Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	04-May-89
Project No.:	007.11.100	Time:	03:38 PM
Channel Section:	D-44B	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.40	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:	0.17	ft/ft
	Max. Bottom Slope:	0.21	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.22	feet
	Qn/1.49(S)1/2=	0.020	
	A(R)2/3=	0.020	
	Required Depth:	0.72	feet
	Area:	0.09	ft2
	Perimeter:	0.97	feet
	Hydraulic Radius:	0.10	feet
	Velocity:	4.25	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.21	feet
	Qn/1.49(S)1/2=	0.018	
	A(R)2/3=	0.018	
	Required Depth:	0.71	feet
	Area:	0.09	ft2
	Perimeter:	0.94	feet
	Hydraulic Radius:	0.09	feet
	Velocity:	4.54	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:	0.17	ft/ft
	Max. Bottom Slope:	0.21	ft/ft
	Channel Depth:	0.72	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-1-32
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-1-32 (Permanent Structure)

Tributary Area → Ditch D-1

$Q_{TOT} = 3.9$ cfs (10 yr, 6 hr)

check pipe flow

32" CMP
$n = 0.024$
$S = 25\%$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 132.0$ cfs OK

Since $Q_{allow} >> Q_{TOT}$ pipe flow not limiting
OK

check Inlet control

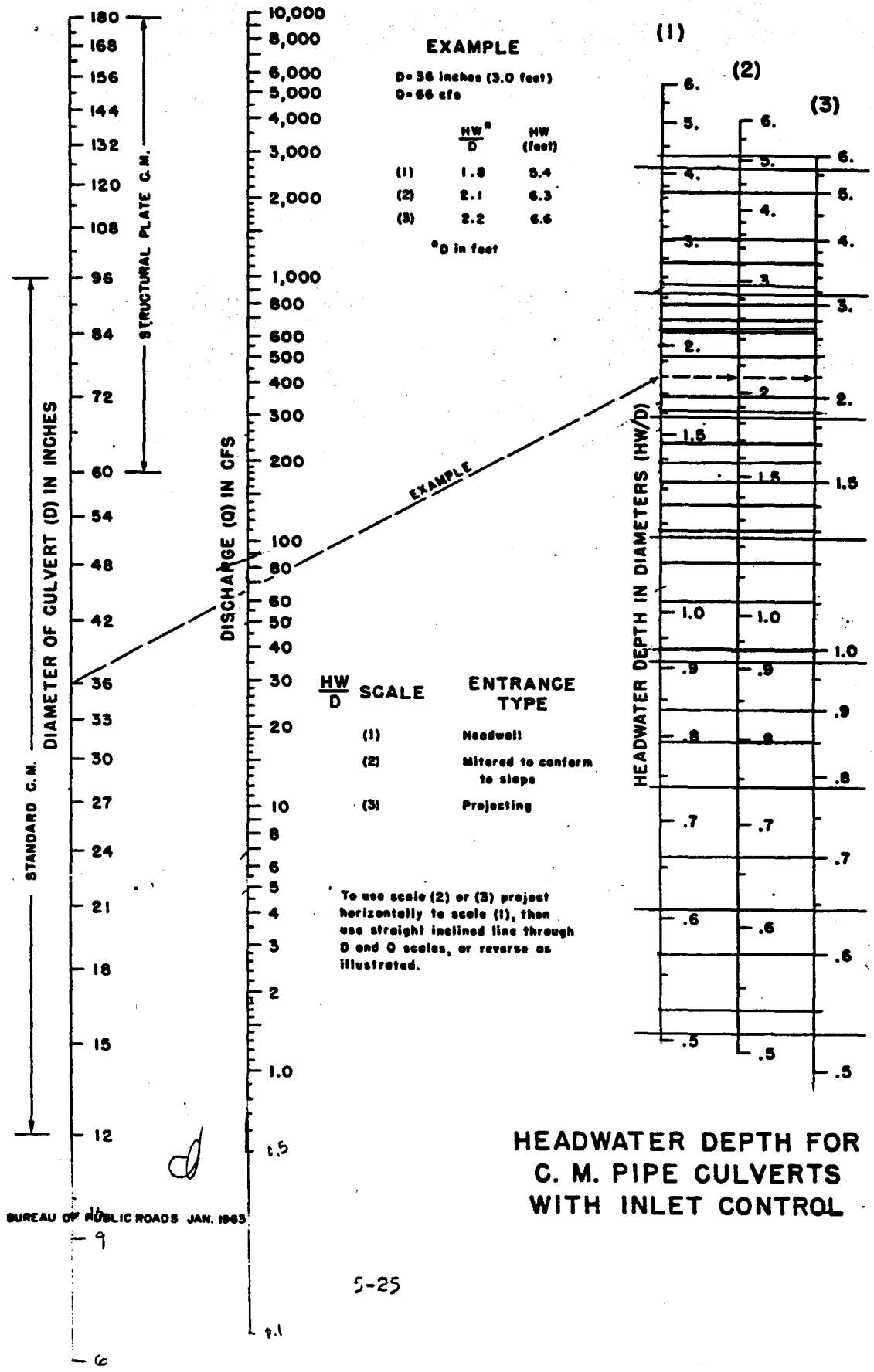
HW depth = 5.2'

$\frac{HW}{D} = 1.9$ Using Chart 5 assume projecting entrance

$Q_{HW} = 45.0$ cfs

Since $Q_{HW} > Q_{TOT}$ inlet control does not limit
OK

CHART 5



HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

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C-2-18

This culvert drains very little area and is used for the draining of a small area sometimes used for storage of equipment. Since there is no identifiable tributary area, no calculations are made.

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FEATURE C-3-18
PROJECT NO. 007.11.100

SHEET ___ OF ___
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DATE 5/18/89

C-3-18

Tributary Flow - D-3

$Q_{TOT} = 2.61$ cfs

Check Pipe Flow

18" CMP
$n = 0.024$
$S = 3\%$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 9.86$ cfs OK

Since $Q_{allow} > Q_{TOT}$ pipe flow not limiting

Check Inlet Control

HW depth = 0.9' $\frac{HW}{D} = 2.7$

Using Chart 5 - Assume projecting entrance

$Q_{HW} = 12.5$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

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PROJECT Permit
FEATURE C-4-42
PROJECT NO. 007.11.100

SHEET ___ OF ___
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CHECKED ___
DATE 5/19/89

C-4-42 (Permanent structure)

Total Area = 63 * 1.401 = 88 acres
90% Cover Oak/Aspen = 69 acres CN = 40
25% Cover Sage/Grass = 19 acres CN = 75

CN	A	Q
40	69	0.04
75	19	0.51

$\overline{Q} = 0.14$ $\overline{CN} = 61.7$

Precipitation = 2.25 inches (100 yr, 6 hr)

hydraulic length = 4,000 feet

$$\text{slope} = \frac{(16{,}000)(80)(100)}{43{,}560\,(88)} = 33.4\%$$

Calculated Runoff $Q_{TOT} = 3.96$ cfs

Check Pipe Flow

- 42" CMP
- $n = 0.024$
- $S = 3\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 94.39$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting

Check Inlet Control

- HW depth = 6.5' $\frac{HW}{D} = 1.86$

Use Chart 5 - assume projecting entrance

$Q_{HW} = 90$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

PROJECT : Valley Camp Coal - C-4-42 Runoff Calculation

AREA= 88.0 ACRES
AVERAGE BASIN SLOPE= 33.4 PERCENT
CURVE NUMBER= 61.7
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 4000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .3071 HOURS QPCFS= 216.73 CFS QPIN= 2.4424 INCHES
C3= 12.0387 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.40	1.1753	.0000	.0000	.0	.00
2.46	1.2776	.0002	.0002	10.9	.00
2.52	1.3581	.0021	.0019	67.3	.04
2.58	1.3857	.0033	.0011	143.9	.17
2.64	1.4133	.0046	.0014	199.0	.41
2.70	1.4410	.0062	.0016	216.7	.70
2.76	1.4686	.0080	.0018	203.0	1.01
2.82	1.4962	.0100	.0020	171.4	1.31
2.89	1.5239	.0123	.0022	134.0	1.62
2.95	1.5515	.0147	.0025	98.9	1.92
3.01	1.5783	.0173	.0026	69.7	2.22
3.07	1.6004	.0196	.0023	47.3	2.51
3.13	1.6225	.0220	.0024	31.2	2.77
3.19	1.6446	.0246	.0025	20.0	2.98
3.25	1.6667	.0273	.0027	12.6	3.15
3.32	1.6889	.0301	.0028	7.7	3.29
3.38	1.7110	.0330	.0029	4.7	3.43
3.44	1.7331	.0361	.0031	2.8	3.57
3.50	1.7551	.0393	.0032	1.7	3.72
3.56	1.7703	.0415	.0023	1.0	3.86
3.62	1.7855	.0438	.0023	.6	3.95
3.68	1.8007	.0462	.0024	.3	3.96
3.75	1.8159	.0487	.0024	.2	3.91
3.81	1.8311	.0511	.0025	.1	3.83
3.87	1.8463	.0537	.0026	.0	3.75
3.93	1.8615	.0563	.0026	.0	3.69
3.99	1.8767	.0590	.0027	.0	3.67
4.05	1.8907	.0615	.0025	.0	3.66

HYDROGRAPH PEAK= 3.96 cfs
TIME TO PEAK= 3.68 Hours
RUNOFF VOLUME= 1.02 Acre-Feet

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CLIENT Valley Camp
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FEATURE C-5-18
PROJECT NO. 007.11-100

SHEET ___ OF ___
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DATE 5/18/89

C-5-18

Tributary Flow D-5A, D-5B

$Q_{5A} + Q_{5B} = (0.43 + 2.16)$ cfs

$Q_{TOT} = 2.59$ cfs

Check pipe characteristics

- 18" cast Iron
- $n = 0.014$
- $S = 3\%$

$Q_{allow} = \frac{1.49}{n} AR^{2/3} S^{1/2}$

$Q_{allow} = 16.89$ cfs ok

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

- HW depth = 2.3'

$\frac{HW}{D} = 1.5$ assume projecting entrance or type A

Select most limiting solution using either chart 5 or 7

Chart 5 ⇒ $Q_5 = 9.0$ cfs

Chart 7 ⇒ $Q_7 = 10.5$ cfs

$Q_{HW} = 9.0$ cfs

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

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FEATURE C-6-18
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-6-18

Tributary Flow (C-5-18) 2.59 cfs
(D-6) 0.82 cfs
Small Area - Negligable
3.41 cfs

Check pipe flow

- 18" CMP
- $n = 0.024$
- $S = 2.5\%$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 9.0$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

HW depth = 4.1 feet $\frac{HW}{D} = \frac{4.1}{1.5} = 2.7$

Use Chart 5 - Assume projecting entrance

$Q_{HW} = 13.0$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

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FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
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DATE 10/30/89

C-7-24

Tributary Areas Ditch D-7A $Q = 0.57$
D-7B $Q = 1.27$
$Q_{TOT} = 1.84$ cfs

Check pipe flow:

- 24" CMP
- $n = 0.024$
- $S = 5\%$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 27.4$ cfs >> Q_{TOT} ok

Pipe Flow not limiting

Check Inlet flow

- HW = 2.8'

$\frac{HW}{D} = 1.4$

Using Chart 5 - assume projecting Inlet

$Q_{HW} = 16.5$ cfs >> Q_{TOT} ok

Inlet Control not limiting

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FEATURE C-8-18
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
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DATE 5/18/89

C-8-18

Tributary Flows

D-8 = 1.17 cfs
D-9A, 9B = 0.07
Q_{TOT} = 1.24 cfs

Check Pipe Flow

- 18" CMP
- n = 0.024
- S = 4%

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

Q_{allow} = 11.4 cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

HW depth = 2.30

$\frac{HW}{D} = 1.5$

Use Chart 5
assume projecting entrance

Q_{HW} = 9.0 cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet Control not limiting

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SHEET 1 OF
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C-9-15

Tributary Ditches D-9A, D-9B } $Q_{TOT} = 0.07$ cfs

Check Pipe Flow

- 15" CMP
- $n = 0.024$
- $S = 0.001$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 1.1$ cfs $> Q_{TOT}$ ✓

Pipe flow not limiting

Check Inlet Control

- $HW = 1.25$

$\frac{HW}{D} = 1.0$

from Chart 5 - Projecting Inlet

$Q_{HW} = 3.5$ cfs $> Q_{TOT}$ ✓

Inlet Control not limiting

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PROJECT Permit
FEATURE C-10-18
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-10-18.

Tributary Area Ditch D-10

$Q_{TOT} = 1.18$ cfs

Check Pipe flow

- 18" CMP
- $n = 0.024$
- $S = 10\%$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 18.0$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

- HW depth = 2.3 feet

$\frac{HW}{D} = \frac{2.3}{1.5} = 1.5$ Use chart 5 - assume projecting entrance

$Q_{HW} = 9.0$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

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FEATURE C-11-12
PROJECT NO. 007.11.100

SHEET ___ OF ___
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DATE 5/18/89

C-11-12

Tributary Area = 940 * .000875 = 0.8 ac
disturbed = 840 * .000875 = 0.7 ac
paved = = 0.1 ac

CN	A	Q
90	0.7	0.72
98	0.1	1.33

$\overline{Q} = 0.80$ $\overline{CN} = 91.3$

P = 1.55 inches (10 yr, 6 hr)

hydraulic length = 300'

$slope = \frac{(1425)(5)(100)}{43,560(0.8)} = 20.4\%$

Calculated Runoff $Q_{TOT} = 0.64$ cfs

Check Pipe flow

- 12" CMP
- n = 0.024
- S = 8%

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 5.5$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

HW = 16.0 ft (Seems high - Use 1.0')

$\frac{HW}{D} = 1$

$Q_{HW} = 2.0$ cfs OK

Inlet Control not limiting

PROJECT : Valley Camp Coal - C-11-12 Runoff Calculation

AREA= .8 ACRES
AVERAGE BASIN SLOPE= 20.4 PERCENT
CURVE NUMBER= 91.3
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 300. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0198 HOURS QPCFS= 30.51 CFS QPIN=37.8167 INCHES
C3=186.3984 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.39	.1898	.0000	.0000	.0	.00
1.41	.1932	.0000	.0000	30.5	.00
1.43	.1966	.0000	.0000	9.9	.00
1.45	.1999	.0000	.0000	1.1	.00
1.47	.2033	.0002	.0000	.0	.00
2.38	.7878	.2301	.0140	.0	.58
2.40	.8105	.2443	.0143	.0	.59
2.42	.8332	.2588	.0145	.0	.60
2.44	.8559	.2735	.0147	.0	.61
2.46	.8786	.2885	.0149	.0	.62
2.47	.9013	.3036	.0152	.0	.63
2.49	.9240	.3190	.0154	.0	.64
2.51	.9345	.3262	.0072	.0	.39
2.53	.9407	.3304	.0042	.0	.22
2.55	.9468	.3346	.0042	.0	.18
2.57	.9529	.3388	.0042	.0	.18
2.59	.9591	.3431	.0043	.0	.18
2.61	.9652	.3473	.0043	.0	.18

HYDROGRAPH PEAK= .64 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .05 Acre-Feet

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FEATURE C-12-24
PROJECT NO. 007.11.100

SHEET ___ OF ___
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DATE 5/18/69

C-12-24

Tributary Area = D-12A, D-12B

$Q_{D-12A} + Q_{D-12B} = 0.19 + 0.74$

$Q_{TOT} = 0.93$ cfs

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 2\%$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 17.3$ cfs ok

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

HW depth = 4.0'

$\frac{HW}{D} = 2.0$ Use Chart 5 - Assume projecting entrance

$Q_{HW} = 22.0$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

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SHEET 1 OF
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DATE 6/30/89

C-13-24

Tributary Ditch D-13A $Q_{TOT} = 0.600$ cfs

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 30\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 67.1$ cfs >> Q_{TOT} ok

Pipe Flow Not Limiting

Check Inlet Conditions

- HW = 3.0'

$\frac{HW}{D} = 1.5$

From Chart 5-
Assume projecting Inlet

$Q_{HW} = 18$ cfs >> Q_{TOT} ok

Inlet Control Not Limiting

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PROJECT Permit
FEATURE C-14-42
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/18/89

C-14-42 (Permanent structure)

Tributary Area = 173 * 1.401 = 242 Acres
90% Cover Oak/Aspen = 123 ac
25% Cover Sage/Grass = 119 ac

Ground cover taken by assuming that all North facing, and south facing slopes are characteristic.
North facing - 90% oak/Aspen CN = 40
South facing - 25% Sage/Grass CN = 75

CN	A	Q
40	123	0.04
75	119	0.51

$\bar{Q} = 0.27$ $\bar{CN} = 67.5$

Precipitation = 2.25" (100yr, 6hr)

hydraulic length = 5000 feet

$$\text{slope} = \frac{(10{,}000)(400)(100)}{43{,}560\ (242)} = 37.9\%$$

Calculated Run-Off $Q_{TOT} = 21.88$ cfs

Check Pipe Flow

- D = 42"
- n = 0.024
- S = 3% min

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 94.4$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting

Check Inlet Control

HW depth = 6.5' $\frac{HW}{D} = 1.86$ assume proj entrance

from Chart 5

$Q_{HW} = 90.0$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet Control not limiting

PROJECT : Valley Camp Coal - C-14-42 Runoff Calculation

AREA= 242.0 ACRES
AVERAGE BASIN SLOPE= 37.9 PERCENT
CURVE NUMBER= 67.5
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 5000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .2965 HOURS QPCFS= 617.23 CFS QPIN= 2.5294 INCHES
C3= 12.4672 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.25	.9395	.0000	.0000	.0	.00
2.31	1.0382	.0012	.0012	31.0	.04
2.37	1.1370	.0061	.0049	191.7	.37
2.43	1.2357	.0146	.0086	409.8	1.68
2.49	1.3345	.0266	.0120	566.6	4.68
2.55	1.3725	.0321	.0055	617.2	9.47
2.61	1.3992	.0362	.0041	578.2	14.64
2.67	1.4259	.0406	.0044	488.0	18.65
2.73	1.4525	.0452	.0046	381.7	20.97
2.79	1.4792	.0500	.0048	281.7	21.85
2.85	1.5059	.0550	.0050	198.5	21.88
2.91	1.5326	.0603	.0052	134.8	21.58
2.97	1.5593	.0657	.0055	88.8	21.27
3.02	1.5838	.0709	.0052	57.0	21.11
3.08	1.6051	.0756	.0047	35.8	21.08
3.14	1.6265	.0804	.0048	22.0	21.04
3.20	1.6478	.0853	.0049	13.4	20.92
3.26	1.6692	.0903	.0050	8.0	20.76
3.32	1.6905	.0955	.0052	4.7	20.63
3.38	1.7119	.1008	.0053	2.7	20.58
3.44	1.7332	.1062	.0054	1.6	20.65
3.50	1.7546	.1118	.0055	.9	20.82
3.56	1.7694	.1157	.0039	.5	21.03
3.62	1.7841	.1196	.0039	.3	21.03
3.68	1.7987	.1236	.0040	.2	20.68
3.74	1.8134	.1277	.0040	.0	20.07

HYDROGRAPH PEAK= 21.88 cfs
TIME TO PEAK= 2.85 Hours
RUNOFF VOLUME= 5.46 Acre-Feet

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FEATURE C-15-24
PROJECT NO. 007.11.100

SHEET ___ OF ___
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DATE 5/18/89

C-15-24

Tributary Flow = D-15

$Q_{TOT} = 1.57$ cfs

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 5\%$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 27.4$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

- HW depth = 3.2'

$\frac{HW}{D} = 1.6$

Use Chart 5 Assume projecting entrance

$Q_{HW} = 18.5$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet Control not limiting

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FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 10/30/89

C-16-24

Tributary Culvert C-15-24 $Q_{TOT} = 1.57$ cfs

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 10\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 38.7$ cfs >> Q_{TOT} ok

Pipe Flow not limiting

Check Inlet Conditions

- HW = 1.0'

$\frac{HW}{D} = 0.5$

From Chart 5
Assuming projecting Inlet

$Q_{HW} = 3.8$ cfs > Q_{TOT} ok

Inlet Conditions not limiting

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SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 6/30/89

C-17-21 & C-18-21

Tributary Ditches D18A, D18B } $Q_{TOT} = 0.59 + 0.47 = 1.06$ cfs

Check Pipe Flow

- 21" CMP
- $n = 0.024$
- $S = 1\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 8.6$ cfs $> Q_{TOT}$ ok

Pipe Flow not limiting

Check Inlet Conditions

- $HW = 1.75'$

$\frac{HW}{D} = 1.0$

From Chart 5
Assume projecting Inlet

$Q_{HW} = 8$ cfs $> Q_{TOT}$ ok

Inlet Conditions not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-20-48, C-19-48
PROJECT NO. 007.11.100

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

C-20-48, C-19-48

Total Area = 1060 * 1.401 = 1485 acres
90% cover Oak/Aspen = 761 acres
25% cover sage/grass = 724 acres

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 16,600 feet

$$\text{slope} = \frac{(63,500)(400)(100)}{43,560\,(1485)} = 39.3\%$$

CN	Area	Q
40	761	0.155
75	724	0.185
		$\bar{Q} = 0.17$

$\bar{CN}_{10} = 74.26$

Calculated Run-off $Q_{TOT_{10yr}} = 77.0$ cfs

NOT APPLICABLE

For a 100 year, 6 hr

$P_{100} = 2.25$ inches

CN	A	Q
40	761	0.039
75	724	0.510
		$\bar{Q} = 0.266$

$\bar{CN}_{100} = 67.4$

Calculated Run-off $Q_{TOT_{100yr}} = 118.8$ cfs

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-19-48
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/18/89

C-19-48

Culvert Analysis

$S = 6\%$
$n = 0.024$
48" CMP

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 190.6 cfs$ OK

Since $Q_{allow} > Q_{TOT}$ pipe flow not limiting

check Inlet Control

HW depth = 8.5'

$\frac{HW}{D} = \frac{8.5'}{4} = 2.1$

assume projecting entrance using chart 5

$Q_{HW} = 130$ cfs OK

since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

C-20-48

Culvert Analysis

$S = 4\%$
$n = 0.024$
48" CMP

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 155.6$ cfs OK

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting

Check Inlet Control

HW depth = 9.0'

$\frac{HW}{D} = 2.25$

assume projecting entrance using chart 5

$Q_{HW} = 140$ cfs OK

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

PROJECT : Valley Camp Coal - C-19-48, C-20-48 Runoff Calculation

10 yr, 6hr

AREA= 1485.0 ACRES
AVERAGE BASIN SLOPE= 39.3 PERCENT
CURVE NUMBER= 74.3
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 16600. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .6315 HOURS QPCFS= 1778.42 CFS QPIN= 1.1877 INCHES
C3= 5.8539 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.27	.6700	.0000	.0000	.0	.00
2.40	.8149	.0042	.0042	89.2	.38
2.53	.9380	.0164	.0121	552.4	3.42
2.65	.9772	.0218	.0054	1180.6	12.18
2.78	1.0163	.0278	.0061	1632.6	24.75
2.90	1.0555	.0346	.0068	1778.4	37.66
3.03	1.0927	.0416	.0070	1665.9	48.97
3.16	1.1240	.0480	.0064	1406.2	58.13
3.28	1.1554	.0548	.0068	1099.9	64.99
3.41	1.1867	.0619	.0072	811.6	69.92
3.54	1.2152	.0688	.0068	572.0	73.50
3.66	1.2367	.0742	.0054	388.5	75.99
3.79	1.2583	.0797	.0055	255.8	77.04
3.92	1.2798	.0854	.0057	164.2	76.67
4.04	1.3007	.0911	.0057	103.1	75.38
4.17	1.3203	.0966	.0055	63.5	73.72
4.29	1.3398	.1023	.0056	38.5	72.03
4.42	1.3594	.1080	.0058	23.0	70.53
4.55	1.3775	.1135	.0054	13.6	69.36
4.67	1.3932	.1183	.0048	7.9	68.38
4.80	1.4089	.1231	.0049	4.6	67.25
4.93	1.4245	.1281	.0050	2.6	65.84
5.05	1.4402	.1331	.0050	1.5	64.33
5.18	1.4558	.1382	.0051	.8	62.96
5.30	1.4715	.1434	.0052	.5	61.90
5.43	1.4872	.1487	.0053	.3	61.25
5.56	1.5019	.1537	.0050	.1	60.95
5.68	1.5156	.1585	.0047	.0	60.82

HYDROGRAPH PEAK= 77.04 cfs
TIME TO PEAK= 3.79 Hours
RUNOFF VOLUME= 20.80 Acre-Feet

PROJECT : Valley Camp Coal - C-19-48, C-20-48 Runoff Calculation

100 Yr, 6hr

AREA= 1485.0 ACRES
AVERAGE BASIN SLOPE= 39.3 PERCENT
CURVE NUMBER= 67.4
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 16600. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .7625 HOURS QPCFS= 1472.91 CFS QPIN= .9836 INCHES
C3= 4.8483 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.13	.7421	.0000	.0000	.0	.00
2.29	.9960	.0002	.0002	73.9	.01
2.44	1.2499	.0156	.0154	457.5	1.22
2.59	1.3916	.0342	.0186	977.8	8.60
2.74	1.4602	.0456	.0114	1352.1	24.66
2.90	1.5288	.0584	.0128	1472.9	45.45
3.05	1.5929	.0716	.0133	1379.7	66.08
3.20	1.6478	.0839	.0123	1164.6	83.77
3.35	1.7027	.0970	.0131	910.9	97.42
3.51	1.7568	.1108	.0137	672.2	107.35
3.66	1.7946	.1208	.0100	473.7	114.31
3.81	1.8323	.1312	.0104	321.7	118.05
3.96	1.8700	.1420	.0108	211.9	118.76
4.12	1.9051	.1523	.0103	136.0	117.40
4.27	1.9394	.1627	.0104	85.4	114.95
4.42	1.9738	.1733	.0107	52.6	112.21
4.57	2.0047	.1832	.0099	31.9	109.68
4.73	2.0322	.1921	.0089	19.0	107.33
4.88	2.0596	.2012	.0091	11.2	104.80
5.03	2.0871	.2105	.0093	6.5	102.06
5.18	2.1145	.2199	.0094	3.8	99.38
5.34	2.1419	.2295	.0096	2.2	97.12
5.49	2.1694	.2393	.0098	1.2	95.49
5.64	2.1936	.2480	.0088	.7	94.49
5.79	2.2177	.2568	.0088	.4	93.68
5.95	2.2417	.2657	.0089	.2	92.75
6.10	2.2417	.2657	.0000	.1	91.06
6.25	2.2417	.2657	.0000	.0	85.97

HYDROGRAPH PEAK= 118.76 cfs
TIME TO PEAK= 3.96 Hours
RUNOFF VOLUME= 32.88 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT PERMIT
FEATURE C-21-48
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED DEH
CHECKED ___
DATE 12/14/89

C-21-48 PERMANENT STRUCTURE

FLOW TRIBUTARY

TOTAL AREA = 1479 * 1.401 = 2072 ac
90% OAK ASPEN 645 904
25% SAGE GRASS 834 1168

ASSUMING THAT NORTH & SOUTH FACING SLOPES ARE CHARACTERISTICALLY:

NORTH FACING 90% COVER OAK/ASPEN (CN = 70)
SOUTH FACING 25% COVER SAGE/GRASS (CN = 75)

CN	A	Q
70	904	0.10
75	1168	0.19
		$\bar{Q} = 0.15$

$\bar{CN} = 73$

PRECIPITATION = 1.55 inches (10 YR, 6 HR)

HYD. LENGTH = 12,000 ft

SLOPE = $\frac{(78{,}000)(400)(100)}{43{,}560\ (2072)} = 34.6\%$ $Q = 92.6$ cfs

CHECK PIPE FLOW

- D = 48"
- $\eta = 0.024$
- $S = 1\%$

$Q = \frac{1.49}{\eta} AR^{2/3} S^{1/2} = 77.81$ cfs < 92.6 - Add Avail Head (33'-4 = 29' Available)

$S_f = \frac{29 + 0.01(250)}{250} = 0.126$

$Q = \frac{1.49}{\eta} AR^{2/3} (.126)^{1/2} = 276$ cfs >> 92.6 ✓

CHECK INLET FLOW (USING "HYDRAULICS CHARTS FOR THE SELECTION OF HIGHWAY CULVERTS")

PIPE LENGTH = 250 ft
HW DEPTH = 33 ft HW/D = 8.25 HW/D = 6.0 (Max Shown on Chart)

$Q = 215$ cfs - ✓
for HW/D = 6.0

PIPE IS ADEQUATE

PROJECT : Valley Camp Coal - C-21-52 Runoff Calculation

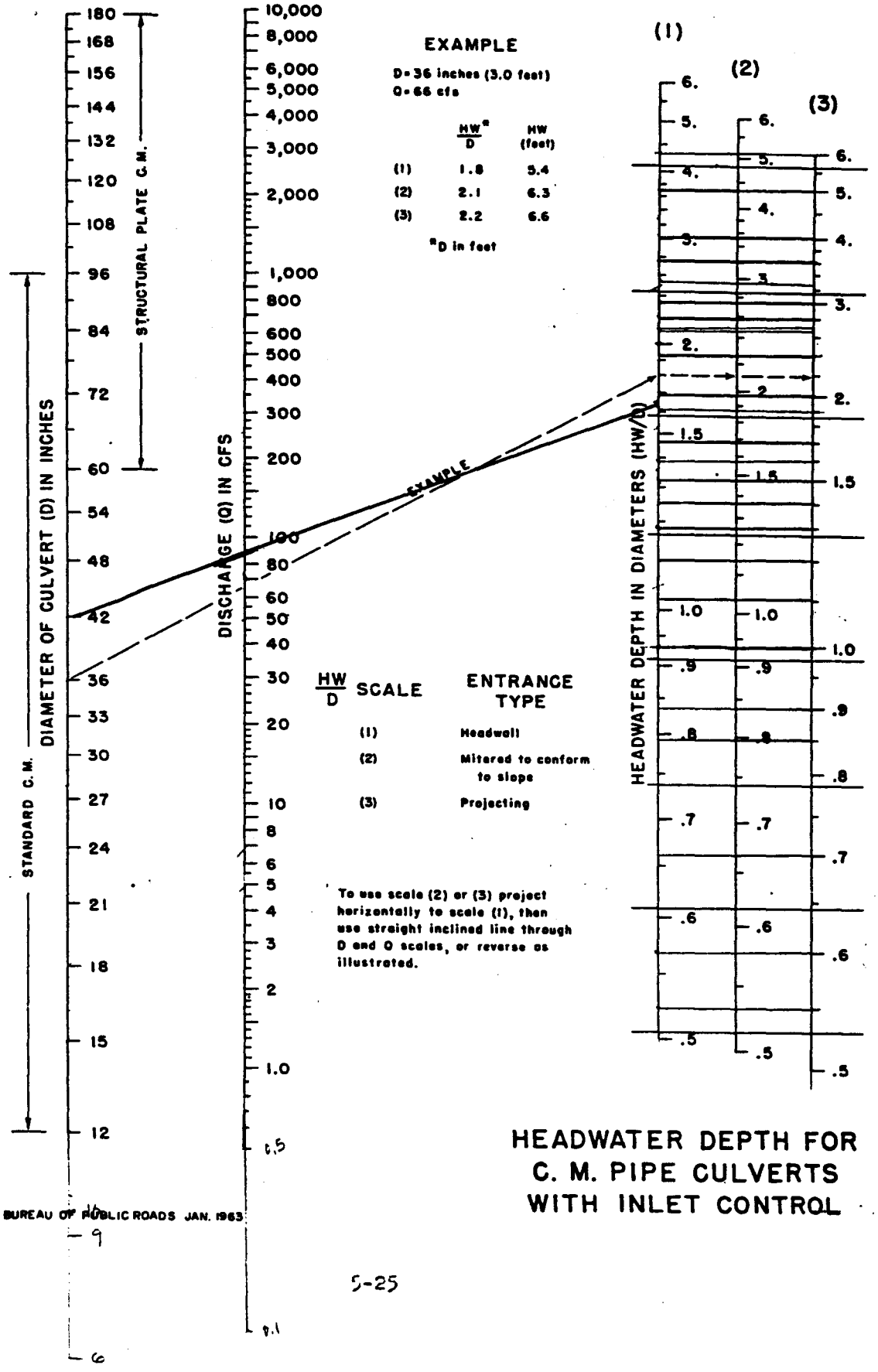
AREA= 2072.0 ACRES
AVERAGE BASIN SLOPE= 34.6 PERCENT
CURVE NUMBER= 73.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 12000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .5385 HOURS QPCFS= 2909.81 CFS QPIN= 1.3927 INCHES
C3= 6.8646 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.26	.6567	.0000	.0000	.0	.00
2.37	.7802	.0004	.0004	146.0	.06
2.48	.9038	.0070	.0065	903.8	1.35
2.58	.9563	.0120	.0050	1931.7	7.48
2.69	.9897	.0158	.0038	2671.2	18.87
2.80	1.0231	.0202	.0043	2909.8	32.51
2.91	1.0565	.0250	.0048	2725.7	45.63
3.02	1.0889	.0301	.0051	2300.8	57.15
3.12	1.1156	.0347	.0046	1799.6	66.87
3.23	1.1423	.0395	.0048	1327.9	74.59
3.34	1.1690	.0446	.0051	935.9	80.44
3.45	1.1957	.0500	.0054	635.6	84.97
3.55	1.2182	.0548	.0048	418.6	88.70
3.66	1.2366	.0588	.0040	268.7	91.43
3.77	1.2550	.0630	.0042	168.7	92.56
3.88	1.2733	.0673	.0043	103.9	92.13
3.98	1.2917	.0717	.0044	63.0	90.73
4.09	1.3086	.0758	.0042	37.6	89.06
4.20	1.3253	.0800	.0042	22.2	87.45
4.31	1.3420	.0843	.0043	12.9	86.02
4.42	1.3587	.0887	.0044	7.5	84.91
4.52	1.3747	.0930	.0043	4.3	84.21
4.63	1.3880	.0967	.0037	2.4	83.75
4.74	1.4014	.1004	.0037	1.4	83.00
4.85	1.4147	.1042	.0038	.8	81.73
4.95	1.4281	.1080	.0038	.4	80.14
5.06	1.4414	.1119	.0039	.2	78.58
5.17	1.4548	.1158	.0039	.1	77.31
5.28	1.4681	.1199	.0040	.0	76.47

HYDROGRAPH PEAK= 92.56 cfs
TIME TO PEAK= 3.77 Hours
RUNOFF VOLUME= 24.68 Acre-Feet

CHART 5



HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-22-24
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED paul
CHECKED ___
DATE 5/19/89

C-22-24 (Permanent Structure)

Tributary Area = 16 * 1.401 = 22 Acres
90% Cover Oak/Aspen CN = 70 = 20 ac
25% Cover Sage/grass CN = 75 = 2 ac

CN	A	Q
70	20	0.10
75	2	0.19
		$\bar{Q}$ = 0.10

$\bar{CN}$ = 70.5

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 2,500 ft

$$\text{slope} = \frac{(6000)(80)(100)}{43{,}560\ (22)} = 50\%$$

Calculated Run-Off = Q_{TOT} = 0.79 cfs

Check Pipe Flow

- 24" CMP
- n = 0.024
- S = 5.7%

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

Q_{allow} = 29.3 cfs ok

Pipe flow not limiting

Check Inlet Control

- HW depth = 2.8'

$\frac{HW}{D}$ = 1.4 Use Chart 5 - assume proj. entrance

Q_{HW} = 17.0 cfs ok

Inlet control not limiting

PROJECT : Valley Camp Coal - C-22-24 Runoff Calculation

AREA= 22.0 ACRES
AVERAGE BASIN SLOPE= 50.0 PERCENT
CURVE NUMBER= 70.5
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1368 HOURS QPCFS= 121.60 CFS QPIN= 5.4813 INCHES
C3= 27.0175 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.41	.8246	.0000	.0000	.0	.00
2.44	.8560	.0000	.0000	6.1	.00
2.46	.8874	.0006	.0005	37.8	.00
2.49	.9187	.0016	.0010	80.7	.03
2.52	.9354	.0023	.0007	111.6	.09
2.54	.9439	.0027	.0004	121.6	.18
2.57	.9524	.0031	.0004	113.9	.25
2.60	.9609	.0036	.0005	96.1	.31
2.63	.9694	.0041	.0005	75.2	.35
2.65	.9779	.0046	.0005	55.5	.37
2.68	.9863	.0052	.0006	39.1	.39
2.71	.9948	.0057	.0006	26.6	.40
2.74	1.0033	.0064	.0006	17.5	.41
2.76	1.0118	.0070	.0007	11.2	.42
2.79	1.0203	.0077	.0007	7.0	.44
2.82	1.0288	.0084	.0007	4.3	.46
2.85	1.0372	.0092	.0007	2.6	.48
2.87	1.0457	.0099	.0008	1.6	.50
2.90	1.0542	.0107	.0008	.9	.52
2.93	1.0627	.0116	.0008	.5	.55
2.96	1.0712	.0124	.0009	.3	.57
2.98	1.0797	.0133	.0009	.2	.59
3.01	1.0875	.0142	.0009	.1	.62
3.04	1.0943	.0149	.0008	.0	.64
3.37	1.1757	.0254	.0010	.0	.71
3.39	1.1825	.0264	.0010	.0	.73
3.42	1.1893	.0274	.0010	.0	.74
3.43	1.1961	.0284	.0010	.0	.75
3.48	1.2029	.0294	.0010	.0	.77
3.50	1.2095	.0305	.0010	.0	.78
3.53	1.2141	.0312	.0007	.0	.79
3.56	1.2188	.0319	.0007	.0	.79
3.58	1.2235	.0327	.0008	.0	.78
3.61	1.2281	.0335	.0008	.0	.75

PROJECT : Valley Camp Coal - C-22-24 Runoff Calculation
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.64	1.2328	.0342	.0008	.0	.72
3.67	1.2375	.0350	.0008	.0	.70
3.69	1.2421	.0358	.0008	.0	.67

HYDROGRAPH PEAK= .79 cfs
TIME TO PEAK= 3.53 Hours
RUNOFF VOLUME= .19 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-23-24
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED ___
CHECKED ___
DATE ___

C-23-24 (Permanent Structure)

Total Area = 16 + 1.401 = 22 acres
90% Cover Oak/Aspen (CN=70) = 20
25% Cover Sage/grass (CN=75) = 2

CN	A	C
70	20	0.10
75	2	0.19

$\bar{C} = 0.10$ $\bar{CN} = 70.5$

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 2,500 ft

$$\text{slope} = \frac{(6{,}000)(80)(100)}{43{,}560\ (22)} = 50\%$$

Calculated Runoff: $Q_{TOT} = 0.79$ cfs

Check Pipe Flow

- 24" CMP
- n = 0.024
- S = 8%

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 34.66$ cfs OK

Pipe flow not limiting

Check Inlet Control

HW depth = 3.5'

$\frac{HW}{D} = 1.75$

Use Chart 5 - assume projecting entrance

$Q_{HW} = 20.0$ cfs OK

Inlet control not limiting

PROJECT : Valley Camp Coal - C-23-24 Runoff Calculation

AREA= 22.0 ACRES
AVERAGE BASIN SLOPE= 50.0 PERCENT
CURVE NUMBER= 70.5
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1368 HOURS QPCFS= 121.60 CFS QPIN= 5.4813 INCHES
C3= 27.0175 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.41	.8246	.0000	.0000	.0	.00
2.44	.8560	.0000	.0000	6.1	.00
2.46	.8874	.0006	.0005	37.8	.00
2.49	.9187	.0016	.0010	80.7	.03
2.52	.9354	.0023	.0007	111.6	.09
2.54	.9439	.0027	.0004	121.6	.18
2.57	.9524	.0031	.0004	113.9	.25
2.60	.9609	.0036	.0005	96.1	.31
2.63	.9694	.0041	.0005	75.2	.35
2.65	.9779	.0046	.0005	55.5	.37
2.68	.9863	.0052	.0006	39.1	.39
2.71	.9948	.0057	.0006	26.6	.40
2.74	1.0033	.0064	.0006	17.5	.41
2.76	1.0118	.0070	.0007	11.2	.42
2.79	1.0203	.0077	.0007	7.0	.44
2.82	1.0288	.0084	.0007	4.3	.46
2.85	1.0372	.0092	.0007	2.6	.48
2.87	1.0457	.0099	.0008	1.6	.50
2.90	1.0542	.0107	.0008	.9	.52
2.93	1.0627	.0116	.0008	.5	.55
2.96	1.0712	.0124	.0009	.3	.57
2.98	1.0797	.0133	.0009	.2	.59
3.01	1.0875	.0142	.0009	.1	.62
3.04	1.0943	.0149	.0008	.0	.64
3.37	1.1757	.0254	.0010	.0	.71
3.39	1.1825	.0264	.0010	.0	.73
3.42	1.1893	.0274	.0010	.0	.74
3.45	1.1961	.0284	.0010	.0	.75
3.48	1.2029	.0294	.0010	.0	.77
3.50	1.2085	.0305	.0010	.0	.78
3.53	1.2141	.0312	.0007	.0	.79
3.56	1.2198	.0319	.0007	.0	.79
3.58	1.2255	.0327	.0008	.0	.79
3.61	1.2281	.0335	.0008	.0	.75

PROJECT : Valley Camp Coal - C-23-24 Runoff Calculation
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.64	1.2328	.0342	.0008	.0	.72
3.67	1.2375	.0350	.0008	.0	.70
3.69	1.2421	.0358	.0008	.0	.67

HYDROGRAPH PEAK= .79 cfs
TIME TO PEAK= 3.53 Hours
RUNOFF VOLUME= .19 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-24-24
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/19/89

C-24-24 (Permanent Structure)

Tributary Area = 9*1.401 = 20 acres

CN = 75 (25% Cover Sage/Grass)

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 2000 ft

$$\text{slope} = \frac{(4000)(80)(100)}{43{,}560\,(20)} = 44.1\%$$

Calculated Run-off: $Q_{TOT} \sim 2.04$ cfs

Check Pipe Flow

- 24" CMP
- n = 0.024
- S = 12%

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 42.45$ cfs OK

Pipe Flow not limiting

Check Inlet Control

- HW depth = 4.2'

$\frac{HW}{D} = 2.1$ Use Chart 5 assume projecting entrance

$Q_{HW} = 22.0$ cfs OK

Inlet control not limiting

PROJECT : Valley Camp Coal - C-24-34 Runoff Calculation

AREA= 20.0 ACRES
AVERAGE BASIN SLOPE= 44.1 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1075 HOURS QPCFS= 140.71 CFS QPIN= 6.9769 INCHES
C3= 34.3891 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.26	.6517	.0000	.0000	.0	.00
2.28	.6764	.0000	.0000	7.1	.00
2.30	.7010	.0004	.0003	43.7	.00
2.32	.7257	.0010	.0007	93.4	.02
2.34	.7503	.0020	.0010	129.2	.07
2.36	.7750	.0034	.0014	140.7	.16
2.39	.7997	.0051	.0017	131.8	.30
2.41	.8243	.0071	.0020	111.3	.49
2.43	.8490	.0095	.0023	87.0	.71
2.45	.8736	.0121	.0026	64.2	.96
2.47	.8983	.0150	.0030	45.3	1.23
2.49	.9230	.0183	.0032	30.7	1.51
2.52	.9348	.0200	.0017	20.2	1.78
2.54	.9414	.0209	.0010	13.0	1.98
2.56	.9481	.0219	.0010	8.2	2.04
2.58	.9548	.0229	.0010	5.0	1.98
2.60	.9614	.0239	.0010	3.0	1.83
2.62	.9681	.0250	.0010	1.8	1.65
2.64	.9747	.0261	.0011	1.1	1.48
2.67	.9814	.0272	.0011	.6	1.33
2.69	.9881	.0283	.0011	.4	1.22
2.71	.9947	.0294	.0011	.2	1.15
2.73	1.0014	.0305	.0012	.1	1.10
2.75	1.0081	.0317	.0012	.0	1.07

HYDROGRAPH PEAK= 2.04 cfs
TIME TO PEAK= 2.56 Hours
RUNOFF VOLUME= .31 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-25-36
PROJECT NO. 007-11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/19/89

C-25-36 (Permanent Structure)

Tributary Area = 108 * 1.401 = 151 acres
90% Cover Oak/Aspen (CN=70) = 78
25% Cover Sage/Grass (CN=75) = 73

CN	A	Q
70	78	0.10
75	73	0.19

$\bar{Q} = 0.14$, $\overline{CN} = 72.7$

Precipitation = 1.55 inches (10 yr, 6 hr)

hydraulic length = 5,500 feet

$$\text{slope} = \frac{(6{,}500)(400)(100)}{43{,}560\ (151)} = 39.5\%$$

Calculated Run-Off: $Q_{TOT} = 17.0$ cfs

Check Pipe Flow

- 36" CMP
- n = 0.024
- S = 12%

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 125.15$ cfs OK

Pipe Flow not limiting

Check Inlet Control

- HW depth = 22'

$\frac{HW}{D} = 7.33$

Use Chart 5 - assume projecting entrance

Extrapolation yields a flow of 130 cfs

Inlet control not limiting

PROJECT : Valley Camp Coal - C-25-36 Runoff Calculation

AREA= 151.0 ACRES
AVERAGE BASIN SLOPE= 39.5 PERCENT
CURVE NUMBER= 72.7
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 5000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .2523 HOURS QPCFS= 452.63 CFS QPIN= 2.9727 INCHES
C3= 14.6524 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.32	.7247	.0000	.0000	.0	.00
2.37	.7826	.0003	.0003	22.7	.00
2.42	.8405	.0021	.0018	140.6	.08
2.47	.8984	.0056	.0035	300.5	.41
2.52	.9371	.0088	.0032	415.5	1.22
2.57	.9527	.0103	.0015	452.6	2.41
2.62	.9684	.0119	.0016	424.0	3.60
2.67	.9840	.0136	.0017	357.9	4.49
2.72	.9997	.0154	.0018	279.9	5.05
2.78	1.0153	.0174	.0019	206.6	5.34
2.83	1.0309	.0194	.0020	145.6	5.49
2.88	1.0466	.0216	.0021	98.9	5.59
2.93	1.0622	.0238	.0023	65.1	5.69
2.98	1.0779	.0262	.0024	41.8	5.83
3.03	1.0918	.0284	.0022	26.2	6.01
3.08	1.1043	.0304	.0020	16.2	6.18
3.13	1.1168	.0325	.0021	9.8	6.31
3.18	1.1294	.0346	.0022	5.9	6.38
3.23	1.1419	.0368	.0022	3.5	6.42
3.28	1.1544	.0391	.0023	2.0	6.44
3.33	1.1669	.0415	.0023	1.2	6.48
3.38	1.1794	.0439	.0024	.7	6.55
3.43	1.1919	.0463	.0025	.4	6.64
3.48	1.2044	.0488	.0025	.2	6.76
3.53	1.2145	.0509	.0021	.1	6.88
3.58	1.2231	.0527	.0018	.0	6.96
3.63	1.2317	.0545	.0018	.0	6.92
3.68	1.2403	.0564	.0019	.0	6.77
3.73	1.2489	.0583	.0019	.0	6.56
3.78	1.2575	.0602	.0019	.0	6.34
3.83	1.2661	.0621	.0019	.0	6.16
3.89	1.2747	.0641	.0020	.0	6.02

HYDROGRAPH PEAK= 6.96 cfs
TIME TO PEAK= 3.58 Hours
RUNOFF VOLUME= 1.74 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-26-24
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/19/89

C-26-24 (Permanent Structure)

Tributary Area = 10. * 1.401 = 14 Acres

CN = 75 (25% Sagi/Gran)

Precipitation = 1.55 inches (10 yr, 6hr)

hydraulic length = 2,000 feet

$$\text{slope} = \frac{(4{,}000)(80)(100)}{43{,}560\,(14)} = 52.5\%$$

Calculated Run-Off: $Q_{10} = 1.48$ cfs

Check Pipe Flow

- 24" CMP
- n = 0.024
- S = 18%

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 51.99$ cfs OK

Pipe Flow not limiting

Check Inlet control

- HW depth = 4.0

$\frac{HW}{D} = 2.0$ Use Chart 5 assume projecting entrance

$Q_{HW} = 22.0$ cfs OK

Inlet control not limiting

PROJECT : Valley Camp Coal - C-26-24 Runoff Calculation

AREA= 14.0 ACRES
AVERAGE BASIN SLOPE= 52.5 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0985 HOURS QPCFS= 107.47 CFS QPIN= 7.6124 INCHES
C3= 37.5215 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.27	.6616	.0000	.0000	.0	.00
2.29	.6842	.0000	.0000	5.4	.00
2.31	.7068	.0005	.0004	33.4	.00
2.33	.7294	.0012	.0007	71.3	.02
2.34	.7520	.0021	.0010	98.7	.06
2.36	.7746	.0034	.0013	107.5	.14
2.38	.7972	.0049	.0015	100.7	.24
2.40	.8198	.0067	.0018	85.0	.37
2.42	.8424	.0088	.0021	66.5	.52
2.44	.8650	.0111	.0023	49.0	.68
2.46	.8876	.0137	.0026	34.6	.86
2.48	.9102	.0166	.0028	23.5	1.04
2.50	.9307	.0194	.0028	15.5	1.23
2.52	.9369	.0203	.0009	9.9	1.39
2.54	.9430	.0211	.0009	6.2	1.48
2.56	.9491	.0221	.0009	3.8	1.47
2.58	.9552	.0230	.0009	2.3	1.38
2.60	.9613	.0239	.0009	1.4	1.25
2.62	.9674	.0249	.0010	.8	1.12
2.64	.9735	.0259	.0010	.5	1.00
2.66	.9796	.0269	.0010	.3	.90
2.68	.9857	.0279	.0010	.2	.83
2.70	.9918	.0289	.0010	.0	.78

HYDROGRAPH PEAK= 1.48 cfs
TIME TO PEAK= 2.54 Hours
RUNOFF VOLUME= .22 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit 1
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 10/30/89

C-27-24.

Tributary Area: Ditch UDD-2 Q = 0.57cfs (See HA&L, 1989 Sed. Pond Report)

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 43\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 80.16$ cfs ✓

Pipe flow not limiting

Check Inlet Control

- HW depth = 4.5'

$\frac{HW}{D} = 2.25$ Use Chart 5

Assume Projecting entrance

$Q_{HW} = 24$ cfs ✓

Inlet Control not limiting

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE
PROJECT NO. 007.11.100

SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 6/30/89

C-28-24

Tributary Area : UDD-2 : 14.7ac ← from 1989 HA&L
Tributary Area 20.3ac Report on Sed. Ponds
35.0 ac

CN	A	Q
75	33.6	0.19
70	1.4	0.10
	35.0	

$\bar{Q} = 0.18$ $\bar{CN} = \underline{74.8}$

Slope from Tributary Area = $\frac{6800(80)100}{43560(20.3)} = 61.5\%$

Avg. Slope = $\frac{61.5(20.3) + 37(14.7)}{35} = \underline{51.2\%}$

Precipitation = 1.55 inches (10yr, 6hr)

Hydraulic Length = 2350 feet

Calculated Runoff $Q_{TOT} = \underline{3.3\ cfs}$

Check Pipe Flow

- 24" CMP
- $n = 0.024$
- $S = 30\%$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = \underline{67.12\ cfs}$ ✓

Pipe Flow not limiting

Check Inlet Control

- HW depth = 8.5'

Use Chart 5 - Assume Projecting Inlet

$\frac{HW}{D} = 4.25$

$Q_{HW} = 35.0\ cfs$

Inlet control not limiting

PROJECT : Valley Camp Coal - C-28-24 Runoff Calculation

AREA= 35.0 ACRES
AVERAGE BASIN SLOPE= 51.2 PERCENT
CURVE NUMBER= 74.8
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2350. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1142 HOURS QPCFS= 231.87 CFS QPIN= 6.5699 INCHES
C3= 32.3828 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.26	.6550	.0000	.0000	.0	.00
2.28	.6812	.0000	.0000	11.6	.00
2.31	.7074	.0003	.0003	72.0	.00
2.33	.7336	.0010	.0007	153.9	.03
2.35	.7597	.0021	.0011	212.9	.12
2.37	.7859	.0036	.0015	231.9	.28
2.40	.8121	.0055	.0018	217.2	.52
2.42	.8383	.0077	.0022	183.3	.85
2.44	.8645	.0102	.0026	143.4	1.25
2.47	.8907	.0131	.0029	105.8	1.71
2.49	.9169	.0164	.0032	74.6	2.19
2.51	.9335	.0186	.0022	50.6	2.69
2.53	.9406	.0196	.0010	33.4	3.09
2.56	.9477	.0206	.0010	21.4	3.30
2.58	.9548	.0216	.0010	13.4	3.27
2.60	.9618	.0227	.0011	8.3	3.07
2.63	.9689	.0238	.0011	5.0	2.80
2.65	.9760	.0249	.0011	3.0	2.52
2.67	.9831	.0260	.0011	1.8	2.28
2.69	.9901	.0272	.0012	1.0	2.10
2.72	.9972	.0283	.0012	.6	1.97
2.74	1.0043	.0295	.0012	.3	1.88
2.76	1.0114	.0307	.0012	.2	1.84
2.79	1.0185	.0320	.0012	.1	1.82
2.81	1.0255	.0333	.0013	.0	1.82

HYDROGRAPH PEAK= 3.30 cfs
TIME TO PEAK= 2.56 Hours
RUNOFF VOLUME= .53 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-29-16
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Pan 1
CHECKED ___
DATE 5/9/89

C-29-16

Tributary Flow D-29A, D-29B

$Q_{TOT} = 1.14$ cfs

Check Pipe Flow

- 16" cast iron
- $n = 0.014$
- $S = 5\%$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 15.9$ cfs

Since $Q_{allow} > Q_{TOT}$ Culvert is acceptable OK

Check Inlet Control

HW depth = 16" $\frac{HW}{D} = 1$

Evaluate inlet based on 2 know charts from "Hydraulic Charts for the selection of Highway Culverts".

Chart 7 - assume type A $\Rightarrow Q_{HW_7} = 5$ cfs

Chart 5 - assume proj. entrance $Q_{HW_5} = 4.2$ cfs ←

Select lower value

Since $Q_{HW_5} > Q_{TOT}$ Inlet control not limiting OK

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE Culvert Calculations
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED paul
CHECKED
DATE 5/9/89

C-30-24

Receiver flow from D-30

flow D-30 = 4.5 cfs = Q_{TOT}

Check Pipe Characteristics

- 24" CMP
- $n = 0.024$
- $S = 4\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 24.5$ cfs

since $Q_{allow} > Q_{TOT}$ Culvert is Acceptable

Check Inlet Control

HW depth = 48" $\frac{HW}{D} = 2$

assume projecting entrance - Based on Chart 5 of Federal Highway Administration

$Q_{HW_5} = 21.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ inlet control does not limit

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-31-18
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/9/89

C-31-18

Tributary Flow - D-31 1.48 cfs

Check Pipe Flow

- 18" CMP
- $n = 0.024$
- $S' = 18\%$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 24.14$ cfs

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting OK

Check Inlet Control

- HW depth = 21.6" $\frac{HW}{D} = 1.2$

from Chart 5 assume projecting entrance

$Q_{HW_5} = 7.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting OK

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-32-36
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/9/89

C-32-36

Tributary Flow D-32A, D-32B

$Q_{TOT} = 0.58$ cfs

Check Pipe Flow

- 36" CMP
- $n = 0.024$
- $S = 4\%$

$$Q_{allow} = \frac{1.49}{n} AR^{2/3} S^{1/2}$$

$Q_{allow} = 72.26$ cfs

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting OK

Check Inlet Control

HW depth = 7.67' (drop box w/grate. Assume headwall entrance conditions to model inlet.)

$\frac{HW}{D} = 2.56$

from Chart 5 $Q_{HW_5} = 80.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet control not limiting OK

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE Culvert Analysis
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED paul
CHECKED ___
DATE 5/9/89

C-33-24

Receives flow from D-33A, D-33B

flow D-33A = 5.36 cfs
D-33B = 6.6 cfs

Q_{TOT} = 11.96 cfs

Check Pipe Characteristics

- 24" CMP
- $n = 0.024$
- $S = 17\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

Q_{allow} = 50.5 cfs

Since $Q_{allow} > Q_{TOT}$ Culvert is Adequate OK

Check Inlet Control

HW depth = 48" $\frac{HW}{D} = 2.0$

using Chart 5 → Q_{HW_5} = 22.0 cfs
assume projecting entrance

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control does not limit OK

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE Culvert Analysis
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE

C-34-24

Receives flow from D-34A, D-34B

flow D-34A = 0.64 cfs
D-34B = 1.88 cfs

Q_{TOT} 2.52 cfs

Check culvert Characteristics

- 24" CMP
- $n = 0.024$
- $S = 30\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 67.17$ cfs

Since $Q_{allow} > Q_{TOT}$ Culvert is adequate

Check Inlet Control

HW depth = 4.3'

$$\frac{HW}{D} = \frac{4.3}{2} = 2.15$$

using Chart 5 $\Rightarrow$ $Q_{HW_5} = 22.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet control does not limit

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE Culvert Analysis
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/9/89

C-35-18

Receives flow from C-36-12 and D-35

C-36-12 has 1.06 cfs
D-35 has 3.00 cfs

$Q_{TOT} = 4.06$ cfs

Check Pipe Characteristics

- 18" Cast Iron
- $n = 0.014$
- $S = 4\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 16.89$ cfs

Since $Q_{allow} > Q_{TOT}$ Culvert is acceptable

Check Inlet Control

HW depth = $\frac{HW}{D} = 1.0$
assume projecting entrance

using Chart 5 $\Rightarrow Q_{HW_5} = 5.5$ cfs

using Chart 7 $\Rightarrow Q_{HW_7} = 6.5$ cfs

select limiting value

$Q_{HW_5} = 5.5$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet control not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-36-12
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED RWL
CHECKED ___
DATE 5/9/89

C-36-12

Trib Flow D-36, C-38-6

D-36 ⇒ 0.70
C-38-6 ⇒ 0.36

1.06 cfs = Q_{TOT}

Check Pipe Flow

- 12" CMP
- $n = 0.024$
- $S = 30\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 10.57$ cfs

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting OK

Check Inlet Control

HW depth = 2.2 feet $\frac{HW}{D} = 2.2$

assume projecting entrance

from Chart 5 ⇒ $Q_{HW_5} = 4.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-37-18
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/9/89

C-37-18

Receives all flow from D-37

$Q_{TOT} = 2.6$ cfs

Check Pipe Characteristics

- 18" Cast Iron
- $n = 0.014$
- $S = 2\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 16.89$ cfs

Since $Q_{allow} > Q_{TOT}$ culvert acceptable

Check Inlet Control

HW depth = $\frac{HW}{D} = 1.0$

Check Chart 5 Assume projecting entrance

$Q_{HW_5} = 5.5$ cfs

Check Chart 7 Assume type A entrance

$Q_{HW_7} = 7.0$ cfs

Use limiting value $Q_{HW_5} = 5.5$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-38-6
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED paul
CHECKED ___
DATE 5/8/89

C-38-6

Area tributary = 313 * 0.00702 = 2.2 acres

		Q		
CN = 70	A = 1.8	0.096	$\bar{Q}$ = 0.210	$\overline{CN}$ = 76.1
CN = 90	A = 0.4	0.723		

Precipitation = 1.55 inches (10 yr, 6 hr SCS)

hydraulic length = 570 feet

$$\text{Slope} = \frac{(1250)(25)(100)}{(2.2)43{,}560} = 32.6\%$$

Run-off Calculations $Q = 0.36$ cfs

Check Pipe Characteristics

- 6" CMP
- $n = 0.024$
- $S = 7\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 0.80$ cfs

since $Q_{allow} > Q_{TOT}$ culvert acceptable

Check Inlet Control

$HW = 18"$ $\frac{HW}{D} = 3.0$

based upon an extrapolation of Chart 5

$Q_{HW} \approx 1.5$ cfs

Since $Q_{HW} > Q_{TOT}$ Inlet control not limiting

PROJECT : Valley Camp Coal - C-38-6 Runoff Calculation

AREA= 2.2 ACRES
AVERAGE BASIN SLOPE= 32.6 PERCENT
CURVE NUMBER= 76.1
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 570. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0444 HOURS QPCFS= 37.50 CFS QPIN=16.9046 INCHES
C3= 83.3230 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.23	.6241	.0000	.0000	.0	.00
2.25	.6411	.0000	.0000	7.6	.00
2.26	.6580	.0003	.0002	28.7	.00
2.28	.6750	.0007	.0004	37.5	.01
2.29	.6919	.0013	.0006	31.7	.03
2.31	.7089	.0020	.0008	21.1	.05
2.32	.7259	.0030	.0009	12.1	.07
2.34	.7428	.0040	.0011	6.2	.09
2.35	.7598	.0053	.0013	3.0	.12
2.37	.7768	.0067	.0014	1.3	.14
2.38	.7937	.0083	.0016	.6	.17
2.40	.8107	.0100	.0017	.2	.19
2.41	.8277	.0119	.0019	.0	.22
2.43	.8446	.0140	.0020	.0	.24
2.44	.8616	.0162	.0022	.0	.26
2.46	.8786	.0185	.0023	.0	.29
2.47	.8955	.0210	.0025	.0	.31
2.48	.9125	.0236	.0026	.0	.33
2.50	.9294	.0264	.0028	.0	.35
2.51	.9344	.0272	.0008	.0	.36
2.53	.9390	.0280	.0008	.0	.32
2.54	.9436	.0288	.0008	.0	.26
2.56	.9482	.0296	.0008	.0	.20
2.57	.9528	.0304	.0008	.0	.16
2.59	.9574	.0312	.0008	.0	.14
2.60	.9619	.0321	.0008	.0	.13

HYDROGRAPH PEAK= .36 cfs
TIME TO PEAK= 2.51 Hours
RUNOFF VOLUME= .04 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-39-8
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/9/89

C-39-8

Tributary Flow D-39A, D-39B

$Q_{TOT} = 0.06$ cfs

Check Pipe Flow

- 8" CMP
- $n = 0.024$
- $S = 8\%$

$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$Q_{allow} = 1.85$ cfs

Since $Q_{allow} > Q_{TOT}$ Pipe Flow not limiting OK

Check Inlet Control

- HW depth = 1.9 feet $\frac{HW}{D} = 2.8$

assume projecting entrance

from Chart 5 $Q_{HW_5} = 2.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting OK

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Permit
FEATURE C-40-42
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/8/89

(Permanent Structure)

C-40-42 tributary Area + culverts C-44-24, C-41-12

Trib. Area = 20 * 2.747 = 54.9 acres

CN = 70 (25% Oak/Aspen)

Precipitation = 1.55 inches (10 yr, 6 hr SCS)

Hydraulic length = 2,000 feet

$$\text{slope} = \frac{(8{,}500)(80)(100)}{(43{,}560)(54.9)} = 28.4\%$$

Run-Off Calculation: Q = 1.81 cfs $Q_{TOT} = 1.81 + 2.46 + 0.99$

$Q_{TOT} = 5.26$ cfs

Check Pipe Characteristics

- 42" CMP
- $n = 0.027$
- $S = 30\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 265.33$ cfs

since $Q_{allow} >> Q$ culvert adequate

* For a 100 yr, 6 hr event

Precip = 2.25 in ⇒ Q = 10.88 cfs

$Q_{TOT} = 10.88 + 14.82 + 1.37 + 0.99$ ⇒ $Q_{TOT} = 28.06$ cfs

Note. even under the 100 yr event

$Q_{allow} > Q$ culvert still adequate

Check Inlet Control

Hwl depth = 15' $\frac{HWL}{D} = \frac{15}{3.5} = 4.3$

assume projecting entrance

Using Chart 5 ⇒ $Q_{HW_5} = 140.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control does not limit

PROJECT : Valley Camp Coal - Culvert C-40-42 Capacity Calculations

AREA= 54.9 ACRES
AVERAGE BASIN SLOPE= 28.4 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1539 HOURS QPCFS= 269.71 CFS QPIN= 4.8720 INCHES
C3= 24.0139 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.43	.8522	.0000	.0000	.0	.00
2.46	.8875	.0002	.0002	13.5	.00
2.49	.9229	.0010	.0008	83.8	.03
2.52	.9376	.0015	.0005	179.1	.11
2.56	.9472	.0019	.0004	247.6	.24
2.59	.9567	.0023	.0004	269.7	.37
2.62	.9662	.0027	.0004	252.6	.49
2.65	.9758	.0032	.0005	213.3	.58
2.68	.9853	.0037	.0005	166.8	.65
2.71	.9949	.0043	.0006	123.1	.71
2.74	1.0044	.0049	.0006	86.7	.77
2.77	1.0140	.0055	.0006	58.9	.82
2.80	1.0235	.0062	.0007	38.8	.88
2.83	1.0331	.0069	.0007	24.9	.94
2.86	1.0426	.0077	.0008	15.6	1.01
2.89	1.0521	.0085	.0008	9.6	1.07
2.92	1.0617	.0093	.0008	5.8	1.14
2.96	1.0712	.0102	.0009	3.5	1.20
2.99	1.0808	.0111	.0009	2.1	1.27
3.02	1.0893	.0119	.0008	1.2	1.33
3.05	1.0969	.0127	.0008	.7	1.39
3.08	1.1045	.0135	.0008	.4	1.43
3.11	1.1122	.0143	.0008	.2	1.45
3.14	1.1198	.0152	.0008	.1	1.46
3.17	1.1274	.0160	.0009	.0	1.47
2.43	.8522	.0000	.0000	.0	.00
2.46	.8875	.0002	.0002	13.5	.00
2.49	.9229	.0010	.0008	83.8	.03
2.52	.9376	.0015	.0005	179.1	.11
2.56	.9472	.0019	.0004	247.6	.24
2.59	.9567	.0023	.0004	269.7	.37
2.62	.9662	.0027	.0004	252.6	.49
2.65	.9758	.0032	.0005	213.3	.58
2.68	.9853	.0037	.0005	166.8	.65
2.71	.9949	.0043	.0006	123.1	.71

PROJECT : Valley Camp Coal - Culvert C-40-42 Capacity Calculations
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.74	1.0044	.0049	.0006	86.7	.77
2.77	1.0140	.0055	.0006	58.9	.82
2.80	1.0235	.0062	.0007	38.8	.88
2.83	1.0331	.0069	.0007	24.9	.94
2.86	1.0426	.0077	.0008	15.6	1.01
2.89	1.0521	.0085	.0008	9.6	1.07
2.92	1.0617	.0093	.0008	5.8	1.14
2.96	1.0712	.0102	.0009	3.5	1.20
2.99	1.0808	.0111	.0009	2.1	1.27
3.02	1.0893	.0119	.0008	1.2	1.33
3.05	1.0969	.0127	.0008	.7	1.39
3.08	1.1045	.0135	.0008	.4	1.43
3.11	1.1122	.0143	.0008	.2	1.45
3.14	1.1198	.0152	.0008	.1	1.46
3.17	1.1274	.0160	.0009	.0	1.47
3.20	1.1351	.0169	.0009	.0	1.48
3.23	1.1427	.0178	.0009	.0	1.49
3.26	1.1503	.0188	.0009	.0	1.51
3.29	1.1580	.0197	.0010	.0	1.54
3.33	1.1656	.0207	.0010	.0	1.57
3.36	1.1732	.0217	.0010	.0	1.60
3.39	1.1809	.0227	.0010	.0	1.63
3.42	1.1885	.0238	.0010	.0	1.67
3.45	1.1961	.0248	.0011	.0	1.71
3.48	1.2038	.0259	.0011	.0	1.75
3.51	1.2107	.0269	.0010	.0	1.79
3.54	1.2159	.0277	.0008	.0	1.81
3.57	1.2212	.0285	.0008	.0	1.81
3.60	1.2264	.0293	.0008	.0	1.78
3.63	1.2317	.0301	.0008	.0	1.72
3.66	1.2369	.0309	.0008	.0	1.66
3.69	1.2422	.0317	.0008	.0	1.60
3.73	1.2474	.0326	.0008	.0	1.56

HYDROGRAPH PEAK= 1.81 cfs
TIME TO PEAK= 3.54 Hours
RUNOFF VOLUME= .44 Acre-Feet

[illegible] (6 hour SCS)

AREA= 54.9 ACRES
AVERAGE BASIN SLOPE= 28.4 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1539 HOURS QPCFS= 269.71 CFS QPIN= 4.8720 INCHES
C3= 24.0139 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.19	.8270	.0000	.0000	.0	.00
2.22	.8783	.0001	.0001	13.5	.00
2.25	.9295	.0012	.0011	83.8	.02
2.28	.9808	.0035	.0023	179.1	.14
2.31	1.0321	.0069	.0034	247.6	.46
2.34	1.0833	.0113	.0045	269.7	1.05
2.37	1.1346	.0169	.0055	252.6	1.94
2.40	1.1858	.0234	.0065	213.3	3.10
2.43	1.2371	.0309	.0075	166.8	4.49
2.46	1.2884	.0394	.0085	123.1	6.03
2.49	1.3396	.0488	.0094	86.7	7.67
2.52	1.3610	.0530	.0042	58.9	9.29
2.56	1.3749	.0558	.0028	38.8	10.46
2.59	1.3888	.0587	.0029	24.9	10.88
2.62	1.4026	.0616	.0029	15.6	10.58
2.65	1.4165	.0646	.0030	9.6	9.81
2.68	1.4303	.0676	.0030	5.8	8.88
2.71	1.4442	.0707	.0031	3.5	7.98
2.74	1.4580	.0739	.0032	2.1	7.24
2.77	1.4719	.0771	.0032	1.2	6.68
2.80	1.4857	.0804	.0033	.7	6.30
2.83	1.4996	.0838	.0033	.4	6.07
2.86	1.5134	.0872	.0034	.2	5.95
2.89	1.5273	.0906	.0035	.1	5.90
2.92	1.5412	.0941	.0035	.0	5.92

HYDROGRAPH PEAK= 10.88 cfs
TIME TO PEAK= 2.59 Hours
RUNOFF VOLUME= 1.55 Acre-Feet

HANSEN ALLEN & LUCE inc

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

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/9/89

C-41-12

Mine Discharge to concrete settling Ponds.

data based on records gathered by Vaughn Hansen Assoc from 9/77 to 10/83.

Max value measured. ⇒ 9/12/83 $\underline{0.99 \text{ cfs}} = Q_{TOT}$

Assume maximum value.

Check Pipe Characteristics

- 12" CMP
- $n = 0.024$
- $S = 17\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$$\underline{Q_{allow} = 7.96 \text{ cfs}}$$

Since $Q_{allow} > Q$ Culvert is acceptable

Check Inlet Control

Hwl depth = 2.4' $\frac{HW}{D} = 2.4$

assume projecting entrance

Use Chart 5 ⇒ $\underline{Q_{HW_5} = 4.5 \text{ cfs}}$

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE C-42-8
PROJECT NO. 007-11-100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/8/89

C-42-8

Tributary Area D-42

$Q_{TOT} = 0.51$ cfs

Check Pipe Flow

- $n = 0.024$
- 8" CMP
- $S = 5\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 1.46$ cfs

Since $Q_{allow} > Q_{TOT}$ Pipe flow not limiting ok

Check Inlet Control

- HW depth = 2.67'

$$\frac{HW}{D} = \frac{2.67}{.67} = 4.0$$

assume projecting entrance

from Chart 5 $\Rightarrow$ $Q_{HW_5} = 2.5$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting ok

HANSEN ALLEN & LUCE inc

CLIENT Valley Camp
PROJECT Mine Permit
FEATURE Culvert Analysis
PROJECT NO. 007-11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED ___
DATE 5/8/89

C-43-8

Total Area = 184 * 0.00702 = 1.3 ac
Undist. Area = 57 * 0.00702 = 0.4 ac (25% Oak/Aspen)
Dist. Area = 130 * 0.00702 = 0.9 ac

CN	Area	Q
70	0.4	0.096
90	0.9	0.723

$\bar{Q} = 0.530$ $\bar{CN} = 86.1$

Precip = 1.55" (10 yr, 6 hr. SCS)

Hydraulic length = 325 feet

$$\text{Slope} = \frac{(550)(25)(100)}{43{,}560\,(1.3)} = 24.3\%$$

Run-Off Calculation: $Q = 0.71$ cfs

Check Pipe Characteristics

8" CMP
$n = 0.024$
$S = 30\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 3.59$ cfs

since $Q_{allow} > Q$ culvert adequate

For a 100 year, 6 hour event

$P = 2.25$ inches $\Rightarrow Q_{TOT} = 1.37$ cfs

since $Q_{allow} > Q_{TOT}$ culvert is acceptable

Check Inlet Control

HW depth = 2.17'

$$\frac{HW}{D} = \frac{2.17}{0.67} = 3.25$$

Use projecting entrance

Use Chart 5 $\Rightarrow Q_{HW_5} = 2.0$ cfs

Since $Q_{HW_5} > Q_{TOT}$ Inlet Control not limiting

PROJECT: Valley Camp Coal - Culvert C-43-8 Capacity Calculations

AREA= 1.3 ACRES
AVERAGE BASIN SLOPE= 24.3 PERCENT
CURVE NUMBER= 86.1
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 325. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0238 HOURS QPCFS= 41.38 CFS QPIN=31.5630 INCHES
C3=155.5737 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.88	.3212	.0000	.0000	.0	.00
1.90	.3282	.0000	.0000	41.4	.00
1.93	.3352	.0000	.0000	13.2	.00
1.95	.3422	.0002	.0001	1.5	.00
1.98	.3493	.0004	.0002	.1	.00
2.00	.3563	.0007	.0003	.0	.01
2.36	.7651	.0951	.0103	.0	.57
[illegible]	.7924	.1058	.0107	.0	.59
[illegible]	.8197	.1169	.0111	.0	.62
2.43	.8470	.1284	.0115	.0	.64
2.45	.8743	.1404	.0119	.0	.66
2.48	.9016	.1527	.0123	.0	.69
2.50	.9289	.1654	.0127	.0	.71
2.52	.9371	.1693	.0039	.0	.35
2.55	.9444	.1728	.0035	.0	.22
2.57	.9518	.1763	.0035	.0	.20
2.59	.9592	.1799	.0036	.0	.20
2.62	.9666	.1835	.0036	.0	.20
2.64	.9740	.1871	.0036	.0	.20

HYDROGRAPH PEAK= .71 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .06 Acre-Feet

PROJECT : [illegible] Camp Hall - Culvert C-43-8 (100 yr, 6 hour SCS)

AREA= 1.3 ACRES
AVERAGE BASIN SLOPE= 24.3 PERCENT
CURVE NUMBER= 86.2
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 325. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0237 HOURS QPCFS= 41.53 CFS QPIN=31.6773 INCHES
C3=156.1375 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.52	.3109	.0000	.0000	.0	.00
1.54	.3211	.0000	.0000	41.5	.00
1.56	.3312	.0000	.0000	13.3	.00
1.59	.3413	.0003	.0002	1.5	.00
1.61	.3515	.0006	.0003	.1	.02
1.64	.3616	.0010	.0004	.0	.02
2.35	1.0941	.2522	.0212	.0	1.19
2.37	1.1336	.2740	.0218	.0	1.22
2.39	1.1730	.2964	.0224	.0	1.25
2.42	1.2125	.3193	.0229	.0	1.28
2.44	1.2519	.3428	.0234	.0	1.31
2.46	1.2914	.3667	.0239	.0	1.34
2.49	1.3309	.3911	.0244	.0	1.37
2.51	1.3555	.4066	.0155	.0	1.00
2.54	1.3662	.4133	.0067	.0	.52
2.56	1.3768	.4201	.0068	.0	.40
2.58	1.3875	.4269	.0068	.0	.38
2.61	1.3982	.4338	.0068	.0	.39
2.63	1.4088	.4406	.0069	.0	.39

HYDROGRAPH PEAK= 1.37 cfs
TIME TO PEAK= 2.49 Hours
RUNOFF VOLUME= .11 Acre-Feet

HANSEN ALLEN & LUCE INC

CLIENT Valley Camp
PROJECT Permit
FEATURE Culvert Analysis
PROJECT NO. 007.11.100

SHEET ___ OF ___
COMPUTED Paul
CHECKED
DATE 5/8/97

C-44-24

Total Area = 27+(2.747) = 74.2 Acres (25% Oak/Aspen)

CN = 70 (25% Oak/Aspen)

Precipitation = 1.55 inches (10 year, 6 hr SCS)

Hydraulic length = 2,000 feet

$$\text{slope} = \frac{(12{,}200)(80)(100)}{43{,}560\ (74.2)} = 30.2\%$$

Run-Off Calculation: $Q = 2.46$ cfs

Check Pipe Characteristics

- 24" CMP
- $n = 0.024$
- $S = 8\%$

$$Q_{allow} = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$Q_{allow} = 34.66$ cfs

Since $Q_{allow} > Q$ culvert adequate

* For a 100 year, 6hr event

Precip = 2.25 inches $\Rightarrow Q_{TOT}$ 14.82 cfs

$Q_{TOT} = 14.82 + 1.37$ ← From C-43-8 $Q_{TOT} = 16.19$ cfs

Note: even under the 24 hr. conditions

$Q_{allow} > Q$ ∴ culvert acceptable

Check Inlet Control

HWI depth = 6.3 feet $\frac{HWI}{D} = \frac{6.3}{2.0} = 3.15$

assume projecting entrance

Use Chart 5 $\Rightarrow Q_{HWI_5} = 29.0$ cfs

Since $Q_{HWI_5} > Q_{TOT}$ Inlet Control not limiting

PROJECT : Valley Camp Coal - Culvert C-44-C4 Capacity Calculation
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.64	1.2333	.0303	.0008	.0	2.29
3.67	1.2384	.0311	.0008	.0	2.21
3.70	1.2435	.0319	.0008	.0	2.14
3.73	1.2485	.0328	.0008	.0	2.09

HYDROGRAPH PEAK= 2.46 cfs
TIME TO PEAK= 3.55 Hours
RUNOFF VOLUME= .59 Acre-Feet

PROJECT - Valley Camp Coal - Culvert C-44-24 (100 yr, 6 hour SCS)

AREA= 74.2 ACRES
AVERAGE BASIN SLOPE= 30.2 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1493 HOURS QPCFS= 375.90 CFS QPIN= 5.0240 INCHES
C3= 24.7632 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.18	.8163	.0000	.0000	.0	.00
2.21	.8660	.0000	.0000	18.9	.00
2.24	.9157	.0008	.0008	116.8	.02
2.27	.9654	.0027	.0019	249.5	.13
2.30	1.0152	.0056	.0029	345.1	.47
2.33	1.0649	.0096	.0040	375.9	1.16
2.36	1.1146	.0146	.0050	352.1	2.24
2.39	1.1643	.0205	.0060	297.2	3.69
2.42	1.2140	.0274	.0069	232.5	5.45
2.45	1.2637	.0352	.0078	171.5	7.43
2.48	1.3134	.0439	.0087	120.9	9.57
2.51	1.3535	.0515	.0076	82.1	11.76
2.54	1.3670	.0542	.0027	54.1	13.69
2.57	1.3804	.0569	.0027	34.7	14.78
2.60	1.3939	.0597	.0028	21.8	14.82
2.63	1.4073	.0626	.0029	13.4	14.02
2.66	1.4207	.0655	.0029	8.1	12.79
2.69	1.4342	.0685	.0030	4.9	11.49
2.72	1.4476	.0715	.0030	2.9	10.33
2.75	1.4610	.0746	.0031	1.7	9.42
2.78	1.4745	.0777	.0031	1.0	8.77
2.81	1.4879	.0809	.0032	.6	8.34
2.84	1.5013	.0842	.0033	.3	8.09
2.87	1.5148	.0875	.0033	.2	7.98
2.90	1.5282	.0908	.0034	.0	7.95

HYDROGRAPH PEAK= 14.82 cfs
TIME TO PEAK= 2.60 Hours
RUNOFF VOLUME= 3.10 Acre-Feet

I- Undisturbed Area Runoff Channels

A- Drainage Basin Characteristics

Channel	Basin Area (acres)	Hydraulic Length ft	Watershed Slope %
UDA-1	6.7	700	27
UDA-2	14.7	1900	37
UDA-3	8.1	1500	32
UDA-4	5.5	1250	31
UDA-5	7.2	1100	28

$$\text{Watershed Slope} = \frac{L_c * CI}{DA} * 100$$

L_c = length of Contour lines.
CI = Contour Interval in feet.
DA = Drainage Area

Channel	L_c ft	CI ft	DA ft²	Slope %
UDA-1	1000	80	291,852	27
UDA-2	11,900	20	640,332	37
UDA-3	5,600	20	352,836	32
UDA-4	3750	20	239,580	31
UDA-5	4400	20	313,632	28

B- Curve Number

Use CN = 75 for Sage-grass cover
CN = 70 for Aspen or Forest Cover

See Calculations 9/18/88 for justification.

Channel	Area Sage-Grass ac	Area Aspen or Forest ac
UDA-1	6.7	0
UDA-2	1.4	13.3
UDA-3	8.1	0
UDA-4	0	5.5
UDA-5	0	7.2

PROJECT : Valley Camp Coal - Culvert C-44-24 Capacity Calculation

AREA= 74.2 ACRES
AVERAGE BASIN SLOPE= 30.2 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 2000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1493 HOURS QPCFS= 375.90 CFS QPIN= 5.0240 INCHES
C3= 24.7632 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.42	.8363	.0000	.0000	.0	.00
2.45	.8705	.0000	.0000	18.9	.00
2.48	.9048	.0005	.0005	116.8	.01
2.51	.9324	.0013	.0008	249.5	.08
2.54	.9417	.0016	.0003	345.1	.23
2.57	.9510	.0020	.0004	375.9	.42
2.60	.9602	.0024	.0004	352.1	.60
2.63	.9695	.0029	.0004	297.2	.74
2.66	.9787	.0034	.0005	232.5	.85
2.69	.9880	.0039	.0005	171.5	.93
2.72	.9972	.0044	.0006	120.9	1.00
2.75	1.0065	.0050	.0006	82.1	1.07
2.78	1.0157	.0057	.0006	54.1	1.14
2.81	1.0250	.0063	.0007	34.7	1.22
2.84	1.0343	.0070	.0007	21.9	1.30
2.87	1.0435	.0078	.0007	13.4	1.38
2.90	1.0528	.0085	.0008	8.1	1.47
2.93	1.0620	.0093	.0008	4.9	1.55
2.96	1.0713	.0102	.0008	2.9	1.64
2.99	1.0805	.0111	.0009	1.7	1.73
3.02	1.0888	.0119	.0008	1.0	1.81
3.05	1.0962	.0126	.0008	.6	1.89
3.08	1.1036	.0134	.0008	.3	1.94
3.10	1.1110	.0142	.0008	.2	1.97
3.13	1.1184	.0150	.0008	.0	1.98
3.37	1.1777	.0223	.0010	.0	2.20
3.40	1.1851	.0231	.0010	.0	2.24
3.43	1.1925	.0243	.0010	.0	2.29
3.46	1.1999	.0254	.0010	.0	2.33
3.49	1.2073	.0264	.0011	.0	2.40
3.52	1.2129	.0273	.0008	.0	2.44
3.55	1.2180	.0280	.0008	.0	2.46
3.58	1.2231	.0288	.0008	.0	2.44
3.61	1.2282	.0296	.0008	.0	2.37

HANSEN ALLEN & LUCE INC

CLIENT Valley County
PROJECT Hydrology - Surface Facilities
FEATURE Runoff; Peak Flow Projections
PROJECT NO.

SHEET 2 OF 17
COMPUTED DMA
CHECKED
DATE 1/18/89

Weighted Curve #s based on runoff volume

Channel	Area ac	CN	10-yr 24-hr Runoff Depth in	Wt. CN based on Wt. Q
UAD-1	6.7	75	0.62	75
	0	70	0.43	
			WTQ = 0.62	
UAD-2	1.4	75	0.62	
	13.3	70	0.43	70.5 Use 71
			WTQ = 0.45	
UAD-3	8.1	75	0.62	
	0.0	70	0.43	75
			WTQ = 0.62	
UAD-4	0	75	0.62	
	5.5	70	0.43	70
			WTQ = 0.43	
UAD-5	0	75	0.62	
	7.2	70	0.43	70
			WTQ = 0.43	

10-yr 24-hr Precip = 2.45 inches

10-yr 6-hr Precip = 1.55 inches.

C- Peak Discharge Summary

Estimated Peak Discharge for Undisturbed Area Bypass Channels from 10-year, 24-hour and 10-year, 6-hour Precipitation Events.

CHANNEL	PEAK FLOW 10-YEAR, 24-HOUR (cfs)	PEAK FLOW 10-YEAR, 6-HOUR (cfs)
UD-1	4.5	.84
UD-2	6.4	.57
UD-3	5.1	.85
UD-4	2.3	.19
UD-5	3.0	.25

See Attached Printouts for Hydrograph output data.

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL ~~UD-1~~ UDD-1

AREA= 6.7 ACRES
AVERAGE BASIN SLOPE= 27.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.45 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 700. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0593 HOURS QPCFS= 85.42 CFS QPIN=12.6436 INCHES
C3= 62.3202 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.38	.6649	.0000	.0000	.0	.00
11.40	.6704	.0000	.0000	26.7	.00
11.42	.6758	.0000	.0000	78.6	.00
11.45	.6813	.0000	.0000	79.8	.00
11.47	.6868	.0001	.0000	52.5	.00
11.50	.6923	.0002	.0000	27.2	.01
11.52	.7290	.0011	.0009	12.1	.04
11.54	.7733	.0033	.0022	4.9	.14
11.57	.8177	.0065	.0032	1.8	.34
11.59	.8620	.0108	.0043	.6	.59
11.61	.9063	.0161	.0053	.2	.87
11.64	.9506	.0223	.0062	.0	1.16
11.85	1.3494	.1161	.0134	.0	3.38
11.88	1.3938	.1302	.0141	.0	3.59
11.90	1.4381	.1450	.0148	.0	3.79
11.92	1.4824	.1604	.0154	.0	3.98
11.95	1.5267	.1764	.0160	.0	4.17
11.97	1.5710	.1930	.0166	.0	4.35
12.00	1.6153	.2102	.0172	.0	4.52
12.02	1.6310	.2164	.0062	.0	4.38
12.04	1.6394	.2198	.0034	.0	3.55
12.07	1.6478	.2231	.0034	.0	2.51
12.09	1.6562	.2265	.0034	.0	1.74
12.11	1.6646	.2299	.0034	.0	1.30
12.14	1.6730	.2334	.0034	.0	1.10

HYDROGRAPH PEAK= 4.52 cfs
TIME TO PEAK= 12.00 Hours
RUNOFF VOLUME= .35 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL UDD-1 ~~UD-1~~

AREA= 6.7 ACRES
AVERAGE BASIN SLOPE= 27.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 700. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0593 HOURS QPCFS= 85.42 CFS QPIN=12.6436 INCHES
C3= 62.3202 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.26	.6559	.0000	.0000	.0	.00
2.28	.6832	.0000	.0000	26.7	.00
2.31	.7105	.0006	.0005	78.6	.02
2.33	.7378	.0015	.0009	79.8	.07
2.36	.7651	.0028	.0013	52.5	.15
2.38	.7924	.0046	.0017	27.2	.25
2.40	.8197	.0067	.0021	12.1	.36
2.43	.8470	.0093	.0025	4.9	.48
2.45	.8743	.0122	.0029	1.8	.59
2.48	.9016	.0155	.0033	.6	.70
2.50	.9289	.0191	.0037	.2	.81
2.52	.9371	.0203	.0012	.0	.84
2.55	.9444	.0214	.0011	.0	.71
2.57	.9518	.0225	.0011	.0	.54
2.59	.9592	.0236	.0011	.0	.42
2.62	.9666	.0248	.0012	.0	.36
2.64	.9740	.0259	.0012	.0	.34
2.67	.9813	.0271	.0012	.0	.33

HYDROGRAPH PEAK= .84 cfs
TIME TO PEAK= 2.52 Hours
RUNOFF VOLUME= .10 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL ~~UD-2~~ UDD-2

AREA= 14.7 ACRES
AVERAGE BASIN SLOPE= 37.0 PERCENT
CURVE NUMBER= 71.0
DESIGN STORM= 2.45 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 1900. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1260 HOURS QPCFS= 88.25 CFS QPIN= 5.9534 INCHES
C3= 29.3443 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.56	.8133	.0000	.0000	.0	.00
11.59	.8602	.0005	.0005	4.4	.00
11.61	.9071	.0019	.0015	27.4	.02
11.64	.9540	.0045	.0025	58.6	.08
11.67	1.0010	.0079	.0035	81.0	.21
11.69	1.0479	.0124	.0044	88.2	.42
11.72	1.0948	.0177	.0053	82.7	.72
11.74	1.1417	.0239	.0062	69.8	1.09
11.77	1.1886	.0310	.0071	54.6	1.52
11.79	1.2355	.0389	.0079	40.3	1.98
11.82	1.2824	.0476	.0087	28.4	2.46
11.84	1.3293	.0571	.0095	19.3	2.96
11.87	1.3763	.0674	.0103	12.7	3.46
11.89	1.4232	.0784	.0110	8.1	3.95
11.92	1.4701	.0901	.0117	5.1	4.43
11.94	1.5170	.1024	.0124	3.2	4.91
11.97	1.5639	.1155	.0131	1.9	5.37
11.99	1.6108	.1292	.0137	1.1	5.82
12.02	1.6307	.1352	.0060	.7	6.22
12.04	1.6396	.1379	.0027	.4	6.40
12.07	1.6485	.1407	.0027	.2	6.21
12.09	1.6573	.1434	.0028	.1	5.69
12.12	1.6662	.1462	.0028	.0	4.98
12.14	1.6751	.1490	.0028	.0	4.22
12.17	1.6840	.1518	.0028	.0	3.54
12.19	1.6929	.1547	.0029	.0	2.98

HYDROGRAPH PEAK= 6.40 cfs
TIME TO PEAK= 12.04 Hours
RUNOFF VOLUME= .57 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL ~~UD-2~~ ODD-2

AREA= 14.7 ACRES
AVERAGE BASIN SLOPE= 37.0 PERCENT
CURVE NUMBER= 71.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1900. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1260 HOURS QPCFS= 88.25 CFS QPIN= 5.9534 INCHES
C3= 29.3443 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.39	.8078	.0000	.0000	.0	.00
2.42	.8367	.0000	.0000	4.4	.00
2.44	.8656	.0006	.0005	27.4	.00
2.47	.8945	.0014	.0009	58.6	.02
2.49	.9234	.0027	.0013	81.0	.07
2.52	.9360	.0034	.0007	88.2	.14
2.54	.9438	.0038	.0005	82.7	.22
2.57	.9517	.0043	.0005	69.8	.28
2.60	.9595	.0048	.0005	54.6	.32
2.62	.9673	.0053	.0005	40.3	.33
2.65	.9751	.0059	.0006	28.4	.34
2.67	.9829	.0065	.0006	19.3	.34
2.70	.9907	.0071	.0006	12.7	.33
2.72	.9985	.0077	.0006	8.1	.33
2.75	1.0063	.0084	.0007	5.1	.33
2.77	1.0141	.0091	.0007	3.2	.34
2.80	1.0220	.0098	.0007	1.9	.35
2.82	1.0298	.0105	.0007	1.1	.36
2.85	1.0376	.0113	.0008	.7	.37
2.87	1.0454	.0121	.0008	.4	.39
2.90	1.0532	.0129	.0008	.2	.40
2.92	1.0610	.0138	.0008	.1	.42
2.95	1.0688	.0146	.0009	.0	.43
3.38	1.1783	.0294	.0010	.0	.52
3.40	1.1845	.0304	.0010	.0	.53
3.43	1.1908	.0314	.0010	.0	.54
3.45	1.1970	.0324	.0010	.0	.55
3.48	1.2033	.0334	.0010	.0	.56
3.50	1.2094	.0344	.0010	.0	.57
3.53	1.2136	.0351	.0007	.0	.57
3.55	1.2179	.0359	.0007	.0	.57
3.58	1.2222	.0366	.0007	.0	.56
3.60	1.2265	.0373	.0007	.0	.54
3.63	1.2308	.0381	.0008	.0	.52

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL ~~UD-2~~ UDD-2
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.65	1.2351	.0388	.0008	.0	.50
3.68	1.2394	.0396	.0008	.0	.48

HYDROGRAPH PEAK= .57 cfs
TIME TO PEAK= 3.53 Hours
RUNOFF VOLUME= .14 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL ~~UD-3~~ UDD-3

AREA= 8.1 ACRES
AVERAGE BASIN SLOPE= 32.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.45 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 1500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1002 HOURS QPCFS= 61.10 CFS QPIN= 7.4811 INCHES
C3= 36.8746 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.37	.6630	.0000	.0000	.0	.00
11.39	.6676	.0000	.0000	3.1	.00
11.41	.6722	.0000	.0000	19.0	.00
11.43	.6768	.0000	.0000	40.6	.00
11.45	.6815	.0000	.0000	56.1	.00
11.47	.6861	.0001	.0000	61.1	.00
11.49	.6907	.0002	.0000	57.2	.00
11.51	.7093	.0005	.0004	48.3	.00
11.53	.7466	.0019	.0013	37.8	.02
11.55	.7839	.0040	.0021	27.9	.06
11.57	.8213	.0069	.0029	19.7	.13
11.59	.8586	.0105	.0036	13.3	.26
11.61	.8959	.0148	.0043	8.8	.42
11.63	.9333	.0197	.0050	5.6	.63
11.65	.9706	.0254	.0057	3.5	.87
11.67	1.0079	.0317	.0063	2.2	1.12
11.69	1.0453	.0386	.0069	1.3	1.38
11.71	1.0826	.0461	.0075	.8	1.65
11.73	1.1199	.0543	.0081	.5	1.92
11.75	1.1573	.0629	.0087	.3	2.19
11.77	1.1946	.0722	.0092	.2	2.45
11.79	1.2319	.0820	.0098	.0	2.70
11.37	.6630	.0000	.0000	.0	.00
11.39	.6676	.0000	.0000	3.1	.00
11.41	.6722	.0000	.0000	19.0	.00
11.43	.6768	.0000	.0000	40.6	.00
11.45	.6815	.0000	.0000	56.1	.00
11.47	.6861	.0001	.0000	61.1	.00
11.49	.6907	.0002	.0000	57.2	.00
11.51	.7093	.0005	.0004	48.3	.00
11.53	.7466	.0019	.0013	37.8	.02
11.55	.7839	.0040	.0021	27.9	.06
11.57	.8213	.0069	.0029	19.7	.13
11.59	.8586	.0105	.0036	13.3	.26
11.61	.8959	.0148	.0043	8.8	.42

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL ~~UD-3~~ UDD-3
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.63	.9333	.0197	.0050	5.6	.63
11.65	.9706	.0254	.0057	3.5	.87
11.67	1.0079	.0317	.0063	2.2	1.12
11.69	1.0453	.0386	.0069	1.3	1.38
11.71	1.0826	.0461	.0075	.8	1.65
11.73	1.1199	.0543	.0081	.5	1.92
11.75	1.1573	.0629	.0087	.3	2.19
11.77	1.1946	.0722	.0092	.2	2.45
11.79	1.2319	.0820	.0098	.0	2.70
11.81	1.2693	.0923	.0103	.0	2.95
11.83	1.3066	.1031	.0108	.0	3.19
11.85	1.3439	.1144	.0113	.0	3.43
11.87	1.3813	.1262	.0118	.0	3.66
11.89	1.4186	.1384	.0122	.0	3.88
11.91	1.4559	.1511	.0127	.0	4.09
11.93	1.4933	.1642	.0131	.0	4.30
11.95	1.5306	.1778	.0136	.0	4.51
11.97	1.5679	.1918	.0140	.0	4.71
11.99	1.6053	.2062	.0144	.0	4.90
12.01	1.6278	.2151	.0089	.0	5.07
12.03	1.6349	.2179	.0028	.0	5.12
12.05	1.6420	.2208	.0028	.0	4.93
12.07	1.6490	.2236	.0028	.0	4.51
12.09	1.6561	.2265	.0029	.0	3.93
12.11	1.6632	.2293	.0029	.0	3.32
12.13	1.6702	.2322	.0029	.0	2.76
12.15	1.6773	.2351	.0029	.0	2.30

HYDROGRAPH PEAK= 5.12 cfs
TIME TO PEAK= 12.03 Hours
RUNOFF VOLUME= .42 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL ~~UD-3~~ UDD-3

AREA= 8.1 ACRES
AVERAGE BASIN SLOPE= 32.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1500. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1002 HOURS QPCFS= 61.10 CFS QPIN= 7.4811 INCHES
C3= 36.8746 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.27	.6612	.0000	.0000	.0	.00
2.29	.6842	.0000	.0000	3.1	.00
2.31	.7072	.0005	.0004	19.0	.00
2.33	.7301	.0012	.0007	40.6	.01
2.35	.7531	.0022	.0010	56.1	.04
2.37	.7761	.0035	.0013	61.1	.08
2.39	.7991	.0051	.0016	57.2	.14
2.41	.8221	.0069	.0019	48.3	.21
2.43	.8451	.0091	.0021	37.8	.30
2.45	.8681	.0115	.0024	27.9	.40
2.47	.8911	.0142	.0027	19.7	.50
2.49	.9141	.0171	.0029	13.3	.61
2.51	.9319	.0196	.0025	8.8	.72
2.53	.9381	.0204	.0009	5.6	.81
2.55	.9444	.0214	.0009	3.5	.85
2.57	.9506	.0223	.0009	2.2	.84
2.59	.9568	.0232	.0009	1.3	.78
2.61	.9630	.0242	.0010	.8	.71
2.63	.9692	.0252	.0010	.5	.63
2.65	.9754	.0262	.0010	.3	.57
2.67	.9816	.0272	.0010	.2	.51
2.69	.9879	.0282	.0010	.0	.48

HYDROGRAPH PEAK= .85 cfs
TIME TO PEAK= 2.55 Hours
RUNOFF VOLUME= .12 Acre-Feet

12/17

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL ~~UD-4~~ UDD-4

AREA= 5.5 ACRES
AVERAGE BASIN SLOPE= 31.0 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 2.45 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 1250. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1012 HOURS QPCFS= 41.12 CFS QPIN= 7.4135 INCHES
C3= 36.5410 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.57	.8296	.0000	.0000	.0	.00
11.59	.8673	.0000	.0000	2.1	.00
11.61	.9050	.0005	.0005	12.8	.00
11.63	.9426	.0017	.0011	27.3	.00
11.65	.9803	.0034	.0018	37.7	.03
11.67	1.0180	.0058	.0024	41.1	.08
11.69	1.0556	.0088	.0030	38.5	.15
11.71	1.0933	.0123	.0035	32.5	.24
11.73	1.1310	.0164	.0041	25.4	.36
11.76	1.1687	.0211	.0047	18.8	.49
11.78	1.2063	.0263	.0052	13.2	.63
11.80	1.2440	.0320	.0057	9.0	.77
11.82	1.2817	.0383	.0062	5.9	.92
11.84	1.3194	.0450	.0067	3.8	1.07
11.86	1.3570	.0522	.0072	2.4	1.22
11.88	1.3947	.0599	.0077	1.5	1.36
11.90	1.4324	.0681	.0082	.9	1.51
11.92	1.4701	.0767	.0086	.5	1.65
11.94	1.5077	.0857	.0091	.3	1.78
11.96	1.5454	.0952	.0095	.2	1.92
11.98	1.5831	.1052	.0099	.1	2.05
12.00	1.6208	.1155	.0103	.0	2.18
12.02	1.6308	.1183	.0028	.0	2.29
12.04	1.6379	.1203	.0020	.0	2.31
12.06	1.6451	.1224	.0020	.0	2.20
12.08	1.6522	.1244	.0021	.0	1.98
12.10	1.6594	.1265	.0021	.0	1.71
12.12	1.6665	.1286	.0021	.0	1.44
12.14	1.6736	.1307	.0021	.0	1.20
12.16	1.6808	.1328	.0021	.0	1.01

HYDROGRAPH PEAK= 2.31 cfs
TIME TO PEAK= 12.04 Hours
RUNOFF VOLUME= .20 Acre-Feet

PROJECT : VALLEY CAMP 10-YR 6-HR PEAK FLOW CHANNEL ~~UD-4~~ UDD-4

AREA= 5.5 ACRES
AVERAGE BASIN SLOPE= 31.0 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1250. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1012 HOURS QPCFS= 41.12 CFS QPIN= 7.4135 INCHES
C3= 36.5410 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.43	.8473	.0000	.0000	.0	.00
2.45	.8705	.0000	.0000	2.1	.00
2.47	.8937	.0003	.0003	12.8	.00
2.49	.9169	.0008	.0005	27.3	.00
2.51	.9327	.0013	.0005	37.7	.02
2.53	.9390	.0015	.0002	41.1	.03
2.55	.9453	.0018	.0002	38.5	.05
2.57	.9516	.0020	.0003	32.5	.06
2.59	.9578	.0023	.0003	25.4	.07
2.61	.9641	.0026	.0003	18.8	.07
2.63	.9704	.0029	.0003	13.2	.07
2.65	.9766	.0032	.0003	9.0	.08
2.67	.9829	.0036	.0003	5.9	.08
2.69	.9892	.0039	.0004	3.8	.08
2.71	.9955	.0043	.0004	2.4	.08
2.73	1.0017	.0047	.0004	1.5	.09
2.75	1.0080	.0051	.0004	.9	.09
2.77	1.0143	.0056	.0004	.5	.09
2.79	1.0206	.0060	.0004	.3	.10
2.81	1.0268	.0065	.0005	.2	.10
2.83	1.0331	.0069	.0005	.1	.11
2.85	1.0394	.0074	.0005	.0	.11
3.40	1.1840	.0232	.0007	.0	.17
3.42	1.1890	.0238	.0007	.0	.18
3.44	1.1940	.0245	.0007	.0	.18
3.46	1.1990	.0253	.0007	.0	.18
3.48	1.2040	.0260	.0007	.0	.18
3.50	1.2090	.0267	.0007	.0	.19
3.52	1.2125	.0272	.0005	.0	.19
3.54	1.2159	.0277	.0005	.0	.19
3.56	1.2194	.0282	.0005	.0	.18
3.58	1.2228	.0288	.0005	.0	.18
3.60	1.2263	.0293	.0005	.0	.17
3.62	1.2297	.0298	.0005	.0	.16

PROJECT : VALLEY CAMP 10-YR 6-HR PEAK FLOW CHANNEL ~~UD-4~~ UDD-4
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.64	1.2332	.0303	.0005	.0	.16

HYDROGRAPH PEAK= .19 cfs
TIME TO PEAK= 3.52 Hours
RUNOFF VOLUME= .04 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 24-HR PEAK FLOW CHANNEL ~~UD-5~~ UDO-5

AREA= 7.2 ACRES
AVERAGE BASIN SLOPE= 28.0 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 2.45 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 1100. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0961 HOURS QPCFS= 56.66 CFS QPIN= 7.8043 INCHES
C3= 38.4674 ITERATIONS= 8 SCS 24-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.57	.8239	.0000	.0000	.0	.00
11.59	.8596	.0000	.0000	2.8	.00
11.61	.8954	.0003	.0003	17.6	.00
11.63	.9312	.0013	.0009	37.6	.00
11.65	.9670	.0027	.0015	52.0	.03
11.67	1.0028	.0048	.0020	56.7	.08
11.69	1.0386	.0074	.0026	53.1	.17
11.70	1.0744	.0105	.0031	44.8	.28
11.72	1.1101	.0141	.0036	35.0	.42
11.74	1.1459	.0182	.0041	25.9	.57
11.76	1.1817	.0229	.0046	18.2	.75
11.78	1.2175	.0280	.0051	12.4	.93
11.80	1.2533	.0335	.0056	8.2	1.11
11.82	1.2891	.0395	.0060	5.2	1.30
11.84	1.3249	.0460	.0065	3.3	1.48
11.86	1.3607	.0529	.0069	2.0	1.67
11.88	1.3964	.0603	.0073	1.2	1.85
11.90	1.4322	.0680	.0078	.7	2.03
11.92	1.4680	.0762	.0082	.4	2.20
11.94	1.5038	.0848	.0086	.3	2.37
11.95	1.5396	.0937	.0090	.1	2.54
11.97	1.5754	.1031	.0093	.0	2.70
11.99	1.6112	.1128	.0097	.0	2.86
12.01	1.6286	.1177	.0049	.0	3.00
12.03	1.6354	.1196	.0019	.0	3.05
12.05	1.6422	.1215	.0019	.0	2.95
12.07	1.6490	.1235	.0019	.0	2.69
12.09	1.6558	.1254	.0020	.0	2.35
12.11	1.6625	.1274	.0020	.0	1.99
12.13	1.6693	.1294	.0020	.0	1.66
12.15	1.6761	.1314	.0020	.0	1.39

HYDROGRAPH PEAK= 3.05 cfs
TIME TO PEAK= 12.03 Hours
RUNOFF VOLUME= .26 Acre-Feet

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL ~~UD-5~~ UDD-5

AREA= 7.2 ACRES
AVERAGE BASIN SLOPE= 28.0 PERCENT
CURVE NUMBER= 70.0
DESIGN STORM= 1.55 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1100. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0961 HOURS QPCFS= 56.66 CFS QPIN= 7.8043 INCHES
C3= 38.4674 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.42	.8401	.0000	.0000	.0	.00
2.44	.8622	.0000	.0000	2.8	.00
2.46	.8842	.0002	.0002	17.6	.00
2.48	.9063	.0006	.0004	37.6	.00
2.50	.9283	.0012	.0006	52.0	.02
2.52	.9355	.0014	.0002	56.7	.03
2.54	.9415	.0016	.0002	53.1	.06
2.56	.9474	.0019	.0002	44.8	.08
2.58	.9534	.0021	.0003	35.0	.09
2.59	.9593	.0024	.0003	25.9	.09
2.61	.9653	.0027	.0003	18.2	.10
2.63	.9713	.0030	.0003	12.4	.10
2.65	.9772	.0033	.0003	8.2	.10
2.67	.9832	.0036	.0003	5.2	.10
2.69	.9891	.0039	.0003	3.3	.11
2.71	.9951	.0043	.0004	2.0	.11
2.73	1.0010	.0047	.0004	1.2	.11
2.75	1.0070	.0051	.0004	.7	.12
2.77	1.0130	.0055	.0004	.4	.12
2.79	1.0189	.0059	.0004	.3	.13
2.81	1.0249	.0063	.0004	.1	.13
2.83	1.0308	.0068	.0004	.0	.14
3.40	1.1847	.0233	.0006	.0	.23
3.42	1.1894	.0239	.0007	.0	.23
3.44	1.1942	.0246	.0007	.0	.23
3.46	1.1990	.0252	.0007	.0	.24
3.48	1.2037	.0259	.0007	.0	.24
3.50	1.2085	.0266	.0007	.0	.24
3.52	1.2119	.0271	.0005	.0	.25
3.54	1.2152	.0276	.0005	.0	.25
3.56	1.2185	.0281	.0005	.0	.24
3.57	1.2218	.0286	.0005	.0	.23
3.59	1.2250	.0291	.0005	.0	.22
3.61	1.2283	.0296	.0005	.0	.21

PROJECT : VALLEY CAMP 10-YR, 6-HR PEAK FLOW CHANNEL ~~UD-5~~ UDD-5
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
3.63	1.2316	.0301	.0005	.0	.21

HYDROGRAPH PEAK= .25 cfs
TIME TO PEAK= 3.52 Hours
RUNOFF VOLUME= .06 Acre-Feet

HANSEN ALLEN & LUCE inc

CLIENT: VALLEY CAMP
PROJECT: PERMIT
FEATURE: UNDISTURBED DITCHES
PROJECT NO.:

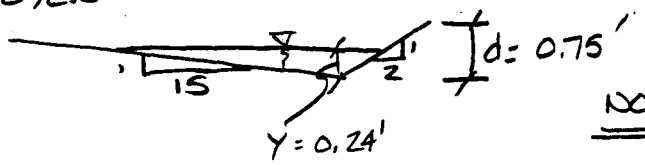
SHEET 1 OF
COMPUTED DEH
CHECKED
DATE 2 MAY 89

UDD-1

ALL DESIGNS TO BE COMPLETED ACCORDING TO 30CFR REQUIREMENT OF A 10-YR-6HR EVENT AND AS PENDING IN NEW UTAH REG'S.

COMPUTER CALC'S SHOWN ON ATTACHED SHEETS (SHEET 2)

$S_{min} = 2\%$ $\eta = .03$ $M_1 = 15$ freeboard = 0.5'
$S_{max} = 20\%$ (field) $b = 0$ $M_2 = 2$
30% (off Map)
$Q_{design} = 0.84$ cfs



NO LINING REQ'd

UDD-2

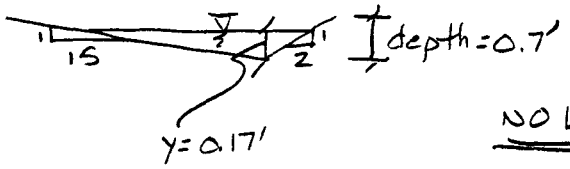
$Q_{design} = 0.57$ cfs

Try Triangular Section. $b = 0$ $S_{min} = 7\%$ > from Mapping
$\eta = .03$ $S_{max} = 23\%$ >
$m_1 = m_2 = 2$ freeboard = 0.5'

Velocity Check on Sheet 3 Shows vel > 5.0'

Change to Road Style design - (SHEET 3)

$b = 0$ $\eta = .03$
$M_1 = 15$ $S_{min} = 0.07$
$M_2 = 2$ $S_{max} = 0.23$

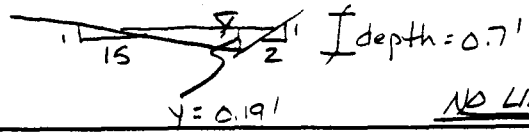


NO LINING REQ'd

UDD-3 $Q_{design} = 0.85$ cfs

$S_{min} = 7\%$ > from Mapping $b = 0$ freeboard = 0.5'
$S_{max} = 20\%$ > $M_1 = 15$
$M_2 = 2$

Use Road Style Design (SHEET 4)



NO LINING REQ'd

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	03-May-89
Project No.:	007.11.100	Time:	10:13 AM
Channel Section:	UDD-1 - Trial 1	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.84	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:	0.30	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.24	feet
	Qn/1.49(S)1/2=	0.120	
	A(R)2/3=	0.119	
	Required Depth:	0.74	feet
	Area:	0.49	ft2
	Perimeter:	4.16	feet
	Hydraulic Radius:	0.12	feet
	Velocity:	1.70	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.15	feet
	Qn/1.49(S)1/2=	0.031	
	A(R)2/3=	0.031	
	Required Depth:	0.65	feet
	Area:	0.18	ft2
	Perimeter:	2.50	feet
	Hydraulic Radius:	0.07	feet
	Velocity:	4.70	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:	0.30	ft/ft
	Channel Depth:	0.74	feet
	Riprap:	Not Needed	

Comment:

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	02-May-89
Project No.:	007.11.100	Time:	02:39 PM
Channel Section:	UDD-2 - Trail 2	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.57	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:	0.07	ft/ft
	Max. Bottom Slope:	0.23	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.17	feet
	Qn/1.49(S)1/2=	0.043	
	A(R)2/3=	0.043	
	Required Depth:	0.67	feet
	Area:	0.23	ft2
	Perimeter:	2.85	feet
	Hydraulic Radius:	0.08	feet
	Velocity:	2.46	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.13	feet
	Qn/1.49(S)1/2=	0.024	
	A(R)2/3=	0.023	
	Required Depth:	0.63	feet
	Area:	0.14	ft2
	Perimeter:	2.25	feet
	Hydraulic Radius:	0.06	feet
	Velocity:	3.97	ft/sec
	Riprap Ck (V<5?):	Not Needed	

DESIGN CRITERIA:

Side Slope 1:	15.0	1/m1
Side Slope 2:	2.0	1/m2
Min. Bottom Slope:	0.07	ft/ft
Max. Bottom Slope:	0.23	ft/ft
Channel Depth:	0.7	feet
Riprap:	Not Needed	

Comment: Channel Velocities < 5.0 fsp.
Design OK

Trapezoidal Channel Flow Calculations using Mannings Equation

Client:	Valley Camp Coal Company	Date:	02-May-89
Project No.:	007.11.100	Time:	03:33 PM
Channel Section:	UDD-3 - Trial 1	Computed:	DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.85	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:	0.07	ft/ft
	Max. Bottom Slope:	0.20	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.19	feet
	Qn/1.49(S)1/2=	0.065	
	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:	2.71	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.16	feet
	Qn/1.49(S)1/2=	0.038	
	A(R)2/3=	0.038	
	Required Depth:	0.66	feet
	Area:	0.21	ft2
	Perimeter:	2.71	feet
	Hydraulic Radius:	0.08	feet
	Velocity:	4.06	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:	0.07	ft/ft
	Max. Bottom Slope:	0.20	ft/ft
	Channel Depth:	0.69	feet
	Riprap:	Not Needed	

Comment: Build channel on existing scar

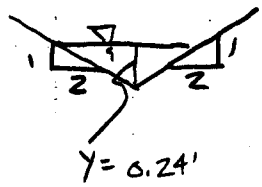
UDD-4

Qdesign = 0.19 cfs

b = 0
$M_1 = M_2 = 2$

$S_{min} = 2\%$, $S_{max} = 13\%$ } From Mapping

USE DITCH STYLE DESIGN (SHEET 6)



depth = 0.75'

NO LINING REQ'd

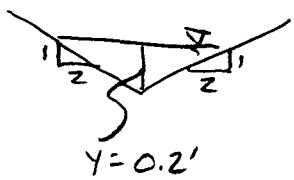
UDD-5

Qdesign = 0.25 cfs

b = 0
$M_1 = M_2 = 2$

$S_{min} = 12\%$, $S_{max} = 25\%$ } From Mapping

USE DITCH STYLE DESIGN (SHEET 7)



depth = 0.7'

NO LINING REQ'd

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company — Date: 02-May-89
Project No.: 007.11.100 — Time: 03:41 PM
Channel Section: UDD-4 - Trial 1 — Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.19	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:	0.13	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.24	feet
	Qn/1.49(S)1/2=	0.027	
	A(R)2/3=	0.027	
	Required Depth:	0.74	feet
	Area:	0.12	ft2
	Perimeter:	1.08	feet
	Hydraulic Radius:	0.11	feet
	Velocity:	1.62	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.18	feet
	Qn/1.49(S)1/2=	0.011	
	A(R)2/3=	0.011	
	Required Depth:	0.68	feet
	Area:	0.06	ft2
	Perimeter:	0.78	feet
	Hydraulic Radius:	0.08	feet
	Velocity:	3.10	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:	0.13	ft/ft
	Channel Depth:	0.74	feet
	Riprap:	Not Needed	

Comment:

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp Coal Company
Project No.: 007.11.100
Channel Section: UDD-5 - Trial 1

Date: 02-May-89
Time: 03:56 PM
Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	0.25	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:	0.12	ft/ft
	Max. Bottom Slope:	0.25	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. Flow):	0.20	feet
	Qn/1.49(S)1/2=	0.015	
	A(R)2/3=	0.015	
	Required Depth:	0.70	feet
	Area:	0.08	ft2
	Perimeter:	0.87	feet
	Hydraulic Radius:	0.09	feet
	Velocity:	3.29	ft/sec
	Riprap Ck (V<5?):	Not Needed	
CALCULATION: (Velocity Check)	Depth (Max. Flow):	0.17	feet
	Qn/1.49(S)1/2=	0.010	
	A(R)2/3=	0.010	
	Required Depth:	0.67	feet
	Area:	0.06	ft2
	Perimeter:	0.76	feet
	Hydraulic Radius:	0.08	feet
	Velocity:	4.33	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:	0.12	ft/ft
	Max. Bottom Slope:	0.25	ft/ft
	Channel Depth:	0.70	feet
	Riprap:	Not Needed	

Comment:

HANSEN ALLEN & LUCE INC

CLIENT: Valley Camp
PROJECT: Permit Response
FEATURE:
PROJECT NO.: 007.11.200

SHEET 1 OF 2
COMPUTED: DEH
CHECKED:
DATE: 2 NOV 89

SAE's

SAE's Changed to ASCA's according to new DOGM Policy clarification.

ASCA #3 is dropped - Area has been added to Pond 3

AREA OF ASCA #3 = 0.11 ac

TOTAL AREA CONTAINED BY PONDS = 62.83 ac

POND	AREA
001A	11.53
2A	7.12
3A	7.08
4A	37.10
	62.83 ac

$$Q(in) = \frac{(P-0.2S)^2}{P+0.8S}$$

$$CN = \frac{1000}{10+S}$$

TRIBUTARY AREA FOR ASCA's

ASCA #	AREA Paved	Disturbed	Sage/Grass	Forest	TOTAL
1	—	1.13	—	—	1.13
2	0.11	1.00	—	—	1.11
3	0.75	0.87	—	0.5	2.12
4	—	0.19	—	—	0.19
5	—	1.16	—	—	1.16
6	—	0.95	—	—	0.95

Curve Numbers:

PAVED	= 98
DISTURBED	= 90
SAGE/GRASS	= 75
FOREST	= 70

$P_{10YR-24HR} = 2.45$ in

VOL = Q * AREA

Q = .15 Runoff Depth

ASCA #	Paved Area Q(in)	Vol(AF)	Dist. Area Q(in)	Vol(AF)	Sage/Grass Q(in)	Vol(AF)	Forest Area Q(in)	Vol(AF)	Runoff Vol (Ac-Ft)
1	2.22	—	1.49	0.14	—	—	—	—	0.14
2	2.22	0.02	1.49	0.12	—	—	—	—	0.14
3	2.22	0.14	[illegible]	0.11	—	—	0.13	0.02	0.27
4	2.22	—	1.49	0.02	—	—	—	—	0.02
5	2.22	—	1.49	0.14	—	—	—	—	0.14
6	2.22	—	1.49	0.12	—	—	—	—	0.12

HANSEN ALLEN & LUCE INC

CLIENT: VALLEY CAMP
PROJECT:
FEATURE:
PROJECT NO. 007.11.200

SHEET 2 OF 2
COMPUTED DEH
CHECKED
DATE 2 NOV 89

RUNOFF VOLUME INCLUDING TRIBUTARY AREAS

ASCA#	PAVED	DISTURBED	SAGE/GRASS	FOREST/ASPEN	TOTAL
1	—	1.13	—	—	1.13
2	0.60	1.00	—	—	1.60
3	0.75	0.87	—	0.50	2.12
4	—	0.19	—	0.37	0.56
5	—	1.16	—	—	1.16
6	—	0.95	1.00	1.34	3.29

ASCA#	PAVED		DISTURBED		SAGE/GRASS		FOREST/ASPEN		TOTAL RUNOFF VOLUME ac-ft
	Q (in)	Vol (ac-ft)	Q (in)	Vol (ac-ft)	Q (in)	Vol (ac-ft)	Q (in)	Vol (ac-ft)	
1	2.22	—	1.49	0.14	0.62	—	0.43	—	0.14
2	"	0.11	"	0.12	"	—	"	—	0.23
3	"	0.14	"	0.11	"	—	"	0.02	0.27
4	"	—	"	0.02	"	—	"	0.01	0.03
5	"	—	"	0.14	"	—	"	—	0.14
6	"	—	"	0.12	"	0.05	"	0.05	0.22

PERCENT AREA AS ASCA = $\frac{6.66 \text{ ac}}{62.83 \text{ ac}} * 100 = 10.6\%$

TOTAL POND RUNOFF VOLUME

POND #	10-YR, 24-Hr Volume (ac-ft)
001A	1.18
002A	0.94
003A	0.67
004A	3.15
TOTAL	5.94

ASCA Runoff Vol. as a % of Total Pond Runoff Vol = $\frac{0.83}{5.94} * 100 = 14.0\%$

APPENDIX R614-301-750

NPDES Discharge Permit

HANSEN ALLEN & LUCE inc

191999

Permit No.: UT-0022985

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
DENVER PLACE
999 18TH STREET, SUITE 500
DENVER, COLORADO 80202-2405

AUTHORIZATION TO DISCHARGE UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. §1251 et seq; the "Act"),

Valley Camp of Utah, Inc.,

is authorized to discharge from a facility located in Sections 8, 17, and 30 of Township 13 South, Range 7 East, Carbon County, Utah,

to receiving waters named Pleasant Valley Creek and Whiskey Creek, both tributaries to the Price River,

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective March 1, 1988.

This permit and the authorization to discharge shall expire at midnight, July 31, 1992.

Signed this 8th day of February 1988.

Authorized Permitting Official

Max H. Dodson
Director
Water Management Division
Title

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I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Definitions.

1. The "30-day (and monthly) average," other than for fecal coliform bacteria and total coliform bacteria, is the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria and total coliform bacteria. The calendar month shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms.

2. The "7-day (and weekly) average," other than for fecal coliform bacteria and total coliform bacteria, is the arithmetic mean of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria and total coliform bacteria. The 7-day and weekly averages are applicable only to those effluent characteristics for which there are 7-day average effluent limitations. The calendar week which begins on Sunday and ends on Saturday, shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms. Weekly averages shall be calculated for all calendar weeks with Saturdays in the month. If a calendar week overlaps two months (i.e., the Sunday is in one month and the Saturday in the following month), the weekly average calculated for that calendar week shall be included in the data for the month that contains the Saturday.

3. "Daily Maximum" ("Daily Max.") is the maximum value allowable in any single sample or instantaneous measurement.

4. "Composite samples" shall be flow proportioned. The composite sample shall, as a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six (6) hours nor more than 24 hours. Acceptable methods for preparation of composite samples are as follows:

   a. Constant time interval between samples, sample volume proportional to flow rate at time of sampling;

   b. Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at the time the sample was collected may be used;

A. Definitions (Continued)

c. Constant sample volume, time interval between samples proportional to flow (i.e., sample taken every "X" gallons of flow); and,

d. Continuous collection of sample, with sample collection rate proportional to flow rate.

5. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

6. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.

7. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

8. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

9. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

10. "Active mining area" means the areas on and beneath land used or disturbed in activity related to the extraction, removal, or recovery of coal from its natural deposits. This term excludes coal preparation plants, coal preparation plant associated areas and post-mining areas.

11. "Reclamation area" means the surface area of a coal mine which has been returned to required contour and on which revegetation (specifically, seeding or planting) work has commenced.

A. Definitions (Continued)

12. The term "10-year, 24-hour precipitation event" shall mean the maximum 24-hour precipitation event with a probable reoccurrence interval of once in 10 years as defined by the National Weather Service and Technical Paper No. 40, "Rainfall Frequency Atlas of the U.S.," May 1961, and subsequent amendments or equivalent regional or rainfall probability information develped therefrom.

13. The term "coal preparation plant" means a facility where coal is crushed, screened, sized, cleaned, dried, or otherwise prepared and loaded for transit to a consuming facility.

14. The term "coal preparation plant associated areas" means the coal preparation plant yards, immediate access roads, coal refuse piles, and coal storage piles and facilities.

15. The term "settleable solids" is that matter measured by the volumetric method specified below:

The following procedure is used to determine settleable solids:

Fill an Imhoff cone to the one-liter mark with a thoroughly mixed sample. Allow to settle undisturbed for 45 minutes. Gently stir along the inside surface of the cone with a stirring rod. Allow to settle undisturbed for 15 minutes longer. Record the volume of settled material in the cone as milliliters per liter. Where a separation of settleable and floating material occurs, do not include the floating material in the reading.

16. "Director" means Director of the United States Environmental Protection Agency's Water Management Division.

17. "EPA" means the United States Environmental Protection Agency.

18. Acute toxicity occurs when 20 percent or more mortality is observed for either test species at any effluent concentration. Mortality in the control must simultaneously be 10 percent or less for the results to be considered valid.

19. Outfall Description: Outfalls 001, 002, and 003 discharge intermittently from surface runoff settling ponds adjacent to the train loadout facility into Pleasant Valley Creek; 004 discharges intermittently from a surface runoff settling pond adjacent to the mine into Whiskey Creek and 005 discharges into Whiskey Creek from a filter pond which receives mine water from underground operations.

B. Specific Limitations and Self-Monitoring Requirements

1. During the period beginning immediately and lasting through June 30, 1992, the permittee is authorized to discharge from Outfalls 001, 002, 003, 004 and 005 associated with active mining operations indicated on the area maps submitted and approved pursuant to Part IV, Q.1. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations			Monitoring Requirements	
	30-Day Average a/	7-Day Average a/	Daily Maximum a/	Measurement Frequency	Sample Type a/
Flow, gpd	N/A	N/A	N/A	2 x Month	Measured a/ c/
Total Suspended Solids, mg/L	25	35	70	2 x Month	Grab
Total Iron, mg/L	N/A	N/A	2.0 b/	Monthly	Grab
Total Dissolved Solids, mg/L	N/A	N/A	700 d/	Monthly	Grab

Oil and Grease shall not exceed 10 mg/L and shall be monitored monthly by a grab sample.

The pH shall not be less than 6.5 standard units nor greater than 9.0 standard units and shall be monitored monthly by grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge of sanitary wastes.

2. See Schedule of Compliance. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at any point which is representative of each discharge prior to its mixing with the receiving stream and as indicated by the solid triangles on the current area maps submitted pursuant to Part IV, P.1.

a/ See Definitions, Part I.A. for definition of terms.

b/ If any Iron analysis exceeds this limitation, the State of Utah and the permittee shall review the actions necessary to achieve compliance with the limitation and the continued appropriateness of the limitation. In no event shall the discharge exceed a daily maximum limitation for Total Iron of seven (7) milligrams per liter.

c/ For the intermittent discharges, the duration of the discharge shall be reported.

d/ The total amount of Total Dissolved Solids (TDS) discharged from all outfalls is limited to one ton (2,000 pounds) per day of TDS.

B. Specific Limitations and Self-Monitoring Requirements (Active Mining Operations) (Continued)

3. Effective July 1, 1991, there shall be no acute toxicity in the discharge from outfall 005, the mine water filter pond discharge. (See Acute Toxicity definition Part I.A.)

4. Any overflow, increase in volume of a discharge or discharge from a bypass system caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the following limitation instead of the Total Suspended Solids limitations contained in Part I, B.1.

Effluent Characteristic	Daily Maximum
Settleable Solids	0.5 mL/L

Settleable Solids shall be monitored weekly during periods of precipitation.

5. Any overflow, increase in volume of a discharge or discharge from a bypass system caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the following limitations instead of the otherwise applicable limitations:

The pH shall not be less than 6.5 standard units nor greater than 9.0 standard units.

6. The operator shall have the burden of proof that the discharge or increase in discharge was caused by the applicable precipitation event described in Parts I, B.4. and B.5. The alternate limitations in Parts I, B.4. and B.5. shall not apply to treatment systems that treat underground mine water only.

B. Specific Limitations and Self-Monitoring Requirements

7. Whole Effluent Testing

Starting in the fourth quarter of calendar year 1988, the permittee shall, once each calendar quarter, conduct acute static replacement toxicity tests on a grab sample of the final effluent of outfall 005.

The replacement static toxicity tests shall be conducted in general accordance with the procedures set out in the latest revision of "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms", EPA-600/4-85-013 (Rev. March 1985) and the "Region VIII EPA NPDES recommended acute test conditions". The permittee shall conduct an acute 48-hour static toxicity test using Ceriodaphnia sp. and an acute 96-hour static replacement toxicity test using fathead minnows five days (± 2 days) of age. After each 24 hours of the test period, the dilutions shall be replaced with freshly prepared dilutions of the original effluent sample. If more than 10 percent control mortality occurs, the test shall be repeated until satisfactory control survival is achieved.

If acute toxicity occurs in a routine test, an additional test shall be conducted within four weeks of the date of the initial sample. Should acute toxicity occur in the second test, testing shall occur once a month until further notified by the permit issuing authority.

Test results shall be reported along with the Discharge Monitoring Report (DMR) submitted for the end of the reporting calendar quarter (e.g., biomonitoring results for the calendar quarter ending March 31 shall be reported with the DMR due April 28, with the remaining biomonitoring reports submitted with DMRs due each July 28, October 28, and January 28). The format for the report shall be consistent with the February 1987 Region VIII Guidance for Biomonitoring Reporting, or its latest revision, and shall include all chemical and physical data as specified for the tests. If monthly testing is implemented, results shall be submitted with each monthly discharge monitoring report (e.g., the DMR and toxicity testing data for each month would be due by the 28th day of the following month).

If the results for the first four consecutive quarters of testing indicate no acute toxicity, the permittee may request the permit issuing authority to allow a reduction to quarterly acute toxicity testing on only one species. The permittee is to specify which species would be used in the testing. The permit issuing authority may approve or deny the request based on the biomonitoring results and other available information without an additional public notice. If the request is approved, the test procedures are to be the same as specified above for the test species.

B. Specific Limitations and Self-Monitoring Requirements

8. Toxicity Reduction Evaluation (TRE)

If acute toxicity is detected prior to July 1, 1991, and it is determined by the permit issuing authority that a TRE is necessary, the permittee shall be so notified and shall initiate a TRE immediately thereafter. The purpose of the TRE will be to establish the cause of the toxicity, locate the source(s) of the toxicity, and control or provide treatment for the toxicity prior to the deadline for compliance contained in Part I.B.3. of this permit.

If the TRE establishes that the toxicity cannot be eliminated by the deadline contained in this permit, the permittee shall submit a proposed compliance plan to the permit issuing authority. The plan shall include the proposed approach to control toxicity and a proposed compliance schedule for achieving control. If the approach and schedule are acceptable to the permit issuing authority, this permit may be reopened and modified.

If the TRE shows that the toxicity is caused by a toxicant(s) that may be controlled with specific numerical limitations, the permittee may:

a. Submit an alternative control program for compliance with the numerical requirements.

b. If necessary, provide a modified biomonitoring protocol which compensates for the pollutant(s) being controlled numerically.

If acceptable to the permit issuing authority, this permit may be reopened and modified to incorporate any additional numerical limitations, a modified compliance schedule if judged necessary by the permit issuing authority, and/or a modified biomonitoring protocol.

Failure to conduct an adequate TRE, or failure to submit a plan or program as described above, or the submittal of a plan or program judged inadequate by the permit issuing authority, shall in no way relieve the permittee from the deadline for compliance contained in Part I.B.3. of this permit.

B. Specific Limitations and Self-Monitoring Requirements

9. Schedule of Compliance

a. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

(1) If there are any changes, corrections, or other modifications or adjustments of the location of the point source discharges, the Permittee shall submit a revised Area Map(s) as described in Part IV.Q. Such maps must be submitted 60 days prior to commencement of the discharge.

(2) If the required biomonitoring establishes toxicity, as determined by the permit issuing authority, an elimination of whole effluent toxicity must be achieved by July 1, 1991.

II. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling. Samples taken in compliance with the monitoring requirements established under Part I shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge.

B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

C. Penalties for Tampering. The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both.

D. Reporting of Monitoring Results. Effluent monitoring results obtained during the previous month shall be summarized and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. If no discharge occurs during the reporting period, "no discharge" shall be reported. Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with the requirements of Signatory Requirements (see Part IV), and submitted to the Director, Water Management Division and the State agency at the following addresses:

original to: United States Environmental Protection Agency
Region VIII
Denver Place
999 18th Street, Suite 500
Denver, Colorado 80202-2405

Attention: Water Management Division
Compliance Branch (8WM-C)

copy to: Utah Department of Health
Bureau of Water Pollution Control
P.O. Box 16690
Salt Lake City, Utah 84116-0690

E. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. Additional Monitoring by the Permittee. If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such increased frequency shall also be indicated.

G. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The individual(s) who performed the analyses;
5. The analytical techniques or methods used; and,
6. The results of such analyses.

H. Retention of Records. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time. Data collected on site, copies of Discharge Monitoring Reports, and a copy of this NPDES permit must be maintained on site during the duration of activity at the permitted location.

I. Twenty-four Hour Notice of Noncompliance Reporting.

1. The permittee shall report any noncompliance which may seriously endanger health or the environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the EPA, Region VIII, Emergency Response Branch at (303) 293-1788.

2. The following occurrences of noncompliance shall be reported by telephone to the EPA, Region VIII, Compliance Branch at (303) 293-1589 by the first workday (8:00 a.m. - 4:30 p.m. Mountain Time) following the day the permittee became aware of the circumstances:

   a. Any unanticipated bypass which exceeds any effluent limitation in the permit (See Part III.G., Bypass of Treatment Facilities.);

   b. Any upset which exceeds any effluent limitation in the permit (See Part III.H., Upset Conditions.); or,

c. Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit to be reported within 24 hours.

3. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. The period of noncompliance, including exact dates and times;

   c. The estimated time noncompliance is expected to continue if it has not been corrected; and,

   d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

4. The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Compliance Branch, Water Management Division, Denver, Colorado, by phone, (303) 293-1589.

5. Reports shall be submitted to the addresses in Part II.D., Reporting of Monitoring Results.

J. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D. are submitted. The reports shall contain the information listed in Part II.I.2.

K. Inspection and Entry. The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

III. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions. The Act provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a civil penalty not to exceed $25,000 per day of such violation. Any person who willfully or negligently violates permit conditions implementing Sections 301, 302, 306, 307, or 308 of the Act is subject to a fine of not less than $5,000, nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both. Except as provided in permit conditions on Part III.G., Bypass of Treatment Facilities and Part III.H., Upset Conditions, nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit. However, the permittee shall operate, as a minimum, one complete set of each main line unit treatment process whether or not this process is needed to achieve permit effluent compliance.

F. Removed Substances. Collected screenings, grit, solids, sludges, or other pollutants removed in the course of treatment shall be buried or disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge/digestor supernatant and filter backwash shall not directly enter either the final effluent or waters of the United States by any other direct route.

G. Bypass of Treatment Facilities:

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2. and 3. of this section. Return of removed substances, as described in Part III.F., to the discharge stream shall not be considered a bypass under the provisions of this paragraph.

2. Notice:

   a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 60 days before the date of the bypass.

   b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.I., Twenty-four Hour Reporting.

3. Prohibition of bypass.

   a. Bypass is prohibited and the Director may take enforcement action against a permittee for a bypass, unless:

      (1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

      (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and,

      (3) The permittee submitted notices as required under paragraph 2. of this section.

   b. The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in paragraph 3.a. of this section.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of paragraph 2. of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred and that the permittee can identify the cause(s) of the upset;

   b. The permitted facility was at the time being properly operated;

   c. The permittee submitted notice of the upset as required under Part II.I., Twenty-four Hour Notice of Noncompliance Reporting; and,

   d. The permittee complied with any remedial measures required under Part III.D., Duty to Mitigate.

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

I. Toxic Pollutants. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

J. Changes in Discharge of Toxic Substances. Notification shall be provided to the Director as soon as the permittee knows of, or has reason to believe:

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. One hundred micrograms per liter (100 ug/L);

   b. Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2,4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

   c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or,

   d. The level established by the Director in accordance with 40 CFR 122.44(f).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. Five hundred micrograms per liter (500 ug/L);

   b. One milligram per liter (1 mg/L) for antimony:

   c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or,

   d. The level established by the Director in accordance with 40 CFR 122.44(f).

IV. GENERAL REQUIREMENTS

A. Planned Changes. The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source as determined in 40 CFR 122.29(b); or,

2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under Part IV.A.1.

B. Anticipated Noncompliance. The permittee shall give advance notice of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

C. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application should be submitted at least 180 days before the expiration date of this permit.

E. Duty to Provide Information. The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

F. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Director, it shall promptly submit such facts or information.

G. Signatory Requirements. All applications, reports or information submitted to the Director shall be signed and certified.

1. All permit applications shall be signed as follows:

   a. For a corporation: by a responsible corporate officer;

   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;

   c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to the Director, and,

   b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph IV.G.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph IV.G.2. must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports. The Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both.

I. Availability of Reports. Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Director. As required by the Act, permit applications, permits and effluent data shall not be considered confidential.

J. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

K. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

L. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers. This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Director at least 30 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2. above.

N. State Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

K. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

L. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers. This permit may be automatically transferred to a new permittee if:

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3. The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2. above.

N. State Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

O. Water Quality Standard Requirement - Reopener Provision
This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations and compliance schedule, if necessary, if one or more of the following events occurs:

1. Water Quality Standards for the receiving water(s) to which the permittee discharges are modified in such a manner as to produce different effluent limits than contained in this permit.

2. A final wasteload allocation is developed and approved by the State and/or EPA for incorporation in this permit.

3. A revision to the current 208 plan is approved and adopted which calls for different effluent limitations than contained in this permit.

P. Toxicity Limitation-Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include a new compliance date, additional or modified numerical limitations, a new or different compliance schedule, a change in the biomonitoring protocol, or any other conditions related to the control of toxicants if one or more of the following events occur:

a. Toxicity was detected late in the life of the permit near or past the deadline for compliance.

b. The TRE results indicate that compliance with the toxic limits will require an implementation schedule past the date for compliance and the permit issuing authority agrees with the conclusion.

c. The TRE results indicate that the toxicant(s) represent pollutant(s) that may be controlled with specific numerical limits, and the permit issuing authority agrees that numerical controls are the most appropriate course of action.

d. Following the implementation of numerical controls on toxicants, the permit issuing authority agrees that a modified biomonitoring protocol is necessary to compensate for those toxicants that are controlled numerically.

e. The TRE reveals other unique conditions or characteristics which, in the opinion of the permit issuing authority, justify the incorporation of unanticipated special conditions in the permits.

Q. OTHER REQUIREMENTS

1. Area Maps (Active Mining Operations)

a. Facilities which have already identified the location of each discharge need not submit an area map.

b. The permittee shall submit revised Area Map(s) to show any changes, corrections, or other modifications or adjustments of the location of the point source discharges. The purpose of this requirement is to assure that the Regional Administrator and the State of Utah are kept fully advised as to the current location of such discharges.

c. The revised Area Map(s) shall be submitted in the form specified below and shall be made from USGS topographical maps (7.5 or 15-minute series) or other appropriate sources as approved by the Regional Administrator or his designee. Each revised Area Map shall be 8 1/2 inches by 11 inches and shall be in black and white suitable to produce readable copies by rapid printing methods (Xerox, Dennison, Offset printing, etc.) or as approved by the Regional Administrator or his designee. Where additional 8 1/2 inch by 11 inch maps are required to show the area of operation, they shall be numbered and a key shall be shown on the first map. The first map section shall have the company name, mine/job name, address, and NPDES number clearly printed thereon. Also, one line of latitude and one line of longitude shall be marked on each map section. The Area Map(s) shall delineate the following, using the graphics as indicated:

(1) Existing Area of Operation _____ (Solid Outline)

(2) Existing point source ▲ (Solid Triangle)

(3) The projected area of operation for the next five years - - - - - - - - - - - - (Dashed Outline)

(4) Project point source for the next five years △ (Opened Triangle)

(5) The monitoring reports must indicate the active-inactive status of all discharge points which are listed on the current area maps. These discharge points shall be assigned numbers 001, 002, 003, etc.

2. Monitoring of a discharge may be terminated if either:

   (a) Sufficient data has been accumulated to show to the satisfaction of the Regional Administrator or his designee that the untreated discharge from an area where active mining has ceased will meet the limitations herein; or,

   (b) The discharge emanates from an area on which the State of Utah has released the grading bond or has taken other similar action.

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