Valley Camp of Utah, Inc.

Mine Permit Renewal Application

Appendicies R614-301-722.100
thru R614-301-750 and References

Volume IV

December 1989

CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE INC
SALT LAKE CITY, UTAH

APPENDIX R614-301-722.100a

Water Quality Data

HANSEN ALLEN & LUCE inc

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-001
Location Belina Mine Discharge

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
6-8-83					7.80								<0.1	
6-8-83					7.80								<0.1	
6-9-83					8.00								<0.1	
6-21-83	15:50	0.9	20	12	7.3								<0.1	
8-25-83	14:10	0.14	19	16	7.4								<0.1	
9-12-83	17:32	0.99	21	14	8.1								1.2	
10-19-83	16:51	0.29	7	8	7.4								<0.2	

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3^--N	NITROGEN NITRITE as NO_2^--N	NITROGEN TOTAL KJELDHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
6-8-83											56.0		532											
6-8-83											77.0		528											
6-9-83											44.0		504											
6-21-83											123		836			523								
8-25-83											85.0		832			605								
9-12-83											46.0		454			590								
10-19-83											43.0		360			510								

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL				COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L				
6-8-83																	2.350																	
6-8-83																	1.750																	
6-9-83																	1.650																	
6-21-83																	1.650																	
8-25-83																	1.590																	
9-12-83																	0.260																	
10-19-83																	0.370																	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-001
Location Belina Mine Discharge

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
7-14-82	14:30	0.5	24	14	7.5	49.0	49.0			47.0			2.0												50.0		480			730				260.30		7.00		
7-28-82	14:40	0.02	22	14	7.8																				1.0		422			581				216.70		3.00		
8-11-82	16:13	0.02	14	11	8.0								0.8												5.0		480			571				248.50		2.00		
8-25-82	14:25	0.02			7.9																				1.0		418			640				181.30		<0.01		
9-8-82	14:55	0.16	22	9	8.1								0.4												23.0		362			577				232.50		1.00		
9-22-82	14:30	-0-																																					
10-13-82	14:50	-0-																																					
10-27-82	11:48	0.01	1	2	7.7								<0.1												460	<0.1	382			820								
11-10-82	14:00	-0-	In-Accessible			Road	Closed		Snow																														
11-24-82		0.16			7.9								<0.1												480		610											
12-8-82					7.9								<0.1												1.0		462			700								
12-27-82	13:35	0.08	4	3	8.1								<0.1												<0.1		432											
1-27-83		0.06			7.6								<0.1												56.0		468											
2-21-83	12:55	0.06	6	3	7.5								0.2												47.0		402											
2-25-83					7.5																				42.0		448											
3-18-83					7.2								0.8												7.0		348											
4-13-83					7.3								<0.2												22.0		378											
4-21-83	11:43	0.06			8.1								<0.2												58.0		356			445								
4-27-83					7.60								2.00												53.0		260											
5-25-83					7.80								0.4												106		248											

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
7-14-82																	0.820								<0.001						
7-28-82																	0.050														
8-11-82																	0.318								0.004						Grab Sample
8-25-82																	0.010														
9-8-82																	0.914								0.005						Grab Sample
9-22-82																															Pond under Repair
10-13-82																															Pond under Repair
10-27-82																	0.018														Below lower pond
11-10-82																															
11-24-82																	1.17														Collected by Valley Camp above Pond
12-8-82																	0.090														Collected by Valley Camp
12-27-82																	0.270														
1-27-83																	0.280														
2-21-83																	3.660														
2-25-83																	0.310														
3-18-83																	0.360														
4-13-83																	0.380														
4-21-83																	2.670														Thawing - Storm Runoff
4-27-83																	0.200														
5-25-83																	3.150														

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-001
Location Belina Mine Discharge

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L
9-23-81	14:21	0.02	18	12	8.0									
10-14-81	14:25	0.03	1	4	8.0	700	5			2.4			78.60	
10-28-81	14:30	0.02	13	5	8.1									
11-11-81	13:23	0.003	4	4	7.5								1.40	
11-25-81	13:00	0.004	-3	2	7.2									
12-9-81	16:50	0.002	4	1									0.20	
12-23-81	13:28	0.004	-10	1	7.7									
1-13-82	13:00	-0-												
1-27-82		-0-												
2-10-82		-0-												
2-24-82	13:10	-0-												
3-10-82	15:00	0.07	3	1	7.5	2.0	<2.0			1.5			<1.0	
3-24-82		-0-												
4-14-82	14:00	0.04	11	3	7.7	7.0	<2.0			6.8			<1.0	
4-28-82		-0-												
5-12-82		-0-												
5-26-82	14:30	0.21	19	6	7.1								<1.0	
6-9-82	14:00	0.11	15	11	7.4								<1.0	
6-23-82	15:20	0.33			7.7									

DATE	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
9-23-81											1.0		376			382				194		<0.01		
10-14-81											16.0		330			500				199.10		<0.01		
10-28-81											4.0		325			236				168.50		<0.001		
11-11-81											5.0		370			320				182.40		<0.01		
11-25-81											1.0		335			340				194.30		<0.01		
12-9-81											23.0		385			260				168.80		8.00		
12-23-81											3.0		375			305				183.65		2.00		
1-13-82																								
1-27-82																								
2-10-82																								
2-24-82																								
3-10-82											2.0		500			729				196.40		4.00		
3-24-82																								
4-14-82								51.0			2.0		340			510				124.10		6.00		
4-28-82																								
5-12-82																								
5-26-82											1.0		610			659				142.90		10.00		
6-9-82											44.00		490			448				248.50		8.00		
6-23-82											217		415			640				40.50		4.00		

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	COMMENTS
9-23-81																	0.188														
10-14-81																	0.210								<0.001						
11-11-81																	0.166														
11-25-81																	0.195								<0.001						
12-9-81																	0.155														Grab Sample
12-23-81																	0.120								0.002						
1-13-82																	0.130														Grab Sample
1-27-82																															Trevor Whiteside
2-10-82																															Trevor Whiteside
2-24-82																															Trevor Whiteside
3-10-82																	0.050								<0.001						Grab Sample
3-24-82																															Trevor Whiteside
4-14-82																	0.117								<0.001						Grab Sample
4-28-82																															Trevor Whiteside
5-12-82																															Trevor Whiteside
5-26-82																	0.120								<0.001						
6-9-82																	0.090								<0.001						
6-23-82																	2.550														

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-001
Location Belina Mine Discharge

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	PCI/L	PCI/L
1-14-81	16:21	0.4	-2	5	7.4	79.0	<2.0			16.0			1.20												14.0		365			450				250		4.0		
1-28-81		-0-																																				
2-11-81		-0-																																				
2-25-81	15:25	0.07	-2	4		27.0	<2.0			8.5			1.00												30.0		315							240		<0.1		
3-11-81	14:00	0.001	-2	3	7.7																				5.0		280			276				230		8.0		
3-25-81	14:40	0.01	5	3	7.8	17.0	<2.0			23.0			0.10												54.0		330			560				118		6.0		
4-8-81	14:48	0.07	6	5	8.0																				3.0		280			480				220		12.0		
4-22-81	15:30	0.06			8.0	79.0	<2			40.0			<1.0												154		295			450				212		10.0		
4-27-81		Pond			7.4	230	<2			76.0			10.1														370							120		3.74		
4-28-81		Pond			7.7	330	<2			64.0			9.3														350							108		1.87		
4-30-81		Pond			7.8	170	<2			61.0			3.2														405							126		1.87		
5-13-81	16:30	Pond	15	19																					27.0		293							190		<0.01		
5-27-81	15:30	0.06				23.0	<2			16.0			0.20												10.0		330							208		32.00		
6-10-81	15:40	Pond	26	21	8.4																				33.0		425			580				126		<0.01		
6-24-81	16:00	0.05	22	"	8.1								1.60												12.0		430			490				192		3.20		
7-8-81	16:30	0.04			8.1	4.0	2.0			5.3			<0.01												10.0		480			750				194		<0.01		
7-22-81	14:50	0.02	17	12	8.0																				1.0		380			540				198		<0.01		
8-12-81	15:20					Pond under remodeling, no discharge																																
8-26-81	14:50	0.04	20	20	8.4																				2.0		350			445				192		1.90		
9-9-81	14:45	0.12	14	12	7.0								1.80												35.0		345			355				164		<0.01		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL				COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L				
1-14-81																	0.180			0.022					<0.001									Grab Samples
1-28-81																																		
2-11-81																																		
2-25-81																	0.120			0.020					0.001									
3-11-81																	0.050																	
3-25-81																	3.240								0.002									
4-8-81																	0.147																	Grab Sample
4-22-81																	4.600			0.090					0.002									
4-27-81																1.060																		
4-28-81																0.630																		
4-30-81																1.100																		
5-13-81																	3.450																	Grab
5-27-81																	0.170								<0.001									
[illegible]																	[illegible]																	
[illegible]																	[illegible]								[illegible]									
7-8-81																	0.250								0.001									
7-22-81																	0.166																	
[illegible]																																		
[illegible]																	[illegible]								[illegible]									
9-9-81																	[illegible]								[illegible]									

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-001
Location Belina Mine Discharge

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
3-12-80	15:30	-0-												
3-26-80	16:00	-0-												
4-9-80		-0-												
4-23-80		-0-												
5-14-80		-0-												
5-28-80		-0-												
6-11-80		-0-												
6-25-80		-0-												
7-11-80	10:00				8.0	49.0	23.0			96.0			654	
7-24-80	15:15	0.045	18	15	7.2					8.3			2.00	
7-13-80	12:32	0.04	23	12	8.0	7.0	2.0			<1.0			0.20	
8-27-80	16:00	0.116	19.5	14	8.2									
9-10-80	13:55	0.13			7.6	1700	49.0			5.0			<0.10	
9-24-80	15:30	0.29	13	10	7.4									
10-8-80	16:05	0.21	19	13	7.6	79.0	2.0			14.5			0.20	
10-22-80	15:40	0.29	2	9	7.6									
11-12-80	15:10	0.33	3	6	7.3	170	<2.0			3.6			5.0	
11-26-80	15:30	0.27	-5	4	7.2									
12-10-80	14:20	0.002	2	3	7.7	5.0	<2.0			4.6			3.0	
12-24-80	12:40	0.6	3	3	7.6									

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
3-12-80																								
3-26-80																								
4-9-80																								
4-23-80																								
5-14-80																								
5-28-80																								
6-11-80																								
6-25-80																								
7-11-80											74.0		315			450				180		<0.1		
7-24-80											10.0		308			480				202		4.0		
7-13-80											4.0		380			500				216		10.0		
8-27-80											41.0		345			525				214		14.0		
9-10-80											84.0		254			390				186		4.0		
9-24-80											32.0		328			490				216		21.0		
10-8-80											6.0		311			445				216		6.0		
10-22-80											6.0		310			440				1200		8.0		
11-12-80											2.0		860			1320				200		6.0		
11-26-80											32.0		390			590				256		20.0		
12-10-80											6.0		380			550				262		22.0		
12-24-80											23.0		490			700				254		<0.1		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
3-12-80																															
3-26-80																															
4-9-80																															
4-23-80																															
5-14-80																															
5-28-80																															
6-11-80																															
6-25-80																															
7-11-80																	2.330	0.004		0.020											Collected by Vaughn Hansen personnel
7-24-80																	0.180			0.002					<0.001						
7-13-80																	0.110			<0.010					<0.001						[illegible]
8-27-80																	0.150														
9-10-80																	0.160			0.010					<0.001						
9-24-80																	0.158														
10-8-80																	0.250			0.010					<0.001						
10-22-80																	0.166														
11-12-80																	0.230			0.010					<0.001						
11-26-80																	0.228														
12-10-80																	0.155			0.011					<0.001						
12-24-80																	0.225														

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-001
Location Belina mine discharge

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
5-9-79	14:15	0.0005	0	1	7.65	<2.0	<2.0			3.7		9.4	1.0	
5-24-79	16:10	0.008	14	10	8.2									
6-13-79	16:00	0.27	20	13	8.4	11.0	<2.0			2.8		7.3	<1.0	
6-27-79	15:30	0.37	22	12	7.75									
7-11-79	19:23	0.09	20	16	7.7	2.0	<2.0			<1.0			<1.0	
7-25-79	15:00	0.36	23	13	7.3									
8-9-79	16:30	0.12	23	16.5	7.6	17.0	<2.0			<1.0		6.0	<1.0	
8-22-79	15:45	0.03	15	9	7.8									
9-12-79	14:45	0.21			7.6	33.0	5.0	.		1.5			1.4	
9-26-79	16:15	0.18	14	11.5	7.6									
10-10-79	14:30	0.22		6	7.7	490	20.0			<1.0			1.6	
10-24-79	16:05	0.18			7.3									
11-14-79	14:52	0.01	1	1	7.58	110	<2.0			<1.0			0.8	
11-26-79	16:00	-0-												
12-12-79	09:10	-0-												
12-26-79	16:00	-0-												
1-9-80	16:00	-0-												
1-23-80	15:25	0.002	-6	4	8.2	2.0	<2.0			<1.0			2.4	
2-13-80	15:00	-0-												
2-27-80	15:00	-0-												

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
5-9-79											2.0		200							144		16.0		
5-24-79											52.0		314							200		12.0		
6-13-79											5.0		320			490				248		20.0		
6-27-79											5.0		330			520				226		24.0		
7-11-79											2.0		300			4900				210		18.0		
7-25-79											7.0		240			400				140		8.0		
8-9-79											3.0		210			430				272		14.0		
8-22-79											7.0		200			500				242		13.0		
9-12-79											64.0		310			480				210		22.0		
9-26-79											67.0		440			450				214		12.0		
10-10-79											4.0		370			450				196		7.0		
10-24-79											12.0		285			390				204		12.0		
11-14-79											<1.0		308			460				210		20.0		
11-26-79																								
12-12-79																								
12-26-79																								
1-9-80																								
1-23-80											8.0		310			480				206		18.0		
2-13-80																								
2-27-80																								

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL				COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L				
5-9-79																	0.04			0.012					<0.001									
5-24-79																	1.934																	
6-13-79																	0.015			0.004					<0.001									
6-27-79																	0.040																	
7-11-79																	0.045			0.010					<0.001									
7-25-79																	0.210																	
8-8-79																	0.09			0.002					<0.001									
8-22-79																	0.590																	
9-12-79																	0.57			0.004					0.001									
9-26-79																	1.290																	
10-10-79																	0.55			0.021					<0.001									
10-24-79																	0.580			0.445														
11-14-79																	0.440			0.008					<0.001									
11-26-79																																		
12-12-79																																		
12-26-79																																		
1-9-80																																		
1-23-80																	0.450			0.010					<0.001									
2-13-80																																		
2-27-80																																		

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-001
Location Belina Mine Discharge

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
7-12-78	15:25	0.06	21	13	7.6							6.3													41.0		274								218		14.0		
7-26-78	15:20	0.03	28	13	8.0	9	<2			12.0		6.7	<1.0												24.0		336								210		18.0		
8-9-78	14:55	0.04	17	15	7.9							6.8													67.0		951			1400					216		16.0		
8-23-78	14:45	0.01	23	12	7.9	33	<2			<1.0		6.9	<1.0									28.0			7.0		283			438					192		20.0		
9-13-78	17:25	0.02	15	10	7.5							6.9													64.0		270								198		26.0		
9-27-78	14:50	0.003	16	9.5	8.2	23	<2			1.3		8.4	<1.0												11.0		280								200		22.0		
10-11-78	14:20	0.009	15	7.5	7.7							7.1													71.0		274			430					204		22.0		
10-25-78	14:15	0.01	4	5	7.0	110	<2			1.7		8.4	<1.0												27.0		270			440					206		12.0		
11-8-78	15:00	-0-																																					
11-21-78	09:30	-0-																																					
12-13-78	14:40	-0-																																					
12-27-78	15:10	-0-																																					
1-10-79		-0-																																					
1-24-79		-0-																																					
2-14-79		-0-																																					
2-28-79	12:30	-0-																																					
3-14-79		-0-																																					
3-28-79		-0-																																					
4-11-[illegible]		-0-																																					
4-25-[illegible]		-0-																																					

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX. as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
7-12-78																	0.095														
7-26-78																	0.178								<0.001						
8-9-78																	0.196														
8-23-78																	0.012								<0.001						
9-13-78																	0.019														
9-27-78																	0.015								<0.001						
10-11-78																	0.172														
10-25-78																	0.024								<0.001						
11-8-78																															Ponds under Repair
11-21-78																															
12-13-78																															
12-27-[illegible]																															

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station YC-001
Location Zeina mine Air-case

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
9-27-77	10:30	0.007	12	10	8.10	14	<2			2.5		7.2	<1.0												14.0		263							218		30.0		
10-12-77	10:45	0.001	10	6	8.2																				15.0		221							226		10.0		
10-26-77	15:15	0.004	12	6	7.8	34	<2.2			2.0		8.4	<1.0												10.0		254							232		20.0		
11-9-77	16:25	0.003	5	9	7.7							7.5													49.0		272							222		20.0		
11-23-77	15:30	0.0004	6	1	7.5	2	<2			1.2		8.4	2.0												6.0		260							214		20.0		
12-14-77	15:40	Dry																																					
12-29-77	08:30	Dry																																					
1-11-78	14:50	Dry																																					
1-25-78	15:00	Dry																																					
2-8-78	13:20	Dry																																					
2-22-78	16:30	Dry																																					
3-8-78	16:00	Dry																																					
3-22-78	15:15	Dry																																					
4-12-78	16:45	Dry																																					
4-26-78	15:10	0.15	6	3	7.3	12	<2			16.0		7.1	15.6												178		208							112		32.0		
5-10-78	14:40	0.27	15	7	7.5							7.6													162		240							104		18.0		
5-24-78	15:30	0.18	9	11	7.6	110	<2			<1.0		7.2	<1.0												158		246							221		[illegible]		
6-14-78	15:40	0.30	18	13	7.8							6.8													58.0		300							219		14.0		
6-28-78	15:15	0.23	24	12	7.5	330	<20			<1.0			<1.0												6.2		250							220		20.0		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL				COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L				
9-27-77																	0.207								<0.001									
10-12-77																	0.221																	
10-26-77																	0.138								<0.001									
11-9-77																	0.141																	
11-23-77																	0.158								<0.001									
12-14-77																																		
12-29-77																																		
1-11-78																																		
1-25-78																																		
2-8-78																																		
2-22-78																																		
3-8-78																																		
3-22-78																																		
4-12-78																																		
4-26-78																	0.045								0.013									
5-10-78																	0.104																	
5-24-78																	[illegible]								[illegible]									
6-14-78																	0.096																	
6-28-78																	0.086								0.001									

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CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station VC-1
Location Mud Creek below Utah #2 Mine

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROGEN ION	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	CHLORITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89	14:25	10.77	6	6	7.6							10.2			<0.2	0.120	<0.01			0.046		614			30		311		44	515			220		245			
5-23-89	17:10	12.05	17	10	7.5							8.0										770			30		285			480		0	223					
6-21-89	17:30	6.21	13	16	7.6							8.8	<0.5									66			14	<0.1	381			562		0	234				<10	
7-19-89	15:55	4.35	25	20	7.4																	107					437			660		0	285					
9-25-89	14:30	5.54	21	13	7.5							10.7	<0.5									147			12	<0.1	425			704		0	271		316		12	

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX. as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89	<0.1						<0.01	71.2	28.0			<0.01					0.56	<0.01	21.2	0.030		<0.01	<0.01	1.9	<0.002			15.1	0.188		<0.1	6.00	5.67	2.82	
5-23-89								38.4	16.1										30.8					1.9				13.1				5.07	5.71	5.97	
6-21-89								44.2	19.1										32.8					3.1				17.2				5.73	5.75	0.14	
7-19-89								49.8	18.3										42.9					4.0				18.2				6.91	7.41	3.53	
9-25-89								68.0	21.4								0.205		48.8	0.028				4.9				23.1				8.54	8.11	2.60	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-1
Location Mud Creek below Utah #2 mine

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L
6-17-85	14:30	22.79	22	16	7.6									
7-17-85	16:25	9.45	26	18	8.2									
10-1-85	15:20	3.04	15	9	7.3									
6-27-86	18:55	27.50	21	16	8.7									
7-29-86	09:20	5.17	17	10	7.2									
10-15-86	17:51	9.38	6	6	7.7									
4-23-87	10:30	13.50	12	9	7.1									
6-15-87	10:50	8.53	25	16	7.0									
7-1-87	12:10	7.89	23	16	7.5									
9-9-87	09:20	6.11	13	7	8.2									
4-22-88	10:10	9.28	2	4	7.2									
5-31-88	09:30	17.17	11	6	7.2									
6-29-88	15:50	7.12	24	21	7.6									
7-28-88	15:30	5.68	22	19	7.7									
7-30-88	11:30	6.36	28									8.4	<0.5	<0.001
9-28-88	16:30	5.03	11	10	7.8							10.7	<0.5	

DATE	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	SPECIFIC COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK as HCO_3 MG/L	TOTAL ALK as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY PCi/L	BETA RADIO-ACTIVITY PCi/L
6-17-85	<0.1	0.020	0.009			0.054		24.1			38		273		68	374			194		206				
7-17-85								23.2			28		286			307			310						
10-1-85	<0.1	0.022	<0.005			0.024		12.4			<1		342		78	416			200		306				
6-27-86	0.32	0.095	0.014			0.022		44.8			44		156		22	583			170	139	226				
7-29-86								55.3			17		531			531			228						
10-15-86	<0.1	0.061	0.0122			0.021		76.6			28		366		38	544			359	302	285				
4-23-87	0.11	0.34	<0.005			0.010		31.2			56		348		45	468			338		261				
6-15-87								49.1			35		340			493			264						
7-1-87								91.0			32		374			558			274						
9-9-87	0.22	0.16	0.021			0.036		96			92		365		63	551			293	240	314				
4-22-88	0.58	0.38	0.018			0.022		88.0			23		368			727			272	223	186				
5-31-88								72.0			27		282			454			199						
6-29-88								82.9			59		330			545			230						
7-28-88								100			9.2	<0.1	337			555			184						
7-30-88																						85			
9-28-88								85			5.2	<0.1	482			628		0	230	188	294	72			

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L
6-17-85	<0.1						<0.01	44.3	8.5			<0.1		
7-17-85								76.2	7.8					
10-1-85	<0.1						<0.01	65.8	15.4			<0.01		
6-27-86	0.25						<0.01	48.8	10.3			<0.01		
7-29-86								50.2	10.8					
10-15-86	0.18						<0.01	72.8	11.4			<0.01		
4-23-87	0.74						<0.01	47.2	20.0			<0.01		
6-15-87								51.3	13.7					
7-1-87								71.8	15.0					
9-9-87	<0.1		<0.01				<0.01	80	17.6			<0.01		0.24
4-22-88							<0.01	92.8	66.8			<0.01		
5-31-88								54.8	11.8					
6-29-88								50.9	13.9					
7-28-88								56.7	18.5					
7-30-88														
9-28-88								58.1	13.1					

DATE	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	SULFIDE as S MG/L	MAJOR CATIONS MEQ/L	MAJOR ANIONS MEQ/L	C-A / C+A x 100	COMMENTS
6-17-85			0.39	<0.01	17.4	0.030		<0.01	<0.01	1.58	<0.002			4.44	<0.01		<0.1	3.89	3.92		
7-17-85					24.7					2.4				6.12				6.18	5.70		
10-1-85			0.09	<0.01	30.9	<0.01		<0.01	<0.01	3.80	<0.002			9.82	<0.01		<0.1	6.37	6.29		
6-27-86			0.59	<0.01	17.1	0.043		<0.01	<0.01	1.4	<0.002			4.28	<0.01		<0.01	4.064	4.012	1.29	
7-29-86					26.9					1.72				4.82				4.972	5.194	-4.353	
10-15-86			0.060	0.045	42.8	<0.01		<0.01	<0.01	2.3	<0.002			8.34	0.020		<0.01	7.577	7.803	-2.935	
4-23-87			1.86	0.028	50.9	0.12		<0.01	<0.01	1.8	<0.002			9.8	<0.01		<0.1	7.01	6.75	-1.24	
6-15-87					28.9					2.6				10.8				5.48	5.73	-2.23	
7-1-87					32.1					2.5				8.8				6.68	6.81	-0.96	
9-9-87			3.02	0.042	43.6	0.088		<0.01	<0.01	4.3	0.00034			0.9	0.234		<0.1	7.75	7.29	3.01	
4-22-88			0.79	<0.01	32.2	0.095		<0.01	<0.01	3.1	0.0028			29.9	0.040		<0.1	8.68	8.17	3.01	3" New Snow - Overcast
5-31-88					22.1					2.8				11.2				5.13	5.09	0.34	
6-29-88					29.9					3.2				13.8				5.70	5.89	1.64	Rain during night
7-28-88					27.1					2.9				13.6				5.74	5.62	1.07	
7-30-88																					
9-28-88			0.255		32.3	0.015				2.7				16.5				6.34	5.91	3.55	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station YC-1
Location Mud Creek below Utah mine #2

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL DISSOLVED SOLIDS MG/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
8-26-81	08:41	5	16	11	7.6								4.00	<0.001	<0.01	<0.01				0.250	0.100	33.0			6.0		292			498			280.40	230		6.0		
10-14-81	09:43	5.2	3	1	6.7									<0.001	0.25					0.220		36.0			35.0		328			500			333.09					
12-23-81	11:32		-10	1	7.2									<0.001	2.35					0.520		69.0			22.0		415			345			366.56	300.37				
2-24-82	12:05		-2	0	8.0									0.361	1.15					0.600		80.0			309		422			650			317.40	264.20				
4-14-82	13:04		12	9	7.6									0.026	0.06					0.470		50.0			204		358			604			312.20	255.90				
6-9-82	10:18	6.8	10	7	7.9									<0.001	0.41					0.060		7.5			90		192			283			216.43	177.40				
8-11-82	13:35	23	15	14	8.5									<0.001	0.10					1.230		4.2			640		275			381			221.90	181.90				
10-13-82	16:25	6.2	10	8	8.0								0.8	<0.001	0.04	0.07				0.130	0.090	24.0			78.0		305			553			322.40	264.80		<0.01		
12-21-82	11:45		5	1	8.2									<0.001	0.27					0.110		39.0			26.0		358			482			347.10					
2-21-83	15:30	8.2		2										0.013	0.03					0.420		47.0			265		345			485			316.70					
4-21-83	12:51	8.5	7	6	8.2									<0.001	0.28					0.15		45.0			114		365			512			300.10					
6-21-83	16:45		23	14	7.9									<0.001	<0.01					0.240		36.0			217		256			262			183					
8-24-83	17:20	20.4	12	12	7.4								<0.1	<0.001	<0.01	<0.01				0.25		35			150		234			480			253.70	208		<0.01		
10-19-83	17:55	21.4	3	5	7.6									<0.001	<0.20					0.02		46			12.0		280			496			256.20					
12-[illegible]-83					8.00									<0.001	<0.10					0.05		44			42.0		310			490			279.40					
2-27-84	12:55	7.76	-1	6	7.2										<0.1					0.084		52			11		356			589			157					
6-26-84	17:30	48.73	16	14	7.6										<0.1					4.55		27.2			3680		229			334			221	362				
8-26-84	18:00	9.29	12	9	7.3										<0.1	0.018	0.010			0.037		51.4			7		321			377			287		219			
4-27-85	11:45	22.3	10	8	7.5																	52.9			128		318			243			261					
5-30-85	13:17	55.9	14	9	6.8																	22.5			94		232			211			180					

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	SULFIDE as S MG/L	MAJOR CATIONS meq/l	MAJOR ANIONS meq/l	COMMENTS
8-26-81			0.002	0.050		0.040	<0.001	64.80	13.60	<0.001		0.020		0.19		0.020	0.380	<0.001	21.60	0.050	<0.0002			2.65	0.005		<0.001	12.50	0.020					
10-14-81								75.20	8.10								0.395		23.52	0.044				2.50				13.00						
12-23-81								93.50	12.80								0.382		31.50	0.036				2.30				12.60						
2-24-82								97.00	34.70								7.660		27.50	0.330				2.58				18.30						
4-14-82								85.00	25.30								3.900		25.50	0.230				2.43				12.5						
6-9-82								55.00	7.50							0.450	7.510		12.60	0.150				0.99				3.2						
8-11-82								54.40	55.00								7.250		18.72	2.000				0.90				22.0						Storm Runoff
10-13-82			<0.001	0.055		0.100	<0.001	44.80	11.70	<0.001		0.020		0.16		0.885	1.750	<0.001	44.16	0.100	<0.0002			2.15	0.007		0.001	6.4	0.025					
12-21-82								82.40	11.50								0.460		20.16	0.090				2.14				22.0						
2-21-83								76.00	15.80								3.800		24.96	0.195				2.24				13.0						
4-21-83								77.60	35.20								1.300		23.04	0.160				2.48				20.0						
6-21-83								48.00	8.00								3.400		18.56	0.127				1.21				14.3						
8-24-83			<0.001	0.850		0.050	<0.001	46.00	7.2	<0.001		0.003		0.14		0.850	2.980	<0.001	9.98	0.130	<0.0002			1.3	<0.001		<0.001	41.9	0.019					
10-19-83								62.40	14.00								0.200		26.88	0.060				2.2				6.30						
12-[illegible]-83								73.80	16.00								0.490		22.56	0.100				2.3				9.50						
2-27-84								19.2	28.0								0.67		42.[illegible]	0.103				2.22				10.8				4.69	4.44	
6-26-84								58.2	5.2							0.06	402		14.4	2.11				3.25				5.85				4.43	4.33	
8-26-84	<0.1						0.020	74.5	11.4			<0.01					0.070	<0.01	26.8	0.048		<0.1	<0.01	2.42				5.64	0.018		<0.1	6.23	[illegible]	
4-27-85								77.5	25.5										20.6					1.51				12.8				6.16	6.10	
5-30-85								41.9	6.40										13.3					1.22				5.82				3.47	3.60	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-1
Location Mud creek [illegible] mine #2

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
3-17-77	13:15	6	3	5	7.5				4.8		3.0	10.15	<1.0	
6-16-77	10:20	2.4	21	12	7.6				10.0		8.0	8.8	<1.0	0.009
6-28-78	16:10	1.0	20	16	7.1	110	<20				18.0		<1.0	0.009
8-23-78	12:40	3	27	15	8.3							8.5	1.3	0.008
10-25-78	10:50	4.7	5	3	7.5							11.0	1.6	0.028
12-27-78	09:45	2.9	-17	0	7.86							10.4	1.1	0.006
2-28-79	11:00	5.7	-7	0.2	7.8							10.0	1.2	<0.001
4-18-79	10:35	12.6	13	6.5	7.72							10.0	1.4	0.008
6-20-79	09:55	12.2	10	4	7.95							10.0	3.2	<0.001
8-23-79	09:55	4.3	11	8.0	8.0							9.0	<1.0	0.108
10-31-79	14:23	2.7	-1	1	7.9							9.0	<1.0	<0.001
2-27-80	13:30	16.6	3	0.5	8.7							10.0	13.80	0.024
4-29-80	10:15	25.6	10	3	8.9							9.2		0.070
6-25-80	09:25	30.9	4	5	7.8							9.6		<0.002
8-25-80	12:45	9.7	15	13	8.7							9.4	<0.01	<0.001
10-7-80	08:23	4.7	5	4	8.1									<0.001
12-10-80	15:40	7.1	-3	1	7.6									0.007
2-25-81	13:30	4.2	8	4	8.1								1.20	0.012
4-8-81	11:27	6.4	5	5	8.1									<0.001
6-24-81	09:06	6.4	19	11	8.4									<0.001

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
3-17-77	0.15	0.02	<0.01	0.25		0.042	0.015	43.0	<0.01		13.0	<0.1	440		
6-16-77	0.75	0.01		0.90		0.025	0.010	22.0	<0.01		22.0	0.4	320		
6-28-78		0.20	<0.01	0.10				28.0			12.8		210		
8-23-78								31.5			2.0		255		
10-25-78								38.0			4.0		295		
12-27-78								41.0			16.0		341.0		
2-28-79		0.10					0.155	45.0			51.0		290		
4-18-79		0.11					0.19	38.0			111		315		
6-20-79		0.24					0.015	19.0			19.0		219		
8-23-79		0.04					0.120	57.0			27.0		300		
10-31-79		<0.01					0.080	54.0			27.0		310		
2-27-80		0.15				0.320	0.080	37.0			102		730		
4-29-80	<0.01					0.400		31.0			500		238		
6-25-80	<0.01					0.130		45.0			79.0		204		
8-25-80	<0.01	<0.01				0.080	<0.010	30.0			29.0		310		
10-7-80	0.25					0.060		30.0			4.0		305		
12-10-80	<0.01					0.040		33.0			20.0		320		
2-25-81	<0.01	0.07				0.020		9.0			17.0		250		
4-8-81	0.12					0.028		32.0			57.0		300		
6-24-81	<0.01					0.200		55.5			13.0		291		

DATE	CONDUCTIVITY µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
3-17-77	670	1.50	<0.01	297.6	244	232			
6-16-77	450	7.50	<0.01	319.6	262	298		2	6
6-28-78	325			195.2					
8-23-78	390			253.7					
10-25-78	540			295.2					
12-27-78				336.7					
2-28-79	440			287.92	236				
4-18-79	480			292.8	238				
6-20-79	375			231.8	120		10.0		
8-23-79	510			279.16	224		6.0		
10-31-79	550			314.4	225		14.0		
2-27-80	560			305	250		8.0		
4-29-80	425			224.48					
6-25-80	320			163.98					
8-25-80	480			312.00	240		50.0		
10-7-80	470			317.20					
12-10-80	490			334.28					
2-25-81	300			295.24	242		<0.1		
4-8-81	332			300.12					
6-24-81	355			265.76	226		<0.1		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX. as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
3-17-77	0.021		<0.001	0.006		<0.001	<0.001	65.6	4.0	<0.001		0.013		0.17
6-16-77	0.009	<0.001	<0.001	0.056	<0.001	0.017	<0.001	68.0	10.0	<0.001	<0.001	0.015	<0.01	0.27
6-28-78			<0.001				<0.001	48.8	10.0	<0.001		0.005		0.14
8-23-78			0.004				<0.001	57.6	10.0	<0.001		0.004		0.15
10-25-78			<0.001				<0.001	74.4	8.0	<0.001		0.015		0.16
12-27-78			<0.001				<0.001	84.0	12.0	<0.001		0.010		0.16
2-28-79			<0.001				<0.001	61.6	<0.1	<0.001		0.003		0.18
4-18-79			<0.001				<0.001	77.6	14.0	<0.001		0.004		0.16
6-20-79			<0.001				<0.001	56.0	4.0	<0.001		0.002		0.24
8-23-79			<0.001				<0.001	96.0	1.0			0.007		0.25
10-31-79			<0.001	0.210		0.050	<0.001	63.20	8.0	<0.001		0.010		0.17
2-27-80			<0.001	0.090		0.115	<0.001	60.80	20.0	<0.001		0.010		0.16
4-29-80								60.00	8.0					
6-25-80								47.20	2.0					
8-25-80			<0.001	<0.001		<0.001	<0.001	64.80	12.0	<0.001		<0.001		0.16
10-7-80								62.40	3.9					
12-10-80								92.00	5.85					
2-25-81			0.001	0.050		0.030	0.002	44.40	12.0	<0.001		<0.001		0.17
4-8-81								96.00	[illegible]					
6-24-81								[illegible]	[illegible]					

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
3-17-77			0.201	<0.001	29.32	0.014	<0.0002		0.002	2.53	<0.001	6.0	<0.001	5.33	0.013		
6-16-77	<0.001		0.146	<0.001	28.32	0.047	<0.0002	<0.001	<0.001	2.30	<0.001	5.6	<0.001	5.66	0.013	<0.001	
6-28-78			0.079	<0.001	11.52	0.049	<0.0002			1.155	<0.001	3.6	<0.001	18.0	0.007		
8-23-78			0.237	<0.001	24.5	0.025	<0.0002			2.09	<0.001		<0.001	4.14	0.010		
10-25-78			0.170	<0.001	24.0	0.030	<0.0002			2.450	<0.001			4.00	0.007		
12-27-78			0.139	<0.001	26.4	0.053	<0.0002			2.215	<0.001			8.5	0.004		
2-28-79			0.406	<0.001	24.48	0.088	<0.0002			2.001	<0.001		<0.001	10.2	0.008		
4-18-79			3.428	0.003	20.16	0.142	<0.0002			2.318	<0.001		<0.001	8.83	0.012		
6-20-79			1.080	0.004	14.4	0.051	0.0003			1.105	<0.001		<0.001	4.10	0.016		
8-23-79			0.890	<0.001	4.32	0.051	<0.0002			2.208	<0.001		<0.001	7.80	0.005		
10-31-79			0.320	<0.001	26.88	0.049	<0.0002			2.250	<0.001		<0.001	7.60	0.006		
2-27-80			3.590	0.002	120	0.130	<0.0002			2.26	<0.001		<0.001	9.20	0.010		
4-29-80			3.216		14.40	0.150				2.50				9.30			
6-25-80			0.548		14.88	0.060				0.97				2.40			
8-25-80		<0.001	[illegible]	<0.002	17.60	<0.001	<0.0002			1.70	<0.001		<0.001	[illegible]	[illegible]		
10-7-80			0.613		21.60	0.012				2.31				20.00			
12-10-80			0.250		18.24	0.060				2.27				5.65			
2-25-81			0.140	[illegible]	[illegible]	[illegible]	<0.0002			2.37	0.001		<0.001	1.50	0.015		
4-8-81			0.510		22.52	0.145				2.50				[illegible]			
6-24-81			[illegible]		[illegible]	[illegible]				2.00				[illegible]			

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-1
Location Mud Creek below mine

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SUPERFOSFAT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
8-26-75					7.85											0.08				0.05		49.70						417										
12-26-75					7.75											0.04				0.02		45.0						480			641	1.70	<0.01	264.20	218	276.0		
1-26-76	16:45	14.0	-4.0	0	8.0				16.0		12.0	10.0	<1.0			0.173				0.07	0.06	65.0	<0.01					435			730	1.4	<0.01	314.76	258	304.0		
2-9-76	10:20	8.1	2.0	1.0	8.3				2.9		14.0	8.4				0.145				0.155	0.130	46.0	<0.01					508			670	0.16	<0.01	263	216	266		
4-28-76	12:05	8	10	6	7.9				8.0		12.0	6.8	<1.0			0.140				0.150	0.120	56.0	<0.01					458			780	2.60	<0.01	237.1	278	330		
6-14-76	11:00	15	4	2	8.1				7.5		10.0	7.1	<1.0			0.17				0.160	0.090	55.0	<0.01					420			700	0.60	<0.01	287.9	236	266		
8-2-76	12:45	6	15	15	8.2				7.0		11.0	8.0	<1.0			0.18				0.165	0.110	37.6	<0.01					470			640	1.30	<0.01	265.9	218	242		
9-30-76	12:10	9	19	9	7.2				6.0		12.0	9.2	4.0			0.12				0.200	0.095	33.0	<0.01		18.0			350			720	5.10	<0.01	317.2	260	275	<1	<3
10-27-76	10:45	4.5	0	1.5	7.4				5.5		3.0	10.4	2.6			0.10				0.160	0.140	33.8	<0.01		21.0			500			520	5.10	<0.01	124.4	102	253.1		
11-29-76	14:20	5.5	-4	1.0	7.0				5.1		2.0	9.9	2.4			0.08				0.130	0.100	61.0	<0.01		11.0			550			760	2.40	<0.01	358.7	294	305		
12-28-76	10:48	8	-5	0	7.8				5.2		3.0	9.8	<1.0			0.06				0.150	0.080	39.0	<0.01		7.0			510			840	0.48	<0.01	373.3	306	370		
																															780	2.0	<0.01	353.8	290	304	<1	<2

DATE	ALUMINUM DISS.	ANTIMONY DISS.	ARSENIC DISS.	BARIUM DISS.	BERYLLIUM DISS.	BORON DISS.	CADMIUM Total DISS.	CALCIUM Total DISS.	CHLORIDE Total DISS.	CHROMIUM HEX. as CR	COBALT Total DISS.	COPPER DISS.	CYANIDE as Cn	FLUORIDE DISS.	GERMANIUM DISS.	IRON DISS.	IRON TOTAL	LEAD DISS.	MAGNESIUM DISS.	MANGANESE DISS.	MERCURY DISS.	MOLYBDENUM DISS.	NICKEL DISS.	POTASSIUM DISS.	SELENIUM DISS.	SILICA as SiO_2	SILVER DISS.	SODIUM DISS.	ZINC DISS.	VANADIUM DISS.	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
8-26-75	<0.01		<0.01	<0.01		<0.01	<0.001	68.0	6.0	<0.01		<0.01	<0.01	0.18		0.05	0.09	<0.01	25.44	<0.01	<0.001			2.01	<0.01	2.68	<0.001	3.72	0.05		
12-26-75	<0.01		<0.001	0.03		<0.01	<0.001	77.6	8.0	<0.01		<0.01	<0.01	0.23		0.095	0.210	<0.001	26.4	0.01	<0.001			2.28	<0.01	2.25	<0.001	5.0	0.009		
1-26-76	0.392	0.004	0.007	0.084	<0.001	<0.001	<0.001	59.2	9.0	<0.001	<0.001	<0.001		0.23	0.015		0.219	0.018	28.3	0.042	<0.001	0.015	<0.001	2.87	0.055	4.50	<0.001	12.1	0.430	<0.001	
3-9-76	0.376	<0.001	0.003	0.065	<0.001	<0.001	<0.001	78.4	8.0	<0.001	<0.001	<0.001		0.36	0.007		0.250	0.004	32.16	0.040	<0.001	<0.001	<0.001	2.78	0.012		<0.001	3.50	0.032	<0.001	
4-27-76	0.138	<0.001	0.002	0.044	<0.001	0.105	<0.001	72.8	6.0	<0.001	<0.001	<0.001		0.25	<0.001		0.288	<0.001	20.16	0.051	<0.0001	<0.001	<0.001	2.88	0.015	5.80	<0.001	15.0	0.029	<0.001	
6-14-76	0.110	<0.001	<0.001	0.023	<0.001	<0.001	<0.001	63.2	6.0	<0.001	<0.001	<0.001		0.27	<0.001		0.279	<0.001	20.16	0.056	<0.0002	<0.001	<0.001	1.63	0.019		<0.001	19.4	0.021	<0.001	
8-2-76	0.100		<0.001	0.025		<0.001		69.0	12.0			0.005		0.39	<0.001		0.210	<0.001	25.0	0.049	<0.0002	<0.001	<0.001	2.51	0.016	15.4		17.0	0.019		
9-30-76	0.066		<0.001	0.012		<0.001		69.1	98.0			0.009		0.27	<0.001		0.220	<0.001	19.60	0.015	<0.0002	<0.001	<0.001	2.54	0.004			8.10	0.015		
10-27-76	0.026		<0.001	0.009		<0.001		52.0	4.0			0.010		0.12	<0.001		0.223	<0.001	42.0	0.016	<0.0002	<0.001	<0.001	2.51	<0.001	12.5		12.0	0.025		
11-29-76	0.014		<0.001	0.004		<0.001		40.0	6.0			0.015		0.20	<0.001		0.275	<0.001	16.8	0.010	<0.0002	<0.001	<0.001	3.23	<0.001	7.60		4.7	0.034		
12-28-76	0.010		<0.001	0.007		<0.001		68.8	6.0			0.003		0.19	<0.001		0.228	<0.001	31.68	0.012	<0.0002	<0.001	<0.001	2.46	<0.001			12.0	0.027		

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CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE INC
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station VC-2
Location Mud Creek above Utah #2 mine

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-25-89	13:35	10.23	6	6	7.6							10.2		
5-23-89	16:35	10.58	15	10	7.6							8.3		
6-21-89	17:00	5.74	15	15	7.6							9.0	<0.5	
7-19-89	15:10	5.18	27	21	7.4									
9-25-89	13:55	5.23	22	13	7.5							11.9	0.94	

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µmhos/cm	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89	<0.2	0.098	<0.01			0.047		49.8			32		292		64	483			214		226			
5-23-89								110			29		263			454		0	220					
6-21-89								97.9			27	<0.1	373			572		0	234			<10		
7-19-89								105					401			600		0	273					
9-25-89								158			20	<0.1	441			730		0	288		334	<10		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	C-A / C+A ×100	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89	<0.1						<0.01	66.4	25.9			<0.01					0.82	<0.01	29.4	0.022		<0.01	<0.01	1.4	0.0029			12.1	0.252		<0.1	6.29	5.27	8.82	
5-23-89								42.9	13.7										44.9					1.8				12.4				6.42	6.28	1.09	
6-21-89								38.6	18.3										45.1					3.1				15.6				6.40	6.39	0.04	
7-19-89								50.1	20.8										34.8					3.9				36.2				7.04	7.24	1.46	
9-25-89								69.9	24.2								0.503		50.2	0.040				5.2				24.1				8.80	8.69	0.62	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-2
Location Mud Creek above Utah #2 mine

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	SPECIFIC COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO ACTIVITY pCi/L
6-17-85	13:50	21.36	21	16	7.7										<0.1	0.072	0.044			0.028		24.8			35		212		58	288			210		210			
7-17-85	15:45	10.36	29	18	8.0																	27.3			34		305			314			288					
10-1-85	14:50	8.39	22	8	7.2										<0.1	0.056	<0.005			0.038		125			5.2		338		98	416			199		316			
6-27-86	17:40	25.78	21	14	8.1										0.14	0.085	0.007			0.094		42.4			47		160		37	384			180	147	224			
7-29-86	08:45	4.65	14	7	7.7																	56.4			16		411			589			230					
10-15-86	18:40	8.79	3	5	7.7										<0.1	0.020	0.007			0.015		74.7			9.6		379		45	512			377	317	290			
4-23-87	09:45	11.79	12	7	7.5										<0.1	0.40	0.033			0.092		37.1			46		389		42	405			366		273			
6-15-87	10:10	9.10	22	14	7.1																	45.9			18		345			455			267					
7-1-87	11:45	7.25	23	15	7.3																	86			53		368			558			259					
9-9-87	08:40	5.99	15	7	8.2										0.14	0.18	0.0074			0.038		94			144		360		89	558			288	236	303			
4-22-88	08:35	8.83	3	3	7.5										0.42	0.46	0.019			0.028		87			33		447			719			263	216	178			
5-31-88	0:825	15.06	5	4	7.6																	61.3			30		261			465			198					
6-29-88	15:00	6.82	26	19	7.4																	83.1			38		307			555			231					
7-28-88	15:40	6.11	21	19	7.6																	104			15		375			427			182					
7-30-88	10:39	6.83	28									8.4	<0.5	<0.001												<0.1										93		
9-28-88	15:30	5.94	10	10	7.8							10.0	<0.5									95			6.8	<0.1	470			642		0	455	373	309	85		

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	SULFIDE as S MG/L	MAJOR CATIONS MEQ/L	MAJOR ANIONS MEQ/L	$\frac{C-A}{C+A} \times 100$	COMMENTS
6-17-85	<0.1						<0.01	47.2	8.8			<0.01					0.25	<0.01	17.7	0.030		<0.01	<0.01	1.53	<0.002			4.44	<0.01		<0.1	3.99	4.21		
7-17-85								65.8	9.2										26.3					2.2				5.98				5.78	5.55		
10-1-85	0.12						<0.01	63.4	12.9			<0.01					0.18	<0.01	29.7	<0.01		<0.01	<0.01	3.67	<0.002			8.62	<0.01		<0.1	6.09	6.22		
6-27-86	0.43						<0.01	52.1	10.4			<0.01					0.71	<0.01	17.0	0.045		<0.01	<0.01	1.4	<0.002			4.06	0.047		<0.1	4.213	4.128	2.00	
7-29-86								51.0	10.1										26.9					1.61				4.54				4.997	5.229	-4.543	
10-15-86	0.22						<0.01	72.9	12.8			<0.01					0.220	0.020	49.3	0.035		<0.01	<0.01	2.2	<0.002			6.82	0.023		<0.01	8.049	8.097	-0.587	
4-23-87	0.64						<0.01	58.9	20.1			<0.01					1.66	0.020	51.1	0.12		<0.01	<0.01	1.8	<0.002			10.1	<0.01		<0.1	7.63	7.34	-1.32	
6-15-87								50.8	12.4										29.2					2.5				9.4				5.42	5.68	-2.34	
7-1-87								71.8	14.3										32.4					2.5				9.4				6.73	6.44	2.25	
9-9-87	0.18		<0.01				<0.01	76	14.4			<0.01		0.32			3.37	<0.01	43.1	0.095		<0.01	<0.01	3.4	<0.002			0.7	0.062		<0.1	7.47	7.08	2.67	
4-22-88	0.10						<0.01	87.6	65.3			<0.01					0.84	<0.01	51.1	0.098		<0.01	<0.01	3.1	<0.002			32.3	0.020		<0.1	8.43	7.96	2.87	5" New Snow - Overcast
5-31-88								54.2	11.8										22.4					2.8				11.2				5.12	4.85	2.69	
6-29-88								51.8	13.0										30.3					3.1				14.2				6.15	5.61	4.58	Rain last night
7-28-88								59.9	16.4										27.8					4.1				17.1				6.13	5.61	4.38	
7-30-88																																				
9-28-88								68.4	10.4								0.245		61.8	0.020				5.8				20.9				9.56	9.73	0.89	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-2
Location Mud Creek above Utah # 2 mine

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
8-26-81	08:59		15	12	8.3								0.40	<0.001
10-14-81	11:23	5.2	2	2	7.8									<0.001
12-23-81	11:45		-10	1	7.4									<0.001
2-24-82	12:42		-1	2	8.1									0.019
4-14-82	13:15		12	7	7.9									0.015
6-9-82	10:30	6.8	12	5	7.9									<0.001
8-11-82	17:00		18	14	8.6									0.004
10-13-82	16:10	6.2	13	7	8.0								0.6	<0.001
12-21-82	14:30		5	2	8.3									<0.001
2-21-83	15:15			2	8.0									0.175
4-21-83	12:33	15.7	5	6	8.0									<0.001
6-21-83	16:35		26	8	7.9									<0.001
8-29-83	17:00		13	14	7.4								<0.1	<0.001
10-19-83	17:35	11.6	5	5	7.9									<0.001
12-[illegible]-83					7.8									<0.001
3-27-84	12:40	5.94	0	3	7.5									
6-26-84	16:55	45.01	19	12	7.6									
9-26-84	17:20	8.61	13	10	7.3									
4-27-85	11:30	20.6	10	7	7.0									
5-30-85	12:50	39.1	22	8	7.0									

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SUSPENDED as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L
8-26-81	<0.01	<0.01				0.220	<0.001	40.0			12.0		304		
10-14-81	0.20					0.230		36.0			21.0		340		
12-23-81	2.61					0.500		135			15.0		499		
2-24-82	1.13					0.910		63.0			47.0		398		
4-14-82	0.06					0.870		59.0			346		370		
6-9-82	0.38					0.110		6.8			105		195		
8-11-82	0.12					3.300		15.0			1402.5		266		
10-13-82	0.05	<0.01				0.140	0.120	27.0			53.0		301		
12-21-82	0.95					0.110		39.0			11.0		350		
2-21-83	0.03					4.200		38.0			104		338		
4-21-83	0.02					0.18		50.0			262		368		
6-21-83	<0.01					0.700		28.0			219		230		
8-29-83	<0.01	0.05				0.65		2.5			244		240		
10-19-83	0.20					0.05		50			16.0		295		
12-[illegible]-83	<0.10					0.05		60			22.0		340		
3-27-84	<0.1					0.025		55			8		342		
6-26-84	<0.1					2.18		24.1			2820		202		
9-26-84	<0.1	<0.01	0.006			0.094		54.3			12		327		
4-27-85								47.8			161		324		
5-30-85								25.2			174		226		

DATE	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
8-26-81	395			280.60	230		14.00		
10-14-81	530			347.7[illegible]					
12-23-81	320			362.80	297.37				
2-24-82	620			330.30	270.70				
4-14-82	594			316.60	259.50				
6-9-82	200			228.90	187.80				
8-11-82	407			185.90	152.40				
10-13-82	572			306.20	251		<0.01		
12-21-82	423			345.90					
2-21-83	493			303.30					
4-21-83	512			295.20					
6-21-83	286			163.90					
8-29-83	448			288.60	230		<0.01		
10-19-83	510			253.76					
12-[illegible]-83	520			277.68					
3-27-84	564			152					
6-26-84	324			166	273				
9-26-84	374			283		266			
4-27-85	252			227					
5-30-85	271			182					

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX. as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
8-26-81			0.002	0.055		0.040	<0.001	72.00	12.70	<0.001		0.010		0.18
10-14-81								72.00	6.80					
12-23-81								90.50	10.35					
2-24-82								83.00	29.00					
4-14-82								90.00	24.10					
6-9-82								53.50	6.20					
8-11-82								58.40	54.20					
10-13-82			<0.001	0.050		0.070	<0.001	73.60	8.00	<0.001		0.020		0.15
12-21-82								73.60	10.90					
2-21-83								72.00	20.80					
4-21-83								77.60	31.20					
6-21-83								48.00	6.00					
8-29-83			<0.001	0.350		0.106	<0.001	46.80	7.1	<0.001		<0.001		0.50
10-19-83								62.40	12.00					
12-[illegible]-83								76.80	14.00					
3-27-84								16.4	24.4					
6-26-84								54.3	7.8					
9-26-84	<0.1						<0.01	71.7	10.1			<0.01		
4-27-85								77.8	29.8					
5-30-85								42.0	6.82					

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
8-26-81		<0.001	0.610	<0.001	24.00	0.070	<0.0002			2.37	0.005		<0.001	5.60	0.015
10-14-81			0.750		24.48	0.060				2.20				20.00	
12-23-81			0.790		29.50	0.050				2.65				48.50	
2-24-82			1.930		25.50	0.150				2.30				26.00	
4-14-82			7.700		25.00	0.300				2.43				12.00	
6-9-82		0.360	1.960		12.30	0.065				0.96				7.5	
8-11-82			2.950		10.56	6.500				0.86				23.5	
10-13-82		0.665	1.370	<0.001	21.60	0.100	<0.0002			1.32	0.006		<0.001	6.3	0.020
12-21-82			1.410		24.96	0.085				2.10				22.0	
2-21-83			1.150		23.04	0.105				2.09				17.0	
4-21-83			5.500		23.52	0.250				2.58				21.0	
6-21-83			4.000		9.60	0.130				1.15				4.6	
8-29-83		1.260	3.440	<0.001	9.47	0.135	<0.0002			1.2	<0.001		<0.001	47.5	0.005
10-19-83			0.260		26.88	0.070				2.2				6.00	
12-[illegible]-83			0.330		27.84	0.080				2.0				7.20	
3-27-84			0.86		37.8	0.093				2.31				10.8	
6-26-84		0.22	72.8		12.8	1.36				3.16				57.4	
9-26-84			0.170	<0.01	26.7	0.062		<0.1	<0.01	2.43				5.42	0.041
4-27-85					20.4					1.73				11.8	
5-30-85					12.8					1.18				5.68	

DATE	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	COMMENTS
	MG/L	MG/L	meq/l	meq/l	
8-26-81					
10-14-81					
12-23-81					
2-24-82					
4-14-82					
6-9-82					Storm Runoff
8-11-82					
10-13-82					
12-21-82					
2-21-83					
4-21-83					
6-21-83					
8-29-83					Rain Showers
10-19-83					
12-[illegible]-83					
3-27-84			4.45	4.32	
6-26-84			4.09	3.44	
9-26-84		<0.1	4.09	5.93	
4-27-85			6.12	5.55	
5-30-85			3.43	3.70	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station: VC-2
Location: Mud Creek above mine

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
8-26-75					7.80									
12-26-75					7.63									
1-26-76	16:30	14.0	-5.0	0	7.9				4.0			9.9	<1.0	
3-9-76	09:50	8.4	-5.0	0	8.3				1.4		8.0	11.2		
4-28-76	12:45	8	9	7	8.2				15.0		17.0	6.5	<1.0	
5-14-76	11:50	15	7	6	8.5				12.0		18.0	8.0	<1.0	
7-2-76	12:15	5.6	19	15	8.2				8.0		15.0	8.8	<1.0	
9-30-76	13:10	4	20	10	7.3				6.0		11.0	7.3	<1.0	
10-27-76	11:20	5	2	1	7.5				6.5		9.0	10.5	<1.0	
11-29-76	15:00	4.3	-2	1	7.1				5.8		6.0	10.2	<1.0	
12-28-76	11:30	2	0	1	7.8				8.0		6.0	9.3	<1.0	

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
8-26-75		0.10				0.07		41.85					374			575	1.50	<0.01	239.97	198.0	260.0		
12-26-75		0.04				0.05		55.0					469			720	0.84	<0.01	295.24	242.0	290.0		
1-26-76		0.069				0.12	0.10	80.0	<0.01				420			640	0.24	<0.01	239.1	196	244		
3-9-76		0.130				0.120	0.100	56.0	<0.01				467			710	2.30	<0.01	302.5	248	302		
4-28-76		0.155				0.165	0.118	50.0	<0.01				416			640	0.50	<0.01	263.5	216	240		
5-14-76		0.16				0.125	0.120	46.0	<0.01				380			580	1.40	<0.01	253.7	208	242		
7-2-76		0.10				0.140	0.110	40.0	<0.01				430			660	9.90	<0.01	285.4	234	260.9		
9-30-76		0.06				0.165	0.085	39.0	<0.01		8.0		480			740	3.40	<0.01	319.6	262	268.2		
10-27-76		0.05				0.095	0.025	41.0	<0.01		7.0		498			760	2.00	<0.01	334	282	292		
11-29-76		0.060				0.085	0.030	41.0	<0.01		6.0		510			780	0.54	<0.01	313.3	300	370		
12-28-76		0.05				0.110	0.100	35.0	<0.01		4.0		489			750	1.9	<0.01	339.2	278	298		
		0.088					0.088																

DATE	ALUMINUM DISS.	ANTIMONY DISS.	ARSENIC DISS.	BARIUM DISS.	BERYLLIUM DISS.	BORON DISS.	CADMIUM DISS.	CALCIUM DISS.	CHLORIDE DISS.	CHROMIUM HEX. as CR	COBALT DISS.	COPPER DISS.	CYANIDE as Cn	FLUORIDE DISS.	GERMANIUM DISS.	IRON DISS.	IRON TOTAL	LEAD DISS.	MAGNESIUM DISS.	MANGANESE DISS.	MERCURY DISS.	MOLYBDENUM DISS.	NICKEL DISS.	POTASSIUM DISS.	SELENIUM DISS.	SILICA as SiO_2	SILVER DISS.	SODIUM DISS.	ZINC DISS.	VANADIUM DISS.	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
8-26-75	<0.01		<0.01	<0.01		<0.01	<0.001	62.40	6.00	<0.01		0.02	<0.01	0.14		0.01	0.13	<0.01	20.16	<0.01	<0.001			1.85	<0.01	2.86	<0.001	3.52	0.02		
12-26-75	<0.01		<0.001	0.06		<0.01	<0.001	70.4	8.0	<0.01		<0.01	<0.01	0.25		0.080	0.160	<0.001	27.36	<0.01	<0.001			2.52	<0.01	2.10	<0.001	12.0	0.015		
1-26-76	0.006	<0.001	<0.001	0.008	<0.001	<0.001	<0.001	51.2	6.0	<0.001	<0.001	<0.001		0.25	<0.001		0.130	0.002	27.8	0.035	<0.001	<0.001	<0.001	2.10	<0.001		<0.001	19.0	0.013	<0.001	
3-9-76	0.013	<0.001	<0.001	0.006	<0.001	<0.001	<0.001	71.2	4.0	<0.001	<0.001	<0.001		0.34	<0.001		0.210	0.001	29.76	0.024	<0.001	<0.001	<0.001	1.91	<0.001		<0.001	4.87	0.015	<0.001	
4-28-76	0.031	<0.001	<0.001	0.009	<0.001	<0.001	<0.001	56.0	6.0	<0.001	<0.001	<0.001		0.30	<0.001		0.244	<0.001	24.0	0.050	<0.0001	<0.001	<0.001	1.94	0.009	5.60	<0.001	16.0	0.015	<0.001	
5-14-76	0.026	<0.001	<0.001	0.012	<0.001	<0.001	<0.001	58.4	2.0	<0.001	<0.001	<0.001		0.27	<0.001		0.250	<0.001	23.00	0.038	<0.0002	<0.001	<0.001	1.42	0.008		<0.001	6.5	0.005	<0.001	
8-2-76	0.033		<0.001	0.010		<0.001		65.0	8.0			0.006		0.35	<0.001		0.280	<0.001	24.0	0.048	<0.0002	<0.001	<0.001	2.14	0.006	21.5		10.0	0.006		
9-30-76	0.011		<0.001	0.004		<0.001		76.8	8.0			0.012		0.25	<0.001		0.300	<0.001	18.60	0.017	<0.0002	<0.001	<0.001	2.27	0.004			18.00	0.011		
10-27-76	0.010		<0.001	0.002		<0.001		52.0	4.0			0.008		0.20	<0.001		0.310	<0.001	42.6	0.018	<0.0002	<0.001	<0.001	2.21	<0.001			11.0	0.002		
11-29-76	0.008		<0.001	0.004		<0.001		40.0	6.0			0.002		0.20	<0.001		0.260	<0.001	64.8	0.017	<0.0002	<0.001	<0.001	3.23	<0.001			4.70	0.005		
12-28-76	0.006		<0.001	0.004		<0.001		77.6	4.0			0.003		0.18	<0.001		0.270	<0.001	24.9	0.012	<0.0002	<0.001	<0.001	2.09	<0.001	5.80		10.0	0.018		

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-2
Location Mud Creek above [illegible] mine #2

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
3-17-77	14:00	3.5	-1	2	7.6				9.5		4.0	9.75	<1.0	
6-16-77	11:30	2.3	21	13	7.6				4.0		3.5	7.1	<1.0	<0.001
6-28-78	15:55	16	24	16	7.2	220	<20			<1.0	19.0		<1.0	0.008
8-23-78	12:50	1.5	26	12	8.0							8.6	1.5	0.002
10-25-78	11:00	3.2	3	3	7.2							10.0	2.0	0.004
12-27-78	10:10	5.7	-11	0	7.92							11.1	1.2	0.003
2-28-79	11:30	5.1	-6	0.2	7.7							9.6	<1.0	<0.001
4-18-79	11:20	12	9	6.5	7.73							9.1	<1.0	0.010
6-20-79	09:25	13.6	14	4.7	7.9							7.5	5.2	<0.001
7-23-79	09:21	7.4	12	6	8.1							7.3	<1.0	0.008
10-31-79	14:08	5.0	2	1	7.8							10.0	<1.0	<0.001
2-29-80	14:05	10.7	6	0.5	9.2							10.1	12.8	0.006
4-29-80	10:55	25.5	9.0	3.0	8.85							9.0		0.018
6-25-80	08:38	31	11	5	8.6							9.3		0.014
7-25-80	13:30	6.7	15	12	8.7							8.6	3.00	0.150
10-7-80	10:42	4.7	16	5	8.7									<0.001
12-10-80	15:25	11	0	1	7.16									0.019
2-2-81	14:10	4.4	11	4	8.0								1.60	<0.002
4-8-81	11:40	6.4	6	4	8.1									<0.001
6-24-81	09:[illegible]	6.4	18	12	8.4									<0.001

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	CHLORIDE as Cl	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L
3-17-77	0.13	0.03	<0.01	0.20		0.062	0.050	52.0	<0.01		8.0	<0.1	450		
6-16-77	0.13	0.01		0.40		0.025	0.011	28.3	<0.01		3.0	0.2	280		
6-28-78		0.20	<0.01	0.10				260			2.2		216		
8-23-78								31.0			6.0		260		
10-25-78								39.0			5.0		298		
12-27-78								48.0			22.0		328		
2-28-79		0.12					0.060	40.0			55.0		316		
4-18-79		0.20					0.08	41.0			54.0		318		
6-20-79		0.28					0.010	14.8			14.0		209		
7-23-79		<0.01					0.140	44.1			84.0		310		
10-31-79		<0.01					0.040	60.0			40.0		312		
2-29-80		0.14				0.316	0.120	380			139		728		
4-29-80	<0.01					0.300		19.5			500		229		
6-25-80	<0.01					0.110		<3.0			76.0		172		
7-25-80	<0.01	<0.01				0.380	<0.010	27.0			28.0		290		
10-7-80	<0.01					0.040		30.0			1.0		310		
12-10-80	<0.01					0.040		34.5			18.0		332		
2-2-81	<0.01	0.04				0.021		48.0			12.0		280		
4-8-81	0.15					0.020		50.0			27.0		350		
6-24-81	0.10					0.200		48.5			11.0		298		

DATE	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
3-17-77	690	1.50	<0.01	297.7	244	280			
6-16-77	425	3.50	<0.01	292.8	240	276		0	0
6-28-78	335			207.4					
8-23-78	395			270.8					
10-25-78				297.6					
12-27-78	500			329.4					
2-28-79	490			324.51	266				
4-18-79	490			292.8	238				
6-20-79	358			224.48	184		10.0		
7-23-79	510			297.89	244		10.0		
10-31-79	550			278.16	228		16.0		
2-29-80	515			280.60	230		12.0		
4-29-80	410			229.36					
6-25-80	270			214.72					
7-25-80	450			309.88	254		10.0		
10-7-80	480			331.84					
12-10-80	500			348.92					
2-2-81	430			258.64	212		<0.1		
4-8-81	319			336.72					
6-24-81	355			265.96	222		<0.01		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
3-17-77	0.008		<0.001	0.005		<0.001	<0.001	68.0	4.0	<0.001		0.002		0.16
6-16-77	0.008	<0.001	<0.001	0.018	<0.001	0.005	<0.001	67.2	17.0	<0.001	<0.001	0.007	<0.01	0.20
6-28-78			<0.001				<0.001	51.2	10.0	<0.001		0.005		0.14
8-23-78			<0.001				<0.001	57.6	4.0	<0.001		0.006		0.14
10-25-78			<0.001				<0.001	72.0	9.0	<0.001		0.009		0.16
12-27-78			<0.001				<0.001	80.8	6.0	<0.001		0.001		0.17
2-28-79			<0.001				<0.001	77.0	<0.1	<0.001		0.006		0.17
4-18-79			<0.001				<0.001	80.8	14.0	<0.001		0.002		0.17
6-20-79			<0.001				<0.001	50.6	4.0	<0.001		0.003		0.16
7-23-79			<0.001				<0.001	96.0	2.0			0.011		0.24
10-31-79			<0.001	0.217		0.060	<0.001	65.60	8.0	<0.001		0.012		0.18
2-29-80			<0.001	0.090		0.115	<0.001	60.80	20.0	<0.001		<0.001		0.15
4-29-80								58.40	10.0					
6-25-80								44.00	<0.1					
7-25-80			0.001	[illegible]		0.030	<0.001	60.40	10.0	<0.001		<0.001		0.15
10-7-80								57.60	3.5					
12-10-80								86.40	5.75					
2-2-81			<0.001	[illegible]		0.030	<0.001	[illegible]	11.00	<0.001		<0.001		0.14
4-8-81								[illegible]	[illegible]					
6-24-81								[illegible]	[illegible]					

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
3-17-77			0.223	<0.001	26.40	0.017	<0.0002		<0.001	2.18	<0.001	5.4	<0.001	3.63	0.017		Snowing
6-16-77	<0.001		0.137	<0.001	25.92	0.003	<0.0002	<0.001	<0.001	2.28	<0.001	5.0	<0.001	4.98	0.011	<0.001	
6-28-78			0.103	<0.001	11.50	0.050	<0.0002			1.289	<0.001	2.9	<0.00	4.0	0.005		
8-23-78			0.164	<0.001	26.9	0.026	<0.0002			1.82	<0.001		<0.001	3.96	0.012		
10-25-78			0.188	<0.001	25.9	0.030	<0.0002			1.80	<0.001			3.90	0.009		
12-27-78			0.200	<0.001	26.4	0.047	<0.0002			2.176	<0.001			4.46	0.006		
2-28-79			0.519	<0.001	24.96	0.079	<0.0002			2.243	<0.001		<0.001	14.0	0.005		Overcast
4-18-79			2.286	0.002	19.20	0.118	<0.0002			2.284	<0.001		<0.001	3.85	0.009		
6-20-79			1.150	<0.001	12.96	0.052	<0.0002			1.048	<0.001		<0.001	2.63	0.006		
7-23-79			1.210	<0.001	9.60	0.066	<0.0002			2.134	<0.001		<0.001	4.92	0.004		
10-31-79			0.860	<0.001	29.76	0.052	<0.0002			2.240	<0.001		<0.001	5.85	0.007		
2-29-80			43.10	0.002	120	0.150	<0.0002			2.15	<0.001		<0.001	8.10	0.010		
4-29-80			2.450		13.44	0.128				2.10				8.00			Light Rain
6-25-80			1.230		12.96	0.050				0.91				4.00			Scattered Showers
7-25-80		<0.001	0.850	<0.002	23.52	<0.001	<0.0005			1.87	<0.001		<0.001	15.00	<0.001		
10-7-80			0.815		25.92	0.010				2.22				23.00			
12-10-80			0.260		23.04	0.060				2.25				5.25			
2-2-81			0.560	0.020	25.20	[illegible]	<0.0002			2.33	0.001		<0.001	3.20	0.010		
4-8-81			1.210		23.52	0.066				2.16				[illegible]			
6-24-81			[illegible]		[illegible]	[illegible]				[illegible]				[illegible]			

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-5
Location below Eccles Canyon mine

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
6-14-76	13:10	0.7	8	5	8.4				32.0		19.0	6.8										46.0	<0.01				320			490	20.00	<0.01	197.6	162	178		
8-2-76	11:30	0.1	24	10	8.4				10.0		8.0	8.6	<1.0	<0.001		0.10				0.120	0.100	11.0	<0.01	<0.01	18.0		320.			490	2.50	<0.01	231.8	190	204.7	<1	<3
9-30-76	14:15	-0-																																			
10-27-76	11:45	-0-																																			
11-29-76	15:30	-0-																																			
12-28-76	12:00	-0-																																			

DATE	ALUMINUM DISS.	ANTIMONY DISS.	ARSENIC DISS.	BARIUM DISS.	BERYLLIUM DISS.	BORON DISS.	CADMIUM DISS.	CALCIUM DISS.	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT DISS.	COPPER DISS.	CYANIDE as Cn	FLUORIDE DISS.	GERMANIUM DISS.	IRON DISS.	IRON TOTAL	LEAD DISS.	MAGNESIUM DISS.	MANGANESE DISS.	MERCURY DISS.	MOLYBDENUM DISS.	NICKEL DISS.	POTASSIUM DISS.	SELENIUM DISS.	SILICA as SiO_2	SILVER DISS.	SODIUM DISS.	ZINC DISS.	VANADIUM DISS.				COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L				
6-14-76								48.8	2.0					0.14					13.44					1.01				16.0						
7-2-76	0.005	<0.001	<0.001	0.210	<0.001	0.015	<0.001	54.0	6.0	<0.001	<0.001	0.130	<0.01	0.37	<0.001		0.250	<0.001	17.0	0.042	<0.0002	<0.001	<0.001	1.10	<0.001	16.5	<0.001	2.20	0.039	<0.001				
9-30-76																																		
10-27-76																																		
11-29-76																																		
12-28-76																																		

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-5
Location Below Belina mine

DATE	TIME	FLOW (CFS)	TEMPERATURE AIR (°C)	TEMPERATURE WATER (°C)	pH	COLIFORM TOTAL (MPN)	COLIFORM FECAL (MPN)	FECAL STREP (MPN)	C.O.D. (MG/L)	B.O.D. (MG/L)	T.O.C. (MG/L)	DISSOLVED OXYGEN (MG/L)	OIL & GREASE (MG/L)	PHENOL DISS. (MG/L)	NITROGEN AMMONIA as NH3-N (MG/L)	NITROGEN NITRATE as NO3-N (MG/L)	NITROGEN NITRITE as NO2-N (MG/L)	NITROGEN TOTAL KJELDAHL (MG/L)	NITROGEN ORGANIC (MG/L)	PHOSPHATE TOTAL as PO4-P (MG/L)	PHOSPHATE ORTHO as PO4-P (MG/L)	SULFATE as SO4 (MG/L)	HYDROGEN as ON (MG/L)	SURFACTANT as MBAS (MG/L)	SOLIDS TSS (MG/L)	SOLIDS TOTAL DISSOLVED SOLIDS (MG/L)	SOLIDS T.D.S. (MG/L)	SOLIDS TOTAL SOLIDS (MG/L)	SOLIDS TOTAL VOLATILE SOLIDS (MG/L)	COND. (μMHOS)	TURBIDITY (FTU)	CARBONATE ALK. as CO3 (MG/L)	BI-CARBONATE ALK. as HCO3 (MG/L)	TOTAL ALK. as CaCO3 (MG/L)	TOTAL HARDNESS as CaCO3 (MG/L)	ACIDITY as CaCO3 (MG/L)	ALPHA RADIO-ACTIVITY (pCi/L)	BETA RADIO-ACTIVITY (pCi/L)
3-17-77	14:25	-0-																																					
6-16-77	13:10	-0-																																					
5-10-78	13:55	1.4	17	2.5	7.5						9.0	9.9	15.2			1.12	0.02	0.55			0.120	102			2640		200			310			50.0						
6-14-78	16:55	1.6	25	10	7.1						23.0	9.0	[illegible]	0.005	0.12	0.46	<0.01	0.25			0.028	10.0			869		138			250			134.2						
7-12-78	15:45	0.3	27	20.5	8.3							8.1	16.0									78.0			75.0		283			355			202.52						
8-23-78	13:10	0.01	22	8	8.4						20.1	8.2	12.0	0.250								26.0			8.0		210			320			219.6						
10-25-78	11:32	-0-																																					
12-29-78	10:40	-0-																																					
2-28-79	12:10	-0-																																					
4-18-79	11:47	0.3	10	1	7.48						16.0	10.0	1.8	0.008		1.09					2.00	191			3910		510			770			231.8	190					
6-20-79	17:48	0.6	20	10	8.3							8.0	2.2	<0.001		0.20					0.015	32.5			18.0		210			360			182.76	174		<1.0			
8-23-79	09:55	0.09	16	5.5	8.1							8.8	<1.0	0.086		<0.01					0.100	44.9			1.0		275			450			214.56	198		10.0			
10-31-79	13:44	-0-																																					
2-27-80	14:26	-0-																																					
4-29-80	11:32	2.6	4	2	9.2							9.2		0.015	0.20					3.100		32.0			3402		215			380			185.44						
6-25-80	14:25	2.2	25	12	9.1							7.5		0.030	<0.01					0.070		45.0			46.0		188			290			146.40						
8-25-80	15:08	0.16	14	14	8.7							8.0	<0.01	<0.001	<0.01	<0.01				0.200	<0.010	52.0			149		270			420			231.80	190		14.0			
10-7-80	10:00	0.4	7	4	9.0									<0.001	<0.01					0.070		25.5			34.0		255			390			220.84						
12-10-80	14:54	-0-																																					
2-25-81		-0-																																					

DATE	ALUMINUM TOTAL (MG/L)	ANTIMONY TOTAL (MG/L)	ARSENIC TOTAL (MG/L)	BARIUM TOTAL (MG/L)	BERYLLIUM TOTAL (MG/L)	BORON TOTAL (MG/L)	CADMIUM TOTAL (MG/L)	CALCIUM TOTAL (MG/L)	CHLORIDE DISS. (MG/L)	CHROMIUM HEX as CR (MG/L)	COBALT TOTAL (MG/L)	COPPER TOTAL (MG/L)	CYANIDE as CN (MG/L)	FLUORIDE DISS. (MG/L)	GERMANIUM TOTAL (MG/L)	IRON DISS. (MG/L)	IRON TOTAL (MG/L)	LEAD TOTAL (MG/L)	MAGNESIUM TOTAL (MG/L)	MANGANESE TOTAL (MG/L)	MERCURY TOTAL (MG/L)	MOLYBDENUM TOTAL (MG/L)	NICKEL TOTAL (MG/L)	PHOSPHORUS TOTAL (MG/L)	SELENIUM TOTAL (MG/L)	SILICA as SiO2 (MG/L)	SILVER TOTAL (MG/L)	SODIUM TOTAL (MG/L)	ZINC TOTAL (MG/L)	VANADIUM TOTAL (MG/L)				COMMENTS
3-17-77																																			
6-16-77																																			
5-10-78			<0.001				<0.001	47.3	10.0	<0.001		0.002		0.19			0.039	<0.001	8.64	0.015	<0.0002			1.34	<0.001	3.90	<0.001	3.79	0.008						
6-14-78			<0.001				<0.001	38.4	9.0	<0.001		0.009		0.14			1.442	<0.001	5.76	0.013	<0.0002			1.032	<0.001	4.50	<0.001	7.5	0.008						
7-12-78			<0.001					32.5	2.0								0.098	<0.001	6.80	0.070	<0.0002			1.496	<0.001		<0.001	62.0	0.014						
8-23-78			<0.001					49.6	<1.0			0.006		0.12			0.011	<0.001	19.2	0.011	<0.0002			1.481	<0.001		<0.001	2.97	0.017						
10-25-78																																			
12-27-78																																			
2-28-79																																			
4-18-79			0.004					77.6	12.0			0.007		0.20			88.5	0.016	11.04	1.532	<0.0002			2.532	<0.001		<0.001	5.58	0.108						
6-20-79			<0.001				<0.001	56.0	4.0	<0.001		<0.001		0.116			0.050	<0.001	12.92	0.043	0.0002			1.321	<0.001		<0.001	2.25	0.015						
8-23-79			<0.001				<0.001	85.6	4.0			0.012		0.22			0.110	<0.001	6.24	0.060	<0.0002			1.800	<0.001		<0.001	4.73	<0.001						
10-31-79																																			
2-27-80																																			
4-29-80								54.40	14.0								0.850		12.96	0.113				6.10				4.30						Rain
6-25-80								49.60	2.0								0.960		10.08	0.030				1.21				2.90						
8-25-80			<0.001	<0.001		0.080	<0.001	50.00	10.0	<0.001		<0.001		0.12		0.001	2.280	<0.002	5.40	<0.04	<0.0002			2.24	<0.001		<0.001	4.50	<0.001					
10-7-80								56.00	8.0								2.650		20.16	0.045				2.53				10.00						
12-10-80																																			
2-25-81																																			

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-5
Location Below Belina Mine
Whiskey Canyon Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-8-81	13:23	-0-												
6-24-81	16:45	0.1	20	20	8.6									<0.001
8-26-81	16:33	0.08	20	17	8.7								1.80	<0.001
10-14-81	13:23	0.3	1	0	8.3									0.002
12-23-81	13:08	-0-												
2-24-82	12:50	-0-												
4-14-82	13:39	-0-												
6-9-82	12:55	3.7	18	9	7.9									0.003
8-11-82	16:47	0.3	16	14	8.5									<0.001
10-13-82	15:50		9	4	8.3								<0.1	<0.001
12-27-82	14:20	-0-												
2-21-83	13:35				7.6									0.004
4-21-83	12:18		5	2	8.0									<0.001
6-21-83	16:12		21	14	7.7									<0.001
8-25-83	14:50	0.6	22	16	7.6								0.3	<0.001
10-19-83	17:10	0.3	4	3	7.7									<0.001
12-[illegible]-83					8.0									<0.001
3-27-84	11:30		Inaccessible											
6-26-84	14:25	1.2	16	12	7.5									
9-26-84	17:05	0.48	14	8	7.2									

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-8-81																								
6-24-81	0.10					0.210		110			15.0		288			410			310	110		<0.01		
8-26-81	<0.01	<0.01				0.230	0.050	54.0			3.0		275			370			180.54	156		<0.01		
10-14-81	0.23					0.235		51.0			224		400			610			349					
12-23-81																								
2-24-82																								
4-14-82																								
6-9-82	0.45					0.160		42.0			215		220			339			198.40	162.60				
8-11-82	0.11					20.100		30.0			1703.0		377			661			181.40	148.70				
10-13-82	0.04	0.28				0.560	0.120	39.0			611		342			558			308.50	252.90		<0.01		
12-27-82																								
2-21-83	0.06					0.280		50.0			3860		359						233.90					
4-21-83	0.09					0.33		80.0			4050		410			578			217.20					
6-21-83	<0.01					0.400		80.0			141		288			369			190.30					
8-25-83	<0.01	0.02				0.38		78			45.0		316			575			219.60	180		<0.01		
10-19-83	0.20					<0.02		93			18.0		335			523			226.92					
12-[illegible]-83	<0.10					0.02		95			45.0		395			600			268.40					
3-27-84																								
6-26-84	<0.1					0.051		186			26		451			643			109	180				
9-26-84	<0.1	0.104	0.008			0.078		105			30		362			389			242		220			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-8-81														
6-24-81								49.20	21.50					
8-26-81			0.003	0.040		0.080	<0.001	48.80	33.90	<0.001		0.010		0.20
10-14-81								40.00	33.90					
12-23-81														
2-24-82														
4-14-82														
6-9-82								56.00	5.10					
8-11-82								60.00	125.30					
10-13-82			<0.001	0.100		0.060	<0.001	84.00	24.30	<0.001		0.020		0.15
12-27-82														
2-21-83								60.00	60.70					
4-21-83								80.80	68.50					
6-21-83								64.80	6.00					
8-25-83			<0.001	0.280		0.330	<0.001	65.20	5.8	<0.001		0.008		0.18
10-19-83								64.80	14.00					
12-[illegible]-83								80.00	20.00					
3-27-84														
6-26-84								85.3	6.8					
9-26-84	<0.1						<0.01	73.9	9.6			<0.01		

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	meq/l	meq/l	
4-8-81																				
6-24-81			0.190		27.24	0.070				2.95				[illegible]						
8-26-81		<0.001	0.510	<0.001	27.84	0.020	<0.0002			3.78	0.003		<0.001	6.50	0.015					
10-14-81			0.550		32.64	0.020				3.50				67.00						
12-23-81																				Frozen
2-24-82																				Frozen
4-14-82																				Frozen
6-9-82		0.390	0.510		15.00	0.150				1.60				5.0						
8-11-82			10.250		38.40	7.150				1.50				21.0						Recent Rain
10-13-82		1.450	4.250	<0.001	16.80	0.260	<0.0002			1.33	0.005		0.001	20.0	0.075					
12-27-82																				
2-21-83			88.000		21.60	1.650				4.21				40.5						
4-21-83			57.500		19.68	1.710				4.78				29.5						Storm Runoff - 11. Snow
6-21-83			1.530		16.32	0.087				2.32				7.0						
8-25-83		0.350	1.650	0.003	15.80	0.240	<0.0002			2.5	<0.001		<0.001	16.0	0.026					
10-19-83			0.220		30.24	0.030				3.7				5.80						
12-[illegible]-83			0.430		24.00	0.130				23.2				10.50						
3-27-84																				Covered with Snow - Dry?
6-26-84			4.52		32.8	0.06				3.62				5.67						
9-26-84			0.250	<0.01	29.9	0.034		<0.1	<0.01	4.15				5.20	0.055		<0.1			

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-5
Location Whiskey Canyon Creek below Belina mine

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L
4-27-85	12:50	1.5	12	6	8.0									
5-30-85	14:47	3.3	15	10	6.8									
6-17-85	16:10	1.36	22	15	7.4									
7-17-85	15:20	1.19	18	15	7.9									
10-1-85	15:30	0.09	12	9	7.2									
6-27-86	09:40	0.91	23	8	7.6									
7-28-86	12:05	1.20	19	10	7.1									
10-15-86	17:15	0.11	6	3	7.8									
4-23-87	11:30	0.84	12	6	7.0									
6-15-87	11:45	0.44	25	14	6.7									
7-1-87	11:15	0.06	16	10	7.5									
9-7-87	11:10	0.29	14	7	8.3									
4-22-88	12:40	0.90	3	4	6.3									
5-31-88	12:20	0.87	6	5	6.9									
6-29-88	14:30	0.28	20	17	7.0									
7-27-88	17:30	0.02	23	20	7.7									
7-30-88	13:15		20									7.9	<0.5	<0.001
9-27-88	10:37	0.445	4	3	7.0							13.4	<0.5	

DATE	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3^--N MG/L	NITROGEN NITRITE as NO_2^--N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4^{-3}-P MG/L	PHOSPHATE ORTHO as PO_4^{-3}-P MG/L	SULFATE as SO_4 MG/L	CHLORIDE as CL MG/L	FLUORIDE as MGAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	SPECIFIC COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
4-27-85								81.8			3310		602			571			225					
5-30-85								123			58		343			376			95.2					
6-17-85	<0.1	0.088	0.017			0.023		146			69		371		108	412			162		309			
7-17-85								168			380		485			564			288					
10-1-85	<0.1	0.056	<0.005			0.029		228			35		508		170	487			123		385			
6-27-86	0.11	0.360	0.020			0.214		154			1100		4000		480	668			215	176	368			
7-28-86								146			172		518			665			212					
10-15-86	<0.1	0.186	0.017			0.020		110			17		440		42	623			353	308	342			
4-23-87	<0.1	0.53	0.049			0.209		133			196		597		48	733			344		350			
6-15-87								114			4.4		486			680			248					
7-1-87								177			14		523			800			237					
9-7-87	0.33	0.16	0.0081			0.064		83			75		463		63	753			241	204	332			
4-22-88								98			1,050		1960			3310			252	206				
5-31-88								121			18		355			620			219					
6-29-88	0.15	<0.01	0.007			0.025		118			19		407		57	719			214		321			
7-27-88								106			133		455			715			128					
7-30-88												<0.1										76		
9-27-88								207			8.8	<0.1	488			664		0	228	187	359	42		

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L
4-27-85								65.8	168					
5-30-85								45.9	14.69					
6-17-85	<0.1						<0.01	54.8	13.0			<0.01		
7-17-85								84.2	16.8					
10-1-85	0.15						<0.01	63.2	14.3			<0.01		
6-27-86	3.54						<0.01	73.8	13.6			<0.01		
7-28-86								62.1	9.0					
10-15-86	0.28						<0.01	76.8	24.7			<0.01		
4-23-87	1.68						<0.01	74.8	84.0			<0.01		
6-15-87								55.2	31.5					
7-1-87								76.8	26.9					
9-7-87	<0.1		<0.01				<0.01	68	64.1			<0.01		0.39
4-22-88								72.2	84					
5-31-88								53.4	29.9					
6-29-88	<0.1						<0.01	68.9	31.2			<0.01		
7-27-88								47.1	91.5					
7-30-88								71.4	7.1					
9-27-88														

DATE	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	MAJOR CATIONS meq/l	MAJOR ANIONS meq/l	SULFIDE as S MG/L	C-A / C+A ×100	COMMENTS
4-27-85				19.1					7.37				110			9.83	10.12			
5-30-85				22.8					3.04				42.2			4.43	4.53			
6-17-85		0.316	<0.01	36.8	0.025		<0.01	<0.01	3.80	<0.002			6.98	<0.01		6.18	6.07	<0.1		
7-17-85				44.8					4.5				6.86			8.32	8.68			
10-1-85		0.30	<0.01	39.8	<0.01		<0.01	<0.01	6.98	<0.002			10.92	0.013		7.12	7.16	<0.1		
6-27-86		6.20	<0.01	36.8	1.80		<0.01	<0.01	2.8	<0.002			4.56	0.030		6.932	7.122	<0.1	-2.737	
7-28-86				39.8					3.12				4.52			6.650	6.770		-1.780	
10-15-86		0.300	<0.01	53.4	0.015		<0.01	<0.01	2.9	<0.002			6.12	0.013		8.567	8.776	<0.01	-2.418	
4-23-87		3.89	0.020	62.8	0.17		0.025	<0.01	3.9	0.0028			38.2	0.025		10.67	10.77	<0.1	-0.37	
6-15-87				43.5					5.4				16.0			7.19	7.32		-0.91	
7-1-87				35.8					4.2				10.1			7.35	8.32		-6.24	
9-7-87		1.82	<0.01	51.8	0.078		<0.01	<0.01	3.9	<0.002			0.8	0.100		7.80	7.48	<0.1	2.10	
4-22-88				47.2					2.8				14.7			8.21	8.53		1.97	3" New Spring - Overcast
5-31-88				46.8					2.6				17.4			7.34	6.95		2.77	
6-29-88		0.390	<0.01	46.3	0.020		<0.01	<0.01	5.4	<0.002			18.2	<0.01		8.20	6.84	<0.1	9.04	
7-27-88				39.6					5.7				35.8			7.34	6.88		3.21	
7-30-88		3.22		51.4	0.010				4.2				10.1			8.34	8.25		0.56	
9-27-88																				

R 1-78

CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE INC
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station VC-5
Location Whiskey Canyon Creek below Belina Mine

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89	13:15	0.59	6	4	7.7							9.4			<0.2	0.067	<0.01			0.055		97.2			36		457		47	707			218		308			
5-23-89	16:05	0.49	17	8	7.4							8.4										85			7.0		387			622		0	232					
6-21-89	16:35	0.36	16	13	7.6							8.2	<0.5									77			39	<0.1	379			580		0	237			<10		
7-19-89	14:40	0.15	25	19	7.8																	123					425			622		10.5	221					
9-26-89	11:25	0.33	20	4	7.6							10.1	<0.5									129			14	<0.1	423			640		0	268		324	21.4		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89	<0.1						<0.01	74.8	73.0			<0.01					0.57	<0.01	31.2	0.060		<0.01	<0.01	3.2	0.0048			31.6	0.707		<0.1	7.76	7.66	0.65	
5-23-89								42.4	33.2										42.1					2.8				17.9				6.43	6.51	0.61	
6-21-89								35.3	23.7										44.6					3.9				9.6				5.95	6.16	1.71	
7-19-89								46.4	26.1										42.4					4.7				13.8				6.53	7.27	5.40	
9-25-89								71.4	16.3								0.050		43.9	<0.01				4.2				8.4				7.65	7.54	0.73	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-4
Location Above Eccles Canyon Mine

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY	
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L	
9-30-76	14:00	-0-																																					
10-27-76	12:05	-0-																																					
11-29-76	15:45	-0-																																					
12-28-76	12:15	-0-																																					

DATE	ALUMINUM DISS.	ANTIMONY DISS.	ARSENIC DISS.	BARIUM DISS.	BERYLLIUM DISS.	BORON DISS.	CADMIUM DISS.	CALCIUM DISS.	CHLORIDE DISS.	CHROMIUM HEX. as CR	COBALT DISS.	COPPER DISS.	CYANIDE as Cn	FLUORIDE DISS.	GERMANIUM DISS.	IRON DISS.	IRON TOTAL	LEAD DISS.	MAGNESIUM DISS.	MANGANESE DISS.	MERCURY DISS.	MOLYBDENUM DISS.	NICKEL DISS.	POTASSIUM DISS.	SELENIUM DISS.	SILICA as SiO_2	SILVER DISS.	SODIUM DISS.	ZINC DISS.	VANADIUM DISS.				COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L				
9-30-76																																		
10-27-76																																		
11-29-76																																		
12-28-76																																		

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station: 12-2
Location: [illegible]

DATE	TIME	FLOW (CFS)	TEMPERATURE AIR (°C)	TEMPERATURE WATER (°C)	pH	COLIFORM TOTAL (MPN)	COLIFORM FECAL (MPN)	FECAL STREP (MPN)	C.O.D. (MG/L)	B.O.D. (MG/L)	T.O.C. (MG/L)	DISSOLVED OXYGEN (MG/L)	OIL & GREASE (MG/L)	PHENOL (MG/L)	NITROGEN: AMMONIA as NH_3-N (MG/L)	NITROGEN: NITRATE as NO_3-N (MG/L)	NITROGEN: NITRITE as NO_2-N (MG/L)	NITROGEN: TOTAL KJELDAHL (MG/L)	NITROGEN: ORGANIC (MG/L)	PHOSPHATE: TOTAL as PO_4-P (MG/L)	PHOSPHATE: ORTHO as PO_4-P (MG/L)	SULFATE as SO_4 (MG/L)	HYDROXIDE as OH (MG/L)	SURFACTANT as MBAS (MG/L)	SOLIDS: TSS (MG/L)	SOLIDS: TOTAL SETTLEABLE SOLIDS (ML/L)	SOLIDS: T.D.S. (MG/L)	SOLIDS: TOTAL SOLIDS (MG/L)	SOLIDS: TOTAL VOLATILE SOLIDS (MG/L)	COND. (µMHOS/CM)	TURBIDITY (FTU)	CARBONATE ALK. as CO_3 (MG/L)	BI-CARBONATE ALK. as HCO_3 (MG/L)	TOTAL ALK. as $CaCO_3$ (MG/L)	TOTAL HARDNESS as $CaCO_3$ (MG/L)	ACIDITY as $CaCO_3$ (MG/L)	ALPHA RADIO-ACTIVITY (PCI/L)	BETA RADIO-ACTIVITY (PCI/L)
3-17-77	14:30	-0-																																					
6-16-77	13:00	-0-																																					
5-10-78	14:35	-0-																																					
6-14-78	15:55	1	20	4	7.0						10.0	9.4	<1.0	<0.001	0.10	0.10	<0.01	0.18			0.025	8.0			85.0		84.0			120			78.2						
7-12-78	15:05	0.07	21	14	7.7							7.3	<1.0									24.0			10.0		110			130			72.72						
8-23-78	14:35	-0-																																					
10-25-78	14:00	-0-																																					
12-27-78	15:10	-0-																																					
2-28-79	12:30	-0-																																					
4-18-79	12:05	-0-																																					
6-27-79	17:20	0.1	16	7	8.0							8.1	1.4	<0.001		0.12					0.012	78.6			64.0		98.0			112			73.2	60.0		6.0			
8-23-79	10:18	0.01	17	7.5	8.3							7.4	<1.0	0.004		<0.01					0.020	10.0			35.0		222			360			216.44	202		10.0			
10-31-79	13:34	-0-																																					
2-27-80	14:20	-0-																																					
4-29-80			In-Accessible																																				
6-25-80	15:05	0.8	27	10	8.7							8.0		<0.002	<0.01					0.070		50.0			37.0		112			170			48.80						
7-25-80	16:40	0.01	13	14	8.4							7.0	7.80	0.002	<0.01	<0.01				0.100	<0.010	7.5			17.0		220			340			231.80	170		28.0			
10-7-80	09:20	0.002	12	6	8.7									<0.001	<0.01					0.100		304			26.0		600			920			273.28						
12-10-80	14:30	-0-																																					
2-25-81	13:30	-0-																																					

DATE	ALUMINUM TOTAL (MG/L)	ANTIMONY TOTAL (MG/L)	ARSENIC TOTAL (MG/L)	BARIUM TOTAL (MG/L)	BERYLLIUM TOTAL (MG/L)	BORON TOTAL (MG/L)	CADMIUM TOTAL (MG/L)	CALCIUM TOTAL (MG/L)	CHLORIDE DISS. (MG/L)	CHROMIUM HEX as CR (MG/L)	COBALT TOTAL (MG/L)	COPPER TOTAL (MG/L)	CYANIDE as CN (MG/L)	FLUORIDE DISS. (MG/L)	GERMANIUM TOTAL (MG/L)	IRON DISS. (MG/L)	IRON TOTAL (MG/L)	LEAD TOTAL (MG/L)	MAGNESIUM TOTAL (MG/L)	MANGANESE TOTAL (MG/L)	MERCURY TOTAL (MG/L)	MOLYBDENUM TOTAL (MG/L)	NICKEL TOTAL (MG/L)	POTASSIUM TOTAL (MG/L)	SELENIUM TOTAL (MG/L)	SILICA as SiO_2 (MG/L)	SILVER TOTAL (MG/L)	SODIUM TOTAL (MG/L)	ZINC TOTAL (MG/L)	VANADIUM TOTAL (MG/L)			COMMENTS
3-17-77																																		
6-16-77																																		
5-10-78																																		
6-14-78			<0.001				<0.001	23.2	8.0	<0.001		0.007		0.08			0.128	<0.001	1.92	0.013	<0.0002			0.489	<0.001	2.50	<0.001	5.5	0.006				
7-12-78			<0.001					11.2	<1.0								0.215	<0.001	1.92	0.011	<0.0002			0.618	<0.001		<0.001	28.0	0.018				
8-23-78																																		
10-25-78																																		
12-27-78																																		
2-28-79																																		
4-18-79																																		
6-27-79			<0.001				<0.001	21.60	<1.0	<0.001		0.007		0.10			0.880	<0.001	3.16	<0.001	<0.0002			0.575	<0.001		<0.001	0.65	0.004				
8-23-79			<0.001				<0.001	72.0	<0.1			0.011		0.20			1.150	<0.001	4.80	0.168	<0.0002			0.733	<0.001		<0.001	3.50	0.055				
10-31-79																																		
2-27-80																																		
4-29-80																																		
6-25-80								15.80	<0.1								0.560		6.72	0.030				0.38				16.00					
7-25-80			<0.001	<0.001		0.040	<0.001	[illegible]	14.0	<0.001		<0.001		0.16		<0.001	0.480	<0.002	[illegible]	<0.001	<0.0002			0.73	<0.001		<0.001	[illegible]	<0.001				
10-7-80								61.60	0.2								0.510		76.00	<0.001				0.89				1.70					
12-10-80																																		
2-25-81																																		

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-4
Location Whiskey Canyon Creek above Belina Mine

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-8-81	15:10	-0-												
6-24-81	16:18	0.004	15	12	8.4									<0.001
8-26-81	14:46	-0-												
10-14-81	14:13	0.004	-1	2	8.4									<0.001
12-23-81	13:40	-0-												
2-24-82	13:20	-0-												
4-14-82	14:00	-0-												
6-9-82	13:50	0.07	12	8	7.7									0.008
8-11-82	16:08	0.02	14	8	8.2									0.008
10-13-82	14:05	0.05	9	6	8.5								0.4	<0.001
12-21-82	Inaccessible													
2-21-83	Inaccessible													
4-21-83	Inaccessible													
6-21-83	15:17	0.7	20	12	7.7									<0.001
8-25-83	13:38	0.004	23	18	7.3								<0.1	<0.001
10-19-83	16:25	0.002	5	3	7.8									<0.001
12-[illegible]-83	Inaccessible													
3-27-84	10:50		Inaccessible											
6-26-84	15:50	0.22	16	7	7.3									
8-26-84	16:50	0.004	10	8	7.2									

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-8-81																								
6-24-81	<0.05					0.160		13.2			20.0		1660			235			175.48	148		<0.01		
8-26-81																								
10-14-81	0.19					0.200		27.0			64.0		221			340			218.40					
12-23-81																								
2-24-82																								
4-14-82																								
6-9-82	0.31					0.060		<0.1			26.0		60.0			121			75.90	62.20				
8-11-82	0.10					7.000		3.0			15940		235			270			184.20	151				
10-13-82	0.30	<0.01				1.450	3.00	81.0			498		145			178			3.30	2.70		8.00		
12-21-82																								
2-21-83																								
4-21-83																								
6-21-83	<0.01					0.240		10.0			89.0		95.0			92			68.30					
8-25-83	<0.01	0.02				0.33		12			68.0		180			271			204.90	168		<0.01		
10-19-83	0.70					<0.02		27			84.0		295			318			202.50					
12-[illegible]-83																								
3-27-84																								
6-26-84	<0.1					0.139		7.1			42		77			92			29.6	48.6				
8-26-84	<0.1	0.151	0.010			0.069		11.5			12		196			256			227		189			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-8-81														
6-24-81								48.00	2.50					
8-26-81														
10-14-81								52.00	3.20					
12-23-81														
2-24-82														
4-14-82														
6-9-82								19.50	1.54					
8-11-82								44.80	50.10					
10-13-82			0.010	0.095		0.100	<0.001	24.00	12.30	0.026		0.040		0.09
12-21-82														
2-21-83														
4-21-83														
6-21-83								17.60	2.00					
8-25-83			<0.001	0.470		0.250	<0.001	16.70	1.5	<0.001		0.002		0.12
10-19-83								53.60	4.00					
12-[illegible]-83														
3-27-84														
6-26-84								16.3	8.2					
8-26-84	<0.1						<0.01	61.9	2.9			<0.01		

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	meq/l	meq/l	
4-8-81																				
6-24-81			0.830		9.60	0.090				0.96				120						
8-26-81																				
10-14-81			0.335		11.52	0.018				2.60				14.00						
12-23-81																				Frozen
2-24-82																				Frozen
4-14-82																				Frozen
6-9-82		0.090	0.350		3.60	0.020				0.40				0.4						
8-11-82			4.420		6.24	6.550				8.5				36.0						Storm Runoff
10-13-82		7.650	22.500	0.021	6.72	0.560	<0.0002			1.59	0.006		0.001	1.0	0.125					
12-21-82																				Snow
2-21-83																				Snow
4-21-83																				Snow
6-21-83			1.100		3.36	0.037				0.41				4.5						
8-25-83		0.750	1.150	<0.001	3.65	0.040	<0.0002			0.5	<0.001		<0.001	56.0	0.017					
10-19-83			0.200		15.36	0.040				1.2				1.60						
12-[illegible]-83																				Covered with Snow
3-27-84																				Covered with Snow
6-26-84			4.24		3.0	0.04				0.74				0.60						
8-26-84			0.045	<0.01	12.1	0.021		<0.1	<0.01	1.28				1.63	0.036		<0.1			

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-4
Location Whiskey Canyon Creek above Belina mine

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-27-85	13:15		Inaccessible																																				
5-30-85	14:05	0.34	13	8	6.9																	6.8			56		128			103			47.2						
6-17-85	15:30	0.067	22	13	7.4										<0.1	0.108	0.046			0.117		7.0			53		60		52	88			48		55				
7-17-85	15:05	0.028	17	17	8.2																	18.8			28		176			260			240						
10-1-85	15:57	0.001	11	5	7.5										<0.1	0.084	0.006			0.060		13.2			8.8		226		106	282			208		196				
6-27-86	08:40	0.09	21	9	7.2										0.12	0.353	0.024			0.039		6.5			24		40		12	150			70.2	57.6	75				
7-29-86	11:16	0.006	17	14	7.1																	<0.5			99		344			309			189						
10-15-86	10:15	0.004	6	2	7.2										<0.1	0.068	0.0099			0.054		7.2			18		223		22	323			288	236	192				
4-23-87	15:00		Inaccessible																																				
6-15-87	12:46	0.005	21	16	6.9										0.42	0.15	0.013			0.171		6.5			16		156		26	228			163		141				
7-1-87	10:25	0.002	16	15	7.5																	1.5			15		180			308			180						
9-8-87	11:10	Seep	15	10	8.0										0.20	0.072	<0.005			0.041		16			23		227		29	346			225	184	198				
4-22-88	12:20		Inaccessible																																				
5-31-88	12:00		Inaccessible																																				
6-29-88	11:45	0.01	20	16	7.8										0.26	0.39	<0.005			0.058		0.98			23		131		36	228			152		132				
7-28-88	10:25	0.002	20	13	7.0																	<0.1			8.4	<0.1	203			177			180						
9-27-88	10:20	-0-																																					

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	MAJOR CATIONS	MAJOR ANIONS	SULFIDE as S	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	meq/l	meq/l	MG/L		
4-27-85								16.1	6.34										2.8					0.81				0.70			1.09	1.09			Covered with Snow
5-30-85							<0.01	13.6	1.8			<0.01					0.99	<0.01	3.04	0.025		<0.01	<0.01	0.68	<0.002			0.40	<0.01		0.97	0.99	<0.1		
6-17-85	<0.1							62.7	2.2										10.3					0.6				1.45			4.06	4.21			
7-17-85																																			
10-1-85	<0.1						<0.01	54.2	4.9			<0.01					0.10	<0.01	13.6	<0.01		<0.01	<0.01	1.91	<0.002			1.09	0.010		3.93	3.82	<0.1		
6-27-86	0.46						<0.01	20.4	3.8			<0.01					0.58	<0.01	4.3	0.018		<0.01	<0.01	0.4	<0.002			0.070	<0.01		1.413	1.399	<0.1	0.927	Snow melt Runoff
7-29-86								48.2	3.56										10.3					0.40				0.71			3.294	3.198		2.950	
10-15-86	0.38						<0.01	50.6	8.60			<0.01					0.245	<0.01	28.8	<0.01		<0.01	<0.01	0.8	<0.002			1.08	0.013		4.9627	5.1159	<0.01	-3.040	
4-23-87																																			Covered with Snow
6-15-87	<0.1						<0.01	38.8	4.2			<0.01					0.44	<0.01	9.4	0.012		<0.01	<0.01	0.5	0.0028			1.0	0.098		2.77	2.83	<0.1	2.74	
7-1-87								45.6	2.36										10.6					0.5				0.9			3.20	3.05		2.48	
9-8-87	<0.1		<0.01				<0.01	52	3.2			<0.01		0.1			0.23	<0.01	19.5	0.020		<0.01	<0.01	1.0	<0.002			0.2	0.102		4.24	4.11	<0.1	1.52	
4-22-88																																			Covered with Snow
5-31-88																																			
6-29-88	<0.1						<0.01	38.2	0.62			<0.01					0.155	<0.01	9.5	<0.01		<0.01	<0.01	0.4	<0.002			1.0	<0.01		2.74	2.53	<0.1	4.08	
7-28-88								59.3	3.58										17.1					0.7				1.2			4.44	4.31		1.45	
9-27-88																																			

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CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station VC-4
Location Whiskey Canyon Creek above Belina Mine

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-25-89	12:40	0.052	6	4	7.7							9.6		
5-23-89	15:50	0.088	15	6	7.4							8.6		
6-21-89	15:45	0.016	10	11	7.9							7.9	<0.5	
7-19-89	14:20	0.0004	25	17	7.8									
9-25-89	12:00	-0-												

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89	<0.2	0.125	<0.1			0.083		2.9			13		96		42	114			69.9		8.1			
5-23-89								8.5			74		86			98		0	62.9					
6-21-89								45.6			14	<0.1	197			148		0	243			29.8		
7-19-89								71					215			296		0	217					
9-25-89																								

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEXavalent CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	C-A / C+A = 100	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89	<0.1						<0.01	19.2	3.8			<0.01					0.85	<0.01	3.5	0.020		<0.01	<0.01	0.2	<0.002			3.8	0.215		<0.1	1.42	1.31	3.78	
5-23-89								15.7	1.9										4.9					0.6				1.2				1.25	1.26	0.29	
6-21-89								22.6	7.6										4.4					0.4				0.4				1.52	1.56	1.45	
7-19-89								46.5	5.2										31.7					0.3				0.9				4.97	5.18	2.03	
9-25-89																																			

R-7-87

CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE INC
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station VC-10
Location South Fork Eccles Creek above Eccles Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-25-89	11:30	0.73	6	4	7.0							9.8		
5-23-89	14:10	1.17	20	7	7.4							8.3		
6-21-89	16:18	0.32	15	14	7.5							7.9	<0.5	
7-19-89	13:40	0.13	26	18	7.7									
9-25-89	10:55	0.03	13	8	7.5							10.6	<0.5	

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HARDNESS as CaCO3	SURFACTANT as MBAS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-25-89	<0.2	0.304	<0.01			0.034		18.8		
5-23-89								100		
6-21-89								102		
7-19-89								138		
9-25-89								368		

DATE	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS TDS	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89	7.5		215		34	315			216		170			
5-23-89	6.5		166			280		0	172					
6-21-89	6.4	<0.1	323			329		0	228			<10		
7-19-89			344			359		8.8	232					
9-25-89	22	<0.1	721			1087		0	241		414	<10		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-25-89	<0.1						<0.01	55.7	6.9			<0.01		
5-23-89								40.9	4.5					
6-21-89								61.0	8.6					
7-19-89								43.8	4.9					
9-25-89								71.5	15.1					

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	C-A / C+A × 100	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89			0.32	<0.01	12.9	0.055		<0.01	<0.01	0.2	<0.008			4.7	0.255		<0.1	4.05	4.13	0.93	
5-23-89					34.1					0.6				0.8				4.90	5.03	1.32	
6-21-89					34.9					0.7				1.4				5.99	6.10	0.90	
7-19-89					58.6					0.7				1.2				7.08	7.11	0.21	
9-25-89			0.255		60.3	0.053				12.1				58.3				11.38	12.04	2.83	

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CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station VC-10
Location South Fork Eccles Creek above Eccles Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	μMHOS	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
7-1-87	09:25	0.43	17	10	7.6																	35.8			9.2		265			414			255					
9-7-87	10:50	0.17	15	7	8.3										0.44	0.072	0.0068			0.021		39			18		308		17	453			254	216	263			
4-22-88	13:00	0.29	8	1	7.1										0.22	0.66	0.010			0.015		27			11		267			393			257	211	234			
5-31-88	12:45	1.55	7	5	6.9																	7.3			66		150			290			156					
6-29-88	14:00	0.49	24	15	7.2																	15.4			8.0		187			384			215					
7-28-88	09:40	0.10	23	12	7.2																	25.6			6.4		235			393			194					
7-30-88	13:35		18									7.3	0.82	<0.001												<0.1										65		
8-23-88	09:30	0.08	3	2	7.6							10.8	<0.5									86.8			5.2	<0.1	304			439		0	236	194	252	86		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
7-1-87								70.2	4.38										25.4					1.2				2.0				5.72	5.65	6.21	
9-7-87	<0.1		<0.01				<0.01	50	6.1			<0.01		0.26			0.21	<0.01	38.2	0.025		<0.01	<0.01	1.9	<0.002			0.3	0.212		<0.1	5.70	5.12	5.14	
4-22-88	<0.1						<0.01	67.1	12.3			<0.01					0.18	<0.01	18.9	0.012		<0.01	<0.01	1.4	<0.002			3.0	<0.01		<0.1	5.08	5.12	0.42	3" New Snow - Overcast
5-31-88								39.4	1.13										12.1					1.3				1.4				3.06	2.74	5.56	
6-29-88								47.6	2.08										22.6					1.0				1.4				4.32	3.90	5.12	
7-28-88								58.8	3.73										13.5					0.9				2.1				4.17	3.82	4.36	
7-30-88																																			
8-23-88								69.5	2.9								0.055		28.4	<0.01				0.8				2.0				5.91	5.76	1.33	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-10
Location South Fork Eccles Creek above Eccles Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
2-21-83	12:15		3	3										0.017
4-21-83	11:20	0.9	6	3	8.1									<0.001
6-21-83	14:35	10.2	21	11	7.7									0.040
8-25-83	14:45	0.58	22	14	7.9								<0.1	0.030
10-19-83	15:00	0.34	10	2	7.6									<0.001
12-83					8.00									<0.001
3-27-84	10:40	-0-												
6-26-84	12:55	3.64	19	10	7.0									
9-26-84	15:55	0.39	16	7	7.1									
9-26-84	16:15	0.39	16	7	7.1									
4-27-85	13:20	1.76	13	7	8.2									
5-30-85	15:00	6.2	16	8	7.0									
6-17-85		7.5	20	14	7.5									
7-17-85	14:20	0.60	21	9	8.2									
10-1-85	17:00	0.41	10	3	7.5									
6-27-86	10:28	2.30	24	7	8.1									
7-29-86	11:00	0.87	18	7	7.2									
10-15-86	17:20	0.44	4	1	8.0									
4-23-87	11:55	1.32	19	6	7.2									
6-15-87	14:00	0.57	23	15	7.0									

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	BICARBONATE as HCO3	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L
2-21-83	0.02					0.120		85.0			38.0		356		
4-21-83	0.16					0.12		70.0			77.0		350		
6-21-83	<0.01					0.420		12.0			115		210		
8-25-83	<0.01	<0.01				0.40		11			88.0		250		
10-19-83	0.70					<0.02		56			15.0		290		
12-83	<0.10					0.10		44			23.0		330		
3-27-84															
6-26-84	<0.1					0.121		27.1			21		228		
9-26-84	<0.1	0.096	0.008			0.019		87.2			5		346		
9-26-84								85.6					357		
4-27-85								46.8			84		271		
5-30-85								26.8			34		207		
6-17-85	<0.1	0.082	0.017			0.051		29.2			18		232		55
7-17-85								33.8			16		310		
10-1-85	<0.1	0.080	<0.005			0.026		152			8.0		357		92
6-27-86	<0.1	0.431	0.010			0.033		47.8			17		168		62
7-29-86								56.1			8.4		459		
10-15-86	<0.1	0.204	0.011			0.020		83.8			2.0		361		18
4-23-87	0.15	0.52	0.011			0.083		47.8			9.0		393		22
6-15-87								33.3			4.4		260		

DATE	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
2-21-83	512			289.90					
4-21-83	467			290.40					
6-21-83	245			168.40					
8-25-83	469			261	214		<0.01		
10-19-83	496			258.64					
12-83	500			300.12					
3-27-84									
6-26-84	356			112	185				
9-26-84	367			274		237			
9-26-84	370			271		236			
4-27-85	327			242					
5-30-85	243			206					
6-17-85	363			205		200			
7-17-85	461			350					
10-1-85	430			172		334			
6-27-86	443			224	203	248			
7-29-86	524			222					
10-15-86	516			349	303	301			
4-23-87	429			366		264			
6-15-87	382			232					

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
2-21-83								81.60	5.10					
4-21-83								98.80	7.90					
6-21-83								44.80	4.00					
8-25-83			<0.001	0.456		0.080	<0.001	13.50	4.2	<0.001		<0.001		0.13
10-19-83								72.80	6.00					
12-83								78.40	16.00					
3-27-84														
6-26-84								65.7	3.4					
9-26-84	<0.1						<0.01	76.0	4.6			<0.01		
9-26-84								73.7	4.6					
4-27-85								70.2	5.2					
5-30-85								41.3	2.62					
6-17-85	<0.1						<0.01	48.9	3.4			<0.01		
7-17-85								81.6	5.6					
10-1-85	0.10						<0.01	64.5	5.2			<0.01		
6-27-86	<0.1						<0.01	59.2	7.7			<0.01		
7-29-86								51.8	3.56					
10-15-86	<0.1						<0.01	69.9	4.48			<0.01		
4-23-87	0.082						<0.01	60.1	5.6			<0.01		
6-15-87								51.2	3.4					

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
2-21-83			0.220		24.00	0.035				1.55				11.8	
4-21-83			1.070		21.12	0.070				1.40				12.0	
6-21-83			1.360		7.68	0.055				0.75				5.0	
8-25-83		0.775	1.330	0.005	8.15	0.049	<0.002			4.9	<0.001		<0.001	71.0	0.033
10-19-83			0.260		22.08	0.050				1.4				2.90	
12-83			0.270		23.04	0.120				1.9				10.20	
3-27-84															
6-26-84			0.83		14.8	0.02				1.10				2.45	
9-26-84			<0.01	<0.01	28.7	0.021		<0.1	<0.01	2.17				2.86	0.050
9-26-84					28.9					2.13				3.01	
4-27-85					15.8					1.48				1.02	
5-30-85					9.9					0.79				2.22	
6-17-85			0.22	<0.01	16.7	0.015		<0.01	<0.01	1.32	<0.002			1.72	<0.01
7-17-85					26.1					2.1				2.75	
10-1-85			0.31	<0.01	30.7	<0.01		<0.01	<0.01	3.32	<0.002			2.52	0.015
6-27-86			0.16	<0.01	18.8	0.015		<0.01	<0.01	1.4	<0.002			2.70	<0.01
7-29-86					24.5					1.40				1.92	
10-15-86			0.132	0.023	48.2	<0.01		<0.01	<0.01	1.0	<0.002			2.29	0.020
4-23-87			0.24	0.030	52.2	0.015		<0.01	<0.01	1.4	<0.002			1.6	<0.01
6-15-87					21.4					1.1				2.1	

DATE	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	meq/l	meq/l		
2-21-83						
4-21-83						Light snow shower
6-21-83						
8-25-83						
10-19-83						
12-83						
3-27-84						
6-26-84			4.63	2.50		
9-26-84		<0.1	6.33	6.43		
9-26-84			6.24	6.35		
4-27-85			4.89	5.09		
5-30-85			3.19	4.01		
6-17-85		<0.1	3.93	4.07		
7-17-85			6.33	6.60		
10-1-85		<0.1	5.96	6.13		
6-27-86		<0.1	4.654	4.885	-4.958	
7-29-86			4.720	4.908	-3.891	
10-15-86		<0.1	7.5904	7.5962	-0.208	
4-23-87		<0.1	7.40	7.16	-1.10	
6-15-87			4.44	4.59	1.68	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-10
Location South Fork Eccles Creek above Eccles Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
5-25-80	16:00	0.9	14	13	8.2	1100	2.0				7.00	8.1	0.60	<0.001
7-16-80	09:04	0.5	12	7	8.5									0.048
10-7-80	12:50	0.157	21	8	8.6									0.023
11-19-80	10:36		-6	0	7.5									<0.001
12-24-80	10:00		In-Accessible											
1-27-81	11:31		In-Accessible											
2-25-81	In-Accessible													
3-11-81	13:40	-0-												
4-8-81	13:27	-0-												
6-5-81		0.6	21	11	8.4									<0.001
8-26-81	16:16	0.2	17	14	8.4								2.20	<0.001
10-14-81	13:36	0.1	3	3	8.3									<0.001
12-23-81	13:11	-0-												
2-24-82	12:55	-0-												
4-14-82	13:44	-0-												
6-9-82	13:08	6.8	18	8	7.8									0.008
8-11-82	15:20	0.6	16	13	8.4									<0.001
10-13-82	13:45	0.8	10	3	8.2								<0.1	<0.001
12-21-82	13:35		4	1	8.1									<0.001

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L
5-25-80	<0.01	<0.01				0.120		25.0			16.0		235		
7-16-80	<0.01					0.080		20.0			17.0		225		
10-7-80	<0.01					0.060		6.0			6.0		212		
11-19-80	<0.01					0.170		12.0			14.0		278		
12-24-80															
1-27-81															
2-25-81															
3-11-81															
4-8-81															
6-5-81	<0.05					0.210		20.0			11.0		212		
8-26-81	<0.01	<0.01				0.290	0.110	15.0			4.0		230		
10-14-81	0.18					0.260		27.0			40.0		320		
12-23-81															
2-24-82															
4-14-82															
6-9-82	0.41					0.090		<0.1			41.0		166		
8-11-82	0.08					0.020		24.0			53.0		326		
10-13-82	0.02	0.05				0.100	0.050	69.0			25.0		336		
12-21-82	0.36					0.160		81.0			3.0		384		

DATE	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	PCI/L	PCI/L
5-25-80	360	7.20		251.32	210		<0.1	1.10	2.
7-16-80	350			241.56					
10-7-80	320			258.64					
11-19-80	260			334.78					
12-24-80									
1-27-81									
2-25-81									
3-11-81									
4-8-81									
6-5-81	300			224.48	190		<0.1		
8-26-81	290			248.88	204		14.00		
10-14-81				273.50					
12-23-81									
2-24-82									
4-14-82									
6-9-82	262			195.20	160				
8-11-82	433			277.80	227.70				
10-13-82				293.40	240.50		<0.01		
12-21-82	521			324.80					

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
5-25-80			<0.001	0.030		0.025	<0.001	59.60	<0.1	<0.001		<0.001	<0.001	0.014
7-16-80								62.40	1.7	<0.001				
10-7-80								59.20	0.4					
11-19-80								72.80	1.30					
12-24-80														
1-27-81														
2-25-81														
3-11-81														
4-8-81														
6-5-81								55.20	2.98					
8-26-81			0.003	0.030		0.020	<0.001	56.80	4.69	<0.001		<0.001		0.17
10-14-81								60.00	4.80					
12-23-81														
2-24-82														
4-14-82														
6-9-82								49.00	3.50					
8-11-82								64.80	50.20					
10-13-82			<0.001	0.035		0.070	<0.001	86.40	4.70	<0.001		0.010		0.12
12-21-82								88.00	4.80					

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
5-25-80		3.100	0.530	<0.001	20.64	0.040	<0.0002			0.89	0.002		<0.001	2.10	0.050		
7-16-80			0.215		15.36	0.026			<0.001	0.60				1.80			
10-7-80			0.420		12.96	0.033				1.01				6.00			
11-19-80			0.490		16.80	0.085				1.07				15.00			
12-24-80																	
1-27-81																	
2-25-81																	
3-11-81																	
4-8-81																	
6-5-81			0.120		15.84	0.030				0.87				2.10			
8-26-81		0.030	0.430	<0.001	18.72	0.070	<0.0002			1.22	0.004		<0.001	2.30	0.010		
10-14-81			0.440		16.32	0.031				1.20				17.00			
12-23-81																	Frozen
2-24-82																	Frozen
4-14-82																	Frozen
6-9-82		0.130	0.360		8.80	0.050				0.58				1.90			
8-11-82					24.00	0.035				0.65				27.0			
10-13-82			0.190	<0.001	22.56	0.030	<0.0002			1.76	0.006		<0.001	2.6	0.003		
12-21-82			0.360		24.48	0.030				1.65				15.0			

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station YC-10
Location Left Fork Eccles Creek above Right Fork

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL RETURNABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL VOLATILE SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°F		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
6-14-78	16:30	8.5	22	9	7.3						27.0	9.0	<1.0	0.002	0.10	0.18	<0.01	0.14			0.021	4.0			89.0		139			210			251.28					
7-12-78	14:45	1	21	16	8.3							7.4	<1.0									15.0			6.0		205			346			219.6					
8-23-78	14:15	0.2	20	12	8.0						22.0	8.1	2.2	0.004								10.0			4.0		200			305			241.5					
10-25-78	11:50	0.3	3	0.5	7.4							11.3	<1.0	0.011								19.0			4.0		231			420			260.8					
11-8-78	10:45	0.3	2	0.2	7.5						11.0	11.4				0.12	<0.01	0.11			0.025	12.0			9.0		245			425			283.04					
12-29-78	11:05	0.2	-2	2	7.65						4.0	10.9	1.0	<0.001		0.26	<0.01	0.10			0.020	14.0			18.0		256			395			290.36					
2-28-79	12:13		In-accessible																																				
4-18-79	11:55		In-accessible																																				
5-11-79	15:28	0.9	0	2.5	8.4						8.0	9.3	1.6	0.076	<0.10	1.32				0.06		5.0			11.0		270			410	5.50		280.16	230		6.0		
6-20-79	11:00	3.8	16	5.5	8.18	70.0	<2.0				<1.00	8.7	<1.0	<0.001	<0.01	0.05				0.040	0.010	10.0			7.0		196			340	6.00		222.04	182		2.0	2.5	12.0
7-18-79	10:52	1.2	24	9.0	7.72						12.0	8.0	<1.0	0.010	<0.01	0.10				0.030		5.0			7.0		225			420	4.20	<0.01	248.40	220		28.0		
9-26-79	17:20	0.6	16	8.5	7.70						1.0	6.8		<0.001	<0.01	0.03				0.020		10.0			4.0		227			380	4.40		265.96	218		19.0		
10-31-79	12:13	0.15	-1	0	7.9							9.4	1.0	<0.001		<0.01					0.060	31.0			24.0		275						270.84	222		24.0		
11-30-79	12:00	0.3	-5	0.3	7.3							10.2		0.010	<0.01					0.060		21.0			6.5		259			430			280.60					
2-27-80			In-Accessible																																				
3-27-80			In-Accessible																																				
4-23-80			In-Accessible																																				
5-14-80	11:23	7.6	10.0	2	9.2							9.9		0.046	<0.01					0.100		50.0			13.0		238			375			234.24					
6-25-80	08:52	7.0	12	4.5	9.2							9.9		0.002	<0.01					0.040		7.2			4.0		190			290			202.52					
9-21-80	12:50	2.2	28	13	8.7									0.021	<0.01					0.030		4.5			7.0		212			320			244.56					

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX. as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL				COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L				
6-14-78			<0.001				<0.001	41.6	8.0	0.001		<0.001		0.13			0.519	<0.001	7.68	0.022	<0.0002			0.577	<0.001	3.90	<0.001	2.00	0.003				
7-12-78			<0.001					26.4	<1.0								0.045	<0.001	5.76	0.005	<0.0002			0.914	<0.001		<0.001	47.0	0.018				
8-23-78			<0.001					52.8	<0.10			0.002		0.13			0.052	<0.001	18.2	0.016	<0.0002			0.937	<0.001		<0.001	2.05	0.015				
10-25-78			<0.001				<0.001	59.2	<1.0	<0.001		0.003		0.14			0.086	<0.001	20.10	0.004	<0.0002			0.890	<0.001			3.2	0.019				
11-8-78			<0.001	0.030			<0.001	66.4	2.0	<0.001		0.002	<0.01	0.12			0.119		19.2	0.019				1.027	<0.001	5.05	<0.001	2.24	0.002				
12-29-78			<0.001	0.026			<0.001	18.24	6.0	<0.001		0.003		0.15			0.079	<0.001	18.24	0.012				0.939	<0.001	5.50	<0.001	4.30	0.003				
2-28-79																																		
4-18-79																																		
5-11-79			<0.001	0.040		0.080	<0.001	68.0	6.0	0.003		0.003	<0.001	0.11		0.023	0.350	0.002	13.92	0.007	<0.0002			1.002	<0.001		<0.001	6.30	0.011				
6-20-79			<0.001	0.045		0.090	<0.001	54.4	<1.0	0.002		0.003	<0.001	0.15		0.020	0.260	0.002	12.48	0.009	<0.0002			0.691	<0.001		0.002	1.71	0.016				
7-18-79			<0.001	0.030		0.090	<0.001	64.80	2.0	0.002		0.006	<0.001	0.15		0.050	0.230	<0.001	13.92	0.022	<0.0002			0.902	<0.001		0.001	2.02	0.017				
9-26-79			<0.001	0.050		0.050	<0.001	63.85	2.0	<0.001		0.015	<0.001	0.19		0.030	0.540	<0.001	14.10	0.036	<0.0002			0.530	<0.001		<0.001	4.90	0.055				
10-31-79			<0.001	0.034		0.030	<0.001	68.80	4.0	<0.001		0.016		0.15			0.310	<0.001	16.80	0.050	<0.0002			2.800	<0.001		<0.001	8.50	0.022				
11-30-79								76.00	2.0								0.400		14.88	0.074				1.014				2.16					
2-27-80																																		
3-27-80																																		
4-23-80																																		
5-14-80								[illegible]	[illegible]								0.235		[illegible]	[illegible]				[illegible]				[illegible]						
6-25-80								[illegible]	[illegible]								0.[illegible]		[illegible]	[illegible]				[illegible]				[illegible]						
9-21-80								[illegible]	[illegible]								0.235		[illegible]	[illegible]				0.418				1.2[illegible]						

A 1-78

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-1D
Location South Fork Eagles Creek above Eagles Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY	
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L	

DATE	ALUMINUM DISS.	ANTIMONY DISS.	ARSENIC DISS.	BARIUM DISS.	BERYLLIUM DISS.	BORON DISS.	CADMIUM DISS.	CALCIUM DISS.	CHLORIDE DISS.	CHROMIUM HEX.as CR.	COBALT DISS.	COPPER DISS.	CYANIDE as Cn	FLUORIDE DISS.	GERMANIUM DISS.	IRON DISS.	IRON TOTAL	LEAD DISS.	MAGNESIUM DISS.	MANGANESE DISS.	MERCURY DISS.	MOLYBDENUM DISS.	NICKEL DISS.	POTASSIUM DISS.	SELENIUM DISS.	SILICA as SiO_2	SILVER DISS.	SODIUM DISS.	ZINC DISS.	VANADIUM DISS.	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
11-8-79																															
12-27-79																															
2-28-79																															
4-18-79																															
5-11-79			<0.001	0.02		0.070	<0.001			<0.001		0.002						<0.001							<0.001		<0.001		0.004		
6-11-79			<0.001	0.040		0.015	<0.001			<0.001		<0.001					0.260	<0.001							<0.001		<0.001		0.004		
7-18-79			<0.001	0.020		0.075	<0.001			<0.001		0.006						<0.001							<0.001		<0.001		0.009		
8-28-79			<0.001	0.012		0.002	<0.001			0.002		0.008				0.046	0.250	<0.001							<0.001		<0.001		0.003		
9-26-79			<0.001	0.025		0.020	<0.001			<0.001		0.009						<0.001							<0.001		<0.001		0.010		

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CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station VC-11
Location Boardinghouse Creek above Spring houses

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-25-89	10:37	1.24	6	3	7.4							9.4		
5-23-89	10:26	1.30	17	7	7.3							8.5		
6-21-89	10:40	0.63	5	6	7.1							8.9	<0.5	
7-19-89	8:55	0.33	13	9	7.5									
9-25-89	12:25	0.226	20	8	7.6							10.5	<0.5	

DATE	NITROGEN AMMONIA as NH_3-N	NITRATE as NO_3-N	NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL RETRIEVABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89	<0.2	0.243	<0.01			0.059		18.3			15		196		59	320			188		178			
5-23-89								13.0			7.0		164			296		0	177					
6-21-89								29.0			8.0	<0.1	234			399		0	258			<10		
7-19-89								76					300			500		0	307					
9-25-89								33			2.5	<0.1	276			510		0	317		269	<10		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	C-A / C+A = 100	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89	<0.1						<0.01	46.8	8.1			<0.01					0.76	0.030	12.0	0.085		<0.01	<0.01	1.2	<0.002			5.8	0.255		<0.1	3.61	3.69	1.10	
5-23-89								40.2	5.4										42.2					0.7				1.8				5.57	5.76	1.63	
6-21-89								47.1	11.3										28.5					0.8				2.0				4.80	5.15	3.50	
7-19-89								51.9	7.3										47.9					0.9				3.2				6.69	6.82	0.93	
9-25-89								70.2	8.2								0.310		35.4	<0.01				1.1				4.0				6.62	6.11	3.96	

R-7-87

CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station VC-11
Location Boardinghouse Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
5-31-88	11:15	1.87	8	7	6.9																	10.9			16		148			281			155					
6-28-88	17:50	0.80	11	10	7.9																	14.1			72		242			386			234					
7-28-88	14:05	0.51	19	16	7.6																	43.7			7.2		308			458			188					
7-30-88	12:30		22									6.8	<0.5	<0.001												<0.1										102		
8-28-88	11:20	0.39	7	7	6.9							10.1	<0.5									76.4			5.2	<0.1	301			459		0	252	207	258	92		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
5-31-88								38.1	2.26										12.9					1.3				1.8				3.08	2.83	4.23	
6-28-88								49.9	3.12										31.2					1.4				2.2				5.19	4.63	5.69	Light Rain
7-28-88								45.5	5.94										22.3					1.6				2.5				4.26	4.16	1.23	
7-30-88																																			
8-28-88								66.3	3.3								0.120		31.8	<0.01				1.7				3.1				6.10	5.81	2.43	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-11
Location Boardinghouse Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
6-21-83	13:00	12.8	20	11	7.4									0.320
8-24-83	16:35	2.55	12	15	7.3								<0.1	0.145
10-19-83	11:15	0.65	9	4	7.4									<0.001
12- -83	Inaccessible													
3-27-84	11:40		Inaccessible											
6-26-84	14:45	8.42	22	14	7.6									
9-26-84	10:55	1.6	14	7	7.5									
4-27-85	11:12		Inaccessible											
5-30-85	10:30	6.9	9	12	7.6									
6-17-85	12:00	2.96	24	17	7.9									
7-17-85	09:20	1.03	18	13	7.9									
10-1-85	13:55	0.98	14	6	7.3									
6-28-86	15:30	4.50	23	12	7.4									
7-29-86	12:30	1.53	21	16	7.0									
10-15-86	16:40	1.24	6	5	6.9									
4-23-87	13:47	3.05	16	9	7.5									
6-15-87	09:30	0.49	20	13	7.2									
7-1-87	13:05	0.62	22	10	7.5									
9-8-87	11:40	0.27	16	9	8.2									
4-22-88	11:15	0.66	3	4	7.1									

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROGEN as pH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL RETURNABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
6-21-83	<0.01					0.520		12.0			201		134			207			134.30					
8-24-83	<0.01	<0.01				0.47		13			140		255			397			268.40	220		<0.01		
10-19-83	1.25					0.03		34			123		288			451			285.48					
12- -83																								
3-27-84																								
6-26-84	<0.1					0.095		19.1			32		184			302			89	146				
9-26-84	<0.1	0.173	0.006			0.027		24.8			8		285			263			310		199			
4-27-85																								
5-30-85								18.8			56		170			172			142					
6-17-85	<0.1	0.197	0.025			0.034		24.3			17		200		49	201			175		180			
7-17-85								22.2			15		300			347			325					
10-1-85	<0.1	0.110	<0.005			0.035		38.3			1.6		286		63	359			245		279			
6-28-86	<0.1	0.083	0.010			0.033		25.9			10		114		31	436			184	151	203			
7-29-86								26.7			6.4		459			404			202					
10-15-86	<0.1	0.232	0.0093			<0.01		29.4			3.2		331		18	465			390	323	257			
4-23-87	0.17	0.44	0.045			0.158		21.3			76		385		32	306			397		178			
6-15-87								27.4			8.0		291			369			214					
7-1-87								32.4			21		282			458			227					
9-8-87	0.047	0.11	0.0054			0.048		31			9.9		259		15	440			302	248	255			
4-22-88	<0.1					0.016		30			9.0		314			426			268	224	153			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
6-21-83								35.20	4.00					
8-24-83			<0.001	0.670		0.140	<0.001	33.40	3.7	<0.001	<0.001			0.12
10-19-83								71.20	4.00					
12- -83														
3-27-84														
6-26-84								51.5	4.0					
9-26-84	<0.1						<0.01	75.0	5.8			<0.01		
4-27-85														
5-30-85								38.5	3.20					
6-17-85	<0.1						<0.01	42.9	4.3			<0.01		
7-17-85								73.9	3.8					
10-1-85	<0.1						<0.01	64.3	6.5			<0.01		
6-28-86	0.11						<0.01	48.9	6.6			<0.1		
7-29-86								48.5	5.28					
10-15-86	<0.1						<0.01	66.7	4.69			<0.01		
4-23-87	0.48						<0.01	80.8	5.2			<0.01		
6-15-87								58.1	3.7					
7-1-87								52.4	7.02					
9-8-87	<0.1		<0.01				<0.01	66	7.4			<0.01		<0.1
4-22-88	<0.1						<0.01	65.8	9.2			<0.01		

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	C-A / C+A × 100	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	meq/l	meq/l		
6-21-83			2.100		5.76	0.095				0.85				5.8							
8-24-83		0.655	1.880	<0.001	4.98	0.088	<0.0002			0.7	<0.001		<0.001	59.0	0.050						
10-19-83			0.170		21.60	0.030				1.6				3.20							
12- -83																					Covered with Snow
3-27-84																					Covered with Snow
6-26-84			0.82		11.6	0.02				1.13				2.76				3.66	1.97		
9-26-84			<0.01	<0.01	21.9	0.027		<0.1	<0.01	1.49				3.32	0.050		<0.1	5.73	5.76		
4-27-85																					Covered with Snow
5-30-85					9.4					1.08				2.56				2.83	2.81		
6-17-85			0.20	<0.01	13.1	0.010		<0.01	<0.01	0.90	<0.002			1.94	0.01		<0.1	3.33	3.50		
7-17-85					20.5					1.3				3.22				5.56	5.90		
10-1-85			0.19	<0.01	23.1	<0.01		<0.01	<0.01	2.37	<0.002			2.98	0.013		<0.1	5.31	5.00		
6-28-86			0.18	<0.01	13.7	0.015		<0.01	<0.01	0.9	<0.002			2.62	0.012		<0.1	3.705	3.743	-1.030	
7-29-86					19.6					1.08				1.64				4.132	4.016	2.850	
10-15-86			0.095	0.030	41.2	<0.01		<0.01	<0.01	1.2	<0.002			2.49	0.015		<0.01	6.854	7.341	-6.707	
4-23-87			2.16	0.028	46.1	0.058		<0.01	<0.01	1.2	<0.002			1.6	<0.01		<0.1	7.43	7.10	-1.55	
6-15-87					22.0					1.0				2.7				4.86	5.00	1.47	
7-1-87					25.3					1.1				2.4				4.83	4.57	2.55	
9-8-87			0.021	<0.01	35.2	0.020		<0.01	<0.01	1.6	<0.002			0.3	0.030		<0.1	6.25	5.80	3.69	
4-22-88			0.34	<0.01	22.3	<0.01		<0.01	<0.01	1.3	<0.002			3.7	0.048		<0.1	5.32	5.28	0.41	3" New Snow-Correct

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-11
Location Beardinghouse Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
2-27-80	In-Accessible													
4-29-80	In-Accessible													
6-25-80	10:36	6.5	22	9	8.8							8.5		0.016
8-25-80	13:10	1.7	17	10	8.4							8.3	<0.01	<0.001
10-7-80	12:28	0.9	21	8	8.5									0.014
12-10-80	15:13		In-Accessible											
2-25-81	In-Accessible													
4-8-81	12:49		In-Accessible											
6-24-81	10:28	0.6	25	15										<0.001
8-26-81	09:48	0.5	23	14									1.60	<0.001
10-14-81	13:06	0.5	3	4	7.8									<0.001
12-23-81	12:45		-11	2	7.9									<0.001
2-24-82		-0-												
4-14-82	13:22		In-Accessible											
6-9-82	11:32	5.0	10	9	7.6									<0.001
8-11-82	10:00	1.2	19	13	8.1									<0.001
10-13-82	10:40	0.7	9	4	7.7								0.2	<0.001
12-21-82	In-Accessible													
2-21-83	In-Accessible													
4-21-83	In-Accessible													

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
2-27-80																								
4-29-80																								
6-25-80	<0.01					0.070		22.0			33.0		145			230			131.04					
8-25-80	<0.01	0.04				0.060	0.006	16.5			19.0		268			410			266.40	224		<0.1		
10-7-80	<0.01					0.070		3.0			8.0		252			390			309.88					
12-10-80																								
2-25-81																								
4-8-81																								
6-24-81	0.10					0.080		39.0			11.0		258			310			294.44	210		<0.01		
8-26-81	<0.01	<0.01				0.280	0.060	34.0			4.0		285			360			285.48	224		16.00		
10-14-81	0.22					0.280		21.0			51.0		310			470			328.18					
12-23-81	2.70					0.440		32.0			26.0		295			260			304.80	248.84				
2-24-82																								
4-14-82																								
6-9-82	0.39					0.160		3.0			30.0		155			255			130.50	148				
8-11-82	0.12					0.020		3.0			75.0		283			382			295.70	242.46				
10-13-82	0.02	0.15				0.180	0.090	15.0			63.0		265			459			291.60	239		<0.01		
12-21-82																								
2-21-83																								
4-21-83																								

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
2-27-80														
4-29-80														
6-25-80								27.60	<0.1					
8-25-80			<0.001	0.030		0.010	<0.001	70.40	18.0	<0.001		<0.001		0.14
10-7-80								65.60	2.2					
12-10-80														
2-25-81														
4-8-81														
6-24-81								56.00	4.42					
8-26-81			0.003	0.050		0.020	<0.001	71.20	6.67	<0.001		0.010		0.16
10-14-81								43.20	5.90					
12-23-81								77.50	4.78					
2-24-82														
4-14-82														
6-9-82								44.00	3.50					
8-11-82								36.00	35.30					
10-13-82			<0.001	0.035		1.090	<0.001	68.00	2.50	<0.001		0.020		0.12
12-21-82														
2-21-83														
4-21-83														

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
2-27-80																	
4-29-80																	
6-25-80			0.660		9.60	0.040				0.87				2.20			
8-25-80		0.050	0.400	<0.001	15.84	0.020	<0.0002			1.19	<0.001		<0.001	7.00	0.002		
10-7-80			0.390		18.24	0.026				1.47				8.00			
12-10-80																	
2-25-81																	
4-8-81																	
6-24-81			0.730		22.56	0.040				1.27				7.80			
8-26-81		<0.001	0.880	<0.001	23.04	0.050	<0.0002			1.67	0.005		<0.001	3.60	0.010		
10-14-81			0.920		16.32	0.046				1.65				5.400			
12-23-81			0.025		23.00	0.009				0.86				2.10			
2-24-82																	Frozen - Inaccessible Snow
4-14-82																	Snow
6-9-82		0.150	0.880		9.40	0.050				0.75				2.3			
8-11-82			0.630		33.60	0.065				0.88				29.0			
10-13-82		0.995	1.600	<0.001	19.20	0.050	<0.0002			1.48	0.005		<0.001	2.8	0.020		
12-21-82																	Snow
2-21-83																	Snow
4-21-83																	Snow

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CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station VC-12
Location Finn Canyon Creek above Clear Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL METHYLENE SOLIDS	SOLIDS TDS	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89	10:00	0.153	8	5	8.2							8.6			<0.2	0.255	<0.01			0.055		17.8			8.5		205		67	329			216		174			
5-23-89	09:38	0.424	16	8	7.7							9.2										89.8			11		154			242		0	172					
6-21-89	09:40	0.101	5	7	7.3							7.8	<0.5									88			8.4	<0.1	218			283		0	228			<10		
7-19-89	08:30	0.002	18	9	7.3																	48					321			347		0	320					
9-25-89	15:20	0.0004	19	10	7.8							7.9	<0.5									45			61	<0.1	354			544		0	341		314	<10		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	C-A / C+A = 100	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89	<0.1						<0.01	51.6	7.9			<0.01					0.44	0.065	14.8	0.045		<0.01	<0.01	0.8	<0.002			4.6	0.315		<0.1	4.01	4.13	1.48	
5-23-89								32.1	3.2										39.1					0.7				1.4				4.90	4.78	1.23	
6-21-89								53.2	10.9										33.2					0.6				2.1				5.49	5.88	3.37	
7-19-89								31.8	6.4										58.9					1.4				1.9				6.55	6.42	0.98	
9-25-89								78.8	7.7								0.770		39.8	0.060				1.4				3.9				7.41	6.74	4.73	

R-7-87

CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station VC-12
Location Finn Canyon Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH3-N	NITROGEN NITRATE as NO3-N	NITROGEN NITRITE as NO2-N	NITROGEN TOTAL KELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO4-P	PHOSPHATE ORTHO as PO4-P	SULFATE as SO4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND	TURBIDITY	CARBONATE ALK. as CO3	BI-CARBONATE ALK. as HCO3	TOTAL ALK. as CaCO3	TOTAL HARDNESS as CaCO3	ACIDITY as CaCO3	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
5-31-88	10:30	0.81	5	4	7.1																	2.3			11		105			226			131					
6-28-88	18:20	0.171	11	11	7.6																	15.3			39		171			325			205					
7-28-88	16:45	0.008	22	12	7.6																	155			16		405			549			225					
7-30-88	12:40		20									5.2	<0.5	<0.001												<0.1										79		
9-28-88	11:00	0.00003	8	4	7.1							6.9	<0.5									75.6			47	<0.1	387			580		0	327	268	318	90		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEXav CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
5-31-88								22	1.69										10.8					1.6				2.0				2.12	2.24	2.76	
6-28-88								43.6	2.37										20.2					1.8				2.0				3.98	3.75	3.02	Raining
7-28-88								77.8	5.84										35.6					2.0				3.2				7.01	7.08	0.47	
7-30-88																																			
9-28-88								75.9	2.9									1.07	36.4	0.048				2.1				4.0				7.01	7.02	0.03	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-12
Location Finn Canyon Creek

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
6-21-83	12:20		22	9	8.0									<0.001
8-24-83	16:20	0.38	15	11	7.3								<0.1	<0.001
10-19-83	09:25	0.08	5	4	7.4									<0.001
12- -83	Inaccessible													
3-27-84	11:43		Inaccessible											
6-26-84	16:10	3.01	15	9	7.4									
9-26-84	10:40	0.16	11	7	8.1									
4-27-85	10:45		Inaccessible											
5-30-85	10:02	3.8	7	5	7.5									
6-17-85	11:30	1.26	23	11	7.7									
7-17-85	09:00	0.22	18	12	7.9									
10-1-85	14:15	0.15	14	6.5	7.3									
6-27-86	12:25	1.15	26	12	8.3									
7-29-86	12:45	0.18	21	10	7.1									
10-15-86	16:56	0.20	6	5	7.5									
4-23-87	13:00	0.74	16	7	7.4									
6-15-87	09:00	0.24	20	11	7.7									
7-1-87	12:35	0.10	21	10	7.4									
9-9-87	11:35	0.04	14	8	8.2									
4-22-88	10:50	0.04	4	5	7.2									

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC CONO.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM
6-21-83	<0.01					0.500		21.0			228		212			193
8-24-83	<0.01	<0.01				0.51		19			174		247			442
10-19-83	0.60					0.04		38			10.0		300			488
12- -83																
3-27-84																
6-26-84	<0.1					0.095		15.3			24		165			225
9-26-84	<0.1	0.074	0.006			0.037		43.8			6		304			166
4-27-85																
5-30-85								16.2			109		186			167
6-17-85	<0.1	0.068	0.019			0.044		13.1			24		150		43	258
7-17-85								17.8			5.2		276			256
10-1-85	<0.1	0.083	<0.005			0.055		42.8			<1		319		77	363
6-27-86	<0.1	0.213	0.011			0.045		22.4			10		146		22	355
7-29-86								38.1			2.8		330			497
10-15-86	<0.1	0.108	0.0087			0.111		49.7			104		397		29	542
4-23-87	<0.1	0.38	0.033			0.114		21.6			11		296		23	397
6-15-87								18.6			4.4		247			292
7-1-87								18.7			19		276			403
9-9-87	0.22	0.051	0.0061			0.078		35			42		371		30	523
4-22-88	<0.1	0.47	0.010			0.028		60			9.0		322			510

DATE	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
6-21-83			136.60					
8-24-83			283	232		<0.01		
10-19-83			307.44					
12- -83								
3-27-84								
6-26-84			83	135				
9-26-84			318		215			
4-27-85								
5-30-85			51.4					
6-17-85			148		164			
7-17-85			328					
10-1-85			278		295			
6-27-86			166		175	136		
7-29-86			258					
10-15-86			436	357	320			
4-23-87			459		233			
6-15-87			221					
7-1-87			234					
9-9-87			341	279	317			
4-22-88			334	276	200			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
6-21-83								35.20	12.00					
8-24-83			<0.001	0.390		0.140	<0.001	36.50	10.8	<0.001	<0.001			0.13
10-19-83								73.60	6.00					
12- -83														
3-27-84														
6-26-84								46.5	3.1					
9-26-84	<0.1						<0.01	80.2	5.0			<0.01		
4-27-85														
5-30-85								18.9	3.67					
6-17-85	<0.1						0.015	37.8	4.2			<0.01		
7-17-85								86.1	4.0					
10-1-85	<0.1						<0.01	68.6	6.2			<0.01		
6-27-86	0.011						<0.01	42.7	7.0			<0.01		
7-29-86								60.2	4.53					
10-15-86	<0.1						<0.01	76.2	5.47			<0.01		
4-23-87	0.17						<0.01	83.6	4.8			<0.01		
6-15-87								48.6	4.6					
7-1-87								50.4	7.02					
9-9-87	<0.1		<0.01				<0.01	72	8.4			<0.01		0.10
4-22-88	<0.1						<0.01	79.8	8.5			<0.01		

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
6-21-83			2.900		5.76	0.095				0.83				16.8			
8-24-83		1.445	3.010	<0.001	5.60	0.090	<0.0002			0.9	<0.001		<0.001	67.0	0.045		
10-19-83			0.230		24.96	0.030				1.8				4.60			
12- -83																	
3-27-84																	
6-26-84			1.01		10.4	<0.01				0.95				2.89			
9-26-84			0.025	<0.01	24.2	0.027		<0.1	<0.01	1.65				4.15	0.041		<0.1
4-27-85																	
5-30-85					2.2					0.78				2.95			
6-17-85			0.33	<0.01	11.4	<0.01		<0.01	<0.01	0.79	<0.002			1.93	<0.01		<0.1
7-17-85					21.1					1.2				3.68			
10-1-85			0.19	<0.01	26.6	<0.01		<0.01	<0.01	2.42	<0.002			3.86	0.018		<0.1
6-27-86			0.20	<0.01	13.0	<0.01		<0.01	<0.01	0.8	<0.002			2.51	<0.01		<0.1
7-29-86					22.8					1.17				2.82			
10-15-86			0.105	0.055	50.8	0.015		<0.01	<0.01	1.3	<0.002			3.44	0.020		<0.01
4-23-87			0.36	0.030	48.4	<0.01		<0.01	<0.01	1.1	<0.002			2.8	<0.01		<0.1
6-15-87					13.5					0.9				2.9			
7-1-87					23.4					1.1				2.6			
9-9-87			0.68	<0.01	41.1	0.038		<0.01	<0.01	1.8	<0.002			0.3	0.038		<0.1
4-22-88			0.44	<0.01	29.8	<0.01		<0.01	<0.01	1.9	<0.002			4.7	0.031		<0.1

DATE	MAJOR CATIONS	MAJOR ANIONS	C-A / C+A X 100	COMMENTS
	meq/l	meq/l		
6-21-83				
8-24-83				Scattered rain showers
10-19-83				
12- -83				Covered with Snow
3-27-84				Covered with Snow
6-26-84	3.33	1.77		
9-26-84	6.22	6.26		
4-27-85				Covered with Snow
5-30-85	1.27	1.28		
6-17-85	2.92	2.82		
7-17-85	6.24	5.78		
10-1-85	5.85	5.62		
6-27-86	3.334	3.389	-1.646	
7-29-86	5.033	5.150	-2.303	
10-15-86	8.673	8.390	-2.105	
4-23-87	8.30	8.11	-0.84	
6-15-87	4.10	4.14	-0.47	
7-1-87	4.59	4.42	1.81	
9-9-87	7.04	6.55	3.56	
4-22-88	6.70	6.96	1.95	3" New Snow - Overcast

R 1-78

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station VC-12
Location Finn Canyon Creek

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROGEN ION as pH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
2-27-80	In-Accessible																																					
4-29-80	In-Accessible																																					
6-25-80	10:20	4.2	20	6.5	8.7							8.2		<0.002	<0.01					0.080		16.0			30.0		125			210			117.12					
8-25-80	12:53	0.3	13	9	7.9							6.7	<0.01	<0.001	0.11	<0.01				0.550	0.040	13.5			20.0		228			370			251.32	206		6.0		
10-1-80	12:13	0.004	20	10	8.4									<0.001	<0.01					0.060		15.0			1.0		318			490			363.44					
12-10-80	15:08	-0-																																				
2-25-81		-0-																																				
4-8-81	12:41	-0-																																				
6-24-81	10:15	0.4	24	13	8.6									<0.001	<0.05					0.130		14.9			3.0		159			209			175.08	149		<0.01		
8-26-81	09:36	-0-																																				
10-14-81	10:35	-0-																																				
12-23-81	11:50	In-Accessible																																				
2-24-82		-0-	In-Accessible																																			
4-14-82		-0-	In-Accessible																																			
6-9-82	11:18	3.8	18	6	7.6									0.003	0.42					0.080		6.8			36.0		149			158			163	133.6				
8-11-82	09:50	0.04	18	12	8.0									<0.001	0.09					0.080		3.6			21.0		292			335			269	220.50				
10-13-82	10:13	0.06	7	3	7.8								2.4	<0.001	0.06	0.07				0.100	0.050	18.0			7.0		260			390			280.10	229.60		5.00		
12-21-82	In-Accessible																																					
2-21-83	In-Accessible																																					
4-21-83	In-Accessible																																					

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	COMMENTS
2-27-80																															
4-29-80																															
6-25-80								30.40	<0.1								0.700		2.110	0.020				0.68				2.10			
8-25-80			<0.001	0.030		0.020	<0.001	62.40	12.0	<0.001		0.010		0.15		0.040	2.700	<0.001	16.80	0.020	<0.0002			1.28	<0.01		<0.01	3.50	0.004		
10-1-80								79.20	4.2								8.200		22.08	0.031				1.86				13.00			
12-10-80																															
2-25-81																															
4-8-81																															
6-24-81								44.80	2.63								0.020		11.52	0.010				0.58				1.70			
8-26-81																															
10-14-81																															
12-23-81																															Snow
2-24-82																															Frozen - Snow
4-14-82																															Snow
6-9-82								0.41	1.60							0.130	0.230		8.70	0.045				0.64				2.2			
8-11-82								49.60	49.30								0.210		23.04	0.025				0.65				33.0			
10-13-82			<0.001	0.030			<0.001	64.80	4.00	<0.001		0.010		0.11		0.045	0.110	<0.001	17.28	0.015	<0.001			1.88	<0.001		<0.001	8.0	0.002		
12-21-82																															Snow
2-21-83																															Snow
4-21-83																															Snow

R 1-78

CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station S 7-11
Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	CHLORIDE as Cl	SURFACTANT as MBAS	SOLIDS TDS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC CONO.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	μMHOS	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89	11:00		Inaccessible																																				
5-23-89	11:30		Inaccessible																																				
6-21-89	12:37	0.013	7	7	7.8																	8.8					86			89		0	55.8		8.2	35.4		
7-19-89	10:30	0.0003	21	16	7.4																	7.1					193			299		0	176					
9-25-89	17:40	Seep		10	7.6																	16.4					284			410		0	199		210			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A}$ = 100	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89																																			Road impassible - Snow
5-23-89																																			Road impassible - Snow
6-21-89								24.4	7.9							<0.01		<0.01	2.4					0.2				0.8				1.45	1.32	4.84	
7-19-89								42.4	11.4										9.6					<0.1				1.28				3.46	3.35	1.59	
9-25-89								50.8	15.7							<0.01	0.455		18.2	0.020				1.0				4.2				4.24	4.05	2.35	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S7-11
Location

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	CARBONATE as MG/L	SOLIDS T.S.S. MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	SPECIFIC COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
9-26-84	12:25	0.001	8	8	7.2										<0.1	2.56	0.014				0.036	20.2					253			215			230		175			
4-27-85			Inaccessible																																				
5-30-85	11:35		Inaccessible																																				
6-18-85	12:00	0.078	17	2	6.7										<0.1	1.32	0.036				0.051	15.2					180			124			88		64			
7-17-85	11:08	0.002	21	13	6.8																	17.2					239			326			255					
10-1-85	12:20	0.001	5	2	7.2										<0.1	0.992	0.016				0.048	27.4					243			338			190		224			
6-27-86	15:00		Inaccessible																																				
7-29-86	15:50	0.005	20	12	7.5																	<0.5					203			64			102					
10-15-86	15:40	0.001	4	3	6.6										<0.1	0.421	0.0125				0.016	8.6					252			246			292	239	194			
4-23-87	14:00		In-Accessible																																				
6-17-87	09:30		In-Accessible																																				
7-1-87	14:40	0.002	18	12	7.5										<0.1	1.47	0.008				0.012	1.3					209			339			148		167			
9-9-87	12:30	0.001	14	10	8.1										0.11	1.50	0.0081				<0.01	18					351			465			262	215	260			
4-22-88			Inaccessible																																				
5-31-88			Inaccessible																																				
6-29-88	10:30	0.003	19	11	7.6										0.14	0.41	0.012				0.018	1.9					91			174			88.6		83.3			
7-28-88	13:15	0.003	20	17	7.8																	67.5					274			371			186					
8-23-88	14:15	0.0003	15	7	6.8																	38.2					318			441		0	218	178	254			

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX. as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	SULFIDE as S MG/L	MAJOR CATIONS meq/l	MAJOR ANIONS meq/l	C-A / C+A x 100	COMMENTS
9-26-84	<0.1						<0.01	69.9	10.9			<0.01				<0.01		<0.01	11.0	0.034		<0.1	<0.01	0.53				3.72	0.055			4.57	4.50		
4-27-85																																				Covered with Snow
5-30-85																																				Covered with Snow
6-18-85	<0.1						<0.01	26.9	4.6			<0.01				0.24		<0.01	3.13	<0.01		<0.01	<0.01	0.38	0.008			0.92	<0.01		<0.1	1.66	1.89		
7-17-85								83.4	4.8										10.1					0.4				3.42				5.16	4.68		
10-1-85	2.56						<0.01	63.7	16.8			<0.01				<0.01		0.06	13.3	<0.01		<0.01	<0.01	1.15	<0.002			3.75	0.028		<0.1	4.47	4.16		
6-27-86																																				Covered with Snow
7-29-86								27.8	6.36										4.06					0.09				0.79				1.758	1.851	-5.165	Mostly Snow melt
10-15-86	<0.1						<0.01	52.4	4.64			<0.01				0.072		0.045	29.6	<0.01		<0.01	<0.01	0.5	<0.002			1.38	0.025		<0.01	5.1246	5.1036	0.410	
4-23-87																																				Covered with Snow
6-17-87																																				Road Closed - Blocked
7-1-87	0.14						<0.01	36.5	15.8			<0.01				0.12	0.066	0.028	14.0	0.032		<0.01	<0.01	0.5	<0.002			2.2	0.034		<0.1	3.08	2.90	3.00	
9-9-87	<0.1		<0.01				<0.01	79	21.6			<0.01		0.13		0.080	0.316	<0.01	23.1	<0.01		<0.01	<0.01	0.4	<0.002			0.1	0.112		<0.1	5.86	5.28	5.23	
4-22-88																																				Road Closed - Snow
5-31-88																																				Road impassible
6-29-88	<0.1						<0.01	28.1	3.82			0.012				0.170		<0.01	5.0	<0.01		<0.01	<0.01	0.1	<0.002			1.0	<0.01		<0.1	1.86	1.60	7.57	
7-28-88								77.2	20.4										18.1					0.4				3.6				5.51	5.03	4.61	
8-23-88								64.9	14.2							<0.01	0.598		17.1	0.025				0.5				5.9				4.92	4.77	1.51	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S7-11
Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
6-26-80			In-Accessible											
8-27-80	11:25	0.01	9.0	3.0	8.6								<0.01	0.209
10-8-80	11:23	0.002	15	7	8.6									<0.001
12-24-80	In-Accessible	Snow												
2-25-81	In Accessible	Snow												
4-9-81	In-Accessible	-Snow												
6-24-81	11:40	0.001	19	18	8.7									<0.001
8-26-81	11:06	-0-												
10-28-81	11:55	-0-												
12-23-81			In-Accessible											
2-24-82			In-Accessible											
4-14-82			In-Accessible											
6-9-82			In-Accessible											
8-11-82	13:35	0.002	12	10	8.1									<0.001
10-13-82	12:08		In-Accessible											
12-21-82			In-Accessible											
2-21-83			In-Accessible											
4-21-83			In-Accessible											
6-21-83			In-Accessible			Mud slide across road - snow drifts								
9-25-83	09:20	0.004	11	5	6.8								<0.1	<0.001

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	CHLORIDE as Cl	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L
6-26-80															
8-27-80	<0.01	0.30				0.095	0.090	12.00			1.0		169		
10-8-80	<0.01					0.360		4.5			9.0		219		
12-24-80															
2-25-81															
4-9-81															
6-24-81	<0.01					0.210		57.5					172		
8-26-81															
10-28-81															
12-23-81															
2-24-82															
4-14-82															
6-9-82															
8-11-82	0.16					0.110		3.5					146		
10-13-82															
12-21-82															
2-21-83															
4-21-83															
6-21-83															
9-25-83	<0.01	<0.01				0.13		6					260		

DATE	CONDUCTIVITY	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
6-26-80									
8-27-80	260			183	150		8.0		
10-8-80	340			261.08					
12-24-80									
2-25-81									
4-9-81									
6-24-81	220			129.32	114		<0.01		
8-26-81									
10-28-81									
12-23-81									
2-24-82									
4-14-82									
6-9-82									
8-11-82	131			131.30	107.60				
10-13-82									
12-21-82									
2-21-83									
4-21-83									
6-21-83									
9-25-83	442			244	200		<0.01		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
6-26-80														
8-27-80			<0.001	0.010		0.010	<0.001	48.00	2.0	<0.001		0.010		0.06
10-8-80								65.60	0.6					
12-24-80														
2-25-81														
4-9-81														
6-24-81								45.60	13.30					
8-26-81														
10-28-81														
12-23-81														
2-24-82														
4-14-82														
6-9-82														
8-11-82								44.80	24.50					
10-13-82														
12-21-82														
2-21-83														
4-21-83														
6-21-83														
9-25-83			<0.001	0.045		0.050	<0.001	30.20	21.00	<0.001		0.005		0.12

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
6-26-80																	Covered in Snow
8-27-80		0.010	0.140	<0.002	8.64	<0.001	<0.0002			0.53	<0.001		<0.001	3.00	0.010		
10-8-80			0.350		7.68	0.020				0.64				9.00			
12-24-80																	
2-25-81																	
4-9-81																	
6-24-81			0.100		9.12	0.010				0.46				4.00			
8-26-81																	
10-28-81																	Covered with Snow
12-23-81																	Snow
2-24-82																	Snow
4-14-82																	Snow
6-9-82																	Covered with Snow
8-11-82			0.025		6.72	0.003				0.95				3.0			Snow above Spring
10-13-82																	Covered with Snow - Road Closed
12-21-82																	Snow
2-21-83																	Snow
4-21-83																	Road Closed - Snow
6-21-83																	
9-25-83		0.210	0.350	<0.001	2.40	0.020	<0.0002			1.7	<0.001		<0.001	67.0	0.018		

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CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station S 24-12
Location

DATE	TIME	FLOW	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	SPECIFIC CONO. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
4-25-89	11:40		Inaccessible																																			
5-23-89	13:30	0.001	14	9	7.3										0.36	<0.01	<0.005				0.019	79					264		480		0	261		251			
6-21-89	14:55	0.00014	17	9	7.4																	45.0					287		478		0	241			<10		
7-19-89	13:15	0.00013	23	14	7.6																	46.2					299		494		8.8	255					
9-25-89	10:15	Seep	5	5	7.2																	33.3					316		310		0	286		275			

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	SULFIDE as S MG/L	MAJOR CATIONS MEQ/L	MAJOR ANIONS MEQ/L	$\frac{C-A}{C+A} \times 100$	COMMENTS
4-25-89																																				Road impossible - Snow
5-23-89	<0.1						<0.01	51.2	4.1			0.012				<0.01		<0.01	36.8	<0.01		<0.01		1.4	<0.002			2.4	0.050		<0.1	5.72	6.04	2.68	
6-21-89								48.2	6.0										30.7					2.0				2.4				5.09	5.06	0.30	
7-19-89								49.9	6.4										31.5					4.0				3.0				5.02	5.61	5.64	
9-25-89								56.5	9.0							<0.01	0.120		31.2	<0.01				2.5				3.4				5.60	5.63	0.32	

R-7-87

CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE INC
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station S24-12
Location

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	SPECIFIC COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
5-31-88			inaccessible																																			
6-24-88	13:00	0.002	20	11	7.8										0.13	0.17	<0.005				0.026	83.9					357			748			318		336			
7-28-88	09:15	0.002	17	11	7.6																	126					394			650			194					
8-28-88	08:45	0.0008	0	4	7.7																	103					436			632		0	281	231	366			

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX.as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	SULFIDE as S MG/L	MAJOR CATIONS MEQ/L	MAJOR ANIONS MEQ/L	$\frac{C-A}{C+A} \times 100$	COMMENTS
5-31-88																																				Road impassible
6-24-88	<0.1						<0.01	58.2	2.25			<0.01				<0.01		<0.01	47.3	0.075		<0.01	<0.01	2.3	<0.002			2.6	<0.01		<0.1	7.02	7.10	0.56	
7-28-88								83.6	5.10										16.3					2.3				2.4				5.69	5.94	2.16	
8-28-88								88.2	3.3							<0.01	0.050		29.1	<0.01				2.2				5.0				7.07	6.84	1.63	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S24-12
Location

DATE	TIME	FLOW (CFS)	TEMPERATURE AIR (°C)	TEMPERATURE WATER (°C)	pH	COLIFORM TOTAL (MPN)	COLIFORM FECAL (MPN)	FECAL STREP. (MPN)	C.O.D. (MG/L)	B.O.D. (MG/L)	T.O.C. (MG/L)	DISSOLVED OXYGEN (MG/L)	OIL & GREASE (MG/L)	PHENOL (MG/L)	NITROGEN AMMONIA as NH_4-N (MG/L)	NITROGEN NITRATE as NO_3-N (MG/L)	NITROGEN NITRITE as NO_2-N (MG/L)	NITROGEN TOTAL KJELDAHL (MG/L)	NITROGEN ORGANIC (MG/L)	PHOSPHATE TOTAL as PO_4^{-3} (MG/L)	PHOSPHATE ORTHO as PO_4^{-3} (MG/L)	SULFATE as SO_4 (MG/L)	HYDROXIDE as OH (MG/L)	BICARBONATE as HCO3 (MG/L)	SOLIDS T.S.S. (MG/L)	SOLIDS TOTAL SETTLEABLE SOLIDS (ML/L)	SOLIDS T.D.S. (MG/L)	SOLIDS TOTAL SOLIDS (MG/L)	SOLIDS TOTAL VOLATILE SOLIDS (MG/L)	SPECIFIC COND. (μMHOS/CM)	TURBIDITY (FTU)	CARBONATE ALK. as CO_3 (MG/L)	BI-CARBONATE ALK. as HCO3 (MG/L)	TOTAL ALK. as CaCO3 (MG/L)	TOTAL HARDNESS as CaCO3 (MG/L)	ACIDITY as CaCO3 (MG/L)	ALPHA RADIO-ACTIVITY (pCi/L)	BETA RADIO ACTIVITY (pCi/L)
4-21-83			Inaccessible																																			
6-21-83	14:25		Inaccessible																																			
8-25-83	15:45	0.01	23	11	7.8								<0.1	<0.001	<0.01	<0.01				0.24		7					310			585			336.70	276		<0.01		
10-19-83	14:28	0.002	12	10	7.4									<0.001	0.40					0.20		45					388			566			353.84					
12-[illegible]-83	Inaccessible																																					
6-26-84	11:30	0.005	16	7	7.9										<0.1						<0.01	45.0					350			516			163	267			
8-26-84	15:20	0.002	14	8	7.1										<0.1	0.101	0.006				<0.01	41.5					406			426			370		220		
4-27-85			Inaccessible																																			
5-30-85	15:35	0.014	15	8	7.0																	42.2					337			410			116				
6-17-85	16:45	0.003	17	8	7.4										<0.1	0.076	0.035				<0.01	38.2					340			529			300		258		
7-17-85	13:50	0.003	19	9	7.8																	5.63					506			550			440				
10-1-85	16:35	0.004	13	6	7.4										<0.1	0.092	0.007				<0.01	16.6					397			59			210		396		
6-27-86	11:36	0.002	20	8	8.0										<0.1	0.457	0.006				<0.01	86.7					330			605			278	228	345		
7-29-86	10:45	0.003	16	6	7.1																	89.9					410			692			285				
11-15-86	09:00	0.004	-4	2	7.4										0.12	0.151	0.0058				0.133	117					418			629			461	378	347		
4-23-87	12:00		Inaccessible																																			
6-15-87	13:25	0.002	18	14	6.9										1.12	0.28	0.011				0.060	7.2					136			630			149		124		
7-1-87	09:00	0.002	10	6	7.7																	51.9					400			642			310				
9-9-87	10:15	0.001	14	7	8.3										0.19	0.077	0.0074				<0.01	44					390			636			341	279	373		
4-22-88			Inaccessible																																			

DATE	ALUMINUM TOTAL (MG/L)	ANTIMONY TOTAL (MG/L)	ARSENIC TOTAL (MG/L)	BARIUM TOTAL (MG/L)	BERYLLIUM TOTAL (MG/L)	BORON TOTAL (MG/L)	CADMIUM TOTAL (MG/L)	CALCIUM TOTAL (MG/L)	CHLORIDE DISS. (MG/L)	CHROMIUM HEX as CR (MG/L)	COBALT TOTAL (MG/L)	COPPER TOTAL (MG/L)	CYANIDE as CN (MG/L)	FLUORIDE DISS. (MG/L)	GERMANIUM TOTAL (MG/L)	IRON DISS. (MG/L)	IRON TOTAL (MG/L)	LEAD TOTAL (MG/L)	MAGNESIUM TOTAL (MG/L)	MANGANESE TOTAL (MG/L)	MERCURY TOTAL (MG/L)	MOLYBDENUM TOTAL (MG/L)	NICKEL TOTAL (MG/L)	POTASSIUM TOTAL (MG/L)	SELENIUM TOTAL (MG/L)	SILICA as SiO_2 (MG/L)	SILVER TOTAL (MG/L)	SODIUM TOTAL (MG/L)	ZINC TOTAL (MG/L)	VANADIUM TOTAL (MG/L)	SULFIDE as S (MG/L)	MAJOR CATIONS (meq/l)	MAJOR ANIONS (meq/l)	C-A / C+A X 100	COMMENTS
4-21-83																																				Road covered with snow
6-21-83																																				Road Covered with Snow
8-25-83			<0.001	0.060		0.058	<0.001	15.10	10.50	<0.001		0.004		0.14		0.150	0.185	<0.001	3.70	0.045	<0.0002			2.1	<0.001		<0.001	110	0.025							
10-19-83								85.60	4.00								6.270		30.24	0.260				2.5				2.80								
12-[illegible]-83																																				Snow
6-26-84								77.3	3.9								0.36		30.8	0.01				1.87				2.58				6.55	3.72		
8-26-84	<0.1						<0.01	94.4	4.6			<0.01				<0.01		<0.01	33.3	0.021		<0.1	<0.01	2.07				2.97	0.050			7.63	7.54		
4-27-85																																				Road covered with Snow
5-30-85								42.2	3.25										5.8					0.30				2.60				2.71	2.87		
6-17-85	<0.1						0.020	58.8	3.1			<0.01				0.040		<0.01	35.8	<0.01		<0.01	<0.01	1.57	<0.002			2.09	<0.01		<0.1	6.01	5.80		
7-17-85								123	4.2										35.6					2.3				2.90				9.28	8.50		
10-1-85	0.18						<0.01	74.1	5.7			<0.01				0.06		0.08	34.8	<0.01		<0.01	<0.01	3.18	<0.002			2.66	0.010		<0.1	6.77	7.05		
6-27-86	<0.1						<0.01	70.8	5.9			<0.01				0.050		<0.01	32.9	<0.01		<0.01	<0.01	1.5	<0.002			2.39	<0.01		<0.1	6.385	6.536	-2.366	
7-29-86								61.9	3.56										36.9					1.62				1.58				6.236	6.444	-6.347	
11-15-86	<0.1						<0.01	93.8	2.61			<0.01				<0.01		0.100	58.0	0.0100		<0.01	<0.01	1.8	<0.002			2.48	0.010		<0.01	9.6976	10.0733	-4.629	
4-23-87																																				Road covered with Snow
6-15-87	<0.1						<0.01	38.4	3.9			<0.01				<0.01		[illegible]	8.5	<0.01		<0.01	<0.01	0.4	<0.002			0.9	0.025		<0.1	2.67	2.70	-0.63	
7-1-87								67.2	4.6										38.4					1.8				2.1				6.66	6.34	2.32	
9-9-87	<0.1		<0.01				<0.01	98	6.2			<0.01		0.34		0.22	[illegible]	<0.01	20.9	<0.01		<0.01	<0.01	2.5	<0.002			0.4	0.025		<0.1	6.71	6.66	0.22	
4-22-88																																				Road Covered with Snow

R 1-79

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S24-12
Location

DATE	TIME	FLOW	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH3-N MG/L	NITROGEN NITRATE as NO3-N MG/L	NITROGEN NITRITE as NO2-N MG/L	NITROGEN TOTAL KJELDAL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO4-P MG/L	PHOSPHATE ORTHO as PO4-P MG/L	SULFATE as SO4 MG/L	FLUORIDE as F MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
6-26-80	09:27	0.002	17	4	7.4									0.022	<0.01					0.030		15.5			1.0		268			410			302.00					
7-23-80		0.004		6																										560									
8-26-80	15:52	0.003	15	7	7.1	33.0	<2.0				15.00		<0.01	0.005	<0.01	0.38				0.030		18.0			15.0		320			490	0.58		358.68	294		24.0	1.1	2.5
9-16-80	09:24	0.003	12	6	7.3										<0.01															490									
10-7-80	13:40	0.002	21	9	8.6									0.003	<0.01					0.050		12.0			38.0		350			540			422.12					
11-19-80	11:07	0.002	-2	5	7.4																									460									
12-24-80	In-Accessible			Snow																																			
2-25-81	In-Accessible			Snow																																			
4-8-81	In-Accessible			Snow																																			
6-24-81	15:04	0.003	23	10	7.7									<0.001	0.10					1.50		48.0					360			205			336.72	276		11.40		
8-26-81	15:45	0.001	15	11	8.1								4.80	<0.001	<0.01	<0.01				0.180	<0.001	26.0					335			375			363.54	302		<0.01		
10-28-81	10:15	0.001	6	5	6.5									<0.001	0.10					0.200		13.0					315			344			372.30					
12-23-81			In-Accessible																																				
2-24-82			In-Accessible																																				
4-14-82			In-Accessible																																				
6-9-82			In-Accessible																																				
8-11-82	15:00	0.002	16	8	7.7									<0.001	0.12					0.140		3.0					322			530			368.90	303.20				
10-13-82	12:08		In-Accessible																																				
12-2-82			In-Accessible																																				
2-21-83			In-Accessible																																				

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX. as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L				COMMENTS
6-26-80								71.20	6.10								0.020		21.12	<0.010				1.16				2.40							
7-23-80																																			
8-26-80			<0.001	0.050		0.005	<0.001	75.20	4.0	<0.001		<0.001	0.002	0.016			0.260	<0.001	27.36	0.004	<0.0002			12.50	0.001		<0.001	2.60	0.010						
9-16-80																																			
10-7-80								74.40	0.40								0.53		32.16	0.030				1.72				16.00							
11-19-80																																			
12-24-80																																			
2-25-81																																			
4-8-81																																			
6-24-81								56.80	5.40								0.120		40.32	0.010				1.65				8.00							
8-26-81			<0.001	0.060		0.040	<0.001	83.20	3.00	<0.001		0.011		0.18		0.010	0.120	<0.001	28.32	0.010	<0.0002			1.89	0.002		0.002	2.70	0.015						
10-28-81								72.80	3.30								0.15		33.12	0.014				1.90				2.20							
12-23-81																																			Snow
2-24-82																																			Snow
4-14-82																																			Snow
6-9-82																																			Snow
8-11-82								80.00	18.70								0.014		29.76	0.005				1.20				2.6							
10-13-82																																			Road Closed - Snow
12-2-82																																			Snow
2-21-83																																			Snow

R 1-78

CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station S 25-13
Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89	12:25		Inaccessible																																				
5-23-89	15:15	0.052	15	5	7.2										<0.2	0.088	<0.005				<0.01	55.4					51			76		0	41.5		<0.5			
6-27-89	15:30	0.016	11	7	7.5																	50.1					106			120		0	70.2			22.8		
7-19-89	14:05	0.002	25	11	7.9																	8.5					185			316		6.3	184					
9-25-89	11:47	0.002	15	12	7.6																	9.6					193			265		0	184		159			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEXav CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	C-A / C+A ×100	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89																																			Covered with Snow
5-23-89	<0.1						<0.01	14.6	3.9			0.020				<0.01		<0.01	12.5	<0.01		<0.01	<0.01	0.4	0.0034			0.4	0.218		<0.1	1.78	1.94	4.26	
6-27-89								16.9	4.0										13.8					0.5				0.5				2.01	2.31	6.78	
7-19-89								45.2	7.6										11.4					10.9				2.0				3.56	3.62	0.80	
9-25-89								53.9	10.1							<0.01	0.240		12.1	0.015				1.0				2.4				3.82	3.50	4.41	

R-7-87

CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE INC
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station S25-13
Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
9-27-88	10:05	0.0008	2	3	7.0																	10.5					254			312		0	197	162	173			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEXavalent CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
9-27-88								43.9	2.1							<0.01	0.053		12.4	<0.01				0.9				2.1				3.33	3.51	2.65	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S25-13
Location

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	SPECIFIC COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
10-1-83	16:00	0.002	7	4	7.5									<0.001	0.50					0.11		21					199			296			183					
12- -83	Inaccessible																																					
6-26-84	13:40	0.07	15	3	7.4										<0.1						0.081	<0.5					65			79			20.1	33				
9-26-84	16:30	0.002	11	6	7.3										<0.1	0.281	0.007				0.045	20.9					197			239			203		177			
4-27-85			Inaccessible																																			
5-30-85	14:20	0.078	11	2	6.8																	4.5					290			70			315					
6-17-85	15:45	0.045		6	7.4										<0.1	0.172	0.024				0.072	1.2					188			72			38		1.62			
7-17-85	14:50	0.003	17	11	8.0																	9.8					163			269			188					
10-1-85	16:00	0.001	11	4	7.0										<0.1	0.112	<0.005				<0.01	15.8					198			257			170		189			
6-28-86	14:30		20	10	7.6										<0.1	0.353	0.038				<0.01	6.5					72			84			44.2	40.7	43			
7-29-86	11:45	0.002	19	9	7.2																	<0.5					179			222			122					
10-15-86	10:30	0.002	6	3	6.9										<0.1	0.068	0.0047				<0.01	11.2					222			343			280	231	183			
4-23-87	15:00		In-accessible																																			
6-15-87	12:30	0.006	20	10	7.0										0.22	0.27	<0.005				0.023	30.2					360			242			327		304			
7-1-87	10:00	0.002	19	10	7.6																	1.4					183			304			167					
9-8-87	10:50	0.001	14	8	8.3										<0.1	0.24	0.018				0.033	4.4					297			347			382	314	164			
4-22-88			Inaccessible																																			
5-31-88			Inaccessible																																			
6-27-88	12:00	0.003	20	10	7.8										0.11	0.16	0.006				0.051	11.9					123			210			131		117			
7-27-88	10:00	0.002	21	14	7.1																	12.3					198			248			157					

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	SULFIDE as S MG/L	MAJOR CATIONS meq/l	MAJOR ANIONS meq/l	C-A / C+A X 100	COMMENTS
10-1-83								50.40	2.00								0.220		11.52	0.010				0.9				1.50								
12- -83																																				Snow Covered
6-26-84								10.8	1.5								4.29		1.6	0.04				0.77				0.45				0.71	0.38			
9-26-84	<0.1						<0.01	54.6	4.1			<0.01				<0.01		<0.01	11.6	0.021		<0.1	<0.01	1.09				1.67	0.064			3.78	3.88			
4-27-85																																				Covered with Snow
5-30-85								48.2	1.01										32.1					1.72				0.32				5.10	5.29			
6-17-85	<0.1						<0.01	9.3	1.1			<0.01				0.13		<0.01	1.62	0.025		<0.01	<0.01	0.73	0.002			0.29	<0.01		<0.1	0.63	0.67			
7-17-85								55.7	1.8										9.90					0.6				1.49								
10-1-85	<0.1						<0.01	49.5	4.9			<0.01				0.02		0.12	12.2	<0.01		<0.01	<0.01	1.34	<0.002			1.02	0.023		<0.1	3.56	3.25			
6-28-86	2.36						<0.01	13.4	3.3			<0.01				0.16		<0.01	2.4	0.11		<0.01	<0.01	0.7	<0.002			0.83	0.015		<0.1	0.929	0.959	-3.254	Runoff from snowbank Quick series
7-29-86								37.8	2.59										4.08					0.21				0.32				2.241	2.073	7.817	
10-15-86	0.48						<0.01	49.6	3.80			<0.01				0.052		0.015	31.2	<0.01		<0.01	<0.01	0.5	<0.002			1.12	0.028		<0.01	5.0080	4.9309	1.551	
4-23-87																																				Covered with Snow
6-15-87	<0.1						<0.01	74.3	4.9			<0.01				<0.01		0.011	36.2	<0.01		<0.01	<0.01	2.0	<0.01			2.7	<0.01		<0.1	6.86	7.19	-2.17	
7-1-87								33.4	5.0										18.0					0.5				1.2				3.21	3.41	4.97	
9-8-87	<0.1		<0.01				<0.01	98	5.5			<0.01		<0.1		0.29	0.29	<0.01	14.6	<0.01		<0.01	<0.01	1.4	<0.002			0.2	0.018		<0.1	6.15	6.51	2.84	
4-22-88																																				Covered with Snow
5-31-88																																				Road impossible
6-27-88	<0.1						<0.01	34.2	0.89			<0.01				0.035		<0.01	8.7	<0.01		<0.01	<0.01	0.3	<0.002			1.0	<0.01		<0.1	2.48	2.42	1.14	
7-27-88								59.2	3.84										6.4					0.8				1.6				3.58	3.56	0.25	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S25-13
Location

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO ACTIVIT pCi/L
6-26-79	12:34	0.04	21	5	7.4									<0.002	<0.01					0.100		13.0			12.0		51.0			78			31.72					
2-26-80	12:05	0.002	12	7	7.4								<0.01	0.010	<0.01	0.33				0.070	0.070	13.0			42.0		159			250			151.28	124		12.0		
10-8-80	09:33	0.003	14	8	8.8									0.003	<0.01					0.060		6.0			17.0		218			330			263.52					
12-24-80	In-Accessible			Snow																																		
2-25-81	In-Accessible			Snow																																		
4-8-81	In-Accessible			Snow																																		
6-24-81	13:53	0.003	24	6	7.5									<0.001	0.15					0.320		33.0					210			225			200.88	164		7.6		
8-26-81	14:00	0.001	19	11	8.1								3.80	<0.001	<0.01	0.52				0.230	0.050	7.0					220			290			241.56	198		12.00		
10-28-81	13:19	-0-																																				
12-23-81			In-Accessible																																			
2-24-82			In-Accessible																																			
4-14-82			In-Accessible																																			
6-9-82	12:55		In-Accessible																																			
8-11-82	16:00	0.002	16	11	8.2									<0.001	0.17					0.350		<0.1					189			286			184.60	151.30				
10-13-82	14:20	0.02	8	4	8.4								0.2	<0.001	0.03	<0.01				0.160	0.080	43.0					70.0			128			12.40	16.20		3.00		
12-21-82			In-Accessible																																			
2-24-83			In-Accessible																																			
4-21-83			In-Accessible																																			
6-21-83	15:05	0.09	20	8	7.9									<0.001	<0.01					0.140		<3.0					48.0			64			46.40					
8-25-83	12:38	0.004	16	9	7.3								<0.1	<0.001	<0.01	<0.01				0.15		4					135			221			139	114		<0.01		

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L				COMMENTS
6-26-79								11.20	4.0								0.490		4.32	<0.010				0.36				0.60							
2-26-80			<0.001	0.010		<0.001	<0.001	49.20	6.0	<0.001		0.010		0.09		0.020	0.075	<0.001	6.72	<0.001	<0.0002			0.25	<0.001		<0.001	1.20	0.010						
10-8-80								54.40	0.6								0.530		15.36	0.020				0.77				9.30							
12-24-80																																			
2-25-81																																			
4-8-81																																			
6-24-81								49.60	2.90								0.300		12.44	0.010				0.50				9.00							
8-26-81			<0.001	0.015		0.010	<0.001	62.40	3.98	<0.001		0.014		0.14		0.010	0.310	<0.001	18.96	0.020	<0.0002			0.70	0.003		<0.001	2.00	0.010						
10-28-81																																			Covered with Snow
12-23-81																																			Snow
2-24-82																																			Snow
4-14-82																																			Snow
6-9-82																																			Covered with Snow
8-11-82								44.80	28.50								0.025		16.80	0.110				1.14				3.5							
10-13-82			<0.001	0.010		0.070	<0.001	16.00	0.90	<0.001		0.010		0.05		0.650	0.680	<0.001	2.40	0.030	<0.0002			1.39	0.004		<0.001	1.5	0.015						
12-21-82																																			Snow
2-24-83																																			Snow
4-21-83																																			Road Closed - Snow
6-21-83								11.20	<0.01								0.430		1.42	0.012				0.37				0.6							
8-25-83			<0.001	0.150		0.044	<0.001	12.10	<0.01	<0.001		0.008		0.09		0.350	0.480	<0.001	2.50	0.014	<0.0002			0.5	<0.001		<0.001	31.5	0.058						

R 1-78

CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station 531-13
Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89	11:00		Inaccessible																																				
5-23-89	11:50		Inaccessible																																				
6-21-89	11:57	0.007	10	6	7.5																	61.8					256			367		0	246		202	<10		
7-19-89	11:05	0.004	25	8	7.5																	27.7					251			463		0	279					
9-25-89	16:50	0.001		5	7.7																	29.2					308			405		0	294		274			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89																																			Road Impassible-Snow
5-23-89																																			Road Impassible-Snow
6-21-89								52.8	7.2							<0.01		<0.01	34.2					0.7				1.3				5.52	5.52	0.02	
7-19-89								55.7	5.3										28.4					2.8				2.4				5.29	5.30	0.06	
9-25-89								59.4	4.7							<0.01	<0.01		28.1	<0.01				0.9				2.4				5.40	5.56	1.42	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S31-13
Location

DATE	TIME	FLOW (CFS)	TEMPERATURE AIR (°C)	TEMPERATURE WATER (°C)	pH	COLIFORM TOTAL (MPN)	COLIFORM FECAL (MPN)	FECAL STREP. (MPN)	C.O.D. (MG/L)	B.O.D. (MG/L)	T.O.C. (MG/L)	DISSOLVED OXYGEN (MG/L)	OIL & GREASE (MG/L)	PHENOL (MG/L)	NITROGEN AMMONIA as NH_3-N (MG/L)	NITROGEN NITRATE as NO_3-N (MG/L)	NITROGEN NITRITE as NO_2-N (MG/L)	NITROGEN TOTAL KJELDAHL (MG/L)	NITROGEN ORGANIC (MG/L)	PHOSPHATE TOTAL as PO_4-P (MG/L)	PHOSPHATE ORTHO as PO_4-P (MG/L)	SULFATE as SO_4 (MG/L)	CHLORIDE as Cl (MG/L)	SURFACTANT as MBAS (MG/L)	SOLIDS TSS (MG/L)	SOLIDS TOTAL SETTLEABLE SOLIDS (ML/L)	SOLIDS T.D.S. (MG/L)	SOLIDS TOTAL SOLIDS (MG/L)	SOLIDS TOTAL VOLATILE SOLIDS (MG/L)	SPECIFIC COND. (µMHOS/CM)	TURBIDITY (FTU)	CARBONATE ALK. as CO_3 (MG/L)	BI-CARBONATE ALK. as HCO_3 (MG/L)	TOTAL ALK. as $CaCO_3$ (MG/L)	TOTAL HARDNESS as $CaCO_3$ (MG/L)	ACIDITY as $CaCO_3$ (MG/L)	ALPHA RADIO-ACTIVITY (pCi/L)	BETA RADIO-ACTIVITY (pCi/L)
8-26-84	13:15	0.004	18	6	7.2										<0.1	0.536	0.006				0.011	34.7					270			314			268		223			
4-27-85			Inaccessible																																				
5-30-85	11:35		Inaccessible																																				
6-18-85	11:00	0.022	15	5	6.9										<0.1	0.222	0.032				<0.01	1.08					245			307			180		167			
7-17-85	11:52	0.007	20	6	7.3																	2.26					236			385			180					
10-1-85	11:15	0.006	15	6	7.1										<0.01	0.248	<0.005				<0.01	10.0					256			238			260		258			
6-27-86	15:45	0.03	23	6	7.8										<0.1	1.25	0.005				<0.01	28.4					204			379			176	144	199			
7-29-86	15:11	0.008	18	7	7.3																	16.8					271			444			233					
10-15-86	14:00	0.003	8	6	6.9										<0.1	0.776	0.0047				<0.01	28.4					306			498			364	298	257			
4-23-87	14:00		Inaccessible																																				
6-17-87	10:40	0.008	18	5	7.7										0.29	0.84	<0.005				0.016	17.3					222			384			239		214			
7-1-87	15:25	0.007	16	6	7.5																	24.8					243			411			250					
9-7-87	18:35	0.002	21	8	8.0										<0.1	0.71	0.0074				<0.01	20					288			446			275	226	256			
4-22-88			Inaccessible																																				
5-31-88			Inaccessible																																				
6-27-88	08:30	0.007	17	7	7.4										<0.1	0.65	<0.005				0.011	20.1					222			422			245		229			
7-27-88	12:30	0.004	22	12	7.7																	88.0					269			437			201					
9-27-88	13:30	0.0017	7	6	6.8																	21.8					395			506		0	292	239	278			

DATE	ALUMINUM TOTAL (MG/L)	ANTIMONY TOTAL (MG/L)	ARSENIC TOTAL (MG/L)	BARIUM TOTAL (MG/L)	BERYLLIUM TOTAL (MG/L)	BORON TOTAL (MG/L)	CADMIUM TOTAL (MG/L)	CALCIUM TOTAL (MG/L)	CHLORIDE DISS. (MG/L)	CHROMIUM HEX as Cr (MG/L)	COBALT TOTAL (MG/L)	COPPER TOTAL (MG/L)	CYANIDE as CN (MG/L)	FLUORIDE DISS. (MG/L)	GERMANIUM TOTAL (MG/L)	IRON DISS. (MG/L)	IRON TOTAL (MG/L)	LEAD TOTAL (MG/L)	MAGNESIUM TOTAL (MG/L)	MANGANESE TOTAL (MG/L)	MERCURY TOTAL (MG/L)	MOLYBDENUM TOTAL (MG/L)	NICKEL TOTAL (MG/L)	POTASSIUM TOTAL (MG/L)	SELENIUM TOTAL (MG/L)	SILICA as SiO_2 (MG/L)	SILVER TOTAL (MG/L)	SODIUM TOTAL (MG/L)	ZINC TOTAL (MG/L)	VANADIUM TOTAL (MG/L)	SULFIDE as S (MG/L)	MAJOR CATIONS (meq/l)	MAJOR ANIONS (meq/l)	$\frac{C-A}{C+A} \times 100$	COMMENTS
8-26-84	<0.1						<0.01	76.2	3.5			<0.01				<0.01		<0.01	16.4	0.014		<0.1	<0.01	1.00				1.82	0.145			5.27	5.21		
4-27-85																																			Road covered with Snow
5-30-85																																			Road covered with Snow
6-18-85	<0.1						<0.01	43.4	2.0			<0.01				0.012		<0.01	12.6	<0.01		<0.01	<0.01	0.74	0.003			1.02	0.015		<0.1	3.26	3.03		
7-17-85								38.3	1.8										15.8					0.9				1.78							
10-1-85	<0.1						<0.01	66.2	4.2			<0.01				<0.01		0.17	17.9	<0.01		<0.01	<0.01	1.51	<0.002			1.42	0.023		<0.1	4.89	4.59		
6-27-86	<0.1						<0.01	53.2	4.7			<0.01				0.070		<0.01	13.1	<0.01		<0.01	<0.01	0.7	<0.002			1.63	<0.01		<0.1	3.825	3.629	5.128	
7-29-86								56.7	3.34										15.5					0.70				0.48				4.144	4.263	-2.841	
10-15-86	<0.1						<0.01	68.8	8.29			<0.01				<0.01		0.035	37.2	<0.01		<0.01	<0.01	0.6	<0.002			1.27	0.040		<0.01	6.545	6.040	-3.559	
4-23-87																																			Road covered with Snow
6-17-87	<0.1						<0.01	67.5	2.6			<0.01				<0.01		0.038	16.4	<0.01		<0.01	<0.01	0.8	<0.002			1.4	0.018		<0.1	4.81	4.85	4.96	
7-1-87								51.2	4.3										27.8					0.8				1.0				4.91	4.74	1.79	
9-7-87	<0.1		<0.01				<0.01	69	6.1			<0.01		0.24		0.14	0.24	<0.01	26.8	<0.01		<0.01	<0.01	1.0	<0.002			0.2	0.050		<0.1	5.69	5.10	5.48	
4-22-88																																			Road closed with Snow
5-31-88																																			Road impassible
6-27-88	<0.1						<0.01	46.4	0.81			<0.01				0.050		<0.01	25.9	<0.01		<0.01	<0.01	0.9	<0.002			1.0	<0.01		<0.1	4.51	4.46	0.64	
7-27-88								73.8	3.63										20.8					0.9				1.9				5.51	5.23	2.60	
9-27-88								71.2	1.6							<0.01	0.033		23.4	<0.01				1.1				1.8				5.58	5.28	2.76	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station: T 21-13
Location:

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L
6-25-80	11:28	0.02	17	5	7.8									0.002
8-27-80	10:35	0.004	14	7	7.8								<0.01	0.256
10-8-80	10:40	0.003	19	10	8.5									<0.001
12-24-80	In-Accessible			Snow										
2-25-81	In-Accessible			Snow										
4-8-81	In-Accessible			Snow										
6-24-81	12:28	0.01	11	5	7.8									<0.001
8-26-81	11:40	0.001	24	13	7.8								<0.01	0.002
10-29-81	12:26	0.001	9	5	7.6									<0.001
12-23-81			In-Accessible											
2-24-82			In-Accessible											
4-14-82			In-Accessible											
6-9-82			In-Accessible											
8-11-82	11:48	0.1	17	7	7.5									<0.001
10-13-82	12:08		In-Accessible											
12-24-82			In-Accessible											
2-21-83			In-Accessible											
4-7-83			In-Accessible											
6-21-83			In-Accessible											
8-25-83	10:10	0.01	14	5	6.6								<0.1	<0.001

DATE	NITROGEN AMMONIA as NH_3-N MG/L	NITRATE as NO_3-N MG/L	NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
6-25-80	<0.01					0.040		13.5			1.0		152			240			158.60					
8-27-80	<0.01	0.68				0.030	0.010	30.0			8.0		250			380			241.56	198		14.0		
10-8-80	<0.01					0.070		18.0			2.0		258			400			297.68					
12-24-80																								
2-25-81																								
4-8-81																								
6-24-81	<0.01					0.220		42.0					272			190			263.52	216		19.0		
8-26-81	<0.01	0.82				0.170	0.050	36.0					290			328			280.66	230		10.00		
10-29-81	0.20					0.100		20.0					280			282			310.40					
12-23-81																								
2-24-82																								
4-14-82																								
6-9-82																								
8-11-82	0.12					0.120		<0.1					289			462			284.40	233.10				
10-13-82																								
12-24-82																								
2-21-83																								
4-7-83																								
6-21-83																								
8-25-83	<0.01	<0.01				0.08		10					345			459			265.90	218		<0.01		

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEXav CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L
6-25-80								55.20	<0.1					
8-27-80			<0.001	0.020		0.010	<0.001	73.60	6.0	<0.001		<0.001		0.09
10-8-80								76.20	<0.1					
12-24-80														
2-25-81														
4-8-81														
6-24-81								66.40	1.73					
8-26-81			<0.001	0.025		0.010	<0.001	78.40	2.38	<0.001		0.006		0.11
10-29-81								76.00	3.30					
12-23-81														
2-24-82														
4-14-82														
6-9-82														
8-11-82								70.40	10.80					
10-13-82														
12-24-82														
2-21-83														
4-7-83														
6-21-83														
8-25-83			<0.001	0.178		0.078	<0.001	48.20	2.50	<0.001		<0.001		0.09

DATE	FERROMANGANESE TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	COMMENTS
6-25-80			0.110		1.44	<0.010				0.64				1.20			
8-27-80		0.010	0.140	<0.002	12.96	<0.001	<0.0002			0.94	<0.001		<0.001	1.60	0.005		
10-8-80			0.040		13.92	<0.001				0.95				10.80			
12-24-80																	
2-25-81																	
4-8-81																	
6-24-81			0.060		16.80	<0.001				0.94				10.90			
8-26-81		<0.001	0.070	<0.001	12.76	0.010	<0.0002			0.86	0.004		<0.001	2.30	0.015		
10-29-81			0.065		22.08	0.012				0.95				1.80			
12-23-81																	Snow
2-24-82																	Snow
4-14-82																	Snow
6-9-82																	Snow
8-11-82			0.033		15.84	0.003				1.20				2.1			
10-13-82																	Road Closed - Snow
12-24-82																	Snow
2-21-83																	Snow
4-7-83																	Road Closed - Snow
6-21-83																	Road Closed - Mudslide & Snow
8-25-83		0.165	0.222	<0.001	10.40	0.010	<0.0002			0.9	<0.001		<0.001	23.5	0.045		

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CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station S 36-17
Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89	11:00		Inaccessible																																				
5-23-89	10:55	0.015	17	11	7.5										<0.2	0.305	<0.005				0.158	51.1					226			367		0	267		204			
6-21-89	11:10	0.012	10	7	7.6																	52.8					205			398		0	248			14.2		
7-19-89	09:40	0.010	19	9	7.5																	5.0					259			432		4.0	288					
9-25-89	13:10	0.004	20	7	7.6																	8.0					239			496		0	280		236			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	C-A / C+A × 100	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89																																			Road Impossible - Snow
5-23-89	<0.1						<0.01	60.2	3.5			0.012				<0.01		<0.01	29.2	<0.01		<0.01	<0.01	0.5	0.0024			2.8	0.080		<0.1	5.54	5.54	0.02	
6-21-89								70.2	10.0										21.4					0.2				1.4				5.33	5.45	1.08	
7-19-89								45.6	4.2										23.1					2.8				2.5				4.35	5.07	7.63	
9-25-89								65.4	5.3							<0.01	0.120		19.2	<0.01				1.2				3.2				5.01	4.91	1.09	

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CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station S36-17

Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_4-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
9-27-88	12:10	0.0004	15	9	6.9																	38.8					287			392		0	231	190	221			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	MANGANESE TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
9-27-88								65.9	1.6							<0.01	0.105		15.5	<0.01				0.8				2.4				4.69	4.64	0.53	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S 36-17
Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
10-19-83	11:55	0.007	10	8	7.3									<0.001	<0.20					0.07		8					240			386			252.64					
12- -83	Inaccessible																																						
6-26-84	15:20	0.01	15	5	7.4										0.13						<0.01	6.2					226			391			121	199				
9-26-84	11:25	0.004	14	8	7.3										<0.1	0.807	0.008				0.015	7.6					228			272			260		177			
4-27-85			Inaccessible																																				
5-30-85	11:05	0.022	15	4	7.5																	7.4					239			242			257					
6-17-85	12:45	0.011	25	11	7.4										<0.1	0.328	0.024				<0.01	0.98					250			309			190		160			
7-17-85	10:00	0.007	18	5	6.7																	1.26					220			358			245					
10-1-85	09:35	0.04	8	5	7.5										<0.1	0.189	<0.005				<0.01	8.5					242			225			222		226			
6-27-86	11:45	0.01	29	9	8.1										<0.1	0.668	<0.005				<0.01	6.52					210			388			214	208	208			
7-28-86	14:03	0.009	20	13	7.2																	<0.5					243			412			210					
10-5-86	11:25	0.007	11	9	7.0										<0.1	0.676	0.0096				<0.01	<0.5					256			417			344	293	211			
4-23-87	14:00		In-accessible																																				
6-17-87	12:50	0.006	15	10	7.5										0.15	0.45	0.006				0.016	3.9					223			415			268		197			
7-1-87	13:40	0.004	15	8	7.6																	<0.5					233						234					
9-7-87	15:10	0.001	16	12	8.2										<0.1	0.24	<0.005				<0.01	7.8					221			250			260	213	212			
4-27-88			In-accessible																																				
5-31-88			Inaccessible																																				
6-28-88	15:34	0.004	10	7	7.4										<0.1	0.24	0.008				0.015	2.8					239			444			279		240			
7-28-88	10:50		22	15	7.7																	56.3					240			397			174					

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as Cr	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	C-A / C+A X 100	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	meq/l	meq/l		
10-19-83								69.60	4.00								0.210		12.00	0.010				0.7				1.60							
12- -83																																			Snow
6-26-84								68.6	2.0								0.33		11.2	0.02				0.70				1.62				4.44	2.17		
9-26-84	<0.1						<0.01	68.6	2.5			<0.01				<0.01		<0.01	11.6	0.027		0.1	<0.01	0.60				1.36	0.050			4.45	4.49		
4-27-85																																			Road covered with Snow
5-30-85								74.9	2.88										8.9					0.65				1.44				4.55	4.45		
6-17-85	<0.1						<0.01	50.5	2.6			<0.01				0.16		<0.01	10.2	<0.01		<0.01	<0.01	0.44	<0.002			1.13	0.035		<0.1	3.43	3.20		
7-17-85								65.2	1.8										12.5					0.7				1.65				4.37	4.10		
10-1-85	<0.1						<0.01	59.0	2.7			<0.01				<0.01		0.07	14.4	<0.01		<0.01	<0.01	1.01	<0.002			1.09	0.020		<0.1	4.21	3.89		
6-27-86	<0.1						<0.01	62.4	4.8			<0.01				0.16		<0.01	9.6	0.015		<0.01	<0.01	0.3	<0.002			1.69	0.010		<0.1	3.994	4.232	-5.943	
7-28-86								55.1	2.05										10.6					0.18				0.78				3.660	3.500	4.485	
10-5-86	<0.1						<0.01	66.4	2.92			<0.01				<0.01		0.020	30.1	<0.01		<0.01	<0.01	0.4	<0.002			1.42	0.025		<0.01	5.632	5.733	2.245	
4-23-87																																			Road covered with Snow
6-17-87	<0.1						<0.01	57.2	2.8			<0.01				<0.01		0.012	12.2	<0.01		<0.01	<0.01	0.3	<0.002			1.8	0.012		<0.1	3.95	4.55	-7.13	
7-1-87								52.3	3.4										11.8					0.3				1.2			<0.1	4.05	3.44	1.34	
9-7-87	<0.1		<0.01				<0.01	65	5.2			<0.01		<0.1		0.24	0.32	<0.01	19.8	<0.01		<0.01	<0.01	0.6	<0.002			0.1	0.135		<0.1	4.90	4.57	3.43	
4-27-88																																			Road covered with Snow
5-31-88																																			Road impossible
6-28-88	<0.1						<0.01	64.2	0.44			<0.01				0.035		<0.01	17.4	<0.01		<0.01	<0.01	0.4	<0.002			1.4	<0.01		<0.1	4.71	4.64	0.70	Rain
7-28-88								54.1	2.52										15.6					0.5				2.0				4.09	4.09	0.09	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S36-17
Location

DATE	TIME	FLOW	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4^{-P} MG/L	PHOSPHATE ORTHO as PO_4^{-P} MG/L	SULFATE as SO_4 MG/L	CHLORIDE as Cl MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
1-26-80			In-Accessible																																		
8-29-80	09:53	0.01	14	6	8.6								<0.01	0.196	<0.01	2.20				0.050	0.005	10.0			3.0		238			360			256.20	210		160		
10-8-80	08:55	0.004	11	8	7.7									<0.001	<0.01					0.060		6.0			5.0		231			350			275.72					
12-24-80	In-Accessible			Snow																																	
2-25-81	In-Accessible			Snow																																	
4-8-81	In-Accessible			Snow																																	
6-24-81	10:55	0.01	27	11	8.0									<0.001	<0.01					0.250		36.0					298			285			265.76	[illegible]		250		
8-26-81	10:18	0.002	22	13	8.3								<0.01	<0.001	<0.01	1.24				0.180	0.080	20.5					241			290			251.32	210		<0.01		
10-28-81	13:48	0.02	7	6	7.8									<0.001	0.10					0.100		3.0					245			232			292.20					
12-23-81			In-Accessible																																		
2-24-82			In-Accessible																																		
4-14-82			In-Accessible																																		
6-9-82	12:05	0.07	15	9	7.4									<0.001	0.40					0.080		3.0					228			363			268.90	220.40				
8-11-82	10:30	0.01	19	9	8.0									0.042	0.13					0.170		<0.1					259			373			288.70	236.60				
10-13-82	11:15	0.04	7	6	7.6								<0.1	<0.001	<0.01	0.98				0.100	0.050	6.0					267			479			311.20	255.10		6.00		
12-1-82			In-Accessible																																		
2-21-83			In-Accessible																																		
4-21-83			In-Accessible																																		
6-21-83	13:30	0.09	19	10	7.4									0.013	<0.01					0.080		4.0					192			259			208.90					
8-25-83	08:20	0.09	10	7	7.2								<0.1	0.010	<0.01	<0.01				0.09		4					255						300.10	246		<0.01		

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L				COMMENTS
6-26-80																																			Covered by Snow
8-29-80			<0.001	0.010		0.010	<0.001	72.00	6.10	<0.001		<0.001		0.11		0.010	0.250	<0.002	12.00	<0.001	<0.0002			0.57	<0.001		<0.001	1.70	0.007						
10-8-80								64.00	<0.1								0.100		12.96	0.010				0.65				7.20							
12-24-80																																			
2-25-81																																			
4-8-81																																			
6-24-81								51.00	1.65								0.250		23.52	0.010				0.47				14.00							
8-26-81			0.002	0.020		0.020	<0.001	68.00	1.87	<0.001		0.009		0.15		<0.001	0.050	<0.001	14.40	<0.001	<0.0002			0.70	0.003		<0.001	2.00	0.007						
10-28-81								64.00	3.20								0.065		18.72	0.003				0.80				4.00							
12-23-81																																			Snow
2-24-82																																			Snow
4-14-82																																			Snow
6-9-82								68.00	1.40								0.050		11.80	0.003				0.46				1.9							
8-11-82								65.00	13.40								0.065		14.88	0.010				0.65				13.0							
10-13-82			<0.001	0.015		0.040	<0.001	72.00	3.10	<0.001		0.011		0.12		0.095	0.100	<0.001	11.52	0.010	<0.0002			0.78	0.003		<0.001	16.0	0.007						
12-1-82																																			Snow
2-21-83																																			Snow
4-21-83																																			Road Closed - Snow
6-21-83								53.60	<0.01								0.110		8.16	0.003				0.41				1.5							
8-25-83			<0.001	0.035		0.160	<0.001	55.10	<0.01	<0.001		<0.001		0.12		0.146	0.150	<0.001	9.50	0.047	<0.0002			1.8	<0.001		<0.001	34.0	0.039						

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CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station S 36-19
Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-25-89	11:00		Inaccessible											
5-23-89	11:50	0.035	17	9	7.2									
6-21-89	13:45	0.009	10	7	7.5									
7-19-89	11:45	0.003	23	8	7.5									
9-25-89	16:25	0.0000	18	6	7.5									

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L
4-25-89															
5-23-89	<0.2	0.170	<0.005				0.040	48.8					81		
6-21-89								24.8					138		
7-19-89								10.2					145		
9-25-89								5.6					655		

DATE	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	μMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
4-25-89									
5-23-89	112		0	67.2		34.1			
6-21-89	185		0	125			<10		
7-19-89	262		0	174					
9-25-89	314		0	176		150			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-25-89														
5-23-89	<0.1						<0.01	20.8	3.1			0.015		
6-21-89								33.8	6.4					
7-19-89								38.7	8.6					
9-25-89								56.8	8.5					

DATE	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
4-25-89															
5-23-89		<0.01		<0.01	11.8	<0.01		<0.01	<0.01	0.3	<0.002			1.6	0.090
6-21-89					13.3					0.3				1.7	
7-19-89					14.5					2.6				3.1	
9-25-89		<0.01	0.135		6.8	<0.01				1.2				2.6	

DATE	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89						Road Impassible - Snow
5-23-89		<0.1	2.09	2.20	2.77	
6-21-89			2.86	2.75	2.09	
7-19-89			3.32	3.31	0.28	
9-25-89			3.54	3.24	4.38	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S36-19
Location

DATE	TIME	FLOW (CFS)	TEMPERATURE AIR (°C)	TEMPERATURE WATER (°C)	pH	COLIFORM TOTAL (MPN)	COLIFORM FECAL (MPN)	FECAL STREP. (MPN)	C.O.D. (MG/L)	B.O.D. (MG/L)	T.O.C. (MG/L)	DISSOLVED OXYGEN (MG/L)	OIL & GREASE (MG/L)	PHENOL (MG/L)	NITROGEN AMMONIA as NH_3-N (MG/L)	NITROGEN NITRATE as NO_3-N (MG/L)	NITROGEN NITRITE as NO_2-N (MG/L)	NITROGEN TOTAL KJELDAHL (MG/L)	NITROGEN ORGANIC (MG/L)	PHOSPHATE TOTAL as PO_4-P (MG/L)	PHOSPHATE ORTHO as PO_4-P (MG/L)	SULFATE as SO_4 (MG/L)	HYDROXIDE as OH (MG/L)	SURFACTANT as MBAS (MG/L)	SOLIDS TSS (MG/L)	SOLIDS TOTAL SETTLEABLE SOLIDS (ML/L)	SOLIDS T.D.S. (MG/L)	SOLIDS TOTAL SOLIDS (MG/L)	SOLIDS TOTAL VOLATILE SOLIDS (MG/L)	SPECIFIC COND. (µMHOS/CM)	TURBIDITY (FTU)	CARBONATE ALK. as CO_3 (MG/L)	BI-CARBONATE ALK. as HCO_3 (MG/L)	TOTAL ALK. as $CaCO_3$ (MG/L)	TOTAL HARDNESS as $CaCO_3$ (MG/L)	ACIDITY as $CaCO_3$ (MG/L)	ALPHA RADIO-ACTIVITY (pCi/L)	BETA RADIO-ACTIVITY (pCi/L)
8-26-84	14:00	0.002	12	6	6.9										<0.1	0.730	0.005				0.021	5.2					156			186			162		131			
4-27-85			Inaccessible																																			
5-30-85	11:35		Inaccessible																																			
6-18-85	10:15	0.022	20	5	7.3										<0.1	0.301	0.025				0.018	2.21					170			153			80		85			
7-17-85	12:27	0.001	16	9	7.7																	1.68					124						80					
10-1-85	10:35	0.001	10	6	7.0										<0.1	0.319	0.009				0.018	6.2					163			198			150		144			
6-27-86	14:25	0.009	26	20	8.7										<0.1	<0.01	0.011				0.057	6.6					58						3.8	3.1	1.4			
7-29-86	14:43	0.003	20	5	7.3																	<0.5					180			217			122					
10-15-86	13:30		Inaccessible																																			
4-27-87	14:00		Inaccessible																																			
6-17-87	11:40	0.007	15	8	7.3										0.19	0.51	0.013				0.049	0.9					110			199			117		100			
7-1-87	16:05	0.001	15	7	7.3																	<0.5					130			221			135					
9-7-87	14:30	0.001	15	8	8.1										<0.1	0.51	0.0068				0.021	<0.5					194			255			167	137	141			
4-22-88			Inaccessible																																			
5-31-88			Inaccessible																																			
6-29-88	08:20	0.004	13	5	7.7										<0.1	0.31	<0.005				0.028	0.53					99			186			110		95.0			
7-28-88	11:25	0.002	18	11	7.7																	8.3					133			222			122					
9-27-88	13:00	0.0006	4	6	6.8																	25.9					262			257		0	168	138	165			

DATE	ALUMINUM TOTAL (MG/L)	ANTIMONY TOTAL (MG/L)	ARSENIC TOTAL (MG/L)	BARIUM TOTAL (MG/L)	BERYLLIUM TOTAL (MG/L)	BORON TOTAL (MG/L)	CADMIUM TOTAL (MG/L)	CALCIUM TOTAL (MG/L)	CHLORIDE DISS. (MG/L)	CHROMIUM HEX as CR (MG/L)	COBALT TOTAL (MG/L)	COPPER TOTAL (MG/L)	CYANIDE as CN (MG/L)	FLUORIDE DISS. (MG/L)	GERMANIUM TOTAL (MG/L)	IRON DISS. (MG/L)	IRON TOTAL (MG/L)	LEAD TOTAL (MG/L)	MAGNESIUM TOTAL (MG/L)	MANGANESE TOTAL (MG/L)	MERCURY TOTAL (MG/L)	MOLYBDENUM TOTAL (MG/L)	NICKEL TOTAL (MG/L)	POTASSIUM TOTAL (MG/L)	SELENIUM TOTAL (MG/L)	SILICA as SiO_2 (MG/L)	SILVER TOTAL (MG/L)	SODIUM TOTAL (MG/L)	ZINC TOTAL (MG/L)	VANADIUM TOTAL (MG/L)	SULFIDE as S (MG/L)	MAJOR CATIONS (meq/l)	MAJOR ANIONS (meq/l)	C-A / C+A X 100	COMMENTS
8-26-84	<0.1						<0.01	46.8	2.5			<0.01				<0.01		<0.01	4.4	0.014		<0.1	<0.01	0.69				1.61	0.052			2.79	2.83		
4-27-85																																				Covered with Snow
5-30-85																																				Covered with Snow
6-18-85	<0.1						<0.01	23.5	2.3			<0.01				0.15		<0.01	2.35	<0.01		<0.01	<0.01	0.32	<0.002			0.69	0.020		<0.1	1.41	1.42		
7-17-85								20.5	1.6										3.22					0.3				1.25				1.35	1.39		
10-1-85	<0.1						<0.01	43.8	1.9			<0.01				0.02		0.13	5.9	<0.01		<0.01	<0.01	0.92	<0.002			0.78	0.015		<0.1	2.74	2.64		
6-27-86	0.30						<0.01	3.8	2.9			<0.01				0.16		<0.01	0.8	0.020		<0.01	<0.01	0.2	<0.002			0.16	0.012		<0.1	0.277	0.282	-1.924	
7-29-86								37.2	2.8										3.21					0.19				0.29				2.138	2.079	2.814	
10-15-86																																				Covered by Mudslide
4-27-87																																				Road covered with Snow
6-17-87	<0.1						<0.01	35.8	2.0			<0.01				<0.01		0.019	3.9	<0.01		<0.01	<0.01	0.3	<0.002			3.2	0.033		<0.1	2.26	1.99	6.24	
7-1-87								26.8	3.4										10.2					0.2				0.9				2.22	2.32	2.15	
9-7-87	<0.1		<0.01				<0.01	47	4.2			<0.01		<0.1		0.031	0.034	<0.01	8.7	<0.01		<0.01	<0.01	0.4	<0.0002			0.1	0.020		<0.1	3.08	2.87	3.59	
4-22-88																																				Road Covered with Snow
5-31-88																																				Road impassible
6-29-88	<0.1						<0.01	31.4	0.30			<0.01				0.030		<0.01	4.0	<0.01		<0.01	<0.01	0.1	<0.002			0.9	<0.01		<0.1	1.94	1.82	3.12	
7-28-88								29.8	2.16										5.1					1.2				1.3				2.00	2.23	5.46	
9-27-88								54.0	1.6							<0.01	0.525		6.5	<0.01				1.3				1.8				3.34	3.34	0.05	

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S36-19
Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
6-25-80	11:30	0.01	17	5	7.80									<0.002
8-27-80	09:45	0.003	11	6	7.5								0.80	0.029
12-24-80	In-Accessible			Snow										
2-25-81	In-Accessible			Snow										
4-8-81	In-Accessible			Snow										
6-24-81	13:04	0.01	20	4	7.2									0.096
8-26-81	12:40	0.001	24	18	8.0								3.40	<0.001
10-28-81	11:33	-0-												
12-23-81			In-Accessible											
2-24-82			In-Accessible											
4-14-82			In-Accessible											
6-9-82			In-Accessible											
8-11-82	12:00	0.004	15	5	7.5									<0.001
10-13-82	12:08		In-Accessible											
12-21-82			In-Accessible											
2-21-83			In-Accessible											
4-21-83			In-Accessible											
6-21-83			In-Accessible											
8-25-83	10:55	0.004	16	9	7.2								<0.1	<0.001

DATE	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROGEN SULFIDE as O N	SURFACTANT as MBAS	SOLIDS TDS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS TSS	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	μMHOS	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
6-25-80	<0.01					0.070		8.5			1.0		95.0			150			92.72					
8-27-80	<0.01	0.54				0.060	0.040	7.5			5.0		135			200			148.84	122		18.0		
12-24-80																								
2-25-81																								
4-8-81																								
6-24-81	<0.01					0.250		25.5					130			89			112.24	92.00		22.20		
8-26-81	<0.01	0.56				0.340	0.340	7.5					191			285			209.84	172		10.00		
10-28-81																								
12-23-81																								
2-24-82																								
4-14-82																								
6-9-82																								
8-11-82	0.06					0.080		<0.1					132			216			142.10	116.50				
10-13-82																								
12-21-82																								
2-21-83																								
4-21-83																								
6-21-83																								
8-25-83	<0.01	<0.01				0.06		22					145			236			142.60	125		<0.01		

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX. as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
6-25-80								23.40	<0.1					
8-27-80			<0.001	0.010		<0.001	<0.001	44.00	<0.1	<0.001		<0.001		0.08
12-24-80														
2-25-81														
4-8-81														
6-24-81								34.40	1.08					
8-26-81			0.003	0.017		0.010	<0.001	62.40	2.08	<0.010		0.011		0.15
10-28-81														
12-23-81														
2-24-82														
4-14-82														
6-9-82														
8-11-82								38.40	12.90					
10-13-82														
12-21-82														
2-21-83														
4-21-83														
6-21-83														
8-25-83			<0.001	0.055		0.177	<0.001	49.50	4.10	<0.001		<0.001		0.08

DATE	MANGANESE TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	
6-25-80			0.070		0.48	<0.010			0.32				12.00			
8-27-80	<0.001	0.010	1.350	<0.002	4.32	<0.001			0.43	<0.001		<0.001	1.20	0.002		
12-24-80																
2-25-81																
4-8-81																
6-24-81			0.160		5.76	0.010			0.33				3.40			
8-26-81	0.020	<0.001	0.270	<0.001	6.24	<0.0002			0.40	0.004		<0.001	1.90	0.010		
10-28-81																
12-23-81																Snow
2-24-82																Snow
4-14-82																Snow
6-9-82																Snow
8-11-82	0.003		0.049		3.36				0.88				10.0			
10-13-82																Road Closed - Snow
12-21-82																Snow
2-21-83																Snow
4-21-83																Road Closed - Snow
6-21-83																Road Closed - mudslide & snow
8-25-83	0.020	<0.001	0.198	<0.001	4.50	<0.0002			0.4	<0.001		<0.001	3.8	0.024		

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CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE INC
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station S36-23
Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH3-N	NITROGEN NITRATE as NO3-N	NITROGEN NITRITE as NO2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO4-P	PHOSPHATE ORTHO as PO4-P	SULFATE as SO4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL SETTLEABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO3	BI-CARBONATE ALK. as HCO3	TOTAL ALK. as CaCO3	TOTAL HARDNESS as CaCO3	ACIDITY as CaCO3	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	PCI/L	PCI/L
4-25-89	11:00		Inaccessible																																				
5-23-89	12:30	0.011	13	3	7.5										<0.2	0.433	0.0056				0.076	57.1					184			298		0	200		142			
6-21-89	14:10	0.008	10	3	7.3																	54.9					241			366		0	249			<10		
7-19-89	12:10	0.007	18	4	7.4																	71.0					336			398		0	264					
9-25-89	15:55	0.0012	21	6	7.6																	7.6					261			415		0	268		220			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEXavCR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	$\frac{C-A}{C+A} \times 100$	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
4-25-89																																			Road Impassible - Snow
5-23-89	<0.1						<0.01	45.5	3.6			0.012				<0.01		<0.01	20.6	<0.01		<0.01	<0.01	0.5	<0.002			2.4	0.068		<0.1	4.08	4.57	5.61	
6-21-89								56.8	5.3										27.8					0.3				2.6				5.24	5.37	1.23	
7-19-89								60.2	5.2										19.7					21.3				4.1				5.35	5.95	5.34	
9-25-89								71.1	7.7							<0.01	0.155		13.1	<0.01				0.9				2.8				4.77	4.77	0.03	

R-7-87

CONSULTANTS/ENGINEERS
HANSEN ALLEN & LUCE inc
SALT LAKE CITY, UTAH

WATER QUALITY DATA

Station S36-23
Location

DATE	TIME	FLOW	TEMPERATURE AIR	TEMPERATURE WATER	pH	COLIFORM TOTAL	COLIFORM FECAL	FECAL STREP.	C.O.D.	B.O.D.	T.O.C.	DISSOLVED OXYGEN	OIL & GREASE	PHENOL	NITROGEN AMMONIA as NH_3-N	NITROGEN NITRATE as NO_3-N	NITROGEN NITRITE as NO_2-N	NITROGEN TOTAL KJELDAHL	NITROGEN ORGANIC	PHOSPHATE TOTAL as PO_4-P	PHOSPHATE ORTHO as PO_4-P	SULFATE as SO_4	HYDROXIDE as OH	SURFACTANT as MBAS	SOLIDS TSS	SOLIDS TOTAL RETRIEVABLE SOLIDS	SOLIDS T.D.S.	SOLIDS TOTAL SOLIDS	SOLIDS TOTAL VOLATILE SOLIDS	SPECIFIC COND.	TURBIDITY	CARBONATE ALK. as CO_3	BI-CARBONATE ALK. as HCO_3	TOTAL ALK. as $CaCO_3$	TOTAL HARDNESS as $CaCO_3$	ACIDITY as $CaCO_3$	ALPHA RADIO-ACTIVITY	BETA RADIO-ACTIVITY
		CFS	°C	°C		MPN	MPN	MPN	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	ML/L	MG/L	MG/L	MG/L	µMHOS/CM	FTU	MG/L	MG/L	MG/L	MG/L	MG/L	pCi/L	pCi/L
5-31-88			Inaccessible																																				
6-28-88	15:48	0.011	11	4	7.6										<0.1	0.52	<0.005				0.026	15.3					200			374			213		207			
7-28-88	13:45	0.008	18	7	7.3																	27.4					230			312			186					
8-27-88	14:55	0.006	4	5	6.8																	5.8					330			408		0	267	219	225			

DATE	ALUMINUM TOTAL	ANTIMONY TOTAL	ARSENIC TOTAL	BARIUM TOTAL	BERYLLIUM TOTAL	BORON TOTAL	CADMIUM TOTAL	CALCIUM TOTAL	CHLORIDE DISS.	CHROMIUM HEX as CR	COBALT TOTAL	COPPER TOTAL	CYANIDE as CN	FLUORIDE DISS.	GERMANIUM TOTAL	IRON DISS.	IRON TOTAL	LEAD TOTAL	MAGNESIUM TOTAL	MANGANESE TOTAL	MERCURY TOTAL	MOLYBDENUM TOTAL	NICKEL TOTAL	POTASSIUM TOTAL	SELENIUM TOTAL	SILICA as SiO_2	SILVER TOTAL	SODIUM TOTAL	ZINC TOTAL	VANADIUM TOTAL	SULFIDE as S	MAJOR CATIONS	MAJOR ANIONS	C-A / C+A = 100	COMMENTS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MEQ/L	MEQ/L		
5-31-88																																			Road impassible
6-28-88	<0.1						<0.01	65.4	0.62			<0.01				0.050		<0.01	10.8	<0.01		<0.01	<0.01	0.9	<0.002			1.3	<0.01		<0.1	4.22	3.83	4.89	Rain
7-28-88								54.3	3.10										11.2					0.3				1.8				3.72	3.71	0.20	
8-27-88								74.2	1.4							<0.01	0.065		10.2	<0.01				0.5				2.6				4.67	4.54	1.43	

R-7-87

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station S36-23
Location

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	SPECIFIC COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
9-21-83			In-Accessible																																		
6-21-83			In-Accessible																																		
8-25-83	11:20	0.01	19	6	7.0								<0.1	<0.001	<0.01	<0.01				0.10		12					244			374			261	214		<0.01	
10-19-83	13:06	0.008	7	5	7.5									<0.001	<0.20					0.12		15					235			369			234.24				
12- -83	Inaccessible																																				
6-26-84	15:43	0.01	14	3	7.4										0.11						0.020	<0.5					187			310			97	159			
9-26-84	14:30	0.01	10	6	7.0										<0.1	0.592	0.006				0.021	8.5					230			270			266		206		
4-2-85			Inaccessible																																		
5-30-85	11:45	0.018	8	4	7.2																	4.5					176			189			160				
6-18-85	09:35	0.016	16	5	7.8										<0.1	0.248	0.031				<0.01	7.92					192			205			148		137		
7-17-85	13:00	0.008	17	4	7.1																	5.63					281			326			188				
10-1-85	10:10	0.008	11	4	7.2										<0.1	0.182	0.006				0.013	7.7					241			256			242		225		
6-27-86	13:45	0.015	31	6	8.1										<0.1	0.725	0.010				0.012	5.5					190			317			207	170	212		
7-28-86	16:23	0.01	21	5	7.3																	<0.5					253			360			224				
10-15-86	12:26	0.007	8	4	6.9										0.12	0.650	0.0070				<0.01	<0.5					290			390			333	273	208		
4-2-87	14:00		Inaccessible																																		
6-17-87	12:10	0.011	16	3	7.3										0.16	0.55	<0.005				0.030	3.9					220			344			234		198		
7-1-87	16:30	0.008	16	5	7.3																	8.8					237			327			257				
9-7-87	15:38	0.007	16	5	7.4										0.13	0.54	0.012				<0.01	<0.5					267			381			256	210	217		
4-22-88			Inaccessible																																		

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEXAVALENT CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	SULFIDE as S MG/L	MAJOR CATIONS meq/l	MAJOR ANIONS meq/l	$\frac{C-A}{C+A} \times 100$	COMMENTS
4-21-83																																				Road closed with Snow
6-21-83																																				Road Closed mud slide
8-25-83			<0.001	0.048		0.098	<0.001	50.40	3.60	<0.001		<0.001		0.10		0.210	0.244	<0.001	3.40	0.013	<0.0002			0.3	<0.001		<0.001	40.5	0.015							
10-19-83								70.40	4.00								0.080		8.64	0.010				0.5				1.70								
12- -83																																				Snow
6-26-84								54.8	2.0								0.50		7.6	0.02				0.66				1.93				3.46	1.66		
9-26-84	<0.1						<0.01	75.6	1.6			<0.01				<0.01		<0.01	8.1	0.014		<0.1	<0.01	0.47				1.86	0.050			4.54	4.58		
4-2-85																																				Road Closed with Snow
5-30-85								40.1	1.83										9.5					0.81				1.84				2.89	2.77		
6-18-85	<0.1						<0.01	43.8	4.5			<0.01				0.26		<0.01	6.88	<0.01		<0.01	<0.01	0.39	<0.002			1.35	0.025		<0.1	2.82	2.62		
7-17-85								56.8	3.8										7.65					0.3				1.88				3.56	3.31		
10-1-85							<0.01	62.8	2.4			<0.01				<0.01		0.03	9.8	<0.01		<0.01	<0.01	0.90	<0.002			1.27	0.010		<0.1	4.03	4.19		
6-27-86	<0.1						<0.01	53.8	4.1			<0.01				0.11		<0.01	7.6	<0.01		<0.01	<0.01	0.4	<0.002			2.20	<0.1		<0.1	3.422	3.635	-6.225	
7-28-86								57.2	1.51										7.78					0.24				0.68				3.530	3.714	-5.073	
10-15-86	<0.1						<0.01	65.4	2.87			<0.01				<0.01		0.030	28.2	<0.01		<0.01	<0.01	0.4	<0.002			1.28	0.048		<0.01	5.6603	5.5585	1.977	
4-2-87																																				Road Covered with Snow
6-17-87	<0.1						<0.01	63.8	2.7			<0.01				<0.01			8.8	<0.01		<0.01	<0.01	0.4	<0.002			1.8	0.012		<0.1	4.00	3.99	0.11	
7-1-87								63.8	4.44										15.1					0.4				1.4				4.50	4.42	0.94	
9-7-87	<0.1		<0.01				<0.01	69	5.2			<0.01		<0.1		0.10	0.22	<0.01	14.6	<0.01		<0.01	<0.01	0.4	<0.002			0.1	0.070		<0.1	4.66	4.35	3.44	
4-22-88																																				Road covered with Snow

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VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station 2316-2.3
Location

DATE	TIME	FLOW	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
6-25-80	11:54	0.01	15	3	7.70									0.061	<0.01					0.040		20.0			1.0		178			270			175.68					
7-22-80	12:15	0.17		4																										300								
8-26-80	17:40	0.008	12	5	6.9	<2.0	<2.0				<0.01		<0.01	0.105	<0.01	0.39				0.010		10.5			1.0		318			490	0.58		246.44	202		18.0	1.5	2.3
9-16-80	15:30	0.009	19	4	7.0																									350								
10-8-80	12:24	0.008	18	6	7.8									<0.001	<0.01					0.050		4.5			1.0		229			350								
11-19-80	15:06	0.007	4	2	6.8																									470								
12-24-80	In Accessible			Snow																																		
2-25-81	In Accessible			Snow																																		
4-8-81	In Accessible			Snow																																		
6-24-81	13:33	0.01	17	3	7.2									<0.001	0.010					0.240		39.0					249			233			239.12	176		24.00		
8-26-81	13:18	0.007	15	5	7.6								0.40	<0.001	<0.01	0.42				0.240	0.050	9.0					244			255			263.52	216		16.00		
10-28-81	11:09	0.01	6	5	7.7									<0.001	0.30					0.200		3.0					250			235			290.36					
12-23-81			In Accessible																																			
2-24-82			In Accessible																																			
4-14-82			In Accessible																																			
6-9-82			In Accessible																																			
8-11-82	14:13	0.04	12	4	7.5									<0.001	0.13					0.150		<0.1					251			344			283.40	232.20				
10-13-82	12:23	0.008	9	7	7.7								0.4	<0.001	0.04	0.29				0.110	0.060	9.0					240			472			272.10	223		8.00		
12-21-82			In Accessible																																			
2-21-83			In Accessible																																			

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEXavCR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L				COMMENTS
6-25-80								62.40	<0.1								0.100		1.92	<0.010				0.46				1.80							Some Snow melt
7-22-80																																			
8-26-80			<0.001	0.035		0.003	<0.001	76.80	2.0	<0.001		0.002	0.002	0.11		0.100	0.150	0.005	2.40	0.003	<0.0002			0.41	0.001		<0.001	4.90	0.030						
9-16-80																																			
10-8-80								71.20	<0.1								0.050		2.40	0.010				0.42				18.00							
11-19-80																																			
12-24-80																																			
2-25-81																																			
4-8-81																																			
6-24-81								67.20	1.60								0.110		9.60	<0.001				0.46				13.00							
8-26-81			<0.001	0.015		0.010	<0.001	76.00	1.67	<0.001		0.020		0.13		<0.001	0.100	<0.001	7.68	0.020	<0.0002			0.38	0.004		<0.001	2.00	0.015						
10-28-81								75.20	4.00								0.114		10.08	0.022				0.40				6.00							
12-23-81																																			Snow
2-24-82																																			Snow
4-14-82																																			Snow
6-9-82																																			Snow
8-11-82								67.10	18.70								0.049		9.60	0.002				0.76				22.0							
10-13-82			<0.001	0.010		0.100	<0.001	70.40	0.90	<0.001		0.010		0.09		0.020		<0.001	7.68	0.005	<0.0002			0.59	0.005		<0.001	10.4	0.007						
12-21-82																																			Snow
2-21-83																																			Snow

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APPENDIX R614-301-742.221a

Sediment Pond Calculations and Details

HANSEN ALLEN & LUCE INC

I- Curve Number Selection -

A- Hydrologic Soil Group

Ref: "Soils of Utah" - Agriculture Experiment Station - Bulletin 492, Utah State University, Logan, Utah. March 1975

Soils at the Utah No 2 Mine are defined as:

Soil	Hydrologic Soil Group	
Typic Argiborolls	C	Generally B & C for deeper soils and D for shallow soils.
Lithic Argiborolls		
Typic Haploborolls	B	

Soils at the Belina Mine are defined as:

Soil	Hydrologic Soil Group	
Argic Cryoborolls	B & C	Mainly B & C
Pachic Cryoborolls	A, B & C	
Cryic Paleborolls	B & C	

Assume hydrologic soil group C for the whole area which should be conservative.

B- Vegetative cover and CN for Sage Grass Areas, & Forest Aspen Areas.

In undisturbed areas the vegetative cover consists of Sage/Grass cover complex and a Forest/Aspen cover complex. To be conservative assume the ground cover density to be only 25%.

From the attached figures taken from "Design of Small Dams" USBR (1977)

CN ≈ 75 for Sage/Grass, Soil Group C, Density 25%

CN ≈ 70 for Oak-Aspen, Soil Group C, Density 25%

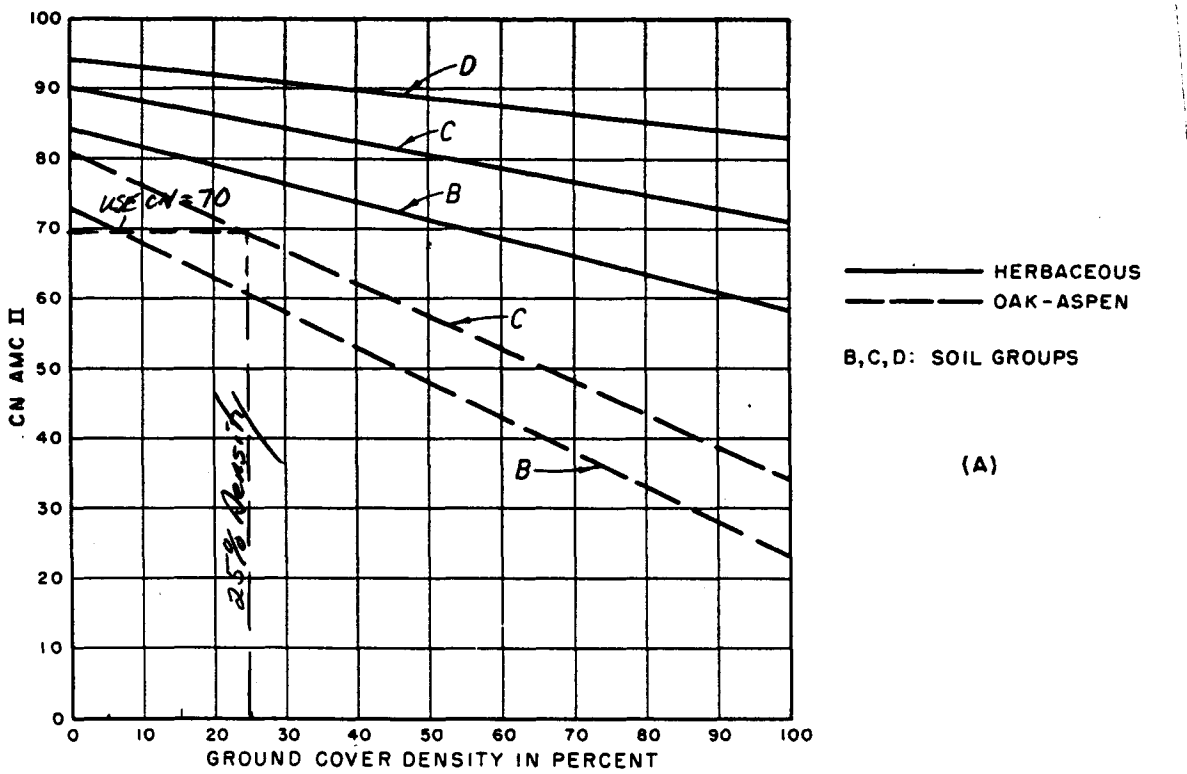
C- Disturbed areas were assumed to be equivalent roads (dirt) (hard surface) in Table A-2 attached, taken from "Design of Small Dams," again assuming Hydrologic Soil Group C.

CN = 90 for Disturbed Areas.

HANSEN ALLEN & LUCE inc

CLIENT Valley County
PROJECT Sediment Pond Analysis
FEATURE Curve Number Selection
PROJECT NO.

SHEET 2 OF 4
COMPUTED MA
CHECKED 9
DATE 9/18/88



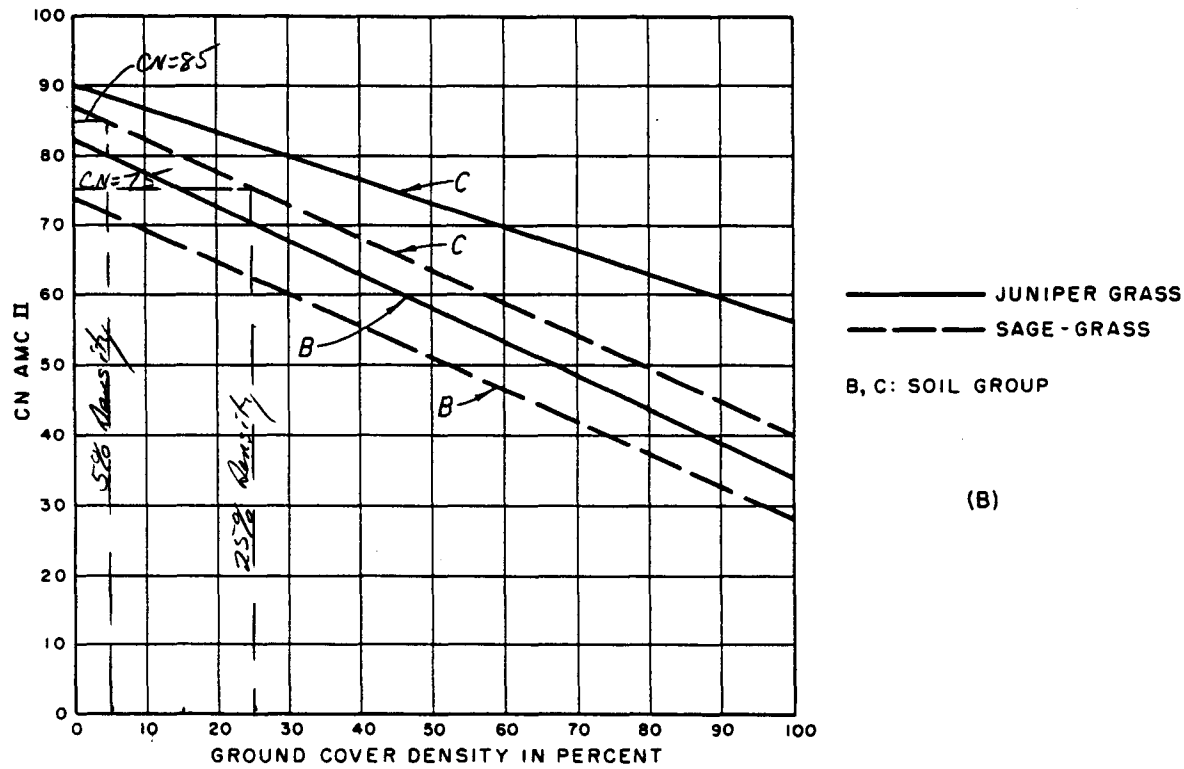


Figure A–3. Determining CN for forest-range in the western United States. 288–D–2824.

Taken from "Design of Small Dams" USBR (1977)

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Sediment Pond Analysis
FEATURE Curve Number Selection
PROJECT NO.

SHEET 3 OF 4
COMPUTED GMA
CHECKED
DATE 9/18/88

TABLE A-2.—*Runoff curve numbers (CN) for hydrologic soil-cover complexes*
(FOR WATERSHED CONDITION AMC-II AND I_a=0.2S)[a]

Taken from "Design of Small Dams" USBR (1977)

Land use or cover	Treatment or practice	Hydrologic condition for infiltrating	Hydrologic soil group			
			A	B	C	D
Fallow	SR		77	86	91	94
Row crops	SR	Poor	72	81	88	91
	SR	Good	67	78	85	89
	C	Poor	70	79	84	88
	C	Good	65	75	82	86
	C&T	Poor	66	74	80	82
	C&T	Good	62	71	78	81
Small grain	SR	Poor	65	76	84	[illegible]
	SR	Good	63	75	83	[illegible]
	C	Poor	63	74	82	[illegible]
	C	Good	61	73	81	84
	C&T	Poor	61	72	79	82
	C&T	Good	59	70	78	81
Close-seeded legumes[1] or rotation meadow.	SR	Poor	66	77	85	89
	SR	Good	58	72	81	85
	C	Poor	64	75	83	85
	C	Good	55	69	78	83
	C&T	Poor	63	73	80	83
	C&T	Good	51	67	76	[illegible]
Pasture or range		Poor	68	79	86	[illegible]
		Fair	49	69	79	84
		Good	39	61	74	80
	C	Poor	47	67	81	88
	C	Fair	25	59	75	83
	C	Good	6	35	70	79
Meadow (permanent).		do	30	58	71	78
Woods (farm woodlots).		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	[illegible]
Farmsteads			59	74	82	[illegible]
Roads (dirt)[2] (hard surface).[2]			72	82	87	89
			74	84	90	92

[1] Close-drilled or broadcast.
[2] Including right-of-way.
[3] See sec. A-5.
SR = Straight row.
C = Contoured.
T = Terraced.
C&T = Contoured and terraced.

(U.S. Soil Conservation Service.)

D- Reclaimed Areas were assumed to have a Sage-Grass cover with only 5% ground cover density.

CN = 85 for sage/Grass, 5% cover density, and hydrologic soil group C.

E- Paved Areas were assumed to be nearly impervious

CN = 98 was assumed.

II- Summary

Area Description	CN
Forest/Aspen	70
Sage/Grass	75
Disturbed Areas	90
Reclaimed	85
Paved Areas	98

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PROJECT Sediment Pond Analysis
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I- Drainage Basin Characteristics

A- Basin Areas

Sed Pond	Disturbed Area	Paved Area	Forested; Aspen Area	Sage/Grass Area	Reclaimed Area	Total
001A	8.13	—	—	3.4	—	11.53
002A	6.3	0.82	—	—	—	7.12
003A	4.0	0.18	1.65	1.0	0.25	7.08
004A	17.3	—	15.1	—	4.7	37.1

B- Curve Numbers

Use:
CN = 90 - Disturbed Areas
CN = 98 - Paved Areas
CN = 70 - Forest & Aspen
CN = 75 - Sage - Grass
CN = 85 - Reclaimed Areas.

} See Calculations 9/18/88 for Justification.

Volume Wt. Curve #5 -
10yr-24hr Precip = 2.45 inches
25yr-24hr Precip = 2.92 inches

Pond	Area ac	CN	Runoff Depth Q inches 10yr 24hr.	Runoff Depth Q inches 25yr 24hr	Wt. CN Based on Volume
001A	8.13	90	1.486	1.911	86.4 ← 10yr ← Use
	3.4	75	0.622	0.909	86.3 ← 25yr
		WtQ -	1.23	1.616	Use 86.4
002A	6.3	90	1.486	1.911	91.2 ← 10yr.
	0.82	98	2.221	2.689	91.0 ← 25yr.
		WtQ	1.571	2.001	Use 91.2
003A	4.0	90	1.486	1.911	84.8 ← 10yr.
	0.18	98	2.221	2.689	84.5 ← 25yr.
	1.65	70	0.432	0.670	Use 85.0
	1.0	75	0.622	0.909	
	0.25	85	1.139	1.521	
		WtQ	1.125	1.486	
004A	17.3	90	1.486	1.911	82.3 ← 10yr.
	15.1	70	0.432	0.670	82.6 ← 25yr
	4.7	85	0.854	1.521	Use 83.0
		WtQ	0.977	1.356	

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C - Hydraulic Length ; Watershed Slope

Sed Pond	Hydraulic Length ft	Watershed Slope %
001A	2760	38.0
002A	860	17.8
003A	1100	32.
004A	2040	40.

II - Runoff Volume - 10yr - 24hr event

P = 2.45 inches.

Sediment Pond	Area acres	Wt. CN	Runoff Depth in	Runoff Volume ac-ft
001A	11.53	86.4	1.229	1.18
002A	7.12	91.2	1.581	0.94
003A	7.08	85.0	1.139	0.67
004A	37.1	83.0	1.018	3.15

III - Peak Flow - 25-year 24-Hour Event

Sed Pond	Peak cfs See attached Printouts
001A	18.3
002A	13.7
003A	11.0
004A	52.0

PROJECT : VALLEY CAMP SEDIMENT POND 001A: 25-YR, 24-HR PEAK INFLOW

AREA= 11.5 ACRES
AVERAGE BASIN SLOPE= 38.0 PERCENT
CURVE NUMBER= 86.4
DESIGN STORM= 2.92 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 2760. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1041 HOURS QPCFS= 83.80 CFS QPIN= 7.2073 INCHES
C3= 35.5247 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
7.35	.3143	.0000	.0000	.0	.00
7.37	.3156	.0000	.0000	4.2	.00
7.39	.3169	.0000	.0000	26.0	.00
7.41	.3183	.0000	.0000	55.6	.00
7.43	.3196	.0000	.0000	76.9	.00
7.45	.3209	.0000	.0000	83.8	.00
7.47	.3223	.0000	.0000	78.5	.00
7.49	.3236	.0000	.0000	66.3	.00
7.51	.3248	.0000	.0000	51.8	.00
7.53	.3259	.0000	.0000	38.2	.00
7.55	.3270	.0000	.0000	27.0	.00
7.58	.3281	.0001	.0000	18.3	.00
7.60	.3292	.0001	.0000	12.1	.00
7.62	.3303	.0002	.0000	7.7	.00
7.64	.3314	.0002	.0000	4.9	.00
7.66	.3325	.0002	.0000	3.0	.00
7.68	.3336	.0002	.0000	1.8	.00
7.70	.3346	.0002	.0000	1.1	.01
7.72	.3357	.0003	.0000	.6	.01
7.74	.3368	.0003	.0000	.4	.01
7.76	.3379	.0003	.0000	.2	.01
7.78	.3390	.0004	.0000	.1	.01
7.80	.3401	.0004	.0000	.0	.01
11.88	1.6770	.6319	.0327	.0	16.72
11.90	1.7232	.6651	.0331	.0	17.03
11.93	1.7694	.6986	.0335	.0	17.33
11.95	1.8156	.7325	.0339	.0	17.61
11.97	1.8617	.7667	.0343	.0	17.88
11.99	1.9079	.8013	.0346	.0	18.13
12.01	1.9394	.8251	.0238	.0	18.32
12.03	1.9481	.8318	.0066	.0	18.19
12.05	1.9569	.8384	.0066	.0	17.33
12.07	1.9656	.8451	.0067	.0	15.70
12.09	1.9744	.8517	.0067	.0	13.60

PROJECT : VALLEY CAMP SEDIMENT POND 001A: 25-YR, 24-HR PEAK INFLOW
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
12.11	1.9832	.8584	.0067	.0	11.40
12.13	1.9919	.8651	.0067	.0	9.41

HYDROGRAPH PEAK= 18.32 cfs
TIME TO PEAK= 12.01 Hours
RUNOFF VOLUME= 1.56 Acre-Feet

PROJECT : VALLEY CAMP SEDIMENT POND 002A: 25-YR, 24-HR PEAK INFLOW

5/8

AREA= 7.1 ACRES
AVERAGE BASIN SLOPE= 17.8 PERCENT
CURVE NUMBER= 91.2
DESIGN STORM= 2.92 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 860. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0495 HOURS QPCFS= 108.75 CFS QPIN=15.1465 INCHES
C3= 74.6572 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
5.19	.1920	.0000	.0000	.0	.00
5.21	.1932	.0000	.0000	33.8	.00
5.23	.1943	.0000	.0000	99.8	.00
5.25	.1955	.0000	.0000	101.9	.00
5.27	.1966	.0000	.0000	67.3	.00
5.29	.1978	.0000	.0000	35.0	.00
5.31	.1989	.0000	.0000	15.7	.00
5.33	.2001	.0000	.0000	6.3	.00
5.35	.2012	.0000	.0000	2.4	.00
5.37	.2024	.0000	.0000	.8	.00
5.39	.2036	.0001	.0000	.3	.00
5.41	.2047	.0001	.0000	.0	.00
11.88	1.6698	.8932	.0370	.0	13.21
11.90	1.7137	.9304	.0372	.0	13.31
11.92	1.7577	.9679	.0374	.0	13.40
11.94	1.8016	1.0055	.0377	.0	13.49
11.96	1.8456	1.0434	.0379	.0	13.58
11.98	1.8895	1.0814	.0381	.0	13.66
12.00	1.9334	1.1197	.0383	.0	13.74
12.02	1.9438	1.1288	.0091	.0	12.82
12.04	1.9521	1.1360	.0073	.0	9.89
12.06	1.9605	1.1433	.0073	.0	6.77
12.08	1.9688	1.1506	.0073	.0	4.63
12.10	1.9771	1.1579	.0073	.0	3.50
12.12	1.9854	1.1652	.0073	.0	2.98

HYDROGRAPH PEAK= 13.74 cfs
TIME TO PEAK= 12.00 Hours
RUNOFF VOLUME= 1.20 Acre-Feet

PROJECT : VALLEY CAMP SEDIMENT POND 003A: 25-YR. 24-HR PEAK INFLOW

AREA= 7.1 ACRES
AVERAGE BASIN SLOPE= 32.0 PERCENT
CURVE NUMBER= 85.0
DESIGN STORM=' 2.92 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 1100. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0571 HOURS QPCFS= 93.76 CFS QPIN=13.1325 INCHES
C3= 64.7302 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
8.03	.3522	.0000	.0000	.0	.00
8.04	.3532	.0000	.0000	8.9	.00
8.05	.3542	.0000	.0000	45.9	.00
8.07	.3552	.0000	.0000	81.6	.00
8.08	.3562	.0000	.0000	93.8	.00
8.10	.3572	.0000	.0000	84.9	.00
8.11	.3582	.0000	.0000	66.1	.00
8.13	.3592	.0000	.0000	46.4	.00
8.14	.3602	.0000	.0000	30.1	.00
8.15	.3612	.0000	.0000	18.5	.00
8.17	.3622	.0000	.0000	10.8	.00
8.18	.3632	.0000	.0000	6.1	.00
8.20	.3642	.0000	.0000	3.3	.00
8.21	.3652	.0000	.0000	1.8	.00
8.23	.3662	.0000	.0000	.9	.00
8.24	.3672	.0001	.0000	.5	.00
8.25	.3682	.0001	.0000	.2	.00
8.27	.3692	.0001	.0000	.1	.00
8.28	.3702	.0002	.0000	.0	.00
11.91	1.7353	.6072	.0216	.0	10.36
11.92	1.7670	.6290	.0218	.0	10.47
11.94	1.7987	.6510	.0220	.0	10.58
11.95	1.8304	.6732	.0222	.0	10.69
11.97	1.8620	.6956	.0224	.0	10.80
11.98	1.8937	.7182	.0226	.0	10.90
12.00	1.9254	.7410	.0227	.0	10.99
12.01	1.9400	.7514	.0105	.0	10.98
12.02	1.9460	.7558	.0043	.0	10.44
12.04	1.9520	.7601	.0043	.0	9.23
12.05	1.9580	.7645	.0044	.0	7.63
12.07	1.9640	.7689	.0044	.0	6.05
12.08	1.9700	.7732	.0044	.0	4.74

HYDROGRAPH PEAK= 10.99 cfs
TIME TO PEAK= 12.00 Hours
RUNOFF VOLUME= .90 Acre-Feet

PROJECT : VALLEY CAMP SEDIMENT POND 004A: 25-YR, 24-HR PEAK INFLOW

AREA= 37.1 ACRES
AVERAGE BASIN SLOPE= 40.0 PERCENT
CURVE NUMBER= 83.0
DESIGN STORM= 2.92 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 2040. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0896 HOURS QPCFS= 312.99 CFS QPIN= 8.3664 INCHES
C3= 41.2379 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
8.77	.4088	.0000	.0000	.0	.00
8.78	.4104	.0000	.0000	15.7	.00
8.80	.4120	.0000	.0000	97.2	.00
8.82	.4135	.0000	.0000	207.8	.00
8.84	.4151	.0000	.0000	287.3	.00
8.86	.4167	.0000	.0000	313.0	.00
8.87	.4182	.0000	.0000	293.2	.00
8.89	.4198	.0000	.0000	247.5	.00
8.91	.4214	.0000	.0000	193.6	.01
8.93	.4230	.0000	.0000	142.8	.02
8.95	.4245	.0001	.0000	100.7	.02
8.96	.4261	.0001	.0000	68.4	.02
8.98	.4277	.0002	.0000	45.0	.03
9.00	.4292	.0002	.0000	28.9	.03
9.02	.4309	.0002	.0000	18.1	.04
9.04	.4326	.0003	.0000	11.2	.04
9.05	.4343	.0003	.0000	6.8	.05
9.07	.4359	.0003	.0000	4.0	.05
9.09	.4376	.0004	.0000	2.4	.06
9.11	.4393	.0004	.0000	1.4	.07
9.13	.4410	.0005	.0000	.8	.07
9.14	.4426	.0005	.0000	.5	.08
9.16	.4443	.0006	.0000	.3	.08
9.18	.4460	.0006	.0000	.1	.09
9.20	.4477	.0007	.0000	.0	.09
11.90	1.7236	.5135	.0248	.0	47.30
11.92	1.7634	.5387	.0252	.0	48.20
11.94	1.8032	.5642	.0255	.0	49.06
11.96	1.8430	.5901	.0259	.0	49.89
11.98	1.8828	.6163	.0262	.0	50.69
11.99	1.9225	.6427	.0265	.0	51.46
12.01	1.9410	.6551	.0124	.0	51.98
12.03	1.9485	.6602	.0051	.0	51.17
12.05	1.9560	.6653	.0051	.0	48.13

PROJECT : VALLEY CAMP SEDIMENT POND 004A: 25-YR, 24-HR PEAK INFLOW
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
12.07	1.9636	.6704	.0051	.0	43.06
12.08	1.9711	.6755	.0051	.0	36.94
12.10	1.9786	.6806	.0051	.0	30.81
12.12	1.9862	.6857	.0051	.0	25.40

HYDROGRAPH PEAK= 51.98 cfs
TIME TO PEAK= 12.01 Hours
RUNOFF VOLUME= 4.27 Acre-Feet

revised by add. of 1.2 acre sage grass 1/3/89

10-yr 24-hr runoff volumes

POND	Tributary Area (acres)	Composite CN	10-yr 24-hr Runoff (inches)	Runoff Volume (Ac Ft)	+ 2yr SED	+ 3yr sed
001A	11.5	86.4	1.23	1.18	0.62	0.93
002A	7.1	91.2	1.58	0.94	.06	0.10
003A	7.1	85	1.14	0.67	0.34	0.51
004A	37.1	83	1.02	3.15	0.50	.75

Sediment Volumes

Modified Universal Soil Loss Equation

$$A = R \cdot K \cdot LS \cdot VM$$

reference: "Erosion and Sedimentation in Utah: A Guide for Control" Israelsen et al 1984

where
- A = soil loss per unit area (tons/acre/year)
- R = rainfall factor
- K = soil erodibility factor
- LS = topographic factor
- VM = erosion control factor

R (rainfall factor):

ref: PRICE ISO-ERODENT (R) VALUES 1983

Mean Annual R = 15 at VC load out site
≈ 19 at Belina mine

K soil erodibility factor

map for state of utah indicates that the Valley Camp Load Out facility is about on the border between soil erodibility types — choose the more conservative range:

K = 0.21 to 0.3 use 0.3

LS see Table 2
λ_n = sum of slope segment lengths =

VM

Undisturbed: Aspen/grass 60% groundcover 0.012
Sage/grass 60-80% 0.039

Disturbed: use VM = 1.0 ref. Red Book Appendix 5A

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Sediment Pond Analysis
FEATURE Mean Annual Sediment Loadings
PROJECT NO. 7-10-1

SHEET 2 OF 4
COMPUTED GJP
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DATE Sep 20, 1988

POND 001 A

- ignore conveyance deposition (conservative approach)
- assume a unit weight of sediment of 75 lb/ft³
- R = 15 K = 0.3 ∴ R·K = 4.5

Sub Area	area (acres)	l ft	S %	LS	VM	4.5·LS·VM A t/ac/yr	Sed tons/yr	Sed AF/yr	
Sage/Grass	3.4	120	62%	.28	.039	4.9	16.7		
Disturbed									
(1) steep slope	1.9	80	62%	1) 37.5	1.0	168.8	320.7		
(2) old parkl yd	2.9	50	6%	2) 1.4	1.0	6.3	18.3		
(3) rest c	2.9	90	40	12.0	1.0	54.0	156.6		
							512.3	0.31	ok

1) $LS = \frac{(L\lambda_n S_{s_n})\lambda_n - (L\lambda_{n-1} S_{s_n})\lambda_{n-1}}{L_n} = \frac{29(165) - 21(85)}{80}$

2) $LS = \frac{(1.0)215 - (0.87)(165)}{50} = 1.43$

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Sediment Pond Analysis
FEATURE Mean Annual sediment Loadings
PROJECT NO. 770-1

SHEET 3 OF 4
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DATE Sep 20, 1988

Pond 002A

$A = RKLSVM$

- $R = 15 \quad K = 0.3 \Rightarrow R \cdot K = 4.5$

Sub Area	area (acres)	ℓ (ft)	S %	LS	VM	A	SED, tons/yr	sed AF/yr
① steep	0.7	60	33%	7.30	1.0	32.8	23.0	
② channel/sides	0.6	40	38%	7.0	1.0	31.5	18.9	
③ pads etc	4.8	130	3%	0.3	1.0	1.35	6.48	
							48.4	
Paved + Pond	1.0				ϕ		ϕ	
	7.1						48.4	0.03

Pond 003A

Sub Area	area (acres)	ℓ (ft)	S %	LS	VM	A	SED tons/yr	SED AF/yr
SAGE/Grass	1.0	400	29%	15.9	.039	2.8	2.8	
ASPEN	1.65	250	35%	16.16	.012		0.9	
Disturbed								
sandstone etc ① Steep	0.4	27	100%	1) 102	1.0	459	184.	
② steep below trail	0.7	95	50%	17.4	1.0	78.3	54.8	
③ upper pads	0.7	55'	4%	0.32	1.0	1.44	1.0	
④ to bottom ditch	0.7	85'	30%	7.3	1.0	32.9	23.0	
⑤ rest	1.5	200'	8.5%	1.53	1.0	6.89	10.3	
⑥ Far South Area	0.25	90'	20%	3.98	1.0	17.91	4.5	
							282.5	0.17 AF/yr 0.5

1) $LS = \dfrac{(L\lambda_n Ss_n)\lambda_n - (L\lambda_{n-1} Ss_n)\lambda_{n-1}}{\ell_n} = \dfrac{(70)277 - 66.8(250)}{27}$

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Sediment Pond Analysis
FEATURE Mean Annual Sediment Loadings
PROJECT NO. 7-10-1

SHEET 4 OF 4
COMPUTED GJP
CHECKED
DATE Nov 8, 1988

Pond 004A

$A = RKLSVM$

$R = 15 \quad K = 0.3 \Rightarrow RK = 4.5$

Sub Area	Area (acres)	l (ft)	S %	LS	VM	A	Sed ton/yr	Sed AF/yr
D4 seg 1	0.9	42	139%	27	.02	2.43	2.2	
seg 2	2.5	540	6%	1.57	1.3	9.18	22.9	
	3.4							
D5	0.8	102	54%	20.5	0.9	83.0	66.4	
D6	3.7	110	45%	15.6	0.01	0.7	2.6	
D7 seg 1	0.8	50	90%	26.9	0.9	108.9	87.1	
seg 2	2.0	440	4%	0.73	1.3	4.27	8.5	
	2.8							
D8	1.0	100	40%	12.65	0.01	0.57	0.6	
D9 seg 1	0.7	170	47%	21.6	0.9	87.48	2.9	
seg 2	0.14	55	200%	233	0.02	20.97		
seg 3	4.7	360	5%	1.0	1.3	5.85	27.5	
	5.5							
D10 seg 1	0.6	170	47%	21.5	0.9	87.0	52.2	
seg 2	2.4	430	8.1%	2.0	1.3	11.7	28.0	
	3.0							
D11	0.8	180	47%	22.0	1.3	128.7	103.0	
U4	7.2	480	39%	23.0	.009	0.93	6.7	
U5	5.3	700	22%	12.62	.009	0.51	2.7	
U6	2.6	206	49%	25.3	.01	1.14	3.0	0.25

416 ton/yr

$$\text{sediment volume} = 416 \text{ t/yr} \; \frac{2000 \text{ lb}}{\text{t}} \; \frac{1 \text{ ft}^3}{75 \text{ lb}} \times \frac{1}{43560}$$

$$= 0.25 \text{ AF}$$

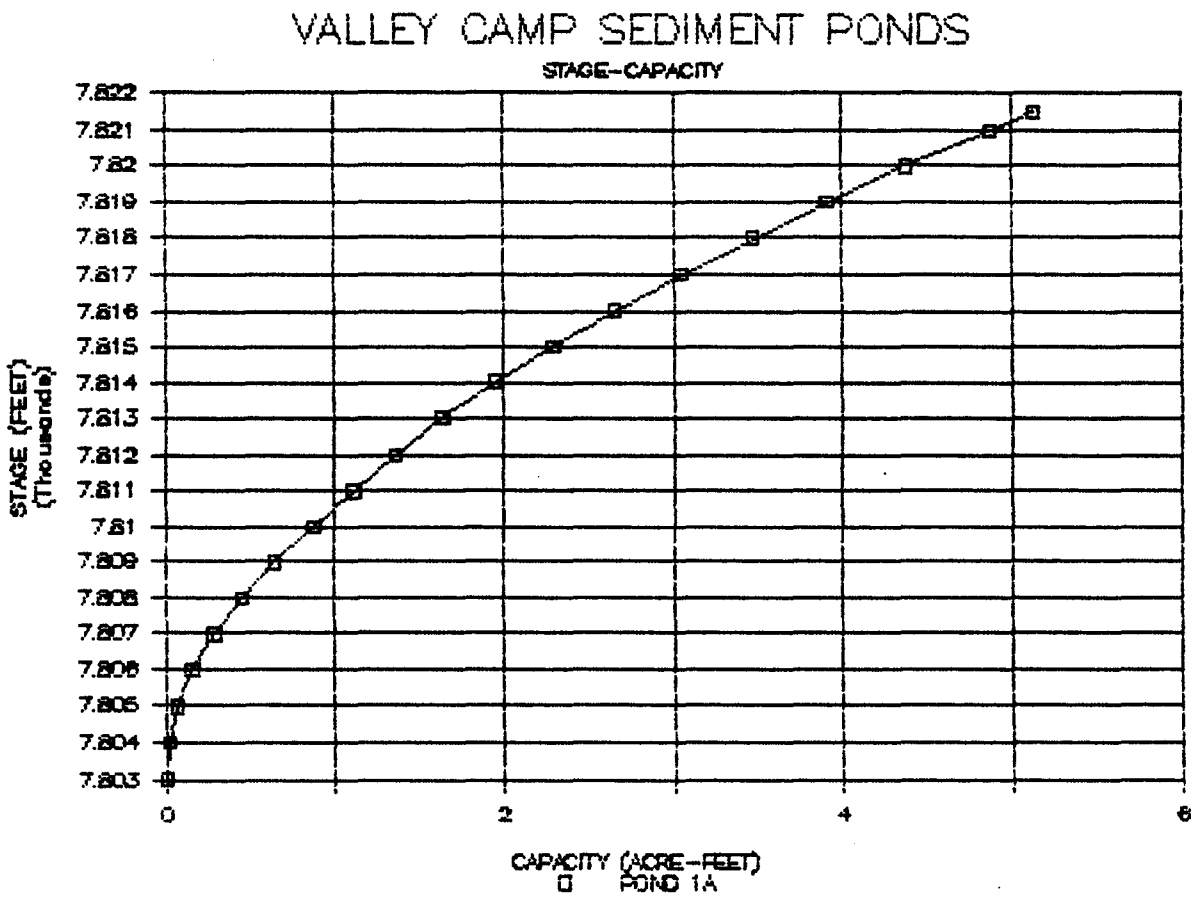
STAGE VOLUME RELATIONSHIP
POND 001A

AFTER CLEANING (OCTOBER 1988)
POND NPDES 001A

ELEV. FT	STAGE FT	AREA FT2	DEL VOL AF	SUM VOL AF	COMMENTS
7803	0	207	0	0	
7804	1	1050	0.01	0.01	
7805	2	3050	0.05	0.06	
7806	3	4880	0.09	0.15	
7807	4	6630	0.13	0.28	
7808	5	7750	0.17	0.45	
7809	6	9360	0.20	0.65	
7810	7	10350	0.23	0.87	
7811	8	10670	0.24	1.11	
7812	9	11000	0.25	1.36	
7813	10	13000	0.28	1.64	
7814	11	14400	0.31	1.95	
7815	12	15416	0.34	2.29	
7816	13	16300	0.36	2.66	Exist. Primary spillway (18
7817	14	17500	0.39	3.05	EL-7816.1
7818	15	18800	0.42	3.46	
7819	16	20000	0.45	3.91	Exist. Emergency spillway (
7820	17	20900	0.47	4.38	EL - 7818.8'
7821	18	22100	0.49	4.87	
7821.5	18.5	22650	0.26	5.13	

PONC 001A AFTER CLEANING

2/7



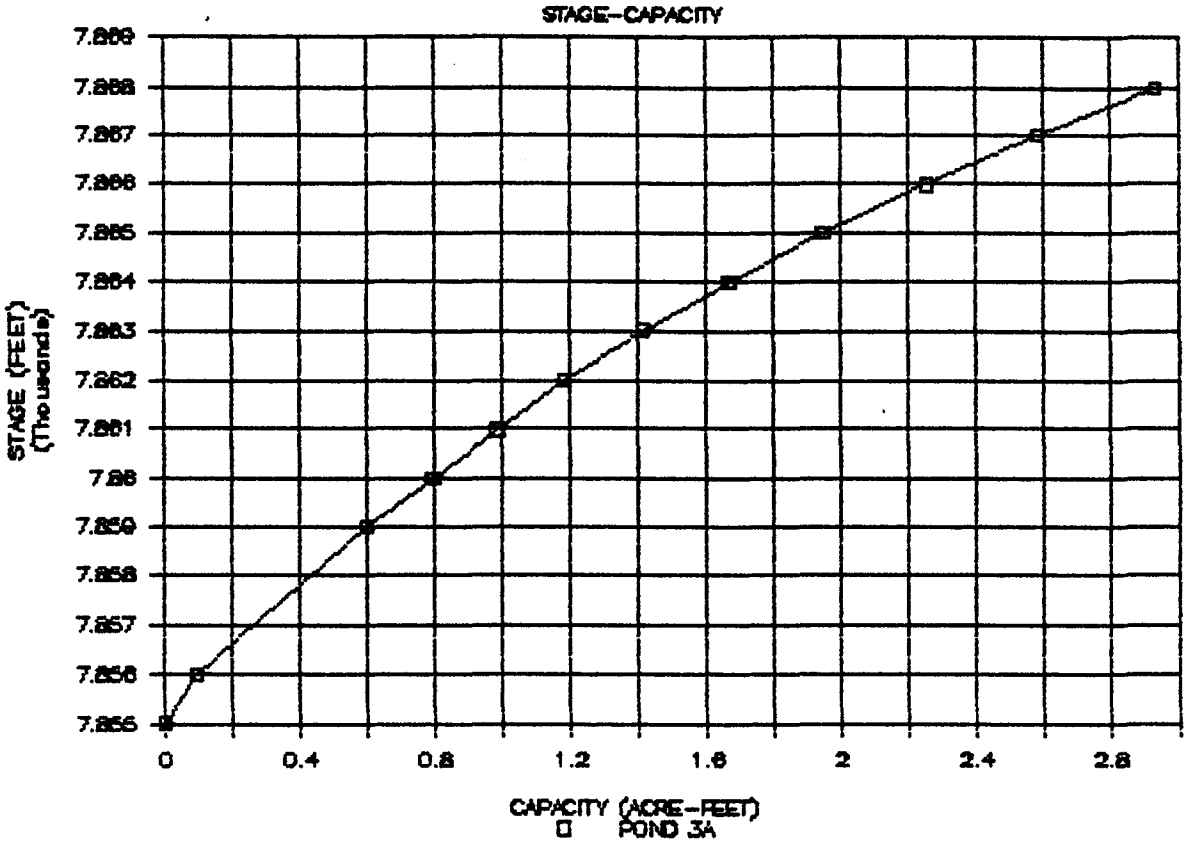
STAGE VOLUME RELATIONSHIP
POND 002A

POND NPDES 002A AFTER CLEANING, NOVEMBER 198

ELEV. FT	STAGE FT	AREA FT2	DEL VOL AF	SUM VOL AF	
7823	0	87	0	0	
7824	1	549	0.01	0.01	
7825	2	1300	0.02	0.03	
7826	3	2180	0.04	0.07	
7827	4	3120	0.06	0.13	
7828	5	4000	0.08	0.21	
7829	6	4880	0.10	0.31	
7830	7	5445	0.12	0.43	Existing
7831	8	6100	0.13	0.56	Decant EL - 7830.8'
7832	9	6690	0.15	0.71	
7833	10	7020	0.16	0.87	
7834	11	7550	0.17	1.04	
7835	12	8460	0.18	1.22	Primary EL - 7835.4
7836	13	9100	0.20	1.42	Emergency EL - 7836.3'
7837	14	9920	0.22	1.64	
7838	15	10810	0.24	1.88	
7838.6	15.6	11400	0.15	2.03	

POND 002A AFTER CLEANING

VALLEY CAMP SEDIMENT PONDS



STAGE VOLUME RELATIONSHIP
POND 003A

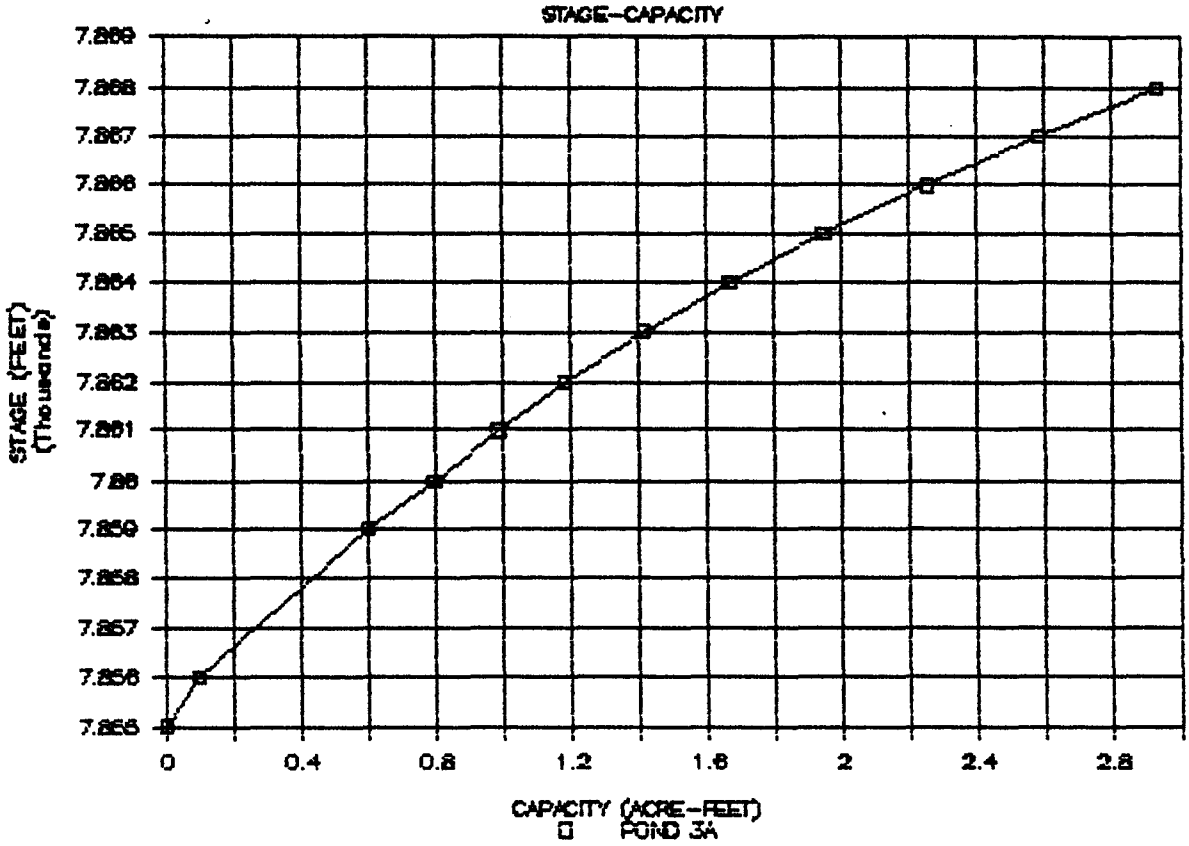
AFTER CLEANING (OCTOBER 1988)
POND NPDES 003A

ELEV. FT	STAGE FT	AREA FT~~3~~ 2	DEL VOL AF	SUM VOL AF	
7855	0	2170	0	0	
7856	1	6430	0.10	0.10	
7859	4	8150	0.50	0.60	
7860	5	8830	0.19	0.80	
7861	6	7861	0.19	0.99	
7862	7	9310	0.20	1.18	
7863	8	10500	0.23	1.41	Primary El - 7863.2
7864	9	11650	0.25	1.67	
7865	10	12700	0.28	1.95	Emergency El - 7865.5
7866	11	14000	0.31	2.25	
7867	12	14580	0.33	2.58	
7868	13	15960	0.35	2.93	

PONO NPDES 003A AFTER CLEANING

6/7

VALLEY CAMP SEDIMENT PONDS



STAGE VOLUME RELATIONSHIP
POND 00HA

ELEV. FT	STAGE FT	AREA FT3	DEL VOL AF	SUM VOL AF
8863	0	0	0	0
8864	1	160	0.00	0.00
8865	2	1730	0.02	0.02
8866	3	6160	0.09	0.11
8867	4	13490	0.23	0.34
8868	5	18090	0.36	0.70
8869	6	21170	0.45	1.15
8870	7	23860	0.52	1.67
8871	8	25980	0.57	2.24
8872	9	27930	0.62	2.86
8873	10	30110	0.67	3.53
8874	11	32330	0.72	4.24
8875	12	34880	0.77	5.01 ← Primary 8874.93
8876.4	13	36850	0.82	5.84 ← Emergency 8876.3

Storage at Primary Spillway = 4.96 ac-ft.

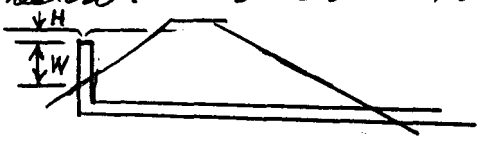
Required decant elev. to provide 3.15 ac-ft of runoff storage = 8870.25'

I- Spillway Configurations:

All primary and emergency spillways for ponds 001A through 003A are 18" diameter CMP riser standpipes, with a barrell through the embankment.

Summarized below are weir and orifice flow for an 18-inch diameter standpipe. These calculations are applicable to all primary and emergency spillways for all three ponds.

Note W in $C = 3.27 + 0.4H/W$ was assumed to be 4.7 ft for all of the ponds. The exact value for W for the ponds was not known. However, variation in W will make little difference in the prediction of weir flow over the region where weir flow governs. For example, even if W were 7 ft. at a head of 0.5 ft (where orifice flow begins to govern), the discharge over the 18" diameter spillway would be 5.48 cfs instead of the 5.52 cfs value reported below. Thus a variation in W makes little difference in Q.



RISER TYPE SPILLWAY HYDRAULICS

WEIR FLOW: Q=CL(H)**3/2 C= 3.27+0.4H/W

ORIFICE FLOW: Q=C'A(2gH)**1/2 C'= 0.6

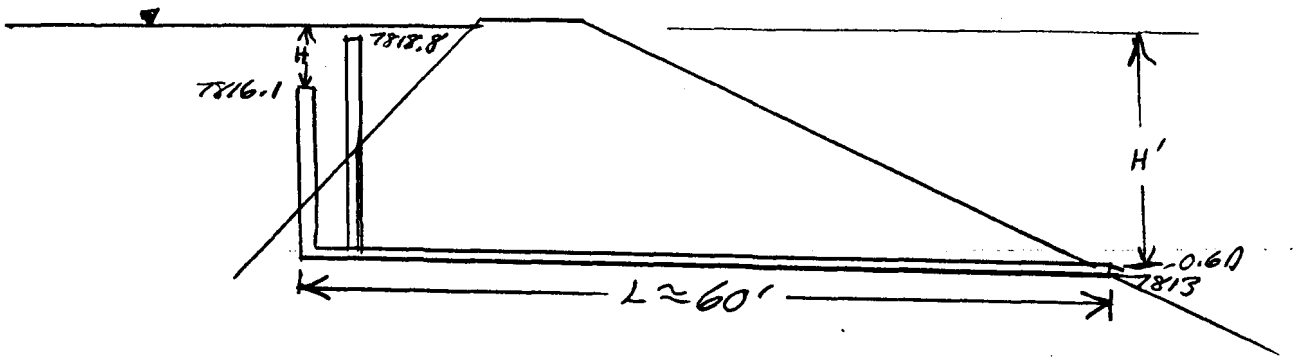
D= 1.5

A (FT2) 1.76625

STAGE H ft.	WEIR FLOW C	WEIR FLOW Q (CFS)	ORIFICE FLOW Q (CFS)	CONTOLLIN Q (CFS)
0	3.27	0	0	0
0.1	3.278	0.49	2.69	0.49
0.2	3.287	1.38	3.80	1.38
0.3	3.295	2.55	4.66	2.55
0.4	3.304	3.94	5.38	3.94
0.5	3.312	5.52	6.01	5.52
0.6	3.321	7.27	6.59	6.59
0.7	3.329	9.18	7.12	7.12
0.8	3.338	11.25	7.61	7.61
0.9	3.346	13.46	8.07	8.07
1	3.355	15.80	8.50	8.50
1.1	3.363	18.28	8.92	8.92
1.2	3.372	20.88	9.32	9.32
1.3	3.380	23.60	9.70	9.70
1.4	3.389	26.44	10.06	10.06
1.5	3.397	29.40	10.42	10.42
1.6	3.406	32.47	10.76	10.76
1.7	3.414	35.65	11.09	11.09
1.8	3.423	38.93	11.41	11.41
1.9	3.431	42.33	11.72	11.72
2	3.440	45.83	12.03	12.03
2.1	3.448	49.43	12.32	12.32
2.2	3.457	53.13	12.61	12.61
2.3	3.465	56.93	12.90	12.90
2.4	3.474	60.83	13.18	13.18
2.5	3.482	64.83	13.45	13.45
2.6	3.491	68.93	13.71	13.71
2.7	3.499	73.12	13.97	13.97
2.8	3.508	77.41	14.23	14.23
2.9	3.516	81.79	14.48	14.48
3	3.525	86.26	14.73	14.73
3.1	3.533	90.83	14.97	14.97
3.2	3.542	95.49	15.21	15.21
3.3	3.550	100.24	15.45	15.45
3.4	3.559	105.08	15.68	15.68

Orifice flow begins to govern

II - Check Pipe Flow from Pond 001A



Primary Spillway

$H' = H + [7816.1 - (7813 + 0.6(1.5))] = H + 2.2$

$L = 60'$

Emergency Spillway

$H' = H + [7818.8 - (7813 + 0.6(1.5))] = H + 4.9$

$L \approx 60'$

$$Q = \frac{a(2gH')^{1/2}}{(1 + K_e + K_b + K_c L)^{1/2}}$$

$K_e = 1$

$K_b = 0.5$

$K_c = \frac{5087(0.027)^2}{(18)^{4/3}} = 0.0786$

$a = 1.770 \text{ ft}^2$

$$Q = \frac{1.77(2 * 32.2 H')^{1/2}}{(1 + 1 + 0.5 + 0.0786(60))^{1/2}} = \frac{14.20 H'^{1/2}}{2.69} = 5.28 H'^{1/2}$$

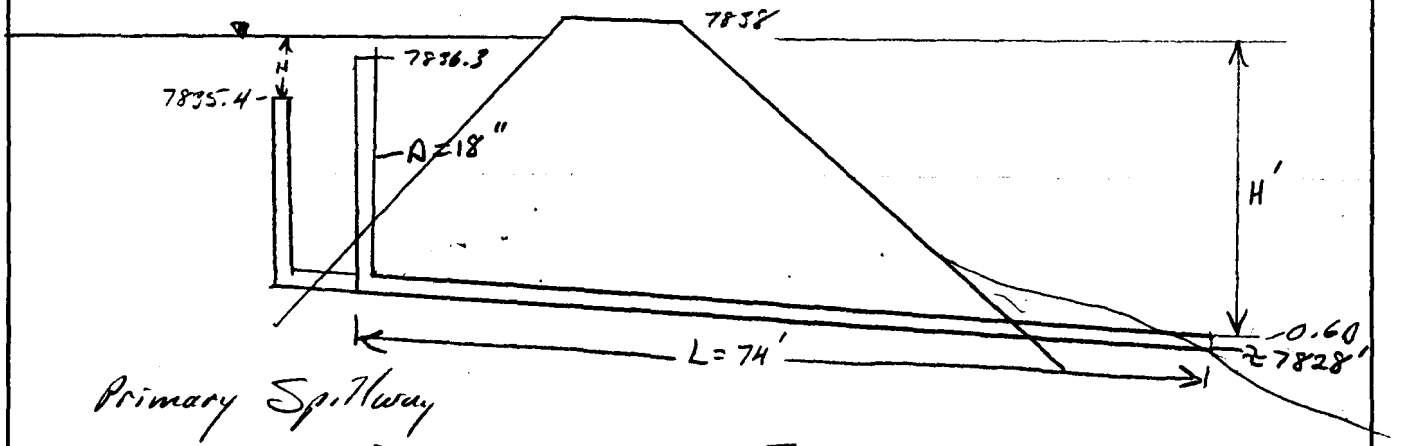
Primary Spillway

H ft	H' ft	Q cfs
0.2	2.4	8.18
0.4	2.6	8.51
0.6	2.8	8.83
0.8	3.0	9.14
1.0	3.2	9.45
1.2	3.4	9.73
1.4	3.6	10.02 ← Pipe flow becomes limiting at this point.
1.6	3.8	10.29
1.8	4.0	10.56
2.0	4.2	10.82
2.1	4.3	10.95
2.3	4.5	11.20
2.5	4.7	11.45
2.7	4.9	11.69
2.9	5.1	11.92
3.1	5.3	12.16
3.3	5.5	12.38
3.5	5.7	12.60
3.7	5.9	12.83

Emergency Spillway

H ft	H' ft	Q cfs
0.2	5.1	11.92
0.4	5.3	12.16
0.6	5.5	12.38
0.8	5.7	12.60
1.0	5.9	12.83
1.2	6.1	13.04
1.4	6.3	13.25
1.6	6.5	13.46
1.8	6.7	13.67
2.0	6.9	13.87 ↑ Orifice flow is still limiting @ H = 2'.

III - Check Pipe Flow from 002A



Primary Spillway

$$H' = H + [7835.4 - (7828 + 0.6(1.5))] = H + 6.5$$
$$L = 74'$$

Emergency Spillway

$$L = 74'$$
$$H' = H + [7836.3 - (7828 + 0.6(1.5))] = H + 7.4$$

$$Q = \frac{a(2gH')^{1/2}}{(1 + K_e + K_b + K_c L)^{1/2}}$$

$K_e = 1.0$ $\quad n = 0.027$

$K_b = 0.5$

$K_c = \frac{5087 n^2}{d_i^{4/3}} = \frac{5087(0.027)^2}{(18)^{4/3}} = 0.0786$

$a = 1.770 \text{ ft}^2$

Principal Spillway & Emergency - (Since both are the same length & diameter)

$$Q = \frac{1.77[2(32.2)H']^{1/2}}{(1 + 1 + 0.5 + 0.0786(74))^{1/2}} = \frac{14.20 H'^{1/2}}{2.884} = 4.92 H'^{1/2}$$

Primary Spillway - Pipe Flow

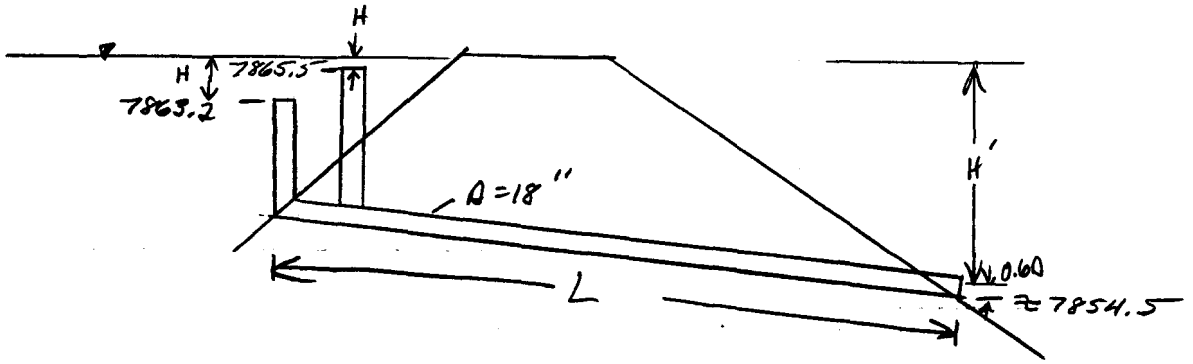
H (ft)	H' (ft)	Q (cfs)
0.2	6.7	12.7
0.4	6.9	12.9
0.6	7.1	13.1
0.8	7.3	13.3
1.0	7.5	13.47
1.2	7.7	13.65
1.4	7.9	13.83
1.6	8.1	14.00
1.8	8.3	14.17
2.0	8.5	14.34

← At this head orifice flow is still controlling, thus pipe flow is not controlling in Pond 002A

Emergency Spillway - Pipe Flow

H (ft)	H' (ft)	Q (cfs)
0.2	7.6	13.56
1.0	8.4	14.26
2.0	9.4	15.05

IV - Check Pipe Flow from Pond 003A



Principal Spillway

$$H' = H + [7863.2 - (7854.5 + 0.6(1.5))] = H + 7.8$$

$L \approx 74'$

Emergency

$$H' = H + [7865.5 - (7854.5 + 0.6(1.5))] = H + 10.1$$

$L \approx 74'$

$$Q = \frac{a(2gH')^{1/2}}{(1 + K_e + K_b + K_c L)^{1/2}}$$

$K_e = 1.0$ $\quad n = 0.027$

$K_b = 0.5$

$$K_c = \frac{5087 n^2}{d_c^{4/3}} = \frac{5087(0.027)^2}{(18)^{4/3}} = 0.0786$$

$$a = \text{area} = \frac{\pi D^2}{4} = \frac{\pi (1.5)^2}{4} = 1.77 ft^2$$

Principal and Emergency - (Since both have the same length & diameter).

$$Q = \frac{1.77[2(32.2)H']^{1/2}}{(1 + 1.0 + 0.5 + 0.0786(74))^{1/2}} = \frac{14.20 H'^{1/2}}{2.884} = 4.92 H'^{1/2}$$

Primary Spillway - Pipe Flow

H (ft)	H' (ft)	Q (cfs)
0.2	8.0	13.91
0.4	8.2	
0.6	8.4	
0.8	8.6	
1.0	8.8	14.60
1.2	9.0	
1.4	9.2	
1.6	9.4	
1.8	9.6	
2.0	9.8	15.40 cfs

Orifice Flow is still limiting at this head. Thus pipe flow is not controlling.

Emergency Spillway - Pipe flow

H (ft)	H' (ft)	Q (cfs)
0.2	10.3	15.8
1.0	11.1	16.4
2.0	12.1	17.1

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Sedimentation Pond Analysis
FEATURE Spillway Rating Curves - Ponds 001A to 003A
PROJECT NO.

SHEET 5 OF 7
COMPUTED MA
CHECKED
DATE 1/25/89

V - Discharge Rating Table - Pond 001A

Elev	Primary Spillway H ft	Primary Spillway Q cfs	Emergency Spillway H ft	Emergency Spillway Q cfs	Combined Q cfs
7816.1	0	0	0	0	0
7816.2	0.1	0.49			0.49
7816.4	0.3	2.55			2.55
7816.6	0.5	5.52			5.52
7816.8	0.7	7.12			7.12
7817.0	0.9	8.07			8.07
7817.2	1.1	8.92			8.92
7817.4	1.3	9.70			9.70
7817.6	1.5	10.16			10.16
7817.8	1.7	10.43			10.43
7818.0	1.9	10.69			10.69
7818.2	2.1	10.95			10.95
7818.4	2.3	11.20			11.20
7818.6	2.5	11.45			11.45
7818.8	2.7	11.69	0	0	11.69
7819.0	2.9	11.92	0.2	1.38	13.30
7819.2	3.1	12.16	0.4	3.94	16.10
7819.4	3.3	12.38	0.6	6.59	18.97
7819.6	3.5	12.60	0.8	7.61	20.21
7819.8	3.7	12.83	1.0	8.50	21.33

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Sedimentation Pond Analysis
FEATURE Spillway Rating Curves - Ponds 001A to 003A
PROJECT NO.

SHEET 6 OF 7
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CHECKED
DATE 1/25/89

VI - Discharge Rating Table - Pond 002A

Elev ft	Primary Spillway H ft	Primary Spillway Q cfs	Emergency Spillway H ft	Emergency Spillway Q cfs	Combined Q cfs
7835.4	0	0	0	0	0
7835.6	0.2	1.38			1.38
7835.8	0.4	3.94			3.94
7836.0	0.6	6.59			6.59
7836.2	0.8	7.61			7.61
7836.3	0.9	8.07	0	0	8.07
7836.4	1.0	8.50	0.1	0.49	8.99
7836.6	1.2	9.32	0.3	2.55	11.87
7836.8	1.4	10.06	0.5	5.52	15.58
7837.0	1.6	10.76	0.7	7.12	17.88
7837.2	1.8	11.41	0.9	8.07	19.48

HANSEN ALLEN & LUCE INC

CLIENT: Valley Camp
PROJECT: Sediment Pond Analysis
FEATURE: Spillway Rating Curves - Ponds 001A to 003A
PROJECT NO.:

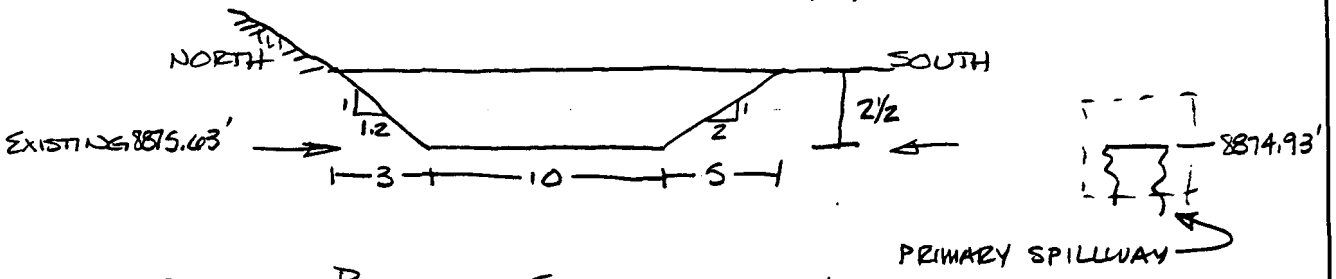
SHEET 7 OF 7
COMPUTED CMA
CHECKED
DATE 1/25/89

Elev ft.	Primary Spillway H ft	Primary Spillway Q cfs	Emergency Spillway H ft	Emergency Spillway Q cfs	Combined Q cfs
7863.2	0	0	0	0	0
7863.4	0.2	1.38			1.38
7863.6	0.4	3.94			3.94
7863.8	0.6	6.59			6.59
7864.0	0.8	7.61			7.61
7864.2	1.0	8.50			8.50
7864.4	1.2	9.32			9.32
7864.6	1.4	10.06			10.06
7864.8	1.6	10.76			10.76
7865.0	1.8	11.41			11.41
7865.2	2.0	12.03			12.03
7865.4	2.2	12.61			12.61
7865.5	2.3	12.90	0	0	12.9
7865.6	2.4	13.18	0.1	0.49	13.67
7865.8	2.6	13.71	0.3	2.55	16.26
7866.0	2.8	14.23	0.5	5.52	19.76
7866.2	3.0	14.73	0.7	7.12	21.85
7866.4	3.2	15.21	0.9	8.07	23.28

POND 4 EMERGENCY SPILLWAY

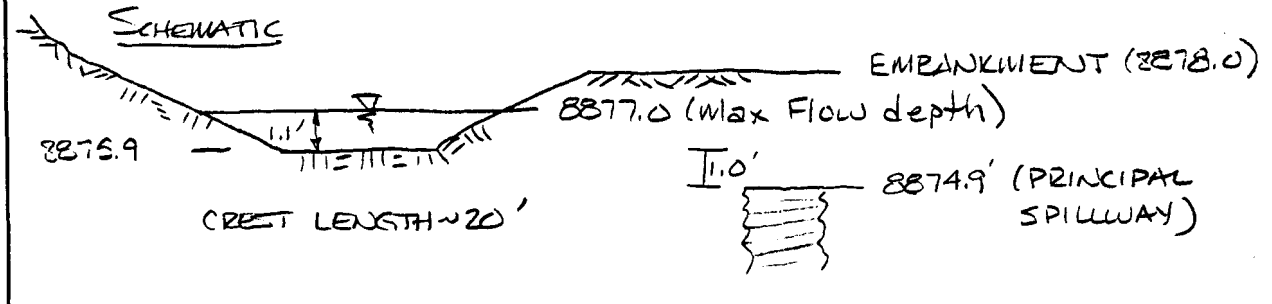
SPILLWAY RECONSTRUCTED AFTER ANIMAL BORINGS CAUSED LEAK IN OLD SPILLWAY.

EXISTING DIMENSIONS TAKEN 5/17/89



ΔH REQUIRED BETWEEN SPILLWAYS = 1.0'
∴ MUST RAISE EMERGENCY TO 8875.9'
EMBANKMENT ELEVATION: EXISTING = 8877.5 - MUST RAISE
PROPOSED = 8878.0 (Raised 0.5')

SCHEMATIC



25 YR - 24 HOUR DISCHARGE REQUIT = 52 cfs

UPSTREAM SLOPE > 2:1 (FROM CLEANED POND CONTOUR MAPPING)

* Modified "C" values based upon decrease noted for Rect. Weir with 20' Crest.

ELEV.	HEAD	C	C*	Q (cfs)
8875.9	0	—	—	—
8876.1	0.2	2.82	2.23	2.0
8876.3	0.4	3.04	2.40	6.1
8876.5	0.6	3.20	2.53	11.8
8876.7	0.8	3.32	2.62	18.7
8876.9	1.0	3.43	2.71	27.1
8877.0	1.1	3.47	2.74	31.6

BROAD (RECTE) WEIR FLOW EQN: $CLH^{3/2} = Q$ $L = 10'$

@ H MAX (1.1 ft) $Q_{EMER} = 31.6$ cfs < 52 cfs ; ADD FLOW FROM PRINCIPAL SPILLWAY

Principal Spillway (Riser)

From earlier work, Orifice Flow @ 8877.0

$Q = 12.32$ cfs

Combine Flows:

Principal Spillway	12.32
Emergency Spillway	31.60
	43.92 < 52 cfs

Must Enlarge

Back Calculate Required Width

Q reqd from Channel = 52 - 12.32 = 39.7 cfs

$Q = CLH^{3/2}$ $\quad 39.7 = 2.74(L)(1.1)^{3/2}$

$L = 12.6$ ft

Use ≥ 13.0' Bottom Width

Recalculate Flow

$Q = 2.74(13)(1.1)^{3/2} = 41.1$ cfs

+ 12.3 cfs (Riser)

53.4 cfs > 52 cfs Req'd OK

Summary - Emergency Channel

Bottom Elev = 8878.0
Bottom Width = 13.0'
Side Slopes : 2:1
Top Width = 21.5' (Rounded up from 21.4')
13.0 + 2*(1.1+1.0)*2 = 21.4
b + 2HM = T

Check of Pond 004A (Pipe Flow Conditions)

PRIMARY SPILLWAY $L \simeq 80'$

$$H' = H + [8874.9 - (8861.4 + 0.6(1.5))] = H + 12.65$$

$$Q = \frac{a(2gH')^{1/2}}{(1 + k_e + k_b + k_c l)^{1/2}} =$$

$K_e = 1$

$K_b = 0.5$

$K_c = \frac{5087(n)^2}{D^{4/3}} = \frac{5087(.027)^{1/2}}{(18)^{4/3}} = 0.0786$

$a = 1.77 ft^2$

$$Q = \frac{1.77(2(32.2)H')^{1/2}}{(1 + 1 + 0.5 + (.0786)80)^{1/2}} = \frac{14.2H'^{1/2}}{2.96}$$

UNDER MAX HEAD CONDITIONS:

$H_{max} = 2.1'$ $\quad H' = 2.1' + 12.65 = 14.75'$

$$Q = \frac{14.2(14.75)^{1/2}}{2.96} = \underline{\underline{18.42 cfs}}$$

18.4 cfs > 12.22 cfs under inlet conditions, so NOT ECCENTRIC

STAGE DISCHARGE RELATIONSHIP SHOWN ON SHEET 4

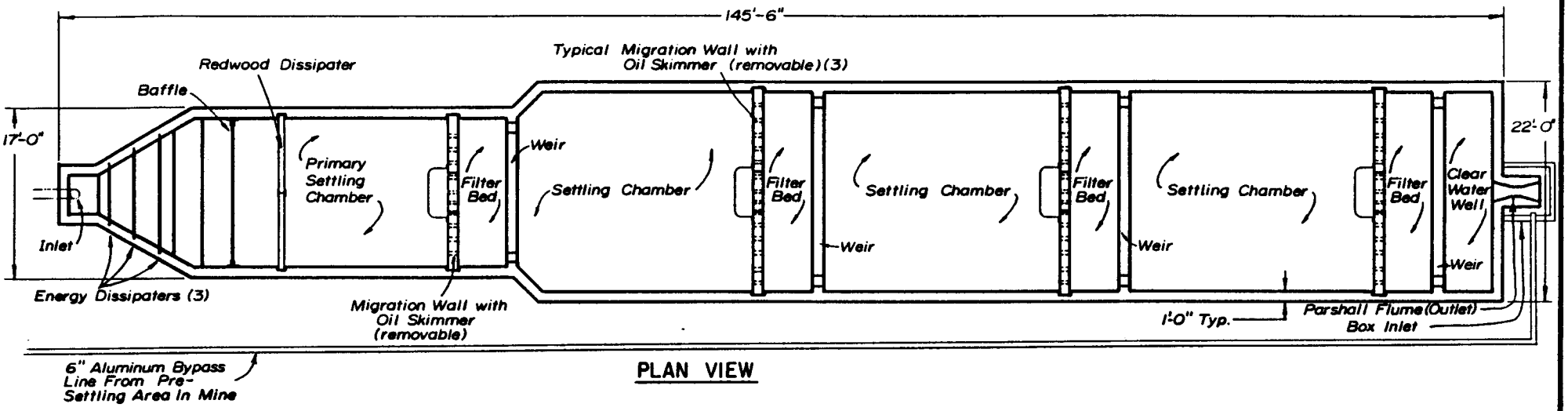
Client : Valley Camp Coal Company - Stage Discharge Hydraulic Analysis - Sediment Pond 004A
Project: 007.11.200
Date : November 8, 1989

Weir Flow Equation: Q=CL(H)**3/2 Where: C=3.27+0.4H/W
Orifice Flow Equation: Q=C'A(2gH)**1/2 C'= 0.6
Channel Weir Flow Equation: Q=C"L(H)3/2

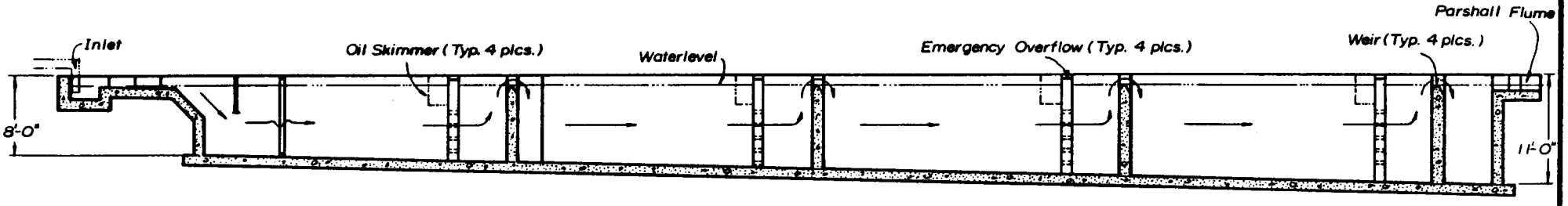
Pipe Dia : 1.5 feet
Weir Elev: 8874.9 feet (msl)
Chan Elev: 8875.9 feet (msl)
Chan Wdth: 13 feet
Weir Area: 1.77 feet squared

Weir Stage	Weir Head (ft)	Weir Flow C	Weir Flow Q(cfs)	Orifice Flow (cfs)	Governing Flow (cfs)	Channel Head (ft)	Channel Flow C"	Channel Flow Q(cfs)	Combined Flow (cfs)
8874.9	0.0	3.35	0.00	0.00	0.00				0.00
8875.0	0.1	3.36	0.50	2.69	0.50				0.50
8875.1	0.2	3.37	1.42	3.80	1.42				1.42
8875.2	0.3	3.38	2.62	4.66	2.62				2.62
8875.3	0.4	3.39	4.04	5.38	4.04				4.04
8875.4	0.5	3.40	5.66	6.01	5.66				5.66
8875.5	0.6	3.41	7.46	6.59	6.59				6.59
8875.6	0.7	3.41	9.42	7.11	7.11				7.11
8875.7	0.8	3.42	11.54	7.61	7.61				7.61
8875.8	0.9	3.43	13.80	8.07	8.07				8.07
8875.9	1.0	3.44	16.20	8.50	8.50	0.0	2.05	0.00	8.50
8876.0	1.1	3.45	18.74	8.92	8.92	0.1	2.14	0.88	9.80
8876.1	1.2	3.46	21.40	9.31	9.31	0.2	2.23	2.59	11.91
8876.2	1.3	3.47	24.19	9.70	9.70	0.3	2.32	4.96	14.65
8876.3	1.4	3.47	27.10	10.06	10.06	0.4	2.40	7.89	17.95
8876.4	1.5	3.48	30.13	10.41	10.41	0.5	2.47	11.35	21.77
8876.5	1.6	3.49	33.28	10.76	10.76	0.6	2.53	15.29	26.04
8876.6	1.7	3.50	36.53	11.09	11.09	0.7	2.58	19.64	30.73
8876.7	1.8	3.51	39.90	11.41	11.41	0.8	2.62	24.37	35.78
8876.8	1.9	3.52	43.37	11.72	11.72	0.9	2.67	29.64	41.36
8876.9	2.0	3.52	46.96	12.03	12.03	1.0	2.71	35.23	47.26
8877.0	2.1	3.53	50.64	12.32	12.32	1.1	2.74	41.09	53.42
8877.1	2.2	3.54	54.43	12.61	12.61	1.2	2.77	47.34	59.95
8877.2	2.3	3.55	58.33	12.90	12.90	1.3	2.80	53.95	66.85
8877.3	2.4	3.56	62.32	13.17	13.17	1.4	2.82	60.73	73.90
8877.4	2.5	3.57	66.41	13.44	13.44	1.5	2.85	68.07	81.51

MONSEN ENG • MC703



PLAN VIEW



SECTION VIEW & FLOW DIAGRAM

REGISTERED PROFESSIONAL ENGINEER
No. 5323
EDWIN BROOKSHIRE FOUST
STATE OF UTAH

DRAWN BY: Ed Sanderson	VALLEY CAMP OF UTAH, INC. SCOFIELD ROUTE HELPER, UTAH 84526
DATE: Sept. 12, 1983	
CHECKED BY:	
DATE:	
APPROVAL:	TITLE: CONCRETE FILTER POND
APPROVAL:	
APPROVAL:	SCALE: NONE — DRAWING NO. B4-0010

Fig 3-6C

APPENDIX R614-301-742.221b

Sediment Pond Stability Reports

HANSEN ALLEN & LUCE inc

Chen-Northern, Inc.

350 West 2700 South
Salt Lake City, Utah 84115
801/487-3661

Billings
Boise
Casper
Colorado Springs
Denver
Elko
Evanston
Gillette
Glenwood Springs
Great Falls
Helena
Phoenix
Pocatello
Rock Springs
Salt Lake City
San Antonio
Tri Cities
Yakima

January 31, 1989

Subject: Geotechnical Consultation
Valley Camp Sedimentation
Ponds 1, 2 and 3,
Scofield, Utah

Job No. 515889

Hansen, Allen and Luce
6771 South 900 East
Midvale, Utah 84047

Attn: Mr. Marv Allen

Gentlemen:

As requested, Chen-Northern, Inc. performed stability analyses for the Valley Camp Sedimentation Ponds 1 through 3. The project site is located along the Scofield route near Helper, Utah.

Soil strength values for Pond 1 were taken from a report by Garco Testing Laboratories dated December 2, 1988. Soil strength values for Ponds 2 and 3 were taken from a report by Rollins, Brown and Gunnell, Inc. dated November 16, 1988.

The strength parameters, as well as the moist and saturated unit weights determined from the above-reference reports, are presented in the following table.

Pond No.	C psf	O Degrees	Moist Unit Weight, pcf	Saturated Unit weight, pcf
1	400	22	112	124
2	150	31	107	122
3	150	31	107	122

The geometry of the embankments and side slopes of the sedimentation ponds were taken from "Val-Cam Loadout Sediment Pond Analysis", Sheets 1, 2 and 3 by Hansen, Allen and Luce, Inc. dated September, 1988. In addition, we were provided with elevations of the bottom of the ponds as well as the top of the primary and emergency spillways for the ponds, which are presented in the following table.

Pond No.	Bottom of Pond feet	Top of Primary Spillway, feet	Top of Emergency spillway, feet
1	7803.0	7816.1	7818.8
2	7823.0	7835.4	7836.3
3	7855.0	7863.2	7865.5

In our analyses, we assumed that the soil profiles were homogenous.

The safety factors have been calculated for rapid-drawdown conditions. The soil beneath the elevation of the primary spillway was assumed to be saturated. The calculated safety factors and approximate slope angles for the sedimentation ponds are presented below:

Pond No.	Slope	Safety Factor
1	2.2H:1V (upstream)	2.1
2	1.9H:1V (upstream)	1.3
3	1.5H:1V (upstream)	1.3
1	2.8H:1V (downstream)	4.1
2	1.7H:1V (downstream)	1.5
3	1.8H:1V (downstream)	1.5

It was determined that flattening the upstream slopes of Sedimentation Ponds 2 and 3 to 2.5V:1V will result in safety factors of approximately 1.5 under rapid-drawdown conditions.

Analyses were performed to assess the stability of Sedimentation Pond 3 under static and dynamic steady-state seepage conditions. Analyses were performed for Pond 3 rather than Ponds 1 and 2 due to the steepness of Pond 3 slopes despite the fact that the embankments for Ponds 1 and 2 are 1 and 4 feet higher, respectively. For the dynamic analyses, a coefficient of horizontal acceleration of 0.1 was used based on the Uniform Building Code seismic zone map for the State of Utah. The safety factors calculated for Pond 3 for static and dynamic conditions are 2.0 and 1.6, respectively. These safety factors correspond to the upstream slopes. The safety factors for the downstream slopes are slightly higher because the downstream slopes are not as steep as the upstream slopes. Based on the rapid-drawdown analyses, the safety factors for Ponds 1 and 2 under steady-state static and dynamic conditions should be approximately equal to or greater than those calculated for Pond 3.

The safety factors calculated from the stability analyses are based on the strength values and topographic information mentioned previously. The geometry within the interior of the ponds was not

provided and was assumed based on the topography and elevation data provided.

The safety factors obtained appear to be suitable for the purpose of the ponds. Static and dynamic safety factors under steady state conditions should be greater than 1.5 and 1.1, respectively. Safety factors under rapid drawdown should be greater than 1.1. Each of the slopes evaluated have safety factors in excess of the minimum values. To maintain the minimum safety factors presented above, the upstream and downstream slopes should be no steeper than 1.5H:1V.

If you have questions, or if we may be of further service, please call.

Sincerely,

CHEN-NORTHERN, INC.

Dean B. Griswold

DBG/cs
Rev. by JEN, P.E.

Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT Valley Camp JOB NO. 515889

PURPOSE Stab. of Sed Ponds - SUMMARY SHEET 1 OF ~~14~~ 13

COMPUTED BY DBG CHECKED BY DATE 1/16/89

Strength Values

Pond	γ_m	γ_{sat}	C	ϕ	From
1	112	124	400	22	GARCo
2	107	122	150	31	RBG
3	107	122	150	31	RBG

Slope Geometry from HAL Figures

Pond	Slope	FS/	
1	up/st 2H:1V	1.7	⇐ Not Embankment
1A	up/st 2.2H:1V	2.1	
2	up/st 1.9H:1V	1.25	
3	up/st 1.5H:1V	1.28	
1A	dn/st 2.8H:1V	4.1	
2	dn/st 1.7H:1V	1.5	
3	dn/st 1.4-1.8H:1V	~~1.26~~ 1.5	

Slopes Req'd for FS=1.5 under Rapid Drawdown

Pond	Slope	FS.
2	2.5H:1V	1.5
3	2.4H:1V	1.5

Steady State Seepage - Static & Dynamic Cases

Pond	Slope	Ground Acceleration	FS
3	u/s 1.5H:1V	0	2.0
3	u/s 1.5H:1V	0.1 g	1.6
3	d/s 1.4-1.8H:1V	0	~~1.9~~ 2.2
3	d/s 1.4-1.8H:1V	0.1 g	~~1.6~~ 1.7

Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT Valley Camp Sedimentation Ponds JOB NO. 515889

PURPOSE Stability Analyses SHEET 2 OF 13

COMPUTED BY DBG CHECKED BY DATE 1/12/89

Strength Values & Lab Results

Pond 1A - From GARCO

Pond Bottom - Lt. Brown Sandy Clay w/ Silt
South & West Sides - Gray Silty Sand

Sample #1 & #5; Sandy Clay

w_i	γ_{di}	w_f	γ_{df}
15.2	115.7	17.3	108.2
15.8	113.4	16.9	129.4
14.7	124.1	15.8	126.4

$w_{AVG} = 16\%$ $\gamma_{d_{AVG}} = 117.4$ pcf

$S_r = 95\%$ $\gamma_m = 136.2$ pcf

$\gamma_{SAT} = 137.1$ pcf

$c = 550$ psf
$\phi = 23.5°$

Sample #2; Very Fine Sand

w_i	γ_{di}	w_f	γ_{df}
42.7	76.4	44.6	75.4
40.6	78.8	47.6	80.4
32.0	83.8	38.5	85.9

$w_{AVG} = 40\%$

$\gamma_m = 112.1$ pcf

$\gamma_{d_{AVG}} = 80.1$ pcf

$S_r = 100\%$ $c = 256$ psf

$\gamma_{SAT} = 112.2$ pcf $\phi = 21.5°$

$w_{AVG} = 28\%$

$\gamma_{d_{AVG}} = 99$ pcf

$\gamma_{SAT} \approx \gamma_m = 124$ pcf

If $S_r = 50\%$, $\gamma_m = 112$ pcf

Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT _____ JOB NO. _____

PURPOSE _____ SHEET 3 OF 13

COMPUTED BY _____ CHECKED BY _____ DATE _____

Ponds 2A, 3A - From RBG, Inc.

Pond 2A

Test Pit	pcf γ_d	% w	tsf torvane	ft Depth
TP-1	100.2	6	0.35	0
	90.3	11	0.45	3
	89.8	15.9	0.50	6
	100.7	16.8	0.35	9

$c = 1$ psi $= 144$ psf
$\phi = 31.5°$
$\gamma_{d_{Av}} = 95.2$
$w = 12.4$
$S_r = 42.5$
$\gamma_{SAT} = 123$

Pond 3A

TP-2	96.8	8.6	0.55	0
	93.5	16.8	0.55	3
	92.1	17.6	0.55	6
	91.6	21.5	0.55	9
	93.6	17.3	0.55	12
	91.1	17.9	0.55	15
	95.8	12.2	0.55	18

$\gamma_{d_{Avg}} = 93.5$
$w_{Av} = 15.1$
$S_r = 122$

$w_{AVG} = 14\%$
$\gamma_{d\,AVG} = 94.1$ pcf
$\gamma_m = 107.3$ pcf

$S_r = 46.7\%$
$\gamma_{SAT} = 122.3$ pcf

✓	✓
0.229	
0.226	14.1
0.545	93.6

Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT _____ JOB NO. _____

PURPOSE _____ SHEET 4 OF 13

COMPUTED BY _____ CHECKED BY _____ DATE _____

Geometry of Ponds

POND 1A

Elevations:

Bottom of Pond	7803
Top Primary Spillway	7816.1
Top Emergency Spill'w	7818.8

1A - 1A'

Dist.	Elev.
0	7840
9	7835
18	7830
30	7825
41	7824
43	7823
46	7822
47.5	7821
49.5	7820
56	7819
57	7818
59	7817
60	7816
62	7815
79	7815

Silted in

1B - 1B'

Dist.	Elev.
0	7835
24	7830
40	7825
42	7824
45	7823
47	7822
49	7821
52	7820
58	7819
118	7819
80	7803

1C - 1C'

Dist	Elev
0	7803
35	19
41	20
43	21
55	21
58	20
72	78.5

Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT _____ JOB NO. _____

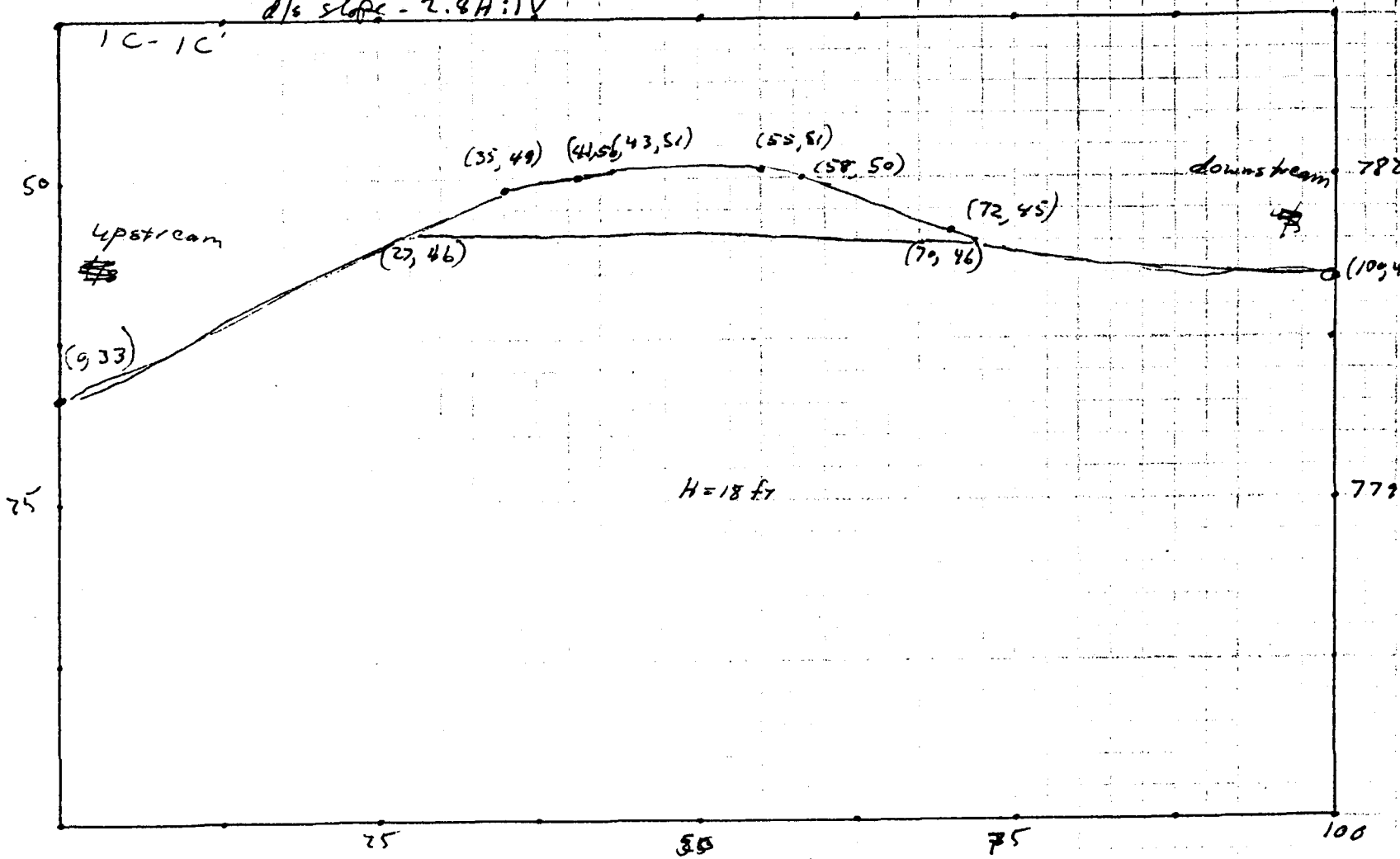
PURPOSE _____ SHEET 5 OF 13

COMPUTED BY _____ CHECKED BY _____ DATE _____

~~Downstream slope~~

u/s slope = 2.2H:1V

d/s slope - 2.8H:1V



Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT _____ JOB NO. _____

PURPOSE _____ SHEET 6 OF 18

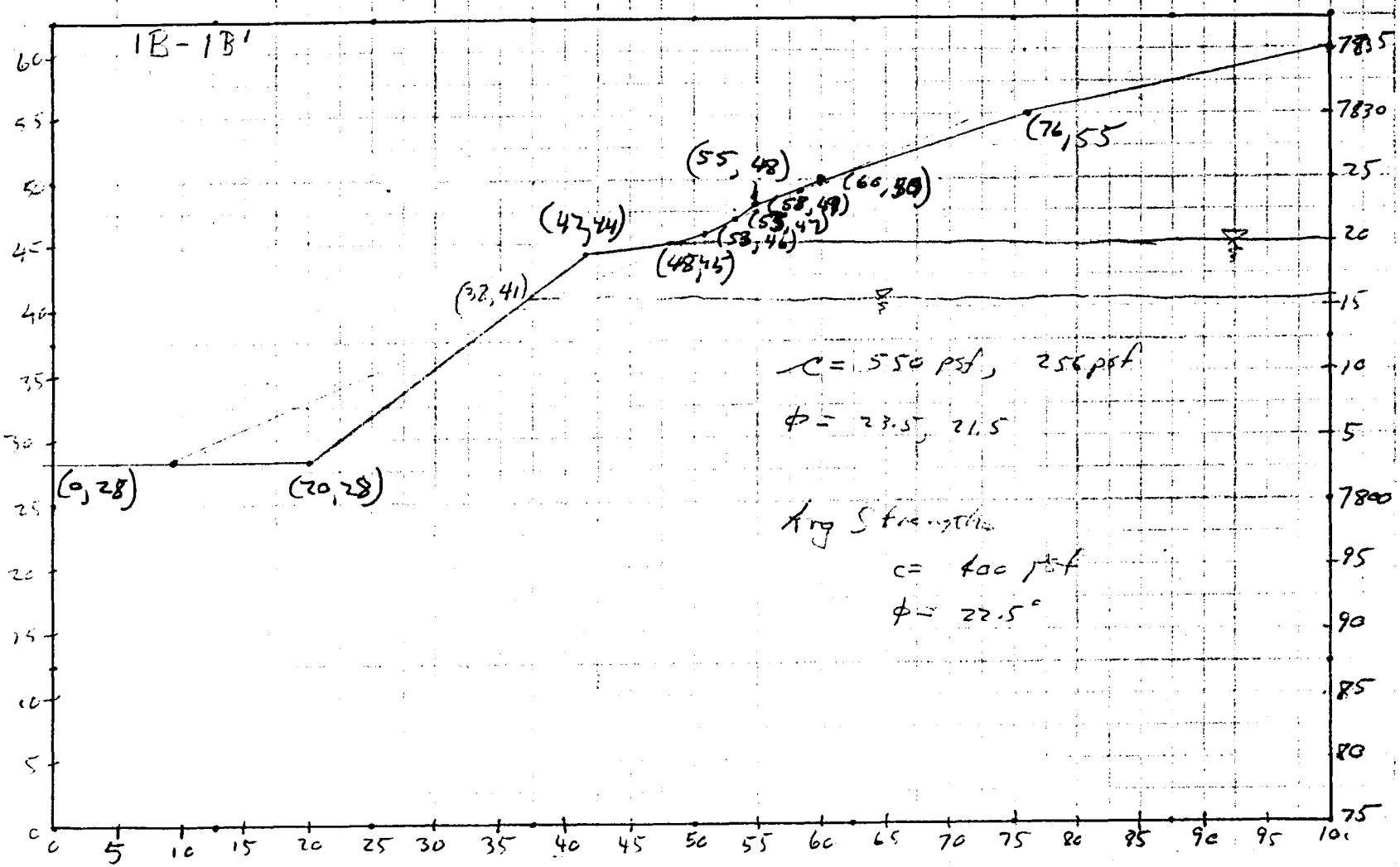
COMPUTED BY _____ CHECKED BY _____ DATE _____

$\frac{44-41}{44-28} = \frac{42-x}{42-20}$

$X = 38$

FS = 1.66

4/1 Slope: 1.8H:1V



Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT _____ JOB NO. _____

PURPOSE _____ SHEET 7 OF 13

COMPUTED BY _____ CHECKED BY _____ DATE _____

Geometry

Pond 2A

Elevations:

Bottom of Pond	7823.6
Top of Primary Spillway	7835.4
Top of Emergency Spillway	7836.3

Section 2A-2A'

Dist.	Elev.
0	7836
48	7836
51	7837
53	7838
61	7838
63	7837
66	7836
68	7835
74	7830
83	7825

Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT _____ JOB NO. _____

PURPOSE _____ SHEET 8 OF 13

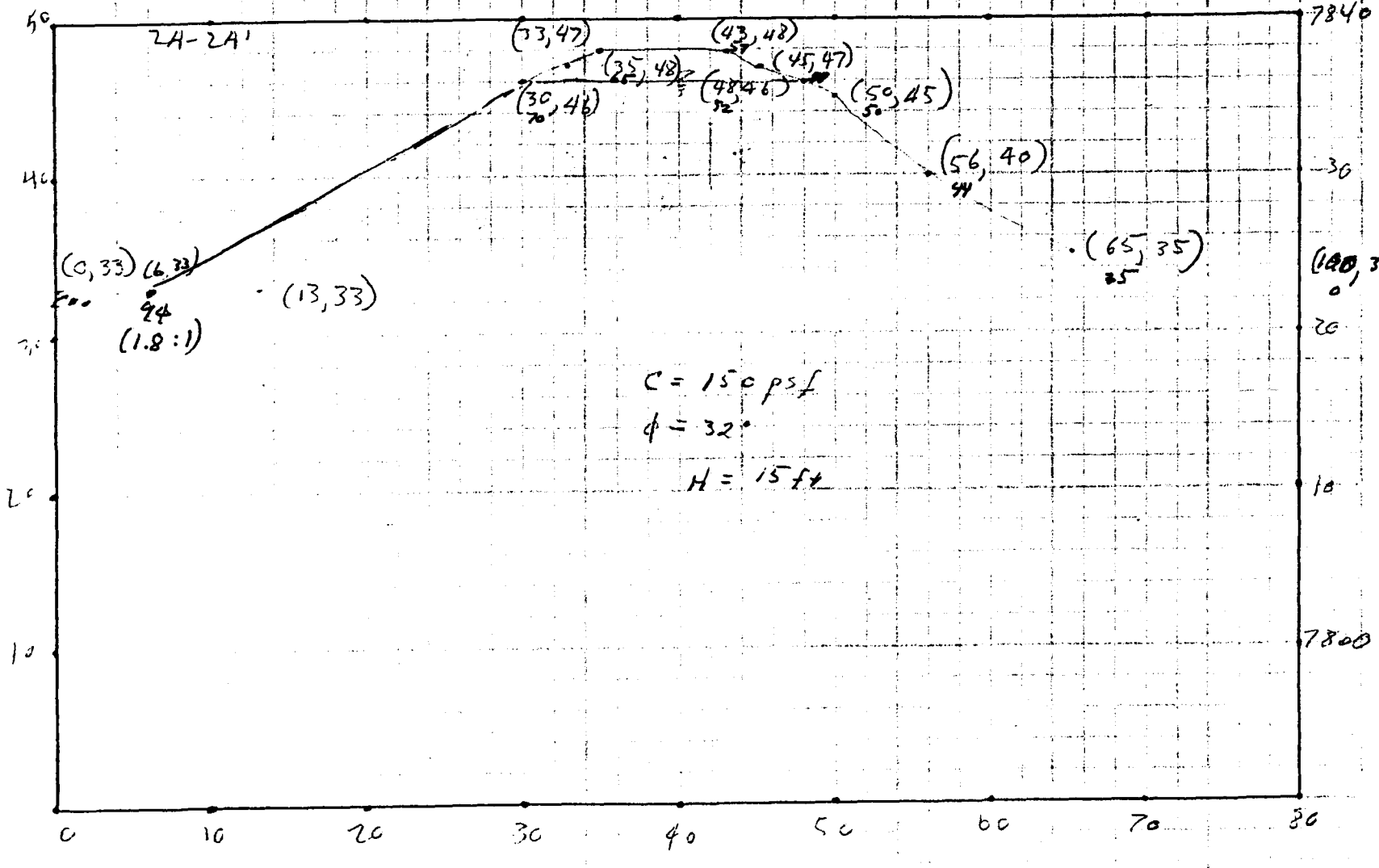
COMPUTED BY _____ CHECKED BY _____ DATE _____

1.515

~~1.42~~

~~1.148~~ ⇐ Orig Conf.

upstream slope



NET-145

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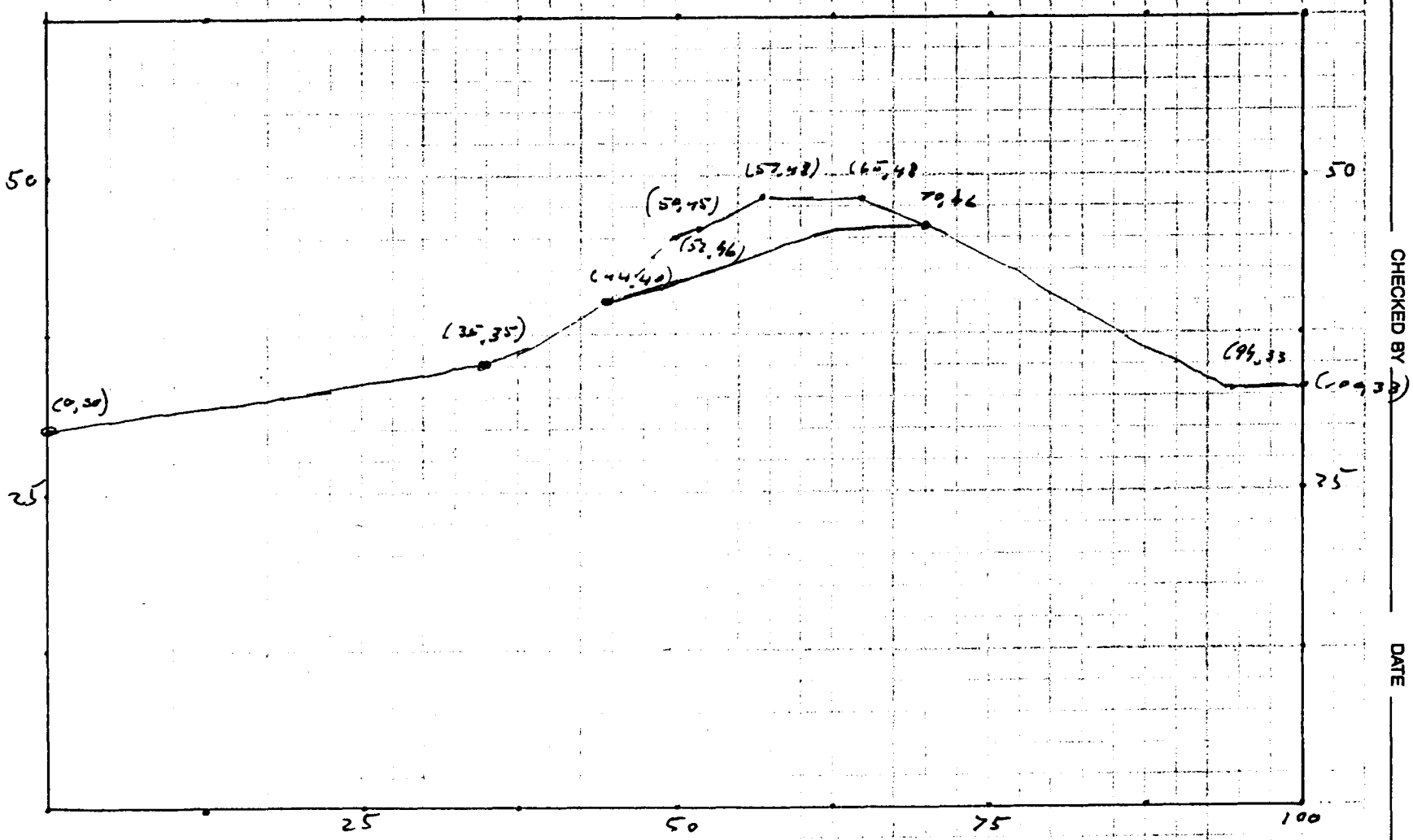
STANDARD COMPUTATION SHEET

PROJECT _____ JOB NO. _____

PURPOSE _____ SHEET 9 OF 13

COMPUTED BY _____ CHECKED BY _____ DATE _____

2A-2A' downstream Slope (orig: 1.7H:1V)



NET115

Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT _____ JOB NO. _____

PURPOSE _____ SHEET 10 OF 13

COMPUTED BY _____ CHECKED BY _____ DATE _____

Geometry

POND 3A

Elevations:

Bottom of Pond	7855.0
Top of primary discharge	7863.2
Top of Emergency discharge	7865.5

Section 3A-3A'

Dist.	Elev		
0	7860	7859	0
79	7860	7859	25
80	7861	7860	26
82	7862	7861	28
84	7863	7862	30
86	7864	7863	32
89	7865	7864	35
92	7866	7868	38
110	7866	7868	56
114	7865	7865	60
121	7860	7860	67
133	7855	7855	79
155	7850	7850	100

Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT _____ JOB NO. _____

PURPOSE _____ SHEET 11 OF 18

COMPUTED BY _____ CHECKED BY _____ DATE _____

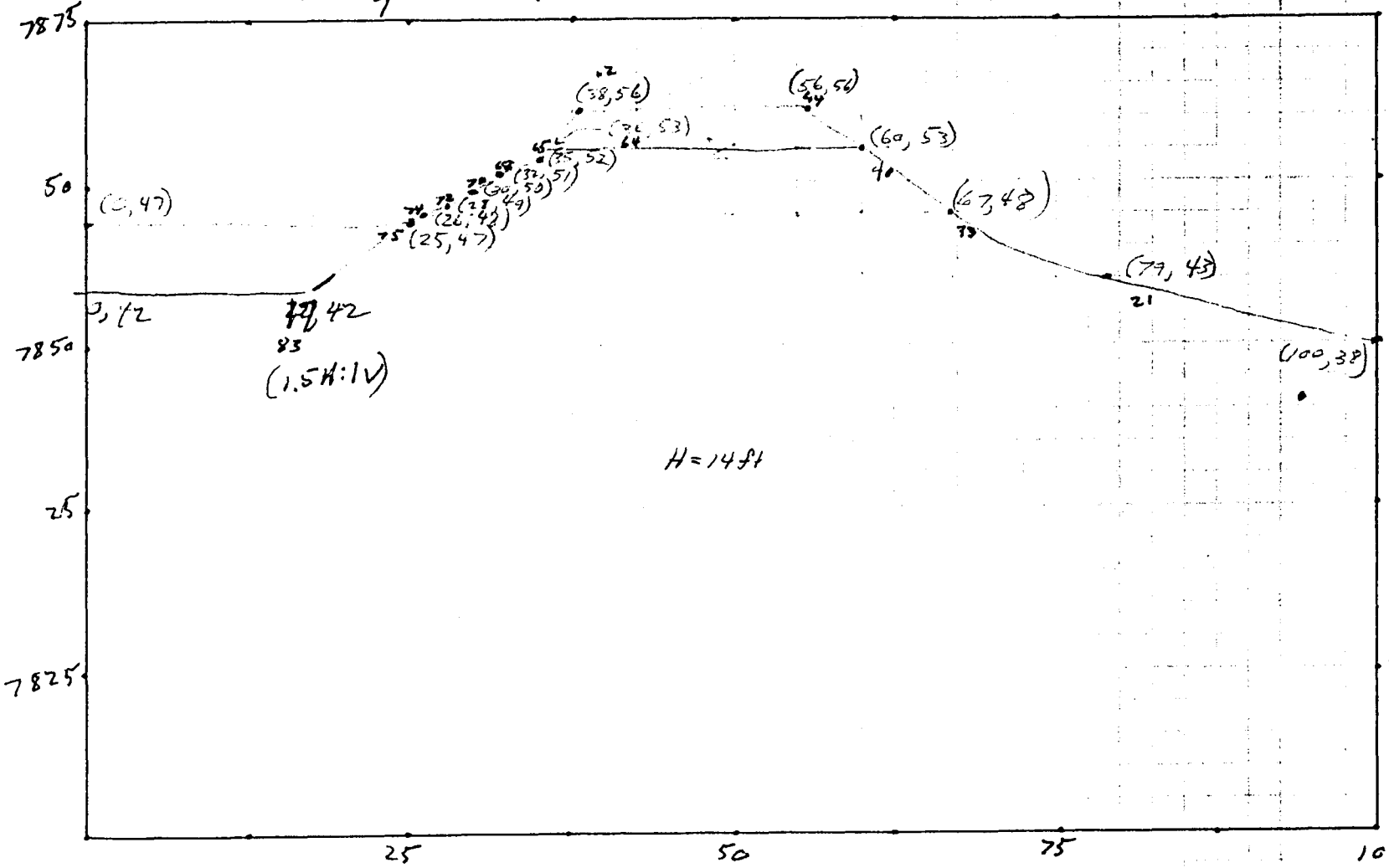
$\frac{56-52}{52-42} = \frac{53-x}{53-35}$

1.48

~~FS = 1.497~~ } Reshaped

FS = 1.284

3A-3A' upstream Slope



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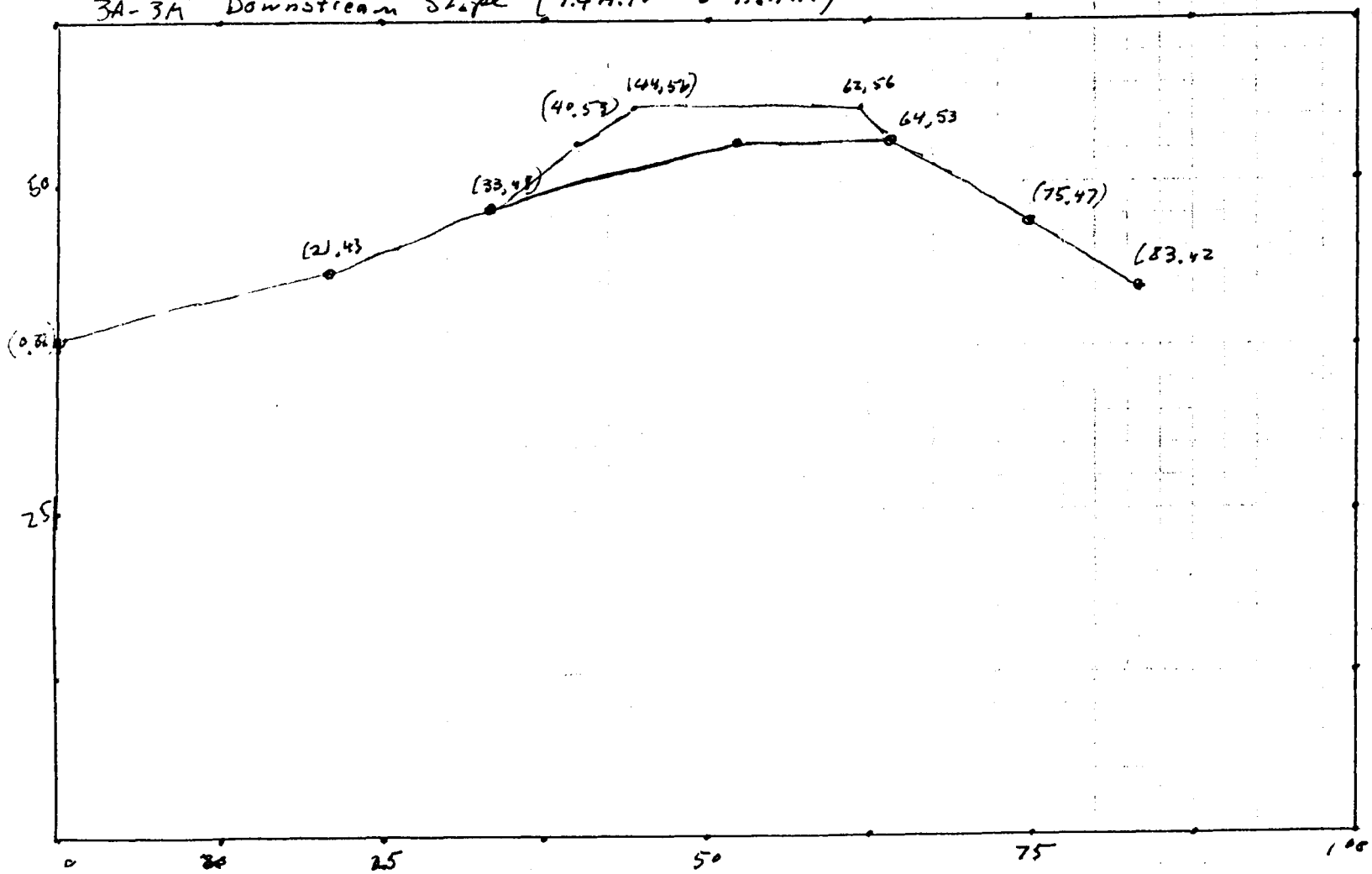
STANDARD COMPUTATION SHEET

PROJECT _____ JOB NO. _____

PURPOSE _____ SHEET 12 OF 19

COMPUTED BY _____ CHECKED BY _____ DATE _____

3A-3A' Downstream Slope (1.4H:1V to 1.8H:1V)



Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT _____ JOB NO. _____

PURPOSE _____ SHEET 13 OF 13

COMPUTED BY _____ CHECKED BY _____ DATE _____

Iteration I : Existing Slopes - Upstream Slopes

Pond	Slope	EQUAK	FS
1	2H:1V	No	1.7
1A	2.2H:1V	No	2.1
2	1.9H:1V	No	1.25
3	1.5H:1V	No	1.28

Iteration II : Slopes Req'd For FS=1.5, Upstream Slopes

1	2H:1V	No	1.7
2	2.5H:1V	No	1.5
3	2.4H:1V	No	1.5

Iteration III : Downstream Slopes, Static, Rapid Drawdown

		No	
1	2.8H:1V	No	4.1
2	1.7H:1V		1.5
3	1.4H- 1.8H:1V	No	~~1.26~~ 1.5

Iteration 3 : Steady State Seepage

3	u/s	1.5H:1V	No	2.0
3	u/s	1.5H:1V	0.1g	1.6
3	d/s	1.4-1.8H:1V	No	~~1.9~~ 2.2
3	d/s	1.4-1.8H:1V	0.1g	~~1.6~~ 1.7

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION VALLEY CAMP SED. POND STABILITY; RAPID DRAWDOWN; UPSTREAM; POND 1A

BOUNDARY COORDINATES

6 TOP BOUNDARIES
6 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	33.00	27.00	46.00	1
2	27.00	46.00	35.00	49.00	1
3	35.00	49.00	43.00	51.00	1
4	43.00	51.00	55.00	51.00	1
5	55.00	51.00	72.00	45.00	1
6	72.00	45.00	100.00	42.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	112.0	124.0	400.0	22.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 4 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	33.00
2	27.00	46.00
3	72.00	45.00
4	100.00	42.00

1 A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 15.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 30.00 FT.
AND X = 70.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

10.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

1 FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL FIRST.

FAILURE SURFACE SPECIFIED BY 8 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	.00	33.00
2	9.45	29.74
3	19.38	28.53
4	29.34	29.43
5	38.89	32.39
6	47.60	37.30
7	55.09	43.93
8	59.21	49.51

*** 2.132 ***

Z

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION VALLEY CAMP SEDIMENTATION POND NO. 2A;
RAPID DRAWDOWN; UPSTREAM

BOUNDARY COORDINATES

7 TOP BOUNDARIES
7 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	33.00	26.00	33.00	1
2	26.00	33.00	50.00	46.00	1
3	50.00	46.00	55.00	48.00	1
4	55.00	48.00	63.00	48.00	1
5	63.00	48.00	68.00	46.00	1
6	68.00	46.00	76.00	40.00	1
7	76.00	40.00	85.00	35.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	107.0	123.0	150.0	31.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 5 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	33.00
2	26.00	33.00
3	50.00	46.00
4	68.00	46.00
5	85.00	35.00

1 A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM
TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.

AND X = 30.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 48.00 FT.
AND X = 85.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

8.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

1 FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL FIRST.

FAILURE SURFACE SPECIFIED BY 7 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	23.33	33.00
2	30.94	30.54
3	38.94	30.92
4	46.28	34.10
5	52.02	39.67
6	55.42	46.91
7	55.50	48.00

*** 1.248 ***

2

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION VALLEY CAMP SEDIMENTATION POND NO. 3A;
RAPID DRAWDOWN; UPSTREAM

BOUNDARY COORDINATES

8 TOP BOUNDARIES
8 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	42.00	17.00	42.00	1
2	17.00	42.00	25.00	47.00	1
3	25.00	47.00	36.00	53.00	1
4	36.00	53.00	38.00	56.00	1
5	38.00	56.00	56.00	56.00	1
6	56.00	56.00	60.00	53.00	1
7	60.00	53.00	67.00	48.00	1
8	67.00	48.00	79.00	43.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	108.0	122.0	150.0	31.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 7 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	42.00
2	17.00	42.00
3	25.00	47.00
4	36.00	53.00
5	60.00	53.00
6	67.00	47.00
7	79.00	43.00

1 A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM
TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 20.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 32.00 FT.
AND X = 79.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION
AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

8.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

1 FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL
FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL
FIRST.

FAILURE SURFACE SPECIFIED BY 6 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	15.56	42.00
2	23.40	40.40
3	31.28	41.76
4	38.13	45.89
5	43.02	52.22
6	44.13	56.00

*** 1.284 ***

Z

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION VALLEY CAMP SED. PONDS; POND 1A DOWNSTREAM; RAP. DRAW.

BOUNDARY COORDINATES

6 TOP BOUNDARIES
6 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	42.00	28.00	45.00	1
2	28.00	45.00	45.00	51.00	1
3	45.00	51.00	57.00	51.00	1
4	57.00	51.00	65.00	49.00	1
5	65.00	49.00	73.00	46.00	1
6	73.00	46.00	100.00	33.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	112.0	124.0	400.0	22.0	.00	.0	1

1 1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 4 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	42.00
2	28.00	45.00
3	73.00	46.00
4	100.00	33.00

1 A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 28.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 42.00 FT.
AND X = 70.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

10.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

1 FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL FIRST.

FAILURE SURFACE SPECIFIED BY 8 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	.00	42.00
2	7.07	34.93
3	15.99	30.41
4	25.87	28.88
5	35.74	30.50
6	44.62	35.11
7	51.62	42.25
8	55.95	51.00

*** 4.143 ***

Z

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION VALLEY CAMP SED. POND 2A; DOWNSTREAM SLP; RAP. DRAW.

BOUNDARY COORDINATES

8 TOP BOUNDARIES
8 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	30.00	35.00	35.00	1
2	35.00	35.00	44.00	40.00	1
3	44.00	40.00	52.00	46.00	1
4	52.00	46.00	57.00	48.00	1
5	57.00	48.00	65.00	48.00	1
6	65.00	48.00	70.00	46.00	1
7	70.00	46.00	94.00	33.00	1
8	94.00	33.00	100.00	33.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	107.0	122.0	150.0	31.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 7 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	30.00
2	35.00	35.00
3	44.00	40.00
4	60.00	45.00
5	70.00	46.00
6	94.00	33.00
7	100.00	33.00

1 A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 35.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 50.00 FT.
AND X = 80.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION
AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

8.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

1 FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL
FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL
FIRST.

FAILURE SURFACE SPECIFIED BY 8 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	23.33	33.33
2	30.71	30.23
3	38.65	29.24
4	46.56	30.43
5	53.85	33.72
6	59.98	38.86
7	64.49	45.47
8	65.31	47.88

*** 1.456 ***

Z

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION VALLEY CAMP SED. POND 3A; DOWNSTREAM; PID DRAWDOWN

RAPID DRAWDOWN

BOUNDARY COORDINATES

6 TOP BOUNDARIES
6 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	38.00	21.00	43.00	1
2	21.00	43.00	33.00	48.00	1
3	33.00	48.00	44.00	56.00	1
4	44.00	56.00	62.00	56.00	1
5	62.00	56.00	64.00	53.00	1
6	64.00	53.00	83.00	42.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	107.0	122.0	150.0	31.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 7 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	38.00
2	21.00	43.00
3	33.00	48.00
4	52.00	53.00
5	64.00	53.00
6	75.00	47.00
7	83.00	42.00

1 A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED

ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 30.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 41.00 FT.
AND X = 75.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

8.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

1 FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL FIRST.

FAILURE SURFACE SPECIFIED BY 8 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	10.00	40.38
2	17.54	37.69
3	25.52	37.12
4	33.36	38.71
5	40.49	42.34
6	46.38	47.75
7	50.61	54.54
8	51.05	56.00

*** 1.484 ***

Z

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION VALLEY CAMP SEDIMENTATION POND NO. 3A;
UPSTREAM; STEADY-STATE; DYNAMIC

BOUNDARY COORDINATES

8 TOP BOUNDARIES
8 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	42.00	17.00	42.00	1
2	17.00	42.00	25.00	47.00	1
3	25.00	47.00	36.00	53.00	1
4	36.00	53.00	38.00	56.00	1
5	38.00	56.00	56.00	56.00	1
6	56.00	56.00	60.00	53.00	1
7	60.00	53.00	67.00	48.00	1
8	67.00	48.00	79.00	43.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	108.0	122.0	150.0	31.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 2 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	42.00
2	79.00	43.00

A HORIZONTAL EARTHQUAKE LOADING COEFFICIENT
OF .100 HAS BEEN ASSIGNED

A VERTICAL EARTHQUAKE LOADING COEFFICIENT
OF .000 HAS BEEN ASSIGNED

CAVITATION PRESSURE = .0 PSF
1 A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM

TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 20.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 32.00 FT.
AND X = 79.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION
AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

8.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

1 FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL
FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL
FIRST.

FAILURE SURFACE SPECIFIED BY 6 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	15.56	42.00
2	23.40	40.40
3	31.28	41.76
4	38.13	45.89
5	43.02	52.22
6	44.13	56.00

*** 1.623 ***

Z

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION VALLEY CAMP SED. POND 3A; DOWNSTREAM;
STEADY-STATE; DYNAMIC, A=0.1g

BOUNDARY COORDINATES

6 TOP BOUNDARIES
6 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	38.00	21.00	43.00	1
2	21.00	43.00	33.00	48.00	1
3	33.00	48.00	44.00	56.00	1
4	44.00	56.00	62.00	56.00	1
5	62.00	56.00	64.00	53.00	1
6	64.00	53.00	83.00	42.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	107.0	122.0	150.0	31.0	.00	.0	1

1 1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 2 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	38.00
2	83.00	42.00

A HORIZONTAL EARTHQUAKE LOADING COEFFICIENT
OF .100 HAS BEEN ASSIGNED

A VERTICAL EARTHQUAKE LOADING COEFFICIENT
OF .000 HAS BEEN ASSIGNED

CAVITATION PRESSURE = .0 PSF
1 A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM
TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 30.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 41.00 FT.
AND X = 75.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION
AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

8.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

1 FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL
FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL
FIRST.

FAILURE SURFACE SPECIFIED BY 10 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	.00	38.00
2	7.24	34.59
3	14.97	32.55
4	22.95	31.95
5	30.91	32.79
6	38.58	35.06
7	45.71	38.67
8	52.08	43.52
9	57.46	49.44
10	61.54	56.00

*** 1.665 ***

Z

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION VALLEY CAMP SEDIMENTATION POND NO. 3A;
UPSTREAM; STEADY-STATE; STATIC

BOUNDARY COORDINATES

8 TOP BOUNDARIES
8 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	42.00	17.00	42.00	1
2	17.00	42.00	25.00	47.00	1
3	25.00	47.00	36.00	53.00	1
4	36.00	53.00	38.00	56.00	1
5	38.00	56.00	56.00	56.00	1
6	56.00	56.00	60.00	53.00	1
7	60.00	53.00	67.00	48.00	1
8	67.00	48.00	79.00	43.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	108.0	122.0	150.0	31.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 2 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	42.00
2	79.00	42.00

1 A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM
TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 20.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 32.00 FT.
AND X = 79.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

8.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL FIRST.

FAILURE SURFACE SPECIFIED BY 6 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	15.56	42.00
2	23.40	40.40
3	31.28	41.76
4	38.13	45.89
5	43.02	52.22
6	44.13	56.00

*** 2.013 ***

Z

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION VALLEY CAMP SED. POND 3A; DOWNSTREAM;
STEADY STATE; STATIC

BOUNDARY COORDINATES

6 TOP BOUNDARIES
6 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	38.00	21.00	43.00	1
2	21.00	43.00	33.00	48.00	1
3	33.00	48.00	44.00	56.00	1
4	44.00	56.00	62.00	56.00	1
5	62.00	56.00	64.00	53.00	1
6	64.00	53.00	83.00	42.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	107.0	122.0	150.0	31.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 2 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	38.00
2	83.00	42.00

1 A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM
TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 30.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 41.00 FT.

AND X = 75.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

8.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

THE FACTOR OF SAFETY FOR THE TRIAL FAILURE SURFACE DEFINED BY THE COORDINATES LISTED BELOW IS MISLEADING.

FAILURE SURFACE DEFINED BY 7 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	30.00	46.75
2	36.95	42.79
3	44.57	40.34
4	52.52	39.52
5	60.48	40.35
6	68.09	42.81
7	74.88	46.70

FACTOR OF SAFETY FOR THE PRECEDING SPECIFIED SURFACE =*******
1 FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL FIRST.

FAILURE SURFACE SPECIFIED BY 6 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	20.00	42.76
2	27.82	41.06
3	35.73	42.25
4	42.69	46.20
5	47.78	52.37
6	48.99	56.00

*** 2.173 ***

^Z

Northern Engineering and Testing, Inc.

STANDARD COMPUTATION SHEET

PROJECT Valley-Camp Sed. Ponds JOB NO. 515889

PURPOSE Stab. Analyses SHEET 1 OF 8

COMPUTED BY DBG CHECKED BY DATE 1/31/89

Steepest Permissible Slopes

Condition	Req'd Safety Factor
Steady State, Static	1.5
Steady State Dynamic	1.1
Rapid Drawdown	1.1

Parameters for Most Critical Slope

Highest Slope: 18 ft

Strength Parameters: $\phi = 31°$, $c = 150$ psf, $\gamma_{SAT} = 122$ pcf, $\gamma_m = 107$ pcf

Steepest Slope: 1.5H:1V

Highest Water level: 13 ft.

Narrowest Crest: 8 ft.

Condition	Safety factor	Slope
Steady State, Static	1.51	0.8H:1V
Steady State Dynamic	1.21	0.72H:1V
Rapid Drawdown	1.15	1.5H:1V

Most Critical Case is Rapid Drawdown w/ FS = 1.15 and Slope = 1.5H:1V

NET-145

2/8

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

$H = 18$ ft
$\gamma_{SAT} = 122$ pcf
$\gamma_{dry} = 107$ pcf
$\phi = 31$
$c = 150$ psf

PROBLEM DESCRIPTION VAL-CAM SED. PONDS; GENERIC POND W/ STEE
PEST SLP & HIGHEST EMB & WEAK SOIL

BOUNDARY COORDINATES

6 TOP BOUNDARIES
6 TOTAL BOUNDARIES

RAPID DRAWDOWN
$FS = 1.15$
Slope = 1.5H:1V

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	40.00	20.00	40.00	1
2	20.00	40.00	40.00	53.00	1
3	40.00	53.00	47.00	58.00	1
4	47.00	58.00	55.00	58.00	1
5	55.00	58.00	73.00	46.00	1
6	73.00	46.00	82.00	40.00	1

ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	107.0	122.0	150.0	31.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 6 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	40.00
2	20.00	40.00
3	40.00	53.00
4	50.00	53.00
5	73.00	46.00
6	82.00	40.00

A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM
TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

3/8

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 30.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 50.00 FT.
AND X = 80.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION
AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

8.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL
FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL
FIRST.

FAILURE SURFACE SPECIFIED BY 7 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	16.67	40.00
2	24.10	37.04
3	32.10	36.77
4	39.71	39.22
5	46.05	44.10
6	50.36	50.84
7	52.00	58.00

*** 1.153 ***

4/8

--SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

PROBLEM DESCRIPTION VAL-CAM SED. PONDS; GENERIC POND W/ STEE
PEST SLP & HIGHEST EMB & WEAK SOIL

$H_t = 18$ ft
$\gamma_{SAT} = 122$ pcf
$\gamma_m = 107$ pcf
$\phi = 31°$
$c = 150$ psf
Steady State, Static
FS = 1.5
Slope = 0.8H:1V

BOUNDARY COORDINATES

6 TOP BOUNDARIES
6 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	40.00	32.00	40.00	1
2	32.00	40.00	43.00	53.00	1
3	43.00	53.00	47.00	58.00	1
4	47.00	58.00	55.00	58.00	1
5	55.00	58.00	73.00	46.00	1
6	73.00	46.00	82.00	40.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	107.0	122.0	150.0	31.0	.00	.0	1

1 1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 2 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	40.00
2	82.00	40.00

1 A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM

TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 30.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 50.00 FT.
AND X = 80.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION
AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

8.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

1 FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL
FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL
FIRST.

FAILURE SURFACE SPECIFIED BY 7 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	20.00	40.00
2	27.84	38.41
3	35.80	39.20
4	43.18	42.30
5	49.31	47.43
6	53.67	54.14
7	54.76	58.00

*** 1.514 ***

6/8

1 GEOSLOPE
Version 2.0

Supplied by GEOCOMP Corp.
342 Sudbury Rd., Concord, MA. 01742
(617)369-8304

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GEOCOMP Corp. has modified the program to run on various microcomputers and plotting devices. GEOCOMP Corp. makes no warranties as to the fitness of this software. The user bears all responsibility for accuracy and correctness of results produced by this software. See the users manual for further warranty information.

1 --SLOPE STABILITY ANALYSIS--
SIMPLIFIED JANBU METHOD OF SLICES
IRREGULAR FAILURE SURFACES

$H = 18$ ft
$\gamma_{SAT} = 122$ pcf
$\gamma_m = 107$ pcf
$\phi = 31°$
$c = 150$ psf

Steady State, Dynamic

$a = 0.1g$

$F = 1.21$

Slope $= 0.72H:1V$

PROBLEM DESCRIPTION VAL-CAM SED. PONDS; GENERIC POND W/ STEE
PEST SLP & HIGHEST EMB & WEAK SOIL

BOUNDARY COORDINATES

6 TOP BOUNDARIES
6 TOTAL BOUNDARIES

BOUNDARY NO.	X-LEFT (FT)	Y-LEFT (FT)	X-RIGHT (FT)	Y-RIGHT (FT)	SOIL TYPE BELOW BND
1	.00	40.00	34.00	40.00	1
2	34.00	40.00	43.00	53.00	1
3	43.00	53.00	47.00	58.00	1
4	47.00	58.00	55.00	58.00	1
5	55.00	58.00	73.00	46.00	1
6	73.00	46.00	82.00	40.00	1

1 ISOTROPIC SOIL PARAMETERS

1 TYPE(S) OF SOIL

SOIL TYPE NO.	TOTAL UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION INTERCEPT (PSF)	FRICTION ANGLE (DEG)	PORE PRESSURE PARAMETER	PRESSURE CONSTANT (PSF)	PIEZOMETRIC SURFACE NO.
1	107.0	122.0	150.0	31.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

UNITWEIGHT OF WATER = 62.40

PIEZOMETRIC SURFACE NO. 1 SPECIFIED BY 2 COORDINATE POINTS

POINT NO.	X-WATER (FT)	Y-WATER (FT)
1	.00	40.00
2	82.00	40.00

A HORIZONTAL EARTHQUAKE LOADING COEFFICIENT
OF .100 HAS BEEN ASSIGNED

A VERTICAL EARTHQUAKE LOADING COEFFICIENT
OF .000 HAS BEEN ASSIGNED

CAVITATION PRESSURE = .0 PSF
A CRITICAL FAILURE SURFACE SEARCHING METHOD, USING A RANDOM
TECHNIQUE FOR GENERATING CIRCULAR SURFACES, HAS BEEN SPECIFIED.

100 TRIAL SURFACES HAVE BEEN GENERATED.

10 SURFACES INITIATE FROM EACH OF 10 POINTS EQUALLY SPACED
ALONG THE GROUND SURFACE BETWEEN X = .00 FT.
AND X = 30.00 FT.

EACH SURFACE TERMINATES BETWEEN X = 50.00 FT.
AND X = 80.00 FT.

UNLESS FURTHER LIMITATIONS WERE IMPOSED, THE MINIMUM ELEVATION
AT WHICH A SURFACE EXTENDS IS Y = .00 FT.

8.00 FT. LINE SEGMENTS DEFINE EACH TRIAL FAILURE SURFACE.

FOLLOWING ARE DISPLAYED THE TEN MOST CRITICAL OF THE TRIAL

8/8

FAILURE SURFACES EXAMINED. THEY ARE ORDERED - MOST CRITICAL FIRST.

FAILURE SURFACE SPECIFIED BY 6 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	26.67	40.00
2	34.63	39.25
3	42.41	41.12
4	49.17	45.41
5	54.17	51.65
6	56.18	57.21

*** 1.211 ***

FAILURE SURFACE SPECIFIED BY 7 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	20.00	40.00
2	27.84	38.41
3	35.80	39.20
4	43.18	42.30
5	49.31	47.43
6	53.67	54.14
7	54.76	58.00

*** 1.267 ***

FAILURE SURFACE SPECIFIED BY 6 COORDINATE POINTS

POINT NO.	X-SURF (FT)	Y-SURF (FT)
1	26.67	40.00
2	34.32	37.66
3	42.22	38.90
4	48.78	43.48
5	52.66	50.48
6	53.06	58.00

NVLAP Accredited

GARCO TESTING LABORATORIES

532 West 3560 South
Salt Lake City, Utah 84115
Phone 266-4498

5826 South 1900 West
Roy, Utah 84067
Phone 776-5355

RECEIV 1988 VHA

December 2, 1988

Valley Camp
Scofield Route
Helper, Utah 84526

Attn: Steve Tanner

Gentlemen,

Enclosed are the in place density, direct shear, soil classification and cohesion properties of samples taken from Valley Camp Pond #1.

The pond bottom is a light brown sandy clay with some silt. The south and west sides have a gray silty sand. The color change could be natural but is probably the result of coal dust deposited in the pond over the years.

Samples were taken by driving (by hand) a thin walled aluminum tube into cut outs from the embankment approximately 2 feet above the water and 2 feet in from the surface.

Samples #1 & #5, and #2 & #3, were so similar that only one direct shear was done per set. Sample #4 was disturbed and no direct was performed but the torvane shear in the field was 200 psf.

As to the request of Randy Harten, Division of Oil, Gas and Mining, no engineering analysis has been performed , only the testing of the samples. If you have any questions regarding this information please do not hesitate to call.

Sincerely,

Tom McNamee
Lab Manager

cc: Randy Harten
Division of Oil, Gas,Mining

National Voluntary Laboratory Accreditation Program

NVLAP

United States Department of Commerce Accredited

Member: ASTM, ACI, AGC

NVLAP Accredited

GARCO TESTING LABORATORIES

532 West 3560 South
Salt Lake City, Utah 84115
Phone 266-4498

5826 South 1900 West
Roy, Utah 84067
Phone 776-5355

December 2, 1988

RECEIVED
DEC - 6 1988
VALLEY CAMP OF UTAH, INC.

Valley Camp of Utah, Inc.
Scofield Route
Helper, Utah 84526

Attn: Steve Tanner:

Sample 1 & 5
Soil Classification - Sandy Clay (CL)

Pn (PSF)	500	1000	1500
At Peak % Load	15.9	20.5	34.1
(PSF) Shear Strength	763	984	1637
M.C.i	15.2	15.8	14.7
γ di	115.7	113.4	120.1
MC f	17.3	16.9	15.8
γ df	108.2	120.4	126.4

Sample 2
Soil Classification - Very fine sand (ML)

Pn (PSF)	100	200	400
At Peak % Load	6.1	7.1	8.6
Shear Strength (PSF)	293	341	413
M.C.i	42.7	40.6	32.0
γ di	76.4	78.8	83.8
MC f	44.6	41.6	38.5
γ df	75.4	80.4	85.9

MC = Moisture Content
γ f = Dry Unit Weight

Sincerely,

Tom McNamee

Tom McNamee
Lab Manager

cc: Randy Harten
Div of Oil,Gas,Mining

National Voluntary Laboratory Accreditation Program
NVLAP
United States Department of Commerce Accredited
Member: ASTM, ACI, AGC

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CHECKED BY
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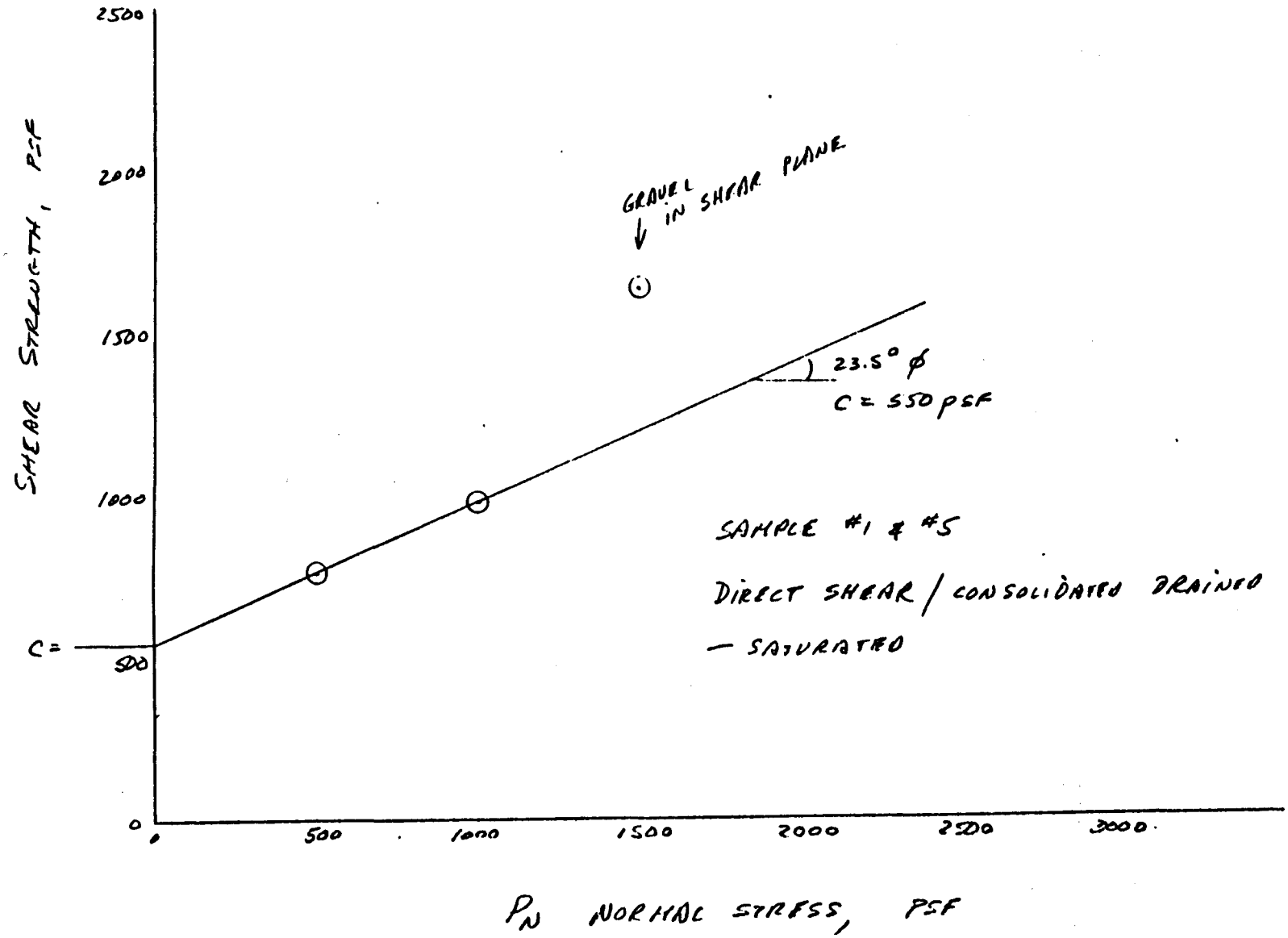
REVISIONS
BY DATE TO EO
BY DATE TO EO



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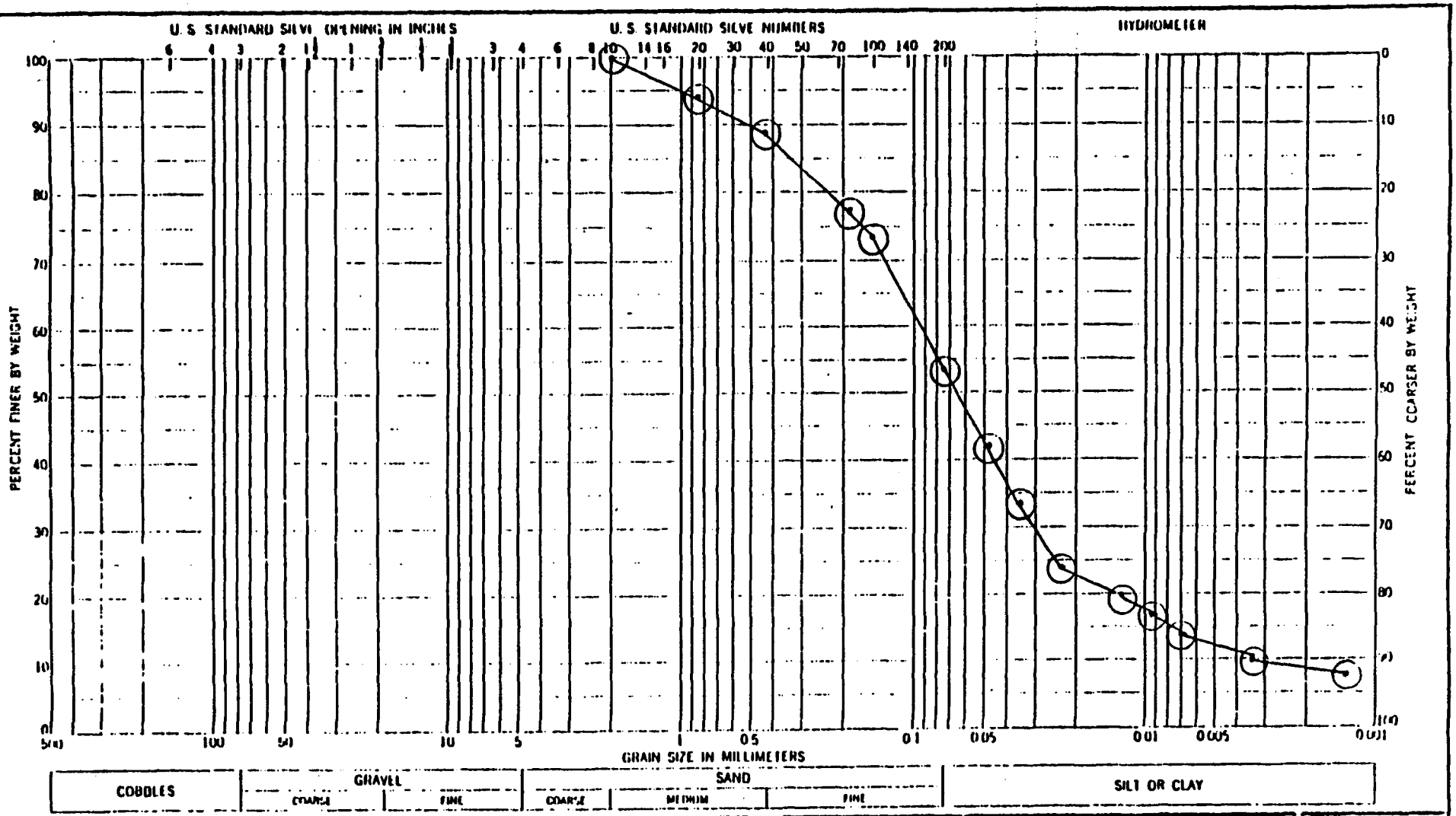


Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
1		SANDY CLAY (CL)		18	16	2

Project VALLEY CAMP

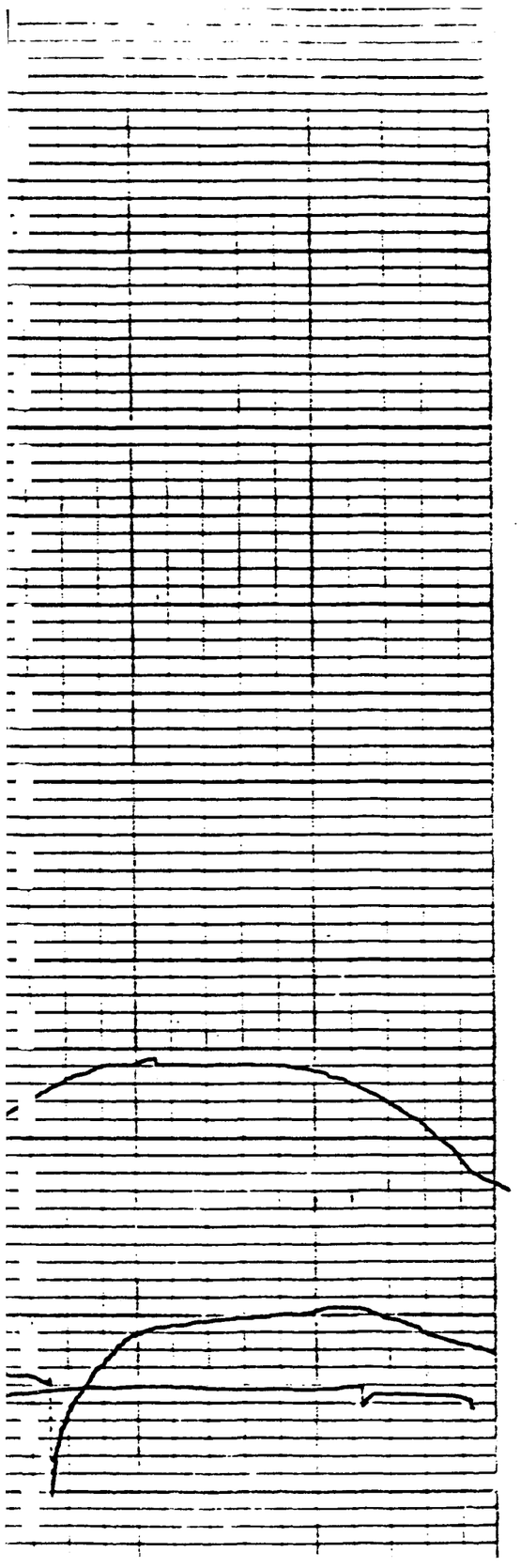
Area POND #1

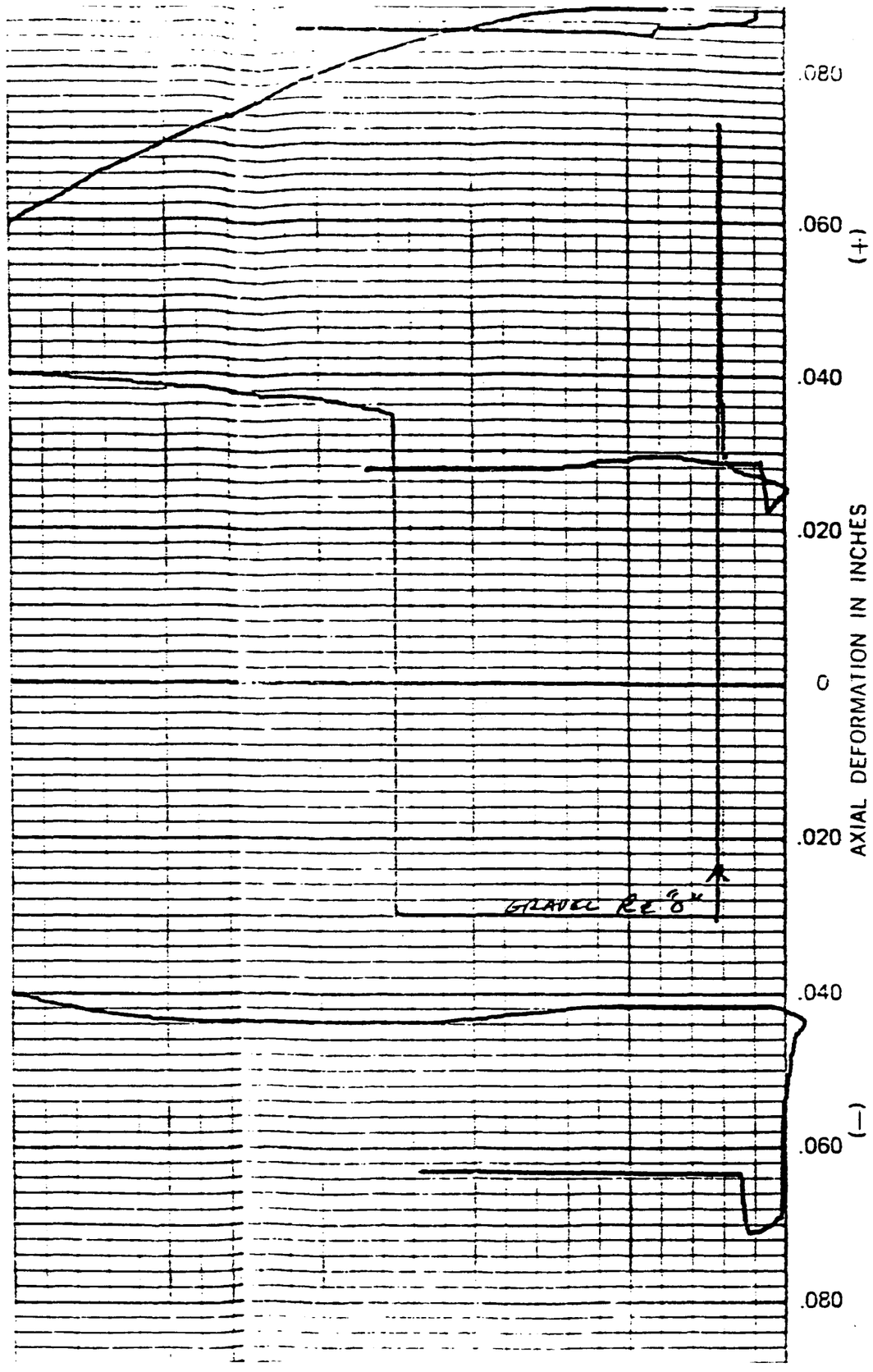
Boring No 1

Date

GRADATION CURVES

ENG FORM 1 MAY 63 2087





Sheet 1 of 2

PROJECT Valley Camp PROJECT NO. 2066

LOCATION SLC

BORING — SAMPLE 5 DEPTH (FT.) —

SAMPLED BY CARLO TESTED BY FGK 11 E SK

SOIL IDENTIFICATION BaFi-C SA CLAY OCC TR Fi GVL

TYPE OF TEST: DS/CD

SHEARING RATE: .012 in./hr. (min.)

NORMAL PRESSURE: psi = 4800 psf

LOAD RANGE USED: 20 = 48. psf/%

	PEAK	ULTIMATE
% SHEAR LOAD		
SHEAR STRENGTH (psf)		
HORIZONTAL DEFORMATION (in.)		

PN	500	1000	1500
~~REMARKS~~ At Peak % LOAD	15.9	20.5	34.1
SHEAR STRENGTH	763	984	1637
H.C.i	15.2	15.8	14.7
γdi	115.7	113.4	120.1
H.C.f	17.3	16.9	15.8
γdf	108.2	120.4	126.4

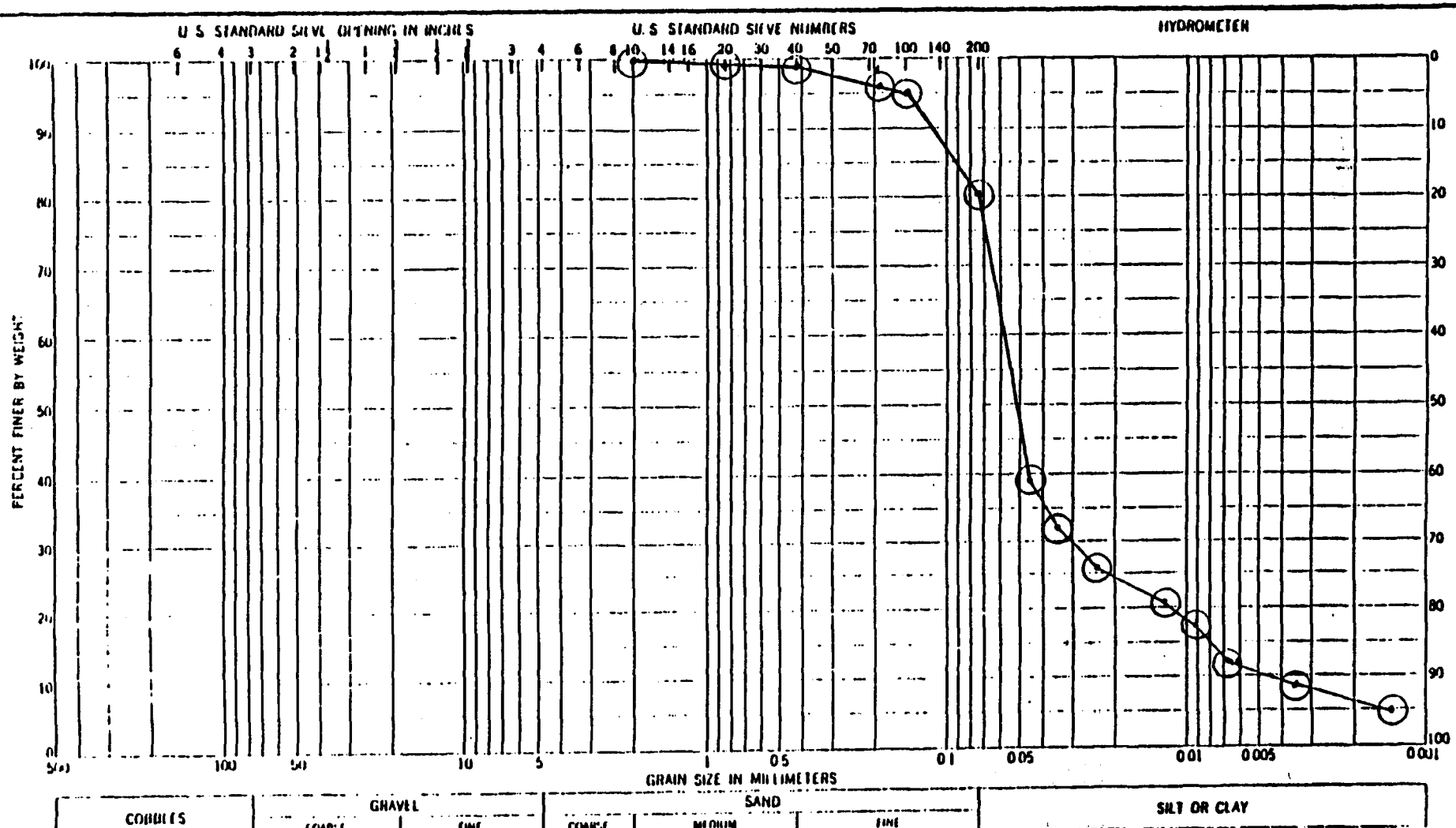
OFFICE NUMBER: 31 RECORDER NUMBER: 7434

SHEAR EQUIPMENT NUMBER: 7327B

RECORDER CALIBRATION CHECKED: 8/84

RECORDER PERFORMANCE CHECKED: 8/84

EQUIPMENT PERFORMANCE CHECKED: 8/84



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
2	–	VERY FINE SAND (ML)		NON-PLASTIC		

Project VALLEY CAMP

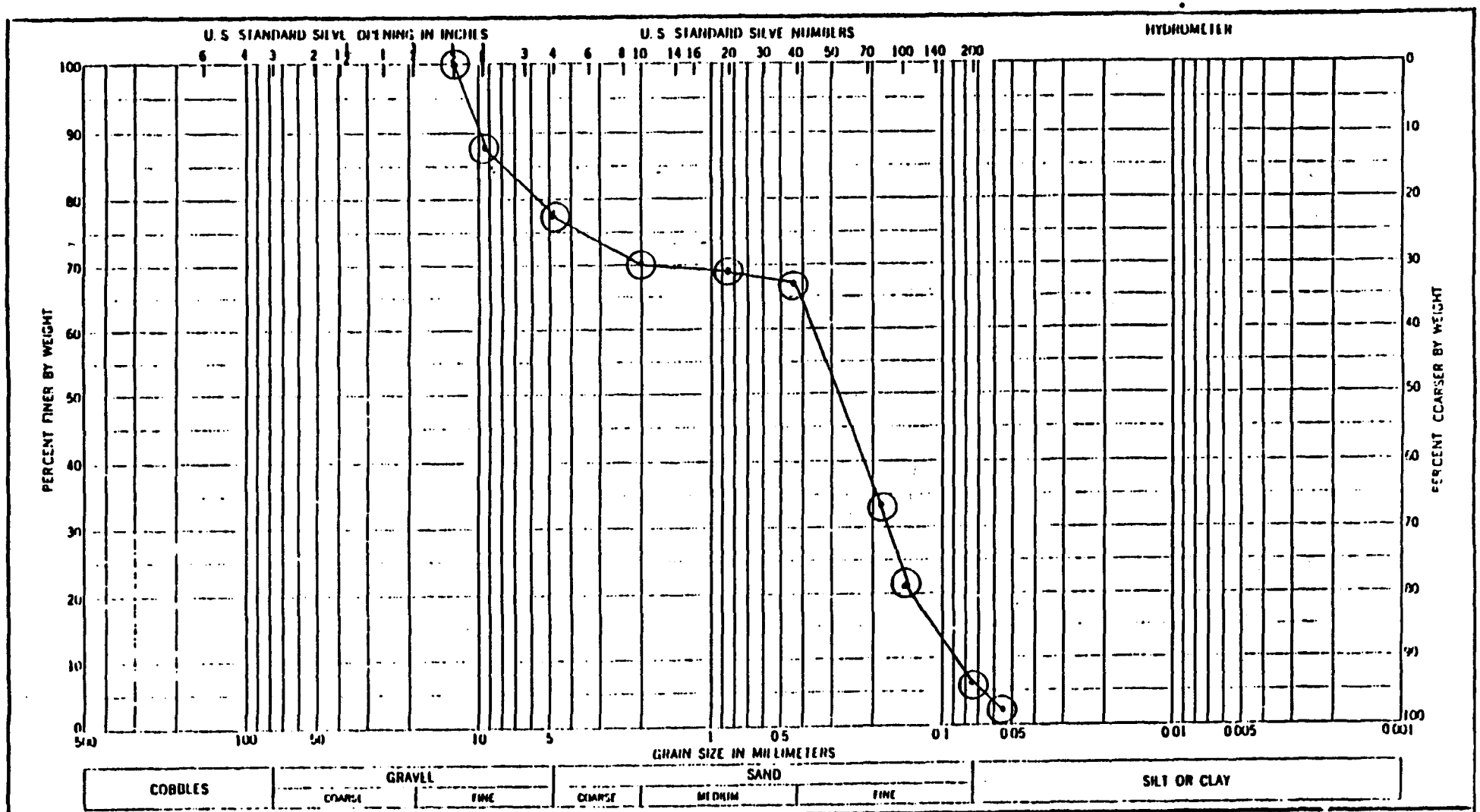
Area POND #1

Boring No. 2

Date

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
4	—	SILTY SAND (SM)		NON-PLASTIC		
		WELL GRADED SAND (SW)				

Project VALLEY CAMP

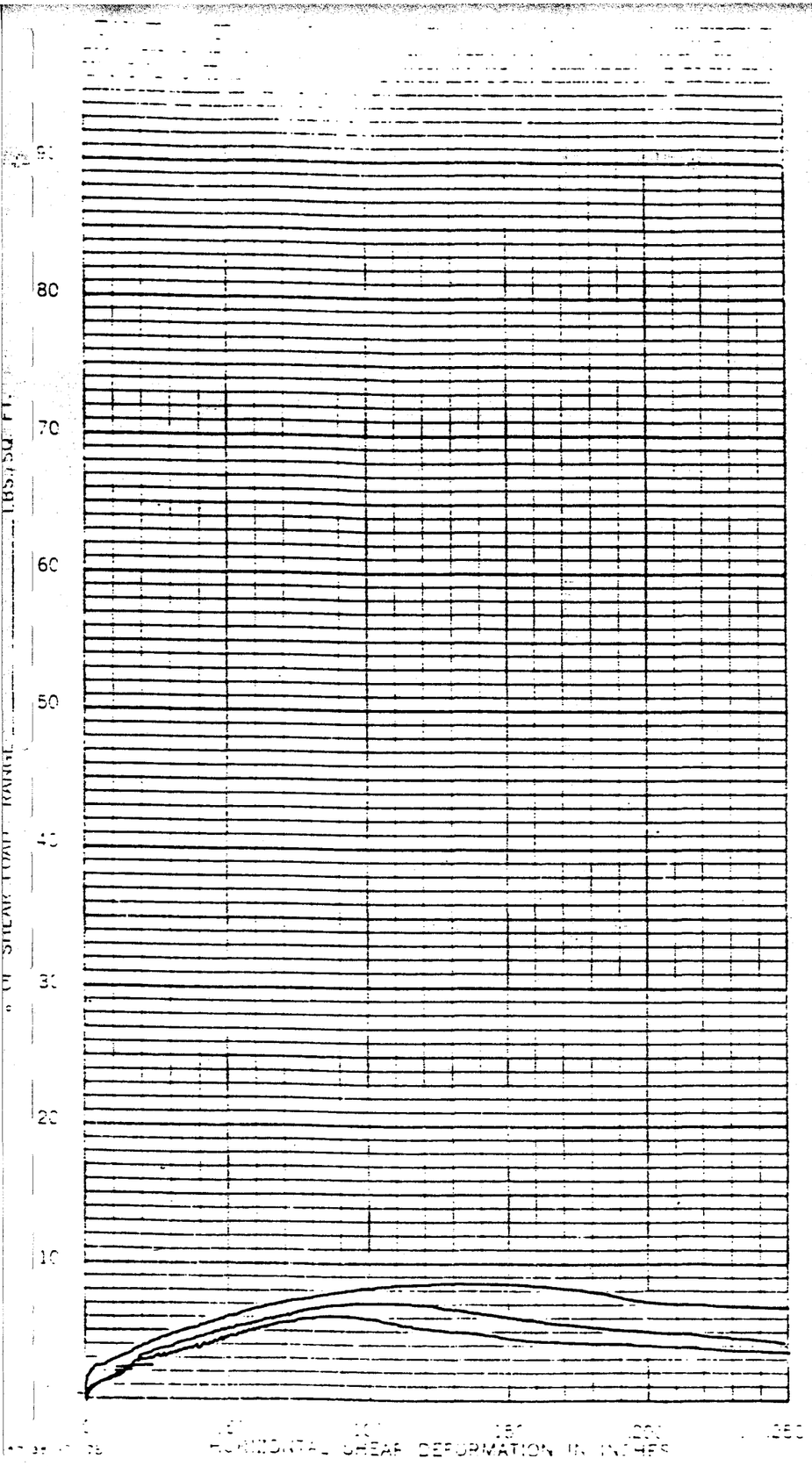
Area POND #1

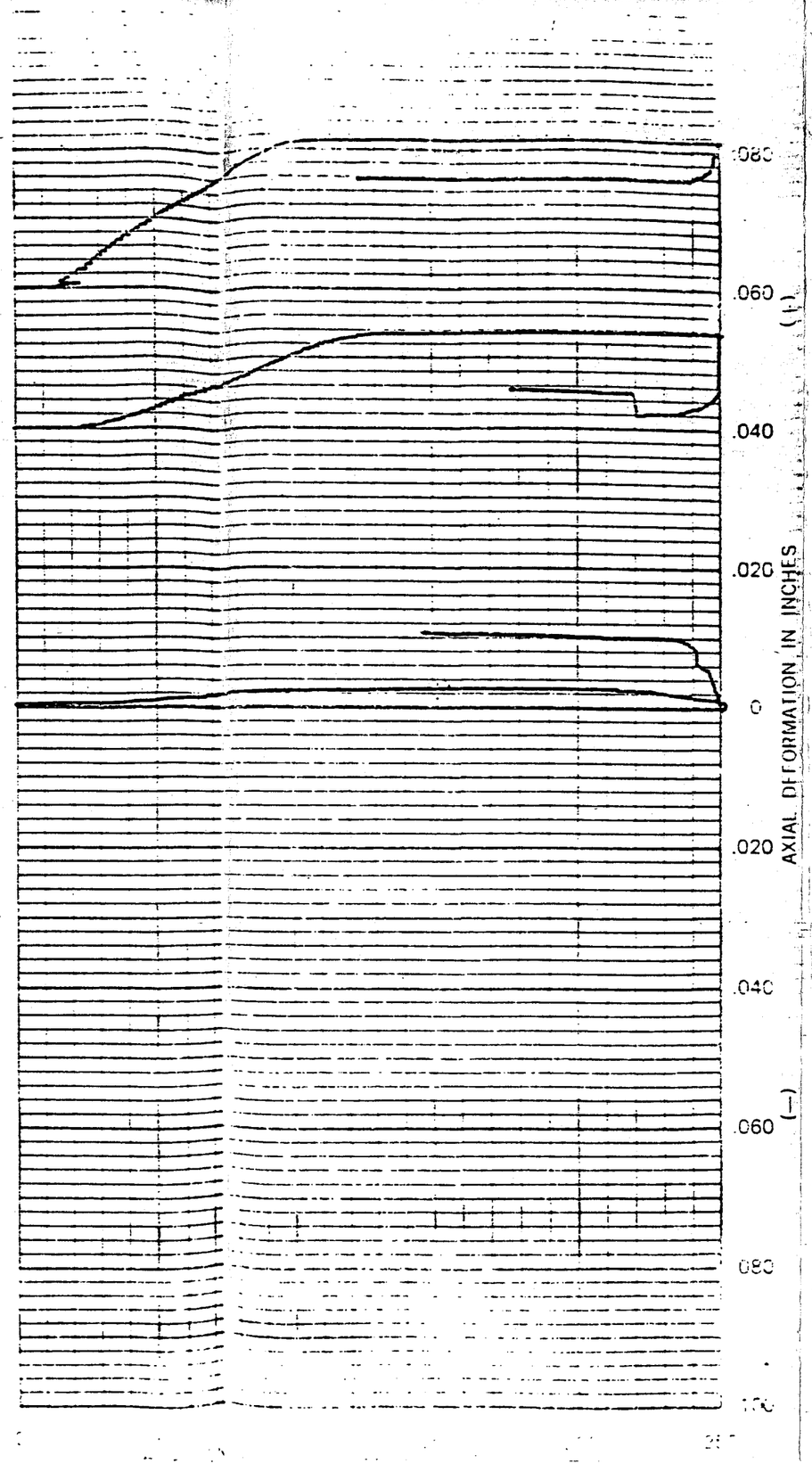
Boring No. 4

Date

GRADATION CURVES

ENG FORM 1 MAY 63 2087





DIRECT SHEAR TEST DATA
Sheet 1 of 2

PROJECT: VALLEY CAMP PROJECT NO: 5361
LOCATION: SLC
BORING: — SAMPLE: 2 DEPTH (FT.): —
SAMPLED BY: GARCO TESTED BY:
SOIL IDENTIFICATION: GRAY SI CLAY & ORG.

TYPE OF TEST: DS/CD
SHEARING RATE: .012 in/min
NORMAL PRESSURE: psi = 4800
LOAD RANGE USED: 40 (12K) = 48

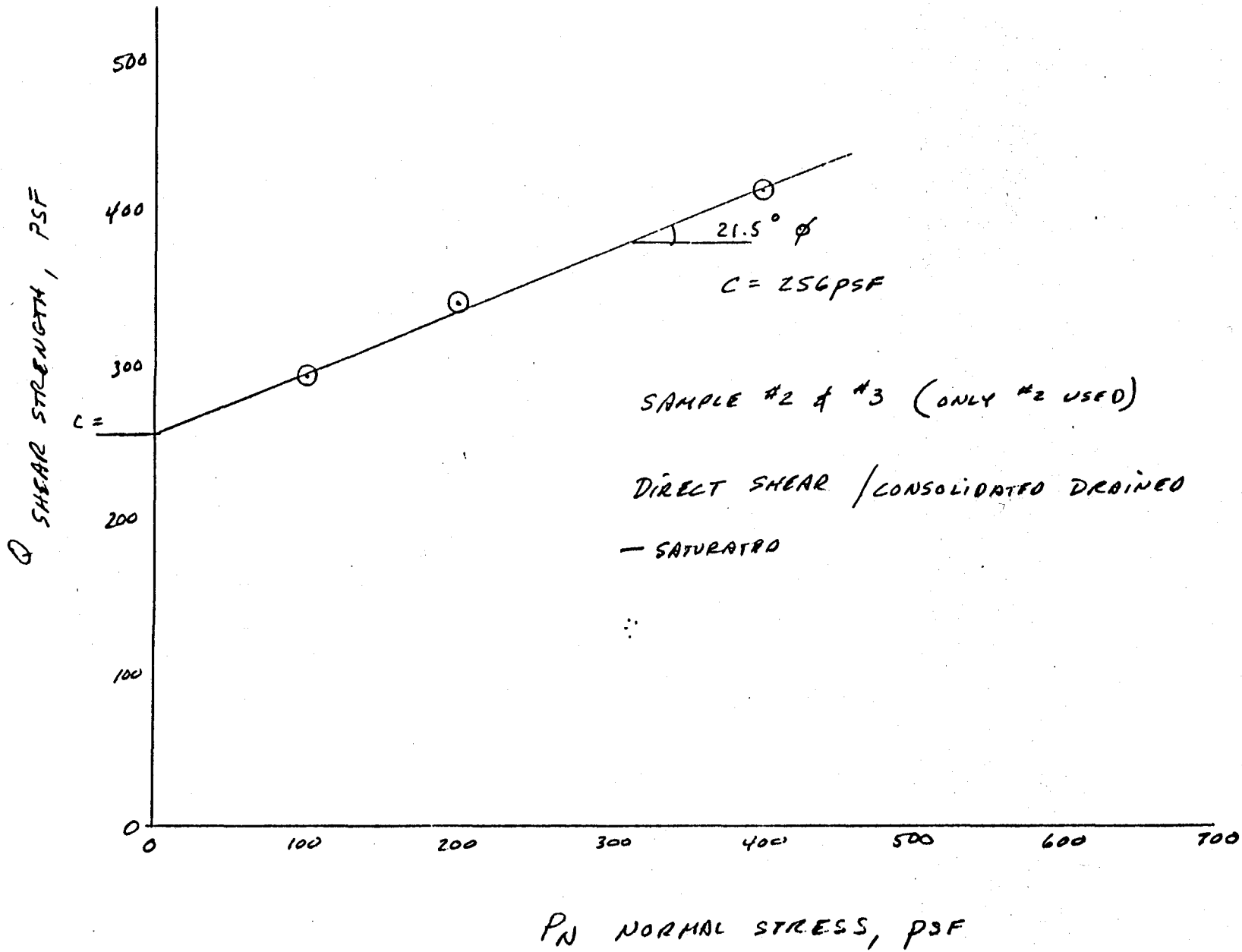
	PEAK	ULTIMATE
% SHEAR LOAD		
SHEAR STRENGTH (psf)		
HORIZONTAL DEFORMATION (in.)		

REMARKS:			
P_N	100	200	400
At Peak % LOAD	6.1	7.1	8.6
SHEAR STRENGTH	293	341	413
$M.C_i$	42.7	40.6	32.0
γ_{di}	76.4	78.8	83.8
$M.C._f$	44.6	41.6	38.5
γ_{df}	75.4	80.4	85.9

OFFICE NUMBER: 31 RECORDER NUMBER: 7434
SHEAR EQUIPMENT NUMBER: 7327 B
RECORDER CALIBRATION CHECKED: 8/84
RECORDER PERFORMANCE CHECKED: 8/84
EQUIPMENT PERFORMANCE CHECKED: 8/84
EQUIPMENT CHECKED BY: EEC DATE: 11/13/

BY EER DATE 11/18/88
CHECKED BY
COPY TO EO

REVISIONS
BY DATE TO EO
BY DATE TO EO



FILE
SUBJECT GRIECO - DS/CD TEST
SHEET 0

ROLLINS,
BROWN and
GUNNELL,
INC. professional engineers

November 16, 1988

NOV 17 1988

VALLEY CAMP OF UTAH, INC.

Barry Barnum
Scofield Route
Helper, UT 84526

Gentlemen:

We have completed the required testing of soil samples obtained from two test pits excavated at Valley Camp near Scofield, Utah. The location of the test pits are shown in Figure No. 1 with their logs presented in Figure No. 2. It will be observed that the subsurface materials in both areas consist of a brown gravelly sandy silty clay.

Sampling of the test pits occurred at three-foot intervals throughout the depth investigated. Each sample was classified according to the Unified Soil Classification System. The symbols designating the soil type are shown on the logs.

The in-place unit weight and natural moisture content are also shown on the logs ranging from about 90 pounds per cubic foot to about 110 pounds per cubic foot and 6% to 11% respectively for Test Hole No. 1 and from 91 pounds per cubic foot to 97 pounds per cubic foot and 8.6% to 21.5% respectively for Test Hole No. 2.

The saturated unit weight for samples obtained from about 6 feet below the ground surface in Test Hole No. 1 is 118.2 pounds per cubic foot.

1435 WEST 820 NORTH
POST OFFICE BOX 711
PROVO, UTAH 84603

PROVO 374-5771
SALT LAKE CITY 521-5771
AREA CODE 801

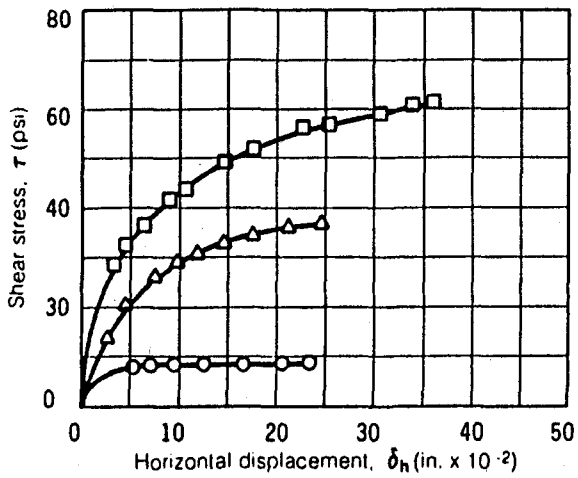
A consolidated drained direct shear test was performed on the samples from a depth of 6 feet in Test Hole No. 1. The results are shown in Figure No. 3 in the form of a Mohr envelope. The results indicate a friction angle of 38.5 degrees and a cohesion of 1 psi.

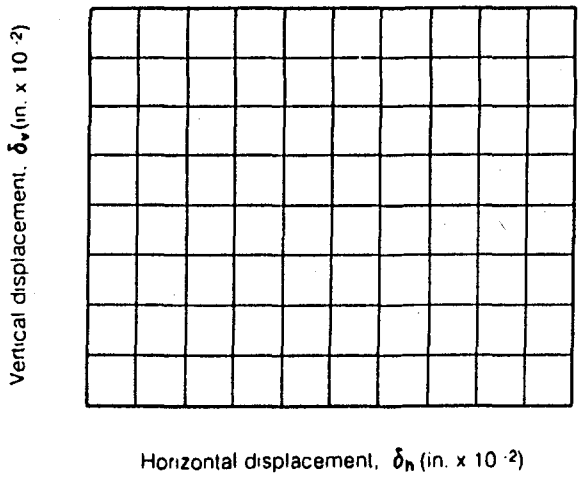
If you have any questions regarding the information contained herein, please contact me.

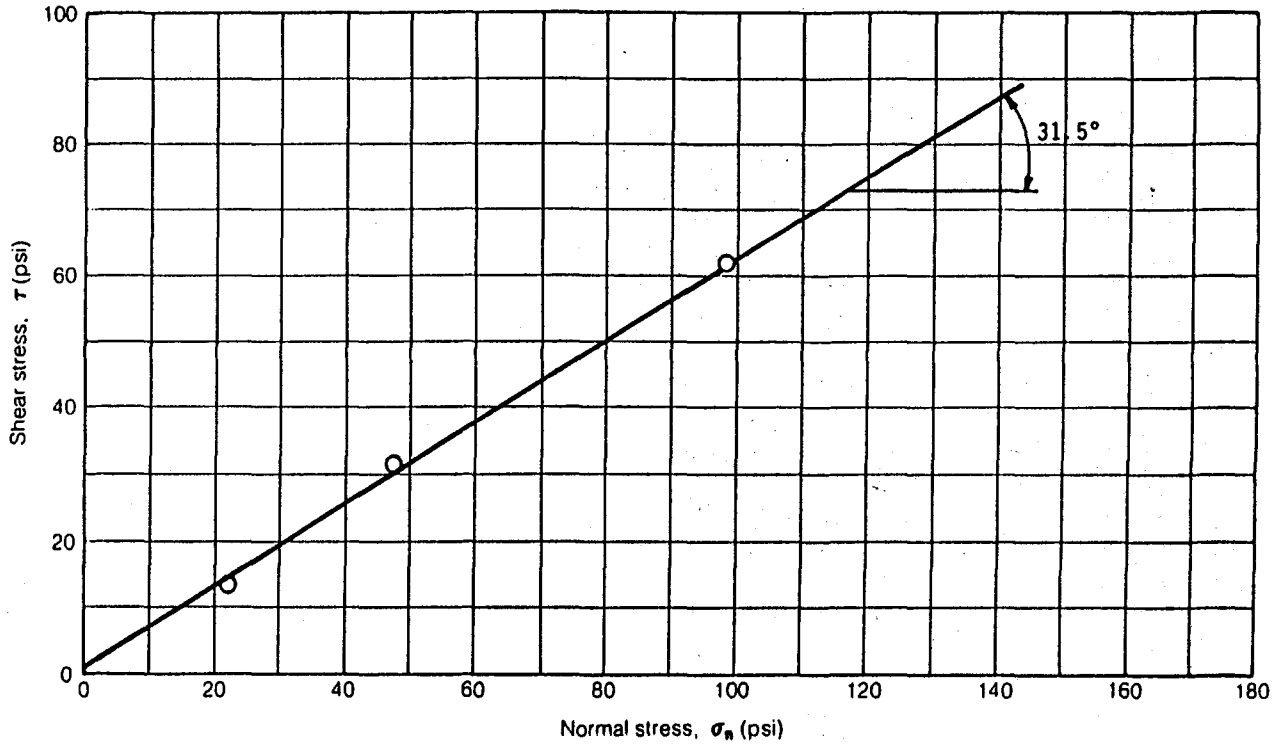
Yours truly,

Steven L. Smith

SLS:jsh







Test no. or symbol	Sample size (inches)	Sample data		Degree of saturation (%)	Normal stress σ_n (psi)	Maximum shear stress τ (psi)	Strain rate (inches / minute)	Shear strength parameters	
		Dry density (pcf)	Moisture content (%)					Friction angle ϕ (degrees)	Cohesion (c / psi)
○		88.6	15.9	100	22.7	13.0	.005	31.5	1
□		88.6	15.9	100	45.8	31.1	.005		
△		88.6	15.9	100	99.2	61.0	.005		

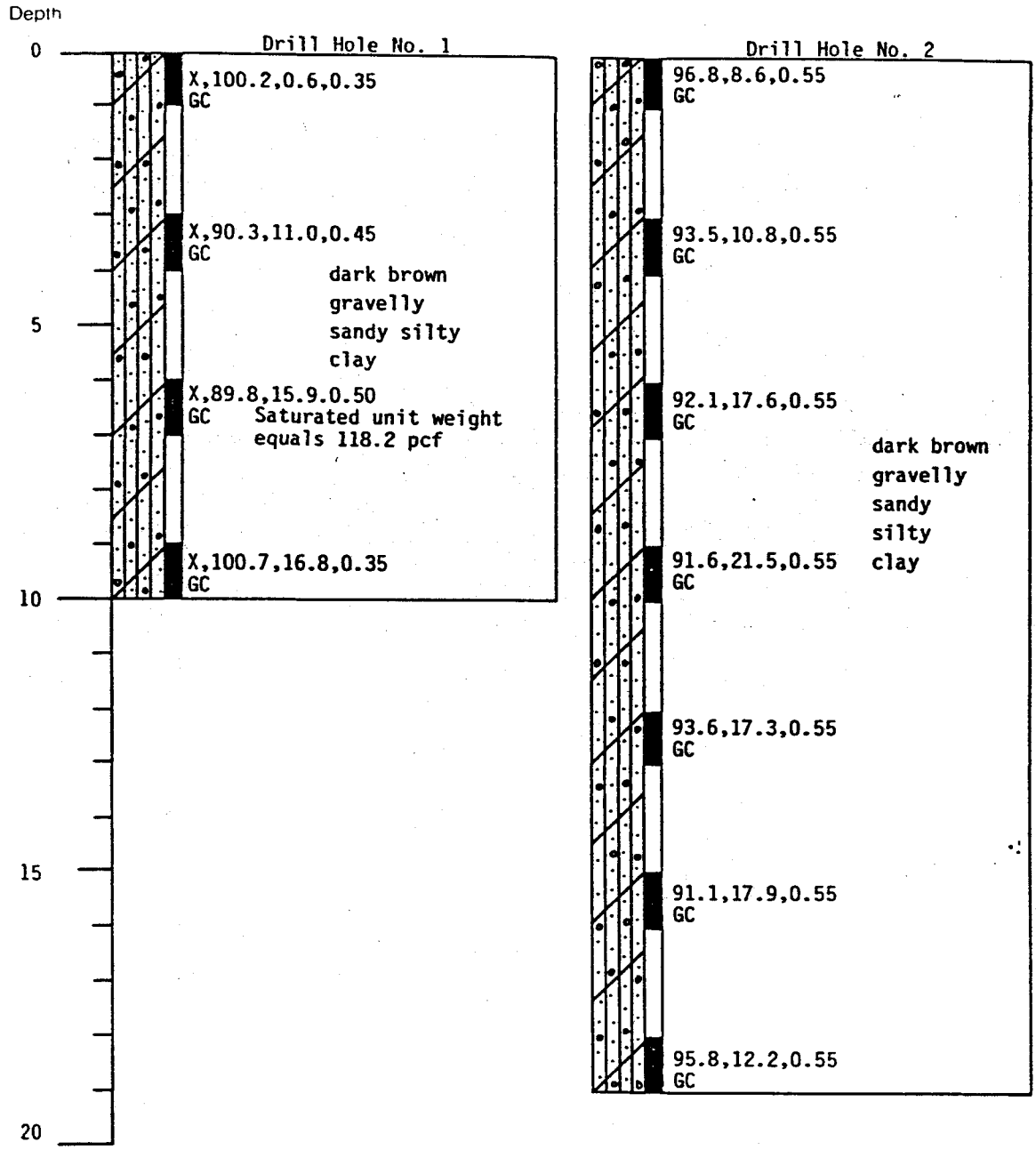
*Assumed

ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

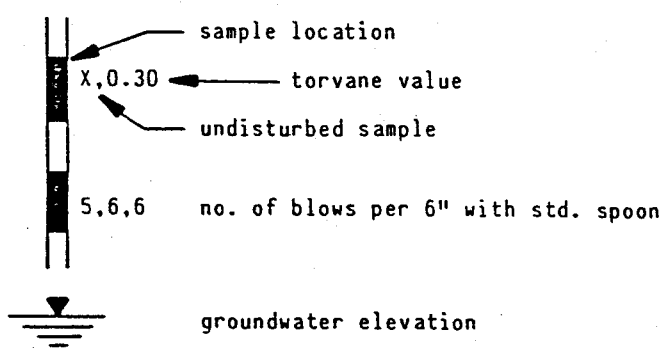
DIRECT SHEAR TEST
Project: Valley Camp of Utah

HOLE NO. 1
DEPTH: 6'

FIGURE NO. 3



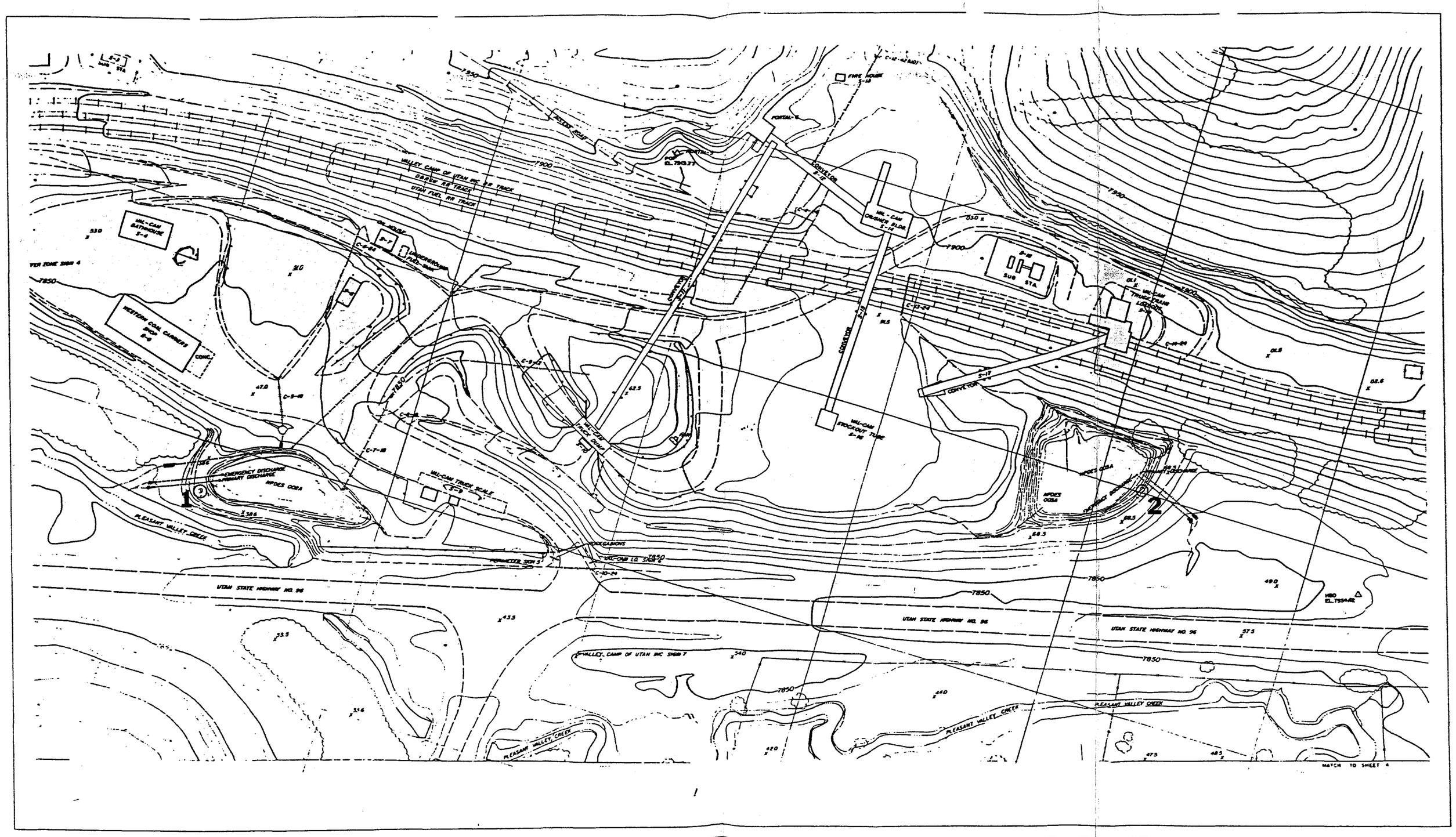
KEY



ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

Log of Borings for:
Valley Camp of Utah

Figure No. 2



ROLLINS, BROWN and GUNNELL, INC. professional engineers

Site Plan and Location of Drill Holes
Valley Camp of Utah

FIGURE NO 1

APPENDIX R614-301-742.310

Hydrologic Calculations

HANSEN ALLEN & LUCE INC

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-1
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/16/89

D-1

Total Area = 46860 * 0.00175 = 8.2 Acres
disturbed = 1000 4.9
Undisturbed = 3.2 (Sage/grass)
Paved 0.1

CN	Area	Q
90	4.9	0.723
75	3.2	0.185
98	0.1	1.329
		Q = 0.520

$\overline{CN} = 85.9$

Precipitation - 1.55 inches (10 yr, 6 hr)

hydraulic length = 2290 feet (Contour Length = 6180 feet

$$\text{slope} = \frac{(6180)(25)(100)}{43{,}560\,(8.2)} = 43.3\%$$

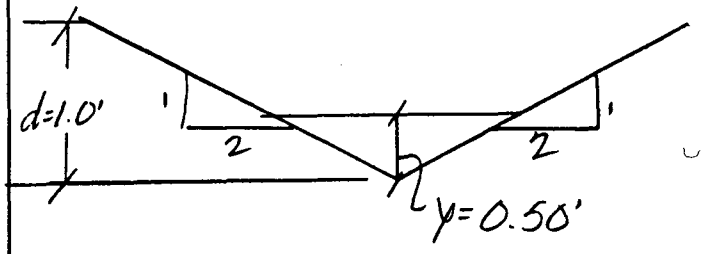
Calculated Runoff: $Q_{TOTAL} = 3.9$ cfs

Ditch Design

$S_{min} = 3\%$
$S_{max} = 5\%$

try trapezoidal channel

$b = 1$ $M = 2$, $n = 0.03$



$V = 4.71$ ft/sec < 5.0 ft/sec OK

No lining required

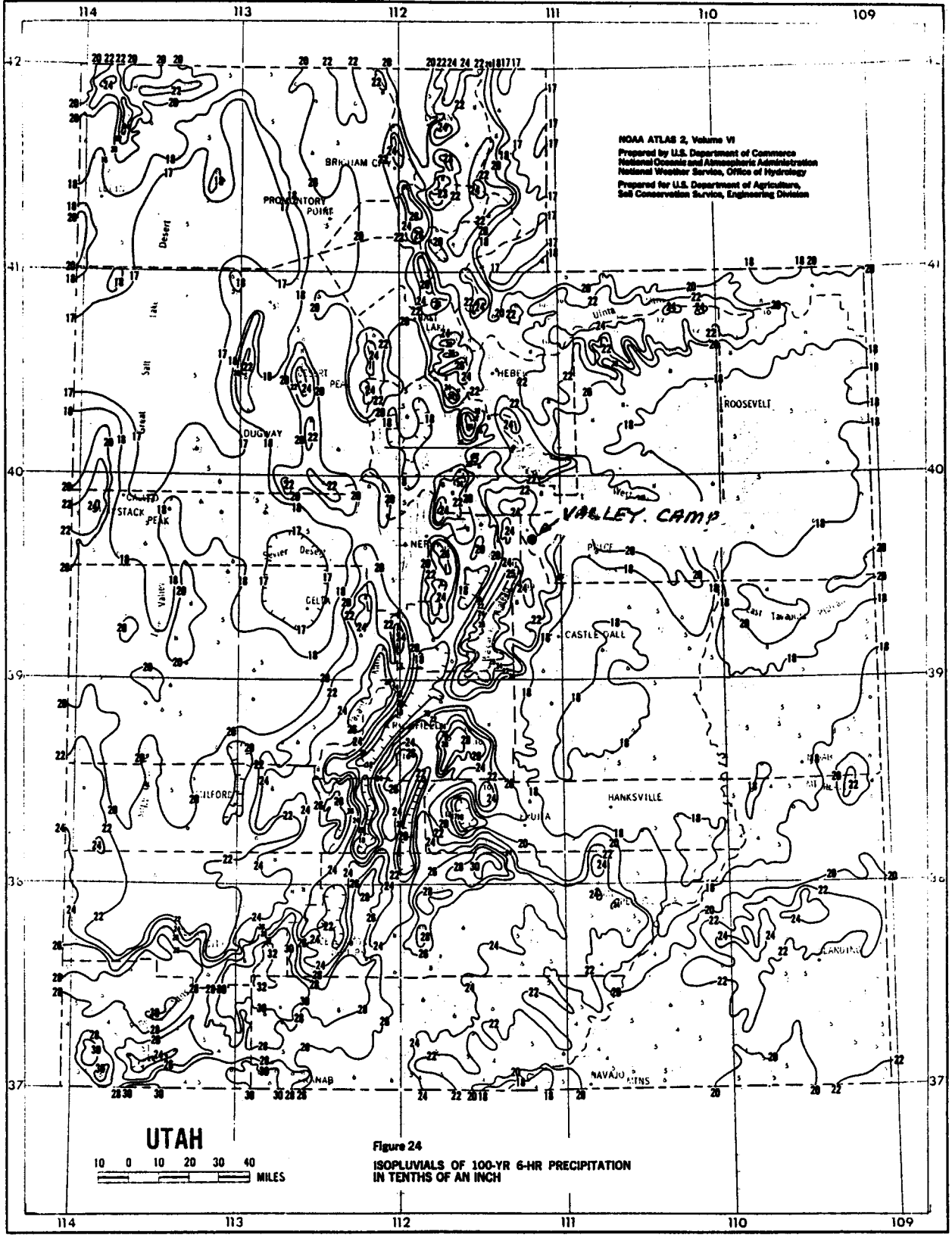


Figure 24
ISOPLUVIALS OF 100-YR 6-HR PRECIPITATION
IN TENTHS OF AN INCH

100 yr, 6hr ⇒ P = 2.25

PROJECT : Valley Camp Trail - 3-1 Runoff Calculation

AREA= 8.2 ACRES
AVERAGE BASIN SLOPE= 43.3 PERCENT
CURVE NUMBER=. 85.9
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2290. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0855 HOURS QPCFS= 72.54 CFS QPIN= 8.7726 INCHES
C3= 43.2401 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.90	.3264	.0000	.0000	.0	.00
1.91	.3315	.0000	.0000	3.6	.00
1.93	.3365	.0000	.0000	22.5	.00
1.95	.3415	.0001	.0000	48.2	.00
1.97	.3466	.0002	.0000	66.6	.00
1.98	.3516	.0003	.0001	72.5	.00
2.00	.3570	.0005	.0002	67.9	.02
2.02	.3767	.0014	.0009	57.4	.03
2.03	.3963	.0027	.0013	44.9	.05
2.05	.4159	.0044	.0017	33.1	.11
2.07	.4355	.0066	.0021	23.3	.20
2.09	.4551	.0091	.0025	15.8	.32
2.10	.4747	.0120	.0029	10.4	.46
2.12	.4943	.0153	.0033	6.7	.62
2.14	.5139	.0189	.0036	4.2	.79
2.16	.5335	.0228	.0040	2.6	.97
2.17	.5532	.0271	.0043	1.6	1.15
2.19	.5728	.0317	.0046	.9	1.32
2.21	.5924	.0366	.0049	.6	1.50
2.22	.6120	.0416	.0052	.3	1.67
2.24	.6316	.0473	.0055	.2	1.83
2.26	.6512	.0531	.0058	.1	1.99
2.27	.6708	.0591	.0061	.0	2.15
2.43	.8277	.1165	.0080	.0	3.24
2.44	.8473	.1247	.0082	.0	3.36
2.45	.8669	.1331	.0084	.0	3.48
2.46	.8866	.1417	.0086	.0	3.59
2.48	.9062	.1505	.0088	.0	3.70
2.50	.9258	.1594	.0090	.0	3.81
2.51	.9454	.1683	.0089	.0	3.89
2.53	.9650	.1683	.0025	.0	3.87
2.55	.9448	.1667	.0025	.0	3.63
2.56	.9501	.1708	.0025	.0	3.34
2.58	.9554	.1733	.0025	.0	2.93

PROJECT Valley Camp Coal - [illegible] Calculation
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.60	.9607	.1759	.0025	.0	2.53
2.62	.9660	.1784	.0025	.0	2.17

HYDROGRAPH PEAK= 3.89 cfs
TIME TO PEAK= 2.51 Hours
RUNOFF VOLUME= .36 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Co.	Date:	30-Jun-89
Project No.:	007.11.100	Time:	04:21 PM
Channel Section:	D-1	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	3.90	cfs
	Bottom Width:	1.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.030	ft/ft
	Max. Bottom Slope:	0.050	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.50	feet
	Qn/1.49(S)1/2=	0.455	
	A(R)2/3=	0.457	
	Required Depth:	1.00	feet
	Area:	1.00	ft2
	Perimeter:	3.24	feet
	Hydraulic Radius:	0.31	feet
	Velocity:	3.90	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.44	feet
	Qn/1.49(S)1/2=	0.352	
	A(R)2/3=	0.353	
	Required Depth:	0.94	feet
	Area:	0.83	ft2
	Perimeter:	2.97	feet
	Hydraulic Radius:	0.28	feet
	Velocity:	4.71	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	1.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	3.0	%
	Max. Bottom Slope:	5.0	%
	Min Channel Depth:	1.00	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-3
PROJECT NO. 007.11.100

SHEET 1 OF 1
COMPUTED Paul
CHECKED
DATE 5/11/83

D-3

Total Area = 3215 * 0.00175 = 5.6 acres
Sage/grass = = 2.4 ac
disturbed = = 3.1 ac
Paved (Bldg) = = 0.1 ac

CN	A	Q
75	2.4	0.185
90	3.1	0.723
98	0.1	1.329

$\bar{Q} = 0.503$ $\bar{CN} = 85.5$

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 1775 feet

$S = \frac{(4080)(25)(100)}{(43{,}560)(5.6)} = 41.8\%$

Calculated Run-off ⇒ $Q_{TOT} = 2.61$ cfs

Ditch Design

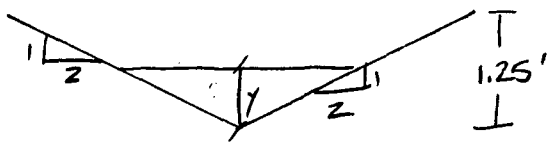
$S_{min} = 1.5\%$ try trapezoidal Channel

$S_{max} = 10\%$ $b = 0$, $M_1 = 2$, $M_2 = 2$ $n = 0.03$

Only occurs in extreme Upper end of Channel where flow is negligible.

$v = 2.74$ ft/sec < 5.0 ft/sec

CK



No lining required

PROJECT : Valley Camp Coal - D-3 Runoff Calculations

AREA= 5.6 ACRES
AVERAGE BASIN SLOPE= 41.8 PERCENT
CURVE NUMBER= 85.5
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1775. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0720 HOURS QPCFS= 58.83 CFS QPIN=10.4178 INCHES
C3= 51.3495 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.93	.3357	.0000	.0000	.0	.00
1.94	.3399	.0000	.0000	3.0	.00
1.96	.3442	.0000	.0000	18.3	.00
1.97	.3484	.0000	.0000	39.1	.00
1.99	.3526	.0001	.0000	54.0	.00
2.00	.3580	.0002	.0001	58.8	.00
2.02	.3745	.0007	.0005	55.1	.00
2.03	.3910	.0015	.0008	46.5	.02
2.04	.4075	.0026	.0011	36.4	.05
2.06	.4241	.0040	.0014	26.8	.10
2.07	.4406	.0057	.0017	18.9	.16
2.09	.4571	.0077	.0019	12.8	.24
2.10	.4736	.0099	.0022	8.5	.32
2.12	.4901	.0123	.0025	5.4	.42
2.13	.5066	.0150	.0027	3.4	.52
2.15	.5231	.0180	.0030	2.1	.62
2.16	.5397	.0212	.0032	1.3	.72
2.17	.5562	.0246	.0034	.8	.82
2.19	.5727	.0283	.0036	.4	.92
2.20	.5892	.0321	.0039	.3	1.02
2.22	.6057	.0362	.0041	.2	1.12
2.23	.6222	.0405	.0043	.0	1.21
2.43	.8534	.1197	.0067	.0	2.30
2.45	.8699	.1265	.0069	.0	2.36
2.46	.8865	.1335	.0070	.0	2.43
2.48	.9030	.1407	.0071	.0	2.49
2.49	.9195	.1479	.0073	.0	2.55
2.51	.9316	.1534	.0054	.0	2.60
2.52	.9361	.1554	.0020	.0	2.61
2.53	.9405	.1574	.0020	.0	2.53
2.55	.9450	.1595	.0020	.0	2.33
2.56	.9495	.1615	.0020	.0	2.07
2.58	.9539	.1636	.0021	.0	1.80
2.59	.9584	.1656	.0021	.0	1.54

PROJECT : Valley Camp Coal - D-3 Runoff Calculations
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.61	.9629	.1677	.0021	.0	1.33

HYDROGRAPH PEAK= 2.61 cfs
TIME TO PEAK= 2.52 Hours
RUNOFF VOLUME= .24 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Co.	Date:	30-Jun-89
Project No.:	007.11.100	Time:	04:26 PM
Channel Section:	D-3	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	2.61	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.015	ft/ft
	Max. Bottom Slope:	0.015	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.69	feet
	Qn/1.49(S)1/2=	0.430	
	A(R)2/3=	0.435	
	Required Depth:	1.19	feet
	Area:	0.95	ft2
	Perimeter:	3.09	feet
	Hydraulic Radius:	0.31	feet
	Velocity:	2.74	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.69	feet
	Qn/1.49(S)1/2=	0.430	
	A(R)2/3=	0.435	
	Required Depth:	1.19	feet
	Area:	0.95	ft2
	Perimeter:	3.09	feet
	Hydraulic Radius:	0.31	feet
	Velocity:	2.74	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	1.5	%
	Max. Bottom Slope:	1.5	%
	Min Channel Depth:	1.19	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-5A
PROJECT NO. 007.11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/11/89

D-5A (Convenience Ditch)

Total Area = 330 * 0.00175 = 0.6 acres

CN = 90 (disturbed)

Precipitation = 1.55 inches (10 year, 6 hr)

hydraulic length = 225 feet

$$\text{slope} = \frac{(450')(5')(100)}{43{,}560\,(0.6)} = 8.6\%$$

Calculated Run-off $Q_{TOT} = 0.43$ cfs

No further design anticipated

VC to provide standard ditch section with

b = 0
m = 2
depth = 1.0'

PROJECT : Valley Camp Coal - D-5A Runoff Calculations

AREA= .6 ACRES
AVERAGE BASIN SLOPE= 8.6 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 225. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0256 HOURS QPCFS= 17.71 CFS QPIN=29.2676 INCHES
C3=144.2600 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.54	.2204	.0000	.0000	.0	.00
1.56	.2279	.0000	.0000	17.7	.00
1.59	.2355	.0002	.0001	5.7	.00
1.61	.2430	.0004	.0002	.6	.00
1.64	.2506	.0007	.0003	.0	.00
2.33	.7377	.1633	.0154	.0	.37
2.36	.7671	.1793	.0159	.0	.38
2.38	.7965	.1957	.0164	.0	.39
2.41	.8259	.2125	.0168	.0	.40
2.43	.8553	.2298	.0173	.0	.41
2.46	.8847	.2474	.0177	.0	.42
2.49	.9141	.2655	.0180	.0	.43
2.51	.9336	.2777	.0122	.0	.33
2.54	.9416	.2827	.0050	.0	.17
2.56	.9495	.2877	.0050	.0	.13
2.59	.9575	.2928	.0051	.0	.12
2.61	.9654	.2979	.0051	.0	.12
2.64	.9734	.3030	.0051	.0	.12

HYDROGRAPH PEAK= .43 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .04 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-5B
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED paul
CHECKED
DATE 5/11/89

D-5B

Total Area = 1614 * 0.00175 = 2.8 acres
disturbed = = 2.4
paved = 234 = 0.4

CN	A	Q
90	2.4	0.723
98	0.4	1.329

$\bar{Q} = 0.810$ $\bar{CN} = 91.5$

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 850 feet

$$\text{slope} = \frac{(4075)(5)(100)}{43{,}560\,(2.8)} = 16.7\%$$

Calculated Run-Off: $Q_{TOT} = 2.16$ cfs

Ditch Design

$S_{min} = 3\%$

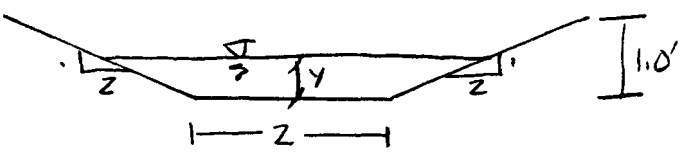
$S_{max} = 11\%$

try trapezoidal channel

$b=0,\ m_1=2,\ m_2=2,\ n=0.03$

$V = 4.78$ ft/sec < 5.0 ft/sec OK

No lining required



PROJECT : Valley Camp Coal - D-5B Runoff Calculations

AREA= 2.8 ACRES
AVERAGE BASIN SLOPE= 16.7 PERCENT
CURVE NUMBER= 91.5
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 850. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0500 HOURS QPCFS= 42.36 CFS QPIN=15.0016 INCHES
C3= 73.9430 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.35	.1837	.0000	.0000	.0	.00
1.37	.1866	.0000	.0000	8.6	.00
1.38	.1894	.0000	.0000	32.5	.00
1.40	.1922	.0000	.0000	42.4	.00
1.42	.1951	.0000	.0000	35.8	.00
1.43	.1979	.0002	.0000	23.8	.00
1.45	.2008	.0002	.0000	13.6	.00
1.47	.2036	.0003	.0000	7.0	.00
1.48	.2065	.0004	.0001	3.3	.01
1.50	.2093	.0006	.0001	1.5	.01
1.52	.2142	.0008	.0003	.6	.02
1.53	.2192	.0012	.0003	.3	.03
1.55	.2241	.0015	.0004	.1	.03
1.57	.2290	.0019	.0004	.0	.04
2.40	.8158	.2546	.0122	.0	1.99
2.42	.8350	.2670	.0124	.0	2.02
2.43	.8541	.2796	.0126	.0	2.05
2.45	.8732	.2923	.0127	.0	2.08
2.47	.8923	.3052	.0129	.0	2.11
2.48	.9115	.3182	.0130	.0	2.14
2.50	.9302	.3311	.0129	.0	2.16
2.52	.9353	.3347	.0036	.0	2.09
2.53	.9405	.3383	.0036	.0	1.80
2.55	.9457	.3419	.0036	.0	1.41
2.57	.9508	.3455	.0036	.0	1.08
2.58	.9560	.3491	.0036	.0	.86
2.60	.9612	.3527	.0036	.0	.73

HYDROGRAPH PEAK= 2.16 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .19 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Co.	Date:	30-Jun-89
Project No.:	007.11.100	Time:	04:55 PM
Channel Section:	D-5B	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	2.16	cfs
	Bottom Width:	2.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.030	ft/ft
	Max. Bottom Slope:	0.110	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.28	feet
	Qn/1.49(S)1/2=	0.252	
	A(R)2/3=	0.253	
	Required Depth:	0.78	feet
	Area:	0.70	ft2
	Perimeter:	3.23	feet
	Hydraulic Radius:	0.22	feet
	Velocity:	3.08	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.19	feet
	Qn/1.49(S)1/2=	0.131	
	A(R)2/3=	0.133	
	Required Depth:	0.69	feet
	Area:	0.45	ft2
	Perimeter:	2.85	feet
	Hydraulic Radius:	0.16	feet
	Velocity:	4.78	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	2.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	3.0	%
	Max. Bottom Slope:	11.0	%
	Min Channel Depth:	0.78	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE D-6
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/11/89

D-6

Total Area = 630 * 0.00175 = 1.1 acres
disturbed = = 1.0 ac
paved (Bldg) = = 0.1 ac

CN	A	Q
90	1.0	0.723
98	1.1	1.329
		$\bar{Q}$ = 0.778

$\bar{CN}$ = 91.0

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 500 feet

$$\text{slope} = \frac{(950')(5')(100)}{43{,}560\,(1.1)} = 9.9\%$$

Calculated Run-Off Q_{TOT} = 0.82 cfs

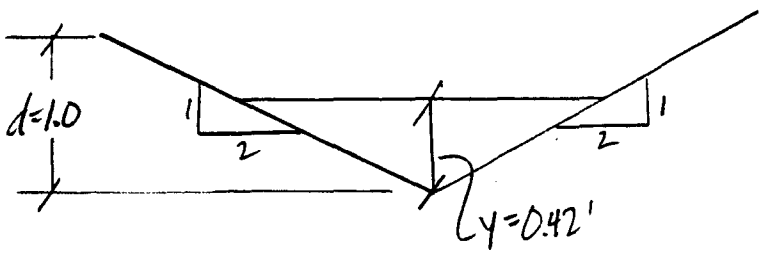
Ditch Design

S_{min} = 2%

S_{max} = 2%

try trapezoidal channel
b=0, m=2, n=0.03

V = 2.30 ft/sec < 5.0 ft/sec
No lining required



PROJECT : Valley Camp Coal - D-6 Runoff Calculations

AREA= 1.1 ACRES
AVERAGE BASIN SLOPE= 9.9 PERCENT
CURVE NUMBER= 91.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0434 HOURS QPCFS= 19.17 CFS QPIN=17.2837 INCHES
C3= 85.1915 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.43	.1976	.0000	.0000	.0	.00
1.45	.2000	.0000	.0000	3.9	.00
1.46	.2025	.0000	.0000	14.7	.00
1.47	.2050	.0000	.0000	19.2	.00
1.49	.2074	.0000	.0000	16.2	.00
1.50	.2104	.0002	.0000	10.8	.00
1.52	.2146	.0003	.0001	6.2	.00
1.53	.2189	.0004	.0002	3.2	.00
1.55	.2232	.0006	.0002	1.5	.00
1.56	.2274	.0009	.0002	.7	.00
1.58	.2317	.0011	.0003	.3	.01
1.59	.2359	.0014	.0003	.1	.02
1.61	.2402	.0017	.0003	.0	.02
2.41	.8323	.2480	.0104	.0	.77
2.43	.8489	.2585	.0105	.0	.78
2.44	.8655	.2691	.0106	.0	.79
2.46	.8821	.2798	.0107	.0	.80
2.47	.8986	.2907	.0108	.0	.81
2.49	.9152	.3016	.0110	.0	.82
2.50	.9305	.3118	.0102	.0	.82
2.52	.9350	.3148	.0030	.0	.79
2.53	.9395	.3178	.0030	.0	.67
2.54	.9439	.3208	.0030	.0	.53
2.56	.9484	.3239	.0030	.0	.40
2.57	.9529	.3269	.0030	.0	.32
2.59	.9574	.3300	.0030	.0	.28

HYDROGRAPH PEAK= .82 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .07 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	18-May-89
Project No.:	007.11.100	Time:	11:42 AM
Channel Section:	Ditch D-6	Computed:	PGH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.82	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.02	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.42	feet
	Qn/1.49(S)1/2=	0.117	
	A(R)2/3=	0.117	
	Required Depth:	0.92	feet
	Area:	0.36	ft2
	Perimeter:	1.89	feet
	Hydraulic Radius:	0.19	feet
	Velocity:	2.30	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.42	feet
	Qn/1.49(S)1/2=	0.117	
	A(R)2/3=	0.117	
	Required Depth:	0.92	feet
	Area:	0.36	ft2
	Perimeter:	1.89	feet
	Hydraulic Radius:	0.19	feet
	Velocity:	2.30	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope :	0.02	ft/ft
	Max. Bottom Slope :	0.02	ft/ft
	Min. Channel Depth:	0.92	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-7A
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/11/89

D-7A.

Total Area = 453 * 0.00175 = 0.8 ac

CN = 90 (disturbed)

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 500 feet

$$\text{slope} = \frac{(1650)(5)(100)}{43{,}560\,(0.8)} = 23.7\%$$

Calculated Run-off: $Q_{TOT} = 0.57$ cfs

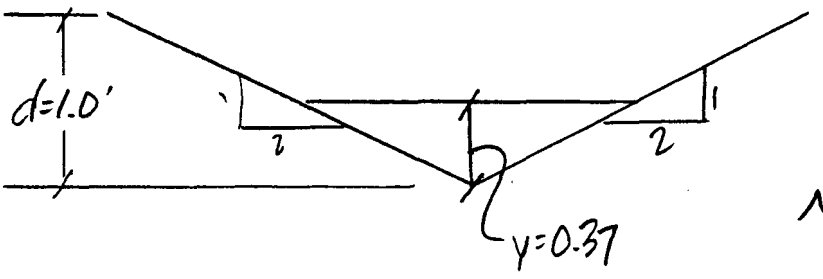
Ditch Design

$S_{min} = 2\%$

$S_{max} = 8\%$

try trapezoidal channel

$b = 0,\ m = 2,\ n = 0.03$



$V = 3.57$ ft/sec < 5.0 ft/sec OK

No lining necessary

PROJECT : Valley Camp Coal - D-7A Runoff Calculations

AREA= .8 ACRES
AVERAGE BASIN SLOPE= 23.7 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0292 HOURS QPCFS= 20.69 CFS QPIN=25.6497 INCHES
C3=126.4273 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.52	.2147	.0000	.0000	.0	.00
1.55	.2233	.0000	.0000	20.7	.00
1.58	.2319	.0000	.0000	6.7	.00
1.61	.2405	.0003	.0002	.7	.00
1.64	.2491	.0006	.0003	.0	.00
2.31	.7084	.1480	.0169	.0	.47
2.34	.7419	.1656	.0176	.0	.49
2.37	.7754	.1839	.0183	.0	.51
2.39	.8089	.2027	.0189	.0	.53
2.42	.8424	.2221	.0194	.0	.54
2.45	.8759	.2421	.0200	.0	.56
2.48	.9094	.2626	.0205	.0	.57
2.51	.9335	.2776	.0150	.0	.46
2.54	.9425	.2833	.0057	.0	.23
2.57	.9516	.2890	.0057	.0	.17
2.60	.9606	.2948	.0058	.0	.16
2.63	.9697	.3006	.0058	.0	.16
2.66	.9787	.3064	.0058	.0	.16

HYDROGRAPH PEAK= .57 cfs
TIME TO PEAK= 2.48 Hours
RUNOFF VOLUME= .05 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	12-May-89
Project No.:	007.11.100	Time:	03:09 PM
Channel Section:	Ditch D-7A	Computed:	PGH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.57	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.08	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.37	feet
	Qn/1.49(S)1/2=	0.081	
	A(R)2/3=	0.081	
	Required Depth:	0.87	feet
	Area:	0.27	ft2
	Perimeter:	1.65	feet
	Hydraulic Radius:	0.16	feet
	Velocity:	2.10	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.29	feet
	Qn/1.49(S)1/2=	0.041	
	A(R)2/3=	0.041	
	Required Depth:	0.79	feet
	Area:	0.16	ft2
	Perimeter:	1.27	feet
	Hydraulic Radius:	0.13	feet
	Velocity:	3.51	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope :	0.02	ft/ft
	Max. Bottom Slope :	0.08	ft/ft
	Min. Channel Depth:	0.87	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-7B
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/11/89

D-7B

Total Area = 905 * 0.00175 = 1.6 ac
paved = 155 = 0.3 ac
disturbed = = 1.3 ac

CN	A	Q
98	0.3	1.329
90	1.3	0.723
		$\bar{Q}$ = 0.837

$\bar{CN}$ = 91.9

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 700'

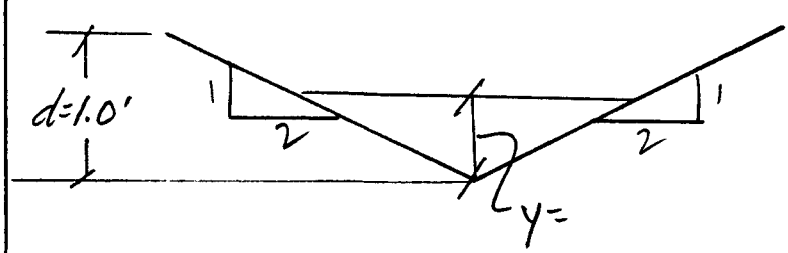
$$\text{slope} = \frac{(1875)(5)(100)}{43{,}560\,(1.6)} = 13.5\%$$

Calculated Run-Off ⇒ Q_{TOT} = 1.27 cfs

Ditch Design

S_{min} = 4.5% by trapezoidal channel

S_{max} = 11% b = 1.0, M = 2, n = 0.03



v = 4.54 ft/sec < 5.0 ft/sec OK

No lining required

PROJECT : Valley Camp Coal - D-7B Runoff Calculations

AREA= 1.6 ACRES
AVERAGE BASIN SLOPE= 13.5 PERCENT
CURVE NUMBER= 91.9
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 700. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0468 HOURS QPCFS= 25.87 CFS QPIN=16.0323 INCHES
C3= 79.0230 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.29	.1741	.0000	.0000	.0	.00
1.31	.1768	.0000	.0000	5.2	.00
1.33	.1794	.0000	.0000	19.8	.00
1.34	.1821	.0000	.0000	25.9	.00
1.36	.1848	.0000	.0000	21.9	.00
1.37	.1874	.0001	.0000	14.5	.00
1.39	.1901	.0002	.0000	8.3	.00
1.40	.1927	.0003	.0000	4.3	.00
1.42	.1954	.0004	.0001	2.1	.00
1.43	.1980	.0005	.0001	.9	.00
1.45	.2007	.0007	.0001	.4	.00
1.47	.2034	.0008	.0001	.2	.01
1.48	.2060	.0010	.0002	.0	.01
2.40	.8163	.2692	.0118	.0	1.18
2.42	.8342	.2812	.0119	.0	1.19
2.43	.8520	.2933	.0121	.0	1.21
2.45	.8699	.3055	.0122	.0	1.22
2.46	.8878	.3178	.0123	.0	1.24
2.48	.9057	.3303	.0125	.0	1.25
2.49	.9236	.3429	.0126	.0	1.27
2.51	.9331	.3496	.0068	.0	1.25
2.53	.9379	.3531	.0034	.0	1.13
2.54	.9428	.3565	.0034	.0	.92
2.56	.9476	.3600	.0035	.0	.71
2.57	.9524	.3634	.0035	.0	.55
2.59	.9573	.3669	.0035	.0	.46

HYDROGRAPH PEAK= 1.27 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .11 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	12-May-89
Project No.:	007.11.100	Time:	03:05 PM
Channel Section:	Ditch D-7B	Computed:	PGH

			UNITS
GENERAL CRITERIA:	Design Flow:	1.27	cfs
	Bottom Width:	1.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.05	ft/ft
	Max. Bottom Slope:	0.11	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.25	feet
	Qn/1.49(S)1/2=	0.121	
	A(R)2/3=	0.121	
	Required Depth:	0.75	feet
	Area:	0.38	ft2
	Perimeter:	2.13	feet
	Hydraulic Radius:	0.18	feet
	Velocity:	3.33	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.20	feet
	Qn/1.49(S)1/2=	0.077	
	A(R)2/3=	0.078	
	Required Depth:	0.70	feet
	Area:	0.28	ft2
	Perimeter:	1.89	feet
	Hydraulic Radius:	0.15	feet
	Velocity:	4.54	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	1.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope :	0.05	ft/ft
	Max. Bottom Slope :	0.11	ft/ft
	Min. Channel Depth:	0.75	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE D-8
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/11/89

D-8

Total Area = 857 * 0.00175 = 1.5 acres
disturbed = 757 = 1.3 ac
paved = 100 = 0.2 ac

CN	A	Q
90	1.3	0.723
98	0.2	1.329

$\bar{Q} = 0.804$ $\bar{CN} = 91.4$

Note: Drainage Area from C-11-12 also contributes to D-8 flow

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 600 feet

$$\text{slope} = \frac{(3400)(5)(100)}{43{,}560\ (1.5)} = 26.0\%$$

Calculated Run-off $Q_{TOT} = 1.17$ cfs

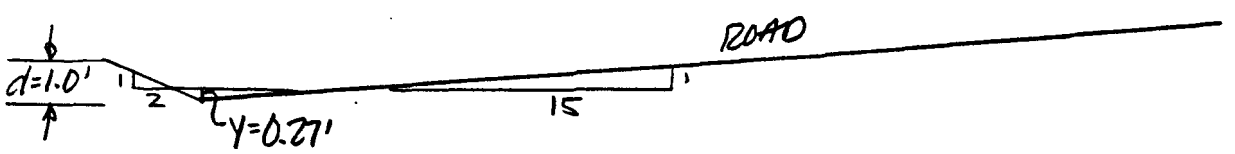
Ditch Design

$S_{min} = 2\%$ try trapezoidal Channel

$S_{max} = 13\%$ $b=0,\ m_1=2,\ m_2=15,\ n=0.03$

Use Roadway Design $V = 3.73$ ft/sec < 5.0 ft/sec OK

No lining required



PROJECT : Valley Camp Coal - D-8 Runoff Calculations

AREA= 1.5 ACRES
AVERAGE BASIN SLOPE= 26.0 PERCENT
CURVE NUMBER= 91.4
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 600. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0305 HOURS QPCFS= 37.25 CFS QPIN=24.6265 INCHES
C3=121.3839 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.37	.1872	.0000	.0000	.0	.00
1.39	.1898	.0000	.0000	18.2	.00
1.40	.1924	.0000	.0000	37.2	.00
1.42	.1950	.0000	.0000	26.3	.00
1.43	.1976	.0000	.0000	12.0	.00
1.45	.2002	.0002	.0000	4.3	.00
1.46	.2028	.0002	.0000	1.3	.00
1.48	.2054	.0003	.0000	.4	.00
1.49	.2080	.0004	.0000	.0	.00
2.41	.8226	.2555	.0112	.0	1.09
2.42	.8400	.2668	.0113	.0	1.11
2.44	.8575	.2782	.0114	.0	1.12
2.45	.8750	.2898	.0116	.0	1.13
2.47	.8924	.3015	.0117	.0	1.15
2.48	.9099	.3133	.0118	.0	1.16
2.50	.9274	.3252	.0119	.0	1.17
2.51	.9340	.3298	.0046	.0	1.05
2.53	.9387	.3330	.0033	.0	.76
2.54	.9435	.3363	.0033	.0	.52
2.56	.9482	.3396	.0033	.0	.39
2.57	.9529	.3429	.0033	.0	.35
2.59	.9576	.3461	.0033	.0	.33

HYDROGRAPH PEAK= 1.17 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .10 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	12-May-89
Project No.:	007.11.100	Time:	02:56 PM
Channel Section:	Ditch D-8	Computed:	PGH

			UNITS
GENERAL CRITERIA:	Design Flow:	1.17	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	15.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.02	ft/ft
	Max. Bottom Slope:	0.13	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.27	feet
	Qn/1.49(S)1/2=	0.167	
	A(R)2/3=	0.168	
	Required Depth:	0.77	feet
	Area:	0.64	ft2
	Perimeter:	4.73	feet
	Hydraulic Radius:	0.13	feet
	Velocity:	1.83	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.19	feet
	Qn/1.49(S)1/2=	0.066	
	A(R)2/3=	0.065	
	Required Depth:	0.69	feet
	Area:	0.31	ft2
	Perimeter:	3.32	feet
	Hydraulic Radius:	0.09	feet
	Velocity:	3.73	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	15.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope :	0.02	ft/ft
	Max. Bottom Slope :	0.13	ft/ft
	Min. Channel Depth:	0.77	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp Coal
PROJECT Permit
FEATURE D-9A, D-9B
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED Paul
CHECKED
DATE 5/11/89

D-9A, D-9B (Convenience Ditches)

Total Area = 70 * 0.00175 = 0.1 acres

CN = 90

Precipitation = 1.55 inches

hydraulic length = 125'

$$\text{Slope} = \frac{(150)(5)(100)}{43{,}560\,(0.1)} = 17.2\%$$

The geometry of this basin does not fit the parameters necessary to run "HYDRO."

A comparison of the other basins in the immediate area, given the same storm are shown below:

Partial Summary of Ditch Capacity at Valcam

Ditch Number	Area (acres)	Slope (%)	CN	Runoff (cfs)
18A	2.1	43.0	78.1	0.46
13A	2.0	44.5	79.4	0.53
13B	2.2	43.7	80.7	0.67
18B	1.4	34.8	81.7	0.47
15	4.2	35.0	82.8	1.57
16A	5.1	31.6	84.3	2.13
3	5.6	41.8	85.5	2.61
5A	0.6	8.6	90.0	0.43
16B	0.7	33.6	90.0	0.50
7A	0.8	23.7	90.0	0.57
6	1.1	9.9	91.0	0.82
8	1.5	26.0	91.4	1.17

As noted, the basin in question differs from those available.

Alternate method - Calculate the time of concentration using the rational method - and re-run "HYDRO" with the new value

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FEATURE D-9A, 9B
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SHEET 2 OF
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DATE 5/15/89

A method for calculating the time of concentration is presented in Urban Storm Drainage Criteria Manual - Volume I by Wright-McLaughlin Engineers (March 1969)

$t_c = t_i + t_t^{0}$

where t_c = time of concentration (minutes)
t_i = overland flow time (minutes)
t_t = travel time in ditch - (assume to be < 1 min) ∴ negligible

$$t_i = \frac{(1.8)(1.1 - C_{10})\sqrt{L}}{\sqrt[3]{S}}$$

where C_{10} = run-off coeff for 10 year freq
L - length overland flow
S - average basin slope (%)

for this basin

$C_{10} = 0.50$ (Railroad yard area most closely models the area.)

$L = 110'$
$S = 17.2$ ⟹ $t_i = 4.4$ minutes
$= 0.073$ hours

Re-run "HYDRO" using calculated t_c

$Q_{TOT} = 0.07$ cfs

No further Design Anticipated

PROJECT : Valley Camp Coal - D-9A, D-9B Runoff Calculation

AREA= .1 ACRES
AVERAGE BASIN SLOPE= 17.2 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 125. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR
USER INPUT TIME OF CONCENTRATION= .07 HOURS

TP= .0488 HOURS QPCFS= 1.55 CFS QPIN=15.3809 INCHES
C3= 75.8125 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.54	.2221	.0000	.0000	.0	.00
1.56	.2269	.0000	.0000	.3	.00
1.58	.2317	.0000	.0000	1.2	.00
1.59	.2365	.0002	.0001	1.6	.00
1.61	.2413	.0003	.0001	1.3	.00
1.63	.2461	.0005	.0002	.9	.00
1.64	.2508	.0007	.0002	.5	.00
1.66	.2556	.0010	.0003	.3	.00
1.67	.2604	.0013	.0003	.1	.00
1.69	.2652	.0016	.0003	.0	.00
2.40	.8210	.2097	.0107	.0	.06
2.42	.8397	.2206	.0109	.0	.06
2.44	.8583	.2316	.0110	.0	.07
2.45	.8769	.2428	.0112	.0	.07
2.47	.8956	.2541	.0113	.0	.07
2.49	.9142	.2656	.0115	.0	.07
2.50	.9308	.2759	.0103	.0	.07
2.52	.9358	.2791	.0032	.0	.07
2.53	.9408	.2822	.0032	.0	.06
2.55	.9459	.2854	.0032	.0	.04
2.57	.9509	.2886	.0032	.0	.03
2.58	.9560	.2918	.0032	.0	.03
2.60	.9610	.2950	.0032	.0	.02

HYDROGRAPH PEAK= .07 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .00 Acre-Feet

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FEATURE D-10
PROJECT NO. 007.11.100

SHEET 1 OF
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D-10

Total Area = 8.5 * 1.401 12.8 acres

CN = 75 (25% sage / grass)

Precipitation = 1.55 inches (10yr, 6 hr)

hydraulic length = 1800 ft

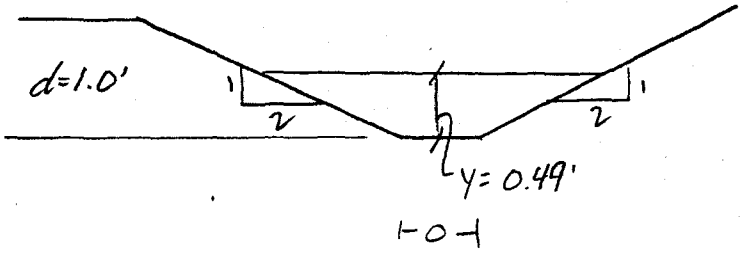
$$\text{slope} = \frac{(17.00)(80)(100)}{43{,}560\,(12.8)} = 24.4\ \%$$

Calculated Runoff $Q_{TOT,10yr} = 1.18$ cfs

Ditch Design

$S_{min} = 2\%$ try trapezoidal channel

$S_{max} = 3\%$ $b = 0'$, $m = 2$, $n = 0.03$



$V_{max} = 2.9$ fps < 5.0 fps ✓

No Lining Required

PROJECT : Valley Camp Coal - D-10 Runoff Calculation

AREA= 12.8 ACRES
AVERAGE BASIN SLOPE= 24.4 PERCENT
CURVE NUMBER=, 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1800. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1328 HOURS QPCFS= 72.87 CFS QPIN= 5.6460 INCHES
C3= 27.8293 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.26	.6526	.0000	.0000	.0	.00
2.28	.6831	.0000	.0000	3.7	.00
2.31	.7135	.0006	.0006	22.6	.00
2.34	.7440	.0018	.0011	48.4	.02
2.36	.7745	.0034	.0016	66.9	.06
2.39	.8049	.0055	.0021	72.9	.14
2.42	.8354	.0081	.0026	68.3	.26
2.44	.8659	.0112	.0031	57.6	.41
2.47	.8964	.0148	.0036	45.1	.55
2.50	.9268	.0188	.0040	33.3	.78
2.52	.9374	.0203	.0015	23.4	.98
2.55	.9456	.0215	.0012	15.9	1.12
2.58	.9539	.0222	.0012	10.5	1.18
2.60	.9621	.0241	.0013	6.7	1.16
2.63	.9703	.0254	.0013	4.2	1.08
2.66	.9786	.0267	.0013	2.6	.99
2.68	.9868	.0281	.0014	1.6	.90
2.71	.9950	.0294	.0014	.9	.82
2.74	1.0033	.0309	.0014	.6	.77
2.76	1.0115	.0323	.0015	.3	.73
2.79	1.0197	.0338	.0015	.2	.71
2.82	1.0280	.0353	.0015	.1	.70
2.84	1.0362	.0369	.0015	.0	.70

HYDROGRAPH PEAK= 1.18 cfs
TIME TO PEAK= 2.58 Hours
RUNOFF VOLUME= .20 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Co.	Date:	12-Jul-89
Project No.:	007.11.100	Time:	02:34 PM
Channel Section:	D-10	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	1.18	cfs
	Bottom Width:	0.0	feet
	Side Slope1:	2.0	1/m1
	Side Slope2:	2.0	1/m2
	Friction Factor:	0.030	
	Min. Bottom Slope:	0.020	ft/ft
	Max. Bottom Slope:	0.030	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.49	feet
	Qn/1.49(S)1/2=	0.168	
	A(R)2/3=	0.170	
	Required Depth:	0.99	feet
	Area:	0.47	ft2
	Perimeter:	2.17	feet
	Hydraulic Radius:	0.22	feet
	Velocity:	2.51	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.45	feet
	Qn/1.49(S)1/2=	0.138	
	A(R)2/3=	0.139	
	Required Depth:	0.95	feet
	Area:	0.41	ft2
	Perimeter:	2.01	feet
	Hydraulic Radius:	0.20	feet
	Velocity:	2.91	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:	Bottom Width:	0.0	feet
	Side Slope 1:	2.0	1/m1
	Side Slope 2:	2.0	1/m2
	Min. Bottom Slope:	2.0	%
	Max. Bottom Slope:	3.0	%
	Min Channel Depth:	0.99	feet
	Riprap (Min S):	Not Needed	
	Riprap (Max S):	Not Needed	

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FEATURE D-12A
PROJECT NO. 007.11.100

SHEET ___ OF ___
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D-12A

Total Area = 110 * 0.00175 = 0.2 ac
paved = = 0.1 ac
dist = 0.1 ac

CN	A	Q
98	0.1	1.329
90	0.1	0.723

$\overline{Q} = 1.026$ $\overline{CN} = 94.6$

Precipitation = 1.55 inches (10 yr, 6hr)

hydraulic length = 200'

$$\text{slope} = \frac{(425)(5)(100)}{43{,}560\,(.2)} = 24.4\%$$

Note
The basin geometry does not allow "HYDRO" analysis.

Calculate t_c using Alternate Method

from "Urban Storm Drainage Criteria manual - Vol 1 by Wright McLaughlin Engineers (March 1969)

$$t_c = t_i + t_t^0$$

where t_c = time of concentration (minutes)
t_i = overland flow time (minutes)
t_t = travel time in ditch (assume negligible)

$$t_i = \frac{(1.8)(1.1 - C_{10})\sqrt{L}}{\sqrt[3]{S}}$$

where $L = 200'$
$S = 24.4\%$
$C_{10} = 0.50$

$t_c = t_i = 5.27$ minutes

$= 0.08777$ hours $\Rightarrow$ $Q_{TOT} = 0.19$ cfs

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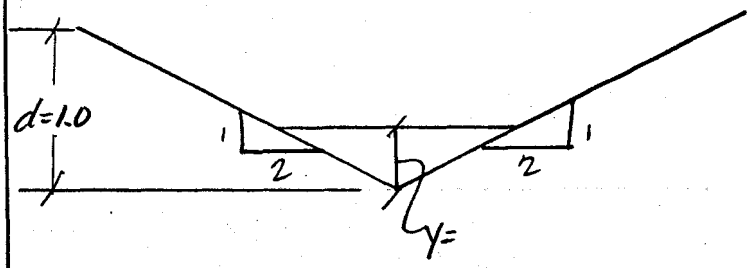
PROJECT Permit
FEATURE D-12A
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/16/89

Ditch Design

try trapezoidal channel

$b=0,\ M=2,\ n=0.03$



$V=1.6$ ft/sec <5.0 ft/sec OK

$\therefore$ no lining required