 6/21 CHECKED BY _____ DATE _____

CULVER ST. NATURAL CHANNEL OPTION REACH 1A

GIVEN: INITIAL Q = 788 cfs FROM $\frac{378c+370c}{2}$ of HEC-1 FILE S24CE16.DAT

USNG = 1820 DSNG = 1770 LENGTH = 1800' Q = 788

S = .028, n = .03 SS 4:1 BW = 125'

V = 7.3 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.41 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL d = .8'

ADD DROPS

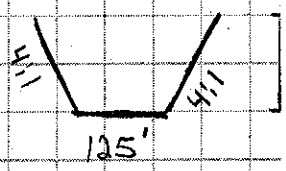
.028 SLOPE ⇒ 4

.003 SLOPE ⇒ Δ

DIFFER

USING .003 SLOP

d = 1.64'



CULVER ST.

OPTION

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 2 OF 9

CALCULATED BY MW DATE 6/21 CHECKED BY _____ DATE _____

CULVER ST. NATURAL CHANNEL OPTION CONT.

REACH 1B GIVEN: Q = 819 cfs USNG = 1770 LENGTH = 2710'
DSNG = 1720

S = .019 n = .03 SS 4:1 BW = 12.5'

V = 6.6 fps > 4 fps ∴ WILL NOT WORK

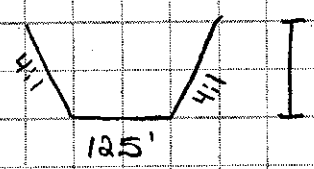
F_n = 1.19 > .86 ∴ WILL NOT WORK FLOW SUPER CRITICAL

ADD DROPS

.019 SLOPE ⇒ ΔEL = 51.5'
.003 SLOPE ⇒ ΔEL = 8.1

DIFFERENCE 43.4' USE 22 DROPS ; 21 @ 2' AND 1 @ 1.4' = 43.4'

USING .003 SLOPE ⇒ F_n = .52 < .86 OK ; V = 3.7 fps < 4 fps O.K. ; d = 1.7'



2.7' CHANNEL 4.7' @ DROPS

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 3 OF 9

CALCULATED BY MW DATE 6/21 CHECKED BY _____ DATE _____

CULVER ST NATURAL CHANNEL OPTION CONT.

REACH 2A GIVEN: Q = 300 cfs USNG = 1730 LENGTH = 760'
DSNG = 1714

S = .021 n = .03 SS 4:1 B.W. = 25'

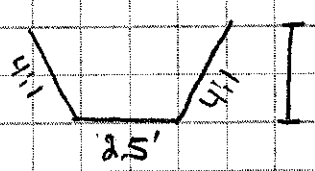
V = 7.6 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.28 > .86 ∴ WILL NOT WORK FLOW SUPER CRITICAL

ADD DROPS

.021 SLOPE ⇒ ΔEL = 16'
.003 SLOPE ⇒ ΔEL = 2.3'
DIFFERENCE 13.7' USE 7 DROPS ; 6 @ 2' AND 1 @ 1.7'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K. ; V = 3.9 fps < 4 fps O.K. ; d = 2.3



3.3' CHANNEL 5.3' @ DROPS

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PROJECT SPOOK HILL

PROJECT NO. 97989 SHEET NO. 4 OF 9

CALCULATED BY MW DATE 6/21 CHECKED BY _____ DATE _____

CULVER ST NATURAL CHANNEL OPTION CONT.

REACH 2B GIVEN: Q = 400 cfs USNG = 1714' LENGTH = 380'
DSNG = 1706'

S = .021 n = .03 SS 4:1 B.W. = 50'

V = 7.1 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.26 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

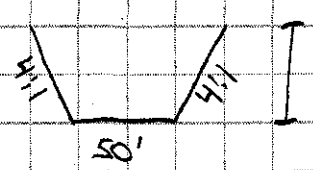
ADD DROPS

.021 SLOPE ⇒ ΔEL = 8'

.003 SLOPE ⇒ ΔEL = 1.1'

DIFFERENCE 6.9' USE 4 DROPS ; 3 @ 2' AND 1 @ .9'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K. ; V = 3.8 fps < 4 fps O.K. ; d = 1.9'



2.9' CHANNEL 4.9' @ DROPS

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PROJECT SPOOK HILL

PROJECT NO. 99489 SHEET NO. 5 OF 9

CALCULATED BY MW DATE 6/21 CHECKED BY _____ DATE _____

CULVER ST. NATURAL CHANNEL OPTION CONT.

REACH 2C GIVEN: Q = 600 cfs USNG = 1706 LENGTH = 760'
DSNG = 1690

S = .021 n = .03 SS 4:1 B.W. = 75'

V = 7.2 fps > 4 fps ∴ WILL NOT WORK

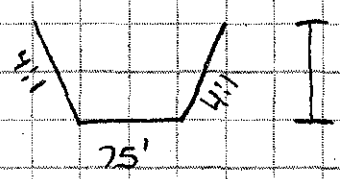
F_n = 1.26 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

ADD DROPS

.021 SLOPE ⇒ ΔEL = 16'
.003 SLOPE ⇒ ΔEL = 2.3'

DIFFERENCE 13.7' USE 7 DROPS ; 6 @ 2' AND 1 @ 1.7'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K. ; V = 3.9 fps < 4 fps O.K. ; d = 1.9'



2.9' CHANNEL 4.9' @ DROPS

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 6 OF 9

CALCULATED BY MW DATE 6/21 CHECKED BY _____ DATE _____

CULVER ST NATURAL CHANNEL OPTION CONT.

REACH 2d GIVEN: Q = 705 cfs USNG = 1690 LENGTH = 800'
DSNG = 1677.2

S = .016 n = .03 SS 4:1 B.W. = 100'

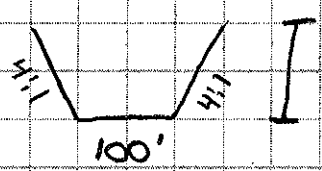
V = 6.4 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.11 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

ADD DROPS

[illegible] SLOPE ⇒ ΔEL = 12.8'
.003 SLOPE ⇒ ΔEL = 2.4'
DIFFERENCE 10.4 USE 7 DROPS; 4 @ 2' AND 1 @ 2.4' = 10.4'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.8 fps < 4 fps O.K.; d = 1.8'



2.8' CHANNEL 4.8' @ DROPS

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 7 OF 9

CALCULATED BY MW DATE 6/21 CHECKED BY _____ DATE _____

CULVER ST NATURAL CHANNEL OPTION CONT.

REACH 2E GIVEN: Q = 900 cfs USNG = 1677.2 LENGTH = 1500'
DSNG = 1653.2

S = .016 n = .03 S.S. 4:1 B.W. = 125'

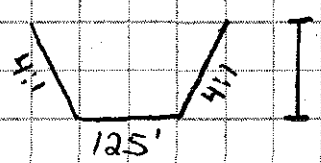
V = 6.4 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.11 > .86 ∴ WILL NOT WORK FLOW SUPERCRITICAL

ADD DROPS

.16 SLOPE ⇒ ΔEL = 24'
.003 SLOPE ⇒ ΔEL = 4.5'
DIFFERENCE 19.5' USE 8 DROPS ; 7 @ 2.5' AND 1 @ 2' = 19.5

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K. ; V = 3.8 fps < 4 fps O.K. ; d = 1.8'



2.8' CHANNEL 4.8' @ DROPS

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 8 OF 9

CALCULATED BY MW DATE 6/21 CHECKED BY _____ DATE _____

CULVER ST. NATURAL CHANNEL OPTION CONT.

REACH 2F GIVEN: Q = 1100 cfs USNG 1653.2 LENGTH = 1500'
DSNG 1629.2

S = .016 n = .03 S.S. 4:1 B.W. = 150'

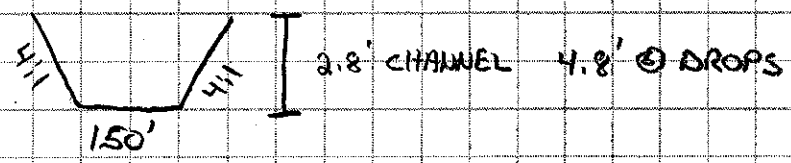
V = 6.5 fps > 4 fps ∴ WILL NOT WORK

F_n = 1.11 > .86 ∴ WILL NOT WORK FLOW SUPER CRITICAL

ADD DROPS

.6 SLOPE ⇒ ΔEL = 24.0'
.003 SLOPE ⇒ ΔEL = 4.5'
DIFFERENCE 19.5' USE 8 DROPS; 7 @ 2.5' AND 1 @ 2' = 19.5'

USING .003 SLOPE ⇒ F_n = .52 < .86 O.K.; V = 3.9 fps < 4 fps O.K.; d = 1.8'



WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 9 OF 9

CALCULATED BY MW DATE 6/21 CHECKED BY _____ DATE _____

CULVER ST NATURAL CHANNEL OPTION CONT.

REACH 4 + 5 GIVEN: $Q_4 = 1300$ cfs USNG$_4$ = 1629.2 LENGTH$_4$ = 1290

DSNG$_4$ = 1618.9

$Q_5 = 1300$ cfs USNG$_5$ = 1618.9 LENGTH$_5$ = 2000'

DSNG$_5$ = 1565.0

$S_4 = .008$ $n_4 = .03$ SS 4:1 B.W.$_4$ = 175' $S_5 = .027$ $n = 175'$ SS 4:1 B.W. = 175'

$V_4 = 5.3$ fps > 4 fps ∴ WILL NOT WORK V = 7.7 > 4 fps ∴ WILL NOT WORK

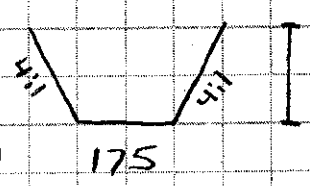
$F_n = .82 \approx .86$ ∴ WILL NOT WORK $F_n = 1.4 > .86$ ∴ WILL NOT WORK

ADD DROPS TO BOTH REACHES

.008 SLOPE$_4$ ⇒ ΔEL = 10.3'
.003 SLOPE ⇒ ΔEL = 3.9'
DIFFERENCE 6.4' USE 3 DROPS; 2 @ 2' AND 1 @ 2.4' = 6.4'

.027 SLOPE$_5$ ⇒ ΔEL = 53.9'
.003 SLOPE ⇒ ΔEL = 6.0'
DIFFERENCE 47.9 USE 16 DROPS; 15 @ 3' AND 1 @ 2.9' = 47.9'

USING .003 SLOPE ⇒ $F_n = .52 < .86$ O.K.; V = 3.9 < 4 fps O.K.; d = 1.9'



2.9' CHANNEL 4.9' @ DROPS

Natural Channel Reach 1a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. Natural R1a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	125.00	ft
Discharge	788.00	cfs

Results		
Depth	1.64	ft
Flow Area	216.0	ft²
Wetted Perimeter	138.54	ft
Top Width	138.13	ft
Critical Depth	1.06	ft
Critical Slope	0.013033	ft/ft
Velocity	3.65	ft/s
Velocity Head	0.21	ft
Specific Energy	1.85	ft
Froude Number	0.51	
Flow Type	Subcritical	

Natural Channel Reach 1b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. Natural R1b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	125.00	ft
Discharge	819.00	cfs

Results		
Depth	1.68	ft
Flow Area	221.3	ft²
Wetted Perimeter	138.85	ft
Top Width	138.44	ft
Critical Depth	1.09	ft
Critical Slope	0.012927	ft/ft
Velocity	3.70	ft/s
Velocity Head	0.21	ft
Specific Energy	1.89	ft
Froude Number	0.52	
Flow Type	Subcritical	

Natural Channel Reach 2a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. Natural Reach 2a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	25.00	ft
Discharge	300.00	cfs

Results		
Depth	2.24	ft
Flow Area	76.1	ft²
Wetted Perimeter	43.48	ft
Top Width	42.93	ft
Critical Depth	1.51	ft
Critical Slope	0.012284	ft/ft
Velocity	3.94	ft/s
Velocity Head	0.24	ft
Specific Energy	2.48	ft
Froude Number	0.52	
Flow Type	Subcritical	

Natural Channel Reach 2b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. Natural Reach 2b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	50.00	ft
Discharge	400.00	cfs

Results		
Depth	1.85	ft
Flow Area	106.4	ft²
Wetted Perimeter	65.29	ft
Top Width	64.83	ft
Critical Depth	1.22	ft
Critical Slope	0.012724	ft/ft
Velocity	3.76	ft/s
Velocity Head	0.22	ft
Specific Energy	2.07	ft
Froude Number	0.52	
Flow Type	Subcritical	

Natural Channel Reach 2c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. Natural Reach 2c
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	75.00	ft
Discharge	600.00	cfs

Results		
Depth	1.87	ft
Flow Area	154.7	ft²
Wetted Perimeter	90.46	ft
Top Width	90.00	ft
Critical Depth	1.23	ft
Critical Slope	0.012547	ft/ft
Velocity	3.88	ft/s
Velocity Head	0.23	ft
Specific Energy	2.11	ft
Froude Number	0.52	
Flow Type	Subcritical	

Natural Channel Reach 2d
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. Natural Reach 2d
Flow Element	*Trapezoidal Channel*
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	100.00	ft
Discharge	705.00	cfs

Results		
Depth	1.75	ft
Flow Area	187.2	ft²
Wetted Perimeter	114.43	ft
Top Width	114.00	ft
Critical Depth	1.14	ft
Critical Slope	0.012784	ft/ft
Velocity	3.77	ft/s
Velocity Head	0.22	ft
Specific Energy	1.97	ft
Froude Number	0.52	
Flow Type	Subcritical	

Natural Channel Reach 2e
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. Natural Reach 2e
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	125.00	ft
Discharge	900.00	cfs

Results		
Depth	1.78	ft
Flow Area	234.7	ft²
Wetted Perimeter	139.65	ft
Top Width	139.21	ft
Critical Depth	1.16	ft
Critical Slope	0.012673	ft/ft
Velocity	3.83	ft/s
Velocity Head	0.23	ft
Specific Energy	2.01	ft
Froude Number	0.52	
Flow Type	Subcritical	

Natural Channel Reach 2f
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. Natural Reach 2f
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	150.00	ft
Discharge	1,100.00	cfs

Results		
Depth	1.80	ft
Flow Area	282.9	ft^2
Wetted Perimeter	164.84	ft
Top Width	164.40	ft
Critical Depth	1.17	ft
Critical Slope	0.012586	ft/ft
Velocity	3.89	ft/s
Velocity Head	0.23	ft
Specific Energy	2.03	ft
Froude Number	0.52	
Flow Type	Subcritical	

Natural Channel Reach 4
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. Natural RH
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	175.00	ft
Discharge	1,300.00	cfs

Results		
Depth	1.82	ft
Flow Area	331.0	ft²
Wetted Perimeter	189.97	ft
Top Width	189.53	ft
Critical Depth	1.19	ft
Critical Slope	0.012524	ft/ft
Velocity	3.93	ft/s
Velocity Head	0.24	ft
Specific Energy	2.06	ft
Froude Number	0.52	
Flow Type	Subcritical	

Natural Channel Reach 5
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. Natural R5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	175.00	ft
Discharge	1,300.00	cfs

Results		
Depth	1.82	ft
Flow Area	331.0	ft^2
Wetted Perimeter	189.97	ft
Top Width	189.53	ft
Critical Depth	1.19	ft
Critical Slope	0.012524	ft/ft
Velocity	3.93	ft/s
Velocity Head	0.24	ft
Specific Energy	2.06	ft
Froude Number	0.52	
Flow Type	Subcritical	

WOOD/PATEL

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SPOOK HILL

PROJECT CULVER ST CHANNEL OPTION

PROJECT NO. 99989 SHEET NO. 1 OF 9

CALCULATED BY MW DATE 6/20 CHECKED BY _____ DATE _____

CULVER OPT. REACH 1A

GIVEN: BEGINNING Q = 788 cfs FROM $\frac{3280+3300}{2}$ OF HEC-1 RUN. FILE S24CE16.DAT

USNG = 1820 DSNG 1770 LENGTH = 1800'

CONCRETE CHANNEL ASSUME SHOTCRETE THICKNESS OF 6"

S = .028 ft/ft n = .017 2:1 15' B.W.

V = 20.4 fps < 15 fps OK

F_n = 2.74 SUPER CRITICAL > 2.0 ∴ WILL NOT WORK

ADD DROPS

.028 SLOPE ⇒ ΔEL = 50'

.01 SLOPE ⇒ ΔEL = 17.9'

DIFFERENCE 32.1' USE 13 DROPS ; 12 @ 2.5' AND 1 @ 2.1' = 32.1'

USING .01 SLOPE ⇒ F_n = 1.70 < 2.0 O.K ; V = 14.3 fps < 15 fps O.K.

d = 2.8'

4.8' CHANNEL 5.8' @ DROPS

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PROJECT CULVER ST CHANNEL OPTION

PROJECT NO. 99989 SHEET NO. 2 OF 9

CALCULATED BY MW DATE 6/20 CHECKED BY _____ DATE _____

CULVER OPTION CONT. REACH 1B

CONCRETE CHANNEL ASSUME SHOTCRETE THICKNESS OF 6" Q = 819 cfs

S = .019 n = .017 2:1 40' B.W. USNG = 1770 LENGTH = 2710
DSNG = 1720

V = 14.1 fps < 15 fps OK

F_n = 2.19 > 2.0 ∴ WILL NOT WORK

ADD DROPS

.019 SLOPE ⇒ ΔELE = 50'

.01 SLOPE ⇒ ΔELE = 27.1'

DIFFERENCE 22.9' USE 9 DROPS ; 8 @ 2.5' AND 1 @ 2.9' = 22.9

USING .01 SLOPE ⇒ F_n = 1.69 < 2.0 O.K. ; V = 13.6 fps O.K. d = 2.42'

℄ 4.42' CHANNEL 5.42' @ DROPS

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PROJECT CULVER ST

PROJECT NO. 99989 SHEET NO. 3 OF 9

CALCULATED BY MW DATE 6/20 CHECKED BY _____ DATE _____

CULVER ST CHANNEL REACH 2A
CONT.

CONCRETE CHANNEL ASSUME SHOTCRETE THICKNESS OF 6" Q = 300 cfs

S = .021 ft/ft n = .017 2:1 SS. 10' B.W. USNG = 1730 LENGTH = 760'
DSNG = 1714

V = 14.4 fps < 15 fps O.K.

F_n = 2.26 > 2.0 ∴ WILL NOT WORK SEE COMPUTER OUTPUT

ADD DROPS

.021 SLOPE ⇒ ΔEL = 16.0'
.01 SLOPE ⇒ ΔEL = 7.6'
DIFFERENCE 8.4' USE 4 DROPS; 3@2' AND 1@2.4' = 8.4'

USING .01 SLOPE ⇒ F_n = 1.6 < 2.0 O.K ; V = 11.2 fps < 15 fps O.K. ; d = 1.94'

4' CHANNEL 5'@ DROPS

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 4 OF 9

CALCULATED BY MW DATE 6/20 CHECKED BY _____ DATE _____

CULVER ST CHANNEL CONT. REACH 2B

CONCRETE CHANNEL ASSUME SHOTCRETE THICKNESS OF 6" Q= 400 cfs

S= .021 ft/ft n= .017 2:1 S.S. 15' B.W. USNG=1714 LENGTH = 380'

V= 14.7 fps < 15 fps O.K. DSNG=1706

F_n= 2.28 > 2.0 ∴ WILL NOT WORK SEE COMPUTER OUTPUT

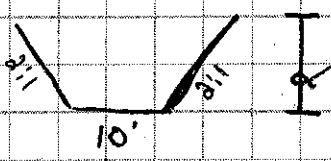
ADD DROPS

.021 ⇒ ΔEL = 8'

.01 ⇒ ΔEL = 3.8'

DIFFERENCE 4.2' USE 2 DROPS ; 1 @ 2' AND 1 @ 2.2' = 4.2'

USING .01 SLOPE ⇒ F_n= 1.59 < 2.0 O.K. ; V= 10.9 fps < 15 fps O.K. ; d= 1.85'



3.85' CHANNEL 4.9' @ DROPS

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 5 OF 9

CALCULATED BY MW DATE 6/20 CHECKED BY _____ DATE _____

CULVER ST CHANNEL CONT. REACH 2C

CONCRETE CHANNEL ASSUME SHOTCRETE THICKNESS OF 6" Q = 600 cfs

S = .021 ft/ft n = .017 2:1 S.S. 30' B.W. USING = 1706 LENGTH = 760'

DSNG = 1690

V = 14.2 fps < 15 fps O.K.

F_n = 2.28 > 2.0 ∴ WILL NOT WORK SEE COMPUTER OUTPUT

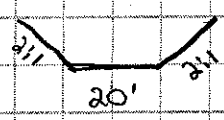
ADD DROPS

.021 ⇒ △EL = 16'

.01 ⇒ △EL = 7.6'

DIFFERENCE 8.4' USE 4 DROPS ; 3 @ 2' AND 1 @ 2.4' = 8.4'

USING .01 SLOPE ⇒ F_n = 1.65 < 2 O.K. ; V = 12.3 fps < 15 fps O.K. ; d = 2.02'



4.02' CHANNEL 5.02 @ DROPS

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 6 OF 9

CALCULATED BY MW DATE 6/20 CHECKED BY _____ DATE _____

CULVER ST CHANNEL CONT. REACH 3A

CONCRETE CHANNEL ASSUME SHOTCRETE THICKNESS OF 6" Q = 70.5 cfs

S = .016 ft/ft n = .017 2:1 S.S. 2.5' B.W. USING = 1690 LENGTH = 600'

V = 14.5 fps < 15 fps O.K. DSNG = 1677.2

F_n = 2.06 > 2.0 ∴ WILL NOT WORK SEE COMPUTER OUTPUT

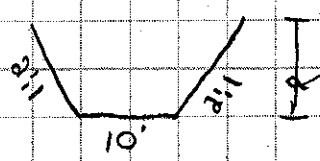
ADD DROPS

.016 ⇒ △ EL = 12.8'

.008 ⇒ △ EL = 6.4'

DIFFERENCE 6.4' USE 3 DROPS ; 2 @ 2' AND 1 @ 2.4' = 6.4'

USING .008 SLOPE ⇒ F_n = 1.52 < 2 OK ; V = 13.2 fps < 15 fps OK ; d = 3.25



5.2' CHANNEL 6.3' @ DROPS

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PROJECT SPOOR HILL

PROJECT NO. 99989 SHEET NO. 7 OF 9

CALCULATED BY NW DATE 6/20 CHECKED BY _____ DATE _____

CULVER ST. CHANNEL CONT. REACH 3B

CONCRETE CHANNEL ASSUME SHOTCRETE THICKNESS OF 6" Q = 900 cfs

S = .016 ft/ft n = .017 2:1 S.S. 35' B.W. USNG = 1677.2 LENGTH = 1500'

V = 14.4 fps < 15 fps o.k. DSNG = 1653.2

F_n = 2.06 > 2.0 ∴ WILL NOT WORK

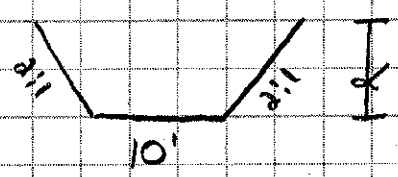
ADD DROPS

.016 SLOPE ⇒ ΔEL = 24'

.008 SLOPE ⇒ ΔEL = 12'

DIFFERENCE 12' USE 6 DROPS @ 2' = 12'

USING .008 SLOPE ⇒ F_n = 1.54 < 2 O.K. ; V = 14.1 fps < 15 fps OK ; d = 3.7'



5.7' CHANNEL 6.7' @ DROPS

WOOD/PATEL

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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 8 OF 9

CALCULATED BY IWW DATE 6/20 CHECKED BY _____ DATE _____

CULVER ST CHANNEL CONT. REACH 3C

CONCRETE CHANNEL ASSUME SHOTCRETE THICKNESS OF 6" $Q = 1100$ cfs

$S = .016$ ft/ft $n = .017$ 2:1 S.S. 40' B.W. USNG = 1653.2 LENGTH = 1500'

$V = 14.8$ fps < 15 fps O.K. DSNG = 1629.2

$F_n = 2.08 > 2$ ∴ WILL NOT WORK

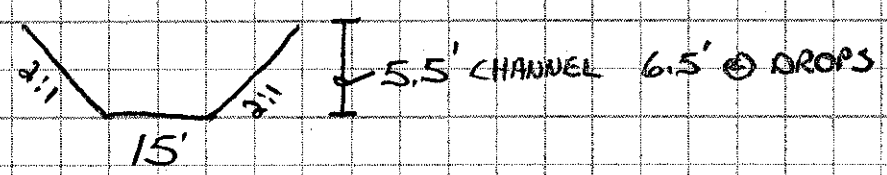
ADD DROPS

.016 SLOPE ⇒ ΔEL = 24'

.008 SLOPE ⇒ ΔEL = 12'

DIFFERENCE 12' USE 6 DROPS @ 2'

USING .008 SLOPE ⇒ $F_n = 1.56 < 2$ O.K. ; $V = 14.4$ fps < 15 fps O.K. ; $d = 3$..



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PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 9 OF 9

CALCULATED BY MW DATE 6/20 CHECKED BY _____ DATE _____

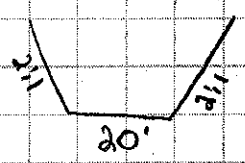
CULVER ST CHANNEL CONT REACH 4

CONCRETE CHANNEL ASSUME SHOTCRETE THICKNESS OF 6" Q= 1300 cfs

S= .008 ft/ft n= .017 2:1 S.S. 20' B.W. USNG= 1629.2 DSNG= 1618.9 LENGTH = 1290'

V= 14.6 fps < 15 fps O.K.

F_n= 1.57 < 2 O.K. SEE COMPUTER OUTPUT



5.4' CHANNEL 6.4' @ DROPS

REACH 5 CULVER ST

CONCRETE CHANNEL ASSUME SHOTCRETE THICKNESS OF 6" Q = 1300 cfs

S= .027 ft/ft n= .017 2:1 S.S. 25' BW USNG= 1618.9 DSNG= 1565.0 LENGTH = 2000'

V= 21.2 fps > 15 fps ∴ WILL NOT WORK

F_n= 2.75 > 2.0 ∴ WILL NOT WORK

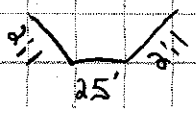
ADD DROPS

.027 SLOPE ⇒ ΔEL = 53.9'

.008 SLOPE ⇒ ΔEL = 16.0'

DIFFERENCE 37.9' USE 15 DROPS; 14 @ 2.5' AND 1 @ 2.9' = 37.9'

USING .008 SLOPE ⇒ F_n= 1.57 < 2 O.K.; V= 14.1 fps < 15 fps O.K.; d= 3'



5' CHANNEL 6' @ DROPS

1800'

Concrete Lined Channel (Shotcrete) Reach 1a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R1a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.010000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	15.00	ft
Discharge	819.00	cfs

Results		
Depth	2.79	ft
Flow Area	57.4	ft²
Wetted Perimeter	27.47	ft
Top Width	26.15	ft
Critical Depth	3.79	ft
Critical Slope	0.003212	ft/ft
Velocity	14.28	ft/s
Velocity Head	3.17	ft
Specific Energy	5.96	ft
Froude Number	1.70	
Flow Type	Supercritical	

2710'

Concrete Lined Channel (Shotcrete) Reach 1b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R1b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.010000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	20.00	ft
Discharge	819.00	cfs

Results		
Depth	2.42	ft
Flow Area	60.1	ft²
Wetted Perimeter	30.81	ft
Top Width	29.67	ft
Critical Depth	3.32	ft
Critical Slope	0.003232	ft/ft
Velocity	13.64	ft/s
Velocity Head	2.89	ft
Specific Energy	5.31	ft
Froude Number	1.69	
Flow Type	Supercritical	

760'

Concrete Lined Channel (Shotcrete) Reach 2a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R2a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.010000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	10.00	ft
Discharge	300.00	cfs

Results		
Depth	1.94	ft
Flow Area	26.9	ft²
Wetted Perimeter	18.67	ft
Top Width	17.75	ft
Critical Depth	2.54	ft
Critical Slope	0.003672	ft/ft
Velocity	11.15	ft/s
Velocity Head	1.93	ft
Specific Energy	3.87	ft
Froude Number	1.60	
Flow Type	Supercritical	

380'

Concrete Lined Channel (Shotcrete) Reach 2b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R2b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.010000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	10.00	ft
Discharge	276.03	cfs

Results		
Depth	1.85	ft
Flow Area	25.4	ft²
Wetted Perimeter	18.28	ft
Top Width	17.41	ft
Critical Depth	2.42	ft
Critical Slope	0.003714	ft/ft
Velocity	10.88	ft/s
Velocity Head	1.84	ft
Specific Energy	3.69	ft
Froude Number	1.59	
Flow Type	Supercritical	

760'

Concrete Lined Channel (Shotcrete) Reach 2c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R2c
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.010000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	20.00	ft
Discharge	600.00	cfs

Results		
Depth	2.02	ft
Flow Area	48.7	ft²
Wetted Perimeter	29.05	ft
Top Width	28.09	ft
Critical Depth	2.75	ft
Critical Slope	0.003387	ft/ft
Velocity	12.33	ft/s
Velocity Head	2.36	ft
Specific Energy	4.39	ft
Froude Number	1.65	
Flow Type	Supercritical	

800'

Concrete Lined Channel (Shotcrete) Reach 3a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R3a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	10.00	ft
Discharge	705.00	cfs

Results		
Depth	3.25	ft
Flow Area	53.6	ft²
Wetted Perimeter	24.52	ft
Top Width	22.99	ft
Critical Depth	4.08	ft
Critical Slope	0.003277	ft/ft
Velocity	13.16	ft/s
Velocity Head	2.69	ft
Specific Energy	5.94	ft
Froude Number	1.52	
Flow Type	Supercritical	

1,500'

Concrete Lined Channel (Shotcrete) Reach 3b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R3b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	10.00	ft
Discharge	900.00	cfs

Results		
Depth	3.68	ft
Flow Area	63.9	ft²
Wetted Perimeter	26.47	ft
Top Width	24.73	ft
Critical Depth	4.65	ft
Critical Slope	0.003175	ft/ft
Velocity	14.08	ft/s
Velocity Head	3.08	ft
Specific Energy	6.76	ft
Froude Number	1.54	
Flow Type	Supercritical	

1500'

Concrete Lined Channel (Shotcrete) Reach 3c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R3c
Flow Element	*Trapezoidal Channel*
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	15.00	ft
Discharge	1,100.00	cfs

Results		
Depth	3.48	ft
Flow Area	76.4	ft²
Wetted Perimeter	30.56	ft
Top Width	28.92	ft
Critical Depth	4.48	ft
Critical Slope	0.003086	ft/ft
Velocity	14.40	ft/s
Velocity Head	3.22	ft
Specific Energy	6.70	ft
Froude Number	1.56	
Flow Type	Supercritical	

1290'

Concrete Lined Channel (Shotcrete) Reach 4
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R4
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	20.00	ft
Discharge	1,300.00	cfs

Results		
Depth	3.34	ft
Flow Area	89.1	ft²
Wetted Perimeter	34.93	ft
Top Width	33.36	ft
Critical Depth	4.36	ft
Critical Slope	0.003024	ft/ft
Velocity	14.59	ft/s
Velocity Head	3.31	ft
Specific Energy	6.65	ft
Froude Number	1.57	
Flow Type	Supercritical	

Concrete Lined Channel (Shotcrete) Reach 5
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.008000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	1,300.00	cfs

Results		
Depth	2.99	ft
Flow Area	92.5	ft^2
Wetted Perimeter	38.35	ft
Top Width	36.94	ft
Critical Depth	3.92	ft
Critical Slope	0.003043	ft/ft
Velocity	14.06	ft/s
Velocity Head	3.07	ft
Specific Energy	6.06	ft
Froude Number	1.57	
Flow Type	Supercritical	

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 2 OF 2

CALCULATED BY MW DATE 6/27 CHECKED BY _____ DATE _____

DETENTION BASIN STORAGE CALCS

CULVER ST: AREA = 97268 SQ FT

AREA = 229869 SQ FT

AREA = 108340 SQ FT

435477 SQ FT ⇒ 10 AC

ASSUME 15% LOST TO SIDE SLOPES ⇒ 8.5 AC @ 6' DEPTH ⇒ 51 AC-FT STORAGE

LSNG 1732

USNG 1758

FT ELEVATION	AC AREA	AC-FT STORAGE
0'	0	
1'	2.2	2.2
2'	2.2	4.4
3'	2.2	6.6
4'	2.2	8.8
5'	2.2	11.0
6'	8.5	51

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT SPOOK HILL

PROJECT NO. 99989 SHEET NO. 1 OF 2

CALCULATED BY MW DATE 6/23 CHECKED BY _____ DATE _____

BASIN STORAGE CALCS

McKELLIPS' EAST BASIN 22' FALL

AREA = 83849 SQFT

AREA = 281703 SQFT

AREA = 69331 SQFT

434883 SQFT ⇒ 10 AC

ASSUME 15% LOST TO SIDE SLOPE ⇒ 8.5 AC

W/6' DEPTH, STORAGE = 51 AC-FT

DSNG 1738

USNG 1760

ELEVATION FT	AREA AC	STORAGE AC-FT
0'	0	0
1'	1.9	1.9
2'	1.9	3.8
3'	1.9	5.7
4'	1.9	7.6
5'	1.9	9.5
	8.5	51

WEST BASIN 24' FALL

AREA = 93767 FT²

AREA = 255074 SQFT

AREA = 91561 SQFT

440402 SQFT ⇒ 10 AC

ASSUME 15% LOST TO SLOPING SIDES ⇒ 8.5 AC STORAGE

W/ 6' DEPTH OF STORAGE ⇒ 51 AC-FT

DSNG 1666

USNG 1690

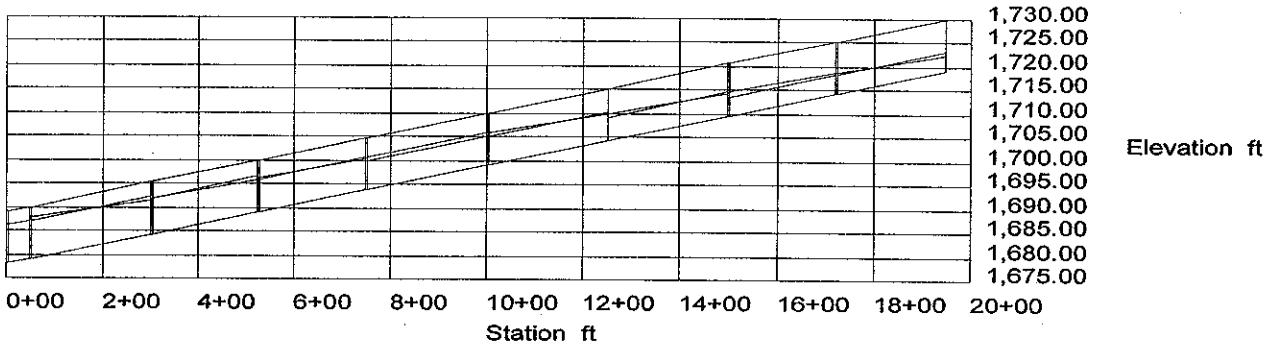
ELEVATION FT	AREA AC	STORAGE AC-FT
0'	0	0
1	2.1	2.1
2'	2.1	4.2
3	2.1	6.3
4'	2.1	8.4
5	2.1	10.5
6'	8.5	51

CULVER ST

Pipe Report

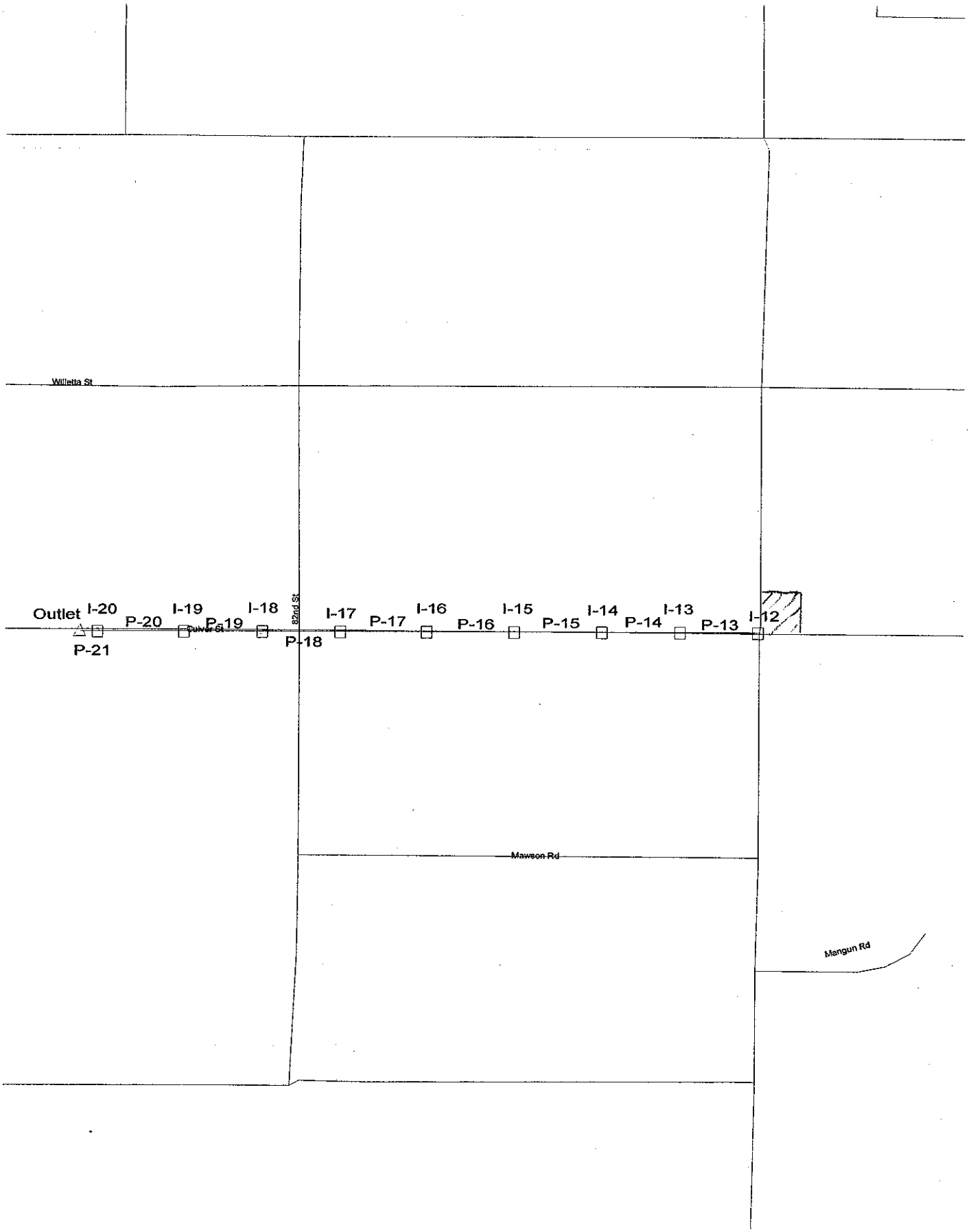
Pipe	Upstream Node	Downstream Node	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Average Velocity (ft/s)	Section Size	Roughness	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)
P-13	I-12	I-13	113.00	225.00	0.020889	9.72	48 inch	0.014	1,719.00	1,714.30	1,730.00	1,725.30
P-14	I-13	I-14	180.00	225.00	0.020889	14.32	48 inch	0.014	1,714.30	1,709.60	1,725.30	1,720.60
P-15	I-14	I-15	314.00	250.00	0.021200	16.18	60 inch	0.014	1,709.60	1,704.30	1,720.60	1,715.30
P-16	I-15	I-16	449.00	250.00	0.020800	16.18	72 inch	0.014	1,704.30	1,699.10	1,715.30	1,710.10
P-17	I-16	I-17	570.00	250.00	0.021200	20.16	72 inch	0.014	1,699.10	1,693.80	1,710.10	1,704.80
P-18	I-17	I-18	675.00	225.00	0.020889	17.84	84 inch	0.014	1,693.80	1,689.10	1,704.80	1,700.10
P-19	I-18	I-19	787.00	225.00	0.020889	18.15	90 inch	0.014	1,689.10	1,684.40	1,700.10	1,695.40
P-20	I-19	I-20	907.00	252.80	0.020965	18.41	96 inch	0.014	1,684.40	1,679.10	1,695.40	1,690.10
P-22	I-20	I-21	1,227.00	497.20	0.016090	19.70	108 inch	0.014	1,679.10	1,671.10	1,690.10	1,682.10
P-24	I-21	I-22	1,357.00	500.00	0.016000	21.58	108 inch	0.014	1,671.10	1,663.10	1,682.10	1,674.10
P-30	I-22	Outlet	1,497.00	500.00	0.016000	24.78	108 inch	0.014	1,663.10	1,655.10	1,674.10	1,666.10

PIPE RUN DOWNSTREAM OF DETENTION BASIN



PIPE RUN DOWNSTREAM OF DETENTION BASIN

PIPE RUN DOWNSTREAM OF DETENTION BASIN



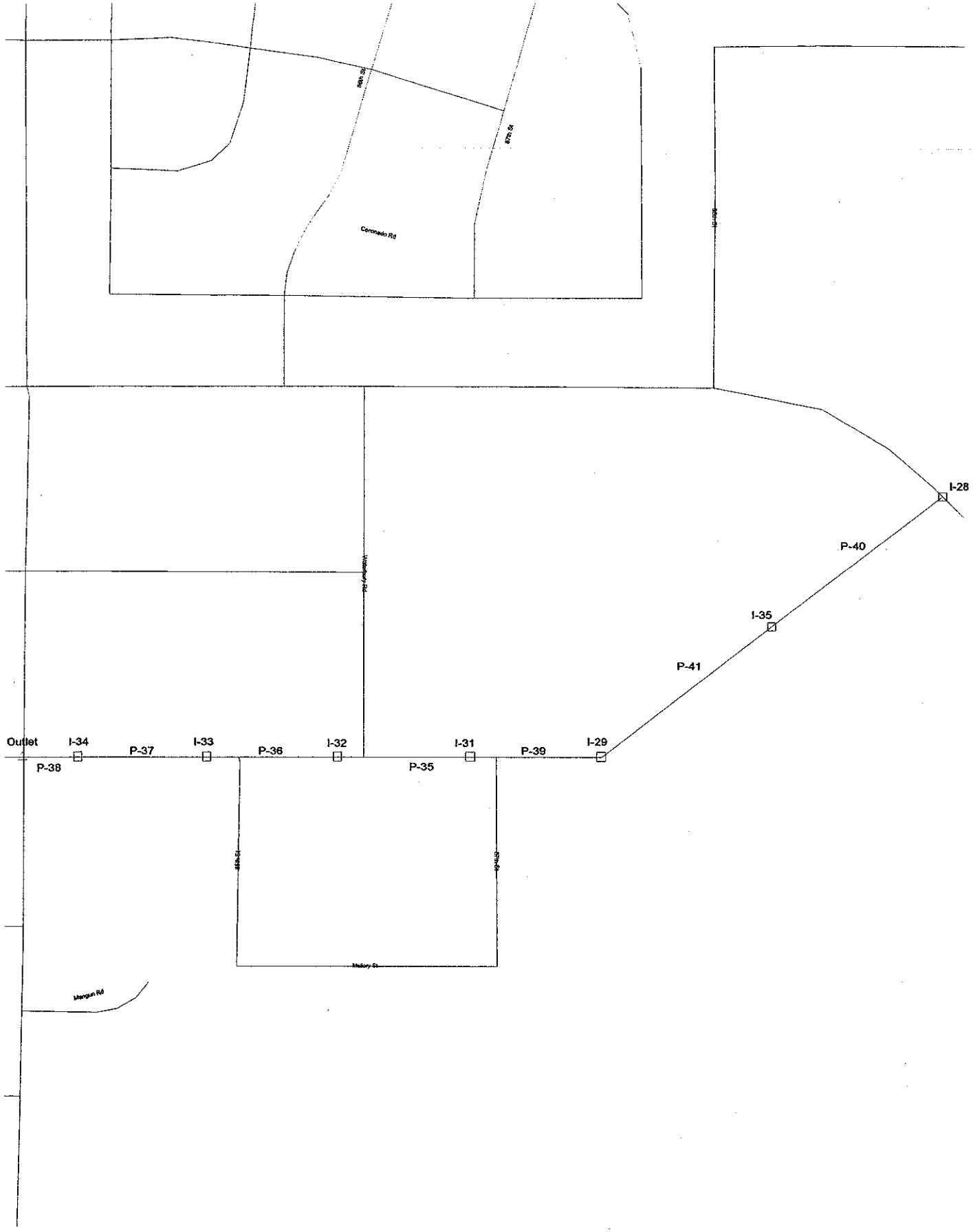
CULVER ST.

Pipe Report

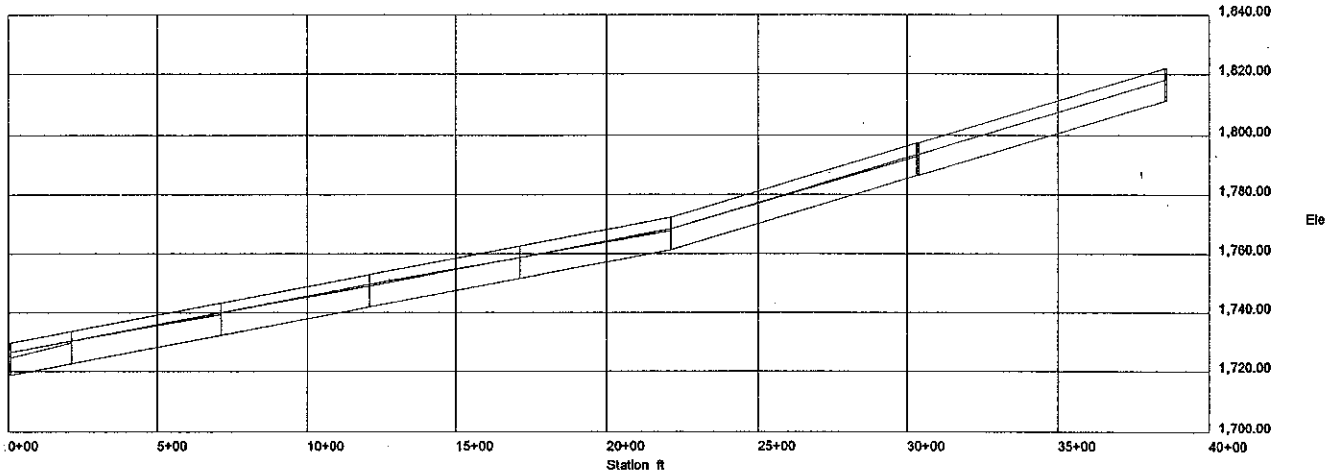
Pipe	Upstream Node	Downstream Node	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Average Velocity (ft/s)	Section Size	Roughness	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)
P-40	I-28	I-35	758.00	821.70	0.030668	19.88	84 inch	0.014	1,811.40	1,786.20	1,822.40	1,797.20
P-41	I-35	I-29	764.00	821.70	0.030668	20.03	84 inch	0.014	1,786.20	1,761.00	1,797.20	1,772.00
P-39	I-29	I-31	776.00	500.00	0.019000	20.33	84 inch	0.014	1,761.00	1,751.50	1,772.00	1,762.50
P-35	I-31	I-32	794.00	500.00	0.019000	18.37	90 inch	0.014	1,751.50	1,742.00	1,762.50	1,753.00
P-36	I-32	I-33	818.00	500.00	0.019000	18.85	90 inch	0.014	1,742.00	1,732.50	1,753.00	1,743.50
P-37	I-33	I-34	842.00	500.00	0.019000	19.34	90 inch	0.014	1,732.50	1,723.00	1,743.50	1,734.00
P-38	I-34	Outlet	867.00	210.00	0.019048	21.64	90 inch	0.014	1,723.00	1,719.00	1,734.00	1,730.00

PIPE RUN UPSTREAM OF DETENTION BASIN

PIPE RUN UPSTREAM OF DETENTION BASIN



PIPE RUN UPSTREAM OF DETENTION BASIN



CULVR5

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 19, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	9.0
FHWA Chart Number	1
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.014
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	1,793.0
Invert Elevation at Downstream end of Culvert (ft)	0.0
Invert Elevation at Upstream end of Culvert (ft)	50.0
Culvert Slope (ft/ft)	0.0279
Starting Flow Rate (cfs)	819.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	819.0
Starting Tailwater Depth (ft)	12.54
Incremental Tailwater Depth (ft)	0.1
Ending Tailwater Depth (ft)	12.54

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
819.0	12.54	12.5	-24.65	4.09	7.07	4.09	29.16

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CULVR 4

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 19, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	9.0
FHWA Chart Number	1
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.014
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	2,710.0
Invert Elevation at Downstream end of Culvert (ft)	0.0
Invert Elevation at Upstream end of Culvert (ft)	51.5
Culvert Slope (ft/ft)	0.019
Starting Flow Rate (cfs)	819.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	819.0
Starting Tailwater Depth (ft)	4.0
Incremental Tailwater Depth (ft)	0.1
Ending Tailwater Depth (ft)	4.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
819.0	4.0	12.54	0.0	4.57	7.07	4.57	25.28

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CULVR3

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 19, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	6.0
FHWA Chart Number	1
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.014
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	700.0
Invert Elevation at Downstream end of Culvert (ft)	0.0
Invert Elevation at Upstream end of Culvert (ft)	14.7
Culvert Slope (ft/ft)	0.021
Starting Flow Rate (cfs)	315.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	315.0
Starting Tailwater Depth (ft)	9.36
Incremental Tailwater Depth (ft)	0.1
Ending Tailwater Depth (ft)	9.36

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
315.0	9.36	8.9	2.04	3.19	4.84	3.19	20.66

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CULVR2

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 19, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	7.0
FHWA Chart Number	1
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.014
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	400.0
Invert Elevation at Downstream end of Culvert (ft)	0.0
Invert Elevation at Upstream end of Culvert (ft)	8.4
Culvert Slope (ft/ft)	0.021
Starting Flow Rate (cfs)	420.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	420.0
Starting Tailwater Depth (ft)	12.23
Incremental Tailwater Depth (ft)	0.1
Ending Tailwater Depth (ft)	12.23

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
420.0	12.23	9.36	8.61	3.45	5.4	3.45	22.2

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800 cfs
DOWNSTREAM
CULVR1

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 19, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	9.0
FHWA Chart Number	1
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.014
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	750.0
Invert Elevation at Downstream end of Culvert (ft)	0.0
Invert Elevation at Upstream end of Culvert (ft)	15.5
Culvert Slope (ft/ft)	0.0207
Starting Flow Rate (cfs)	800.0
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	800.0
Starting Tailwater Depth (ft)	4.0
Incremental Tailwater Depth (ft)	0.1
Ending Tailwater Depth (ft)	4.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
800.0	4.0	12.23	0.0	4.39	6.99	4.39	25.93

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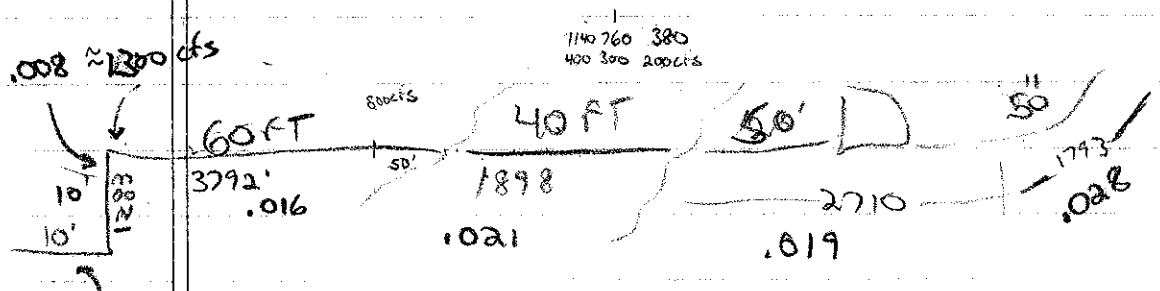
		SIZE		
.014	PIPE	LENGTHS	—	1.5 HRS
.017	SHOT-CRETE CONCRETE	4:1 SS	—	2 HRS
.03 ?	UNLINED	4:1 SS	—	1 HRS
				4.5

11:30 AM STARTED

100 cfs = 1 x

SIZE, EXCAVATION, VELOCITIES

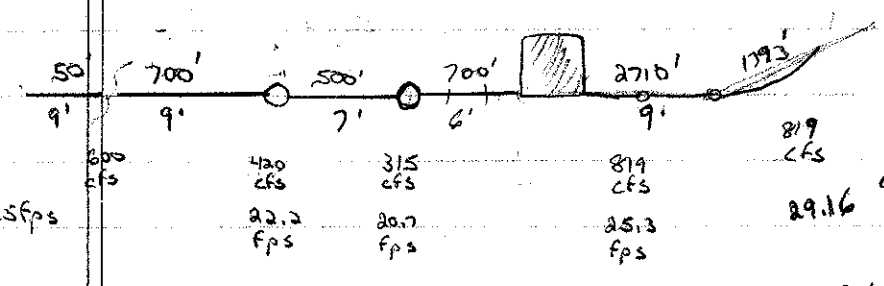
.263 cfs/FT



600 cfs 100 cfs

108"

12.25' 12.23
HW



NEED 3.5' OVER TOP OF PIPE FOR H.W. = 12.5'

CORRUGATED

780403

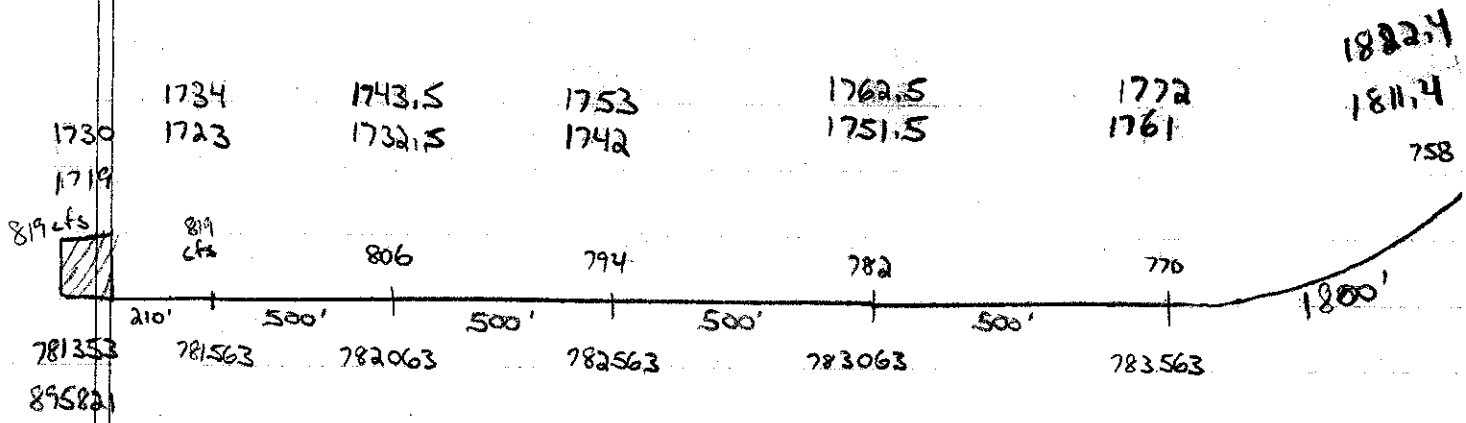
1709.9

781353

895 821

1720.3

903
821



SEE STORM LAD

1800'

Concrete Lined Channel (Shotcrete) Reach 1a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R
Flow Element	Trapezoidal
Method	Manning's F
Solve For	Channel De

Input Data		
Mannings Coefficient	0.017	
Slope	0.028000	ft/ft
Left Side Slope	2.00	H :
Right Side Slope	2.00	H :
Bottom Width	50.00	ft
Discharge	819.00	cfs

Results		
Depth	1.06	ft
Flow Area	55.5	ft²
Wetted Perimeter	54.76	ft
Top Width	54.26	ft
Critical Depth	1.97	ft
Critical Slope	0.003511	ft/ft
Velocity	14.76	ft/s
Velocity Head	3.38	ft
Specific Energy	4.45	ft
Froude Number	2.57	
Flow Type	Supercritical	

THESE RUNS FAILED

BECAUSE OF FROUDE NUMBER

2710'

Concrete Lined Channel (Shotcrete) Reach 1b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R1b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.019000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	40.00	ft
Discharge	819.00	cfs

Results		
Depth	1.36	ft
Flow Area	58.2	ft²
Wetted Perimeter	46.09	ft
Top Width	45.45	ft
Critical Depth	2.26	ft
Critical Slope	0.003410	ft/ft
Velocity	14.07	ft/s
Velocity Head	3.08	ft
Specific Energy	4.44	ft
Froude Number	2.19	
Flow Type	Supercritical	

760'

Concrete Lined Channel (Shotcrete) Reach 2a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R2a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.021000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	10.00	ft
Discharge	300.00	cfs

Results		
Depth	1.58	ft
Flow Area	20.8	ft²
Wetted Perimeter	17.06	ft
Top Width	16.31	ft
Critical Depth	2.54	ft
Critical Slope	0.003672	ft/ft
Velocity	14.44	ft/s
Velocity Head	3.24	ft
Specific Energy	4.82	ft
Froude Number	2.26	
Flow Type	Supercritical	

380'

Concrete Lined Channel (Shotcrete) Reach 2b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R2b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.021000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	15.00	ft
Discharge	400.00	cfs

Results		
Depth	1.51	ft
Flow Area	27.2	ft²
Wetted Perimeter	21.75	ft
Top Width	21.04	ft
Critical Depth	2.50	ft
Critical Slope	0.003556	ft/ft
Velocity	14.70	ft/s
Velocity Head	3.36	ft
Specific Energy	4.87	ft
Froude Number	2.28	
Flow Type	Supercritical	

760'

Concrete Lined Channel (Shotcrete) Reach 2c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R2c
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.021000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	30.00	ft
Discharge	600.00	cfs

Results		
Depth	1.30	ft
Flow Area	42.4	ft²
Wetted Perimeter	35.81	ft
Top Width	35.20	ft
Critical Depth	2.20	ft
Critical Slope	0.003491	ft/ft
Velocity	14.17	ft/s
Velocity Head	3.12	ft
Specific Energy	4.42	ft
Froude Number	2.28	
Flow Type	Supercritical	

800'

Concrete Lined Channel (Shotcrete) Reach 3a
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R3a
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.016000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	705.00	cfs

Results		
Depth	1.72	ft
Flow Area	48.8	ft²
Wetted Perimeter	32.68	ft
Top Width	31.87	ft
Critical Depth	2.70	ft
Critical Slope	0.003346	ft/ft
Velocity	14.45	ft/s
Velocity Head	3.24	ft
Specific Energy	4.96	ft
Froude Number	2.06	
Flow Type	Supercritical	

1500

Concrete Lined Channel (Shotcrete) Reach 3b
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R3b
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.016000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	35.00	ft
Discharge	900.00	cfs

Results		
Depth	1.64	ft
Flow Area	62.7	ft²
Wetted Perimeter	42.32	ft
Top Width	41.55	ft
Critical Depth	2.60	ft
Critical Slope	0.003305	ft/ft
Velocity	14.36	ft/s
Velocity Head	3.21	ft
Specific Energy	4.84	ft
Froude Number	2.06	
Flow Type	Supercritical	

1500'

Concrete Lined Channel (Shotcrete) Reach 3c
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culver St. R3c
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.017	
Slope	0.016000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	40.00	ft
Discharge	1,100.00	cfs

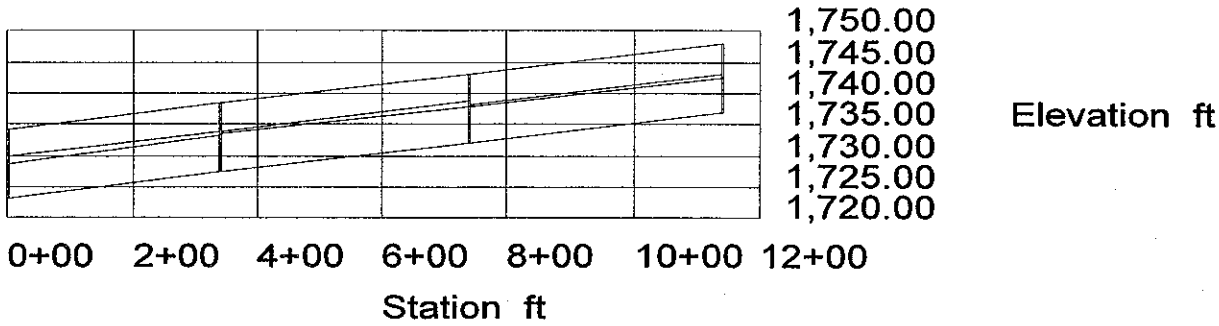
Results		
Depth	1.71	ft
Flow Area	74.1	ft²
Wetted Perimeter	47.63	ft
Top Width	46.83	ft
Critical Depth	2.73	ft
Critical Slope	0.003235	ft/ft
Velocity	14.84	ft/s
Velocity Head	3.42	ft
Specific Energy	5.13	ft
Froude Number	2.08	
Flow Type	Supercritical	

McKELLIPS
OPTION "C"

Pipe Report

Pipe	Upstream Node	Downstream Node	Discharge (cfs)	Length (ft)	Constructed Slope (ft/ft)	Average Velocity (ft/s)	Section Size	Roughness	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)
P-8	I-10	I-11	400.00	400.00	0.012000	14.69	72 inch	0.014	1,737.00	1,732.20	1,748.00	1,743.20
P-9	I-11	I-12	450.00	400.00	0.012000	14.28	78 inch	0.014	1,732.20	1,727.40	1,743.20	1,738.40
P-10	I-12	Outlet	550.00	339.00	0.012094	17.73	78 inch	0.014	1,727.40	1,723.30	1,738.40	1,734.30

PIPE RUN UPSTREAM OF DETENTION BASIN ONE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Elevation ft
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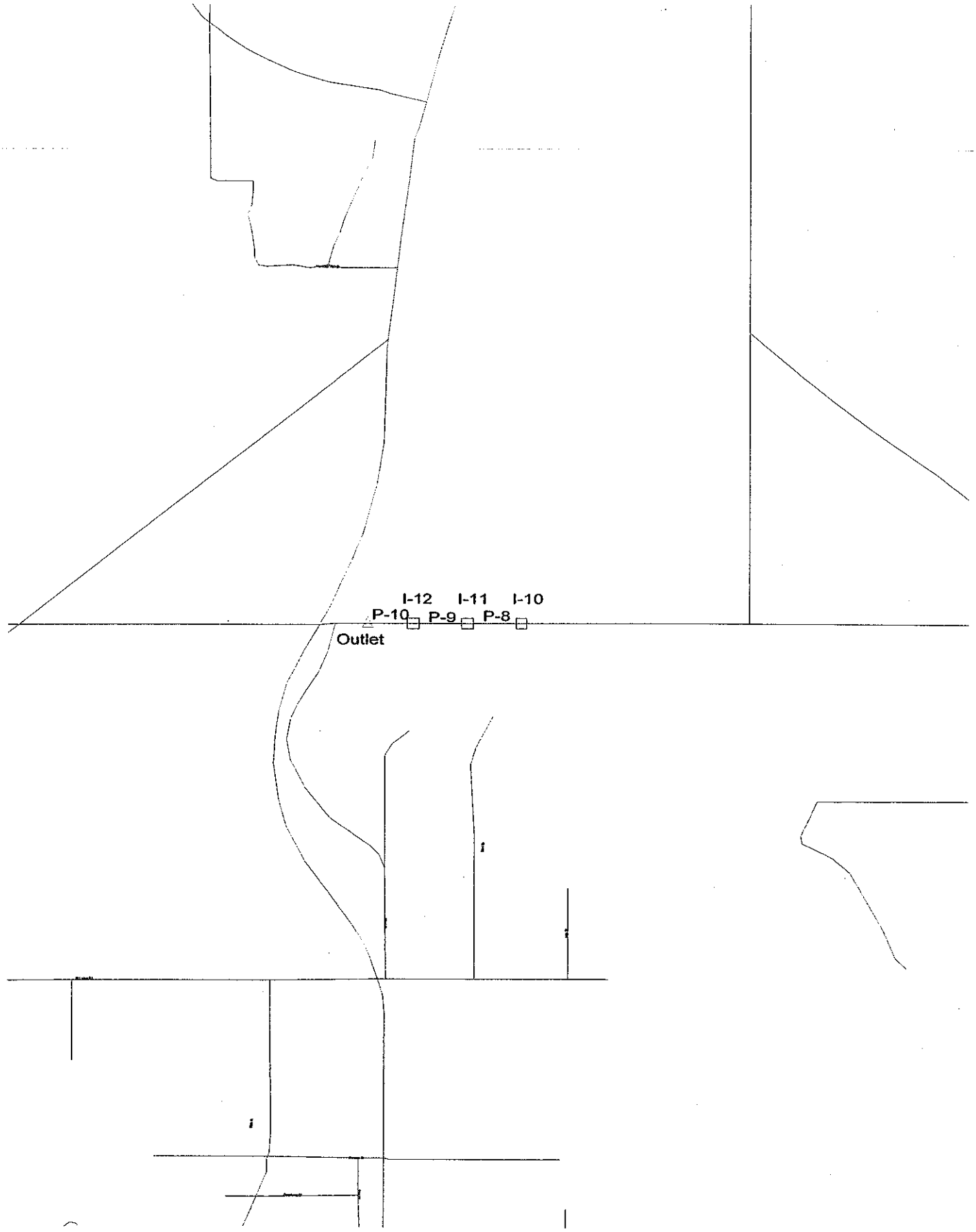
4+00
6+00
8+00
10+00
12+00
Station ft


I-12
I-11
I-10
P-10
P-9
P-8
Outlet

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

June 28, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	521.0
Channel Bottom Slope (ft/ft)	0.019
Manning's Roughness Coefficient (n-value)	0.016
Channel Diameter (ft)	7.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	4.43
Flow Velocity (fps)	20.29
Froude Number	1.834
Velocity Head (ft)	6.4
Energy Head (ft)	10.83
Cross-Sectional Area of Flow (sq ft)	25.67
Top Width of Flow (ft)	6.75

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Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com
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CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

June 28, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	45.0
Channel Bottom Slope (ft/ft)	0.025
Manning's Roughness Coefficient (n-value)	0.016
Channel Diameter (ft)	4.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	1.35
Flow Velocity (fps)	12.12
Froude Number	2.155
Velocity Head (ft)	2.28
Energy Head (ft)	3.63
Cross-Sectional Area of Flow (sq ft)	3.71
Top Width of Flow (ft)	3.78

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2a

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

June 28, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	482.0
Channel Bottom Slope (ft/ft)	0.025
Manning's Roughness Coefficient (n-value)	0.016
Channel Diameter (ft)	6.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	4.39
Flow Velocity (fps)	21.72
Froude Number	1.873
Velocity Head (ft)	7.33
Energy Head (ft)	11.73
Cross-Sectional Area of Flow (sq ft)	22.19
Top Width of Flow (ft)	5.31

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2b

WOOD/PATEL

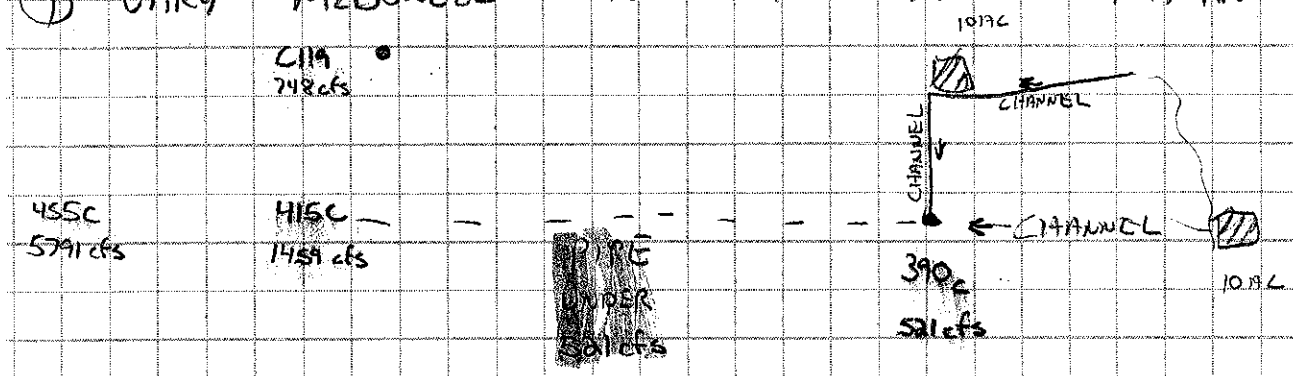
CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

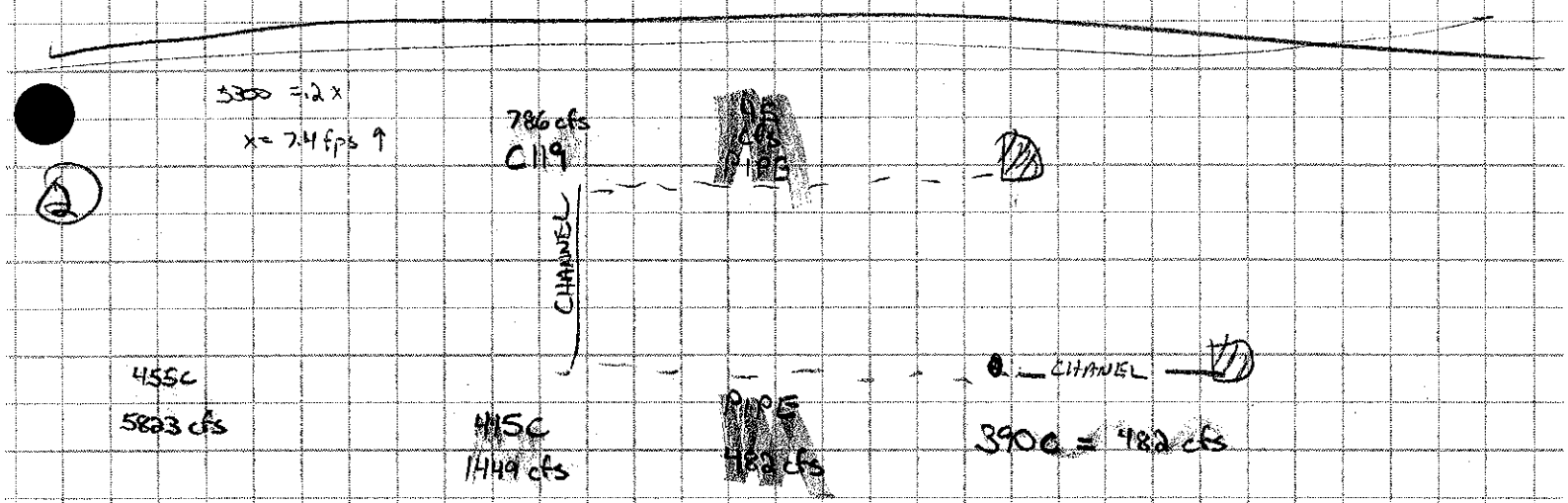
PROJECT _____

PROJECT NO. _____ SHEET NO. _____ OF _____

CALCULATED BY _____ DATE _____ CHECKED BY _____ DATE _____

(1) VARY McDOWELL REMOVE NORTH CHANNEL BASIN ONLY





(2)

100yr 24hr

390C	C119	415C	455C
464 cfs	748cfs	1418 cfs	6574

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Sprock Hill Ramp

PROJECT NO. 99289 SHEET NO. 1 OF

CALCULATED BY JBT DATE 7/14 CHECKED BY DATE

Culver & Street Alternatives - Culverts

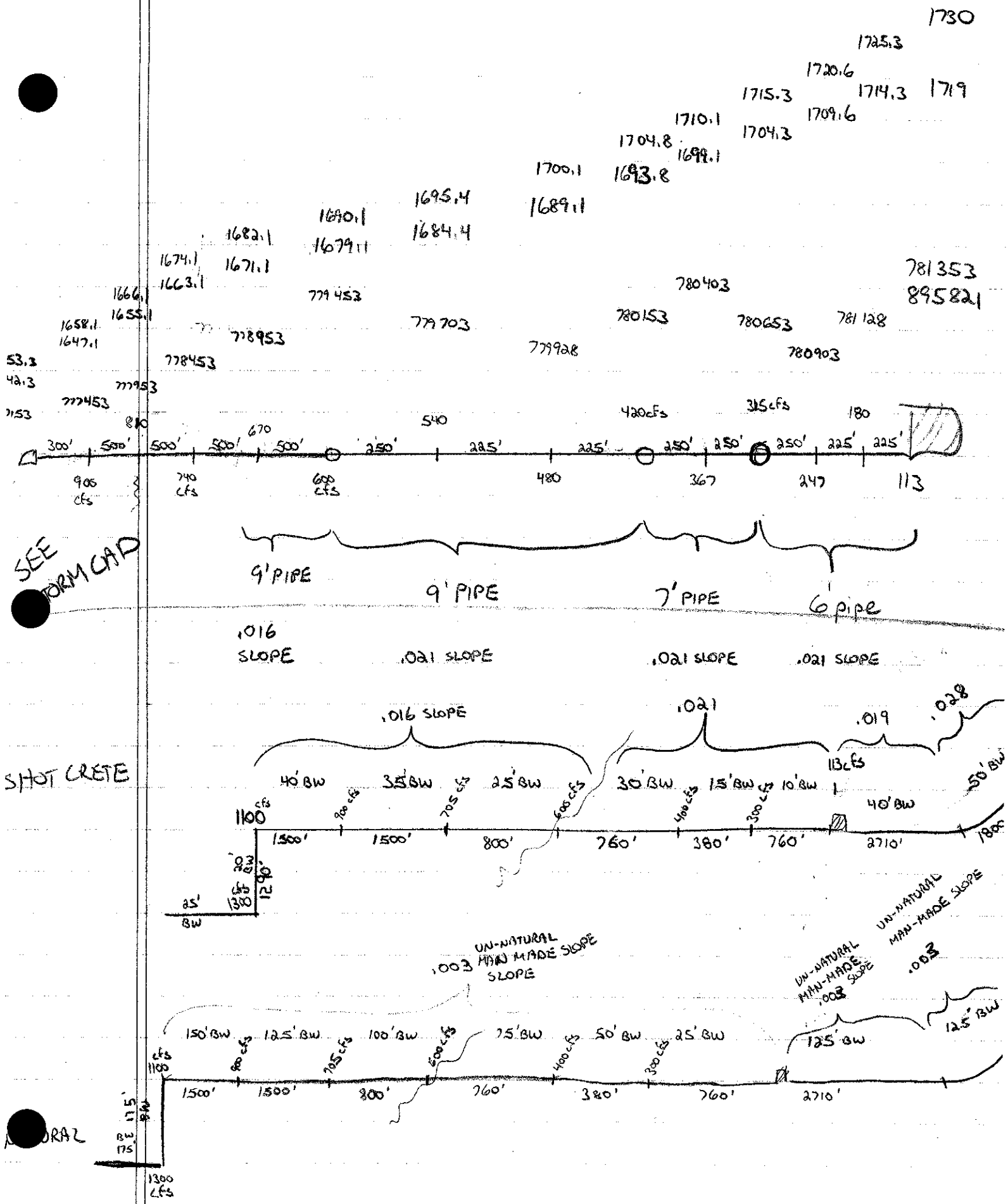
OPTION 3A

1. 1 culvert east of Hawes RD, 700 cfs, 700/12 = 59 SF, 2-8'x4' = 64 SF
   156 + 7.8 + 14 = 178 cy

2. 2 culverts west of Hawes RD to ½ mi west, 100 cfs, 100/12 = 8 SF, 1-6'x3' = 18 SF
   164 + 4.8 + 8.6 = 177 cy

3. 3 culverts Sossaman RD to ½ mile East of Sossaman RD, 1000 cfs, 1000/12 = 50 SF, 2-8'x3' = 48 SF
   148 + 6.2 + 11.2 = 165 cy

4. 1 culvert west of Sossaman & South of Culver Rd 1300 cfs, 1300/12 = 108 SF, 5-6x4 = 120 SF
   100' Long = 287 + 9.8 + 17.6 = 314 cy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780653
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420cfs
315cfs
180
540
670
300'
500'
250'
225'
905 cfs
740 cfs
600 cfs
480
367
247
113
SEE FORMCAD
9' PIPE
9' PIPE
7' PIPE
6' pipe
.016 SLOPE
.021 SLOPE
.021 SLOPE
.021 SLOPE
.016 SLOPE
.021
.019
.028
SHOT CRETE
40' BW
35' BW
25' BW
30' BW
15' BW
10' BW
40' BW
50' BW
1100 cfs
900 cfs
705 cfs
600 cfs
480 cfs
300 cfs
180cfs
1500'
1500'
800'
760'
380'
760'
2710'
1800
25' BW
1300
UN-NATURAL MAN MADE SLOPE
.003 SLOPE
UN-NATURAL MAN-MADE SLOPE .003
UN-NATURAL MAN-MADE SLOPE
.003
150' BW
125' BW
100' BW
75' BW
50' BW
25' BW
125' BW
125' BW
1100 cfs
900 cfs
705 cfs
600 cfs
400 cfs
300 cfs
1500'
1500'
800'
760'
380'
760'
2710'
BW 175
1300 cfs

Land Takes
Culver Street Option 1a Earthen Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
125' B/W	Channel	219-31-4B	P	29.90	1600	162.6	5.97	19.97%	$568,000	$113,453	
	Channel	219-31-1E	P	30.26	200	162.6	0.75	2.47%	$574,500	$14,173	
	Channel	219-31-1G	T					100.00%	$85,500	$85,500	
	Channel	219-31-1D	T					100.00%	$230,000	$230,000	
	Channel	219-31-28C	P	38.71	1295	162.6	4.83	12.49%	$735,000	$91,789	
50' B/W	Channel	219-28-22	T					100.00%	$108,000	$108,000	
	Channel	219-28-24	P	1.09	150	89.2	0.31	28.18%	$153,000	$43,115	
	Channel	219-28-26	P	1.09	150	89.2	0.31	28.18%	$100,000	$28,180	
	Channel	219-28-28	P	1.09	150	89.2	0.31	28.18%	$145,500	$41,002	
	Channel	219-28-30	P	1.09	150	89.2	0.31	28.18%	$152,000	$42,834	
	Channel	219-28-32	P	1.09	150	89.2	0.31	28.18%	$94,500	$26,630	
	Channel	219-28-36	T					100.00%	$103,000	$103,000	
	Channel	219-27-22	T					100.00%	$152,000	$152,000	
	Channel	219-27-24	P	1.13	155	89.2	0.32	28.09%	$30,000	$8,427	
	Channel	219-27-26	P	1.13	155	89.2	0.32	28.09%	$119,500	$33,566	
	Channel	219-27-28	P	1.13	155	89.2	0.32	28.09%	$175,000	$49,155	
	Channel	219-27-30	P	1.13	28.32	89.2	0.06	5.13%	$129,000	$6,620	
125' B/W	Channel	219-27-30	P	1.13	126.68	163.4	0.48	42.05%	$129,000	$54,248	
	Channel	219-27-32	T					100.00%	$30,000	$30,000	
	Channel	219-27-36	T					100.00%	$89,500	$89,500	
	Channel	219-29-22	T					100.00%	$114,000	$114,000	
	Channel	219-29-24	T					100.00%	$138,500	$138,500	
	Channel	219-29-26	T					100.00%	$48,500	$48,500	
	Channel	219-29-28	T					100.00%	$100,500	$100,500	
	Channel	219-29-30	T					100.00%	$70,000	$70,000	
	Channel	219-29-32	T					100.00%	$140,000	$140,000	
	Channel	219-29-36	T					100.00%	$100,500	$100,500	
	Channel	219-34-17	T					100.00%	$29,000	$29,000	
	Channel	219-34-10H	T					100.00%	$119,000	$119,000	
	Channel	219-34-10S	T					100.00%	$115,000	$115,000	
	Channel	219-34-10Q	T					100.00%	$129,500	$129,500	
	Channel	219-34-10P	T					100.00%	$194,500	$194,500	
	Channel	219-34-19	T					100.00%	$161,000	$161,000	
	Channel	219-34-18	T					100.00%	$141,000	$141,000	
	Channel	219-25-95B	T					100.00%	$137,000	$137,000	
	Channel	219-25-95C	T					100.00%	$147,000	$147,000	
	Channel	219-25-95F	T					100.00%	$141,500	$141,500	
	Channel	219-25-95E	T					100.00%	$140,000	$140,000	
	Channel	219-25-75A	P	21.45	660	163.4	2.48	11.54%	$386,000	$44,552	
175' B/W	Channel	219-25-3E	P	40.247	1290	214.2	6.34	15.76%	$573,500	$90,390	
	Channel	219-25-3E	P	40.247	574.03	214.2	2.82	7.01%	$573,500	$40,222	
	Channel	219-25-3C	P	13.335	745.97	214.2	3.67	27.51%	$266,700	$73,364	
	Channel	219-25-38	T					100.00%	$18,140	$18,140	
	Channel	219-25-37	T					100.00%	$19,680	$19,680	$3,804,040
	Basin	219-31-28C	P	38.71	660	660	10.00	25.83%	$735,000	$189,883	$189,883
						Total (ac)	39.88				$3,993,924

Land Takes
Culver Street Option 1a Concrete Channel

Segment	Feature	Parcel	Take (T, P, or N)	Parcel Area (acres)	Parcel Width (ft)	Depth of Take (ft)	Take Area (acres)	Take Area (%)	Land Value ($)	Cost ($)	
15' B/W	Channel	219-31-4B	P	29.90	1600	50.2	1.84	6.17%	$568,000	$35,027	
	Channel	219-31-1E	P	30.26	200	50.2	0.23	0.76%	$574,500	$4,376	
	Channel	219-31-1G	P	2.48	330	53.6	0.41	16.39%	$85,500	$14,011	
	Channel	219-31-1D	P	2.66	330	53.6	0.41	15.25%	$230,000	$35,084	
	Channel	219-31-28C	P	38.71	1295	53.6	1.59	4.12%	$735,000	$30,258	
10' B/W	Channel	219-28-22	P	0.89	240	42	0.23	26.00%	$108,000	$28,081	
	Channel	219-28-24	P	1.09	150	42	0.14	13.27%	$153,000	$20,301	
	Channel	219-28-26	P	1.09	150	42	0.14	13.27%	$100,000	$13,269	
	Channel	219-28-28	P	1.09	150	42	0.14	13.27%	$145,500	$19,306	
	Channel	219-28-30	P	1.09	150	42	0.14	13.27%	$152,000	$20,168	
	Channel	219-28-32	P	1.09	150	42	0.14	13.27%	$94,500	$12,539	
	Channel	219-28-36	P	0.88	234.6	42	0.23	25.70%	$103,000	$26,475	
	Channel	219-27-22	P	0.91	242	42	0.23	25.64%	$152,000	$38,974	
	Channel	219-27-24	P	1.13	155	42	0.15	13.23%	$30,000	$3,968	
	Channel	219-27-26	P	1.13	155	42	0.15	13.23%	$119,500	$15,805	
	Channel	219-27-28	P	1.13	155	42	0.15	13.23%	$175,000	$23,145	
	Channel	219-27-30	P	1.13	28.32	42	0.03	2.42%	$129,000	$3,117	
10' B/W	Channel	219-27-30	P	1.13	126.68	48.7	0.14	12.53%	$129,000	$16,168	
	Channel	219-27-32	P	1.13	155	48.7	0.17	15.34%	$30,000	$4,601	
	Channel	219-27-36	P	0.91	242	48.7	0.27	29.73%	$89,500	$26,610	
	Channel	219-29-22	P	0.91	242	48.7	0.27	29.73%	$114,000	$33,894	
	Channel	219-29-24	P	1.17	155	48.7	0.17	14.81%	$138,500	$20,513	
	Channel	219-29-26	P	1.17	155	48.7	0.17	14.81%	$48,500	$7,183	
	Channel	219-29-28	P	1.17	155	48.7	0.17	14.81%	$100,500	$14,885	
	Channel	219-29-30	P	1.17	155	48.7	0.17	14.81%	$70,000	$10,368	
	Channel	219-29-32	P	1.17	155	48.7	0.17	14.81%	$140,000	$20,736	
	Channel	219-29-36	P	0.91	242	48.7	0.27	29.73%	$100,500	$29,880	
	Channel	219-34-17	P	0.546	144.82	48.7	0.16	29.65%	$29,000	$8,600	
	Channel	219-34-10H	P	0.96	160	48.7	0.18	18.63%	$119,000	$22,174	
	Channel	219-34-10S	P	0.803	164.9	48.7	0.18	22.96%	$115,000	$26,402	
	Channel	219-34-10Q	P	0.803	164.9	48.7	0.18	22.96%	$129,500	$29,731	
	Channel	219-34-10P	P	2.5	330	48.7	0.37	14.76%	$194,500	$28,703	
	Channel	219-34-19	P	1.125	148.5	48.7	0.17	14.76%	$161,000	$23,760	
	Channel	219-34-18	P	1.125	148.55	48.7	0.17	14.76%	$141,000	$20,815	
	Channel	219-25-95B	P	0.774	205	48.7	0.23	29.61%	$137,000	$40,567	
	Channel	219-25-95C	P	1.132	138.55	48.7	0.15	13.68%	$147,000	$20,115	
	Channel	219-25-95F	P	1.132	138.55	48.7	0.15	13.68%	$141,500	$19,362	
	Channel	219-25-95E	P	1.132	138.55	48.7	0.15	13.68%	$140,000	$19,157	
	Channel	219-25-75A	P	21.45	660	48.7	0.74	3.44%	$386,000	$13,278	
20' B/W	Channel	219-25-3E	P	40.247	1290	57.4	1.70	4.22%	$573,500	$24,222	
25' B/W	Channel	219-25-3E	P	40.247	574.03	61	0.80	2.00%	$573,500	$11,455	
	Channel	219-25-3C	P	13.335	745.97	61	1.04	7.83%	$266,700	$20,893	
	Channel	219-25-38	P	0.9	130	61	0.18	20.23%	$18,140	$3,669	
	Channel	219-25-37	P	0.9	130	61	0.18	20.23%	$19,680	$3,981	$865,624
	Basin	219-31-28C	P	38.71	660	660	10.00	25.83%	$735,000	$189,883	$189,883
						Total (ac)	25.12				$1,055,507

Proposed 10-Acre Detention Basin
Basin 1

Elevation	Area		Inc. Vol.	Storage Vol.
	ft	ac	ac-ft	ac-ft
1801	63	0.00	0.0	0.0
1802	13689	0.31	0.2	0.2
1803	50031	1.15	0.7	0.9
1804	56547	1.30	1.2	2.1
1805	64163	1.47	1.4	3.5
1806	71403	1.64	1.6	5.1 ← 5.1
1807	78982	1.81	1.7	6.8
1812	4910	0.11	0.0	0.0
1813	70645	1.62	0.9	0.9
1814	120228	2.76	2.2	3.1
1815	129854	2.98	2.9	5.9
1816	139745	3.21	3.1	9.0
1817	149898	3.44	3.3	12.3 ← 12.3
1818	160315	3.68	3.6	15.9

12.3 ac-ft w/1' FB

Excavation Volume	
2,706,614	cf
100,245	cy
62	ac-ft

OAK & HAWES

Level I

for Level II see Level II Basins

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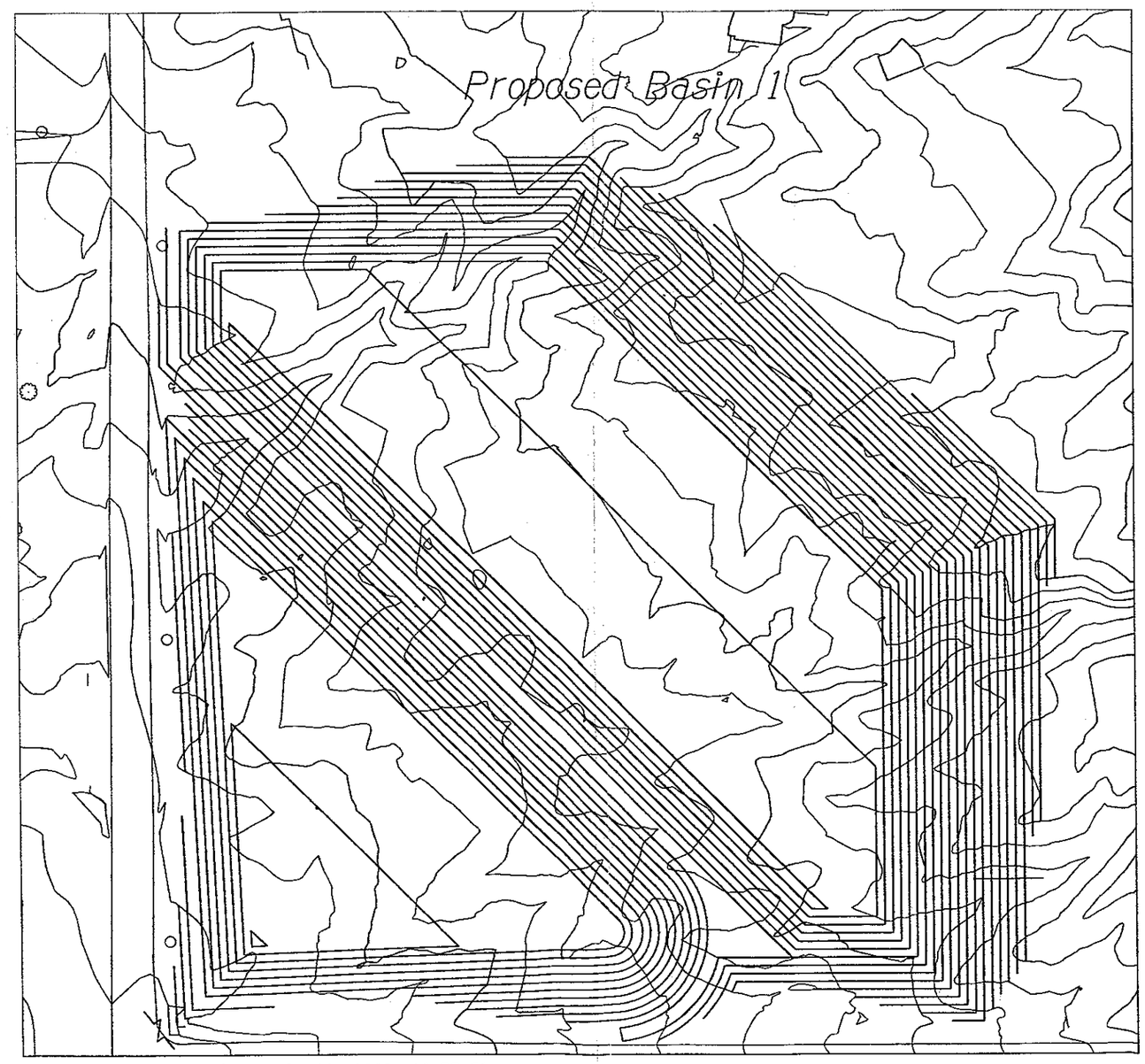

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Proposed 10-Acre Detention Basin
Basin 2

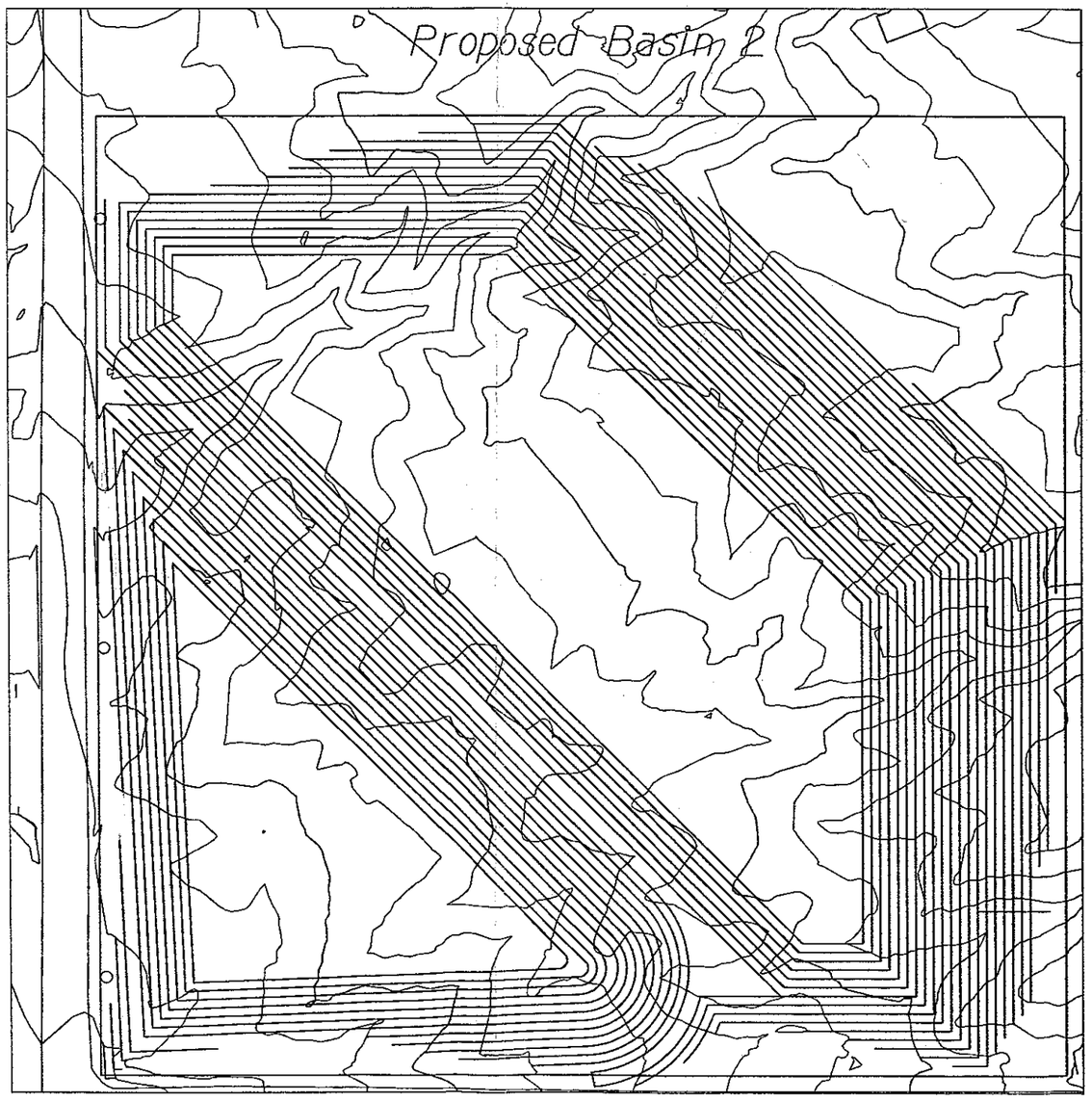
Elevation	Area		Inc. Vol.	Storage Vol.
	ft	ac	ac-ft	ac-ft
1801	37980	0.87	0.0	0.0
1802	43856	1.01	0.9	0.9
1803	50031	1.15	1.1	2.0
1804	56547	1.30	1.2	3.2
1805	64163	1.47	1.4	4.6
1806	71403	1.64	1.6	6.2 ← 6.2
1807	78982	1.81	1.7	7.9
1812	101764	2.34	0.0	0.0
1813	110864	2.55	2.4	2.4
1814	120228	2.76	2.7	5.1
1815	129854	2.98	2.9	8.0
1816	139745	3.21	3.1	11.1
1817	149898	3.44	3.3	14.4 ← 14.4
1818	160315	3.68	3.6	17.9

2060 Ac-ft w/1' FB

Excavation Volume	
2,858,049	cf
105,854	cy
66	ac-ft

SE corn. of Thunder Mtn

Near McDonell Rd



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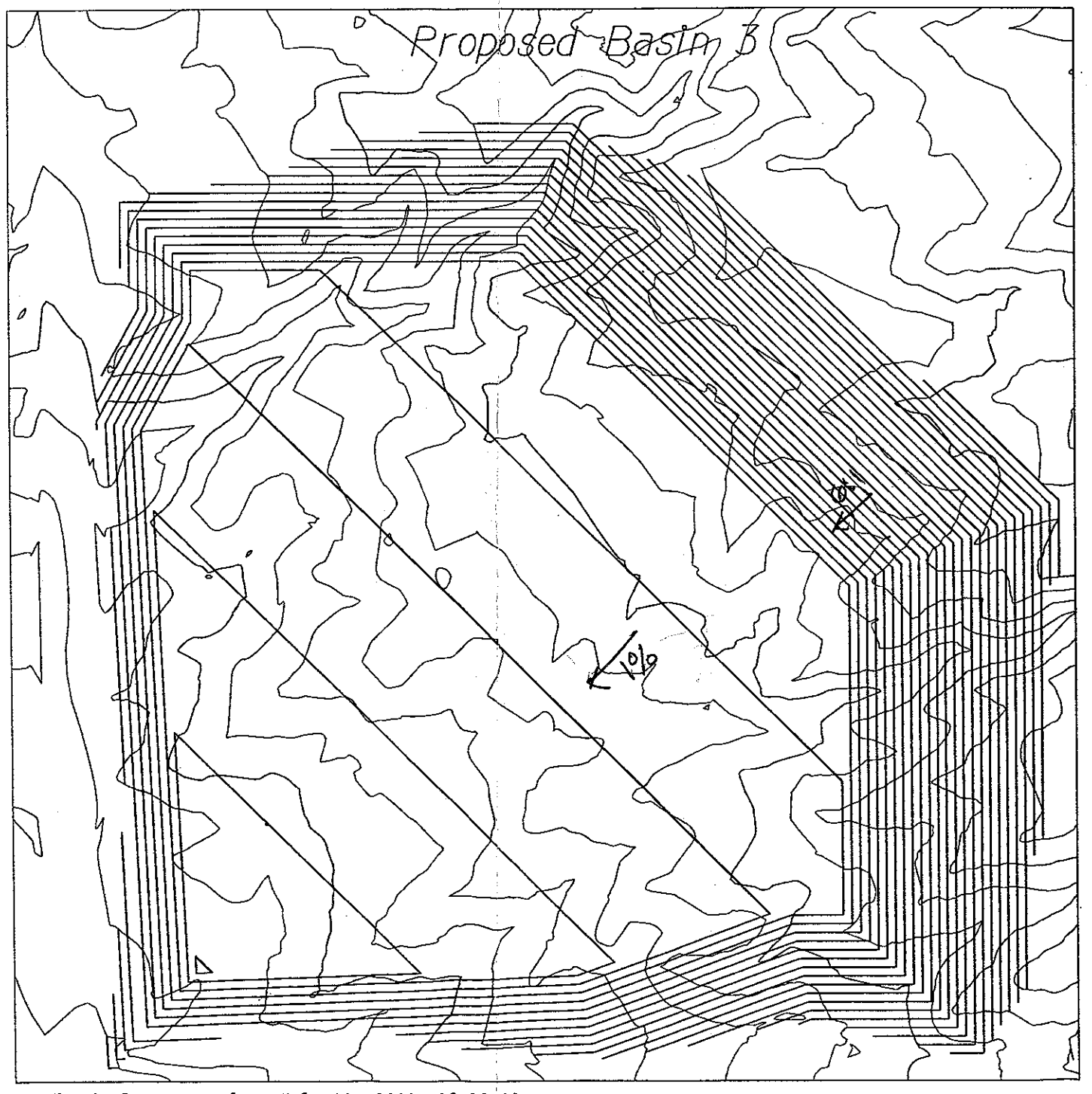
Proposed 10-Acre Detention Basin
Basin 3

Elevation	Area		Inc. Vol.	Storage Vol.
	sq. ft	ac	ac-ft	ac-ft
1801	63	0.00	0.0	0.0
1802	13689	0.31	0.2	0.2
1803	50964	1.17	0.7	0.9
1804	106744	2.45	1.8	2.7
1805	170121	3.91	3.2	5.9
1806	219511	5.04	4.5	10.4
1807	230521	5.29	5.2	15.5

Excavation Volume	
3,387,700	cf
125,470	cy
78	ac-ft



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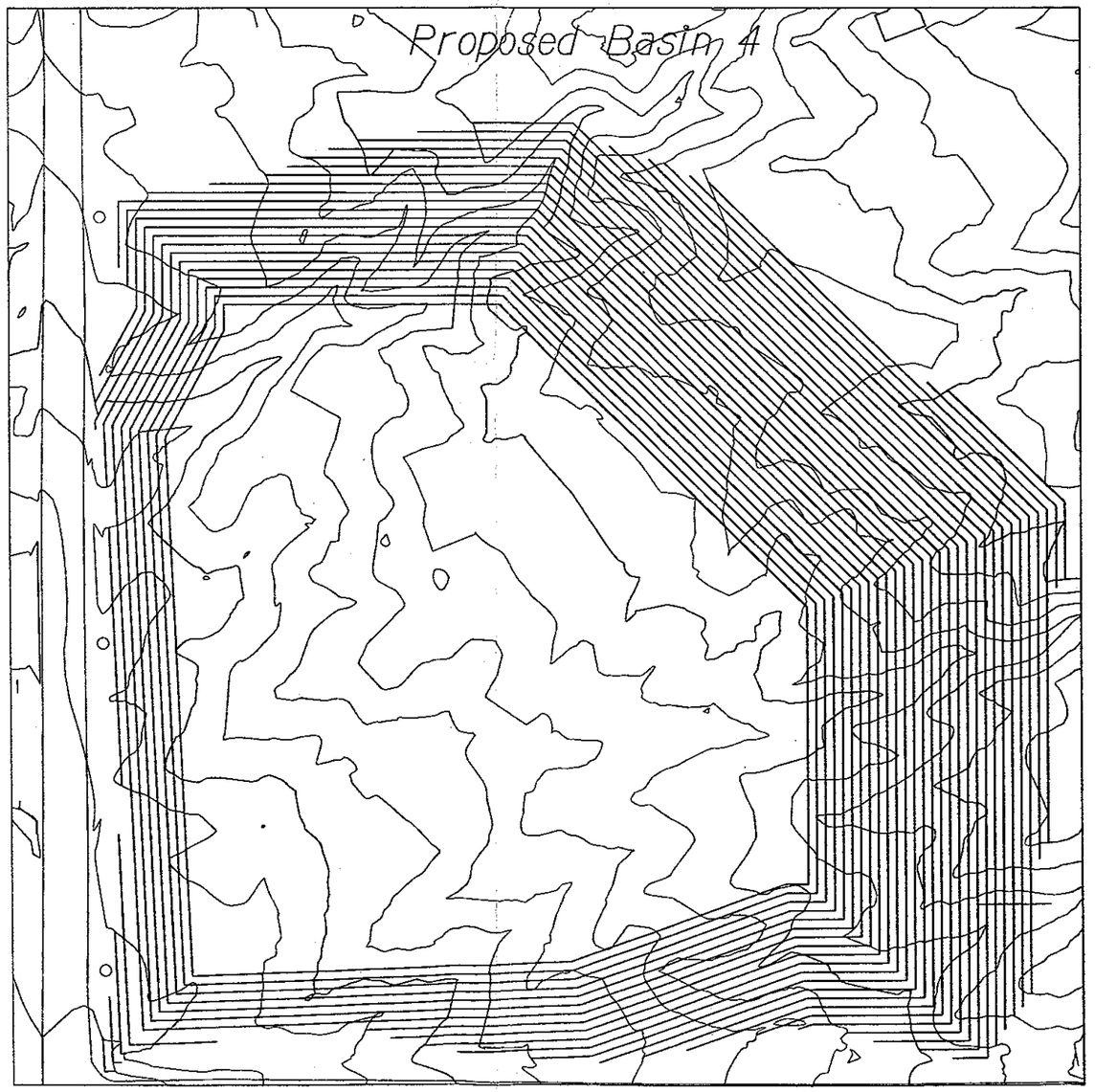
Proposed 10-Acre Detention Basin
Basin 4

Elevation	Area		Inc. Vol.	Storage Vol.
	sq. ft	ac	ac-ft	ac-ft
1801	168595	3.87	0.0	0.0
1802	178226	4.09	4.0	4.0
1803	188134	4.32	4.2	8.2
1804	198317	4.55	4.4	12.6
1805	208776	4.79	4.7	17.3
1806	219511	5.04	4.9	22.2
1807	230521	5.29	5.2	27.4

Excavation Volume	
3,922,400	cf
145,274	cy
90	ac-ft



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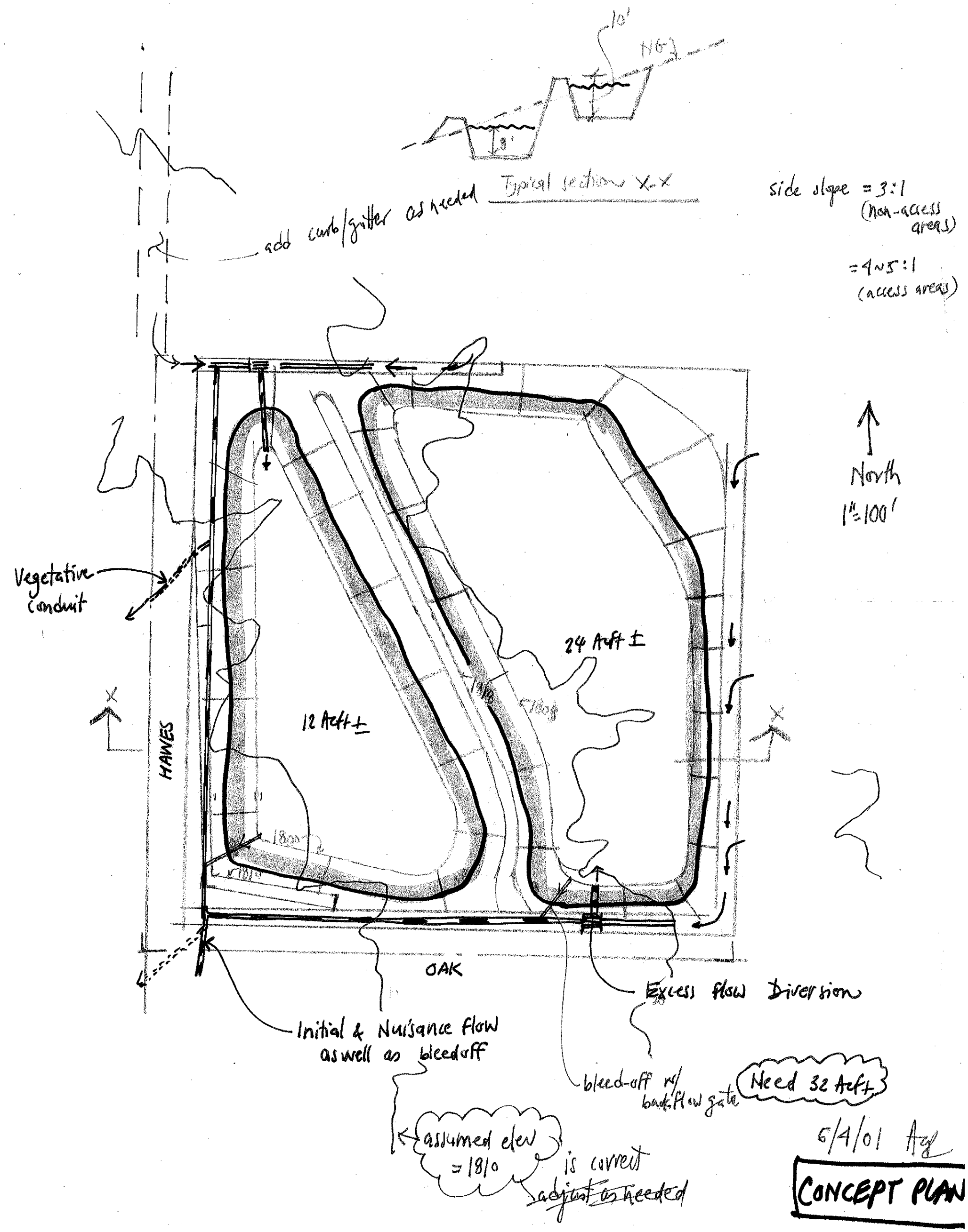
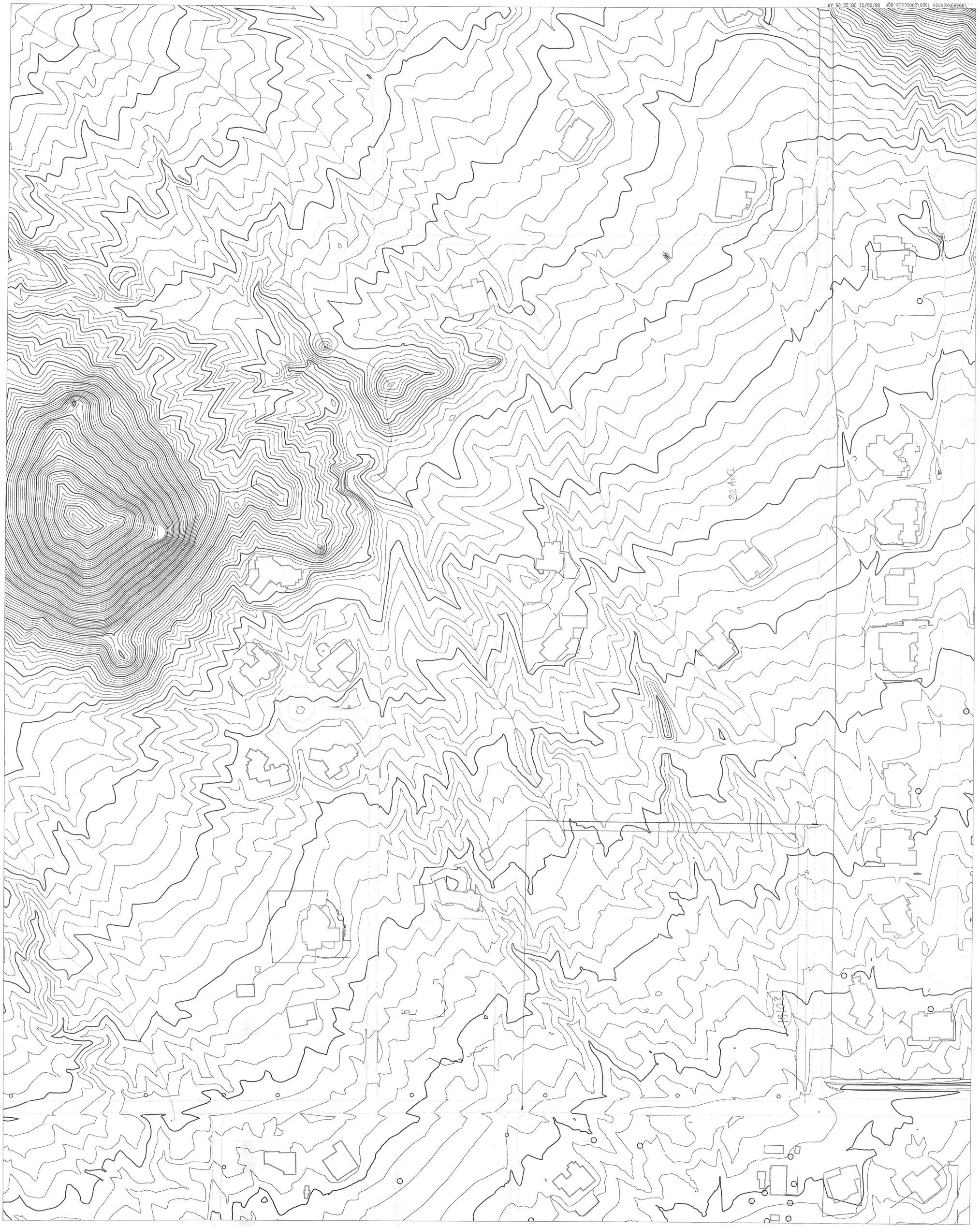
OFFLINE BASIN
CHANNEL
CHANNEL
Granite Reef Estates
SOSSAMAN ROAD
HAWES ROAD
ELLSWORTH ROAD
CRISMON ROAD


10'
HGL
9'
Typical section X-X
side slope = 3:1
(non-access areas)
= 4 ~ 5:1
(access areas)
add curb/gutter as needed
North
1" = 100'
Vegetative conduit
24 Acft ±
12 Acft ±
HAWES
OAK
Excess flow Diversion
Initial & Nuisance flow as well as bleedoff
bleed-off w/ backflow gate
Need 32 Acft
assumed elev = 1810
is correct
adjust as needed
6/4/01 Ag
CONCEPT PLAN



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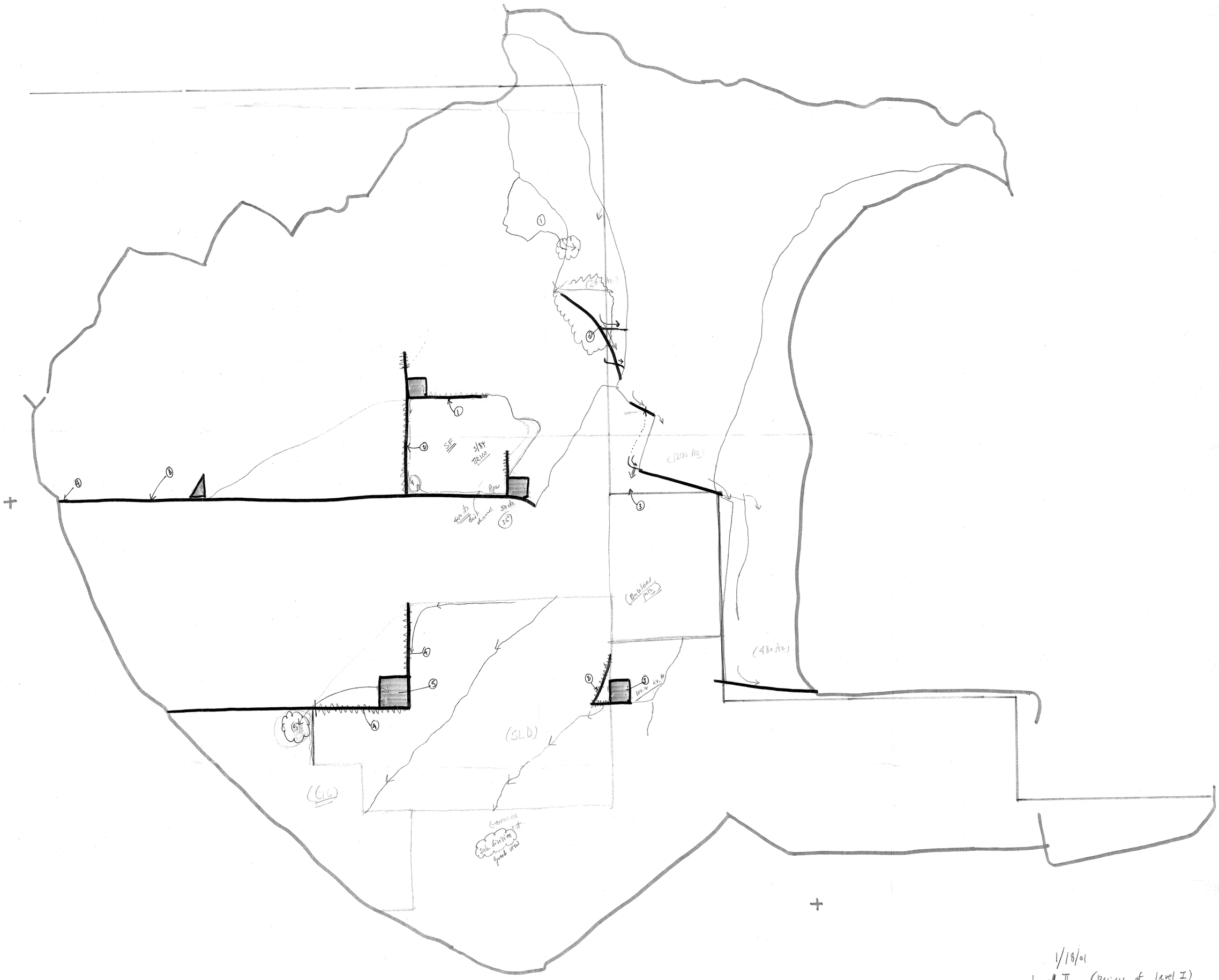
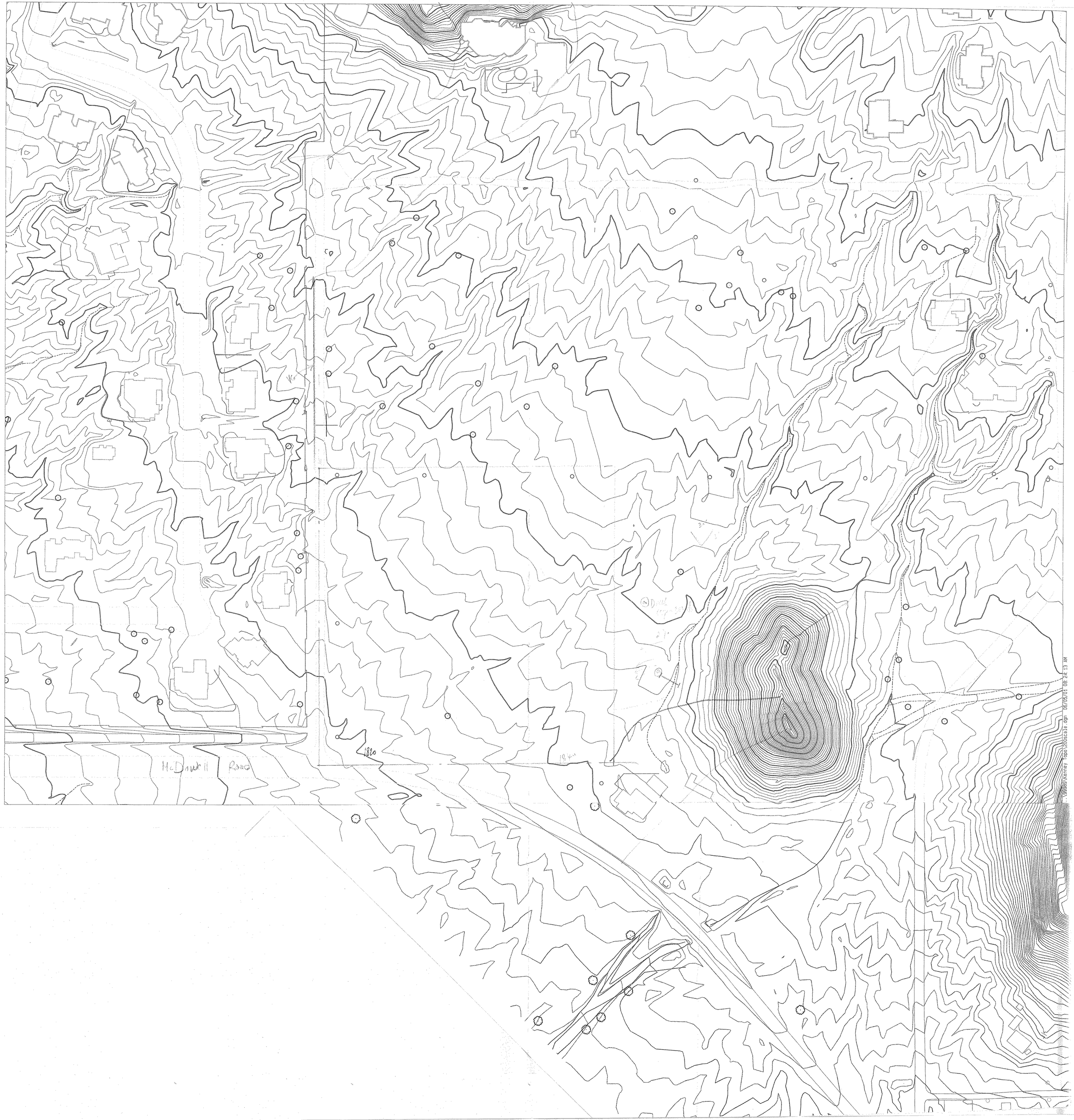


1/18/01

Level II- (Review of Level I)


McDowell Road
1820
1840
Dirt
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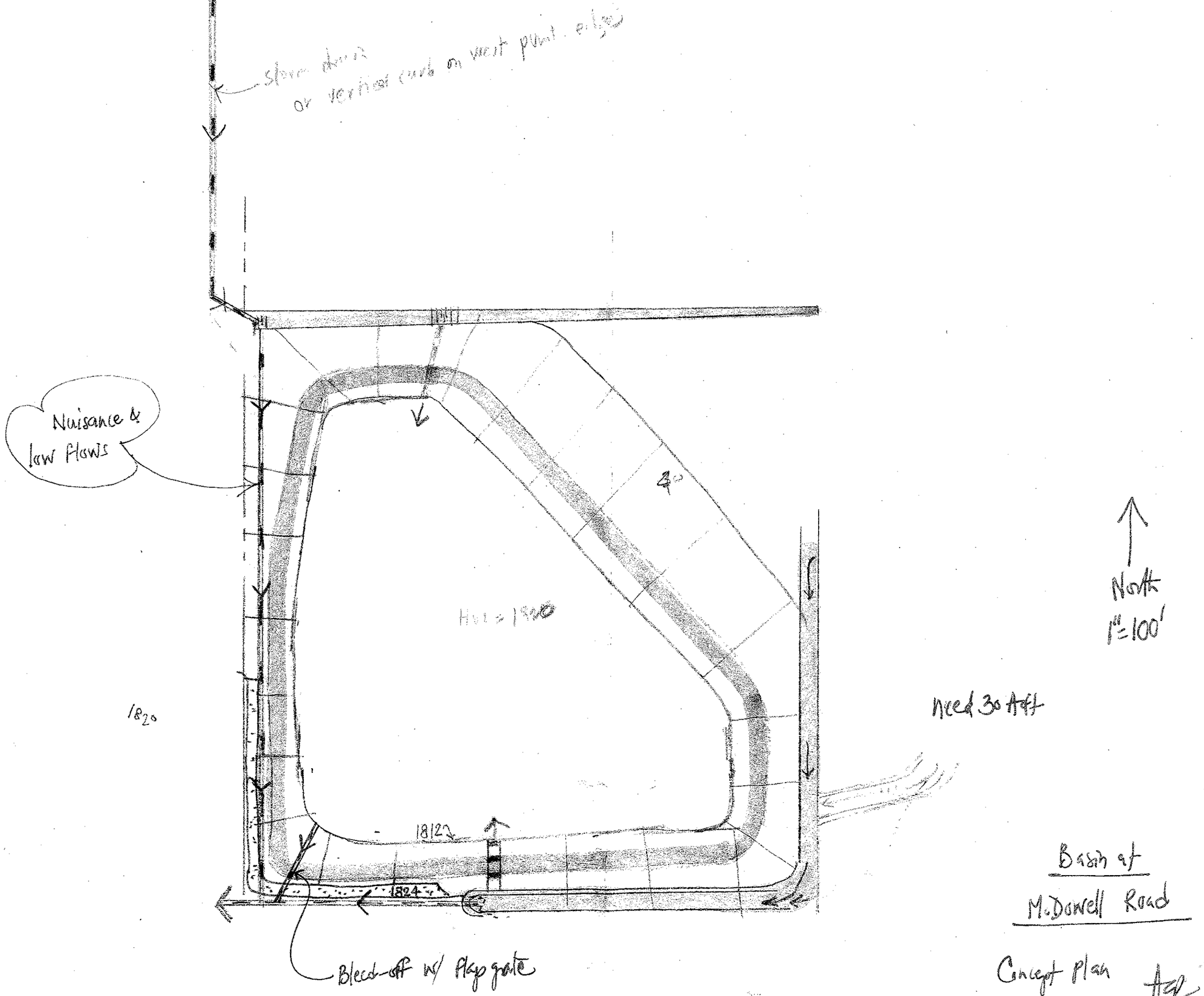
\Vegas\Kenney Topo 20Scale.dgn



Basin at
McDowell Road

Concept plan

TGF 6/5/01

Spook Hill FRS
Existing Storage Summary

	Elevation ft	Area ac	Storage Vol ac-ft
Bottom	1567.86	0	0
Sediment Pool	1577.2	113	271
Principal Spillway	1579.36	154	553.6
Emergency Spillway	1583.86	241	1461.7
Top of Dam	1592.5	466	4506.6

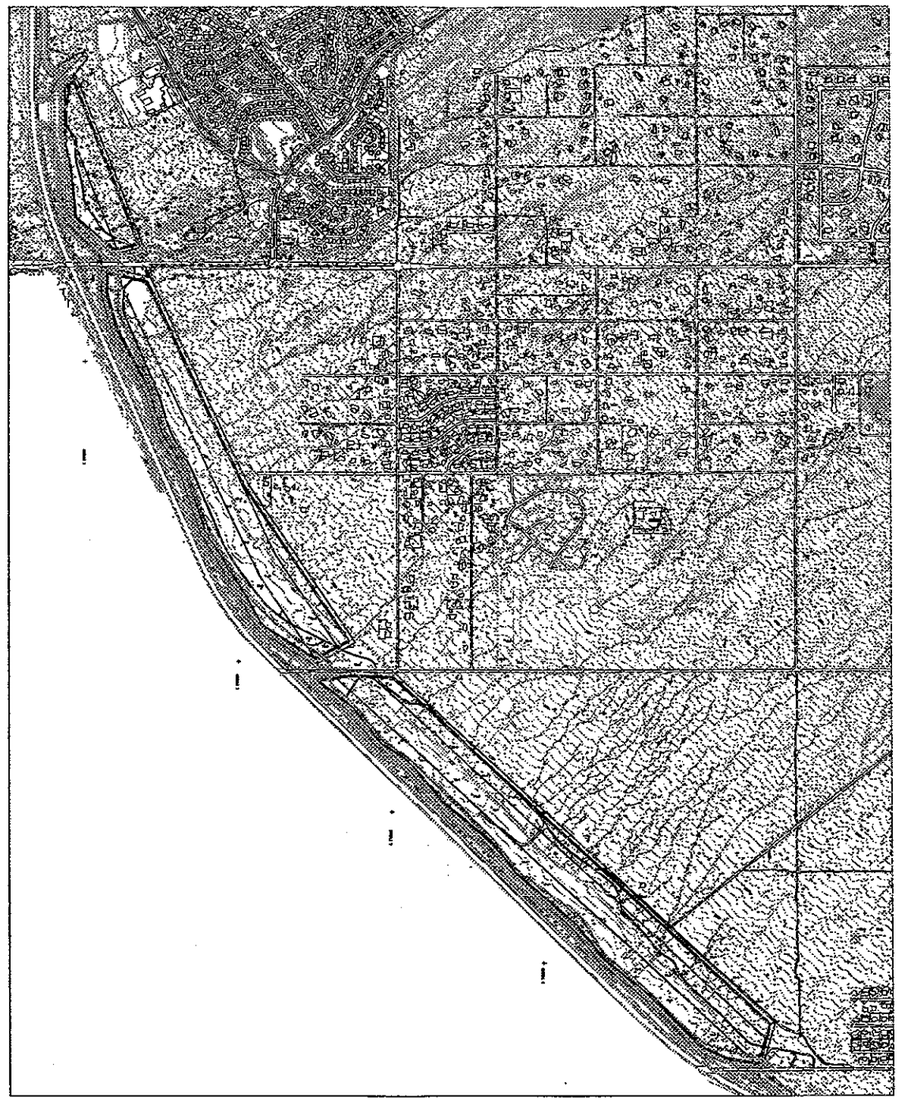
Spook Hill FRS

Existing Condition Rating Curve

elev	cumulative vol		Sediment	Storage vol
ft	cy	ac-ft	ac-ft	ac-ft
1570	1000.8	0.6	271	-270.4
1571	6971.65	4.3	271	-266.7
1572	19877.13	12.3	271	-258.7
1573	43786.02	27.1	271	-243.9
1574	87667.1	54.3	271	-216.7
1575	156273.96	96.9	271	-174.1
1576	257200.24	159.4	271	-111.6
1577	400611.91	248.3	271	-22.7
1578	583510.05	361.7	271	90.7
1579	804276	498.5	271	227.5
1580	1062213.95	658.4	271	387.4
1581	1351106.91	837.5	271	566.5
1582	1673131.81	1037.1	271	766.1
1583	2028658.34	1257.4	271	986.4
1583.86	2358095.82	1461.6	271	1190.6

Spook Hill FRS
Replacement Basin Volumes

Storage Elevation		Area		Cum. Area	Cum. Vol	Storage Vol
	sq ft	sq ft	sq ft	ac	ac-ft	ac-ft
1569	1834201	1589801	316690	85.87	0	0
1570	4285987	3385097	914443	197.10	141.5	141.5
1571	5472354	3714753	929658	232.25	214.7	356.2
1572	5520503	3752151	944945	234.56	233.4	589.6
1573	5568715	3789621	960302	236.88	235.7	825.3
1574	5616985	3827158	975727	239.21	238.0	1063.3
1575	5665319	3864768	991225	241.54	240.4	1303.7
1576	5713724	3902444	1006793	243.87	242.7	1546.4
1577	5762183	3940192	1022427	246.21	245.0	1791.4



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FRS Replacement Excavation Volumes

FRS Structure	Storage option	Excavation Quantity	Excavation cost/cubic yard	Total excavation cost
		cy	$/cy	$
Apache Junction	-	973,000	$2	$1,946,000
Signal Butte	A	2,300,000	$2	$4,600,000
	B	4,032,000	$2	$8,064,000
Spook Hill	-	4,171,000	$2	$8,342,000

FRS Storage Volume Summary

FRS Structure	Principal spillway elevation	Volume @ principal spillway elevation		Emergency spillway elevation	Volume between principal and emergency spillway		Top of dam elevation	Volume @ top of dam elevation	
	ft	cy	ac-ft	ft	cy	ac-ft	ft	cy	ac-ft
Apache Junction	1795.45	214,800	133.1	1801.92	1,041,900	512.7	1812.92	3,823,300	2369.8
Signal Butte	1703.23	742,300	460.1	1714.63	2,161,700	879.8	1724	5,311,400	3292.2
Spook Hill	1579.36	893,100	553.6	1583.86	2,358,100	908.1	1592.5	7,270,700	4506.6

Elevation (ft NAVD 1988)	Gage Height (feet)	Storage (ac-ft)	Surface Area (acres)		
1567.86	0.00	0	0	Invert of P.O.	
1570	2.14	0.44	1		
1571	3.14	4	6		
1572	4.14	13	11		
1573	5.14	29	20		
1574	6.14	55	34		
1575	7.14	98	51		
1576	8.14	160	73		
1577	9.14	245	96		
1578	10.14	352	119		
1579	11.14	482	141		
1580	12.14	634	161		
1581	13.14	804	178		
1582	14.14	990	195		
1583	15.14	1196	216		
1583.86	16.00	1391	234	spillway crest	
1584	16.14	1423	237		
1585	17.14	1670	258		
1586	18.14	1939	281		
1587	19.14	2231	303		
1588	20.14	2546	327		
1589	21.14	2886	351		
1590	22.14	3249	376		
1591	23.14	3637	401		
1592	24.14	4051	427		
1592.5	24.64	4271	440	minimum top of dam	
1593	25.14	4491	453		
1594	26.14	4958	481		

Prepared by T. W. Lehman
March 24, 1997

Source: McClain Harbors topography and DTM from FCD Contract No. 93-51

Triangle Volume Report

Original Surface: spooktop
Design Surface: Default1

Cut (cu yd)	Fill (cu yd)	Net (cu yd)
7270715.54	996415.33	6274300.21

Triangle Volume Report

Original Surface: spooksed
Design Surface: Default1

Cut (cu yd)	Fill (cu yd)	Net (cu yd)
893080.81	8102162.99	-7209082.17

Triangle Volume Report

Original Surface: spookc
Design Surface: Default1

Cut (cu yd)	Fill (cu yd)	Net (cu yd)
52082.42	1485572.80	-1433490.38

Triangle Volume Report

Original Surface: spookr
Design Surface: Default1

Cut (cu yd)	Fill (cu yd)	Net (cu yd)
38762.97	2189796.17	-2151033.20

Triangle Volume Report

Original Surface: spook1
Design Surface: Default1

Cut (cu yd)	Fill (cu yd)	Net (cu yd)
51552.87	495700.46	-444147.59

Signal Butte FRS
Existing Storage Summary

	Elevation ft	Area ac	Storage Vol ac-ft
Bottom	1687.53	0	0
Sediment Pool	1699.83	51	247
Principal Spillway	1703.23	72	460.1
Emergency Spillway	1714.63	142	1339.9
Top of Dam	1724	217	3292.2

Signal Butte FRS

Existing Condition Rating Curve

elev	cumulative vol		Sediment	Storage vol
ft	cy	ac-ft	ac-ft	ac-ft
1690	1201.14	0.7	247	-246.3
1691	9031.72	5.6	247	-241.4
1692	23545.36	14.6	247	-232.4
1693	44066.36	27.3	247	-219.7
1694	70483.78	43.7	247	-203.3
1695	103502.01	64.2	247	-182.8
1696	144495.90	89.6	247	-157.4
1697	194434.98	120.5	247	-126.5
1698	254885.45	158.0	247	-89.0
1699	328624.03	203.7	247	-43.3
1700	412593.87	255.7	247	8.7
1701	505242.63	313.2	247	66.2
1702	606305.65	375.8	247	128.8
1703	715557.20	443.5	247	196.5
1704	834677.49	517.4	247	270.4
1705	960711.90	595.5	247	348.5
1706	1093764.49	678.0	247	431.0
1707	1234605.50	765.3	247	518.3
1708	1384032.12	857.9	247	610.9
1709	1543241	956.6	247	709.6
1710	1712732.12	1061.6	247	814.6
1711	1892103.49	1172.8	247	925.8
1712	2082346.25	1290.7	247	1043.7
1712.4	2161654.36	1339.868	247	1092.9

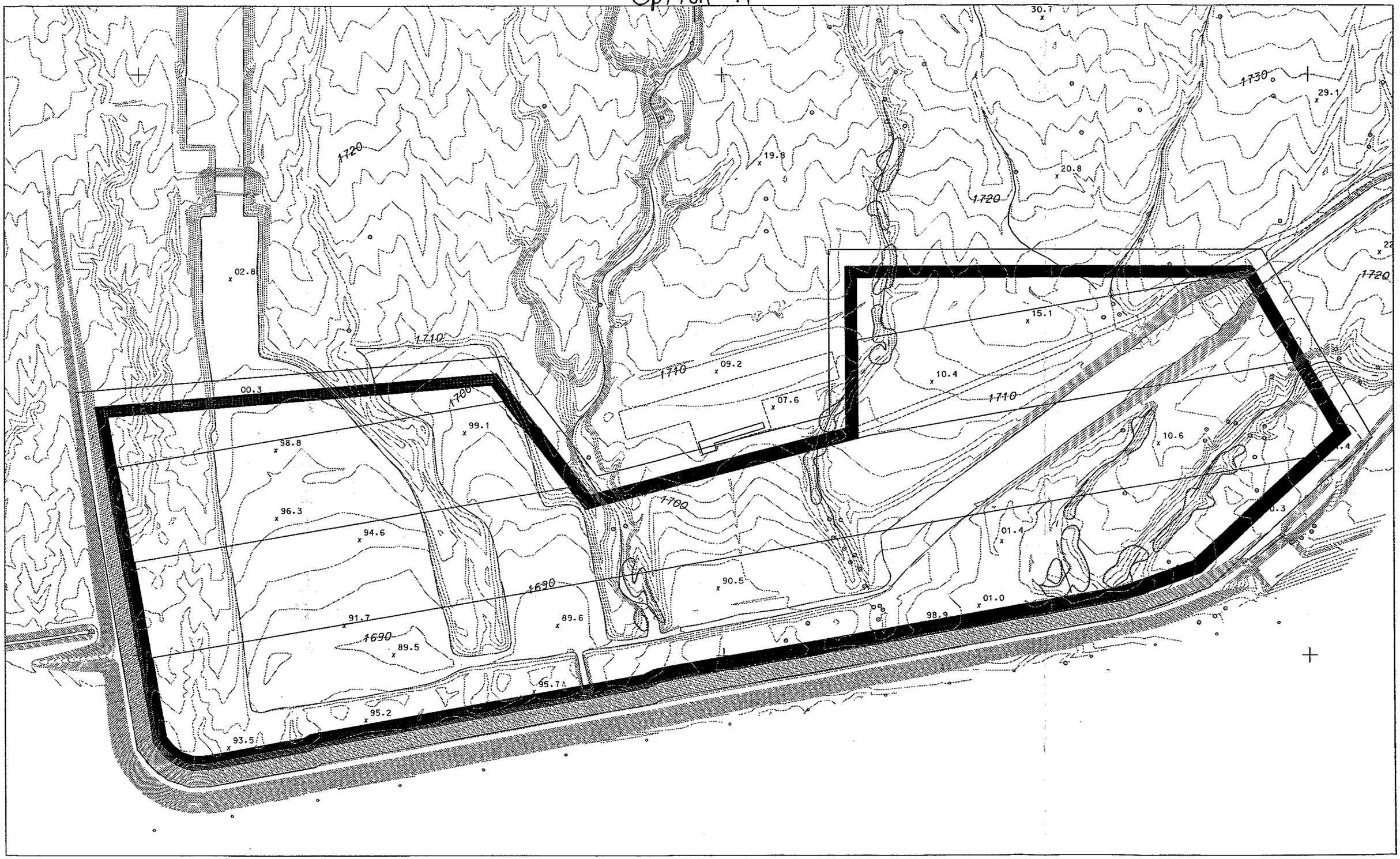
Signal Butte FRS
Replacement Basin Volumes

OPTION A				
Storage Elevation	Area		Cum. Vol	Storage Vol
	sq ft	ac	ac-ft	ac-ft
1685	1271780	29.20	0	0
1686	2594997	59.57	44.4	44.4
1687	3562482	81.78	70.7	115.1
1688	3877741	89.02	85.4	200.5
1689	3909925	89.76	89.4	289.9
1690	3942176	90.50	90.1	380.0
1691	3974492	91.24	90.9	470.9
1692	4006873	91.99	91.6	562.5
1693	4039322	92.73	92.4	654.8
1694	4071833	93.48	93.1	747.9
1695	4104413	94.22	93.9	841.8
1696	4137062	94.97	94.6	936.4
1697	4169773	95.72	95.3	1031.7
1698	4202549	96.48	96.1	1127.8
1699	4235390	97.23	96.9	1224.7
1700	4268300	97.99	97.6	1322.3
1701	4301275	98.74	98.4	1420.7

✓

OPTION B				
Storage Elevation	Area		Cum. Vol	Storage Vol
	sq ft	ac	ac-ft	ac-ft
1690	1338269	30.72	0	0
1691	2740228	62.91	46.8	46.8
1692	3837980	88.11	75.5	122.3
1693	4853758	111.43	99.8	222.1
1694	5736919	131.70	121.6	343.7
1695	6412818	147.22	139.5	483.1
1696	6777010	155.58	151.4	634.5
1697	6827423	156.74	156.2	790.7
1698	6870754	157.73	157.2	947.9
1699	6914153	158.73	158.2	1106.1
1700	6957614	159.72	159.2	1265.4
1701	7001145	160.72	160.2	1425.6

Option A



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Option B

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Option B

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FRS Replacement Excavation Volumes

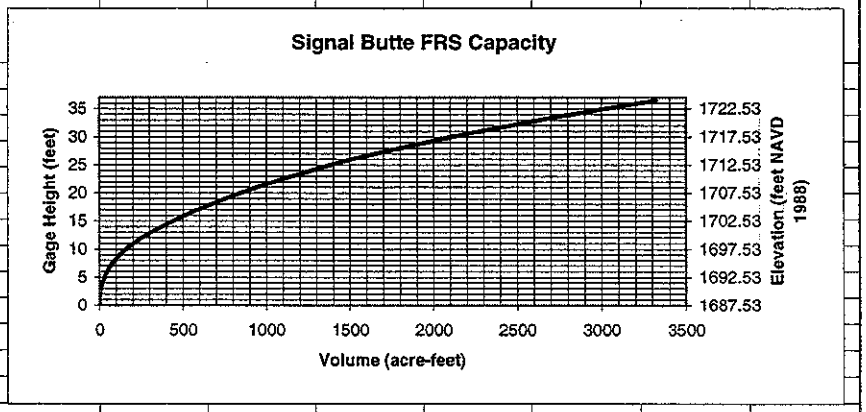
FRS Structure	Storage option	Excavation Quantity	Excavation cost/cubic yard	Total excavation cost
		cy	$/cy	$
Apache Junction	-	973,000	$2	$1,946,000
Signal Butte	A	2,300,000	$2	$4,600,000
	B	4,032,000	$2	$8,064,000
Spook Hill	-	4,171,000	$2	$8,342,000

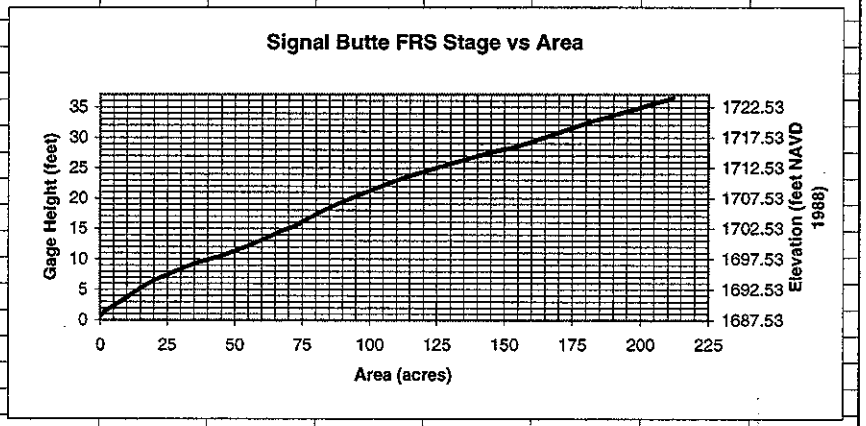
FRS Storage Volume Summary

FRS Structure	Principal spillway elevation	Volume @ principal spillway elevation		Emergency spillway elevation	Volume between principal and emergency spillway		Top of dam elevation	Volume @ top of dam elevation	
	ft	cy	ac-ft	ft	cy	ac-ft	ft	cy	ac-ft
Apache Junction	1795.45	214,800	133.1	1801.92	1,041,900	512.7	1812.92	3,823,300	2369.8
Signal Butte	1703.23	742,300	460.1	1714.63	2,161,700	879.8	1724	5,311,400	3292.2
Spook Hill	1579.36	893,100	553.6	1583.86	2,358,100	908.1	1592.5	7,270,700	4506.6

Signal Butte FRS Capacity
May 19, 1997

	Gage height	Elevation	Area	Volume
	Feet	feet NAVD 1988	Acres	Acre-feet
Middle Culvert Inlet Lip	0	1687.53	0	0
	0.47	1688	0.04	0.01
	1.47	1689	1.7	0.5
	2.47	1690	5.6	4.3
	3.47	1691	9.2	11.7
	4.47	1692	12	23
	5.47	1693	16	37
	6.47	1694	20	55
	7.47	1695	25	77
	8.47	1696	30	105
	9.47	1697	36	138
	10.47	1698	45	178
	11.47	1699	51	226
	12.47	1700	56	280
	13.47	1701	62	339
	14.47	1702	67	403
	15.47	1703	73	473
	16.47	1704	77	548
	17.47	1705	81	626
	18.47	1706	85	709
	19.47	1707	90	797
	20.47	1708	96	890
	21.47	1709	101	989
	22.47	1710	107	1093
	23.47	1711	113	1203
	24.47	1712	121	1320
	25.47	1713	128	1444
	26.47	1714	136	1577
Spillway Crest	27.1	1714.63	141	1665
	27.47	1715	144	1717
	28.47	1716	154	1866
	29.47	1717	161	2023
	30.47	1718	168	2188
	31.47	1719	174	2359
	32.47	1720	181	2536
	33.47	1721	188	2721
	34.47	1722	196	2913
	35.47	1723	204	3114
Top of Dam	36.47	1724	212	3322





Date: May 19, 1997
Prepared by T.W. Lehman

Source: TWL/DEG survey 3/18/97 and
Topography from McLain Harbers survey, FCD Contract 93-51

Triangle Volume Report

Original Surface: signaltop
Design Surface: Default1

Cut (cu yd)	Fill (cu yd)	Net (cu yd)
5311449.19	114402.93	5197046.26

Triangle Volume Report

Original Surface: signalsed
Design Surface: Default1

Cut (cu yd)	Fill (cu yd)	Net (cu yd)
742279.63	3449163.38	-2706883.75

Triangle Volume

Triangle Volume Report

Original Surface: signala
Design Surface: Default1

Mode: Entire Surface
Cut Factor: 1.00
Fill Factor: 1.00

Cut: 7357475.51 cu ft
Fill: 62098851.24 cu ft
Net: -54741375.73 cu ft

Cut: 272499.09 cu yd
Fill: 2299957.45 cu yd
Net: -2027458.36 cu yd

Triangle Volume

Triangle Volume Report

Original Surface: signalb
Design Surface: Default1

Mode: Entire Surface
Cut Factor: 1.00
Fill Factor: 1.00

Cut: 31559744.50 cu ft
Fill: 108855716.33 cu ft
Net: -77295971.83 cu ft

Cut: 1168879.43 cu yd
Fill: 4031693.20 cu yd
Net: -2862813.77 cu yd

Apache Junction FRS
Existing Storage Summary

	Elevation ft	Area ac	Storage Vol ac-ft
Bottom	1785.92	0	0
Sediment Pool	1794.82	43	105
Principal Spillway	1795.45	49	133.1
Emergency Spillway	1801.92	109	645.8
Top of Dam	1812.92	218	2369.8

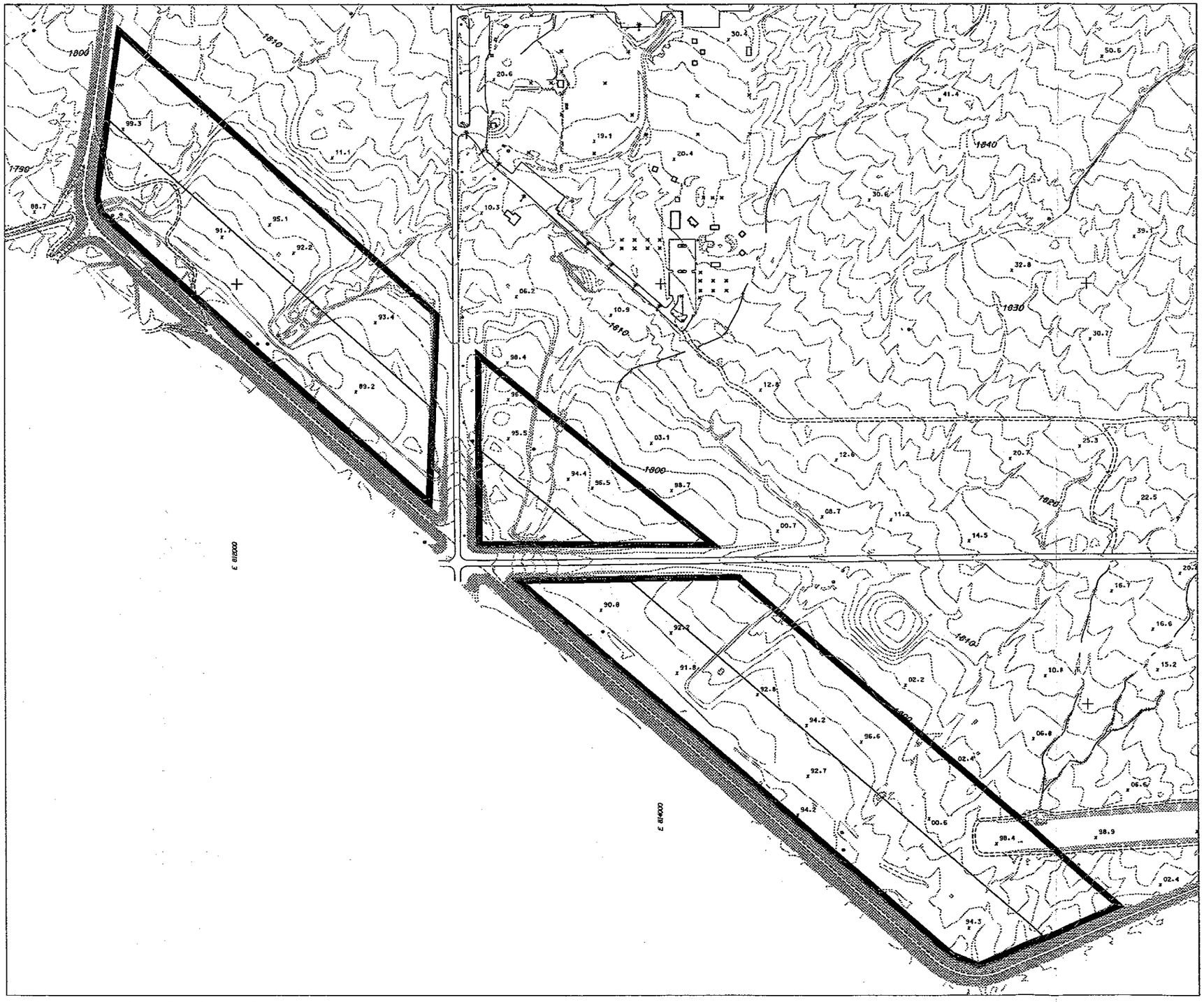
Apache Junction FRS

Rating Curve

elev	cumulative vol		Sediment	Storage vol
ft	cy	ac-ft	ac-ft	ac-ft
1786	0	0.0	105	-105.0
1787	0	0.0	105	-105.0
1788	241.39	0.1	105	-104.9
1789	1762.89	1.1	105	-103.9
1790	6945.47	4.3	105	-100.7
1791	18184.05	11.3	105	-93.7
1792	37903.38	23.5	105	-81.5
1793	69592.72	43.1	105	-61.9
1794	116947.87	72.5	105	-32.5
1795	180826.94	112.1	105	7.1
1796	260850.28	161.7	105	56.7
1797	355405.01	220.3	105	115.3
1798	464445.4	287.9	105	182.9
1799	587659.76	364.3	105	259.3
1800	728856.22	451.8	105	346.8
1801	885500.79	548.9	105	443.9
1801.92	1041924.82	645.8	105	540.8

Apache Junction FRS
Replacement Basin Volumes

Storage Elevation		Area		Cum. Area	Cum. Vol	Storage Vol
	sq ft	sq ft	sq ft	ac	ac-ft	ac-ft
1788	679639	113517	880237	38.42	0	0
1789	1354519	458938	1706727	80.81	59.6	59.6
1790	1371702	468873	1727283	81.91	81.4	141.0
1791	1388975	478912	1747929	83.01	82.5	223.4
1792	1406338	489060	1768670	84.12	83.6	307.0
1793	1423788	499313	1789504	85.23	84.7	391.7
1794	1441328	509673	1810429	86.35	85.8	477.5
1795	1458958	520139	1831452	87.48	86.9	564.4
1796	1476678	530712	1852564	88.61	88.0	652.4
1797	1494486	541390	1873769	89.75	89.2	741.6



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FRS Replacement Excavation Volumes

FRS Structure	Storage option	Excavation Quantity	Excavation cost/cubic yard	Total excavation cost
		cy	$/cy	$
Apache Junction	-	973,000	$2	$1,946,000
Signal Butte	A	2,300,000	$2	$4,600,000
	B	4,032,000	$2	$8,064,000
Spook Hill	-	4,171,000	$2	$8,342,000

FRS Storage Volume Summary

FRS Structure	Principal spillway elevation	Volume @ principal spillway elevation		Emergency spillway elevation	Volume between principal and emergency spillway		Top of dam elevation	Volume @ top of dam elevation	
	ft	cy	ac-ft	ft	cy	ac-ft	ft	cy	ac-ft
Apache Junction	1795.45	214,800	133.1	1801.92	1,041,900	512.7	1812.92	3,823,300	2369.8
Signal Butte	1703.23	742,300	460.1	1714.63	2,161,700	879.8	1724	5,311,400	3292.2
Spook Hill	1579.36	893,100	553.6	1583.86	2,358,100	908.1	1592.5	7,270,700	4506.6

Apache Junction FRS Capacity						
May 19, 1997						
		Gage height	Elevation	Surface Area	Volume	
		Feet	feet NAVD 1988	(acres)	(ac-ft)	
Lip of Culvert Entrance		0	1785.92	0	0	
		0.08	1786	0.05	0.01	
		1.08	1787	0.4	0.2	
		2.08	1788	1.4	1.0	
		3.08	1789	3.7	3.4	
		4.08	1790	7	8	
		5.08	1791	12	18	
		6.08	1792	19	34	
		7.08	1793	29	58	
		8.08	1794	38	91	
		9.08	1795	47	134	
		10.08	1796	56	186	
		11.08	1797	64	246	
		12.08	1798	73	314	
		13.08	1799	82	392	
		14.08	1800	94	479	
		15.08	1801	103	577	
	Spillway Crest	16.0	1801.92	111	676	
		16.08	1802	112	684	
		17.08	1803	120	800	
		18.08	1804	128	924	
		19.08	1805	136	1055	
		20.08	1806	143	1195	
		21.08	1807	151	1341	
		22.08	1808	158	1495	
		23.08	1809	166	1658	
		24.08	1810	177	1829	
		25.08	1811	188	2011	
		26.08	1812	200	2205	
Approx.	Top of Dam	27	1812.92	213	2400	* Extrapola

x 812509
y 888100

.3% cross slope

1640
3:1

Date: May 19, 1997
Prepared by T.W. Lehman

Source: TWL/DEG survey 3/18/97 and
Topography from McLain Harbers survey, FCD Contract 93-51

APACHE FRS

NAVD 1988 Elevation (feet)	Gage Height Elevation (feet)	Discharge Main Outlet (cfs)	Discharge Emergency Spillway (cfs)	Discharge Combined (cfs)	Storage Capacity (acre-feet)	Surface Area (acres)	Draw Down Time (hours)	
1785.92	0	0	0	0	0	0	0	
1786	0.08	0	0	0	0.01	0.05	0	
1787	1.08	9	0	9	0.2	0.4	0.4	
1788	2.08	15	0	15	1	1.4	0.9	
1789	3.08	21	0	21	3.4	3.7	2.6	
1790	4.08	25	0	25	8	7	4.6	
1791	5.08	30	0	30	18	12	9	
1792	6.08	34	0	34	34	19	13.8	
1793	7.08	37	0	37	58	29	22.1	
1794	8.08	40	0	40	91	38	30.3	
1795	9.08	43	0	43	134	47	38	
1796	10.08	74	0	74	186	56	45.8	
1797	11.08	79	0	79	246	64	55.1	
1798	12.08	83	0	83	314	73	64.5	
1799	13.08	87	0	87	392	82	75.4	
1800	14.08	90	0	90	479	94	86.5	
1801	15.08	94	0	94	577	103	99.2	
1801.92	16	97	0	97	676	111	110.9	**Spillway**
1802	16.08	99	5	104	684	112		
1803	17.08	101	297	398	800	120		
1804	18.08	104	829	933	924	128		
1805	19.08	107	1523	1630	1055	136		
1806	20.08	110	2263	2373	1195	143		
1807	21.08	113	3256	3369	1341	151		
1808	22.08	116	4227	4343	1495	158		
1809	23.08	119	5396	5515	1658	166		
1810	24.08	121	6544	6665	1829	177		
1811	25.08	124	7854	7978	2011	188		
1812	26.08	126	9149	9275	2205	200		
1812.92	27	128	10472	10600	2400	213		**Top of Dam**

Draw Down computed by J.J. Riemenschneider 9/3/97 using the ALERT system

Combined Discharge computed by T.W. Lehman 5/20/97 using the ALERT system

Storage Capacity and Surface Area computed by T.W. Lehman 3/18/97

Main Outlet and Emergency Spillway computed by R.W. Cruff 3/24/92

Triangle Volume Report

Original Surface: apachesed
Design Surface: Default1

Cut (cu yd)	Fill (cu yd)	Net (cu yd)
214812.57	3812286.78	-3597474.21

Triangle Volume Report

Original Surface: apachetop
Design Surface: Default1

Cut (cu yd)	Fill (cu yd)	Net (cu yd)
3823344.55	159486.17	3663858.39

Triangle Volume

Triangle Volume Report

Original Surface: apachel
Design Surface: Default1

Mode: Entire Surface
Cut Factor: 1.000000
Fill Factor: 1.000000

Cut: 1210810.893487 cu ft
Fill: 8958456.639989 cu ft
Net: -7747645.746503 cu ft

Cut: 44844.847907 cu yd
Fill: 331794.690370 cu yd
Net: -286949.842463 cu yd

Triangle Volume Report

Original Surface: apacher
Design Surface: Default1

Cut (cu yd)	Fill (cu yd)	Net (cu yd)
40508.82	513501.46	-472992.64

Triangle Volume Report

Original Surface: apachec
Design Surface: Default1

Cut (cu yd)	Fill (cu yd)	Net (cu yd)
45055.45	127355.55	-82300.10

Table 1

Decision Matrix for Pass Mountain Alternative Analysis

Level I Concept Analysis

Option	Description	Total Cost	Capital Improvement Costs	Environmental Impact	Agency Related	Park Related	R/W Cost	Implementability	Weighted Total Score	Ranking
	Weighting Factor		*38%*	*15%*	*16%*	*11%*		*20%*	*100%*	
PM4	Trapezoidal Earthen Channel with Vertical Drops.	$10,786,285	3.0				$1,638,740		**11.40**	**3**
PM4	Trapezoidal Concrete Channel with Vertical Drops.	$12,331,663	1.0				$985,118		**3.80**	**4**
PM4	Trapezoidal Earthen Channel	$6,821,867	10.0				$1,538,593		**38.00**	**1**
PM4	Trapezoidal Concrete Channel	$8,475,643	7.0				$820,701		**26.60**	**2**

Rating Point System

Worst	1-2
Poor	3-4
Average	5-6
Better	7-8
Best	9-10

Draft

Table 1

Pass Mountain Improvements

Level I Concept Analysis Option Opinion of Probable Costs

Option No.	Alternate Description	Opinion of Probable Costs Including Contingencies			Total Cost
		Major Elements	Additional Elements	Land Acquisitions Basins and R/W	
PM4 - Earth Channel Initial Alignment	Trapezoidal Earthen Channel with Vertical Drops.	$7,042,907	$2,104,638	$1,638,740	**$10,786,285**
PM4 - Concrete Channel Initial Alignment	Trapezoidal Concrete Channel with Vertical Drops.	$9,241,908	$2,104,638	$985,118	**$12,331,663**
PM4 - Earth Channel Revised Alignment	Trapezoidal Earthen Channel	$3,308,313	$1,974,961	$1,538,593	**$6,821,867**
PM4 - Concrete Channel Revised Alignment	Trapezoidal Concrete Channel	$7,407,910	$247,032	$820,701	**$8,475,643**

Spook Hill ADMS Update August 7, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

Pass Mountain Initial Alignment
Level I Concept Analysis Opinion of Probable Costs
Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	235,702	$942,808
2	Berm Earthwork	$2.00	CY	711,000	$1,422,000
3	Concrete Channel Lining	$310	CY	0	$0
4	Drop Structures	$163.00	SF	14,873	$2,424,321
5	Splitter Structures	$60,000	EA	0	$0
6	Culverts	$310	CY	664	$205,840
7	Basin Excavation	$4.00	CY	0	$0
			SUBTOTAL MAJOR ELEMENTS		$4,994,969
		CONTINGENCIES:			
		Construction		35%	$1,748,239
		Construction Admin		6%	$299,698
			TOTAL MAJOR ELEMENTS		**$7,042,907**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	1,184,592	$1,303,051
2	Fence	$12	LF	15,800	$189,600
3	Utility Relocations	$5,000	EA	0	$0
			SUBTOTAL ADDITIONAL ELEMENTS		$1,492,651
		CONTINGENCIES:			
		Construction		35%	$522,428
		Construction Admin		6%	$89,559
			TOTAL ADDITIONAL ELEMENTS		**$2,104,638**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$43,560	AC	30	$1,310,992
2	Basin Land Acquisition	$0	AC	0	$0
			SUBTOTAL LAND ACQUISITION		$1,310,992
		CONTINGENCIES :		25%	$327,748
			TOTAL LAND ACQUISITION		**$1,638,740**
				TOTAL	***$10,786,285***

Spook Hill ADMS Update August 7, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

Pass Mountain Initial Alignment
Level I Concept Analysis Opinion of Probable Costs
Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	116,712	$466,849
2	Berm Earthwork	$2.00	CY	711,000	$1,422,000
3	Concrete Channel Lining	$310	CY	13,299	$4,122,747
4	Drop Structures	$163.00	SF	2,068	$337,109
5	Splitter Structures	$60,000	EA	0	$0
6	Culverts	$310	CY	664	$205,840
7	Basin Excavation	$4.00	CY	0	$0
			SUBTOTAL MAJOR ELEMENTS		$6,554,544
		CONTINGENCIES:			
		Construction		35%	$2,294,091
		Construction Admin		6%	$393,273
			TOTAL MAJOR ELEMENTS		**$9,241,908**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	1,184,592	$1,303,051
2	Fence	$12	LF	15,800	$189,600
3	Utility Relocations	$5,000	EA	0	$0
			SUBTOTAL ADDITIONAL ELEMENTS		$1,492,651
		CONTINGENCIES:			
		Construction		35%	$522,428
		Construction Admin		6%	$89,559
			TOTAL ADDITIONAL ELEMENTS		**$2,104,638**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$43,560	AC	$18	$788,094
2	Basin Land Acquisition	$0	AC	$0	$0
			SUBTOTAL LAND ACQUISITION		$788,094
		CONTINGENCIES :		25%	$197,024
			TOTAL LAND ACQUISITION		**$985,118**
				TOTAL	***$12,331,663***

Spook Hill ADMS Update August 7, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

Pass Mountain Revised Alignment
Level I Concept Analysis Opinion of Probable Costs
Earthen Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	220,415	$881,661
2	Berm Earthwork	$2.00	CY	657,000	$1,314,000
3	Concrete Channel Lining	$310	CY	0	$0
4	Drop Structures	$163.00	SF	0	$0
5	Splitter Structures	$60,000	EA	0	$0
6	Culverts	$310	CY	486	$150,660
7	Basin Excavation	$4.00	CY	0	$0
				SUBTOTAL MAJOR ELEMENTS	$2,346,321
		CONTINGENCIES:			
		Construction		35%	$821,213
		Construction Admin		6%	$140,779
				TOTAL MAJOR ELEMENTS	**$3,308,313**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	1,114,074	$1,225,481
2	Fence	$12	LF	14,600	$175,200
3	Utility Relocations	$5,000	EA	0	$0
				SUBTOTAL ADDITIONAL ELEMENTS	$1,400,681
		CONTINGENCIES:			
		Construction		35%	$490,238
		Construction Admin		6%	$84,041
				TOTAL ADDITIONAL ELEMENTS	**$1,974,961**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$43,560	AC	28	$1,230,874
2	Basin Land Acquisition	$0	AC	0	$0
				SUBTOTAL LAND ACQUISITION	$1,230,874
		CONTINGENCIES :		25%	$307,719
				TOTAL LAND ACQUISITION	**$1,538,593**
				TOTAL	***$6,821,867***

Wood/Patel

Spook Hill ADMS Update August 7, 2000
Flood Control District of Maricopa County W/P # 99989
FCD 99-43

Pass Mountain Revised Alignment
Level I Concept Analysis Opinion of Probable Costs
Concrete Channel

MAJOR ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Excavation	$4.00	CY	96,260	$385,041
2	Berm Earthwork	$2.00	CY	657,000	$1,314,000
3	Concrete Channel Lining	$310	CY	10,981	$3,404,137
4	Drop Structures	$163.00	SF	0	$0
5	Splitter Structures	$60,000	EA	0	$0
6	Culverts	$310	CY	486	$150,660
7	Basin Excavation	$4.00	CY	0	$0
			SUBTOTAL MAJOR ELEMENTS		$5,253,837
		CONTINGENCIES:			
		Construction		35%	$1,838,843
		Construction Admin		6%	$315,230
			TOTAL MAJOR ELEMENTS		**$7,407,910**

ADDITIONAL ELEMENTS:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Landscaping	$1.10	SF	0	$0
2	Fence	$12	LF	14,600	$175,200
3	Utility Relocations	$5,000	EA	0	$0
			SUBTOTAL ADDITIONAL ELEMENTS		$175,200
		CONTINGENCIES:			
		Construction		35%	$61,320
		Construction Admin		6%	$10,512
			TOTAL ADDITIONAL ELEMENTS		**$247,032**

LAND ACQUISITION:

ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
1	Channel Land Acquisition	$43,560	AC	15	$656,561
2	Basin Land Acquisition	$0	AC	0	$0
			SUBTOTAL LAND ACQUISITION		$656,561
		CONTINGENCIES :		25%	$164,140
			TOTAL LAND ACQUISITION		**$820,701**
				TOTAL	***$8,475,643***

WOOD/PATEL

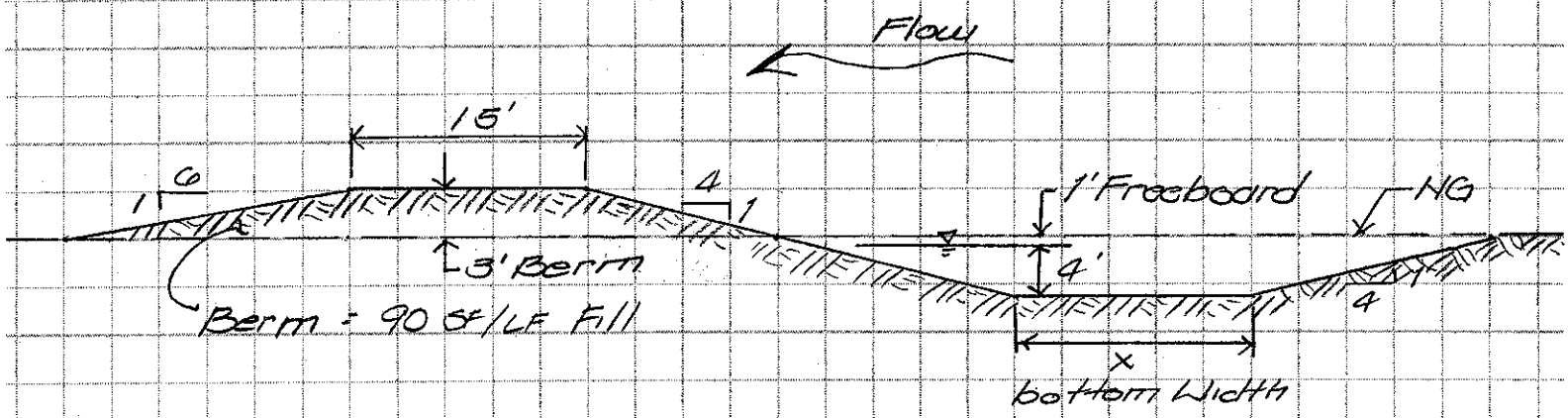
CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spook Hill ADMP

PROJECT NO. 99989 SHEET NO. 1 OF

CALCULATED BY JG DATE 8/7/00 CHECKED BY DATE

Pass Mt Preliminary cost estimate



TYPICAL CHANNEL/BERM @ PASS MT. DIVERSION

Berm = 90 sf/Lf
Channel = (see Spreadsheet)

MASTER SHEET -- CHANNELS

	Preliminary Plan Section No.	Area	Sheet No.	I.D.	HEC-1 Flow I.D.	Design Q100 (cfs)	Comp. Capacity (cfs)	Downstream Invert Elevation (ft)	Upstream Invert Elevation (ft)	Length (ft.)	Computed Invert. Slope (ft./ft.)	Design Invert Slope (ft./ft.)	Total Vertical Drop (ft.)	No. of Drops	Vertical Drop (ft.)	Material Type	Mannings "n" Value	Bottom Width, W (ft.)	Depth of Flow(ft.)	Sideslope (H:1) Left (HL)	Sideslope (H:1) Right (HR)	Flow Top Width (ft)	Hydraulic Depth (ft)	Froude Number	Type of Flow	Velocity (fps)	Freeboard (ft.)	Design Depth (ft)	Channel Topwidth Including Freeboard(ft)	Comment	Channel Width Plus 16' Access Road	Excavated Volume (cy)	Unit Cost ($/cy)	Excavation Cost	Concrete Volume (cy)	Unit Cost ($/cy)	Concrete Cost	Fence Length (ft.)	Unit Cost ($/ft)	Fence Cost	Drop Structures (No.)	Drop Structure Size (ft^2)	Unit Cost ($/sf)	Drop Structures Cost	No. of Utility Crossings	Unit Cost ($ per crossing)	Utilities Cost	Channel Length (ft)	Landscape Width Required (ft.)		Landscaping Unit Cost ($/sf)	Total Landscape Cost	Land Acquisition (Channel & Maint Road(Ac.)	Unit Cost ($/sf)	Channel Land Acquisition Cost
s Mountain Diversion				A1		700	700	2009.0	2021.0	800	0.0150	0.0020	10.4	4	2.6	e	0.0250	25.0	3.6	4	4	53.6	2.6	0.54	Sub	5.0	1.4	5.0	64.8		80.8	8,646	$4	$34,585	0	$310	$0	1,600	$12	$19,200	4	168.4	$163	$109,781	0	$3,000	$0	800	65	51608	$1.10	$56,988.8	1.5	$1.00	$64,608
Channel amd Berm				A2		700	712	1975.0	2009.0	700	0.0486	0.0020	32.6	10	3.3	e	0.0250	25.0	3.6	4	4	53.8	2.6	0.54	Sub	5.0	1.4	5.0	65.0		81.0	7,622	$4	$30,489	0	$310	$0	1,400	$12	$16,800	10	211.9	$163	$345,397	0	$3,000	$0	700	65	45500	$1.10	$50,050.0	1.3	$1.00	$56,700
Initial Alignment				A3		700	712	1959.0	1975.0	1000	0.0160	0.0020	14.0	5	2.8	e	0.0250	25.0	3.6	4	4	53.8	2.6	0.54	Sub	5.0	1.4	5.0	65.0		81.0	10,889	$4	$43,556	0	$310	$0	2,000	$12	$24,000	5	182.0	$163	$148,330	0	$3,000	$0	1000	65	65000	$1.10	$71,500.0	1.9	$1.00	$81,000
				B1		1000	997	1921.0	1933.0	550	0.0218	0.0020	10.9	4	2.7	e	0.0250	52.0	3.1	4	4	76.8	2.6	0.55	Sub	5.0	1.9	5.0	92.0		108.0	9,289	$4	$37,156	0	$310	$0	1,100	$12	$13,200	4	250.7	$163	$163,456	0	$3,000	$0	550	92	50600	$1.10	$55,660.0	1.4	$1.00	$59,400
				C1		2000	2008	1881.0	1913.0	2000	0.0160	0.0020	28.0	9	3.1	e	0.0250	132.0	2.8	4	4	154.4	2.6	0.55	Sub	5.0	2.2	5.0	172.0		188.0	69,333	$4	$277,333	0	$310	$0	4,000	$12	$48,000	9	535.1	$163	$785,008	0	$3,000	$0	2000	172	344000	$1.10	$378,400.0	8.6	$1.00	$376,000
				D1		2600	2602	1775.0	1805.0	2850	0.0105	0.0020	24.3	8	3.0	e	0.0250	180.0	2.7	4	4	201.8	2.6	0.55	Sub	5.0	2.3	5.0	220.2		236.2	129,922	$4	$519,690	0	$310	$0	5,700	$12	$68,400	8	669.0	$163	$872,349	0	$3,000	$0	2850	220	627684	$1.10	$690,452.4	15.5	$1.00	$673,284
				A1		700	697	2009.0	2021.0	800	0.0150	0.0150	0.0	0	0.0	s	0.0170	25.0	1.7	4	4	38.4	1.4	1.98	Sup	13.2	2.3	4.0	56.8		72.8	6,609	$4	$26,436	944	$310	$292,720	1,600	$12	$19,200	0	0.0	$163	$0	0	$3,000	$0	800	0		$1.10	$0.0	1.3	$1.00	$58,208
				A2		700	697	1975.0	2009.0	700	0.0486	0.0150	23.5	8	2.9	s	0.0170	25.0	1.7	4	4	38.4	1.4	1.98	Sup	13.2	2.3	4.0	56.8		72.8	5,783	$4	$23,131	826	$310	$256,130	1,400	$12	$16,800	8	166.7	$163	$217,419	0	$3,000	$0	700	0		$1.10	$0.0	1.2	$1.00	$50,932
				A3		700	697	1959.0	1975.0	1000	0.0160	0.0150	1.0	1	1.0	s	0.0170	25.0	1.7	4	4	38.4	1.4	1.98	Sup	13.2	2.3	4.0	56.8		72.8	8,261	$4	$33,045	1,180	$310	$365,900	2,000	$12	$24,000	1	56.8	$163	$9,252	0	$3,000	$0	1000	0		$1.10	$0.0	1.7	$1.00	$72,760
				B1		1000	999	1921.0	1933.0	550	0.0218	0.0140	4.3	2	2.2	s	0.0170	25.0	2.1	4	4	41.6	1.7	1.97	Sup	14.4	2.9	5.0	64.8		80.8	5,959	$4	$23,837	734	$310	$227,542	1,100	$12	$13,200	2	139.4	$163	$45,446	0	$3,000	$0	550	0		$1.10	$0.0	1.0	$1.00	$44,462
				C1		2000	1994	1881.0	1913.0	2000	0.0160	0.0140	4.0	2	2.0	s	0.0170	60.0	2.0	4	4	75.7	1.8	1.99	Sup	15.0	3.0	5.0	99.7		115.7	37,014	$4	$148,055	3,959	$310	$1,227,384	4,000	$12	$48,000	2	199.4	$163	$64,991	0	$3,000	$0	2000	0		$1.10	$0.0	5.3	$1.00	$231,360
				D1		2600	2610	1775.0	1805.0	2850	0.0105	0.0105	0.1	0	0.0	s	0.0170	60.0	2.5	4	4	79.9	2.2	1.79	Sup	15.0	2.5	5.0	99.9		115.9	53,086	$4	$212,344	5,655	$310	$1,753,070	5,700	$12	$68,400	0	0.0	$163	$0	0	$3,000	$0	2850	0		$1.10	$0.0	7.6	$1.00	$330,372
Pass Mountain Diversion				A1		700	700	2017.0	2021.0	2000	0.0020	0.0020	0.0	0	0.0	e	0.0250	25.0	3.6	4	4	53.6	2.6	0.54	Sub	5.0	1.4	5.0	64.8		80.8	21,616	$4	$86,463	0	$310	$0	4,000	$12	$48,000	0	0.0	$163	$0	0	$3,000	$0	2000	65	129520	$1.10	$142,472.0	3.7	$1.00	$161,520
Channel amd Berm				B1		1000	1004	1933.5	1935.0	650	0.0023	0.0023	0.0	0	0.0	e	0.0250	65.0	2.7	4	4	86.3	2.3	0.58	Sub	5.0	2.3	5.0	104.7		120.7	12,747	$4	$50,988	0	$310	$0	1,300	$12	$15,600	0	0.0	$163	$0	0	$3,000	$0	650	105	68042	$1.10	$74,846.2	1.8	$1.00	$78,442
Revised Alignment				C1		2000	1997	1881.0	1885.0	1950	0.0021	0.0021	-0.1	0	0.0	e	0.0250	140.0	2.7	4	4	161.3	2.5	0.56	Sub	5.0	2.3	5.0	179.7		195.7	70,524	$4	$282,096	0	$310	$0	3,900	$12	$46,800	0	0.0	$163	$0	0	$3,000	$0	1950	180	350376	$1.10	$385,413.6	8.8	$1.00	$381,576
				D1		2600	2594	1775.0	1780.0	2700	0.0019	0.0019	-0.1	0	0.0	e	0.0250	170.0	2.9	4	4	192.9	2.7	0.54	Sub	5.0	2.1	5.0	209.7		225.7	115,529	$4	$462,115	0	$310	$0	5,400	$12	$64,800	0	0.0	$163	$0	0	$3,000	$0	2700	210	566136	$1.10	$622,749.6	14.0	$1.00	$609,336
				A1		700	701	2017.0	2021.0	2000	0.0020	0.0020	0.0	0	0.0	s	0.0170	9.0	4.0	4	4	41.1	2.4	0.79	Sub	7.0	1.2	5.2	50.6		66.6	15,530	$4	$62,122	2,144	$310	$664,716	4,000	$12	$48,000	0	0.0	$163	$0	0	$3,000	$0	2000	0		$1.10	$0.0	3.1	$1.00	$133,228
				B1		1000	980	1933.5	1935.0	650	0.0023	0.0022	0.1	0	0.0	s	0.0170	16.0	4.0	4	4	47.8	2.6	0.84	Sub	7.7	1.2	5.2	57.6		73.6	6,083	$4	$24,330	781	$310	$241,959	1,300	$12	$15,600	0	0.0	$163	$0	0	$3,000	$0	650	0		$1.10	$0.0	1.1	$1.00	$47,816
				C1		2000	2003	1881.0	1885.0	1950	0.0021	0.0021	-0.1	0	0.0	s	0.0170	43.0	4.0	4	4	74.9	3.1	0.85	Sub	8.5	1.3	5.3	85.2		101.2	30,822	$4	$123,288	3,338	$310	$1,034,916	3,900	$12	$46,800	0	0.0	$163	$0	0	$3,000	$0	1950	0		$1.10	$0.0	4.5	$1.00	$197,246
				D1		2600	1989	1775.0	1780.0	2700	0.0019	0.0019	-0.1	0	0.0	s	0.0170	45.0	4.0	4	4	77.0	3.2	0.81	Sub	8.2	1.3	5.3	87.1		103.1	43,825	$4	$175,300	4,718	$310	$1,462,545	5,400	$12	$64,800	0	0.0	$163	$0	0	$3,000	$0	2700	0		$1.10	$0.0	6.4	$1.00	$278,271

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Table 1

Level I Cost Summary for Alternative Options

Culver Street System

Option Name *Culver Street*	Old Option Name	Description	Level I Opinion of Cost
C1E	1A	Trapezoidal Earthen Channel with Vertical Drops. Basin at Hawes Rd. One Basin.	$19,780,000
C1C	2A	Trapezoidal Concrete Channel with Vertical Drops. Basin at Hawes Rd. One Basin.	$12,040,000
C1P	1B	Concrete Pipe Along Entire Alignment. Basin at Hawes Rd. One Basin.	$4,510,000

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Table 1

Level I Cost Summary for Alternative Options

McDowell Road System

Option Name	Old Option Name	Description	Level I Opinion of Cost
MD1E	1A	Trapezoidal Earthen Channel with Vertical Drops. No Basin at Oak St and Hawes Rd. No Storm Drain System in Oak Street. Two Basins	$11,920,000
MD1C	2A	Trapezoidal Concrete Channel with Vertical Drops. No Basin at Oak St and Hawes Rd. No Storm Drain System in Oak Street. Two Basins	$11,580,000
MD2E	1B	Trapezoidal Earthen Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. Three Basins.	$17,420,000
MD2C	2B	Trapezoidal Concrete Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. Three Basins.	$17,440,000
MD3E	1C	Trapezoidal Earthen Channel with Vertical Drops. Storm Drain in Oak St and McDowell Rd. Three Basins.	$20,190,000
MD3C	2C	Trapezoidal Concrete Channel with Vertical Drops. Storm Drain in Oak St and McDowell Rd. Three Basins.	$21,120,000
MD4E	1D	Trapezoidal Earthen Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$21,070,000
MD4C	2D	Trapezoidal Concrete Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$18,090,000
MD5E	1E	Trapezoidal Earthen Channel with Vertical Drops. Storm Drain in Oak Street and Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$25,540,000
MD5C	2E	Trapezoidal Concrete Channel with Vertical Drops. Storm Drain in Oak Street and Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$20,670,000
MD6E	1F	Trapezoidal Earthen Channel with Vertical Drops. Southwest Channel from Oak St and Hawes Rd to McDowell west of Sossaman. Two Basins	$25,090,000
MD6C	2F	Trapezoidal Concrete Channel with Vertical Drops. Southwest Channel from Oak St and Hawes Rd to McDowell west of Sossaman. Two Basins	$21,730,000

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Table 1

Level I Cost Summary for Alternative Options

McDowell Rd (Pass Mountain Diversion in Place)

Option Name	Old Option Name	Description	Level I Opinion of Cost
MD2E PM4	1B	Trapezoidal Earthen Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. Three Basins.	$11,520,000
MD2C PM4	2B	Trapezoidal Concrete Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. Three Basins.	$15,430,000
MD3E PM4	1C	Trapezoidal Earthen Channel with Vertical Drops. Storm Drain in Oak St and McDowell Rd. Three Basins.	$17,780,000
MD3C PM4	2C	Trapezoidal Concrete Channel with Vertical Drops. Storm Drain in Oak St and McDowell Rd. Three Basins.	$18,580,000
MD4E PM4	1D	Trapezoidal Earthen Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$14,980,000
MD4C PM4	2D	Trapezoidal Concrete Channel with Vertical Drops. No Storm Drain in Oak Street west of Hawes Road. No Basin at 88th St and McDowell. Two Basins.	$15,000,000

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Table 1

Level I Cost Summary for Alternative Options

Mckellips Road System

Option Name *McKellips Road*	Old Option Name	Description	Level I Opinion of Cost
MK1E	1A	Trapezoidal Earthen Channel with Vertical Drops. Basin at the NE corner of Ellsworth and McKellips Rd. One Basin	$11,780,000
MK1C	2A	Trapezoidal Concrete Channel with Vertical Drops. Basin at the NE corner of Ellsworth and McKellips Rd. One Basin	$7,270,000
MK2E	1B	Trapezoidal Earthen Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. Two Basins.	$11,000,000
MK2C	2B	Trapezoidal Concrete Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. Two Basins.	$7,000,000
MK3E	1C	Trapezoidal Earthen Channel with Vertical Drops. Basin at Hawes Rd. One Basin.	$11,900,000
MK3C	2C	Trapezoidal Concrete Channel with Vertical Drops. Basin at Hawes Rd. One Basin.	$8,250,000
MK4E			
MK4C			

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Table 1

Level I Cost Summary for Alternative Options

McKellips Rd (with Pass Mountain Diversion in place)

Option Name *McKellips Road*	Old Option Name	Description	Level I Opinion of Cost
MK2E PM4	1B	Trapezoidal Earthen Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. Two Basins.	$6,800,000
MK2C PM4	2B	Trapezoidal Concrete Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. Two Basins.	$7,650,000
MK3E PM4	1B	Trapezoidal Earthen Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. No Channel Across State Land. Two Basins.	$4,290,000
MK3C PM4	2B	Trapezoidal Concrete Channel with Vertical Drops. Basins at Hawes Rd and Ellsworth Road. No Channel Across State Land. Two Basins.	$5,350,000

Note: This option includes improvements at McDowell Road. The proposed McDowell system will cut off all flow from north of McDowell for the design event.

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Table 1

Level I Cost Summary for Alternative Options

Culver Street System

Option Name *Culver Street*	Old Option Name	Description	Level I Opinion of Cost
C1E	1A	Trapezoidal Earthen Channel with Vertical Drops. Basin at Hawes Rd. One Basin.	$19,780,000
C1C	2A	Trapezoidal Concrete Channel with Vertical Drops. Basin at Hawes Rd. One Basin.	$12,040,000
C1P	1B	Concrete Pipe Along Entire Alignment. Basin at Hawes Rd. One Basin.	$4,510,000

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Level I Cost Summary for Alternative Options

Pass Mountain System

Option Name *Pass Mountain*	Old Option Name	Description	Level I Opinion of Cost
PM1			
PM2			
PM3			
PM4	PM4	Pass Mountain Full Diversion	$7,110,000

Table 1

Level I Cost Summary for Alternative Options

McDowell Road with Pass Mountain

McDowell Road Option Name	Pass Mountain Option Name	McDowell Road Option Cost	Pass Mountain Option Cost	System Cost	Rank
MD2E PM4	PM4	*$11,520,000*	*$7,110,000*	***$18,630,000***	1
MD2C PM4	PM4	$15,430,000	$7,110,000	***$22,540,000***	4
MD3E PM4	PM4	$17,780,000	$7,110,000	***$24,890,000***	5
MD3C PM4	PM4	$18,580,000	$7,110,000	***$25,690,000***	6
MD4E PM4	PM4	$14,980,000	$7,110,000	***$22,090,000***	2
MD4C PM4	PM4	$15,000,000	$7,110,000	***$22,110,000***	3

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Table 1

Level I Cost Summary for Alternative Options

McKellips Road with McDowell Road

McKellips Road Option Name	McDowell Road Option Name	McKellips Road Option Cost	McDowell Road Option Cost	System Cost	Rank
MK1E	MD2E	$11,780,000	$17,420,000	*$29,200,000*	20
MK1E	MD2C	$11,780,000	$17,440,000	*$29,220,000*	21
MK1C	MD2E	$7,270,000	$17,420,000	*$24,690,000*	3
MK1C	MD2C	$7,270,000	$17,440,000	*$24,710,000*	4
MK1E	MD3E	$11,780,000	$20,190,000	*$31,970,000*	29
MK1E	MD3C	$11,780,000	$21,120,000	*$32,900,000*	34
MK1C	MD3E	$7,270,000	$20,190,000	*$27,460,000*	11
MK1C	MD3C	$7,270,000	$21,120,000	*$28,390,000*	15
MK1E	MD4E	$11,780,000	$21,070,000	*$32,850,000*	33
MK1E	MD4C	$11,780,000	$18,090,000	*$29,870,000*	26
MK1C	MD4E	$7,270,000	$21,070,000	*$28,340,000*	14
MK1C	MD4C	$7,270,000	$18,090,000	*$25,360,000*	6
MK2E	MD2E	$11,000,000	$17,420,000	*$28,420,000*	16
MK2E	MD2C	$11,000,000	$17,440,000	*$28,440,000*	17
MK2C	MD2E	$7,000,000	$17,420,000	*$24,420,000*	1
MK2C	MD2C	$7,000,000	$17,440,000	*$24,440,000*	2
MK2E	MD3E	$11,000,000	$20,190,000	*$31,190,000*	28
MK2E	MD3C	$11,000,000	$21,120,000	*$32,120,000*	32
MK2C	MD3E	$7,000,000	$20,190,000	*$27,190,000*	10
MK2C	MD3C	$7,000,000	$21,120,000	*$28,120,000*	13
MK2E	MD4E	$11,000,000	$21,070,000	*$32,070,000*	30
MK2E	MD4C	$11,000,000	$18,090,000	*$29,090,000*	19
MK2C	MD4E	$7,000,000	$21,070,000	*$28,070,000*	12
MK2C	MD4C	$7,000,000	$18,090,000	*$25,090,000*	5
MK3E	MD2E	$11,900,000	$17,420,000	*$29,320,000*	22
MK3E	MD2C	$11,900,000	$17,440,000	*$29,340,000*	24
MK3C	MD2E	$8,250,000	$17,420,000	*$25,670,000*	7
MK3C	MD2C	$8,250,000	$17,440,000	*$25,690,000*	8
MK3E	MD3E	$11,900,000	$20,190,000	*$32,090,000*	31
MK3E	MD3C	$11,900,000	$21,120,000	*$33,020,000*	36
MK3C	MD3E	$8,250,000	$20,190,000	*$28,440,000*	17
MK3C	MD3C	$8,250,000	$21,120,000	*$29,370,000*	25
MK3E	MD4E	$11,900,000	$21,070,000	*$32,970,000*	35
MK3E	MD4C	$11,900,000	$18,090,000	*$29,990,000*	27
MK3C	MD4E	$8,250,000	$21,070,000	*$29,320,000*	22
MK3C	MD4C	$8,250,000	$18,090,000	*$26,340,000*	9

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Table 1

Level I Cost Summary for Alternative Options

McKellips Road with McDowell Road and Pass Mountain

McKellips Road Option Name	McDowell Road Option Name	Pass Mountain Option Name	McKellips Road Option Cost	McDowell Road Option Cost	Pass Mountain Option Cost	System Cost	Rank
MK2E PM4	MD2E PM4	PM4	$6,800,000	$11,520,000	$7,110,000	*$25,430,000*	3
MK2E PM4	MD2C PM4	PM4	$6,800,000	$15,430,000	$7,110,000	*$29,340,000*	14
MK2C PM4	MD2E PM4	PM4	$7,650,000	$11,520,000	$7,110,000	*$26,280,000*	4
MK2C PM4	MD2C PM4	PM4	$7,650,000	$15,430,000	$7,110,000	*$30,190,000*	18
MK2E PM4	MD3E PM4	PM4	$6,800,000	$17,780,000	$7,110,000	*$31,690,000*	21
MK2E PM4	MD3C PM4	PM4	$6,800,000	$18,580,000	$7,110,000	*$32,490,000*	22
MK2C PM4	MD3E PM4	PM4	$7,650,000	$17,780,000	$7,110,000	*$32,540,000*	23
MK2C PM4	MD3C PM4	PM4	$7,650,000	$18,580,000	$7,110,000	*$33,340,000*	24
MK2E PM4	MD4E PM4	PM4	$6,800,000	$14,980,000	$7,110,000	*$28,890,000*	11
MK2E PM4	MD4C PM4	PM4	$6,800,000	$15,000,000	$7,110,000	*$28,910,000*	12
MK2C PM4	MD4E PM4	PM4	$7,650,000	$14,980,000	$7,110,000	*$29,740,000*	15
MK2C PM4	MD4C PM4	PM4	$7,650,000	$15,000,000	$7,110,000	*$29,760,000*	16
MK3E PM4	MD2E PM4	PM4	$4,290,000	$11,520,000	$7,110,000	*$22,920,000*	1
MK3E PM4	MD2C PM4	PM4	$4,290,000	$15,430,000	$7,110,000	*$26,830,000*	7
MK3C PM4	MD2E PM4	PM4	$5,350,000	$11,520,000	$7,110,000	*$23,980,000*	2
MK3C PM4	MD2C PM4	PM4	$5,350,000	$15,430,000	$7,110,000	*$27,890,000*	10
MK3E PM4	MD3E PM4	PM4	$4,290,000	$17,780,000	$7,110,000	*$29,180,000*	13
MK3E PM4	MD3C PM4	PM4	$4,290,000	$18,580,000	$7,110,000	*$29,980,000*	17
MK3C PM4	MD3E PM4	PM4	$5,350,000	$17,780,000	$7,110,000	*$30,240,000*	19
MK3C PM4	MD3C PM4	PM4	$5,350,000	$18,580,000	$7,110,000	*$31,040,000*	20
MK3E PM4	MD4E PM4	PM4	$4,290,000	$14,980,000	$7,110,000	*$26,380,000*	5
MK3E PM4	MD4C PM4	PM4	$4,290,000	$15,000,000	$7,110,000	*$26,400,000*	6
MK3C PM4	MD4E PM4	PM4	$5,350,000	$14,980,000	$7,110,000	*$27,440,000*	8
MK3C PM4	MD4C PM4	PM4	$5,350,000	$15,000,000	$7,110,000	*$27,460,000*	9

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Table 1

Level I Cost Summary for Alternative Options

Culver Street with McDowell Road

Culver Street Option Name	McDowell Road Option Name	Culver Street Option Cost	McDowell Road Option Cost	System Cost	Rank
C1E	MD2E	$12,040,000	$17,420,000	***$29,460,000***	1
C1E	MD2C	$12,040,000	$17,440,000	***$29,480,000***	2
C1C	MD2E	$19,780,000	$17,420,000	***$37,200,000***	7
C1C	MD2C	$19,780,000	$17,440,000	***$37,220,000***	8
C1E	MD3E	$12,040,000	$20,190,000	***$32,230,000***	4
C1E	MD3C	$12,040,000	$21,120,000	***$33,160,000***	6
C1C	MD3E	$19,780,000	$20,190,000	***$39,970,000***	10
C1C	MD3C	$19,780,000	$21,120,000	***$40,900,000***	12
C1E	MD4E	$12,040,000	$21,070,000	***$33,110,000***	5
C1E	MD4C	$12,040,000	$18,090,000	***$30,130,000***	3
C1C	MD4E	$19,780,000	$21,070,000	***$40,850,000***	11
C1C	MD4C	$19,780,000	$18,090,000	***$37,870,000***	9

Table 1

Level I Cost Summary for Alternative Options

Culver Street with McDowell Road and Pass Mountain

Culver Street Option Name	McDowell Road Option Name	Pass Mountain Option Name	Culver Street Option Cost	McDowell Road Option Cost	Pass Mountain Option Name	System Cost	Rank
C1E	MD2E PM4	PM4	$12,040,000	$11,520,000	$7,110,000	***$30,670,000***	1
C1E	MD2C PM4	PM4	$12,040,000	$15,430,000	$7,110,000	***$34,580,000***	4
C1C	MD2E PM4	PM4	$19,780,000	$11,520,000	$7,110,000	***$38,410,000***	7
C1C	MD2C PM4	PM4	$19,780,000	$15,430,000	$7,110,000	***$42,320,000***	10
C1E	MD3E PM4	PM4	$12,040,000	$17,780,000	$7,110,000	***$36,930,000***	5
C1E	MD3C PM4	PM4	$12,040,000	$18,580,000	$7,110,000	***$37,730,000***	6
C1C	MD3E PM4	PM4	$19,780,000	$17,780,000	$7,110,000	***$44,670,000***	11
C1C	MD3C PM4	PM4	$19,780,000	$18,580,000	$7,110,000	***$45,470,000***	12
C1E	MD4E PM4	PM4	$12,040,000	$14,980,000	$7,110,000	***$34,130,000***	2
C1E	MD4C PM4	PM4	$12,040,000	$15,000,000	$7,110,000	***$34,150,000***	3
C1C	MD4E PM4	PM4	$19,780,000	$14,980,000	$7,110,000	***$41,870,000***	8
C1C	MD4C PM4	PM4	$19,780,000	$15,000,000	$7,110,000	***$41,890,000***	9

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spookhill

PROJECT NO. _____ SHEET NO. _____ OF _____

CALCULATED BY AEP DATE 10-11-2000 CHECKED BY _____ DATE _____

Spookhill FRS: Non-jurisdictional (structural) Alternatives:

Given: Existing FCD/Wood-patel hydrology for Q_{100} - 24 HR without any interior drainage upgrades

Goal: 1. find a feasible channel/floodway thru' spookhill FRS

2. Evaluate Spookhill floodway to improve conveyance so, it can effectively allow FRS channel outfall.

Assume: Spook Hill principal spillway is no longer needed

Table of Contents

sht. 1 thru 2 — Q_{100} hydrology - Exist. conditions

3 & 4 — { possible channel profile thru' spook - FRS; " " hydraulics - crude

5 & 6 — { revised optimum profile to improve channel slope; possible channel hydraulics - crude

9 — Spookhill floodway, possible improved slopes

7 & 8 — possible mod. to floodway sections

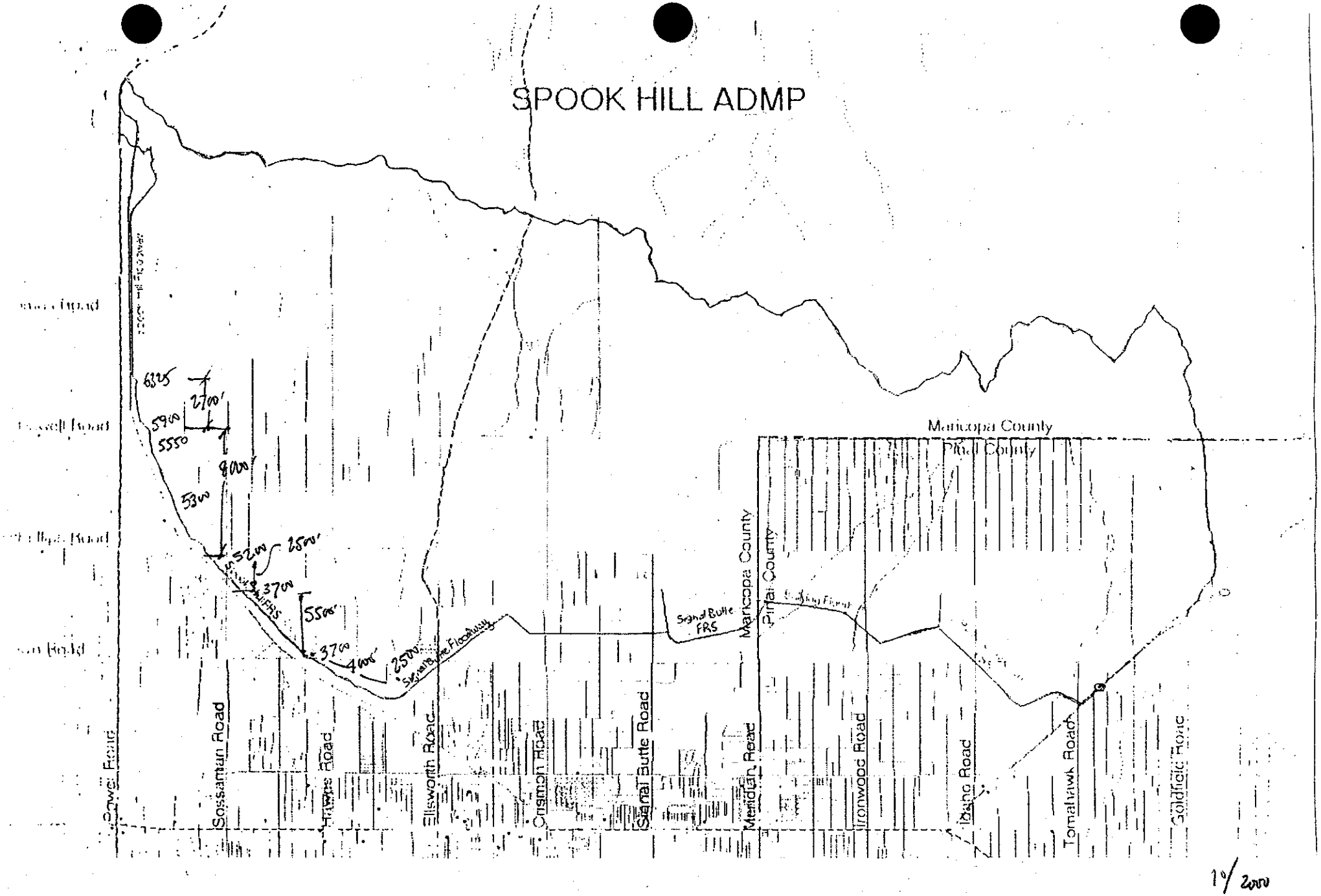
10 — " " " "

11 — optimum floodway profile (adjusted datum)

12 — sewer near Thomas

13 thru 15 — Crude conveyance estimate d/s from spookhill floodway outfall (u/s from Power Rd.

SPOOK HILL ADMP



HEC-1 Existing Conditions 100-Year, 24hr Storm

WOOD/PATEL

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PROJECT Spook Hill FRS

PROJECT NO. 99989 SHEET NO. 1 OF 1

CALCULATED BY RLH DATE 10/23 CHECKED BY _____ DATE _____

Concentration Point	Q_{100-24} - based on Existing Condition & channel routing along FRS
C 320	2531 cfs
C 340	3664 cfs
360C	4256 cfs
380C	5160 cfs
400C	5271 cfs
420C	5536 cfs
455C	5929 cfs
480C	6319 cfs
500C (Principal spillway)	6325 cfs

WOOD/PATEL

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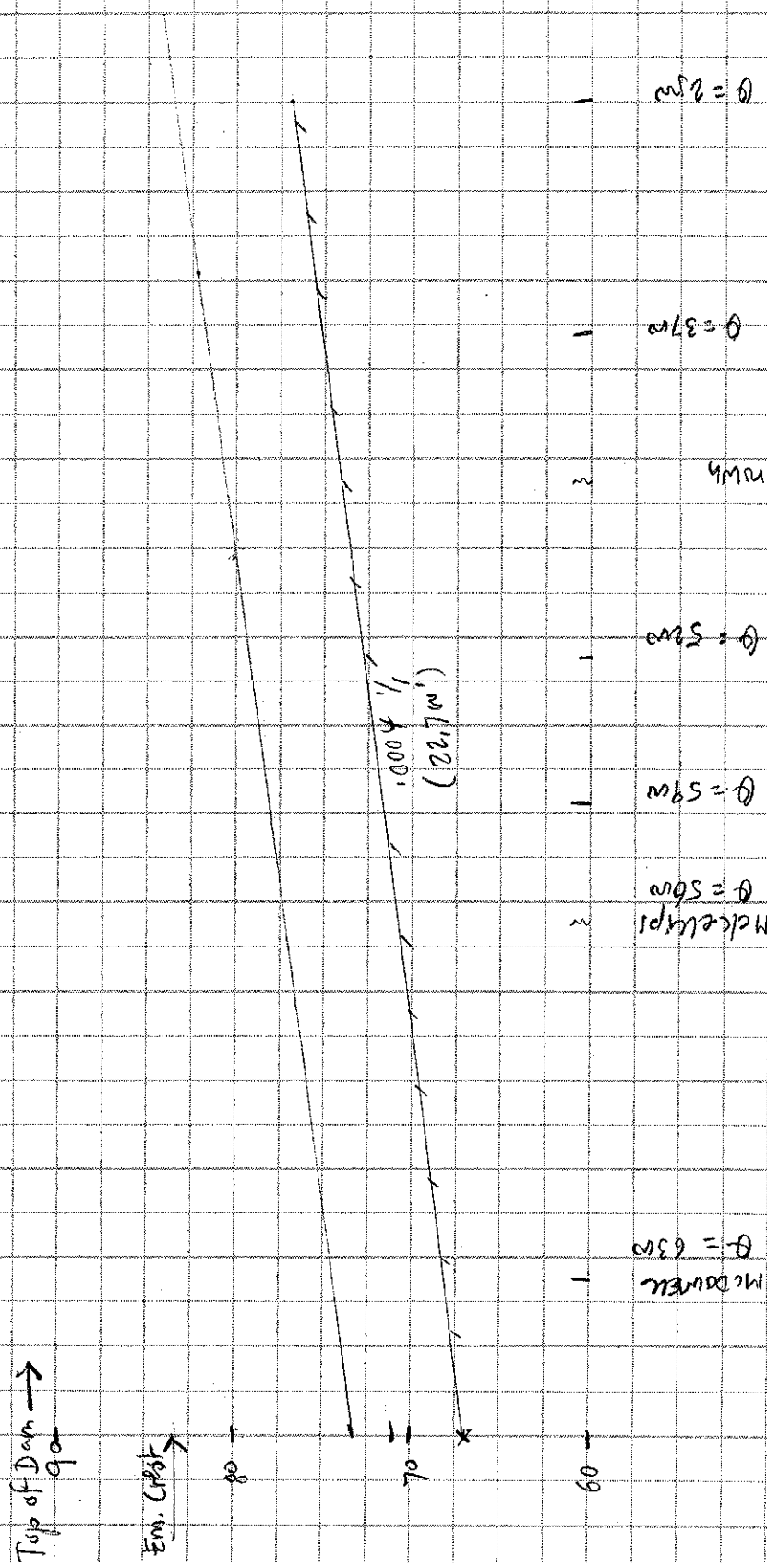
PROJECT Spook Hill FRS

PROJECT NO. _____ SHEET NO. _____ OF _____

CALCULATED BY AGP DATE 10/23/00 CHECKED BY _____ DATE _____

{ channel along FRS, with No principal spillway.
Prin. spillway invert lowered by 5'



TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

October 23, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	5,600.0
Channel Bottom Slope (ft/ft)	0.0004 — ≅ exist slope
Manning's Roughness Coefficient (n-value)	0.014
Channel Left Side Slope (horizontal/vertical)	2.0
Channel Right Side Slope (horizontal/vertical)	2.0
Channel Bottom Width (ft)	120.0

Concrete

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	6.29
Flow Velocity (fps)	6.72
Froude Number	0.494
Velocity Head (ft)	0.7
Energy Head (ft)	6.99
Cross-Sectional Area of Flow (sq ft)	833.83
Top Width of Flow (ft)	145.16

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Spook Hill FRS

channel from South to North

No detention storage used.

WOOD/PATEL

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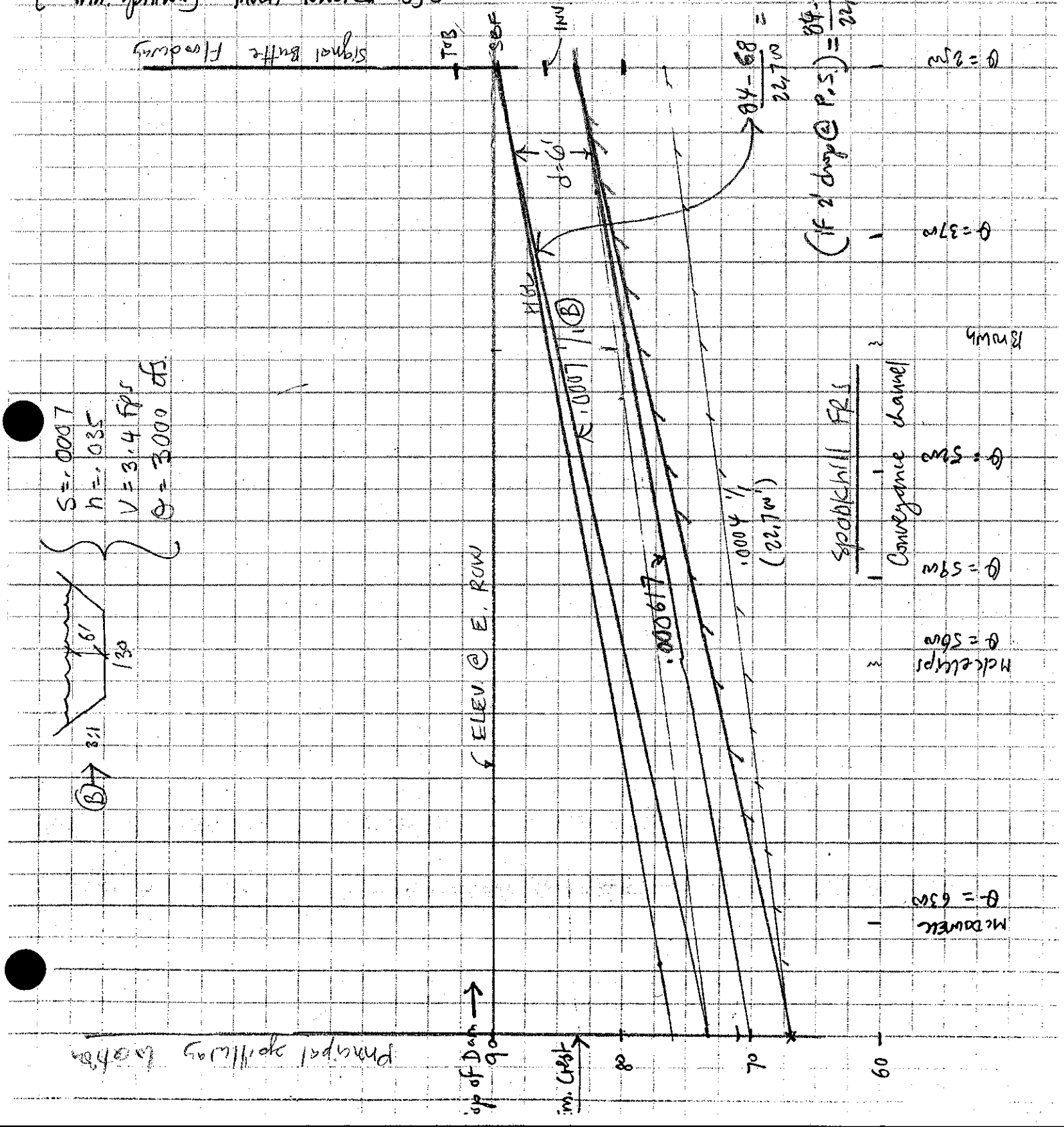
PROJECT Spook Hill FRS

PROJECT NO. _____ SHEET NO. _____ OF _____

CALCULATED BY AG DATE 10/28/00 CHECKED BY _____ DATE _____

{ channel along FRS, with No principal spillway.
{ Prin. spillway invert lowered by 5'



Sprokhill FRS (Conveyance channel)

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

November 1, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.0007 — revised slope
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	130.0
Minimum Flow Depth (ft)	1.0
Maximum Flow Depth (ft)	11.0
Incremental Head (ft)	1.0

dirt section

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
1.0	146.95	1.1	0.197	0.019	1.019	133.0	136.0
2.0	469.8	1.73	0.22	0.046	2.046	272.0	142.0
3.0	930.31	2.23	0.234	0.077	3.077	417.0	148.0
4.0	1,514.53	2.67	0.245	0.11	4.11	568.0	154.0
5.0	2,214.99	3.06	0.253	0.145	5.145	725.0	160.0
6.0	3,027.25	3.41	0.26	0.181	6.181	888.0	166.0
7.0	3,948.66	3.74	0.266	0.217	7.217	1,057.0	172.0
8.0	4,977.61	4.04	0.271	0.254	8.254	1,232.0	178.0
9.0	6,113.28	4.33	0.275	0.291	9.291	1,413.0	184.0
10.0	7,355.34	4.6	0.279	0.328	10.328	1,600.0	190.0
11.0	8,703.88	4.85	0.283	0.366	11.366	1,793.0	196.0

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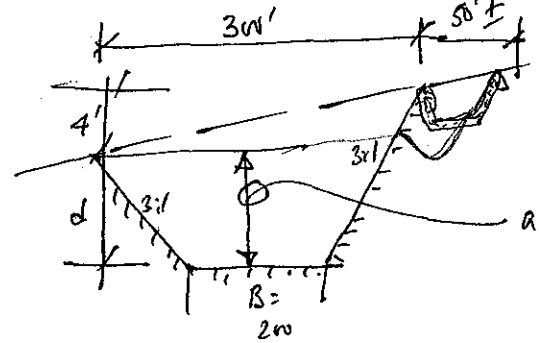
depth	bottom width	Q capacity
6'	130'	3027
6'	175'	4022
6'	200'	4576
6'	90'	2150
6'	100	2370

Top width

130 + 8X2X3 = 178' +
(max depth ±) 223' +
248' +

200' to 300', need collection system = 50' ±

WORST ≡ 350'



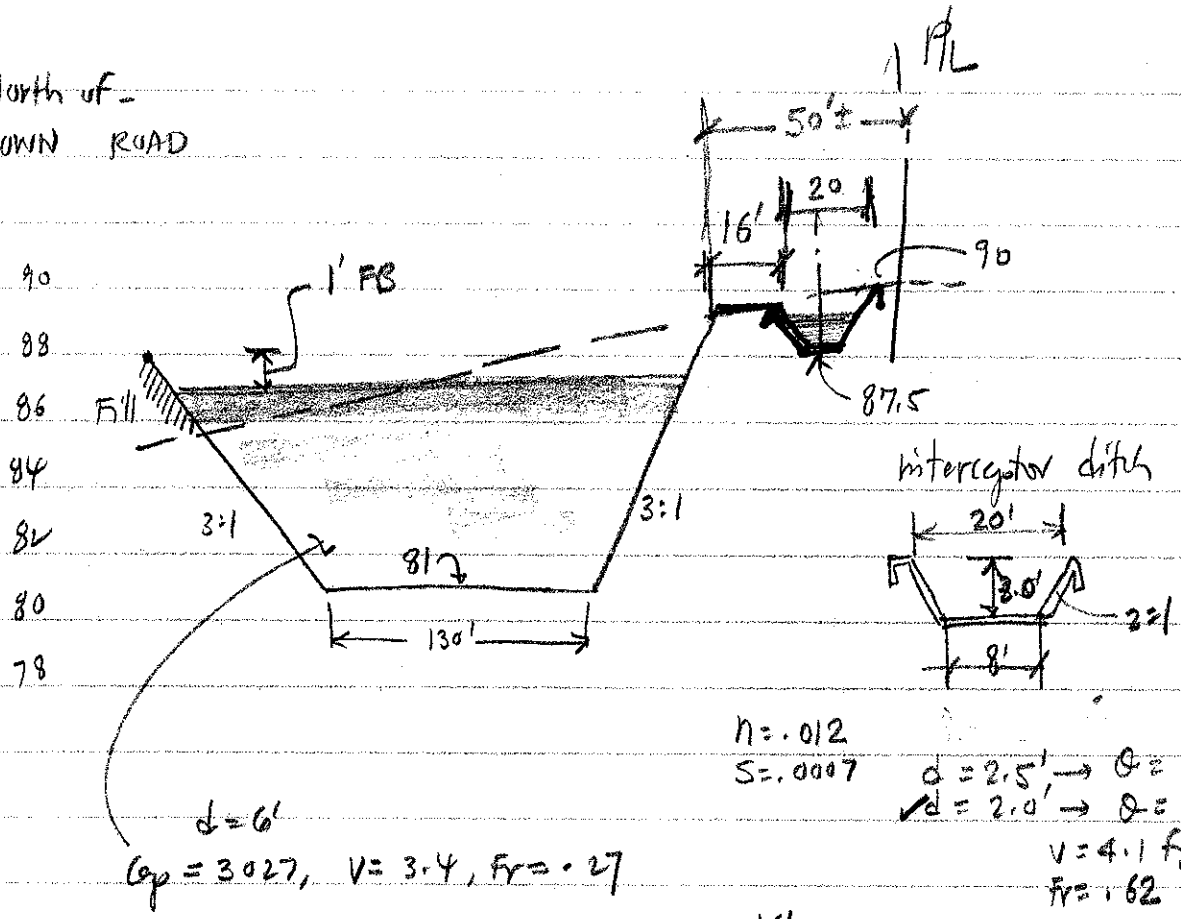
max available depth = 14.7

TW = B + dx3 + (d+4)3

300 = 200 + 3d + 3d + 12 ∴ d = 14.7'

3/19/01

North of BROWN ROAD

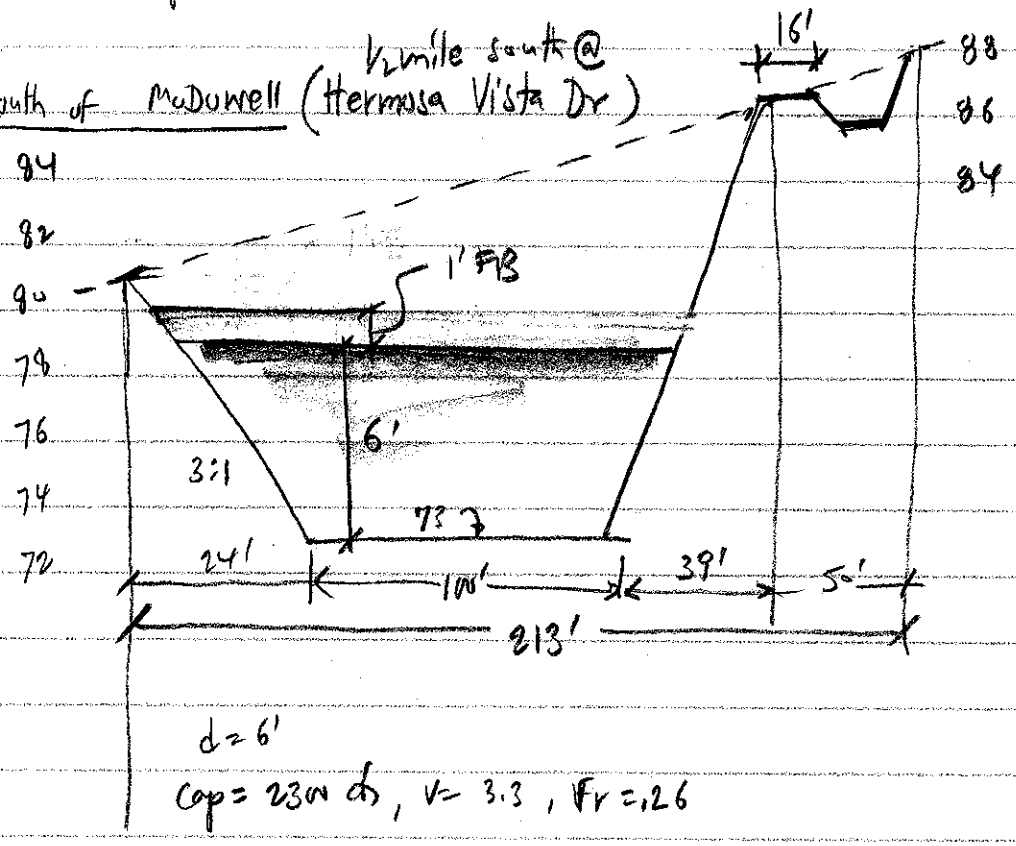


n = .012
S = .0007

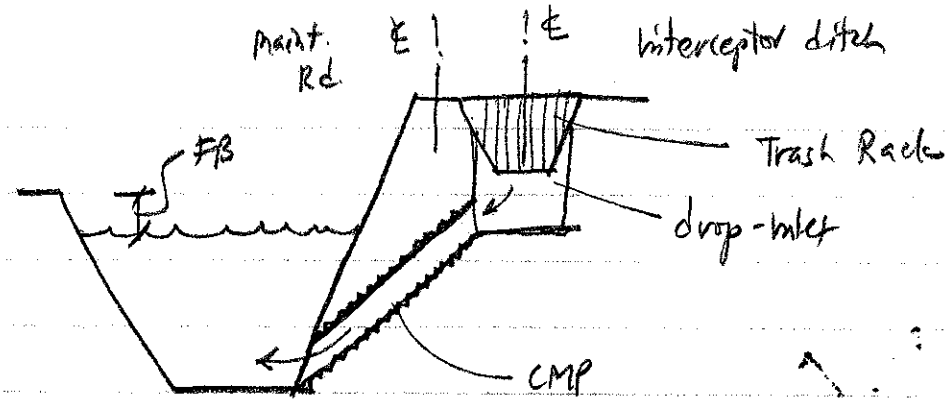
d = 2.5' → Q = 151
d = 2.0' → Q = 100 cfs
V = 4.1 fps
Fr = .62

d = 6'
Cap = 3027, V = 3.4, Fr = .27

South of McDowell (½ mile south @ Hermosa Vista Dr)

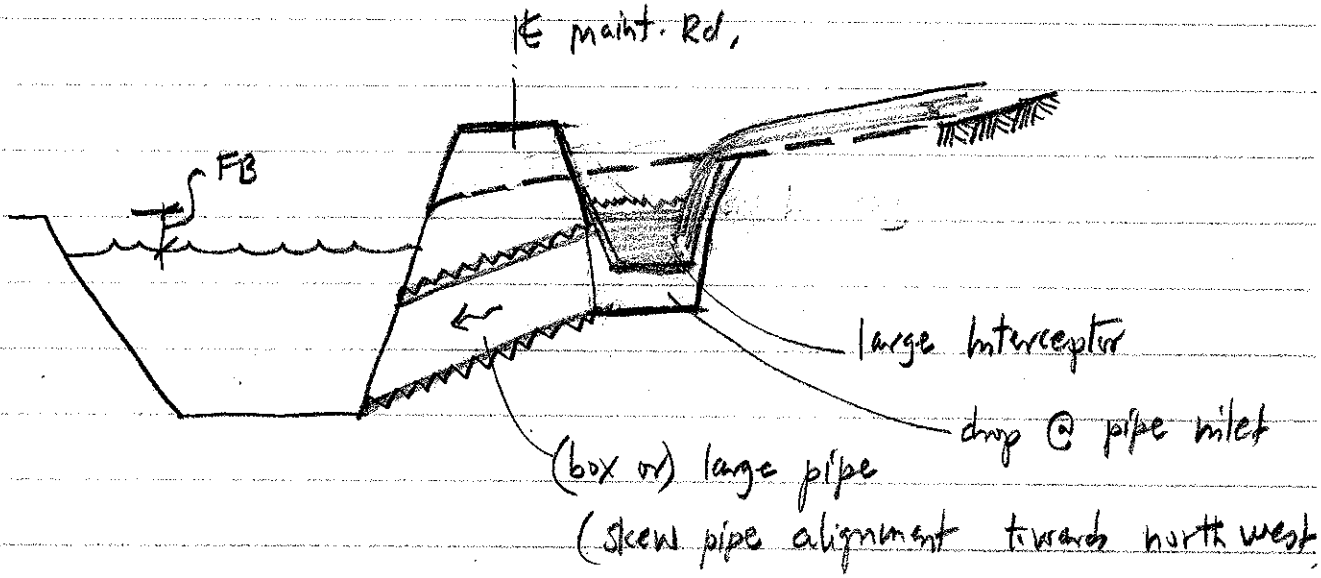


d = 6'
Cap = 2300 cfs, V = 3.3, Fr = .26

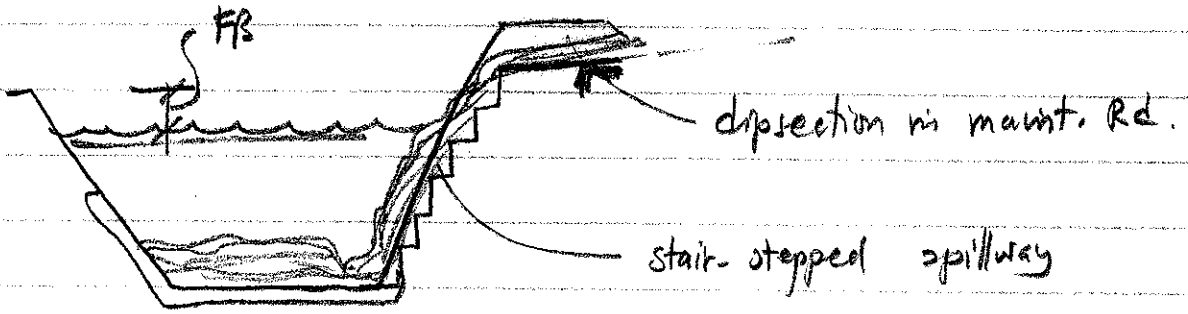


For Major tributary Wash confluence with Diversion

option A



option B



TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

March 20, 2001

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft).....	0.0006
Manning's Roughness Coefficient (n-value).....	0.035
Channel Left Side Slope (horizontal/vertical).....	3.0
Channel Right Side Slope (horizontal/vertical).....	3.0
Channel Bottom Width (ft).....	100.0
Minimum Flow Depth (ft).....	3.0
Maximum Flow Depth (ft).....	7.0
Incremental Head (ft).....	1.0

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
3.0	667.24	2.04	0.216	0.065	3.065	327.0	118.0
4.0	1,089.35	2.43	0.226	0.092	4.092	448.0	124.0
5.0	1,597.94	2.78	0.233	0.12	5.12	575.0	130.0
→ 6.0	2,190.7	3.09	0.239	0.149	6.149	708.0	136.0
7.0	2,866.51	3.38	0.244	0.178	7.178	847.0	142.0

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TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

March 20, 2001

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.0006
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	140.0
Minimum Flow Depth (ft)	3.0
Maximum Flow Depth (ft)	7.0
Incremental Head (ft)	1.0

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
3.0	926.04	2.07	0.217	0.067	3.067	447.0	158.0
4.0	1,506.59	2.48	0.227	0.095	4.095	608.0	164.0
5.0	2,201.86	2.84	0.235	0.125	5.125	775.0	170.0
→ 6.0	3,007.15	3.17	0.241	0.156	6.156	948.0	176.0
7.0	3,919.55	3.48	0.246	0.188	7.188	1,127.0	182.0

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TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

October 23, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.0012
Manning's Roughness Coefficient (n-value)	0.014
Channel Left Side Slope (horizontal/vertical)	2.0
Channel Right Side Slope (horizontal/vertical)	2.0
Channel Bottom Width (ft)	10.0
Minimum Flow Depth (ft)	4.0
Maximum Flow Depth (ft)	9.0
Incremental Head (ft)	0.5

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
4.0	498.19	6.92	0.733	0.744	4.744	72.0	26.0
4.5	630.16	7.37	0.744	0.844	5.344	85.5	28.0
5.0	780.03	7.8	0.753	0.946	5.946	100.0	30.0
5.5	948.57	8.21	0.762	1.048	6.548	115.5	32.0
6.0	1,136.56	8.61	0.77	1.152	7.152	132.0	34.0
6.5	1,344.74	8.99	0.778	1.257	7.757	149.5	36.0
7.0	1,573.88	9.37	0.785	1.364	8.364	168.0	38.0
7.5	1,824.71	9.73	0.792	1.472	8.972	187.5	40.0
8.0	2,097.96	10.09	0.799	1.581	9.581	208.0	42.0
8.5	2,394.36	10.43	0.805	1.691	10.191	229.5	44.0
9.0	2,714.6	10.77	0.811	1.803	10.803	252.0	46.0

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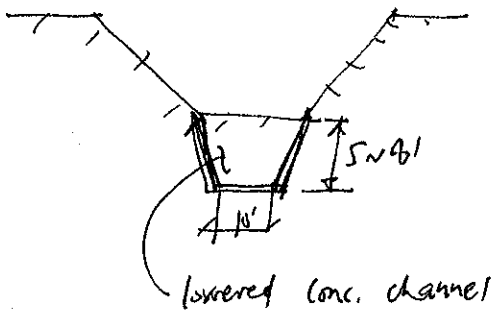

Sprockhill Floodway

pb: [Not enough capacity to handle all sprockhill flow

- off-line basin necessary

WOOD/PATEL

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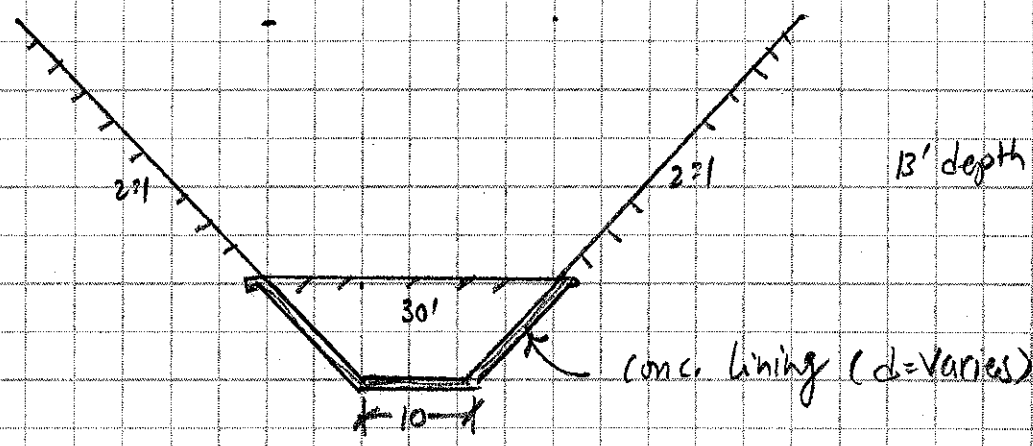
PROJECT _____

PROJECT NO. _____ SHEET NO. _____ OF _____

CALCULATED BY _____ DATE _____ CHECKED BY _____ DATE _____



(SCS) @ Stn 103+23 ± CWSEL = 1577.53 for Q = 29cfs

New per channel mod. above CWSEL = 1569 ±* for Q = 29cfs ± (-8.5 lowe

ADJUSTMENTS: Datum Issue: (SCS plans + 1.86') = New elevations

@ Principal spillway outlet: El.^{SCS} = 1566 (Inv)

∴ New El. = 1566 + 1.86 = 1567.86 (Inv

* CWSEL (new elev) = 1569 + 1.86 = 1570.86

WOOD/PATEL

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PROJECT Spookhill Floodway

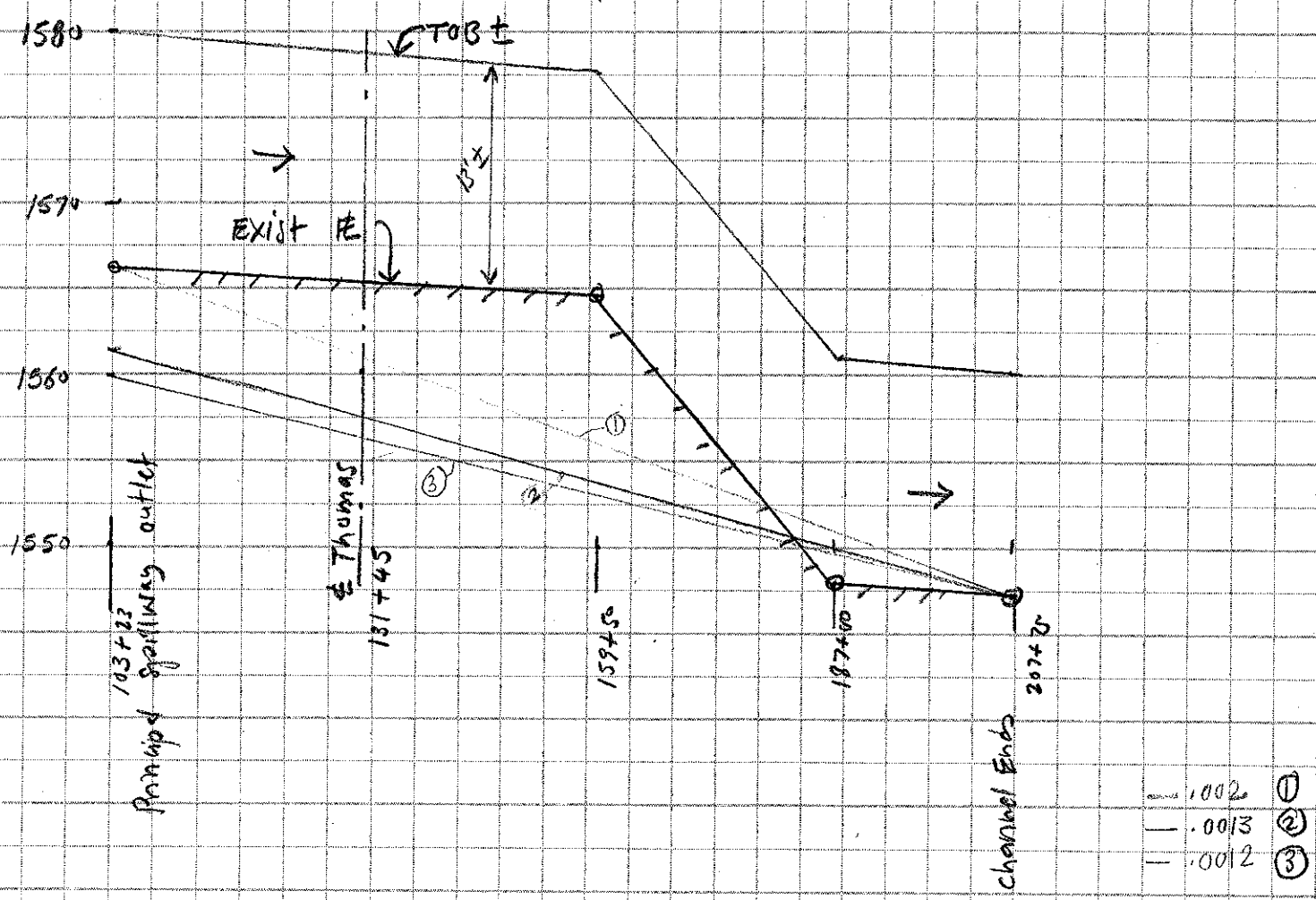
PROJECT NO. _____ SHEET NO. _____ OF _____

CALCULATED BY Acp DATE 10/22/15 CHECKED BY _____ DATE _____

Potential Upgrade

Source: SCS- As-built plans

	Sta.	Elev.	slope	
	103+23	1566.00		
	145+00	1565.16	.0002	.002
			.0002	
	159+50	1564.87		
10450'			.00609	.00609
	187+00	1548.13		
	190+00	1547.97	.000524	.000524
	207+75	1547.04	.000524	



TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

October 23, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	5,600.0
Channel Bottom Slope (ft/ft)	0.0012
Manning's Roughness Coefficient (n-value)	0.014
Channel Left Side Slope (horizontal/vertical)	1.5
Channel Right Side Slope (horizontal/vertical)	1.5
Channel Bottom Width (ft)	80.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	5.8
Flow Velocity (fps)	10.89
Froude Number	0.835
Velocity Head (ft)	1.84
Energy Head (ft)	7.64
Cross-Sectional Area of Flow (sq ft)	514.35
Top Width of Flow (ft)	97.4

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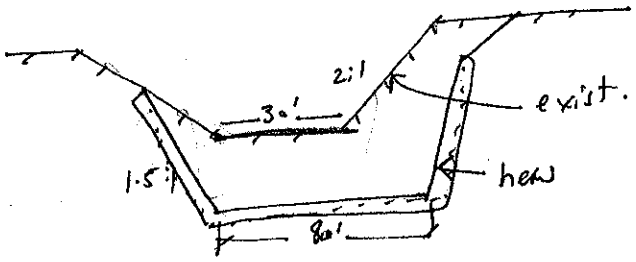
Spook Hill Floodway



Q_{100} (No storage)
All Released

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

PROJECT Spokhill Floodway

PROJECT NO. _____ SHEET NO. _____ OF _____

CALCULATED BY ACR DATE 10/22/98 CHECKED BY _____ DATE _____

Potential Upgrade

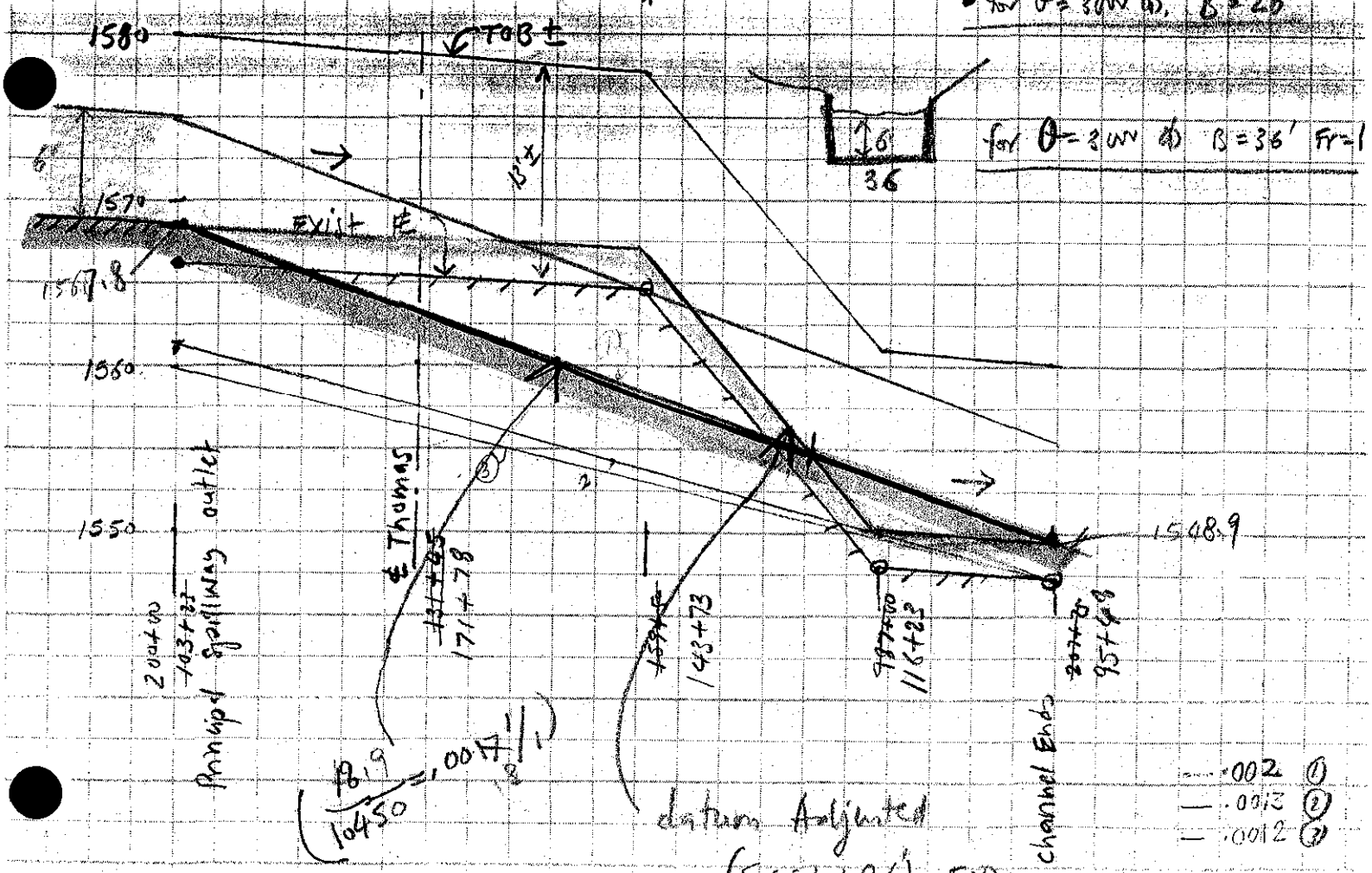
Source: SCS- As-built plans

- n = .03 d = 6
  S = .0017 1/1, θ = 14w cfs
- n = .018 θ = 23w cfs
- n = .014 θ = 3w cfs

	Sta.	Elev.	slope	
	103+23	1566.00		
	145+00	1565.16	.0002	.002
			.0002	
10450'	159+50	1564.87	.00609	.00609
	187+00	1548.13		
	190+00	1547.97	.000524	.000524
	207+75	1547.04	.000524	

- n = .012, d = 6
  θ = 14w cfs B = 10'
- for θ = 3w cfs, B = 28'

for θ = 3w cfs B = 36' Fr = 1



$\frac{18.9}{10450} = .0017 \frac{1}{1}$

Spring Hill Floodway - Modified

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

March 19, 2001

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.0017 ← new slope
Manning's Roughness Coefficient (n-value)	0.012 ← add concrete lining
Channel Left Side Slope (horizontal/vertical)	2.0
Channel Right Side Slope (horizontal/vertical)	2.0
Channel Bottom Width (ft)	30.0
Minimum Flow Depth (ft)	3.0
Maximum Flow Depth (ft)	7.0
Incremental Head (ft)	0.5

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
3.0	1,012.3	9.37	1.03	1.365	4.365	108.0	42.0
3.5	1,324.89	10.23	1.051	1.627	5.127	129.5	44.0
4.0	1,676.06	11.03	1.069	1.889	5.889	152.0	46.0
4.5	2,066.01	11.77	1.085	2.154	6.654	175.5	48.0
5.0	2,495.08	12.48	1.1	2.419	7.419	200.0	50.0
5.5	2,963.73	13.14	1.113	2.684	8.184	225.5	52.0
6.0	3,472.48	13.78	1.125	2.951	8.951	252.0	54.0
6.5	4,021.94	14.39	1.136	3.218	9.718	279.5	56.0
7.0	4,612.74	14.98	1.146	3.486	10.486	308.0	58.0

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TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

March 19, 2001

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.0017
Manning's Roughness Coefficient (n-value)	0.012
Channel Left Side Slope (horizontal/vertical)	0.0
Channel Right Side Slope (horizontal/vertical)	0.0
Channel Bottom Width (ft)	40.0
Minimum Flow Depth (ft)	3.0
Maximum Flow Depth (ft)	7.0
Incremental Head (ft)	0.5

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
3.0	1,161.01	9.68	0.985	1.455	4.455	120.0	40.0
3.5	1,479.74	10.57	0.996	1.736	5.236	140.0	40.0
4.0	1,822.82	11.39	1.004	2.017	6.017	160.0	40.0
4.5	2,187.9	12.16	1.01	2.296	6.796	180.0	40.0
5.0	2,573.01	12.87	1.014	2.572	7.572	200.0	40.0
5.5	2,976.43	13.53	1.017	2.844	8.344	220.0	40.0
6.0	3,396.68	14.15	1.019	3.113	9.113	240.0	40.0
6.5	3,832.45	14.74	1.019	3.376	9.876	260.0	40.0
7.0	4,282.58	15.29	1.019	3.635	10.635	280.0	40.0

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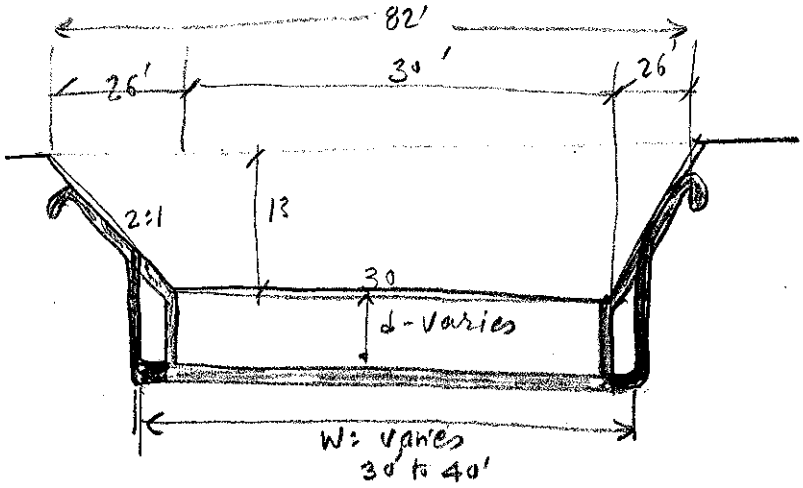


Concern
Fr < 1.15

Spook Hill Floodway

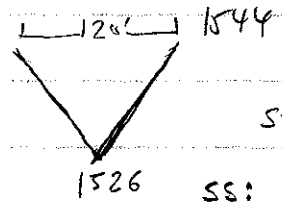
11/1/2000

Check Extra conveyance capacities of natural/designed wash-channel d/s from Spookhill Floodway outlet

distance from Spookhill Floodway outlet-drop

↓

150'



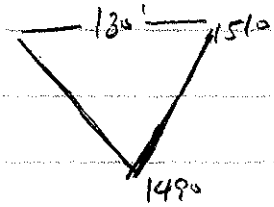
$S = \frac{20}{170} = 11.76\%$

SS: 3.3:1 (ave)

n = .045

	d	cfs	V
Cap =	5'	1800	20.67
	8'	6152	28.07
	10'	11045	32.5

1100'



$S = \frac{10'}{250} = 4\%$

SS: 3.25:1 (ave)

n = .05

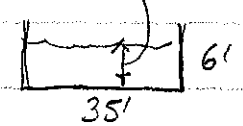
	5'	935	10.8
	8'	3190	14.72
	10'	5708	17.04
	15'	16606	22.25

1500' wash 20' deep No pb w/ capacity

2500' wash 20' deep —do—

3500' wash 20' deep —do—

Power Road: d/s



$6'/200 = 0.03'/1$

Comments: ① Natural wash in betn Power to Spookhill Floodway outfall appears to be capable of handling addition flow

② All conveyance/siltation structures from north of Power Road to Salt River are undersized & will require design modification (including the Power Road culvert)

14/

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

November 1, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.03
Manning's Roughness Coefficient (n-value)	0.03
Channel Left Side Slope (horizontal/vertical)	0.1
Channel Right Side Slope (horizontal/vertical)	0.1
Channel Bottom Width (ft)	35.0
Minimum Flow Depth (ft)	1.0
Maximum Flow Depth (ft)	7.0
Incremental Head (ft)	1.0

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
1.0	290.67	8.28	1.462	1.066	2.066	35.1	35.2
2.0	895.09	12.71	1.589	2.512	4.512	70.4	35.4
3.0	1,709.47	16.14	1.65	4.049	7.049	105.9	35.6
4.0	2,687.15	18.98	1.682	5.596	9.596	141.6	35.8
5.0	3,798.71	21.4	1.699	7.117	12.117	177.5	36.0
6.0	5,023.46	23.52	1.707	8.595	14.595	213.6	36.2
7.0	6,346.03	25.39	1.709	10.021	17.021	249.9	36.4

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North of Power Road

SCS channel for Sparkhill Floodway outfall

Sparkhill - outfall Wash

15

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

November 1, 2000

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.04
Manning's Roughness Coefficient (n-value)	0.05
Channel Left Side Slope (horizontal/vertical)	3.25
Channel Right Side Slope (horizontal/vertical)	3.25
Channel Bottom Width (ft)	1.0
Minimum Flow Depth (ft)	5.0
Maximum Flow Depth (ft)	15.0
Incremental Head (ft)	1.0

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
5.0	935.21	10.84	1.191	1.827	6.827	86.25	33.5
6.0	1,501.12	12.2	1.227	2.315	8.315	123.0	40.0
7.0	2,243.21	13.49	1.258	2.829	9.829	166.25	46.5
8.0	3,180.1	14.72	1.286	3.368	11.368	216.0	53.0
9.0	4,329.56	15.9	1.311	3.93	12.93	272.25	59.5
10.0	5,708.64	17.04	1.333	4.513	14.513	335.0	66.0
11.0	7,333.78	18.14	1.354	5.115	16.115	404.25	72.5
12.0	9,220.89	19.21	1.374	5.735	17.735	480.0	79.0
13.0	11,385.4	20.25	1.392	6.372	19.372	562.25	85.5
14.0	13,842.32	21.26	1.409	7.026	21.026	651.0	92.0
15.0	16,606.31	22.25	1.425	7.695	22.695	746.25	98.5

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location: 11ms' d/s of Sparkhill Floodway outfall (drop)

Ash Patel

From: Joe Daconta
Sent: Friday, November 10, 2000 8:07 AM
To: Ash Patel; Rick Hiner
Cc: Michael Weinberg
Subject: New Spook Hill HEC-1 Q100 Results

Here are the results gentlemen:

1. A Q100 existing condition base run with the Spook Hill FRS modified to a Spook Hill Channel (W:\1999projects \99989-Spook Hill ADMP Update\hydrology\New_Hec-1_7-27-00\S24CE31N&Q). The Spook Hill Channel had a constant Manning's n = 0.035, side slopes of 3:1, a longitudinal slope of 0.04%, and a maximum depth of 6'. The channel varied in bottow width dimension depending on the HEC-1 routing location and were determined to be: R320 =140'; R340=160'; R360=210'; R380=220'; R400=220'; R420=220'.

The Q100's were determined to be: Slope to .0007 & Floodway Improved

Concentration Point	Q100 (cfs)	Q100 (cfs)
C320	2613	2613
C340	2855	2994
360C	3680	3934
C380	4063	4404
400C	3831	4175
420C	3628	3998
455C-Spook Hill Floodway	3525	3932
480C	3761	4388
500C	3726	4333

2. A Q100 existing condition run with the Spook Hill FRS modified to a Spook Hill Channel and an offline detention basin within Red Mountain Regional Park (Concentration Point 380)(W:\1999projects\99989-Spook Hill ADMP Update\hydrology\New_Hec-1_7-27-00\S24CE31O&P&R). The Spook Hill Channel had a constant Manning's n = 0.035, side slopes of 3:1, a longitudinal slope of 0.04%, and a maximum depth of 6'. The channel varied in bottow width dimension depending on the HEC-1 routing location and were determined to be: R320=140'; R340=160'; R360= 210'; R380=130'; R400=130'; R420=130'.

The Detention Basin had a surface area of 20 acres, a Q100 inflow of 2663cfs with 1400cfs staying in the Spook Hill Channel. The maximum basin storage was 100 acre-feet with a maximum stage of 5.5'. The basin outflow was analyzed as 1-10'x4'RCBC with a maximum outflow of 441cfs.

The Q100's were determined to be: Slope to .0007 & Floodway Improved Slope .0007/Floodway/6' Depth

Concentration Point (ft)	Q100 (cfs)	Q100 (cfs)	Channel Width (ft)	Q100 (cfs)	Channel Width (ft)	Depth
C320	2613	2613	140	2613	130	5.4
C340	2868	3027	160	3052	165	5.2
360C	3729	3993	210	3987	200	5.4
C380	4062	4450	130	4512	95	5.4
400C	1854	1888	130	1894	95	5.4
420C	1880	1920	130	1929	95	5.5
455C-Spook Hill Floodway	1956	2027		2045		
480C	2430	2532		2529		
500C	3291	3463		3456		

Joseph Daconta, P.E.
Project Engineer

Wood, Patel & Associates, Inc.
2051 West Northern Avenue, Suite 100

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS • CONSTRUCTION MANAGERS

PROJECT Spook Hill- NO.
CALC'D BY ACP CHK'D BY
SHEET OF DATE 1/2001

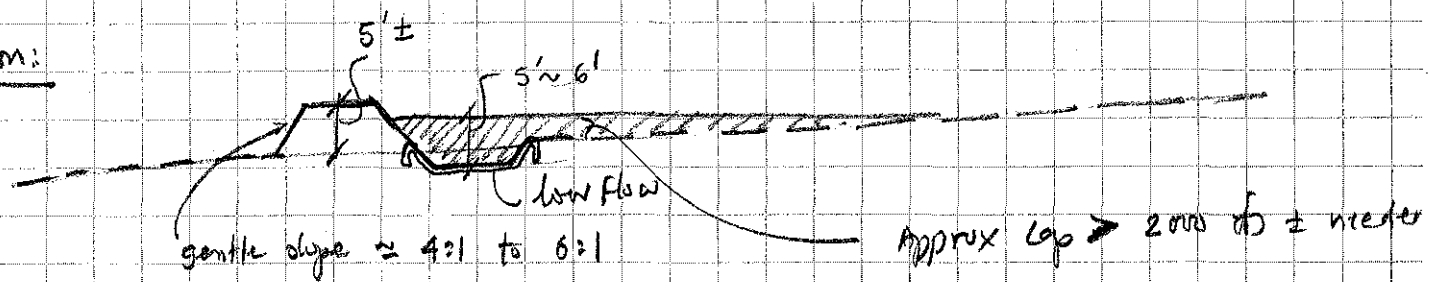
Subject: Pass Mountain - New diversions

Location: North of Boulder Mtn

Goal: Evaluate various alignments & cross-sections, (Recon. level).

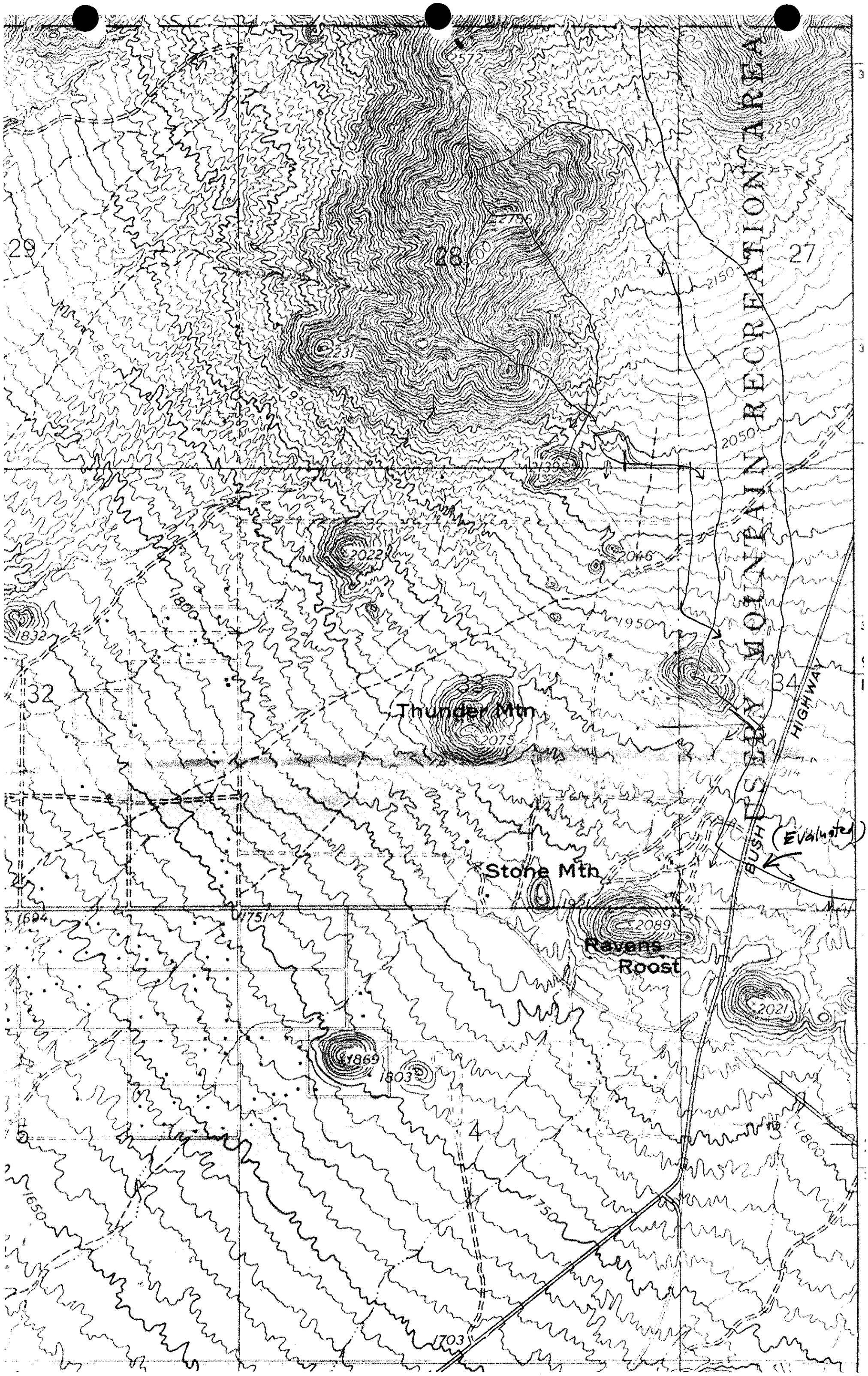
- low flow channel at .005 & .0065 slope - preferred
- concrete channel at .005 slope - environmental concerns

Conclusion:



Concept calcs follow:

- Refine to reduce Levee height (vs Level II)
  - Address freeboard
  - Address low-flow lining - color - roughness
  - Meander alignment
  - Agency feed-back
  - outfall okay?


29
28
27
32
33
34
4
3
Thunder Mtn
Stone Mtn
Ravens Roost
BUSH
HIGHWAY
(Evaluated)
2572
2250
2150
2050
2231
2022
2046
1950
1832
1800
2127
2075
2089
2021
1869
1803
1751
1694
1650
1703
1800

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

March 19, 2001

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.005
Manning's Roughness Coefficient (n-value)	0.018 —(Rough color concrete)
Channel Left Side Slope (horizontal/vertical)	3.5
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	15.0
Minimum Flow Depth (ft)	1.0
Maximum Flow Depth (ft)	5.0
Incremental Head (ft)	0.5

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
1.0	94.62	5.18	0.992	0.418	1.418	18.25	21.5
1.5	194.64	6.53	1.049	0.662	2.162	29.81	24.75
2.0	329.38	7.66	1.09	0.912	2.912	43.0	28.0
2.5	500.52	8.66	1.122	1.165	3.665	57.81	31.25
3.0	710.08	9.56	1.149	1.421	4.421	74.25	34.5
3.5	960.2	10.4	1.173	1.681	5.181	92.31	37.75
4.0	1,253.04	11.19	1.193	1.945	5.945	112.0	41.0
4.5	1,590.8	11.93	1.212	2.213	6.713	133.31	44.25
5.0	1,975.64	12.64	1.229	2.484	7.484	156.25	47.5

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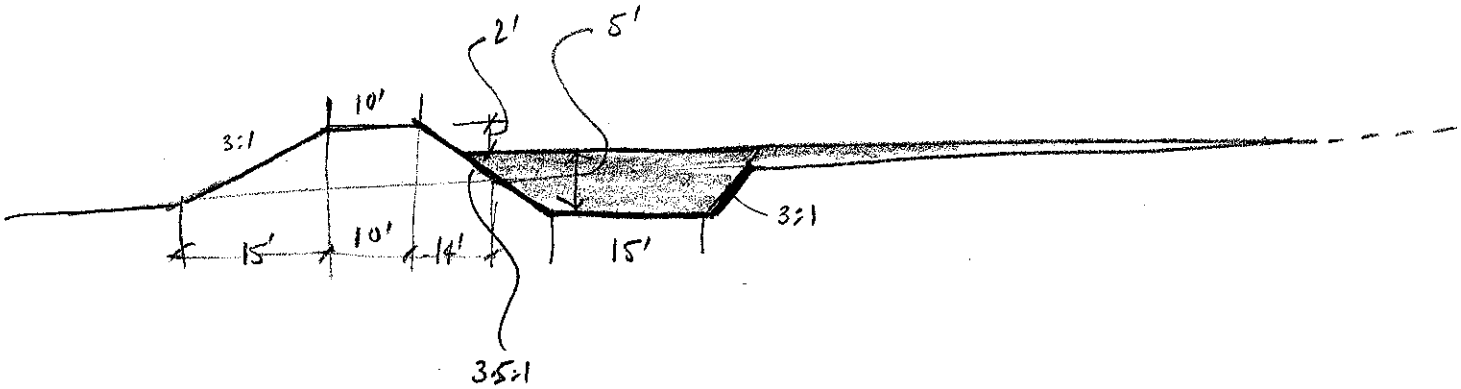

Preferred section
looking west

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

Alignment. 1 (option-1)

January 25, 2001

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.005
Manning's Roughness Coefficient (n-value)	0.022 (concrete (rough))
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	2.0
Channel Bottom Width (ft)	10.0
Minimum Flow Depth (ft)	0.5
Maximum Flow Depth (ft)	6.5
Incremental Head (ft)	0.5

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
0.5	15.61	2.78	0.729	0.12	0.62	5.63	12.5
1.0	51.95	4.16	0.803	0.268	1.268	12.5	15.0
1.5	107.47	5.21	0.846	0.422	1.922	20.63	17.5
2.0	182.92	6.1	0.878	0.578	2.578	30.0	20.0
2.5	279.5	6.88	0.903	0.736	3.236	40.63	22.5
3.0	398.58	7.59	0.924	0.896	3.896	52.5	25.0
3.5	541.54	8.25	0.942	1.058	4.558	65.63	27.5
4.0	709.81	8.87	0.958	1.223	5.223	80.0	30.0
4.5	904.78	9.46	0.972	1.391	5.891	95.63	32.5
5.0	1,127.83	10.03	0.986	1.562	6.562	112.5	35.0
5.5	1,380.3	10.57	0.998	1.735	7.235	130.63	37.5
6.0	1,663.54	11.09	1.01	1.911	7.911	150.0	40.0
6.5	1,978.85	11.6	1.02	2.09	8.59	170.63	42.5

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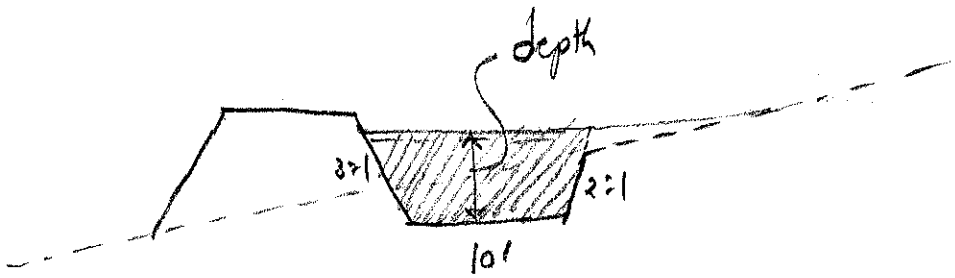


looking West

3.32 PATENTS Seller agrees to defend City at seller's own expense, in all suit, actions, or proceedings in which City is made a defendant for actual or alleged infringement of any United States of America or foreign letters patent resulting from City's use of the goods purchased as a result of this RFP. Seller further agrees to pay and discharge any and all judgments or decrees which may be rendered in any such suit, action or proceedings against City. Seller agrees to indemnify and hold harmless the City from any and all license, royalty and proprietary fees or costs, including legal costs, which may arise out of City's purchase and use of goods supplied by the seller. It is expressly agreed by seller, that these covenants are irrevocable and perpetual.

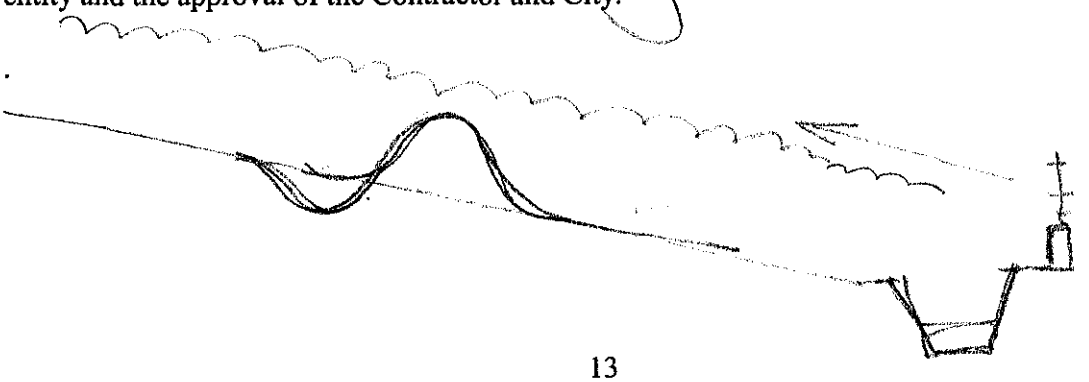
3.33 VENDOR PERFORMANCE Prior offeror performance in regard to product, service, or representation of/from the offeror may be used in evaluation of this offer. Unsatisfactory performance to the City may be considered sufficient grounds for rejection of this offer. No offer will be awarded to any offeror who is in default on any contract with the City.

3.34 FUND APPROPRIATION CONTINGENCY The contractor and the City recognize that the continuation of any contract after the close of any given fiscal year of the City; which ends on June 30, shall be subject to the approval of the budget of the City providing the contract item is an expenditure therein. The City does not guarantee that the budget item will be actually adopted, as it is the determination of the City Council at the time of the adoption of the budget.

3.35 NOTIFICATION OF AWARD The successful offeror(s) will be notified by mail that their offer has been accepted by the City Council as recommended for award

3.36 CONTRACT ADMINISTRATION Contractor must contact the buyer for guidance or direction of matters of interpretation or problems regarding the terms, conditions or scope of this contract. Individuals of the City's using organizations may be designated as authorized representatives to place orders directly to the contractor. However, they are not authorized to change, amend or interpret the specific terms, conditions or provisions of the agreement.

3.37 COOPERATIVE USE OF CONTRACT This agreement may be extended for use by other governmental agencies and political subdivisions of the State. Any such usage by other entities must be in accord with the ordinances, charter, rules and regulations of the respective entity and the approval of the Contractor and City.



(option 1)

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

January 24, 2001

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.0065
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	4.0
Channel Right Side Slope (horizontal/vertical)	40.0
Channel Bottom Width (ft)	1.0
Minimum Flow Depth (ft)	1.0
Maximum Flow Depth (ft)	7.0
Incremental Head (ft)	1.0

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
1.0	50.22	2.18	0.538	0.074	1.074	23.0	45.0
2.0	309.73	3.44	0.603	0.184	2.184	90.0	89.0
3.0	904.19	4.5	0.645	0.314	3.314	201.0	133.0
4.0	1,937.61	5.44	0.677	0.46	4.46	356.0	177.0
5.0	3,502.6	6.31	0.702	0.619	5.619	555.0	221.0
6.0	5,684.21	7.12	0.724	0.788	6.788	798.0	265.0
7.0	8,561.95	7.89	0.742	0.968	7.968	1,085.0	309.0

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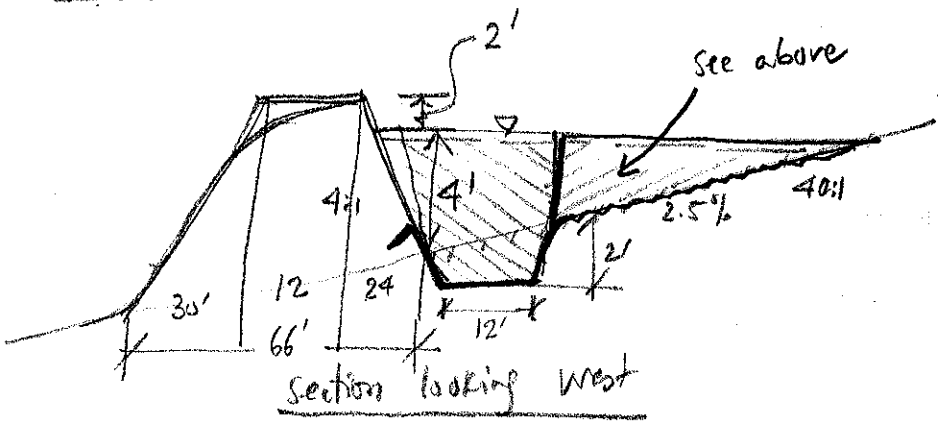
Alignment 1 (A) diversion north of Bolder Mtn subdivision (dike only)



(B) with concrete low flow.

@ 4' Q = 1230, V = 15.4
F_r = 1.6

of actual damages, the successful proposer shall pay to the City as fixed, agreed, and liquidated damages for each calendar day of delay, the amount of $100 The successful proposer shall not be charged with liquidated damages when the delay arises out of cause beyond the control and without the fault of negligence of the successful proposer. The City shall determine what is beyond the control of the successful proposer and his supplier.

2.10 REFERENCES Provide with the offer, four letters of reference from companies for whom contractor has provided similar products/services with at least one reference from an Arizona company in the last twenty-four months. Also include company name, address, phone number, contract person, a description of the products/services provided with a description of any major variation to the requirements of this RFP.

(option 1)

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

January 25, 2001

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.005
Manning's Roughness Coefficient (n-value)	0.04
Channel Left Side Slope (horizontal/vertical)	0.0
Channel Right Side Slope (horizontal/vertical)	40.0
Channel Bottom Width (ft)	1.0
Minimum Flow Depth (ft)	0.5
Maximum Flow Depth (ft)	4.5
Incremental Head (ft)	0.5

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
0.5	5.82	1.06	0.365	0.017	0.517	5.5	21.0
1.0	34.74	1.65	0.408	0.043	1.043	21.0	41.0
1.5	100.27	2.16	0.435	0.072	1.572	46.5	61.0
2.0	213.62	2.61	0.456	0.105	2.105	82.0	81.0
2.5	384.79	3.02	0.474	0.142	2.642	127.5	101.0
3.0	622.97	3.4	0.488	0.18	3.18	183.0	121.0
3.5	936.77	3.77	0.501	0.221	3.721	248.5	141.0
4.0	1,334.29	4.12	0.512	0.264	4.264	324.0	161.0
4.5	1,823.31	4.45	0.522	0.308	4.808	409.5	181.0

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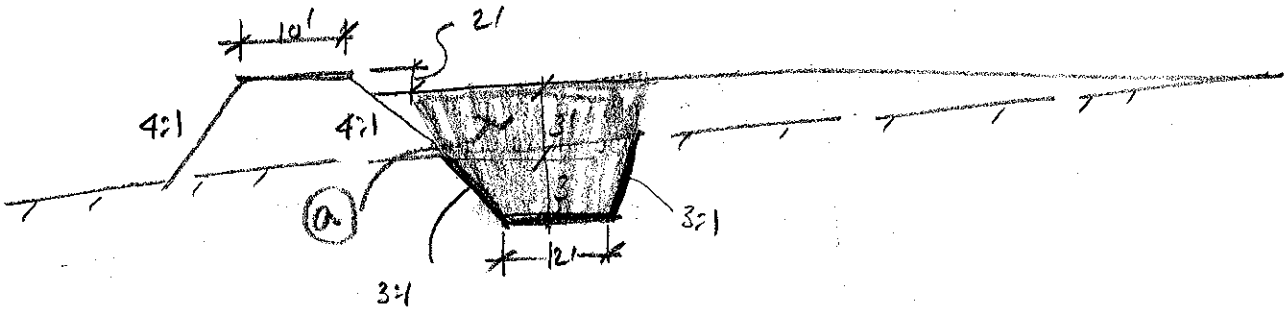


3.23 PROTEST OF AWARD Any person who has an objection to the awarding of a solicitation by the City, pursuant to competitive bidding procedures, shall lodge that protest, in writing, with the Materials Manager prior to award by the City Council. A protest lodged after award by the City Council will not be considered.

3.24 REMEDIES City shall have, in addition to the remedies provided herein, all remedies afforded by the Uniform Commercial Code as adopted by the State of Arizona. Contractor shall have, subject to the limitation imposed by the terms of this agreement, all remedies afforded by the Uniform Commercial Code as adopted by the State of Arizona.

3.25 ASSIGNMENT Neither an order nor monies due thereunder shall be assigned in whole or in part without the City's prior written consent.

3.26 ADDENDA Any change to the proposal will be in the form of a numbered addendum issued by Materials Management. The addendum will be furnished to all who received the proposal. The City will not be responsible for any oral or written instructions made by any employees, officers, contracted consultant or agent of the City in regard to the proposal. The City will not be responsible for offerors adjusting their offer based on oral or written instructions.

3.27 SPECIAL ACCOMMODATIONS Please contact Materials Management at 930-2862 at least 3 days prior to the meeting for special accommodation. Hearing impaired persons, please use the Arizona Relay Service (1-800-367-8939).

3.28 OFFER IDENTIFICATION The City is not responsible for the pre-opening of, post-opening of, or the failure to open, an offer not properly addressed or identified.

3.29 OFFER TABULATION A printed copy of the offer tabulation will be available upon written request to Materials Management. Oral requests will not be accepted. Each request must contain a self-addressed, stamped envelope and reference the RFP title and number.

3.30 LIABILITY Except for the negligence of the City, its officers, managers, employees, or agents, Contractor shall be liable to the City for any physical damage to City property or for the death of, or personal injury to, City personnel arising out of Contractor's occupancy, maintenance, repair, replacement, installation and/or any other work performed pursuant to the contract. Contractor agrees to indemnify, defend and hold the City harmless from any claim or loss arising from such damage or injury.

3.31 OSHA GUIDELINES The contractor shall be familiar with and operate within the guidelines set forth by the Occupational Safety and Health Act.

Alignment 2
(option 2)

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

January 25, 2001

PROGRAM INPUT DATA

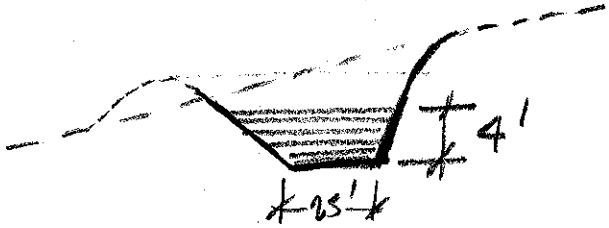
DESCRIPTION	VALUE
Channel Bottom Slope (ft/ft)	0.0055
Manning's Roughness Coefficient (n-value)	0.015
Channel Left Side Slope (horizontal/vertical)	2.0
Channel Right Side Slope (horizontal/vertical)	2.0
Channel Bottom Width (ft)	25.0
Minimum Flow Depth (ft)	1.0
Maximum Flow Depth (ft)	7.0
Incremental Head (ft)	1.0

COMPUTATION RESULTS

Flow Depth (ft)	Flow Rate (cfs)	Flow Velocity (fps)	Froude Number	Velocity Head (ft)	Energy Head (ft)	Flow Area (sq ft)	Top Width (ft)
1.0	187.1	6.93	1.266	0.746	1.746	27.0	29.0
2.0	609.0	10.5	1.396	1.713	3.713	58.0	33.0
3.0	1,231.82	13.25	1.473	2.726	5.726	93.0	37.0
4.0	2,051.86	15.54	1.527	3.755	7.755	132.0	41.0
5.0	3,072.82	17.56	1.57	4.791	9.791	175.0	45.0
6.0	4,301.34	19.38	1.605	5.834	11.834	222.0	49.0
7.0	5,745.46	21.05	1.635	6.883	13.883	273.0	53.0

HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com
All Rights Reserved.

Alignment 2, Incised concrete channel (supercritical flow)
flatter slope Boulder Mtn, channel North of subdivision



deduction from an unpaid balance due; (2) collection against the bid and/or performance bond; or (3) a combination of the aforementioned remedies or other remedies as provided by law.

3.10 TERMINATION FOR CONVENIENCE The City reserves the right to terminate any order or contract upon thirty days written notice. The City will be responsible only for those standard items which have been delivered and accepted. If the items are unique and not saleable or useable for any other application, the City will reimburse the Seller for actual labor, material, and burden costs, plus a profit not to exceed 8%. Title to all materials, work-in-process, and completed but undelivered goods will pass to the City after costs are claimed and allowed.

3.11 SUB-CONTRACTING The contract or any portion thereof, shall not be sub-contracted without the prior written approval of the Materials Manager. No such approval will be construed as making the City a party of or to such sub-contract, or subjecting the City to liability of any kind to any sub-contractor. No sub-contract shall, under any circumstances, relieve the contractor of liability and obligation under this contract; and despite any such subletting the City shall deal through the contractor. Sub-contractors will be dealt with as workmen and representatives of the contractor.

3.12 M.S.D.S. Contractor is to supply Materials Safety Data Sheets (M.S.D.S.) in accordance with Federal requirements. Contractor entering the City workplace with hazardous materials will supply the City with a M.S.D.S. covering those particular products the contractor may expose City employees or the general public to while working at the site.

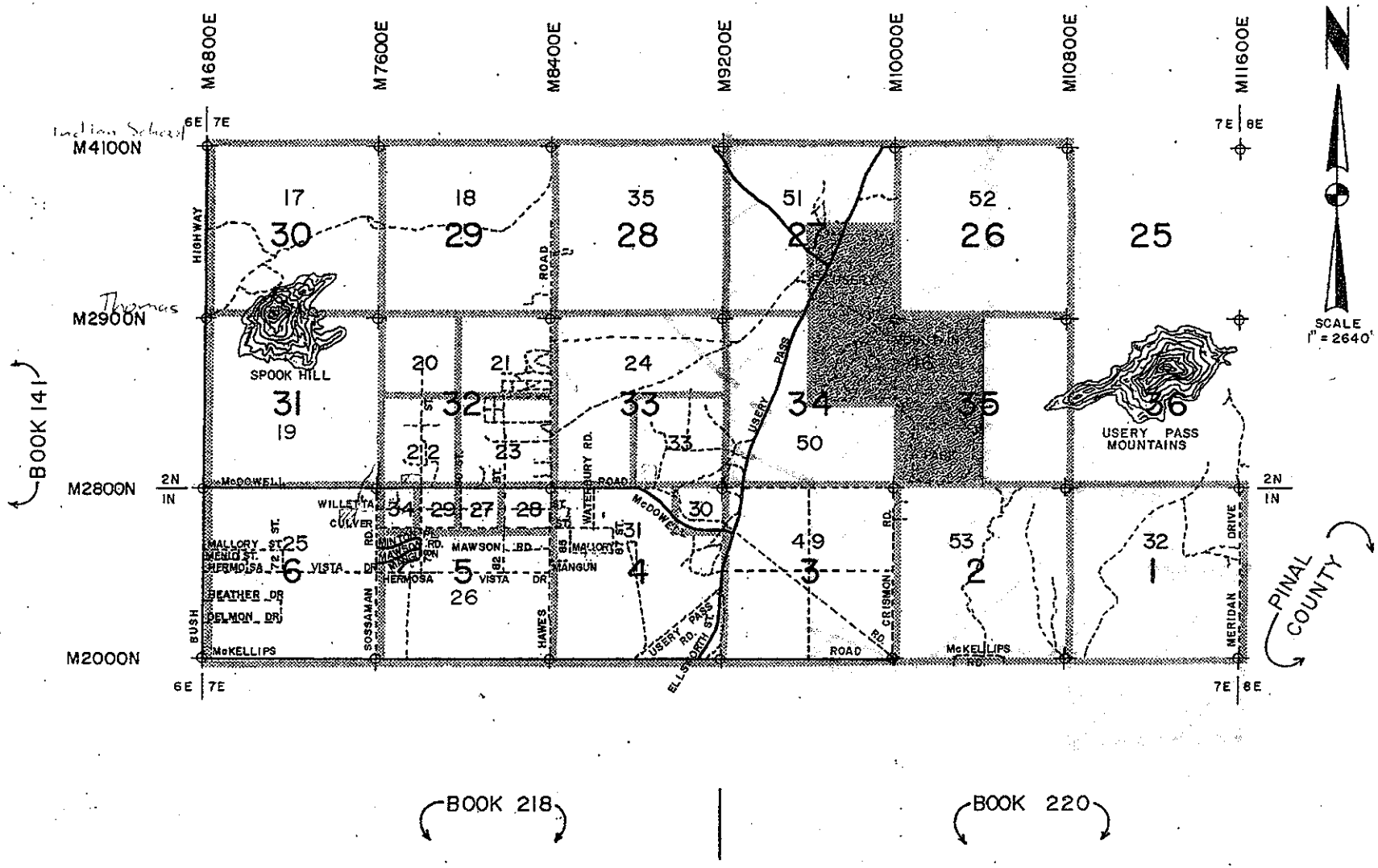
3.13 INDEMNIFY AND HOLD HARMLESS Contractor agrees to indemnify, defend and hold harmless the City against; (1) any and all losses, claims, damages, law suits and liabilities for any personal injury, death, or property damage arising out, or as a consequence of, any work performed pursuant to the contract; (2) any and all expenses related to claims or lawsuits resulting from the above, including court costs and attorney(s) fees; and (3) any and all penalties and damages incurred by reason of contractor's failure to obtain any required permit or license, or comply with any applicable laws, ordinances, or regulations. Contractor shall hold the City harmless from any claimants supplying labor or materials to the contractor or sub-contractors in the performance of the work required under this contract. The City reserves the right to request the contractor to provide written certification that all liens against materials and labor have been satisfied, before City will make payment.

3.14 RESPONSIBILITY FOR COMPLIANCE WITH LEGAL REQUIREMENTS The offeror's products, services, and facilities shall be in full compliance with all applicable Federal, State, and local health, environmental, and safety laws, regulations, standards, and ordinances, regardless of whether or not they are referred to by the City.

Maricopa, AZ, 1999-2000 - 219-Index, Sheet 2 of 2

SECS 1-6 1N, 7E & SECS 25-36 2N, 7E

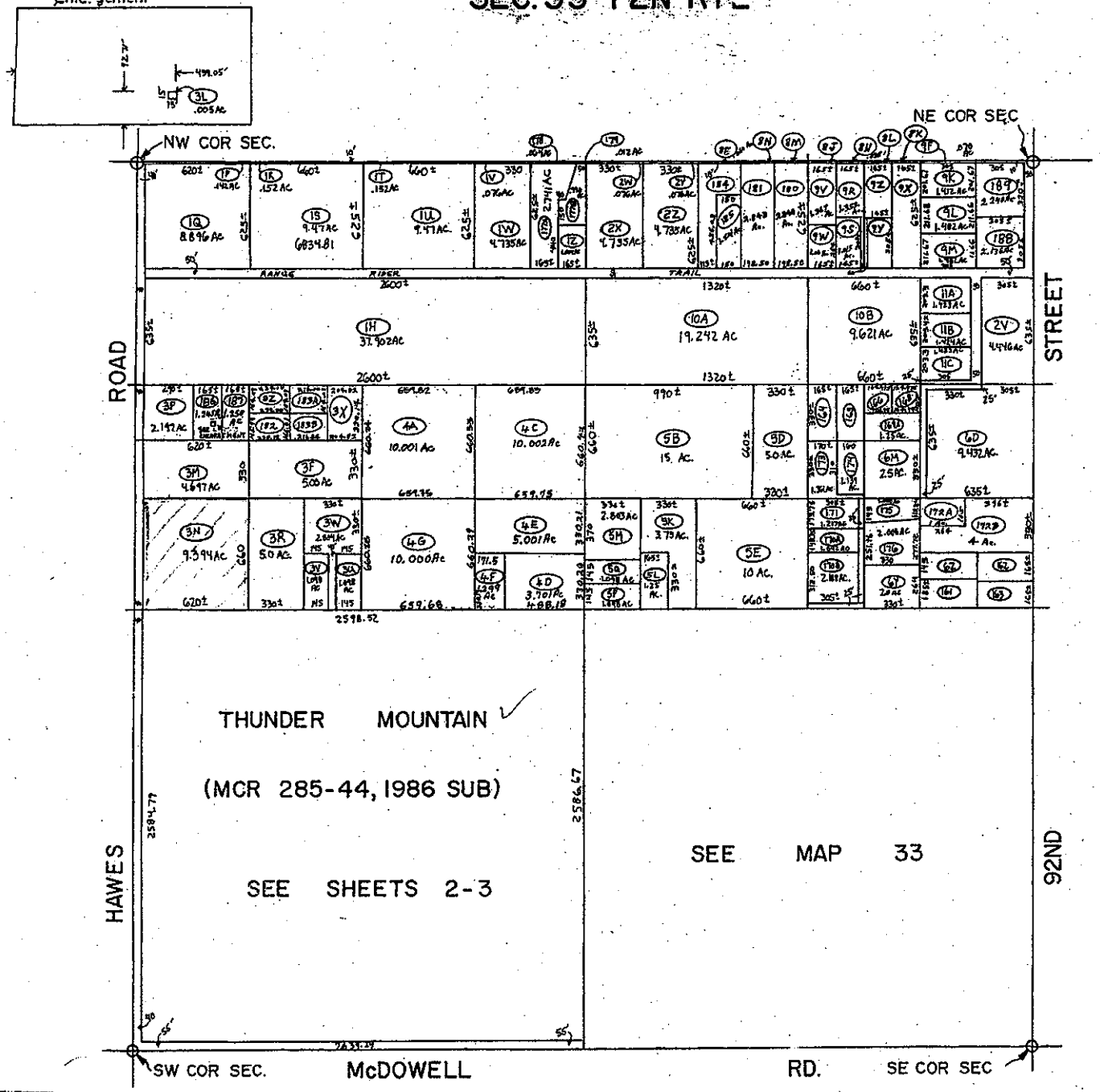
BOOK 219
SHEET TWO



REDRAWN 5/18/76 MG. 2070

SEC. 33 T2N R7E

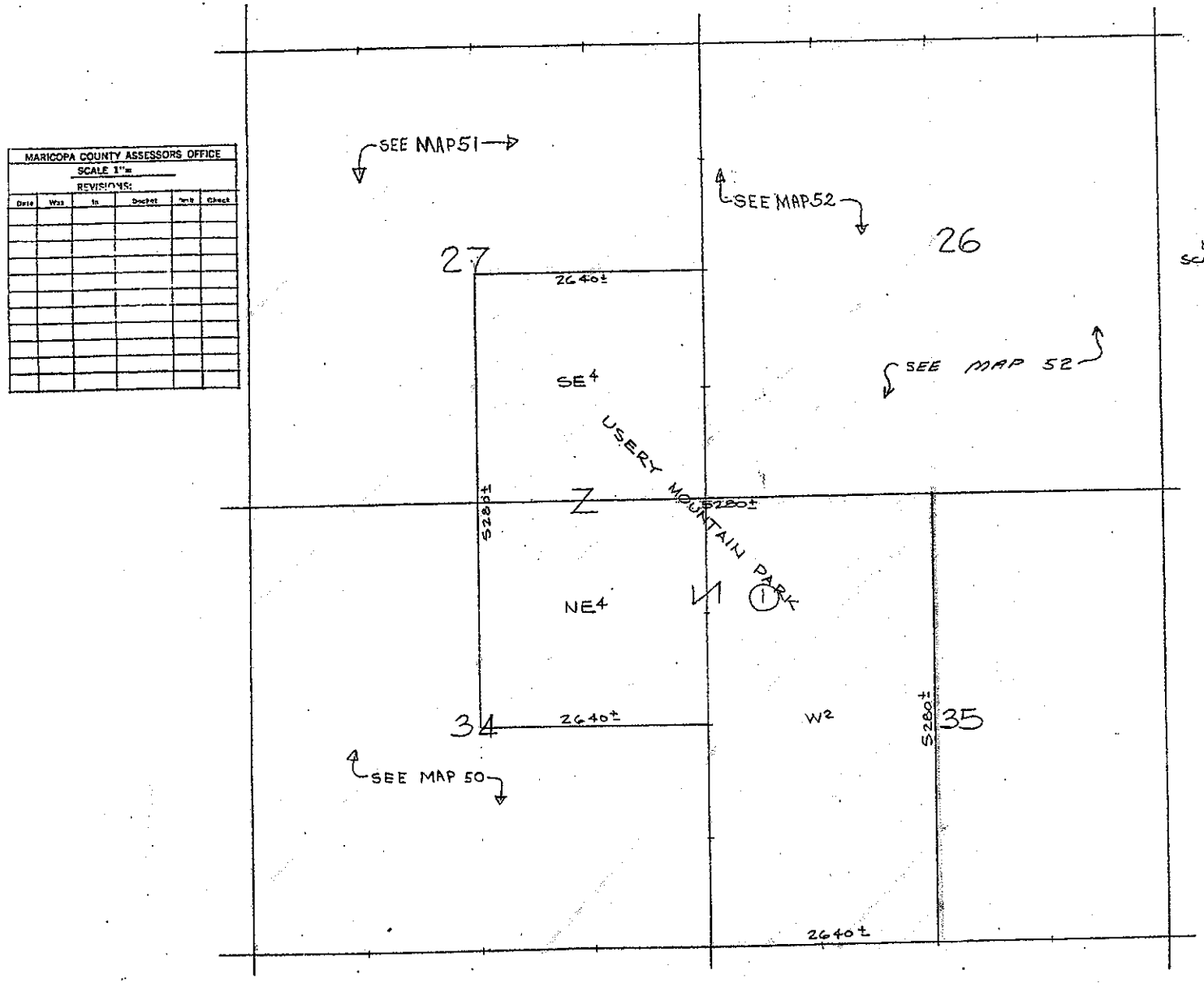
BOOK 219
MAP 24
SHEET 1 of 3



MARICOPA COUNTY ASSESSOR'S OFFICE					
SCALE: 1" = 500'					
REVISIONS:					
Date	Was	To	Docket	Date	Check
4-14-92	8B	8A, 8B	91-556206	2-4-92	N.D. 2072
9-17-92	12	11B, 12 11A, B	91-587810	2-4-92	N.D. 2072
11-17-92	10	10A, B	92-321068	N.D. 2072	—
11-23-92	MAP	REDRAWN		B.C. 3143	N.D. 2072
1-4-94	7B	7B	—	3147 3068	—
5-16-95	16C 16B	3/4 INTERSECT PER SURVEY	MCR 285-2	N.D. 2072	—
9-20-95	9N	9Q, R, S	95-1449931 95-0811871	N.D. 2072	—
1-29-96	8C, 7C	8C, 8E 7C, 7E	95-813920	N.D. 2072	—
5-27-96	8D, 9Q	8N, 8C 9C, 9W	95-579731	N.D. 2072	—
6-11-96	3J	3J, 3K, 3L PER MCR	MCR 402-18	N.D. 2072	—
8-28-96	8E	8K, 8L	96-203710	N.D. 2072	—
9-30-96	9P	9X, Y, Z	96-402397 96-402372	N.D. 2072	—
3-4-97	3J	3X, 3Y	96-479509	N.D. 2072	—
4-18-97	8G	8M, 8N	96-355403	N.D. 2072	—
4-18-97	9U	180, 181	96-355403	N.D. 2072	—
6-23-97	3Y	3Z, 172, 173	96-476768 96-476770	N.D. 2072	—
10-7-97	172	172A, B	97-109647	N.D. 2072	—
10-7-97	183	183A, B	97-515618	N.D. 2072	—
12-16-97	9T	184, 185	97-832927	N.D. 2072	—
5-6-98	4	3/4 INTERSECT PER MCR	MCR 459-4	N.D. 2072	—
6-19-98	4	4A, 4B	97-830846	N.D. 2072	N.D. 2072
12-23-98	3B	186, 187	98-0697638 98-0697639	D.A.J. 3360	
12-23-98	4B	4C, 4D, 4E 4F, G	98-0697570 98-0697572	D.A.J. 3360	
12-23-98	9H	189, 191	98-269552 98-0571877	D.A.J. 3360	

SECS. 26, 27, 34 & 35 2N-7E

BOOK 219
MAP 46

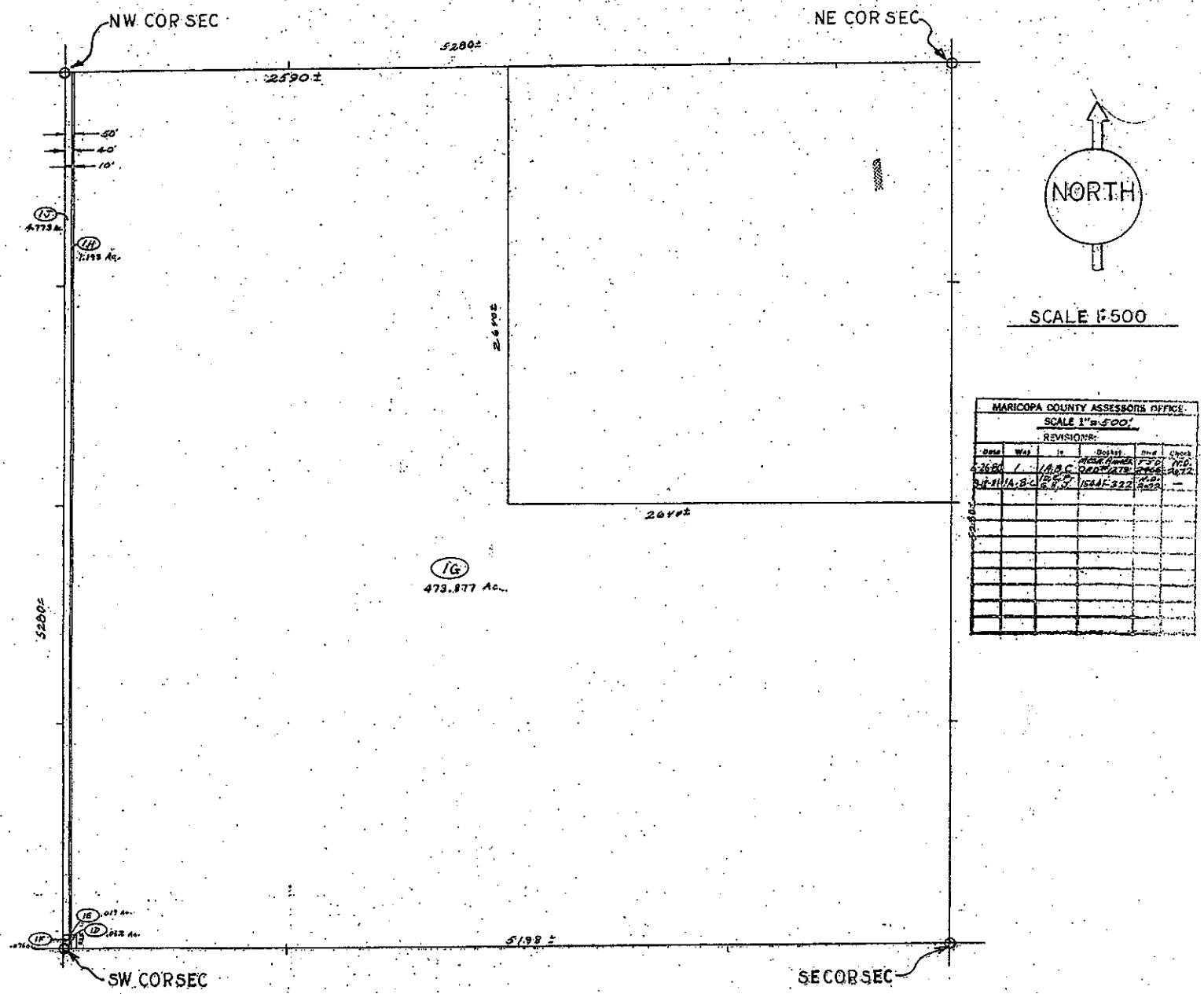


MARICOPA COUNTY ASSESSORS OFFICE					
SCALE 1"=					
REVISIONS:					
Date	Was	In	Docket	Init	Check

Maricopa, AZ, 1999-2000 - 219-50, Sheet: 1 of 1

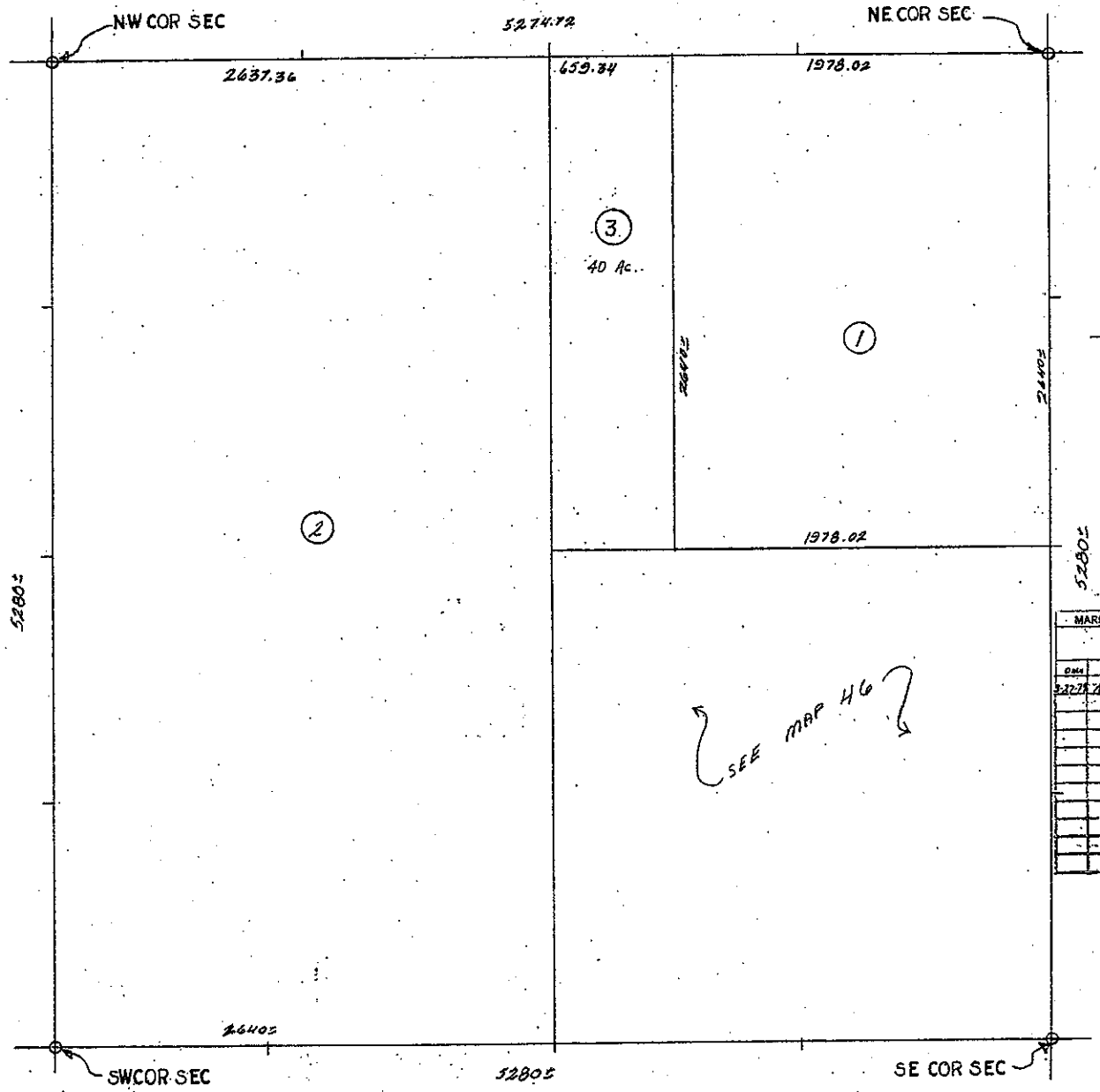
SEC 34 2N 7E

BOOK 219 MAP 50



SEC. 27 2N 7E

BOOK 219 MAR51



SCALE 1 500

MARICOPA COUNTY ASSESSORS OFFICE

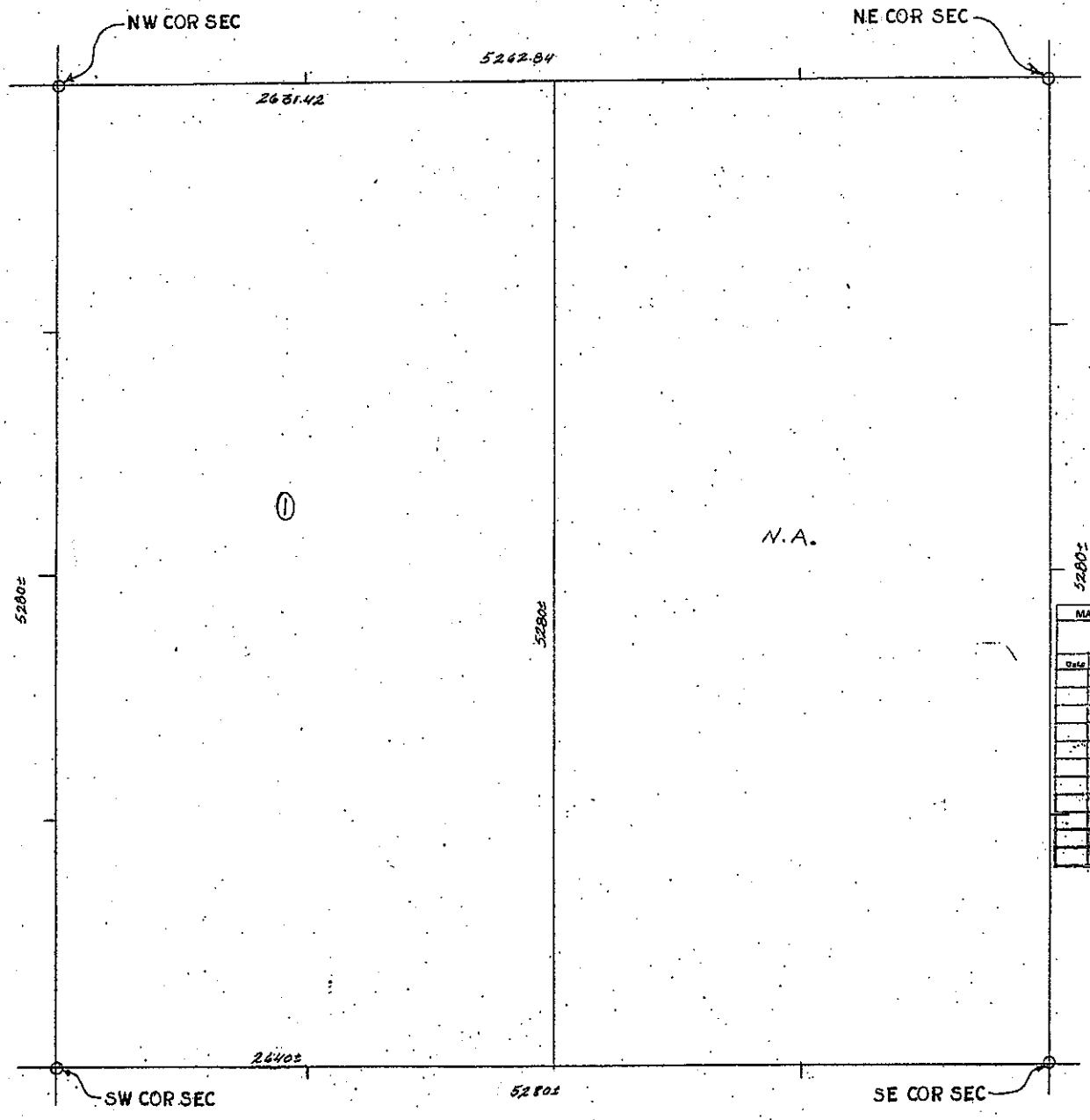
SCALE 1"=

REVISIONS

Date	Was	Is	Docket	Page	Notes
3-27-79	N.A.	3	84-75-0005	3272	

SEC 26 2N 7E

BOOK 219 MAP 52



SCALE 1"=500

MARICOPA COUNTY ASSESSOR'S OFFICE

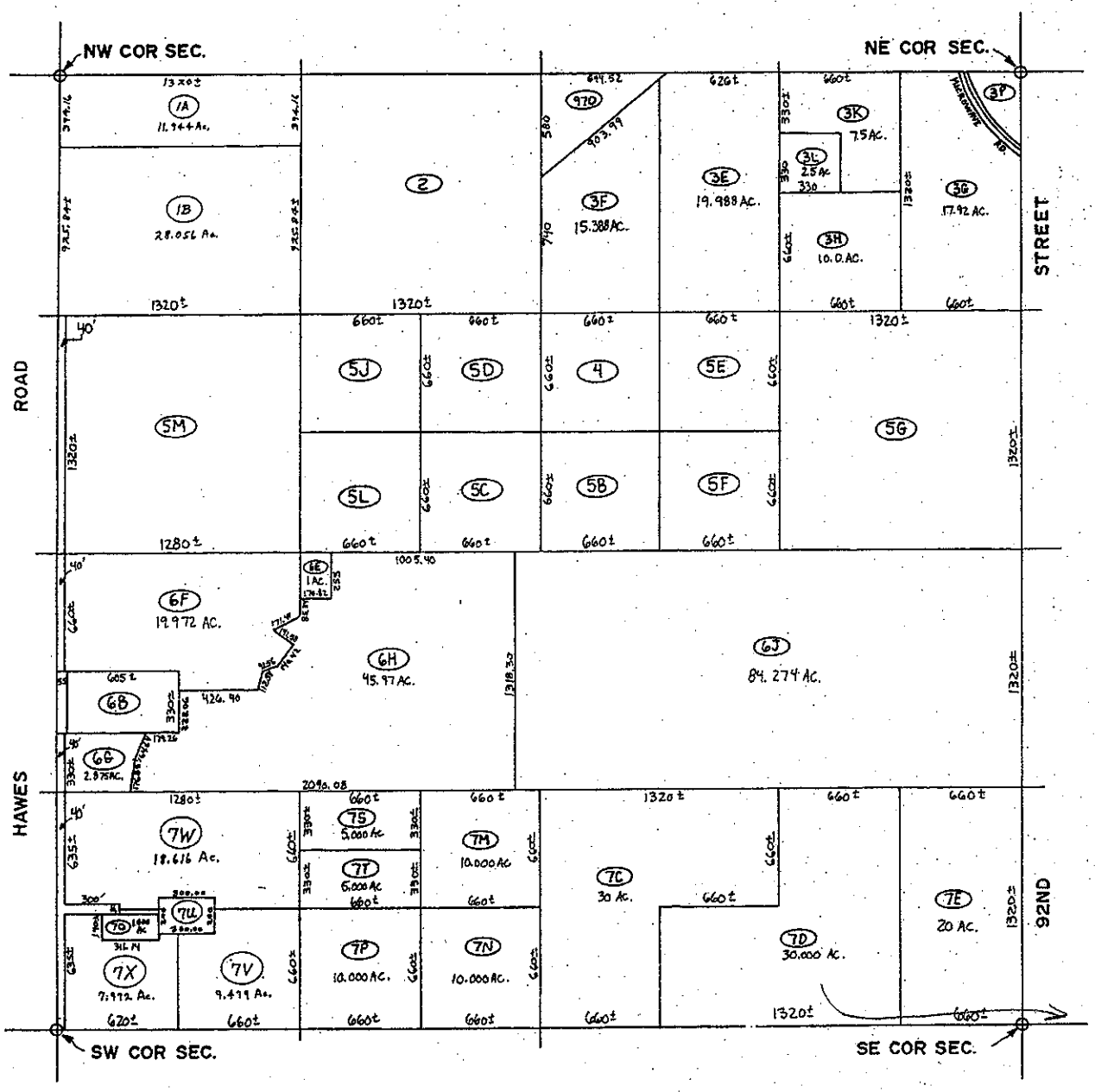
SCALE 1"=

REVISIONS:

Date	Was		Reason	Init	Check

SEC. 28 T2N R7E

BOOK 219
MAP 35



MARICOPA COUNTY ASSESSORS OFFICE
SCALE 1" = 500'
REVISIONS:

Date	Was	Is	Docket	Dwn	Check
9/27/70	MAP REDRAWN			K.C. 3123	N.D. 2072
7-31-75	1	1A, 1B	94-109775	N.D. 2072	—
92-98	7H, 7K 9B	7U, 7V 7W, 7X	97-783618	N.D. 2072	—

Review/comments of Level I

1/18/01

Spook Hill - Level II

✓ How Combination options work / optimized?
✓ Exhibits appropriate for Level II
✓ Cost Analysis - see samples from Merryvale

✓ State land Drainage plan - can we show on our exhibit?

Why should we do Mokelips when it is going to protect undeveloped state land & golf course?

Can Basin @ usery pk corner be done with developer's participation?

Pass mtg, Can we justify the top most diversion? What is its impact on McDowell (selected) option?

Need okay from Afshin for Non-jurisdictional options.
define schedule, priorities, constraints
✓ update utilities - data collection & library
✓ field survey structures? survey Report Number culvert / exhibit.
✓ Status of K-H work - call Bob
✓ " " District's letter to ADOT - did go to ADOT
✓ " " DMJM's schedule
✓ " " News Letter (Ashley) before feb 5th Ready

Any outstanding issues?

McDowell Road

① What is a safe capacity of existing roadway?
② Is this pipe/channel to handle basin outlet only?
③ What is the natural channel capacity here?
④ Where is the outfall?

McKellips Road

① need SLD drainage plan
② Why needed?
③ serves only 52 Ac, is this worth it? When it passes thru' SLD.
④ only serves SLD
⑤ Can this basin be relocated to the GC parcel (Mesa)?

PASS MTN

① With a minor diversion this area can go to Signal Butte FRS

② With this alignment dist channel may not be feasible as intended (Recommended option).
(Possible new alignments)

③ Initial flow needs to follow natural path for sec. 404 purpose.

Non-structural

Floodplain

WOOD/PATEL

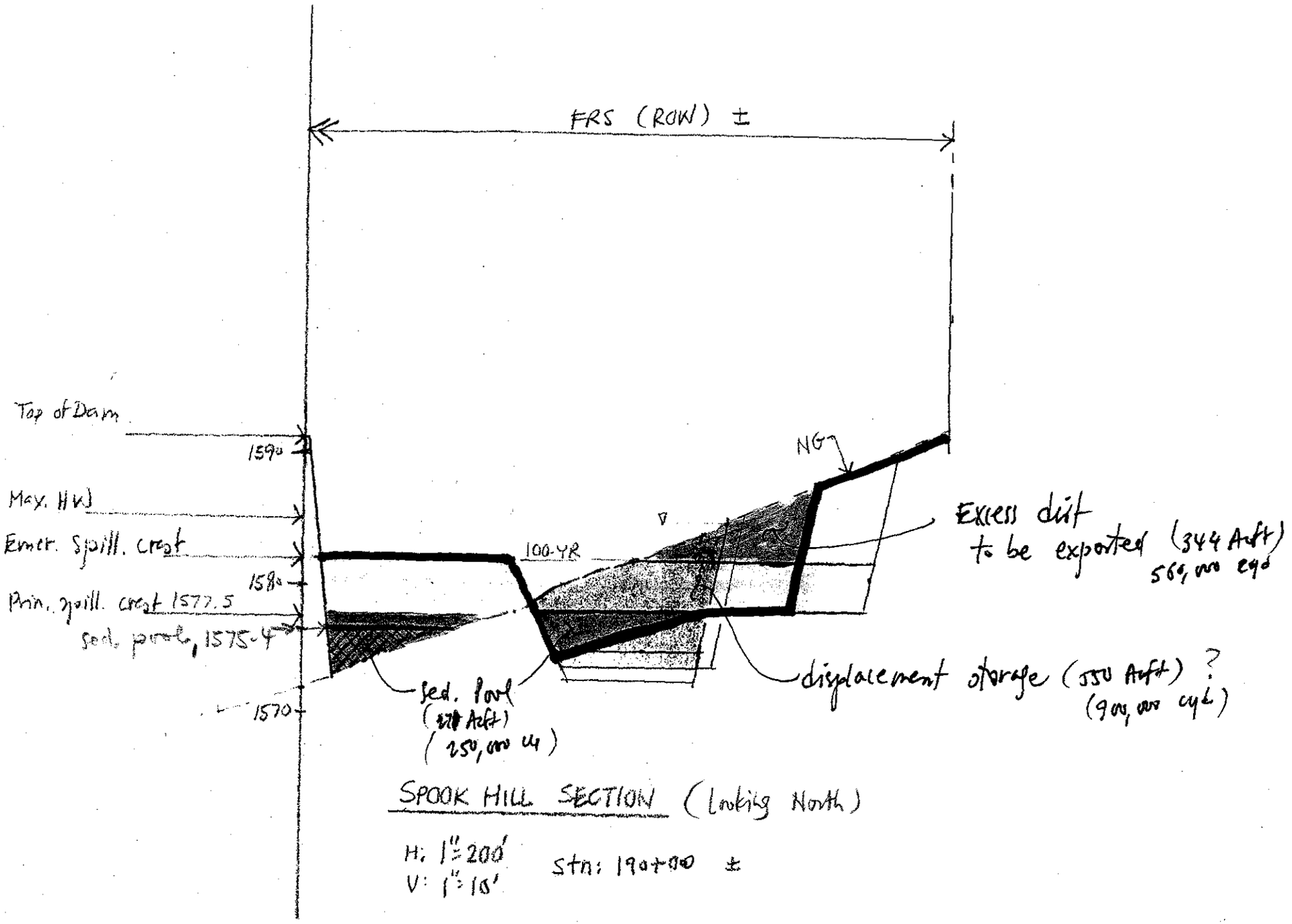
CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS • CONSTRUCTION MANAGERS

PROJECT Spook Hill NO.
CALC'D BY ACP CHK'D BY
SHEET OF DATE 3/01

Fwy - Drainage Concept -
& Crud costs (Needs Refinement to Level I)

1. Spook Hill FRS cross-section w/ Fwy in-place
2. Concept of (A) concrete channel & off-line basin
   (B) Pr. drainage Fwy. channel & diversion (won't work)
3. Sed. pond data
4. Qty. cost (very crude)

(NOTE: Discard these costs after refined work)

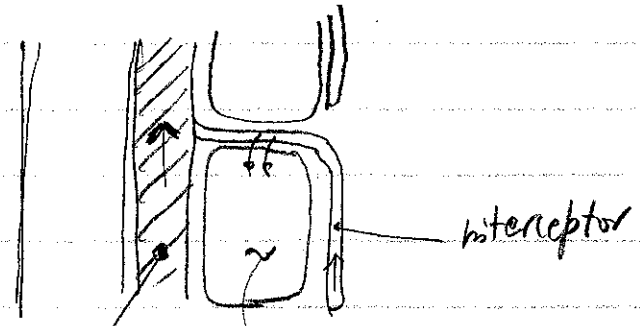


SPOOK HILL SECTION (looking North)

H: 1" = 200'
V: 1" = 10'

Stn: 190+00 ±

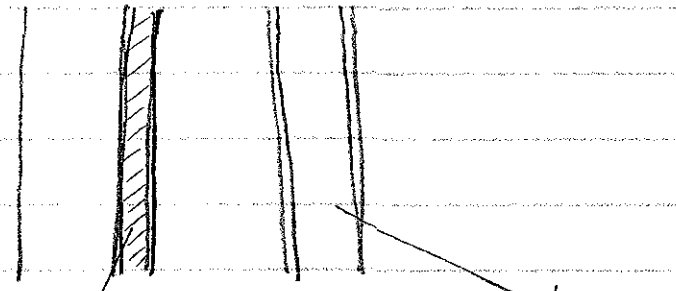
Fury Drainage Concepts:



Conc. channel
(accepts Fury + offsite drainage)
slope not feasible

off-line basin or on-line basin w/ Flaps

(A)



Fury channel
(may not work because of no slope)

(B)

Ash Patel

From: Rick Hiner [rhiner@woodpatel.com]
Sent: Tuesday, January 02, 2001 10:43 AM
To: 'Ash Patel @ Wood/Patel'
Subject: Spook Hill

I have revised the information as you requested.

Ash,

I took a close look at the sediment pool elevation issue using the more recent topographic survey information and have determined the following:

<u>The following values are based on the current topographic datum (NAD '88):</u>

100-year design sediment volume	271 acre-feet
Raw storage at elevation 1579.36	537 acre-feet (elevation 1579.36 is the principal spillway crest)
Elevation of sediment pool	1577.24 feet

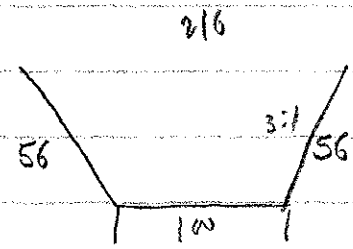
<u>The following values are based on the original design datum (NAD '27):</u>

100-year design sediment volume	271 acre-feet
Raw storage at elevation 1577.5	537 acre-feet (elevation 1577.5 is the principal spillway crest)
Elevation of sediment pool	1575.38 feet

Rick H.

Spokkhill FPS - Channel Diversion

	L	Nr	Inv	Ave channel	
Prop. Spillway					
	2400'	① 84	70	250	
McDowell					Bridge 300'
McKellips	6350	② 85	73	250	
					Bridge 350'
Bowen	7200	③ 87	79	250	
					Bridge 350
Sig. B. outfall	300	④ 86	82.5	250	



① 194,000

② 384,000

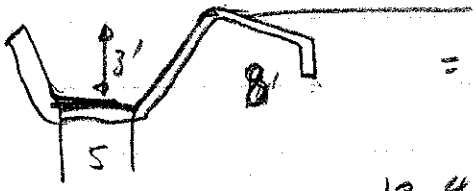
③ 283,000

④ 57,000

918,000 @ 3.50 = 3,500,000

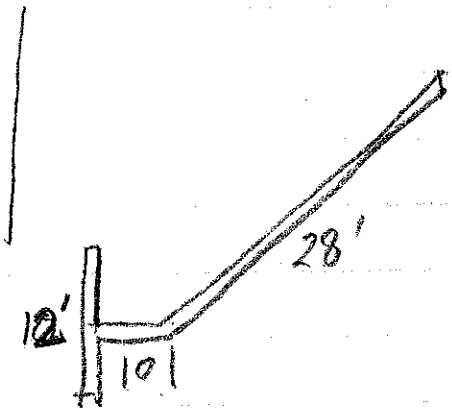
bridge: 100'(300 + 350 + 350) = 100,000 SF @ 60

= 6,000,000



= 22 @ 5/ft = 110 $/ft

19,450' x 110 = $2,140,000



50' @ 7/ft = 350 x 15 = $6000

19,450/300 x 6000 =
65 x 6000 = $390,000

dirt work =	3,500,000	
bridges =	6,000,000	
collector ch =	2,100,000	
drops =	400,000	
	$ 12,000,000	FRS - diversion
	6,000,000	floodway mods
	$ 18,000,000	±

Red Mtn Fwy

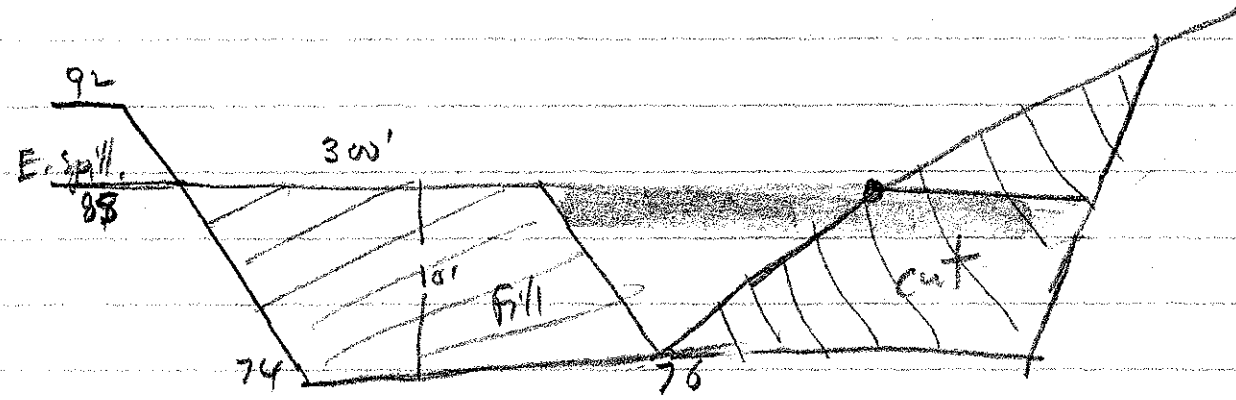
Per EIS - design

McDowell Bridge = 1250' x 100 =

McKellips " = 1800

Brown " = 2000'

5050 x 100 x 70 = $35,350,000



120 cy/ft x 1800 = 2,160,000 cy = 1350 Acft

86 - 75 x 600 x 1800/27 = 4,400,000 cy = 2750 Acft

@ 3.50/cy = 15,500,000 (may be low)

35,500,000 bridge

51,000,000

2,100,000 - Collectors

900,000 - drops

54,000,000

Spook Hill Floodway

Pr. Spillway

28 00

bridge 100'

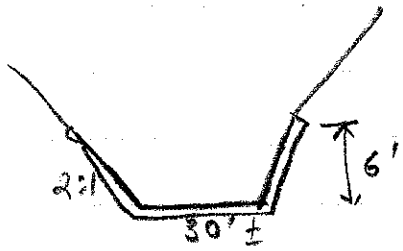
Thomas

59 00'

pg. break

29 00'

outfall



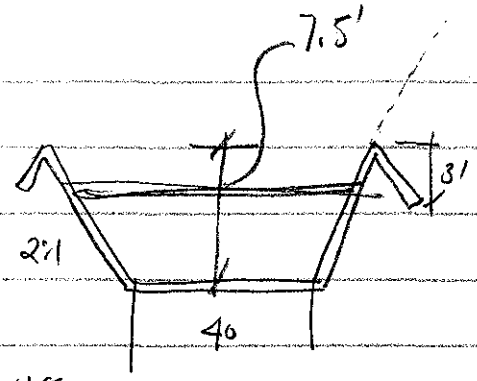
30 + 8.5x2 = 47' @ 6/ft = $282

Cost = 282 x 11,600 = 3,300,000

bridge @ Thomas: (60 x 100) x 100
= 600,000

Cost = 4,000,000 x 1.5 = $6,000,000

Spook hill Diversion: Concrete lined



$n = .015$

$S = .0007$ % $d_n = 6$ – $Q = 2284$ cfs

$V = 7.52$

$FV = .585$

67.2 cf @ 6 \$/cf = 403 \$/ft

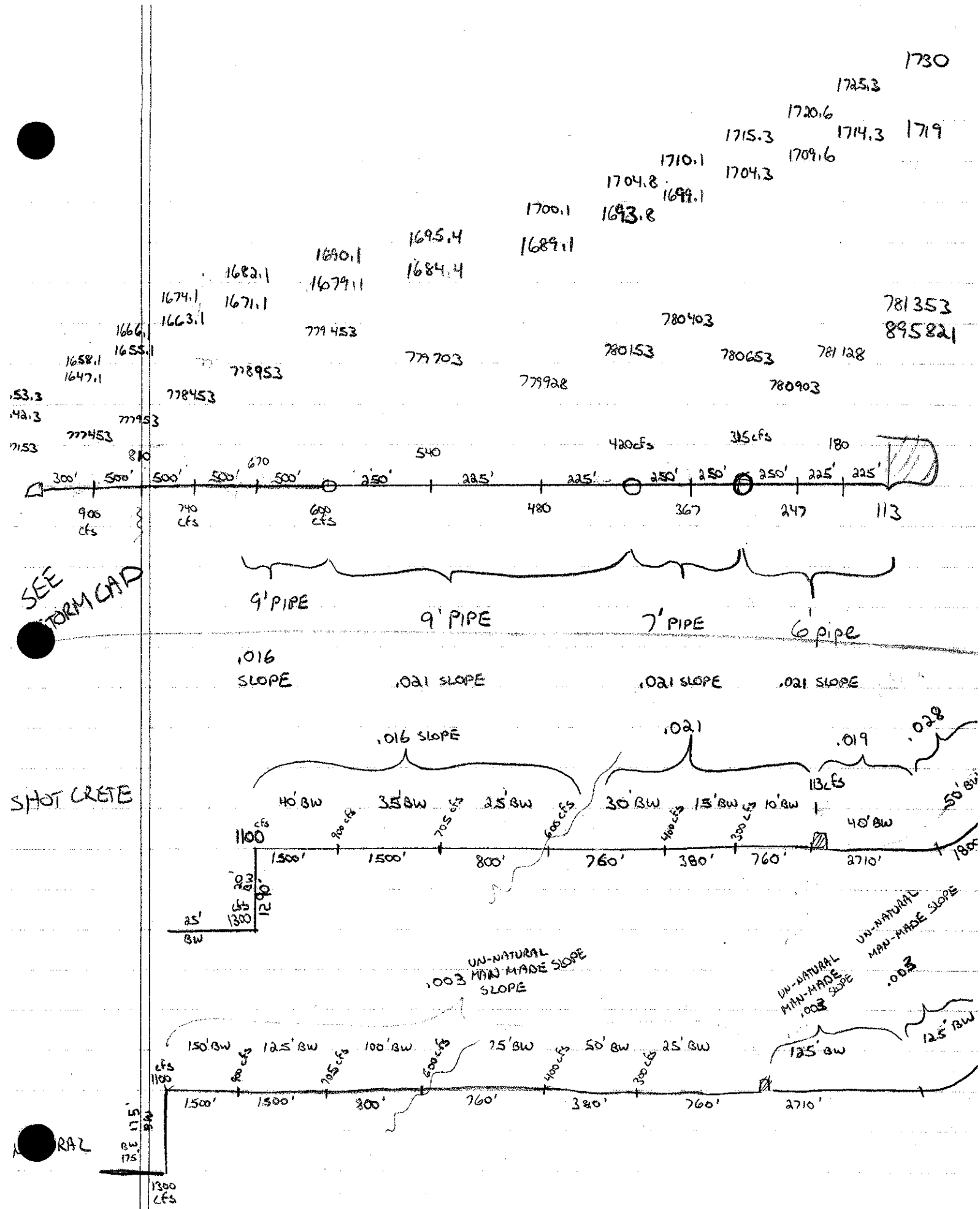
L = 19450 X 403 = \$7,839,000

earth work: $\frac{55 * 7.5}{27.8} \times 19450 = 30{,}000$ cy @ 5 = 1,500,000

cost = 9.5 mill.

bridges:

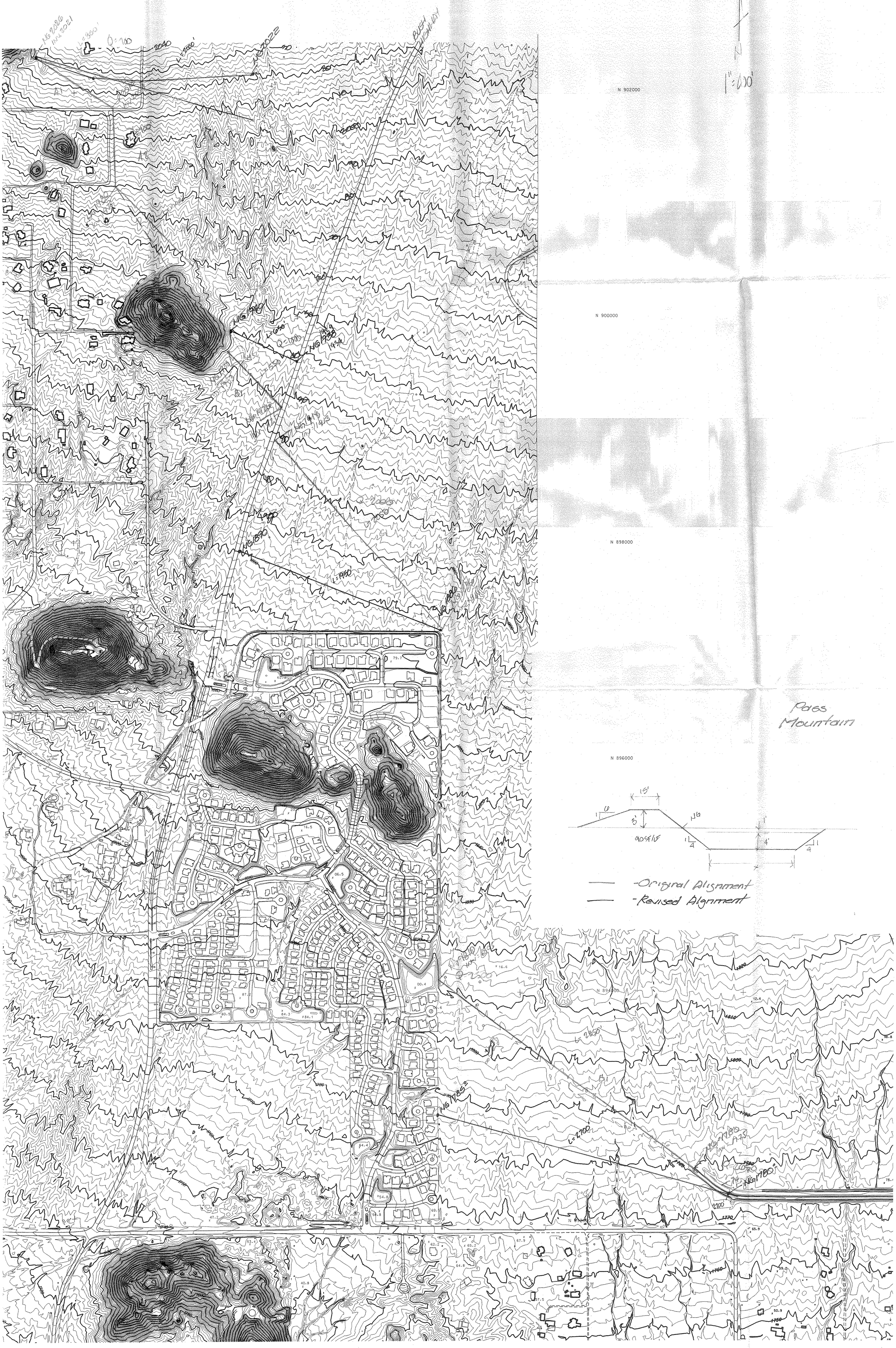
1000 X 100 X 3 = 300,000 @ 60 = 1,800,000



SEE STORM CAD

SHOT CRETE

RAZ


N 902000
N 900000
N 898000
N 896000
N 894000
1" = 200'
Pass Mountain
15'
3'
4'
-Original Alignment
-Revised Alignment

Concept Alignment

Diversion near Boulder Mtn Subdivision

1/25/01

1" = 200'

15

...\99969\Kenney Topo\baseplan.dgn 01/24/01 01:26:05 PM