Southeast Phoenix Regional Drainage Basin Project

Quantities and Calculations

City of Phoenix
Street Transportation Department
Project number ST-83120008

Flood Control District of Maricopa County
PCN 630-01-30

August 1999

HDR
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Suite 250
Phoenix, Arizona 85016-3226
(602) 508-6600
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Don Rerick - FCDX

From: Don Rerick - FCDX
Sent: Friday, August 20, 1999 3:06 PM
To: Gary Shapiro - FCDX; Michael Lopez - FCDX
Cc: Kumar Hanumaiah - FCDX; Don Rerick - FCDX
Subject: "Basin 15" Quantities and Calculations Report

I just received the subject submittals for review. These are finals and require review as soon as possible, with **comments provided NLT Sept. 3.**

Only one copy of the report was received, so Engineering will be provided the report with the following sections included:
Hydraulic calcs
Excavation quantity calcs
Structural quantity calcs
Spillway retaining wall structural design calcs
Weir structure design calcs

P&PM will keep the following section from the report -
All other quantity calcs and cost estimates

Thanks.

Southeast Valley Regional Drainage Basin Project

QUANTITIES AND CALCULATIONS REPORT

CONTENTS

HYDRAULIC CALCULATIONS
EXCAVATION QUANTITY CALCULATIONS
PIPE EXCAVATION AND BACKFILL QUANTITIES
LANDSCAPE COST BREAKOUT
PUMP STATION ELECTRICAL AND LIGHTING ESTIMATE
STRUCTURAL QUANTITIES AND COST ESTIMATES
SPILLWAY RETAINING WALL STRUCTURAL DESIGN CALCULATIONS
OVERFLOW WEIR STRUCTURE DESIGN CALCULATIONS

Logan Simpson Design Inc.

July 30, 1999

48th Street Detention Basin

Phoenix, Arizona

Estimate of Probable Cost

90 % Submittal

Item #	Item Description	Qty.	Units	Unit Price	Total
425-1	TOPSOIL	58660	CY	$12.00	$703,920.00
430-1	LANDSCAPE	1	LS	$70,000.00	$70,000.00
430-2	DECOMPOSED GRANITE	67651	SF	$0.40	$27,060.40
430-3	CONCRETE HEADER	5080	LF	$4.50	$22,860.00
430-4	BERMUDA GRASS	36.5	AC	$2,500.00	$91,250.00
430-5	RYE GRASS	36.5	AC	$2,500.00	$91,250.00
440-1	DRIP IRRIGATION SYSTEM	1	LS	$45,000.00	$45,000.00
440-2	TURF IRRIGATION SYSTEM	1	LS	$564,000.00	$564,000.00
		Estimate of Probable Cost			**$1,615,340.40**

HDR: OPINION OF PROBABLE CONSTRUCTION COST

Project Name: 48th Street Detention Basin
Project Location: Arizona
Project Number: 02271-031-096

Prepaired by: Jim Andersen
Date: 08/03/99

Description	1999 RSMeans Reference	Qty	Unit	Materials Unit Price	Materials Amount	Labor Unit Price	Labor Amount	Equipment Unit Price	Equipment Amount	Overhead & Profit Unit Price	Overhead & Profit Amount	Total Unit Price	Total Amount
Power service													
Handhole	167-110-0600	6	ea	335.00	2,010.00	263.00	1,578.00	56.50	339.00	165.50	993.00	820.00	4,920.00
Trenching	022-258-0450	2036	lf		0.00	0.48	977.28	0.22	447.92	0.28	570.08	0.98	1,995.28
Backfill	022-258-1450	2036	lf		0.00	0.95	1,934.20	0.38	773.68	0.59	1,201.24	1.92	3,909.12
6"x6" NEMA 4 Wireway	160-150-0400	15	lf	15.50	232.50	8.50	127.50		0.00	6.00	90.00	30.00	450.00
Junction Box (12"x12"x6")	162-130-2300	1	ea	33.50	33.50	51.00	51.00		0.00	29.50	29.50	114.00	114.00
3" PVC conduit	167-111-1060	372	lf	1.93	717.96	2.13	792.36		0.00	1.24	461.28	5.30	1,971.60
4" PVC conduit (approx for 3-1/2")	167-111-1070	1850	lf	2.64	4,884.00	3.19	5,901.50		0.00	1.82	3,367.00	7.65	14,152.50
3" RGS conduit	160-205-1930	24	lf	10.40	249.60	10.20	244.80		0.00	5.90	141.60	26.50	636.00
2" RGS conduit	160-205-1870	3	lf	4.96	14.88	5.65	16.95		0.00	3.34	10.02	13.95	41.85
Pull cord	167-110-9960	332	lf	0.08	26.56	0.26	86.32		0.00	0.13	43.16	0.47	156.04
Circuit Breaker 480V, 3 phase, 600A	163-205-0800	2	ea	2,175.00	4,350.00	425.00	850.00		0.00	425.00	850.00	3,025.00	6,050.00
Meter Cabinet:													
Socket	163-240-0900	1	ea	755.00	755.00	425.00	425.00		0.00	295.00	295.00	1,475.00	1,475.00
Enclosure	162-130-7150	1	ea	134.00	134.00	232.00	232.00		0.00	124.00	124.00	490.00	490.00
CT installation	163-268-0800	1	ea		0.00	128.00	128.00		0.00	15.36	15.36	143.36	143.36
PT installation	163-268-1300	2	ea		0.00	32.00	64.00		0.00	3.84	7.68	35.84	71.68
Mounting Rack (meter cabinet):													
Equipment pad	033-130-4000	1	cy	113.00	113.00	75.50	75.50		0.00	58.50	58.50	247.00	247.00
Steel support structure	160-320-4100	100	lf	6.50	650.00	5.10	510.00		0.00	3.20	320.00	14.80	1,480.00
Ground rod	161-810-0100	1	ea	29.50	29.50	58.00	58.00		0.00	31.50	31.50	119.00	119.00
350 kcmil XHHW	161-165-3280	7.4	clf	360.00	2,664.00	142.00	1,050.80		0.00	103.00	762.20	605.00	4,477.00
500 kcmil XHHW	161-165-3320	18.7	clf	510.00	9,537.00	160.00	2,992.00		0.00	130.00	2,431.00	800.00	14,960.00
#8 AWG XHHW	161-165-3060	0.1	clf	23.00	2.30	32.00	3.20		0.00	17.50	1.75	72.50	7.25
#2 AWG XHHW (and #3 AWG XHHW)	161-165-3120	19.1	clf	72.50	1,384.75	56.50	1,079.15		0.00	36.00	687.60	165.00	3,151.50
#1 AWG XHHW	161-165-3140	0.47	clf	91.00	42.77	64.00	30.08		0.00	41.00	19.27	196.00	92.12
SUB TOTAL					**27,831.32**		**19,207.64**		**1,560.60**		**12,510.74**		**61,110.30**
Site lighting													
Installed pole	9.2-252-0360	34	ea	1,375.00	46,750.00	880.00	29,920.00		0.00	338.25	11,500.50	2,593.25	88,170.50
150W HPS fixture and 25' steel pole		34	ea	700.00	23,800.00		0.00		0.00	105.00	3,570.00	805.00	27,370.00
Ground rod	161-810-0100	34	ea	29.50	1,003.00	58.00	1,972.00		0.00	31.50	1,071.00	119.00	4,046.00
Trenching	022-258-0450	6895	lf		0.00	0.48	3,309.60	0.22	1,516.90	0.28	1,930.60	0.98	6,757.10
Backfill	022-258-1450	6895	lf		0.00	0.95	6,550.25	0.38	2,620.10	0.59	4,068.05	1.92	13,238.40
Handhole	167-110-0600	7	ea	335.00	2,345.00	263.00	1,841.00	56.50	395.50	165.50	1,158.50	820.00	5,740.00
1-1/2" PVC conduit	167-111-1040	1834	lf	0.75	1,375.50	1.22	2,237.48		0.00	0.68	1,247.12	2.65	4,860.10
1" PVC conduit	167-111-1030	11221	lf	0.46	5,161.66	0.98	10,996.58		0.00	0.54	6,059.34	1.98	22,217.58
#10 AWG XHHW	161-165-3040	315.6	clf	12.60	3,976.94	25.50	8,048.57		0.00	13.90	4,387.26	52.00	16,412.76
#12 AWG XHHW	161-165-3020	120.6	clf	10.00	1,206.30	23.00	2,774.49		0.00	12.50	1,507.88	45.50	5,488.67
SUB TOTAL					**85,618.40**		**67,649.97**		**4,532.50**		**36,500.24**		**194,301.11**
Water Quality Pump Station													
Mounting Rack:													
Equipment pad	033-130-4000	1	cy	113.00	113.00	75.50	75.50		0.00	58.50	58.50	247.00	247.00
Steel support structure	160-320-4100	100	lf	6.50	650.00	5.10	510.00		0.00	3.20	320.00	14.80	1,480.00
Ground rod	161-810-0100	1	ea	29.50	29.50	58.00	58.00		0.00	31.50	31.50	119.00	119.00
Panel DP-101 (225A):	163-245-2600	1	ea	2,450.00	2,450.00	710.00	710.00		0.00	590.00	590.00	3,750.00	3,750.00
20A breaker, 2 pole	163-250-2650	1	ea	108.00	108.00	34.00	34.00		0.00	28.00	28.00	170.00	170.00
20A breaker, 3 pole	163-250-2660	5	ea	158.00	790.00	41.00	205.00		0.00	37.00	185.00	236.00	1,180.00
TVSS		1	ea	4,000.00	4,000.00		0.00		0.00	480.00	480.00	4,480.00	4,480.00
Lighting contactor	163-310-0100	2	ea	167.00	334.00	64.00	128.00		0.00	49.00	98.00	280.00	560.00
Lighting contactor enclosure	162-130-2300	2	ea	33.50	67.00	51.00	102.00		0.00	29.50	59.00	114.00	228.00
VFD (VFD-101,102)	163-140-0130	2	ea	3,675.00	7,350.00	545.00	1,090.00		0.00	610.00	1,220.00	4,830.00	9,660.00
VFD (VFD-103)	163-140-0110	1	ea	2,600.00	2,600.00	455.00	455.00		0.00	470.00	470.00	3,525.00	3,525.00
Power Center - 5KVA		1	ea	1,537.00	1,537.00	300.00	300.00		0.00	275.55	275.55	2,112.55	2,112.55
20A breaker	163-250-0100	6	ea	10.00	60.00	25.50	153.00		0.00	13.50	81.00	49.00	294.00
Junction Box (12"x12"x6")	162-130-2300	4	ea	33.50	134.00	51.00	204.00		0.00	29.50	118.00	114.00	456.00
Float switch assembly													
Switch		3	ea	200.00	600.00	100.00	300.00		0.00	45.00	135.00	345.00	1,035.00
24" pipe, ductile iron	026-666-2180	30	lf	47.00	1,410.00	30.50	915.00		0.00	33.50	1,005.00	111.00	3,330.00
#12 AWG XHHW	161-165-3020	7.05	clf	10.00	70.50	23.00	162.15		0.00	12.50	88.13	45.50	320.78
#10 AWG XHHW	161-165-3040	0.9	clf	12.60	11.34	25.50	22.95		0.00	13.90	12.51	52.00	46.80
#14 AWG XHHW	161-165-3000	20.16	clf	10.40	209.66	19.65	396.14		0.00	10.95	220.75	41.00	826.56
3/4" RGS conduit	160-205-1770	100	lf	1.72	172.00	3.19	319.00		0.00	1.74	174.00	6.65	665.00
1" RGS conduit	160-205-1800	20	lf	2.38	47.60	3.93	78.60		0.00	2.14	42.80	8.45	169.00
1" PVC conduit	167-111-1030	90	lf	0.46	41.40	0.98	88.20		0.00	0.54	48.60	1.98	178.20
Trenching	022-258-0450	286	lf		0.00	0.48	137.28	0.22	62.92	0.28	80.08	0.98	280.28
Backfill	022-258-1450	286	lf		0.00	0.95	271.70	0.38	108.68	0.59	168.74	1.92	549.12
Handhole	167-110-0600	3	ea	335.00	1,005.00	263.00	789.00	56.50	169.50	165.50	496.50	820.00	2,460.00
Canopy Light		4	ea	56.00	224.00	64.00	256.00		0.00	37.00	148.00	157.00	628.00
Cast outlet box	160-250-8300	2	ea	31.50	63.00	23.00	46.00		0.00	14.50	29.00	69.00	138.00
Outlet box cover plate	162-320-4980	1	ea	25.50	25.50	4.25	4.25		0.00	4.75	4.75	34.50	34.50
Swith cover, weatherproof	162-320-3170	1	ea	7.25	7.25	4.25	4.25		0.00	2.85	2.85	14.35	14.35
Receptacle	162-320-2482	1	ea	30.50	30.50	9.45	9.45		0.00	7.05	7.05	47.00	47.00
Light switch	162-320-0500	1	ea	6.30	6.30	9.45	9.45		0.00	0.00	0.00	15.75	15.75
SUB TOTAL					**24,146.55**		**7,833.92**		**341.10**		**6,678.31**		**38,999.89**

Evacuation Pump Station

Mounting Rack:												
Equipment pad	033-130-4000	2	cy	113.00	226.00	75.50	151.00		0.00	58.50	117.00	247.00	494.00
Steel support structure	160-320-4100	200	lf	6.50	1,300.00	5.10	1,020.00		0.00	3.20	640.00	14.80	2,960.00
Ground rod	161-810-0100	1	ea	29.50	29.50	58.00	58.00		0.00	31.50	31.50	119.00	119.00
Panel DP-201 (600A):	163-245-2750	1	ea	4,975.00	4,975.00	1,350.00	1,350.00		0.00	1,150.00	1,150.00	7,475.00	7,475.00
20A breaker, 2 pole	163-250-2650	1	ea	108.00	108.00	34.00	34.00		0.00	28.00	28.00	170.00	170.00
60A breaker, 3 pole	163-250-2660	2	ea	158.00	316.00	41.00	82.00		0.00	37.00	74.00	236.00	472.00
20A breaker, 3 pole	163-250-2660	2	ea	158.00	316.00	41.00	82.00		0.00	37.00	74.00	236.00	472.00
TVSS		1	ea	4,000.00	4,000.00		0.00		0.00	480.00	480.00	4,480.00	4,480.00
Lighting contactor	163-310-0100	2	ea	167.00	334.00	64.00	128.00		0.00	49.00	98.00	280.00	560.00
Lighting contactor enclosure	162-130-2300	2	ea	33.50	67.00	51.00	102.00		0.00	29.50	59.00	114.00	228.00
VFD (VFD-201,202)	163-140-0170	2	ea	7,375.00	14,750.00	1,075.00	2,150.00		0.00	1,300.00	2,600.00	9,750.00	19,500.00
Power Center - 5KVA		1	ea	1,537.00	1,537.00	300.00	300.00		0.00	275.55	275.55	2,112.55	2,112.55
20A breaker	163-250-0100	6	ea	10.00	60.00	25.50	153.00		0.00	13.50	81.00	49.00	294.00
Pull cord	167-110-9960	208	lf	0.08	16.64	0.26	54.08		0.00	0.13	27.04	0.47	97.76
Junction Box (12"x12"x6")	162-130-2300	2	ea	33.50	67.00	51.00	102.00		0.00	29.50	59.00	114.00	228.00
Float switch assembly													
Switch		3	ea	200.00	600.00	100.00	300.00		0.00	45.00	135.00	345.00	1,035.00
24" pipe, ductile iron	026-666-2180	30	lf	47.00	1,410.00	30.50	915.00		0.00	33.50	1,005.00	111.00	3,330.00
#14 AWG XHHW	161-165-3000	6.2	clf	10.40	64.48	19.65	121.83		0.00	10.95	67.89	41.00	254.20
#12 AWG XHHW	161-165-3020	2.25	clf	10.00	22.50	23.00	51.75		0.00	12.50	28.13	45.50	102.38
#10 AWG XHHW	161-165-3040	1.2	clf	12.60	15.12	25.50	30.60		0.00	13.90	16.68	52.00	62.40
#8 AWG XHHW	161-165-3060	0.9	clf	23.00	20.70	32.00	28.80		0.00	17.50	15.75	72.50	65.25
#6 AWG XHHW	161-165-3080	2.7	clf	33.00	89.10	39.50	106.65		0.00	22.50	60.75	95.00	256.50
3/4" RGS conduit	160-205-1770	164	lf	1.72	282.08	3.19	523.16		0.00	1.74	285.36	6.65	1,090.60
1" RGS conduit	160-205-1800	30	lf	2.38	71.40	3.93	117.90		0.00	2.14	64.20	8.45	253.50
1-1/2" PVC conduit	167-111-1040	40	lf	0.75	30.00	1.22	48.80		0.00	0.68	27.20	2.65	106.00
1-1/2" RGS conduit	160-205-1850	40	lf	3.72	148.80	4.64	185.60		0.00	2.69	107.60	11.05	442.00
3/4" PVC conduit	167-111-1020	239	lf	0.31	74.09	0.88	210.32		0.00	0.47	112.33	1.66	396.74
Trenching	022-258-0450	239	lf		0.00	0.48	114.72	0.22	52.58	0.28	66.92	0.98	234.22
Backfill	022-258-1450	239	lf		0.00	0.95	227.05	0.38	90.82	0.59	141.01	1.92	458.88
Handhole	167-110-0600	2	ea	335.00	670.00	263.00	526.00	56.50	113.00	165.50	331.00	820.00	1,640.00
Canopy Light		6	ea	56.00	336.00	64.00	384.00		0.00	37.00	222.00	157.00	942.00
Cast outlet box	160-250-8300	3	ea	31.50	94.50	23.00	69.00		0.00	14.50	43.50	69.00	207.00
Outlet box cover plate	162-320-4980	2	ea	25.50	51.00	4.25	8.50		0.00	4.75	9.50	34.50	69.00
Swith cover, weatherproof	162-320-3170	1	ea	7.25	7.25	4.25	4.25		0.00	2.85	2.85	14.35	14.35
Receptacle	162-320-2482	2	ea	30.50	61.00	9.45	18.90		0.00	7.05	14.10	47.00	94.00
Light switch	162-320-0500	1	ea	6.30	6.30	9.45	9.45		0.00	0.00	0.00	15.75	15.75
SUB TOTAL					32,156.46		9,768.36		256.40		8,550.86		50,732.08
TOTALS					169,752.73		104,459.89		6,690.60		64,240.14		345,143.37
										Plus 10% Contingency			379,657.70

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SOUTHEAST VALLEY REGIONAL DRAINAGE BASIN PROJECT

Excavation Quantities Calcs

Lee Jacoby

HDR Engineering Inc.

August 6, 1999

Cross Section Number	Cut Area (SF)	Avg Area	Cut Volume	Fill Area (SF)	Avg Area	Fill Volume
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	878	439	10975	0	0	0
5	3148	2013	50325	0	0	0
6	4826	3987	99675	0	0	0
7	7383	6105	152613	0	0	0
8	9891	8637	215925	0	0	0
9	11297	10594	264850	0	0	0
10	11469	11383	284575	0	0	0
11	11524	11497	287413	0	0	0
12	11592	11558	288950	0	0	0
13	11659	11626	290638	0	0	0
14	11809	11734	293350	0	0	0
15	12076	11943	298563	0	0	0
16	12064	12070	301750	0	0	0
17	11773	11919	297963	0	0	0
18	11953	11863	296575	0	0	0
19	12531	12242	306050	0	0	0
20	13496	13014	325338	0	0	0
21	14402	13949	348725	0	0	0
22	14614	14508	362700	0	0	0
23	14609	14612	365288	0	0	0
24	14685	14647	366175	19	10	238
25	14752	14719	367963	21	20	500
26	14826	14789	369725	23	22	550
27	14912	14869	371725	25	24	600
28	15002	14957	373925	25	25	625
29	15088	15045	376125	25	25	625
30	15173	15131	378263	26	26	638
31	15265	15219	380475	26	26	650
32	15374	15320	382988	26	26	650
33	15494	15434	385850	26	26	650
34	15598	15546	388650	26	26	650
35	15701	15650	391238	26	26	650
36	15767	15734	393350	26	26	650
37	15632	15700	392488	26	26	650
38	15676	15654	391350	21	24	588
39	15599	15638	390938	10	16	388
40	15045	15322	383050	10	10	250
41	14164	14605	365113	10	10	250
42	13471	13818	345438	10	10	250
43	13450	13461	336513	10	10	250
44	13439	13445	336113	10	10	250
45	13421	13430	335750	10	10	250
46	13380	13401	335013	10	10	250
47	13312	13346	333650	32	21	525

48	13240	13276	331900	39	36	888
49	13158	13199	329975	40	40	988
50	13233	13196	329888	40	40	1000
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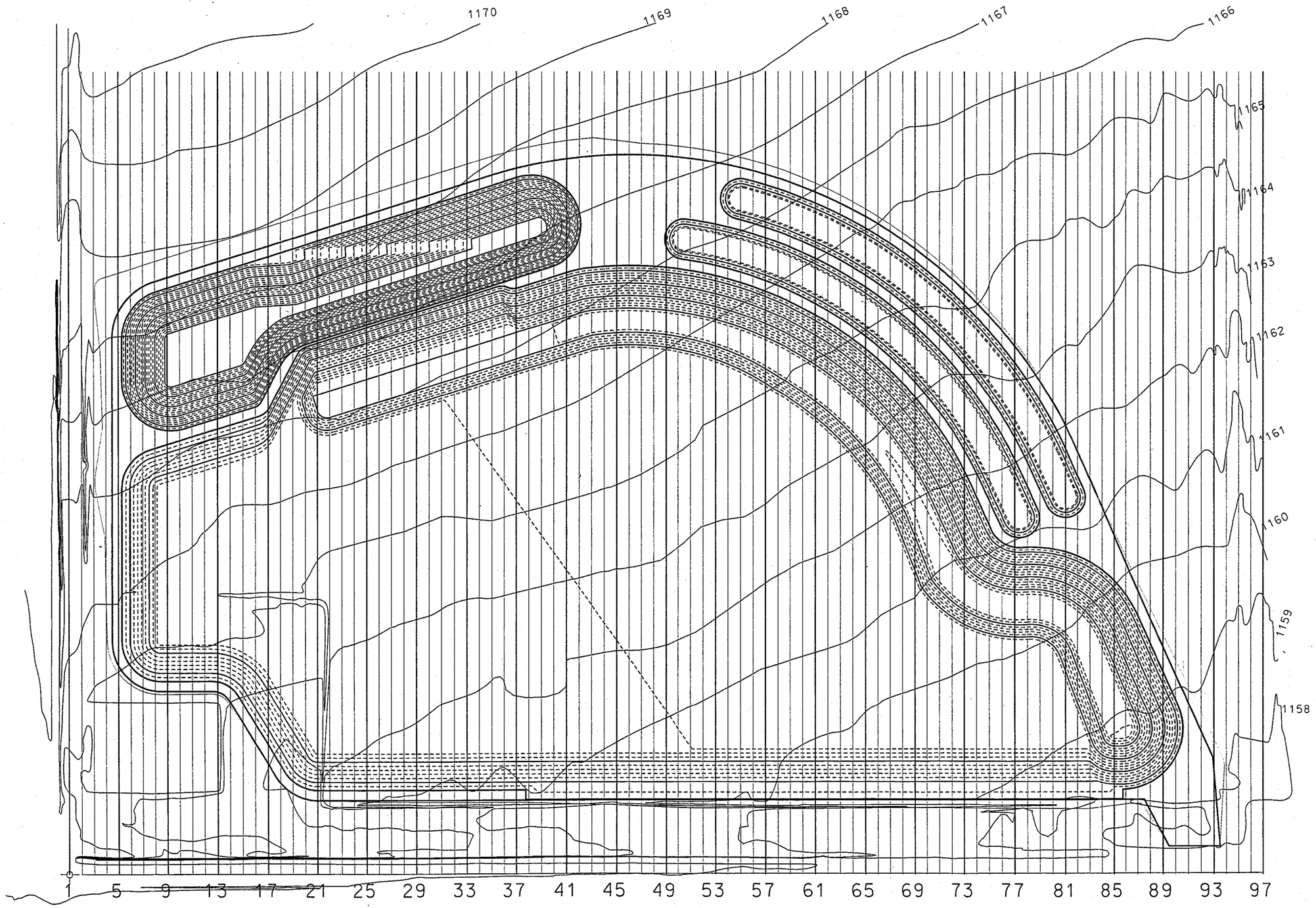
97	0	0	0	0	0	0		
			Cut	23136625 CF			Fill	265843 CF
				856912 CY				9846 CY

8" Overexcavation = 1641721 SF * (8/12) = 1094481 CF = 40536 CY
Topsoil Stripping = 37 acres * (43560) * 1 FT = 1611720 CF = 59693 CY
Excavation Deduct = 25,000 CY

Total Cut is Cut (856912) + 8" Overexc (40536) - Topsoil Stripping (59693) - Excavation Deduct (25000)

Total Cut =	812755 CY
Total Fill =	9846 CY
Total Net =	802909 CY

** Cut Area is the area of the cross-section which is cut
** Fill Area is the area of the cross-section which is fill
** Avg Area is the approx. average cross-sectional area for the 25' wide strip between adjacent x-sections
** Total Fill has been increased by 10% for shrinkage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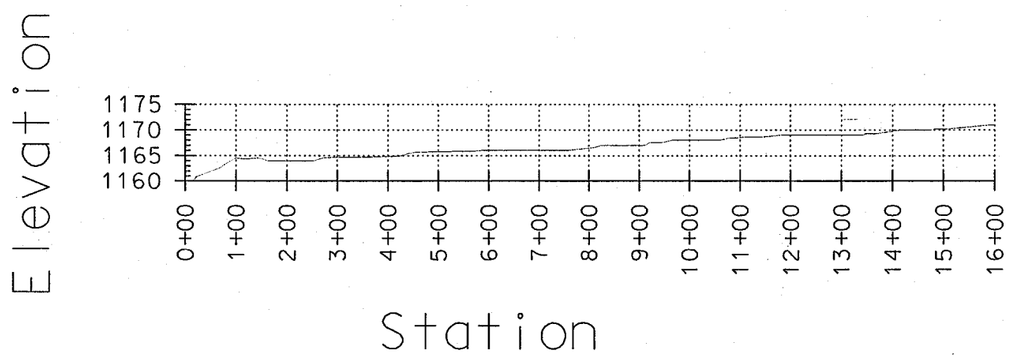
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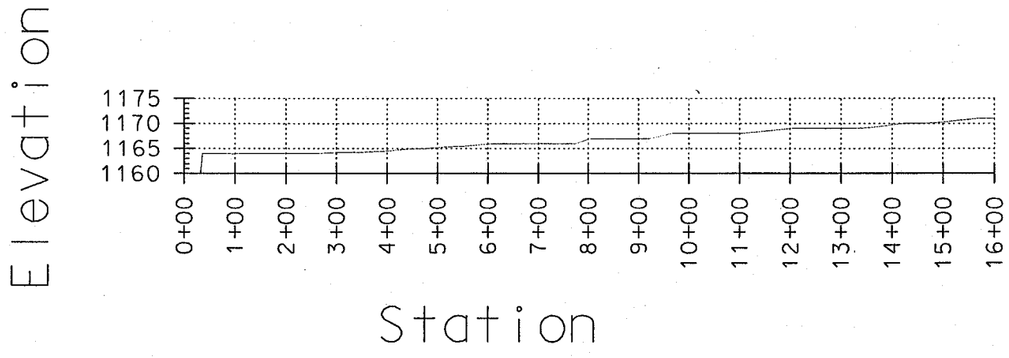
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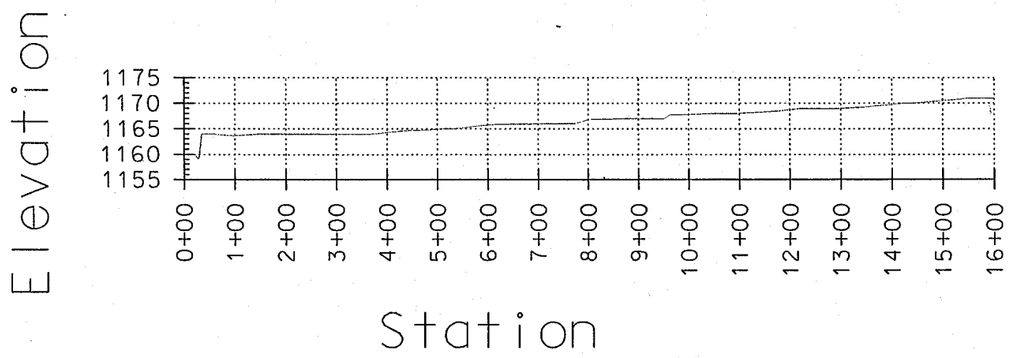
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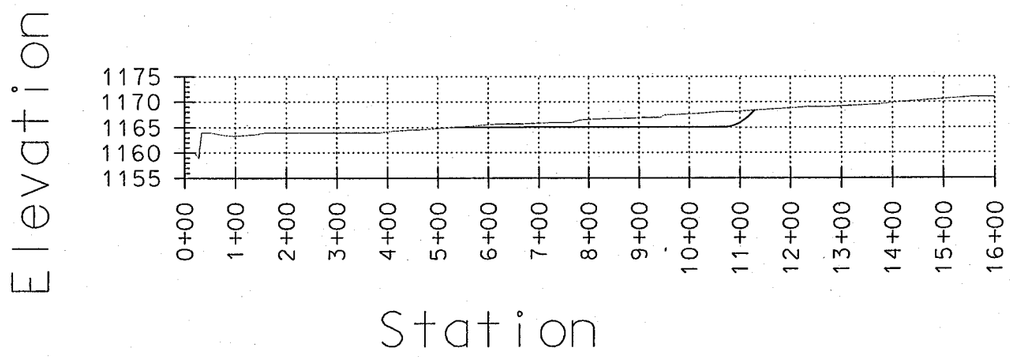
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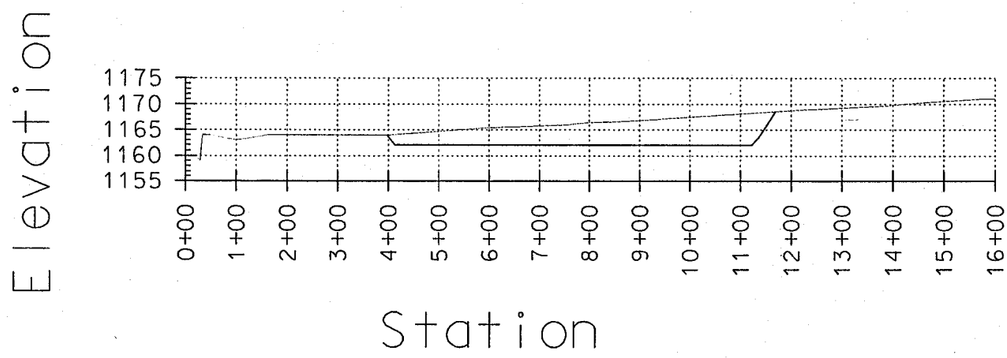
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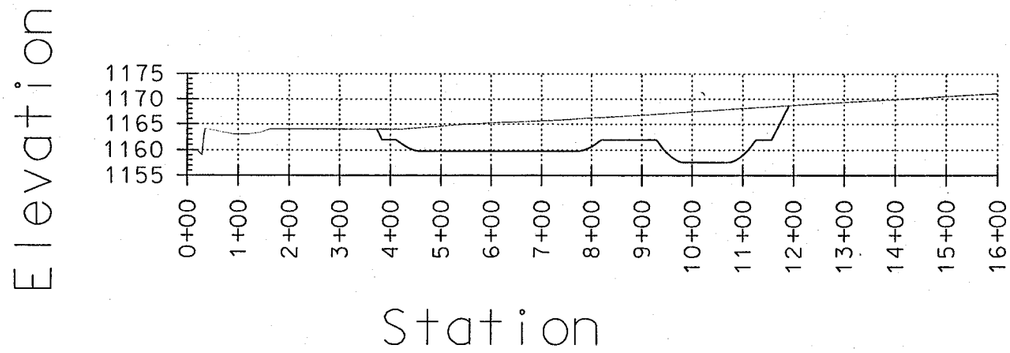
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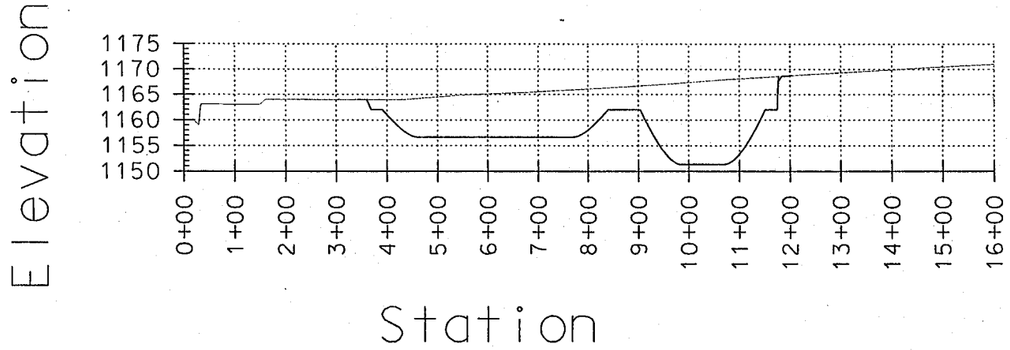
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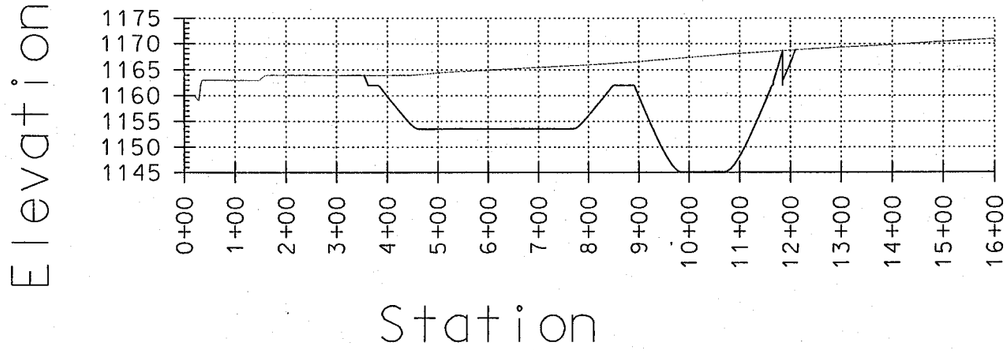
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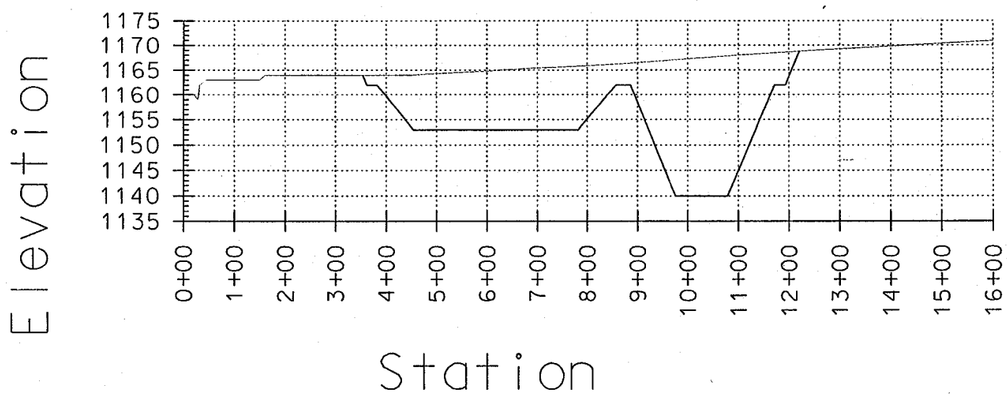
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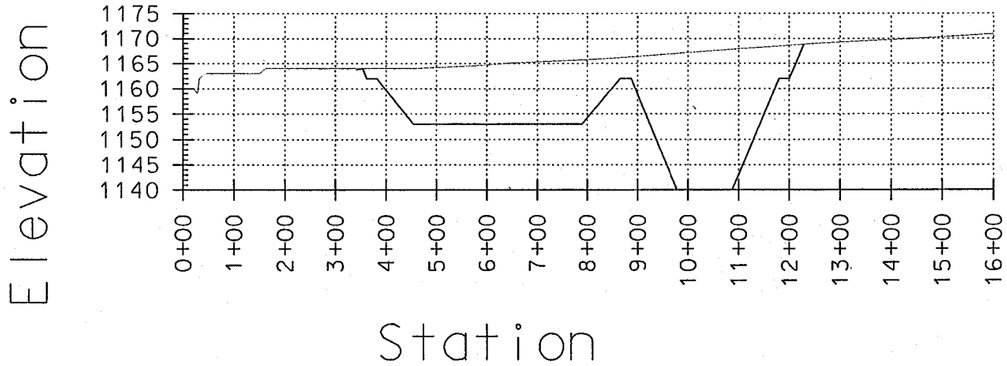
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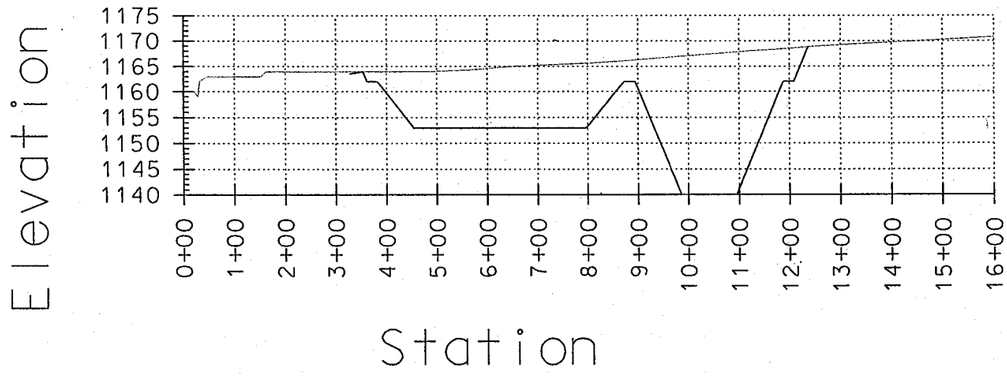
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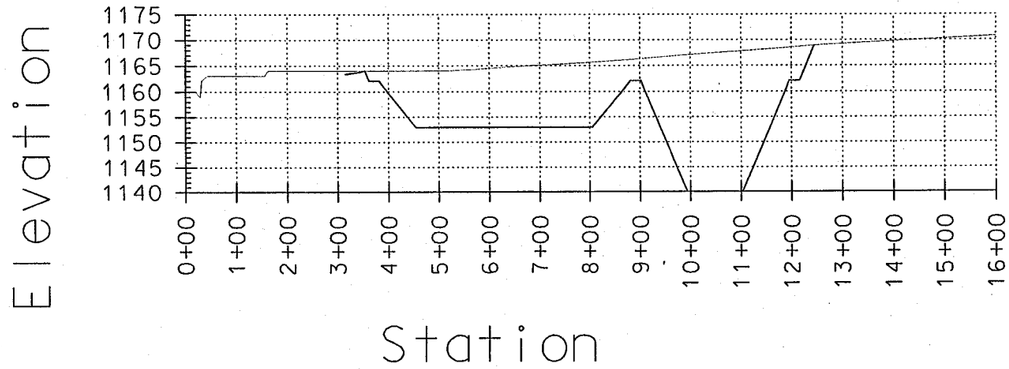
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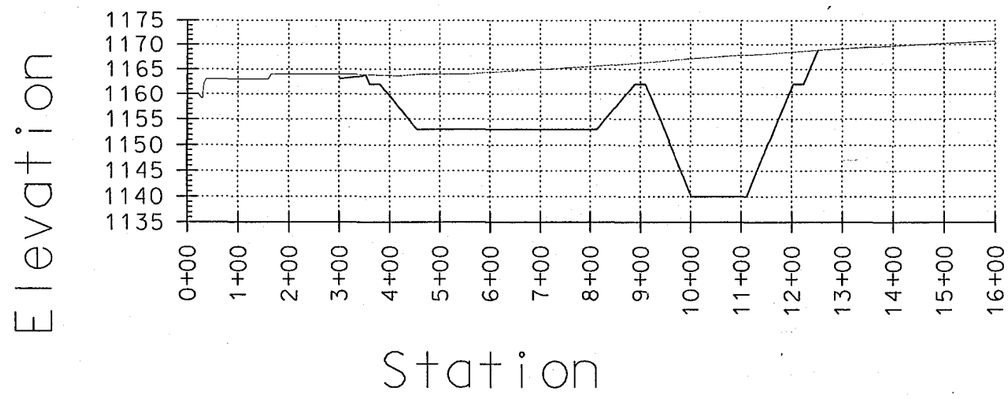
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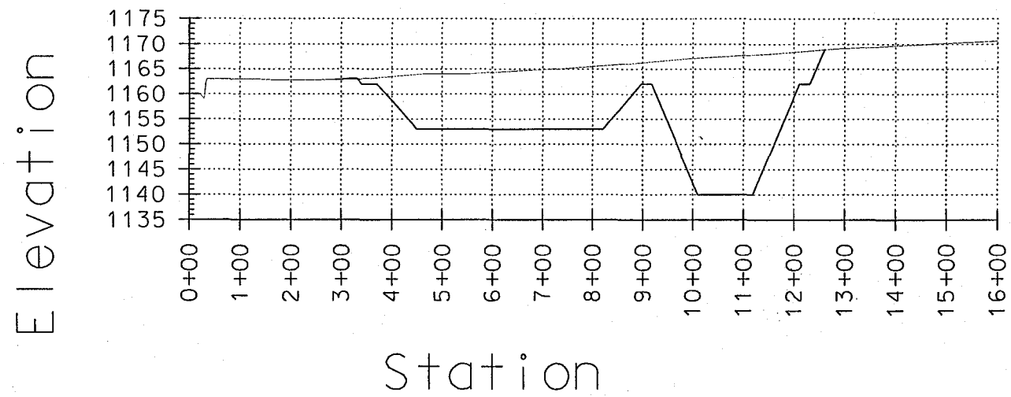
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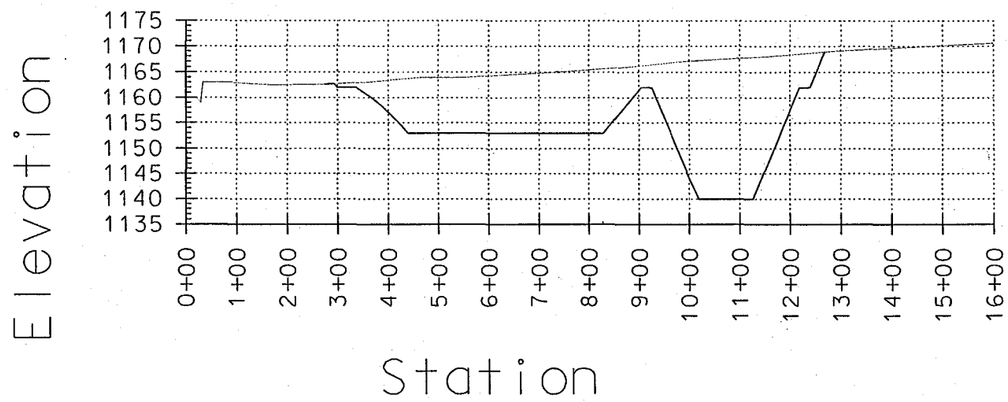
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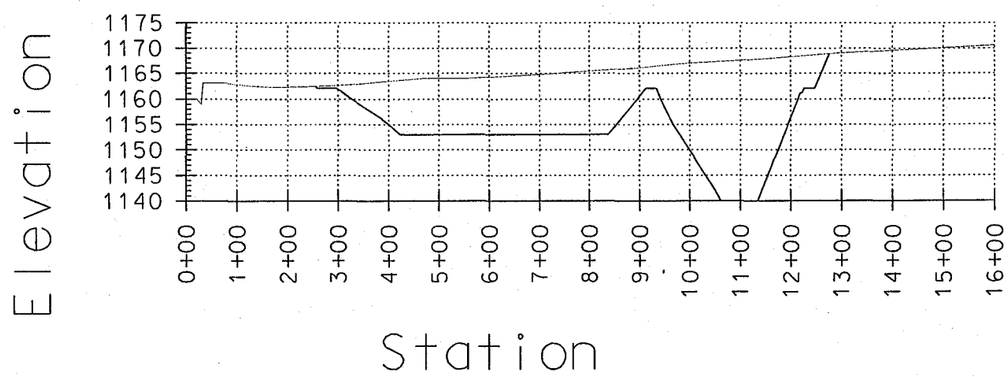
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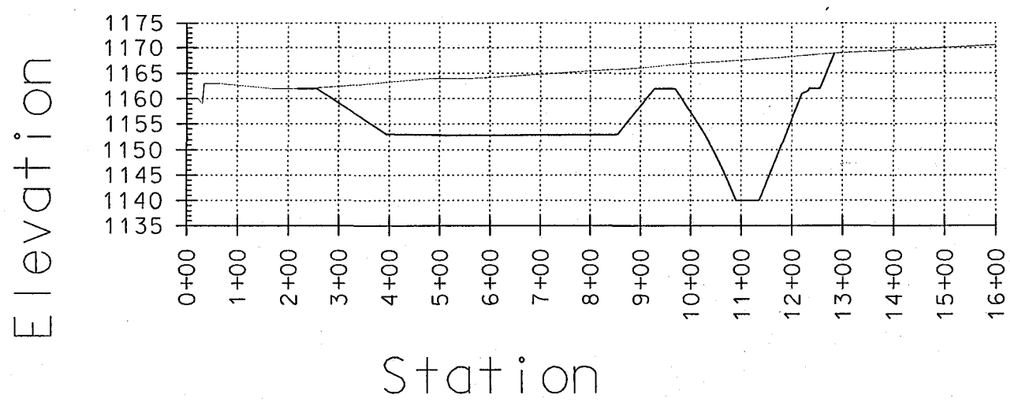
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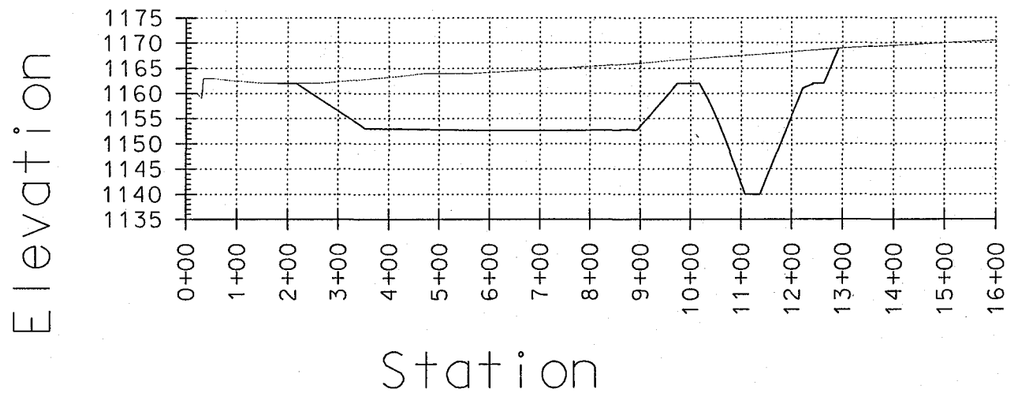
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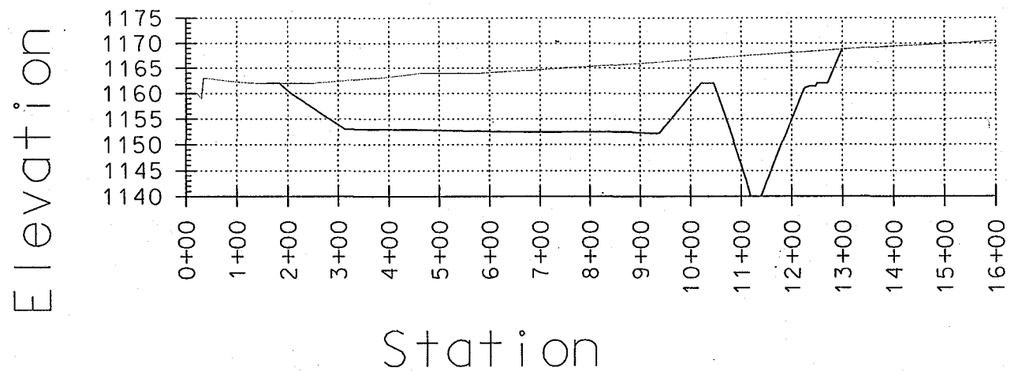
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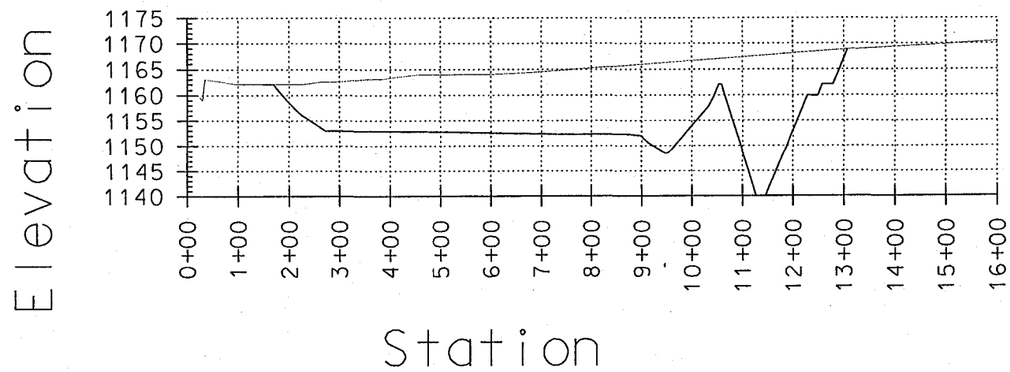
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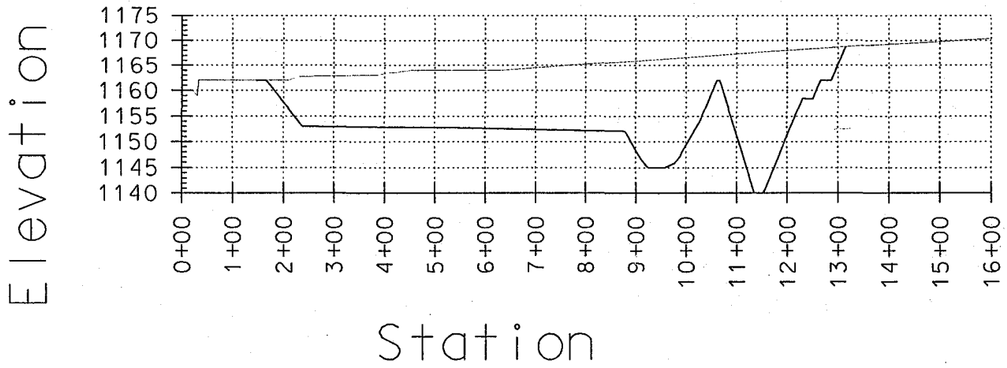
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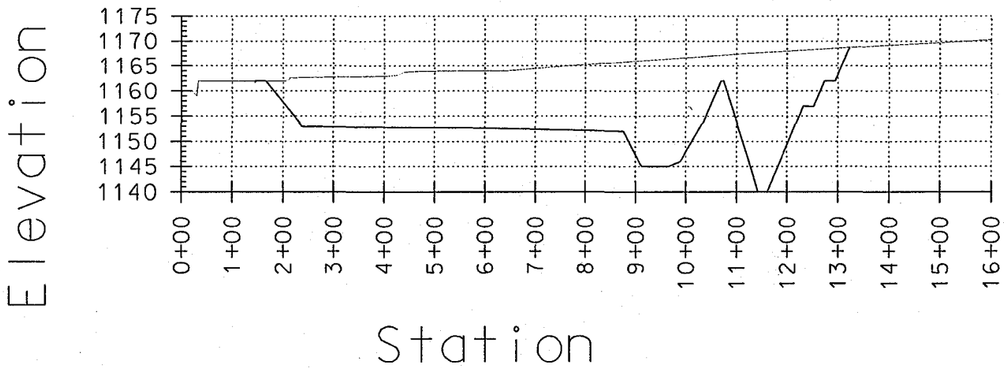
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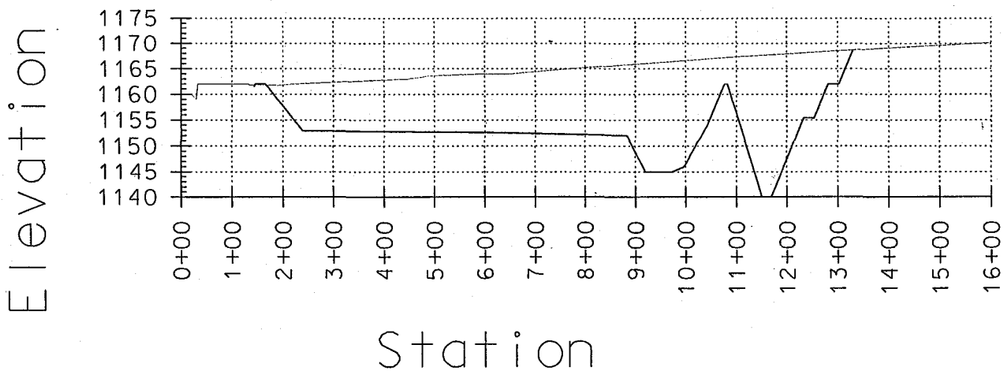
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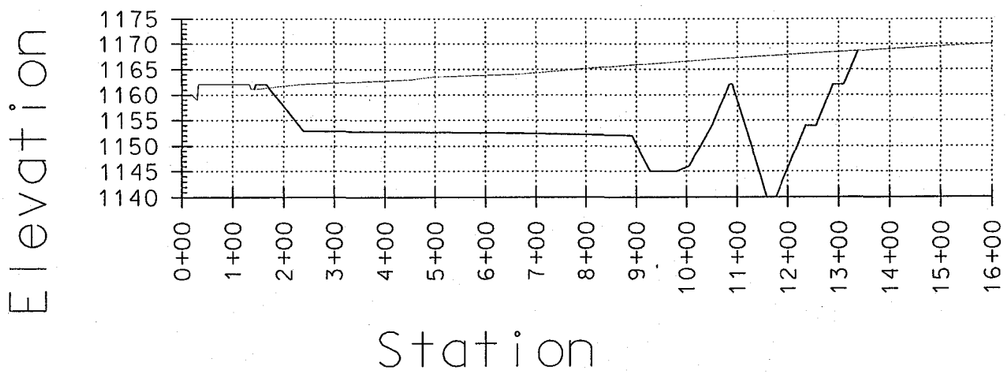
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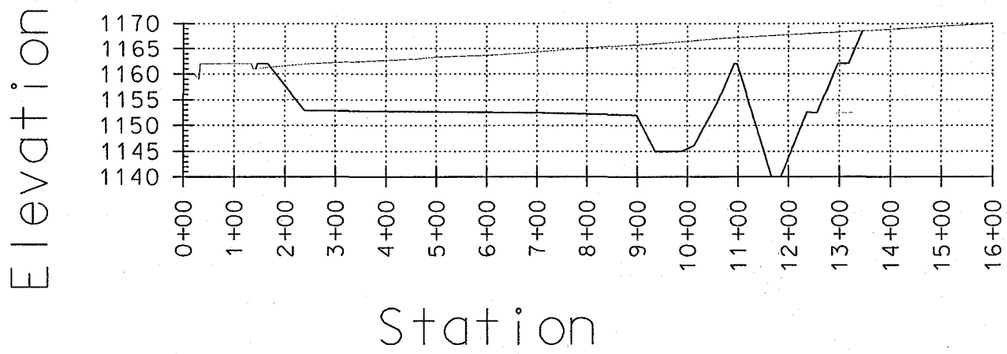
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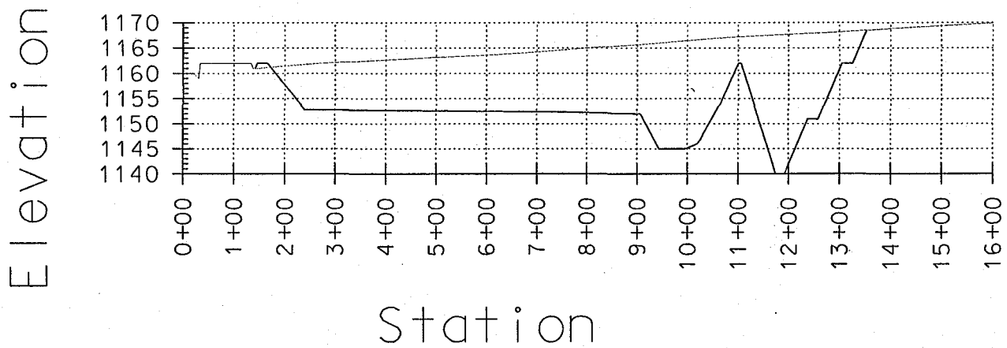
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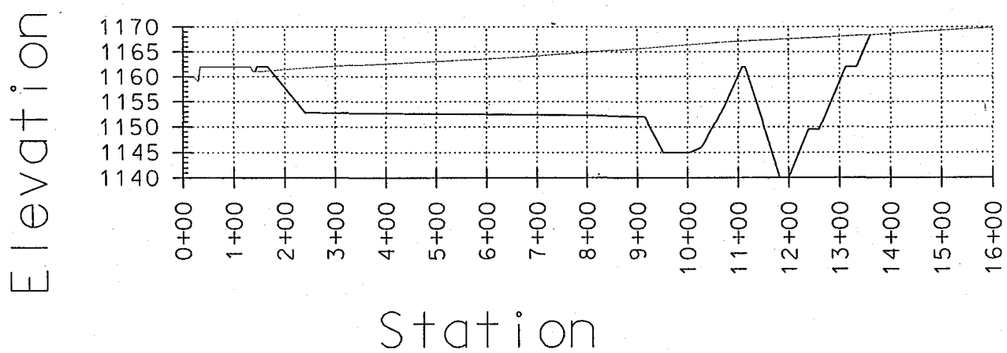
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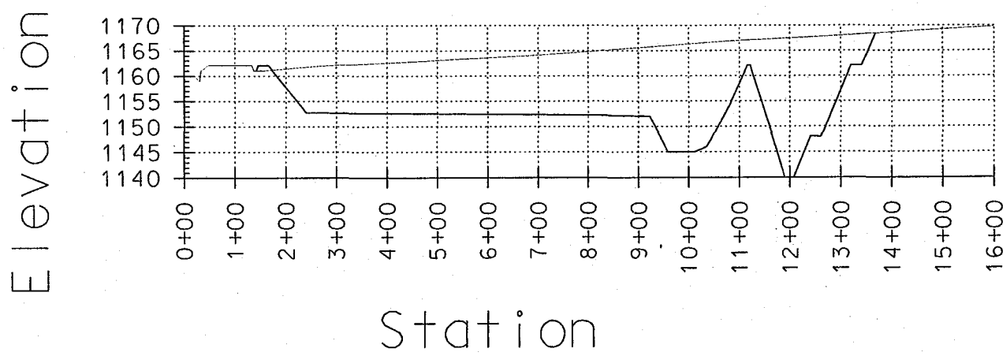
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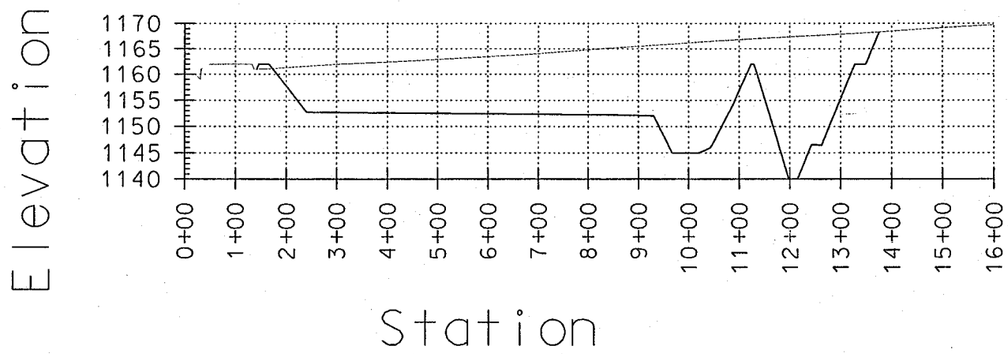
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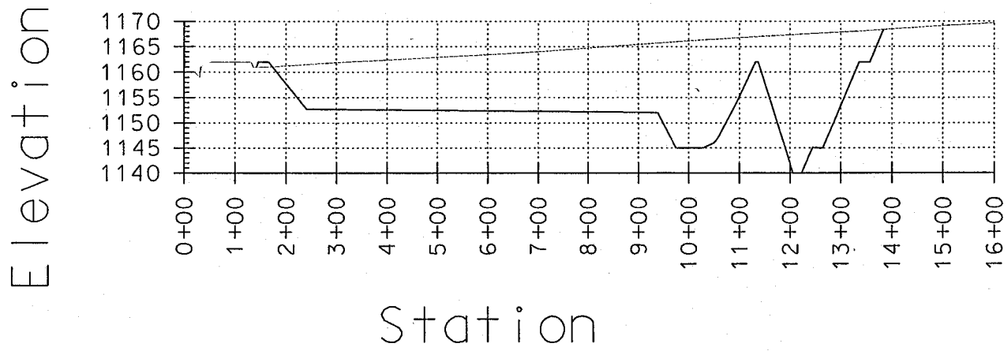
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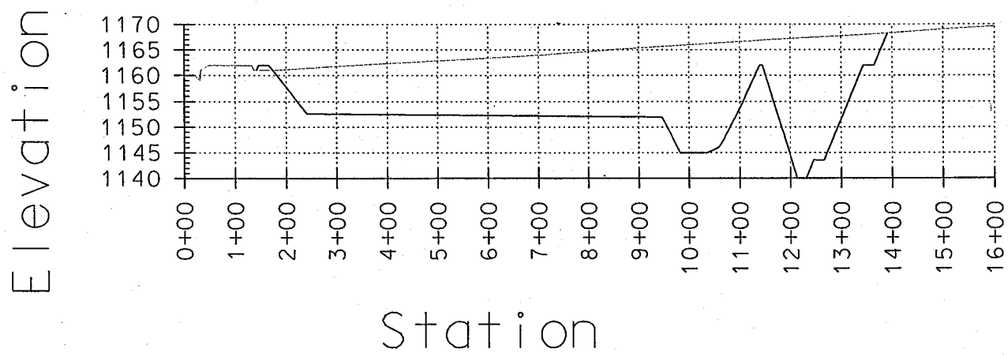
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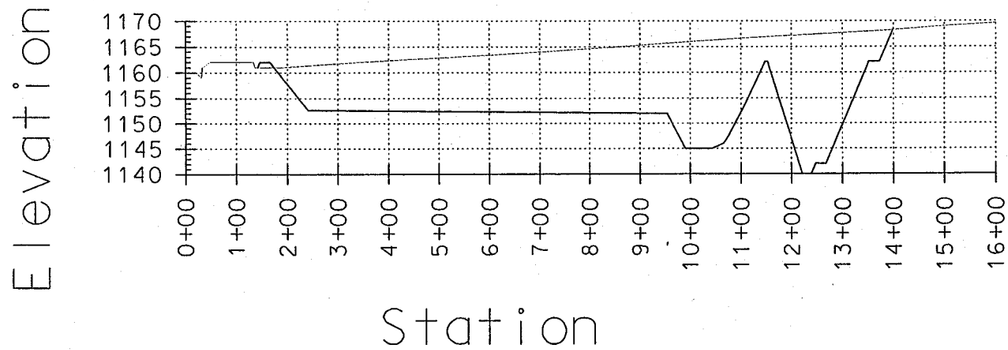
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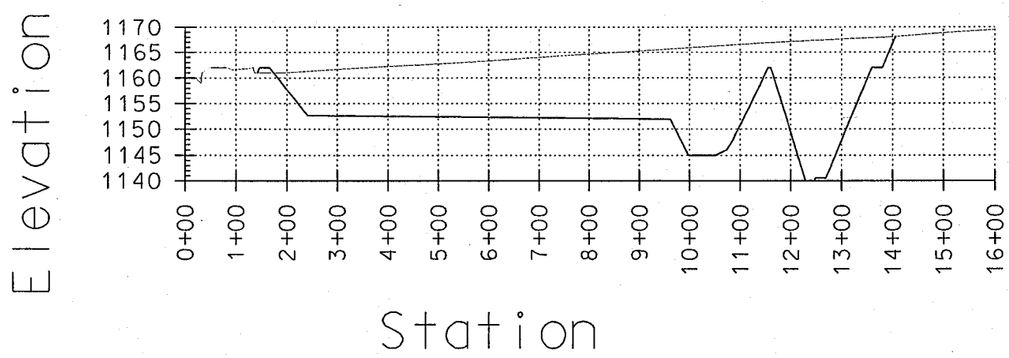
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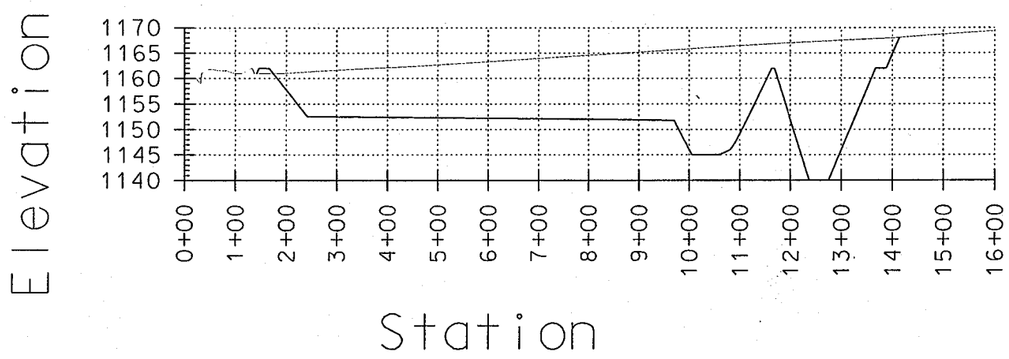
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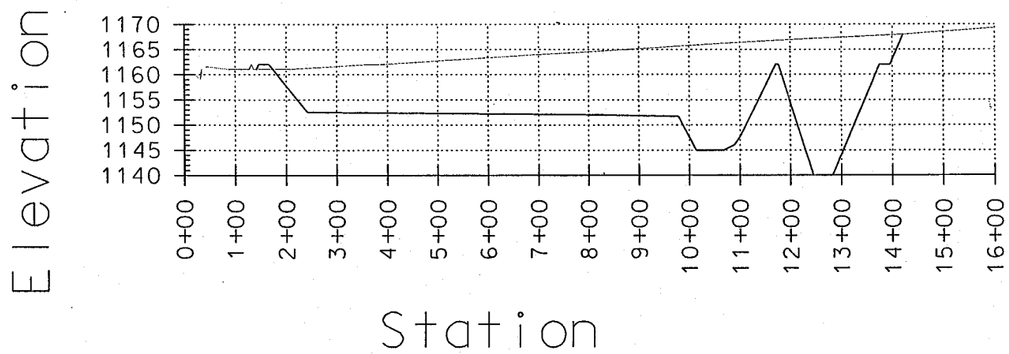
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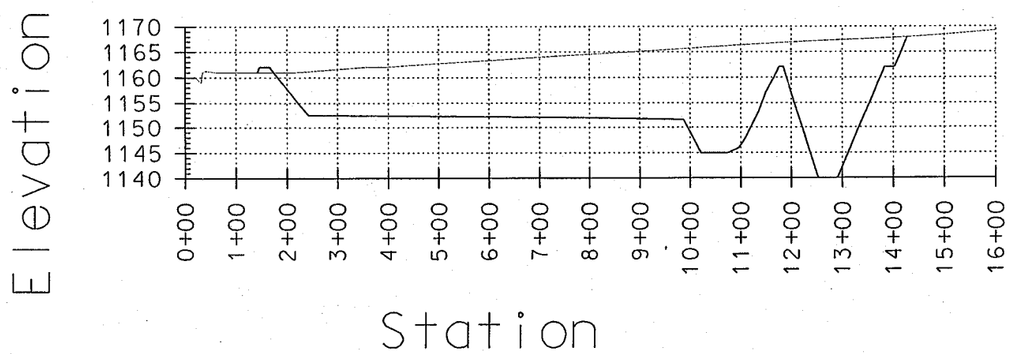
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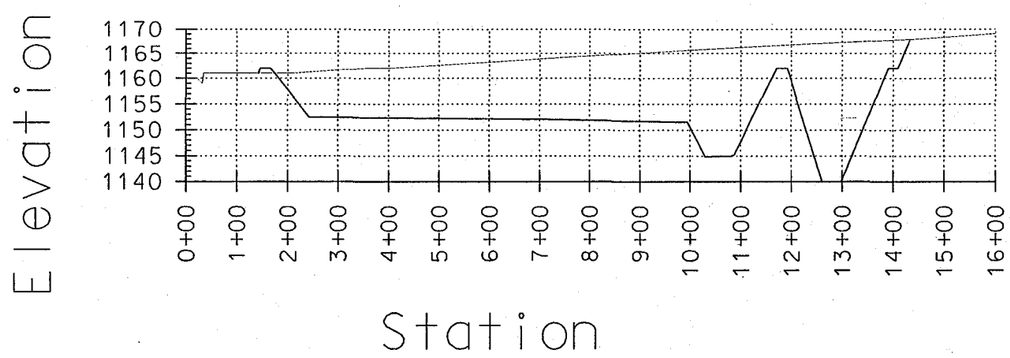
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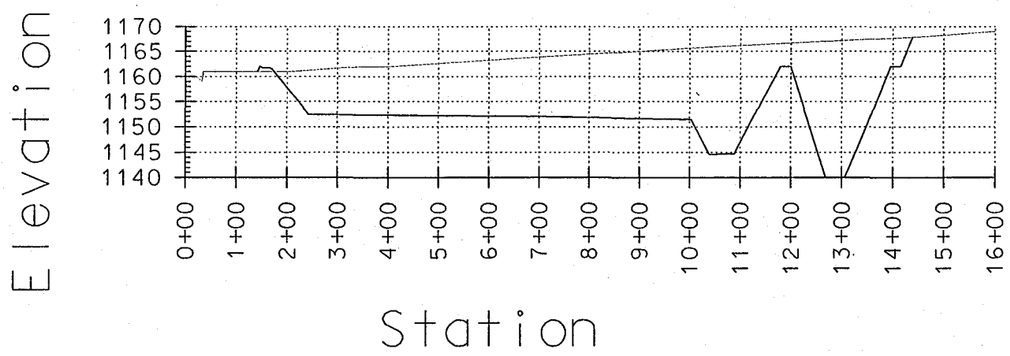
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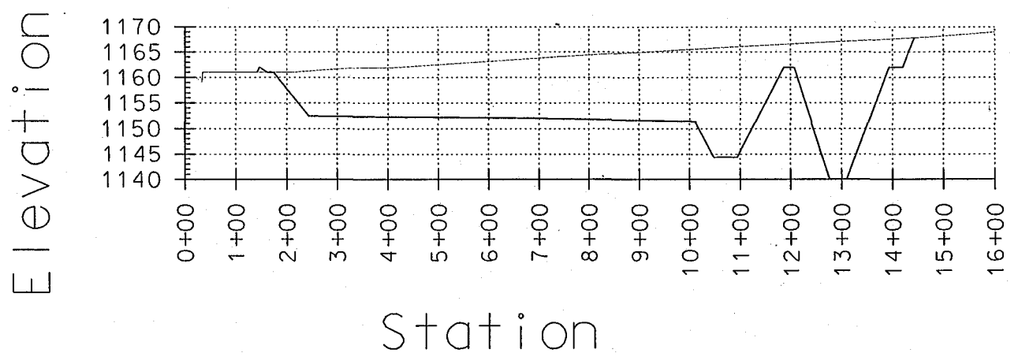
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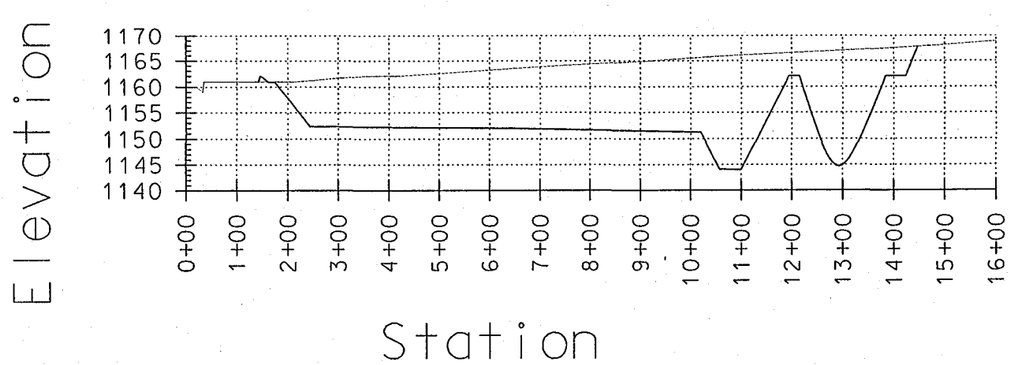
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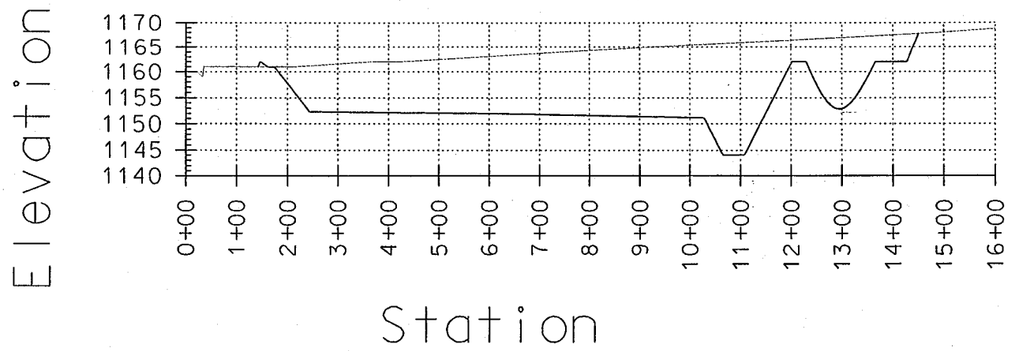
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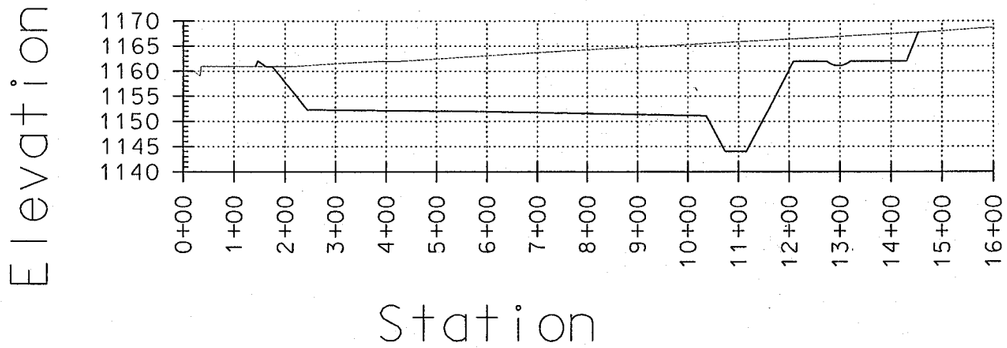
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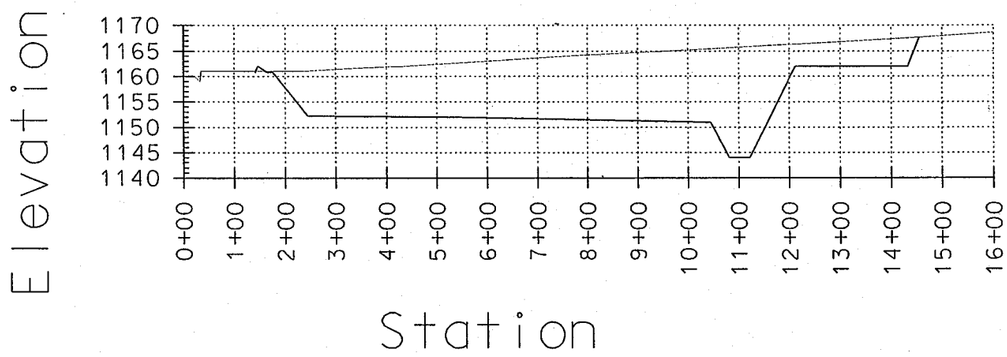
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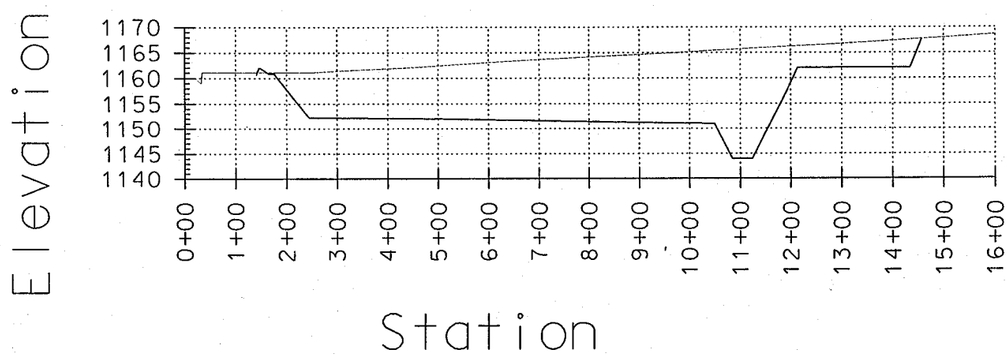
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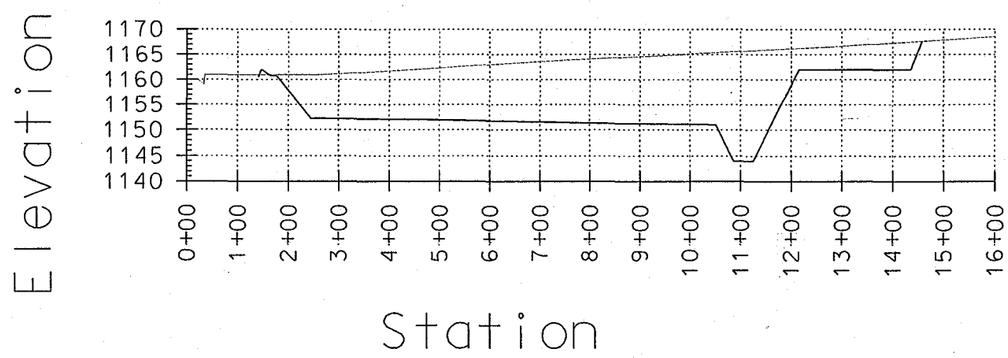
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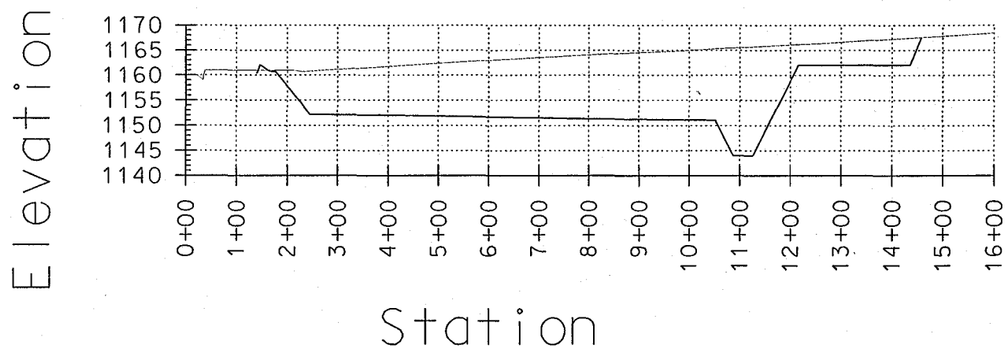
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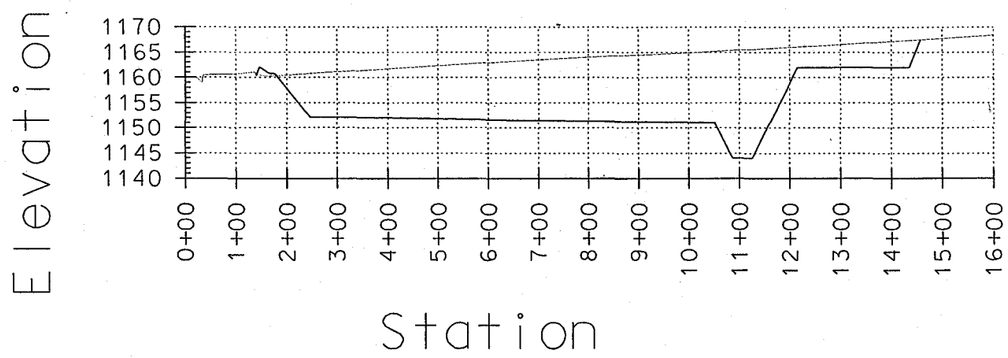
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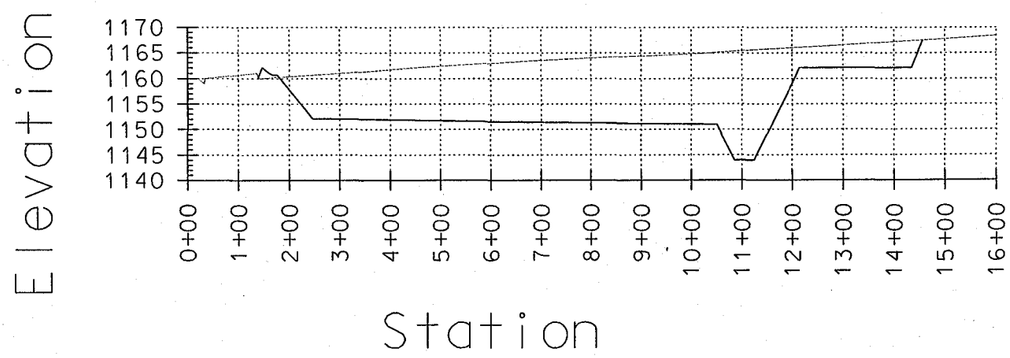
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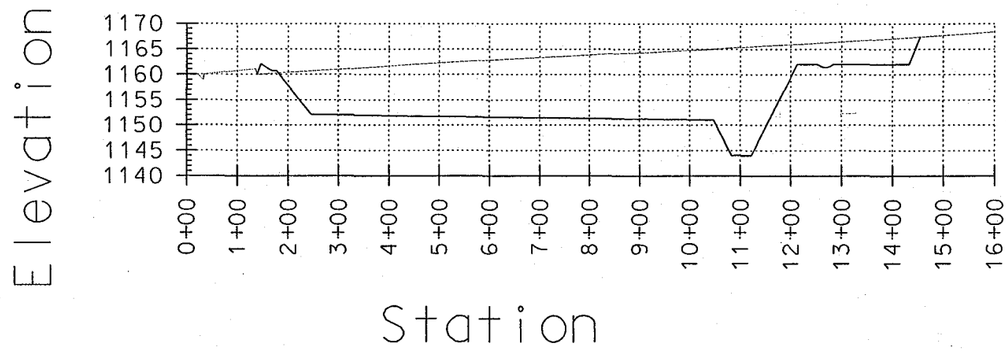
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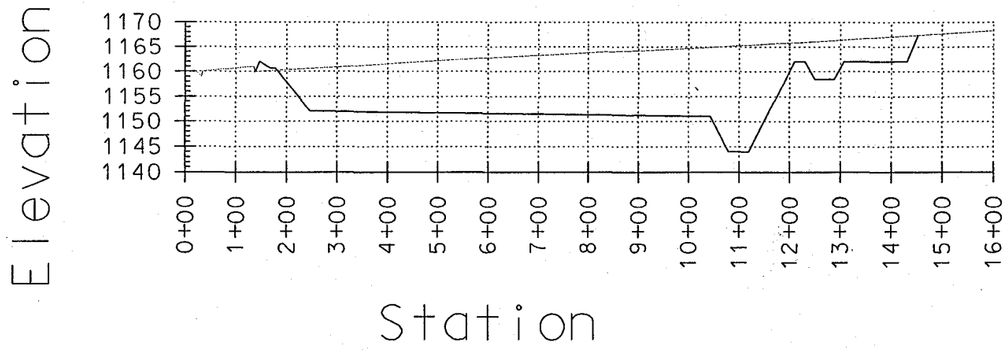
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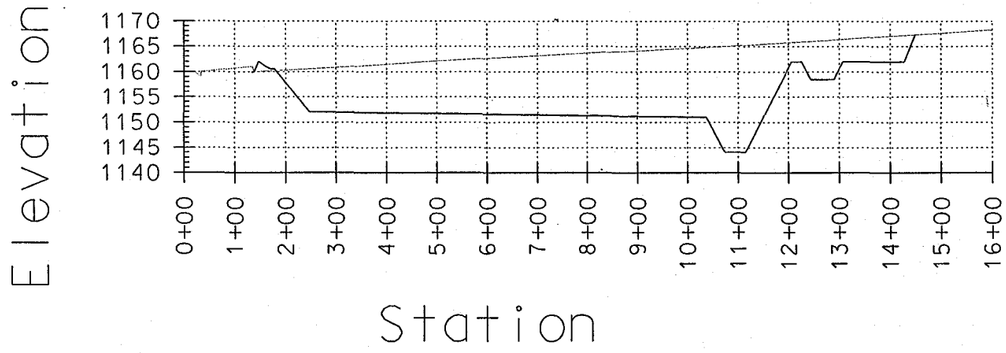
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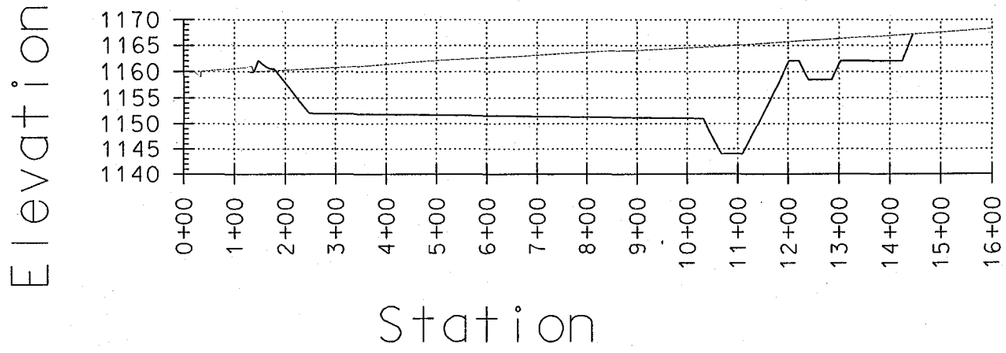
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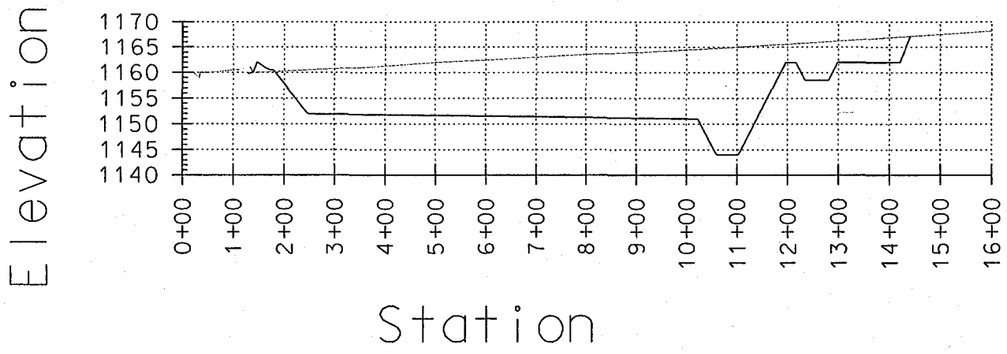
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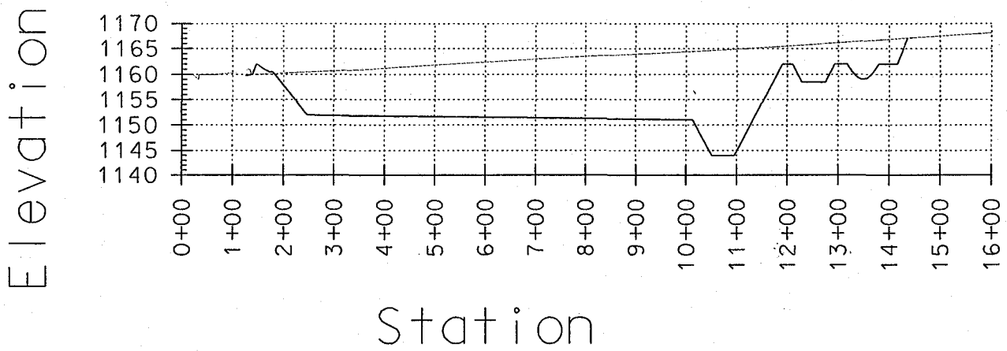
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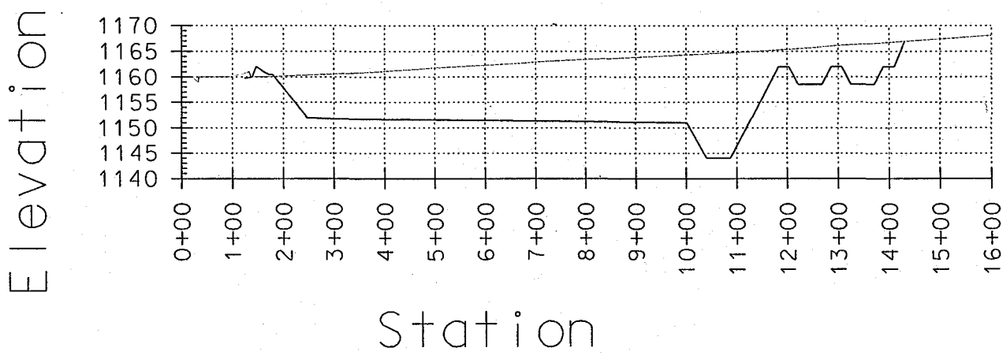
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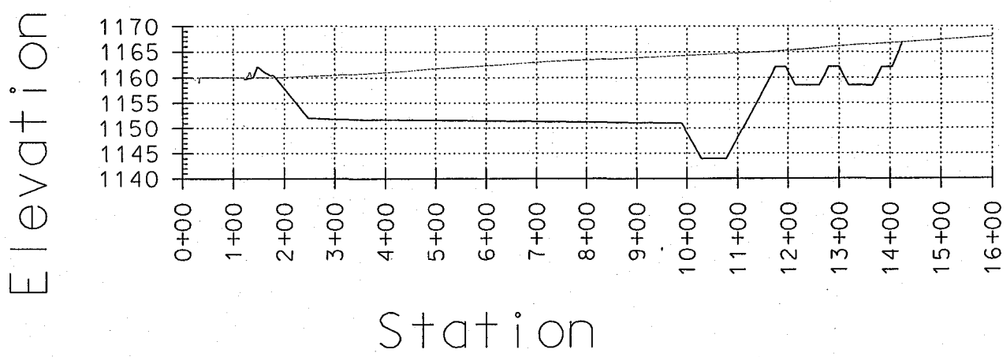
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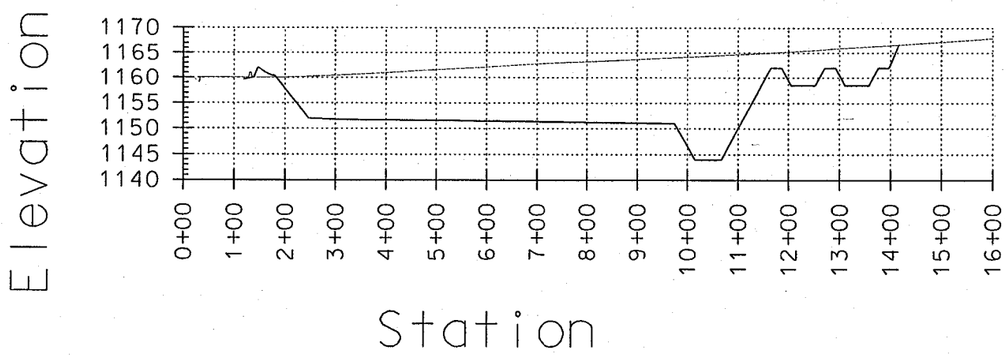
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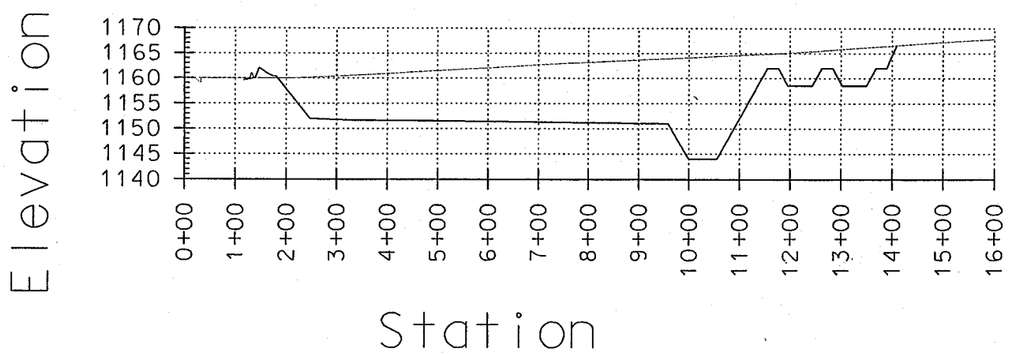
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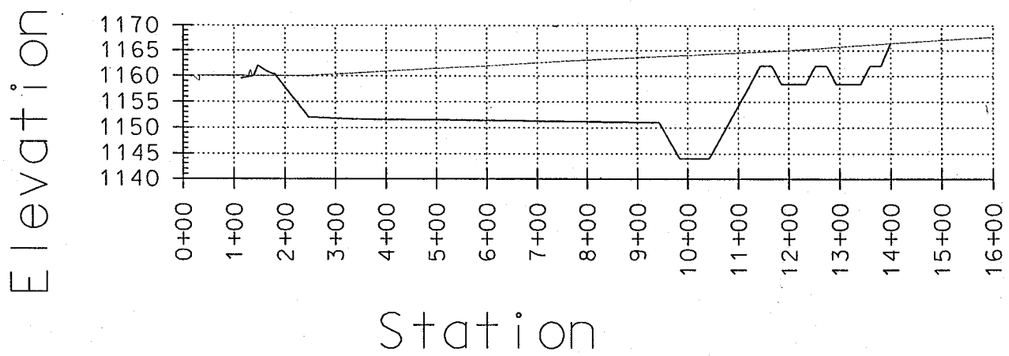
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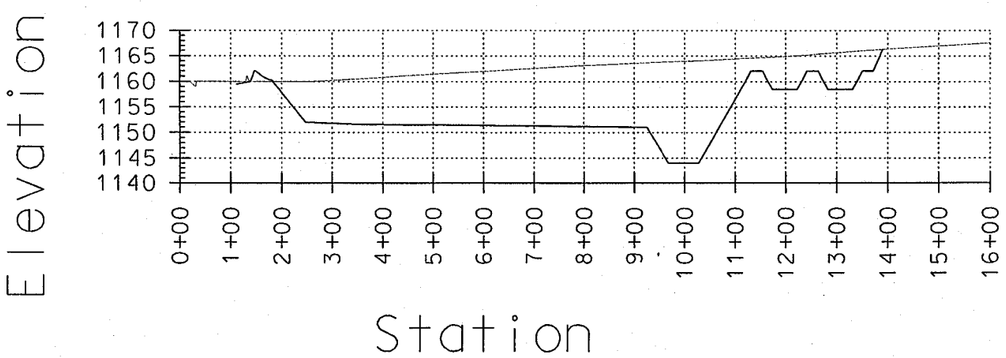
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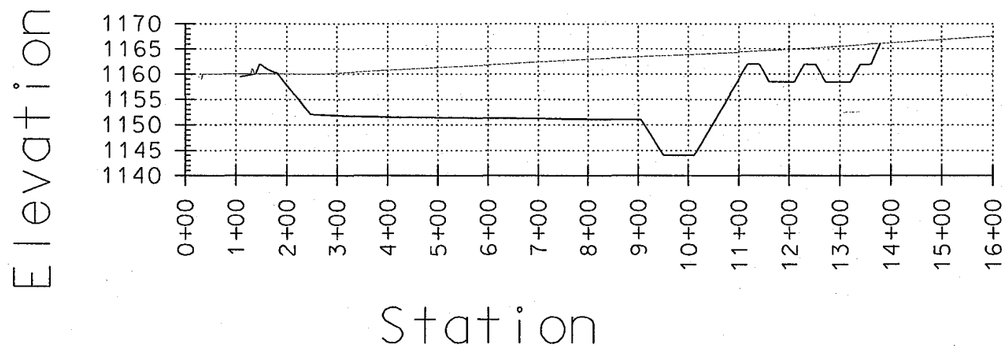
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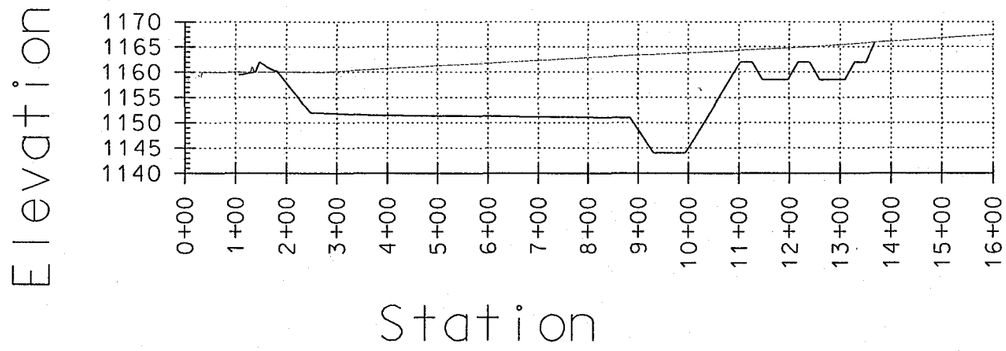
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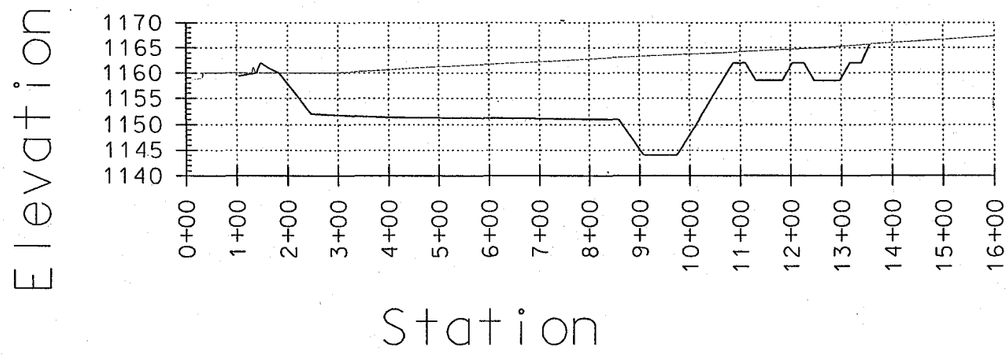
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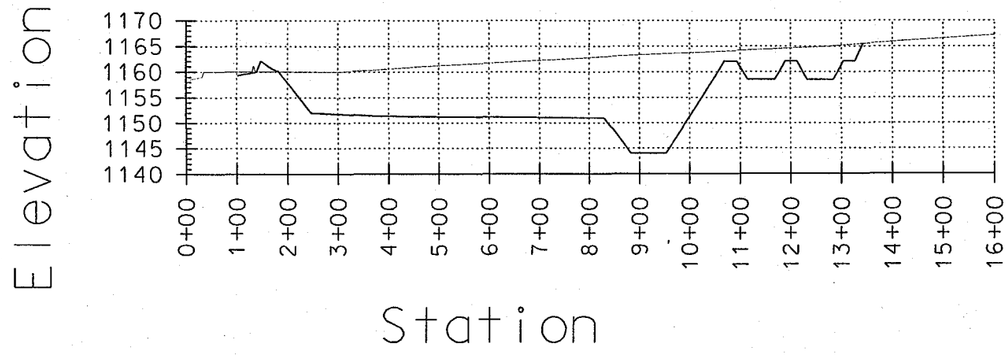
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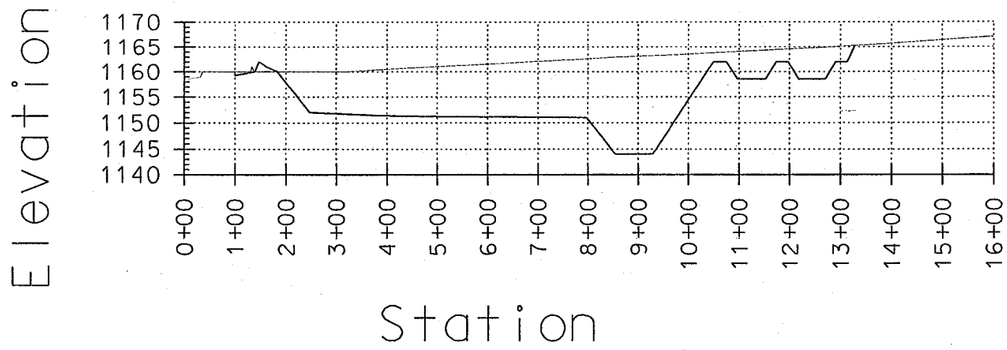
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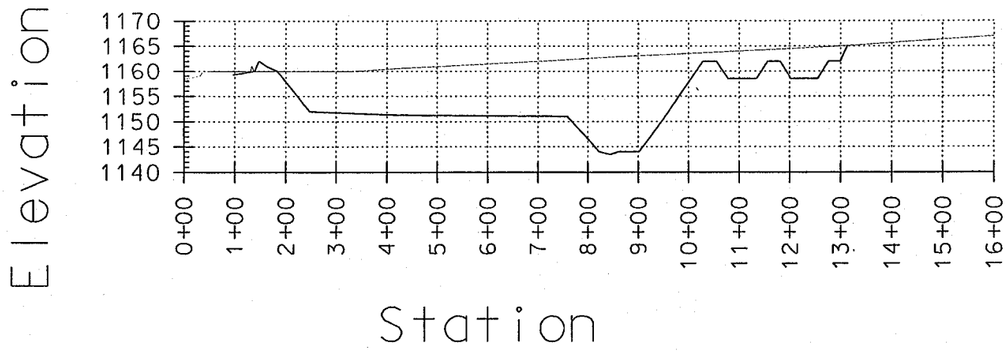
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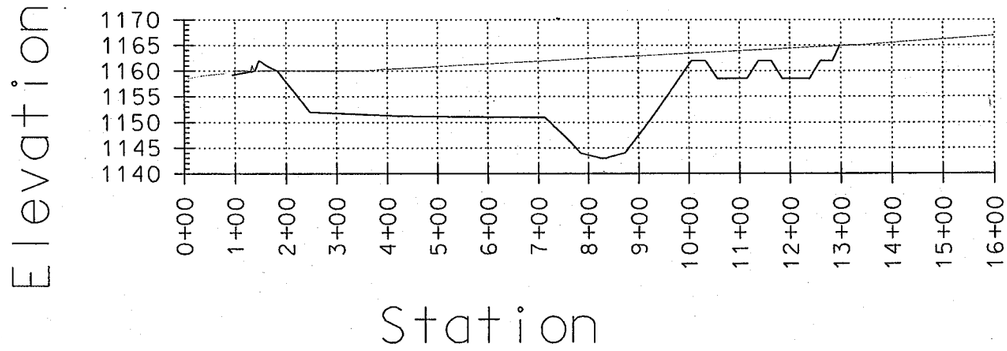
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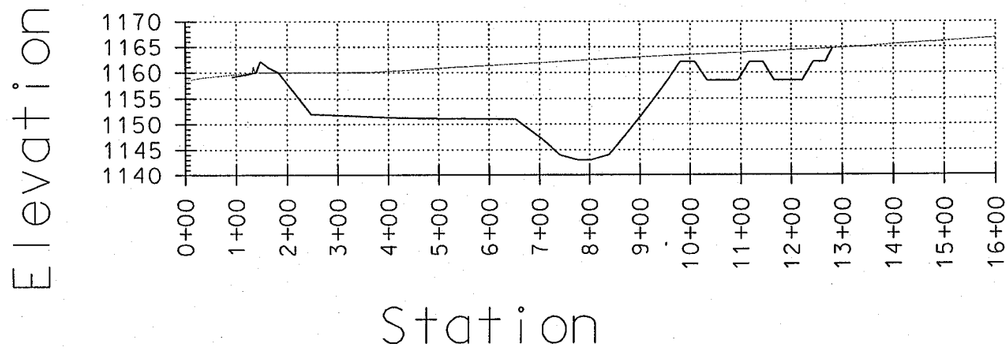
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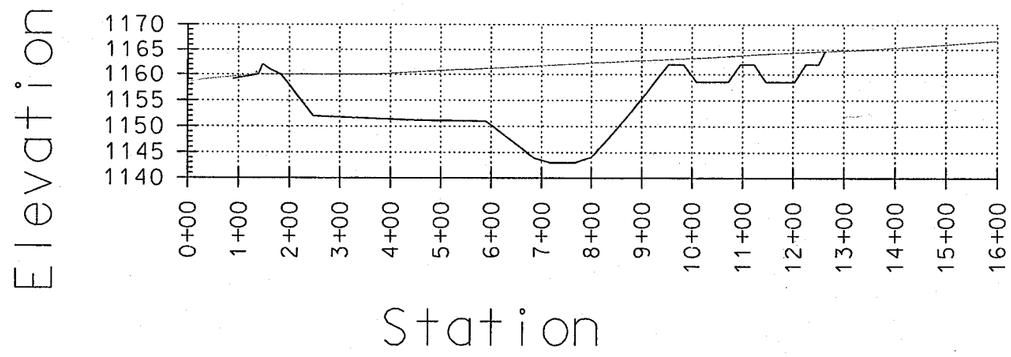
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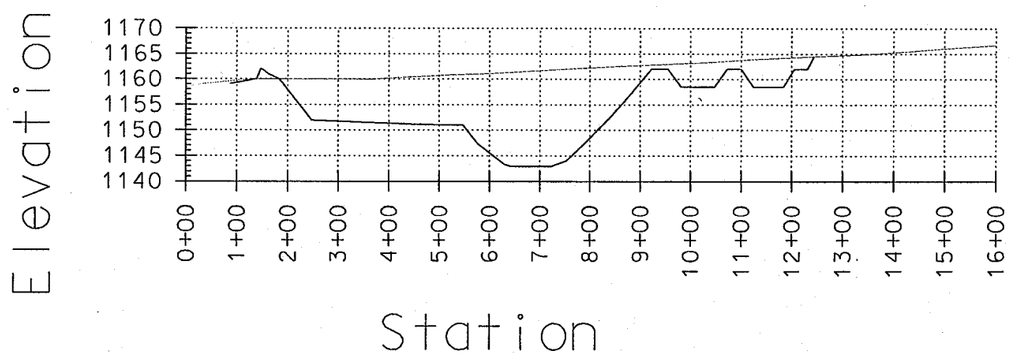
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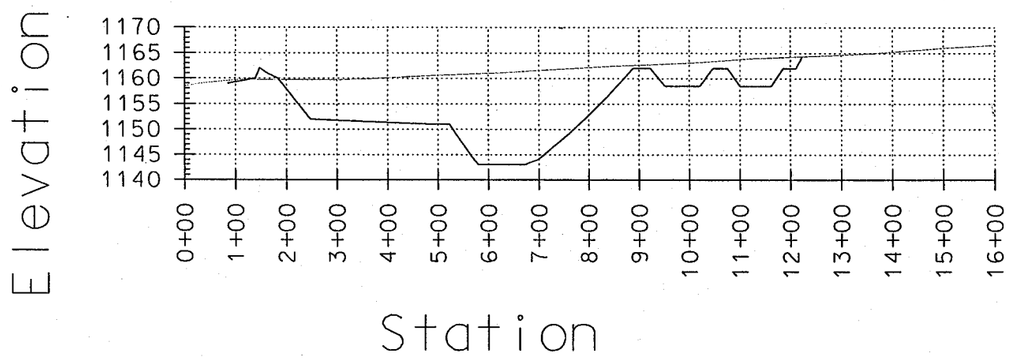
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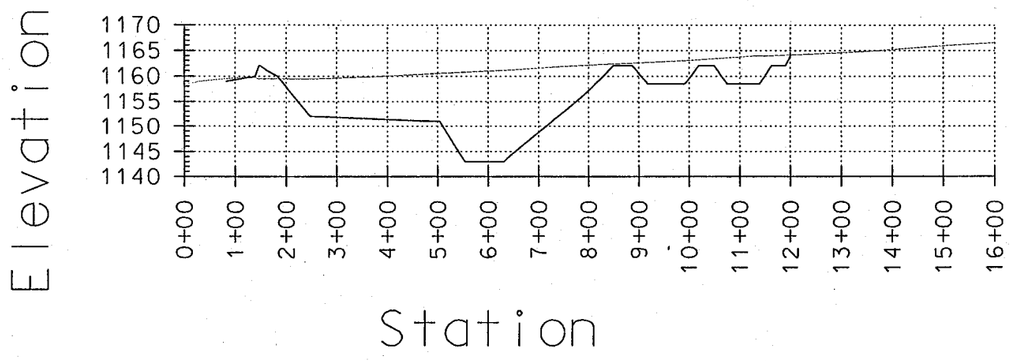
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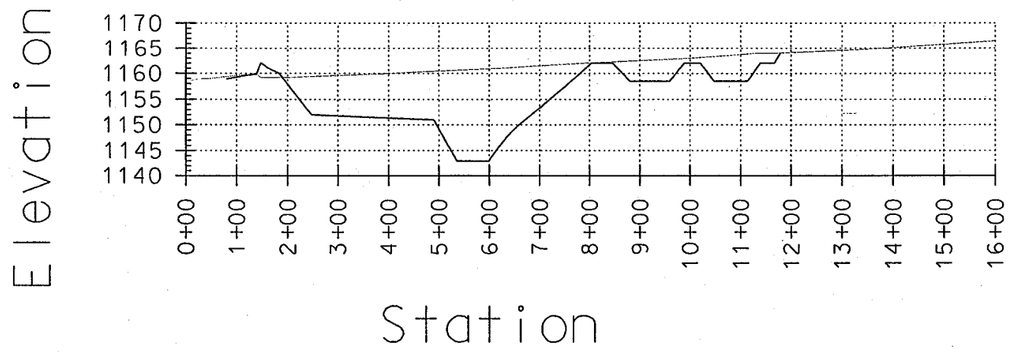
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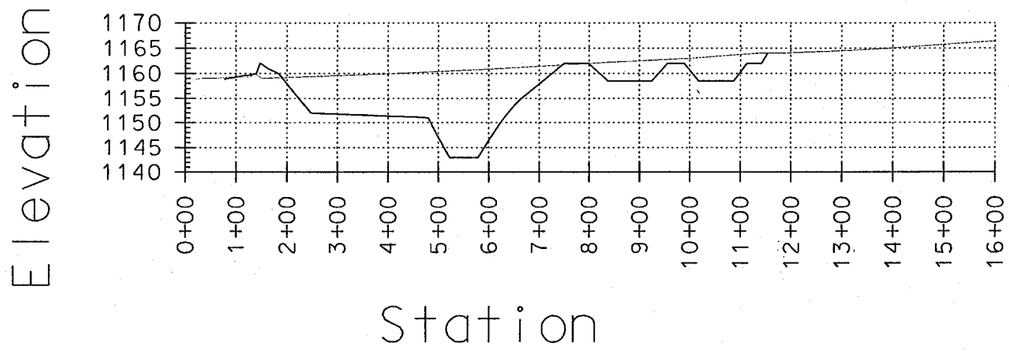
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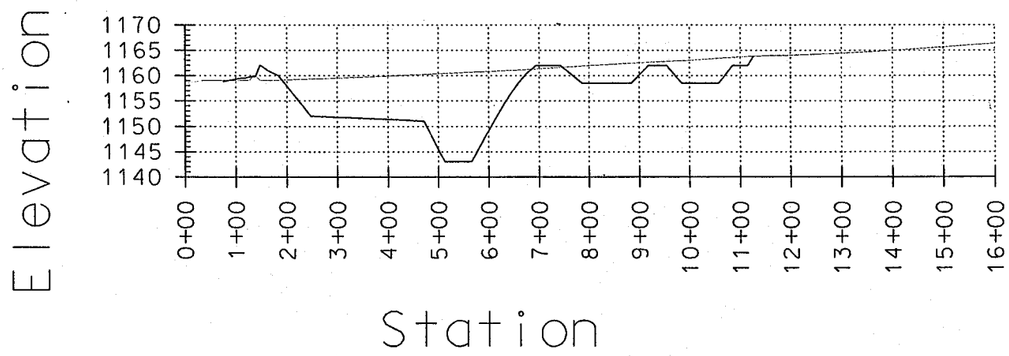
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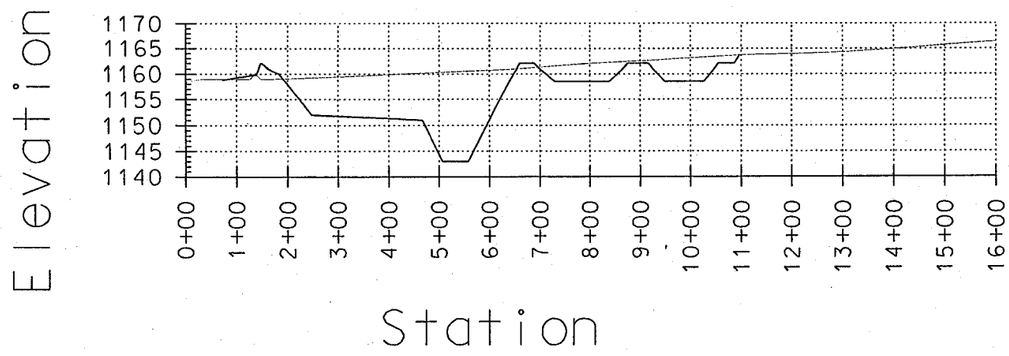
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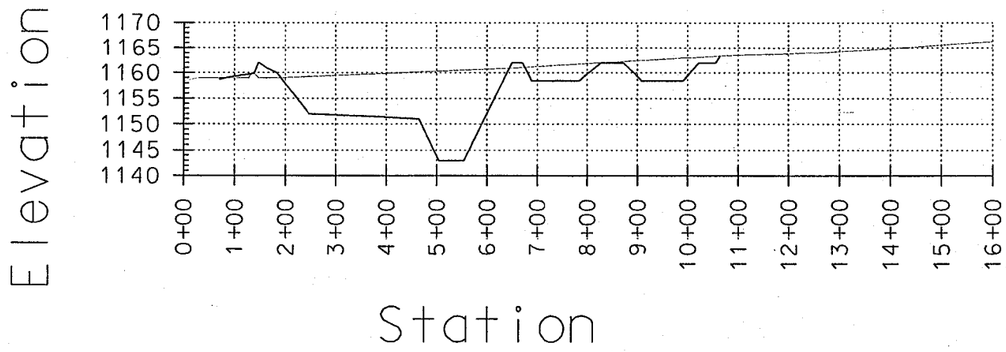
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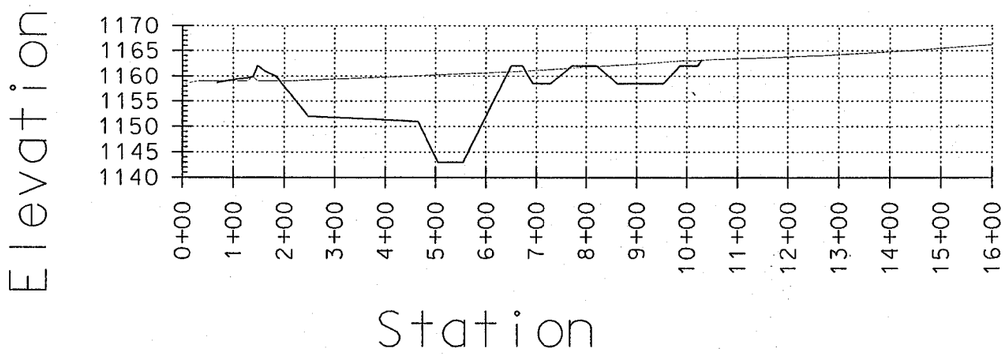
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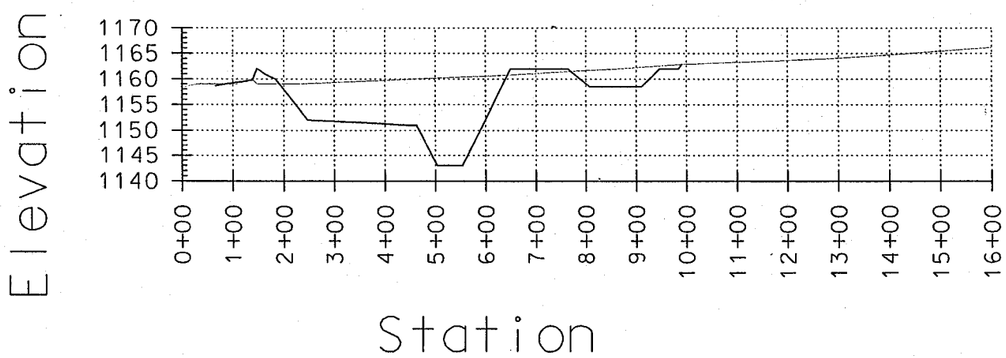
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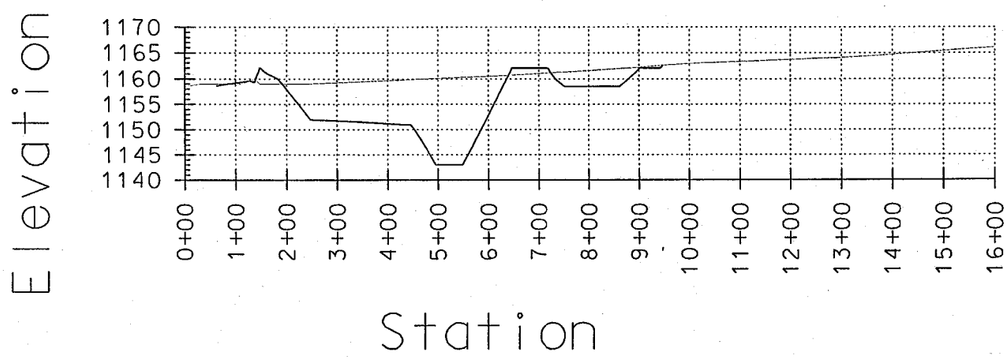
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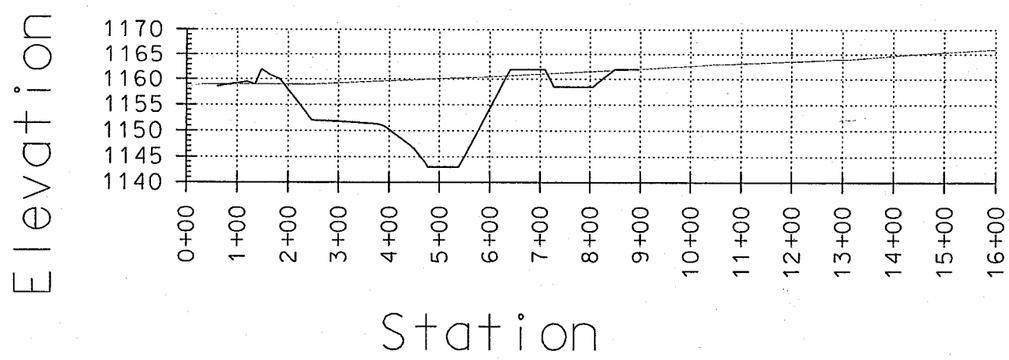
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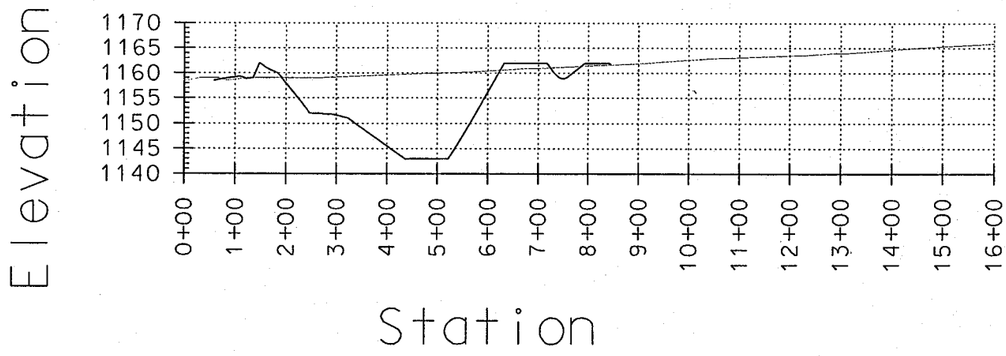
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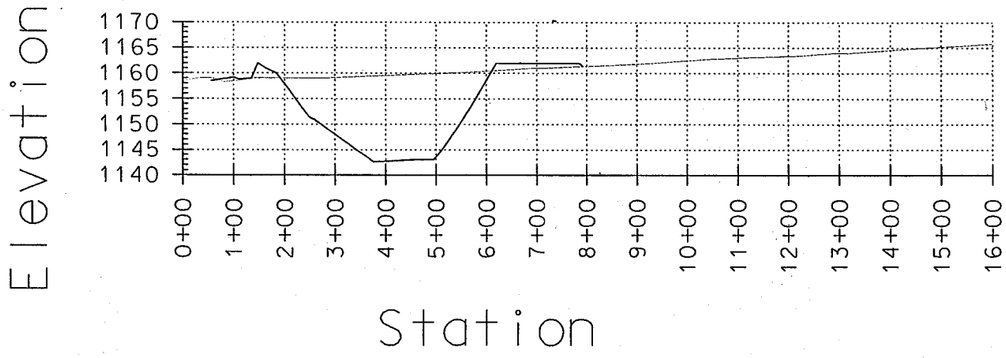
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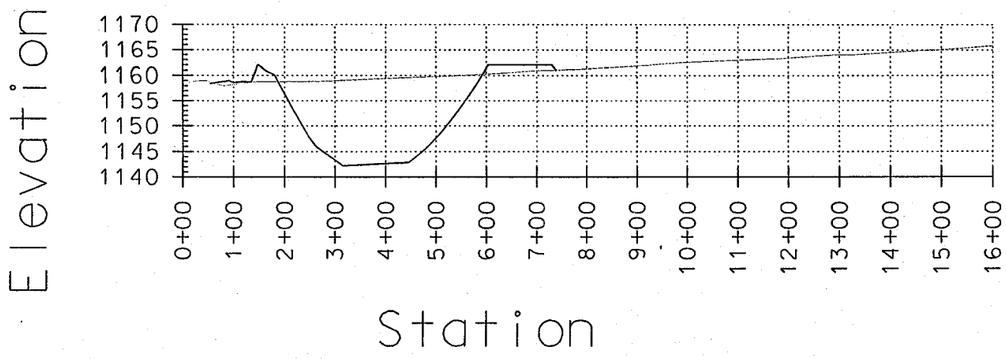
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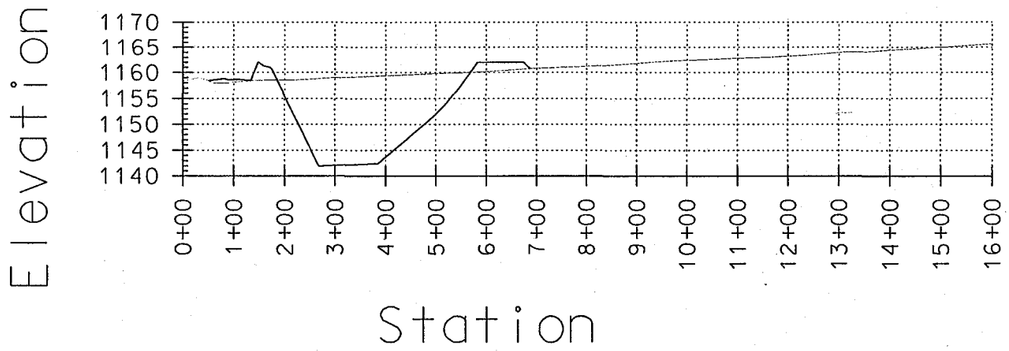
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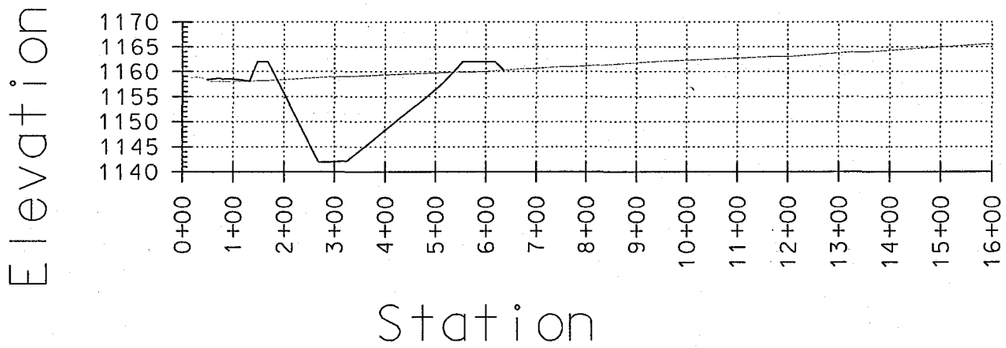
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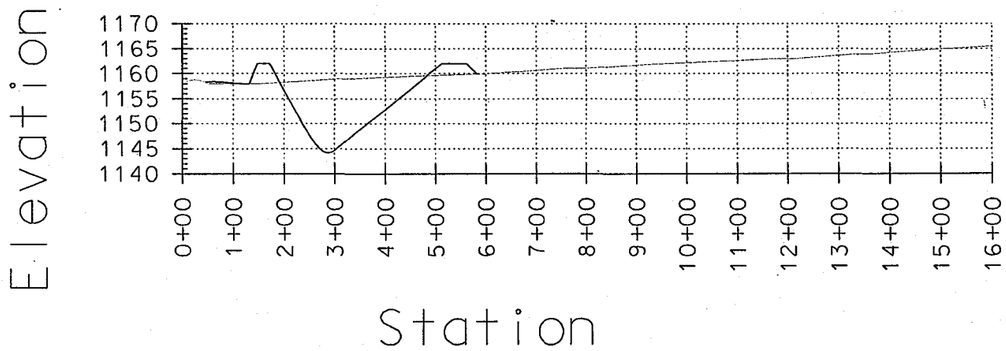
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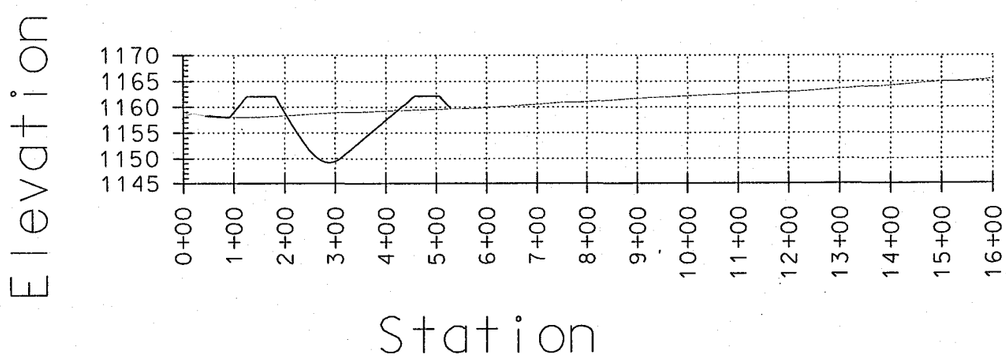
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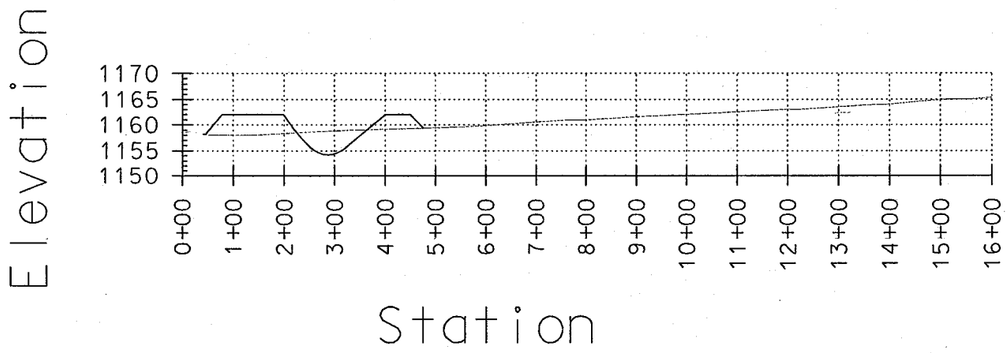
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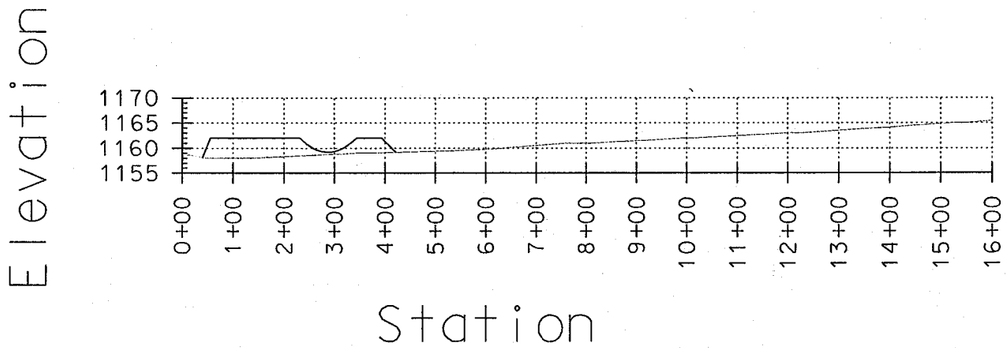
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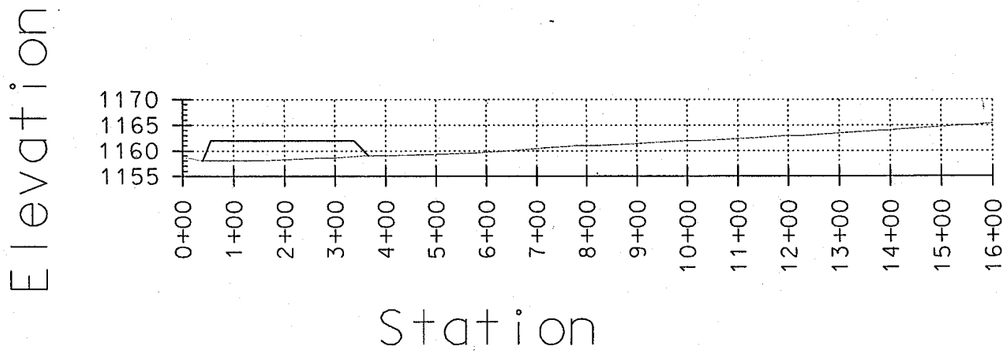
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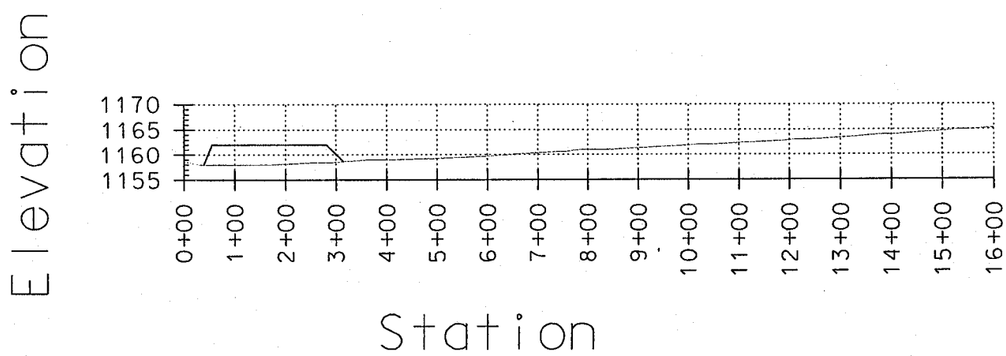
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Station

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Elevation

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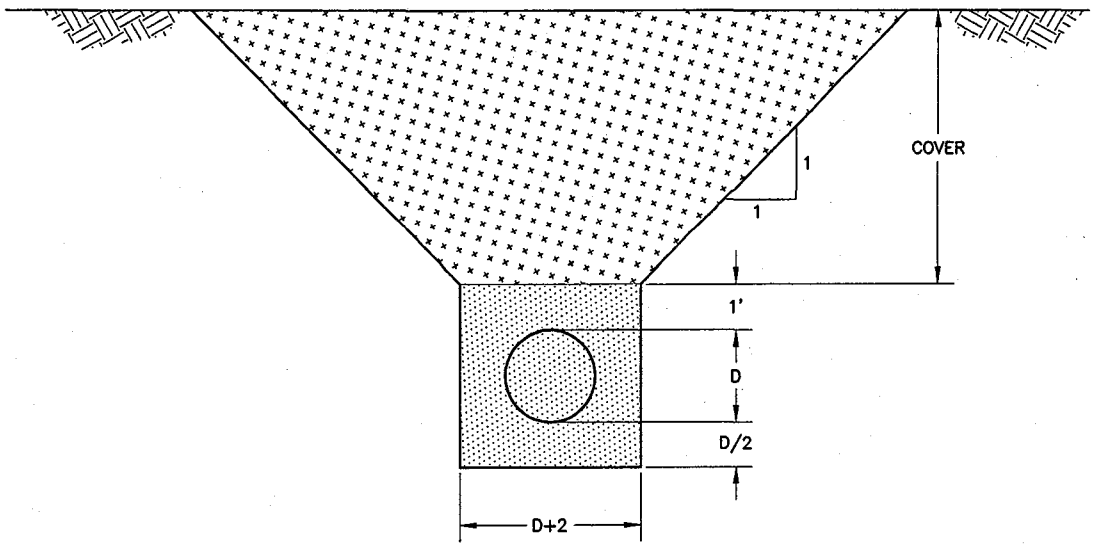
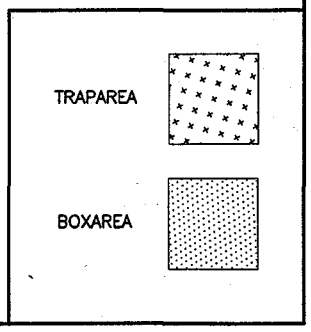
Station

PIPE EXCAVATION AND BACKFILL QUANTITIES



TYPICAL PIPE EXCAVATION CROSS SECTION



TERMS USED IN THIS REPORT:

"PIPE NUMBER" COINCIDES WITH NUMBERING SYSTEM IN PLANS (SEE SHEETS D–1 & D–2)
"BEGIN COVER" IS COVER OVER PIPE AT BEGINNING OF PIPE LENGTH LESS 1' (SEE ABOVE DIAGRAM)
"END COVER" IS COVER OVER PIPE AT END OF PIPE LENGTH LESS 1' (SEE ABOVE DIAGRAM)
"LENGTH" IS PIPE LENGTH
"INCREMENT" IS CHANGE IN COVER FOR ONE INTERVAL (1') OF PIPE LENGTH
"PIPE SIZE" IS DIAMETER OF PIPE IN INCHES
"BOXAREA" IS CROSS–SECTIONAL AREA OF BOX TRENCH AROUND PIPE (SEE ABOVE DIAGRAM)
"TRAPAREA" IS CROSS–SECTIONAL AREA OF TRAPEZOID ABOVE BOX TRENCH (SEE ABOVE DIAGRAM)
"TOTAL AREA" IS THE SUM OF BOXAREA AND TRAPAREA
TOTAL EXCAVATION AND TOTAL BACKFILL QUANTITIES ARE IN CUBIC FEET
TOTAL BACKFILL HAS BEEN INCREASED BY 10% FOR SHRINKAGE

Pipe Number	100	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation		
Begin Cover	0	1	0.28	16.00	1.20	17.20	17		
End Cover	14	2	0.56	16.00	2.55	18.55	36		
Length	50	3	0.84	16.00	4.07	20.07	56		
Increment	0.28	4	1.12	16.00	5.73	21.73	78		
Pipe Size	24	5	1.40	16.00	7.56	23.56	101		
		6	1.68	16.00	9.54	25.54	127		
		7	1.96	16.00	11.68	27.68	154		
		8	2.24	16.00	13.98	29.98	184		
		9	2.52	16.00	16.43	32.43	217		
		10	2.80	16.00	19.04	35.04	252		
		11	3.08	16.00	21.81	37.81	290		
		12	3.36	16.00	24.73	40.73	330		
		13	3.64	16.00	27.81	43.81	374		
		14	3.92	16.00	31.05	47.05	421		
		15	4.20	16.00	34.44	50.44	472		
		16	4.48	16.00	37.99	53.99	526		
		17	4.76	16.00	41.70	57.70	583		
		18	5.04	16.00	45.56	61.56	645		
		19	5.32	16.00	49.58	65.58	710		
		20	5.60	16.00	53.76	69.76	780		
		21	5.88	16.00	58.09	74.09	854		
		22	6.16	16.00	62.59	78.59	933		
		23	6.44	16.00	67.23	83.23	1016		
		24	6.72	16.00	72.04	88.04	1104		
		25	7.00	16.00	77.00	93.00	1197		
		26	7.28	16.00	82.12	98.12	1295		
		27	7.56	16.00	87.39	103.39	1399		
		28	7.84	16.00	92.83	108.83	1507		
		29	8.12	16.00	98.41	114.41	1622		
		30	8.40	16.00	104.16	120.16	1742		
		31	8.68	16.00	110.06	126.06	1868		
		32	8.96	16.00	116.12	132.12	2000		
		33	9.24	16.00	122.34	138.34	2139		
		34	9.52	16.00	128.71	144.71	2283		
		35	9.80	16.00	135.24	151.24	2435		
		36	10.08	16.00	141.93	157.93	2592		
		37	10.36	16.00	148.77	164.77	2757		
		38	10.64	16.00	155.77	171.77	2929		
		39	10.92	16.00	162.93	178.93	3108		
		40	11.20	16.00	170.24	186.24	3294		
		41	11.48	16.00	177.71	193.71	3488		
		42	11.76	16.00	185.34	201.34	3689		
		43	12.04	16.00	193.12	209.12	3898		
		44	12.32	16.00	201.06	217.06	4115		
		45	12.60	16.00	209.16	225.16	4341		
		46	12.88	16.00	217.41	233.41	4574		
		47	13.16	16.00	225.83	241.83	4816		
		48	13.44	16.00	234.39	250.39	5066		
		49	13.72	16.00	243.12	259.12	5325	Total Exc.	5593
		50	14.00	16.00	252.00	268.00	5593	Total Bkfl.	5273

Pipe Number	101	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	0	1	0.14	16.00	0.59	16.59	17
End Cover	14	2	0.28	16.00	1.21	17.21	34
Length	99	3	0.42	16.00	1.88	17.88	52
Increment	0.14	4	0.57	16.00	2.58	18.58	70
Pipe Size	24	5	0.71	16.00	3.33	19.33	90
		6	0.85	16.00	4.11	20.11	110
		7	0.99	16.00	4.94	20.94	131
		8	1.13	16.00	5.81	21.81	152
		9	1.27	16.00	6.71	22.71	175
		10	1.41	16.00	7.66	23.66	199
		11	1.56	16.00	8.64	24.64	223
		12	1.70	16.00	9.67	25.67	249
		13	1.84	16.00	10.73	26.73	276
		14	1.98	16.00	11.84	27.84	304
		15	2.12	16.00	12.98	28.98	333
		16	2.26	16.00	14.17	30.17	363
		17	2.40	16.00	15.40	31.40	394
		18	2.55	16.00	16.66	32.66	427
		19	2.69	16.00	17.97	33.97	461
		20	2.83	16.00	19.31	35.31	496
		21	2.97	16.00	20.70	36.70	533
		22	3.11	16.00	22.12	38.12	571
		23	3.25	16.00	23.59	39.59	611
		24	3.39	16.00	25.09	41.09	652
		25	3.54	16.00	26.64	42.64	694
		26	3.68	16.00	28.23	44.23	739
		27	3.82	16.00	29.85	45.85	784
		28	3.96	16.00	31.52	47.52	832
		29	4.10	16.00	33.22	49.22	881
		30	4.24	16.00	34.97	50.97	932
		31	4.38	16.00	36.75	52.75	985
		32	4.53	16.00	38.58	54.58	1039
		33	4.67	16.00	40.44	56.44	1096
		34	4.81	16.00	42.35	58.35	1154
		35	4.95	16.00	44.30	60.30	1215
		36	5.09	16.00	46.28	62.28	1277
		37	5.23	16.00	48.31	64.31	1341
		38	5.37	16.00	50.37	66.37	1407
		39	5.52	16.00	52.48	68.48	1476
		40	5.66	16.00	54.62	70.62	1547
		41	5.80	16.00	56.81	72.81	1619
		42	5.94	16.00	59.03	75.03	1694
		43	6.08	16.00	61.30	77.30	1772
		44	6.22	16.00	63.60	79.60	1851
		45	6.36	16.00	65.95	81.95	1933
		46	6.51	16.00	68.34	84.34	2018
		47	6.65	16.00	70.76	86.76	2104
		48	6.79	16.00	73.23	89.23	2194
		49	6.93	16.00	75.73	91.73	2285
		50	7.07	16.00	78.28	94.28	2380
		51	7.21	16.00	80.86	96.86	2476

52	7.35	16.00	83.49	99.49	2576	
53	7.49	16.00	86.15	102.15	2678	
54	7.64	16.00	88.86	104.86	2783	
55	7.78	16.00	91.60	107.60	2891	
56	7.92	16.00	94.39	110.39	3001	
57	8.06	16.00	97.22	113.22	3114	
58	8.20	16.00	100.08	116.08	3230	
59	8.34	16.00	102.99	118.99	3349	
60	8.48	16.00	105.93	121.93	3471	
61	8.63	16.00	108.92	124.92	3596	
62	8.77	16.00	111.94	127.94	3724	
63	8.91	16.00	115.01	131.01	3855	
64	9.05	16.00	118.11	134.11	3989	
65	9.19	16.00	121.26	137.26	4126	
66	9.33	16.00	124.44	140.44	4267	
67	9.47	16.00	127.67	143.67	4411	
68	9.62	16.00	130.94	146.94	4557	
69	9.76	16.00	134.24	150.24	4708	
70	9.90	16.00	137.59	153.59	4861	
71	10.04	16.00	140.97	156.97	5018	
72	10.18	16.00	144.40	160.40	5179	
73	10.32	16.00	147.86	163.86	5343	
74	10.46	16.00	151.37	167.37	5510	
75	10.61	16.00	154.91	170.91	5681	
76	10.75	16.00	158.50	174.50	5855	
77	10.89	16.00	162.12	178.12	6033	
78	11.03	16.00	165.79	181.79	6215	
79	11.17	16.00	169.49	185.49	6401	
80	11.31	16.00	173.24	189.24	6590	
81	11.45	16.00	177.02	193.02	6783	
82	11.60	16.00	180.85	196.85	6980	
83	11.74	16.00	184.72	200.72	7181	
84	11.88	16.00	188.62	204.62	7385	
85	12.02	16.00	192.57	208.57	7594	
86	12.16	16.00	196.55	212.55	7806	
87	12.30	16.00	200.58	216.58	8023	
88	12.44	16.00	204.64	220.64	8244	
89	12.59	16.00	208.75	224.75	8468	
90	12.73	16.00	212.89	228.89	8697	
91	12.87	16.00	217.08	233.08	8930	
92	13.01	16.00	221.30	237.30	9168	
93	13.15	16.00	225.57	241.57	9409	
94	13.29	16.00	229.87	245.87	9655	
95	13.43	16.00	234.22	250.22	9905	
96	13.58	16.00	238.60	254.60	10160	
97	13.72	16.00	243.03	259.03	10419	
98	13.86	16.00	247.49	263.49	10682	Total Exc. 10950
99	14.00	16.00	252.00	268.00	10950	Total Bkfl. 10303

Pipe Number	102	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	0	1	0.25	16.00	1.06	17.06	17
End Cover	20	2	0.50	16.00	2.25	18.25	35
Length	80	3	0.75	16.00	3.56	19.56	55
Increment	0.25	4	1.00	16.00	5.00	21.00	76
Pipe Size	24	5	1.25	16.00	6.56	22.56	98
		6	1.50	16.00	8.25	24.25	123
		7	1.75	16.00	10.06	26.06	149
		8	2.00	16.00	12.00	28.00	177
		9	2.25	16.00	14.06	30.06	207
		10	2.50	16.00	16.25	32.25	239
		11	2.75	16.00	18.56	34.56	274
		12	3.00	16.00	21.00	37.00	311
		13	3.25	16.00	23.56	39.56	350
		14	3.50	16.00	26.25	42.25	392
		15	3.75	16.00	29.06	45.06	438
		16	4.00	16.00	32.00	48.00	486
		17	4.25	16.00	35.06	51.06	537
		18	4.50	16.00	38.25	54.25	591
		19	4.75	16.00	41.56	57.56	648
		20	5.00	16.00	45.00	61.00	709
		21	5.25	16.00	48.56	64.56	774
		22	5.50	16.00	52.25	68.25	842
		23	5.75	16.00	56.06	72.06	914
		24	6.00	16.00	60.00	76.00	990
		25	6.25	16.00	64.06	80.06	1070
		26	6.50	16.00	68.25	84.25	1155
		27	6.75	16.00	72.56	88.56	1243
		28	7.00	16.00	77.00	93.00	1336
		29	7.25	16.00	81.56	97.56	1434
		30	7.50	16.00	86.25	102.25	1536
		31	7.75	16.00	91.06	107.06	1643
		32	8.00	16.00	96.00	112.00	1755
		33	8.25	16.00	101.06	117.06	1872
		34	8.50	16.00	106.25	122.25	1994
		35	8.75	16.00	111.56	127.56	2122
		36	9.00	16.00	117.00	133.00	2255
		37	9.25	16.00	122.56	138.56	2393
		38	9.50	16.00	128.25	144.25	2538
		39	9.75	16.00	134.06	150.06	2688
		40	10.00	16.00	140.00	156.00	2844
		41	10.25	16.00	146.06	162.06	3006
		42	10.50	16.00	152.25	168.25	3174
		43	10.75	16.00	158.56	174.56	3349
		44	11.00	16.00	165.00	181.00	3530
		45	11.25	16.00	171.56	187.56	3717
		46	11.50	16.00	178.25	194.25	3911
		47	11.75	16.00	185.06	201.06	4113
		48	12.00	16.00	192.00	208.00	4321
		49	12.25	16.00	199.06	215.06	4536
		50	12.50	16.00	206.25	222.25	4758
		51	12.75	16.00	213.56	229.56	4987

52	13.00	16.00	221.00	237.00	5224	
53	13.25	16.00	228.56	244.56	5469	
54	13.50	16.00	236.25	252.25	5721	
55	13.75	16.00	244.06	260.06	5981	
56	14.00	16.00	252.00	268.00	6249	
57	14.25	16.00	260.06	276.06	6525	
58	14.50	16.00	268.25	284.25	6810	
59	14.75	16.00	276.56	292.56	7102	
60	15.00	16.00	285.00	301.00	7403	
61	15.25	16.00	293.56	309.56	7713	
62	15.50	16.00	302.25	318.25	8031	
63	15.75	16.00	311.06	327.06	8358	
64	16.00	16.00	320.00	336.00	8694	
65	16.25	16.00	329.06	345.06	9039	
66	16.50	16.00	338.25	354.25	9393	
67	16.75	16.00	347.56	363.56	9757	
68	17.00	16.00	357.00	373.00	10130	
69	17.25	16.00	366.56	382.56	10512	
70	17.50	16.00	376.25	392.25	10905	
71	17.75	16.00	386.06	402.06	11307	
72	18.00	16.00	396.00	412.00	11719	
73	18.25	16.00	406.06	422.06	12141	
74	18.50	16.00	416.25	432.25	12573	
75	18.75	16.00	426.56	442.56	13016	
76	19.00	16.00	437.00	453.00	13469	
77	19.25	16.00	447.56	463.56	13932	
78	19.50	16.00	458.25	474.25	14406	
79	19.75	16.00	469.06	485.06	14892	Total Exc. 15388
80	20.00	16.00	480.00	496.00	15388	Total Bkfl. 15518

Pipe Number	103	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	18	1	18.01	16.00	396.30	412.30	412
End Cover	19	2	18.02	16.00	396.61	412.61	825
Length	132	3	18.02	16.00	396.91	412.91	1238
Increment	0.01	4	18.03	16.00	397.21	413.21	1651
Pipe Size	24	5	18.04	16.00	397.52	413.52	2065
		6	18.05	16.00	397.82	413.82	2478
		7	18.05	16.00	398.12	414.12	2892
		8	18.06	16.00	398.43	414.43	3307
		9	18.07	16.00	398.73	414.73	3722
		10	18.08	16.00	399.04	415.04	4137
		11	18.08	16.00	399.34	415.34	4552
		12	18.09	16.00	399.64	415.64	4968
		13	18.10	16.00	399.95	415.95	5384
		14	18.11	16.00	400.25	416.25	5800
		15	18.11	16.00	400.56	416.56	6216
		16	18.12	16.00	400.86	416.86	6633
		17	18.13	16.00	401.17	417.17	7050
		18	18.14	16.00	401.47	417.47	7468
		19	18.14	16.00	401.78	417.78	7886
		20	18.15	16.00	402.08	418.08	8304
		21	18.16	16.00	402.39	418.39	8722
		22	18.17	16.00	402.69	418.69	9141
		23	18.17	16.00	403.00	419.00	9560
		24	18.18	16.00	403.31	419.31	9979
		25	18.19	16.00	403.61	419.61	10399
		26	18.20	16.00	403.92	419.92	10819
		27	18.20	16.00	404.22	420.22	11239
		28	18.21	16.00	404.53	420.53	11659
		29	18.22	16.00	404.84	420.84	12080
		30	18.23	16.00	405.14	421.14	12501
		31	18.23	16.00	405.45	421.45	12923
		32	18.24	16.00	405.76	421.76	13345
		33	18.25	16.00	406.06	422.06	13767
		34	18.26	16.00	406.37	422.37	14189
		35	18.27	16.00	406.68	422.68	14612
		36	18.27	16.00	406.98	422.98	15035
		37	18.28	16.00	407.29	423.29	15458
		38	18.29	16.00	407.60	423.60	15882
		39	18.30	16.00	407.91	423.91	16306
		40	18.30	16.00	408.21	424.21	16730
		41	18.31	16.00	408.52	424.52	17154
		42	18.32	16.00	408.83	424.83	17579
		43	18.33	16.00	409.14	425.14	18004
		44	18.33	16.00	409.44	425.44	18430
		45	18.34	16.00	409.75	425.75	18855
		46	18.35	16.00	410.06	426.06	19281
		47	18.36	16.00	410.37	426.37	19708
		48	18.36	16.00	410.68	426.68	20135
		49	18.37	16.00	410.99	426.99	20562
		50	18.38	16.00	411.29	427.29	20989
		51	18.39	16.00	411.60	427.60	21416

52	18.39	16.00	411.91	427.91	21844
53	18.40	16.00	412.22	428.22	22273
54	18.41	16.00	412.53	428.53	22701
55	18.42	16.00	412.84	428.84	23130
56	18.42	16.00	413.15	429.15	23559
57	18.43	16.00	413.46	429.46	23989
58	18.44	16.00	413.77	429.77	24418
59	18.45	16.00	414.08	430.08	24848
60	18.45	16.00	414.39	430.39	25279
61	18.46	16.00	414.70	430.70	25709
62	18.47	16.00	415.01	431.01	26140
63	18.48	16.00	415.32	431.32	26572
64	18.48	16.00	415.63	431.63	27003
65	18.49	16.00	415.94	431.94	27435
66	18.50	16.00	416.25	432.25	27868
67	18.51	16.00	416.56	432.56	28300
68	18.52	16.00	416.87	432.87	28733
69	18.52	16.00	417.18	433.18	29166
70	18.53	16.00	417.49	433.49	29600
71	18.54	16.00	417.80	433.80	30034
72	18.55	16.00	418.12	434.12	30468
73	18.55	16.00	418.43	434.43	30902
74	18.56	16.00	418.74	434.74	31337
75	18.57	16.00	419.05	435.05	31772
76	18.58	16.00	419.36	435.36	32207
77	18.58	16.00	419.67	435.67	32643
78	18.59	16.00	419.99	435.99	33079
79	18.60	16.00	420.30	436.30	33515
80	18.61	16.00	420.61	436.61	33952
81	18.61	16.00	420.92	436.92	34389
82	18.62	16.00	421.23	437.23	34826
83	18.63	16.00	421.55	437.55	35264
84	18.64	16.00	421.86	437.86	35701
85	18.64	16.00	422.17	438.17	36140
86	18.65	16.00	422.49	438.49	36578
87	18.66	16.00	422.80	438.80	37017
88	18.67	16.00	423.11	439.11	37456
89	18.67	16.00	423.42	439.42	37895
90	18.68	16.00	423.74	439.74	38335
91	18.69	16.00	424.05	440.05	38775
92	18.70	16.00	424.36	440.36	39216
93	18.70	16.00	424.68	440.68	39656
94	18.71	16.00	424.99	440.99	40097
95	18.72	16.00	425.31	441.31	40538
96	18.73	16.00	425.62	441.62	40980
97	18.73	16.00	425.93	441.93	41422
98	18.74	16.00	426.25	442.25	41864
99	18.75	16.00	426.56	442.56	42307
100	18.76	16.00	426.88	442.88	42750

101	18.77	16.00	427.19	443.19	43193	
102	18.77	16.00	427.51	443.51	43636	
103	18.78	16.00	427.82	443.82	44080	
104	18.79	16.00	428.14	444.14	44524	
105	18.80	16.00	428.45	444.45	44969	
106	18.80	16.00	428.77	444.77	45414	
107	18.81	16.00	429.08	445.08	45859	
108	18.82	16.00	429.40	445.40	46304	
109	18.83	16.00	429.71	445.71	46750	
110	18.83	16.00	430.03	446.03	47196	
111	18.84	16.00	430.34	446.34	47642	
112	18.85	16.00	430.66	446.66	48089	
113	18.86	16.00	430.98	446.98	48536	
114	18.86	16.00	431.29	447.29	48983	
115	18.87	16.00	431.61	447.61	49431	
116	18.88	16.00	431.92	447.92	49879	
117	18.89	16.00	432.24	448.24	50327	
118	18.89	16.00	432.56	448.56	50775	
119	18.90	16.00	432.87	448.87	51224	
120	18.91	16.00	433.19	449.19	51673	
121	18.92	16.00	433.51	449.51	52123	
122	18.92	16.00	433.82	449.82	52573	
123	18.93	16.00	434.14	450.14	53023	
124	18.94	16.00	434.46	450.46	53473	
125	18.95	16.00	434.78	450.78	53924	
126	18.95	16.00	435.09	451.09	54375	
127	18.96	16.00	435.41	451.41	54827	
128	18.97	16.00	435.73	451.73	55278	
129	18.98	16.00	436.05	452.05	55730	
130	18.98	16.00	436.36	452.36	56183	
131	18.99	16.00	436.68	452.68	56636	Total Exc. 57089
132	19.00	16.00	437.00	453.00	57089	Total Bkfl. 60474

Pipe Number	104	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	14	1	14.01	16.00	252.40	268.40	268
End Cover	18	2	14.03	16.00	252.81	268.81	537
Length	317	3	14.04	16.00	253.21	269.21	806
Increment	0.01	4	14.05	16.00	253.62	269.62	1076
Pipe Size	24	5	14.06	16.00	254.02	270.02	1346
		6	14.08	16.00	254.43	270.43	1616
		7	14.09	16.00	254.83	270.83	1887
		8	14.10	16.00	255.24	271.24	2159
		9	14.11	16.00	255.65	271.65	2430
		10	14.13	16.00	256.05	272.05	2702
		11	14.14	16.00	256.46	272.46	2975
		12	14.15	16.00	256.87	272.87	3248
		13	14.16	16.00	257.28	273.28	3521
		14	14.18	16.00	257.68	273.68	3795
		15	14.19	16.00	258.09	274.09	4069
		16	14.20	16.00	258.50	274.50	4343
		17	14.21	16.00	258.91	274.91	4618
		18	14.23	16.00	259.32	275.32	4893
		19	14.24	16.00	259.73	275.73	5169
		20	14.25	16.00	260.14	276.14	5445
		21	14.26	16.00	260.55	276.55	5722
		22	14.28	16.00	260.96	276.96	5999
		23	14.29	16.00	261.37	277.37	6276
		24	14.30	16.00	261.78	277.78	6554
		25	14.32	16.00	262.19	278.19	6832
		26	14.33	16.00	262.61	278.61	7111
		27	14.34	16.00	263.02	279.02	7390
		28	14.35	16.00	263.43	279.43	7669
		29	14.37	16.00	263.84	279.84	7949
		30	14.38	16.00	264.26	280.26	8229
		31	14.39	16.00	264.67	280.67	8510
		32	14.40	16.00	265.08	281.08	8791
		33	14.42	16.00	265.50	281.50	9073
		34	14.43	16.00	265.91	281.91	9354
		35	14.44	16.00	266.33	282.33	9637
		36	14.45	16.00	266.74	282.74	9920
		37	14.47	16.00	267.16	283.16	10203
		38	14.48	16.00	267.57	283.57	10486
		39	14.49	16.00	267.99	283.99	10770
		40	14.50	16.00	268.41	284.41	11055
		41	14.52	16.00	268.82	284.82	11339
		42	14.53	16.00	269.24	285.24	11625
		43	14.54	16.00	269.66	285.66	11910
		44	14.56	16.00	270.07	286.07	12196
		45	14.57	16.00	270.49	286.49	12483
		46	14.58	16.00	270.91	286.91	12770
		47	14.59	16.00	271.33	287.33	13057
		48	14.61	16.00	271.75	287.75	13345
		49	14.62	16.00	272.17	288.17	13633
		50	14.63	16.00	272.59	288.59	13922
		51	14.64	16.00	273.01	289.01	14211

52	14.66	16.00	273.43	289.43	14500
53	14.67	16.00	273.85	289.85	14790
54	14.68	16.00	274.27	290.27	15080
55	14.69	16.00	274.69	290.69	15371
56	14.71	16.00	275.11	291.11	15662
57	14.72	16.00	275.53	291.53	15954
58	14.73	16.00	275.96	291.96	16246
59	14.74	16.00	276.38	292.38	16538
60	14.76	16.00	276.80	292.80	16831
61	14.77	16.00	277.22	293.22	17124
62	14.78	16.00	277.65	293.65	17418
63	14.79	16.00	278.07	294.07	17712
64	14.81	16.00	278.49	294.49	18006
65	14.82	16.00	278.92	294.92	18301
66	14.83	16.00	279.34	295.34	18596
67	14.85	16.00	279.77	295.77	18892
68	14.86	16.00	280.19	296.19	19188
69	14.87	16.00	280.62	296.62	19485
70	14.88	16.00	281.05	297.05	19782
71	14.90	16.00	281.47	297.47	20079
72	14.91	16.00	281.90	297.90	20377
73	14.92	16.00	282.32	298.32	20676
74	14.93	16.00	282.75	298.75	20974
75	14.95	16.00	283.18	299.18	21274
76	14.96	16.00	283.61	299.61	21573
77	14.97	16.00	284.04	300.04	21873
78	14.98	16.00	284.46	300.46	22174
79	15.00	16.00	284.89	300.89	22475
80	15.01	16.00	285.32	301.32	22776
81	15.02	16.00	285.75	301.75	23078
82	15.03	16.00	286.18	302.18	23380
83	15.05	16.00	286.61	302.61	23682
84	15.06	16.00	287.04	303.04	23986
85	15.07	16.00	287.47	303.47	24289
86	15.09	16.00	287.90	303.90	24593
87	15.10	16.00	288.33	304.33	24897
88	15.11	16.00	288.77	304.77	25202
89	15.12	16.00	289.20	305.20	25507
90	15.14	16.00	289.63	305.63	25813
91	15.15	16.00	290.06	306.06	26119
92	15.16	16.00	290.50	306.50	26425
93	15.17	16.00	290.93	306.93	26732
94	15.19	16.00	291.36	307.36	27040
95	15.20	16.00	291.80	307.80	27347
96	15.21	16.00	292.23	308.23	27656
97	15.22	16.00	292.67	308.67	27964
98	15.24	16.00	293.10	309.10	28273
99	15.25	16.00	293.54	309.54	28583
100	15.26	16.00	293.97	309.97	28893

101	15.27	16.00	294.41	310.41	29203
102	15.29	16.00	294.84	310.84	29514
103	15.30	16.00	295.28	311.28	29826
104	15.31	16.00	295.72	311.72	30137
105	15.32	16.00	296.15	312.15	30449
106	15.34	16.00	296.59	312.59	30762
107	15.35	16.00	297.03	313.03	31075
108	15.36	16.00	297.47	313.47	31388
109	15.38	16.00	297.90	313.90	31702
110	15.39	16.00	298.34	314.34	32017
111	15.40	16.00	298.78	314.78	32331
112	15.41	16.00	299.22	315.22	32647
113	15.43	16.00	299.66	315.66	32962
114	15.44	16.00	300.10	316.10	33278
115	15.45	16.00	300.54	316.54	33595
116	15.46	16.00	300.98	316.98	33912
117	15.48	16.00	301.42	317.42	34229
118	15.49	16.00	301.86	317.86	34547
119	15.50	16.00	302.31	318.31	34866
120	15.51	16.00	302.75	318.75	35184
121	15.53	16.00	303.19	319.19	35504
122	15.54	16.00	303.63	319.63	35823
123	15.55	16.00	304.07	320.07	36143
124	15.56	16.00	304.52	320.52	36464
125	15.58	16.00	304.96	320.96	36785
126	15.59	16.00	305.40	321.40	37106
127	15.60	16.00	305.85	321.85	37428
128	15.62	16.00	306.29	322.29	37750
129	15.63	16.00	306.74	322.74	38073
130	15.64	16.00	307.18	323.18	38396
131	15.65	16.00	307.63	323.63	38720
132	15.67	16.00	308.07	324.07	39044
133	15.68	16.00	308.52	324.52	39368
134	15.69	16.00	308.97	324.97	39693
135	15.70	16.00	309.41	325.41	40019
136	15.72	16.00	309.86	325.86	40345
137	15.73	16.00	310.31	326.31	40671
138	15.74	16.00	310.75	326.75	40998
139	15.75	16.00	311.20	327.20	41325
140	15.77	16.00	311.65	327.65	41653
141	15.78	16.00	312.10	328.10	41981
142	15.79	16.00	312.55	328.55	42309
143	15.80	16.00	313.00	329.00	42638
144	15.82	16.00	313.45	329.45	42968
145	15.83	16.00	313.90	329.90	43298
146	15.84	16.00	314.35	330.35	43628
147	15.85	16.00	314.80	330.80	43959
148	15.87	16.00	315.25	331.25	44290
149	15.88	16.00	315.70	331.70	44622

150	15.89	16.00	316.15	332.15	44954
151	15.91	16.00	316.60	332.60	45286
152	15.92	16.00	317.05	333.05	45619
153	15.93	16.00	317.51	333.51	45953
154	15.94	16.00	317.96	333.96	46287
155	15.96	16.00	318.41	334.41	46621
156	15.97	16.00	318.87	334.87	46956
157	15.98	16.00	319.32	335.32	47292
158	15.99	16.00	319.77	335.77	47627
159	16.01	16.00	320.23	336.23	47964
160	16.02	16.00	320.68	336.68	48300
161	16.03	16.00	321.14	337.14	48637
162	16.04	16.00	321.59	337.59	48975
163	16.06	16.00	322.05	338.05	49313
164	16.07	16.00	322.50	338.50	49651
165	16.08	16.00	322.96	338.96	49990
166	16.09	16.00	323.42	339.42	50330
167	16.11	16.00	323.87	339.87	50670
168	16.12	16.00	324.33	340.33	51010
169	16.13	16.00	324.79	340.79	51351
170	16.15	16.00	325.25	341.25	51692
171	16.16	16.00	325.70	341.70	52034
172	16.17	16.00	326.16	342.16	52376
173	16.18	16.00	326.62	342.62	52719
174	16.20	16.00	327.08	343.08	53062
175	16.21	16.00	327.54	343.54	53405
176	16.22	16.00	328.00	344.00	53749
177	16.23	16.00	328.46	344.46	54094
178	16.25	16.00	328.92	344.92	54439
179	16.26	16.00	329.38	345.38	54784
180	16.27	16.00	329.84	345.84	55130
181	16.28	16.00	330.30	346.30	55476
182	16.30	16.00	330.76	346.76	55823
183	16.31	16.00	331.22	347.22	56170
184	16.32	16.00	331.69	347.69	56518
185	16.33	16.00	332.15	348.15	56866
186	16.35	16.00	332.61	348.61	57215
187	16.36	16.00	333.08	349.08	57564
188	16.37	16.00	333.54	349.54	57913
189	16.38	16.00	334.00	350.00	58263
190	16.40	16.00	334.47	350.47	58614
191	16.41	16.00	334.93	350.93	58965
192	16.42	16.00	335.40	351.40	59316
193	16.44	16.00	335.86	351.86	59668
194	16.45	16.00	336.33	352.33	60020
195	16.46	16.00	336.79	352.79	60373
196	16.47	16.00	337.26	353.26	60726
197	16.49	16.00	337.72	353.72	61080
198	16.50	16.00	338.19	354.19	61434

199	16.51	16.00	338.66	354.66	61789
200	16.52	16.00	339.13	355.13	62144
201	16.54	16.00	339.59	355.59	62499
202	16.55	16.00	340.06	356.06	62856
203	16.56	16.00	340.53	356.53	63212
204	16.57	16.00	341.00	357.00	63569
205	16.59	16.00	341.47	357.47	63927
206	16.60	16.00	341.94	357.94	64284
207	16.61	16.00	342.41	358.41	64643
208	16.62	16.00	342.88	358.88	65002
209	16.64	16.00	343.35	359.35	65361
210	16.65	16.00	343.82	359.82	65721
211	16.66	16.00	344.29	360.29	66081
212	16.68	16.00	344.76	360.76	66442
213	16.69	16.00	345.23	361.23	66803
214	16.70	16.00	345.70	361.70	67165
215	16.71	16.00	346.17	362.17	67527
216	16.73	16.00	346.65	362.65	67890
217	16.74	16.00	347.12	363.12	68253
218	16.75	16.00	347.59	363.59	68616
219	16.76	16.00	348.07	364.07	68980
220	16.78	16.00	348.54	364.54	69345
221	16.79	16.00	349.01	365.01	69710
222	16.80	16.00	349.49	365.49	70076
223	16.81	16.00	349.96	365.96	70441
224	16.83	16.00	350.44	366.44	70808
225	16.84	16.00	350.91	366.91	71175
226	16.85	16.00	351.39	367.39	71542
227	16.86	16.00	351.86	367.86	71910
228	16.88	16.00	352.34	368.34	72278
229	16.89	16.00	352.82	368.82	72647
230	16.90	16.00	353.29	369.29	73017
231	16.91	16.00	353.77	369.77	73386
232	16.93	16.00	354.25	370.25	73757
233	16.94	16.00	354.73	370.73	74127
234	16.95	16.00	355.20	371.20	74498
235	16.97	16.00	355.68	371.68	74870
236	16.98	16.00	356.16	372.16	75242
237	16.99	16.00	356.64	372.64	75615
238	17.00	16.00	357.12	373.12	75988
239	17.02	16.00	357.60	373.60	76362
240	17.03	16.00	358.08	374.08	76736
241	17.04	16.00	358.56	374.56	77110
242	17.05	16.00	359.04	375.04	77485
243	17.07	16.00	359.52	375.52	77861
244	17.08	16.00	360.00	376.00	78237
245	17.09	16.00	360.48	376.48	78613
246	17.10	16.00	360.97	376.97	78990
247	17.12	16.00	361.45	377.45	79368

248	17.13	16.00	361.93	377.93	79746
249	17.14	16.00	362.41	378.41	80124
250	17.15	16.00	362.90	378.90	80503
251	17.17	16.00	363.38	379.38	80882
252	17.18	16.00	363.87	379.87	81262
253	17.19	16.00	364.35	380.35	81643
254	17.21	16.00	364.83	380.83	82023
255	17.22	16.00	365.32	381.32	82405
256	17.23	16.00	365.80	381.80	82787
257	17.24	16.00	366.29	382.29	83169
258	17.26	16.00	366.78	382.78	83552
259	17.27	16.00	367.26	383.26	83935
260	17.28	16.00	367.75	383.75	84319
261	17.29	16.00	368.23	384.23	84703
262	17.31	16.00	368.72	384.72	85088
263	17.32	16.00	369.21	385.21	85473
264	17.33	16.00	369.70	385.70	85859
265	17.34	16.00	370.18	386.18	86245
266	17.36	16.00	370.67	386.67	86631
267	17.37	16.00	371.16	387.16	87019
268	17.38	16.00	371.65	387.65	87406
269	17.39	16.00	372.14	388.14	87794
270	17.41	16.00	372.63	388.63	88183
271	17.42	16.00	373.12	389.12	88572
272	17.43	16.00	373.61	389.61	88962
273	17.44	16.00	374.10	390.10	89352
274	17.46	16.00	374.59	390.59	89742
275	17.47	16.00	375.08	391.08	90133
276	17.48	16.00	375.57	391.57	90525
277	17.50	16.00	376.07	392.07	90917
278	17.51	16.00	376.56	392.56	91310
279	17.52	16.00	377.05	393.05	91703
280	17.53	16.00	377.54	393.54	92096
281	17.55	16.00	378.04	394.04	92490
282	17.56	16.00	378.53	394.53	92885
283	17.57	16.00	379.02	395.02	93280
284	17.58	16.00	379.52	395.52	93675
285	17.60	16.00	380.01	396.01	94071
286	17.61	16.00	380.51	396.51	94468
287	17.62	16.00	381.00	397.00	94865
288	17.63	16.00	381.50	397.50	95262
289	17.65	16.00	381.99	397.99	95660
290	17.66	16.00	382.49	398.49	96059
291	17.67	16.00	382.98	398.98	96458
292	17.68	16.00	383.48	399.48	96857
293	17.70	16.00	383.98	399.98	97257
294	17.71	16.00	384.48	400.48	97658
295	17.72	16.00	384.97	400.97	98059
296	17.74	16.00	385.47	401.47	98460

297	17.75	16.00	385.97	401.97	98862		
298	17.76	16.00	386.47	402.47	99265		
299	17.77	16.00	386.97	402.97	99668		
300	17.79	16.00	387.47	403.47	100071		
301	17.80	16.00	387.97	403.97	100475		
302	17.81	16.00	388.46	404.46	100880		
303	17.82	16.00	388.96	404.96	101284		
304	17.84	16.00	389.47	405.47	101690		
305	17.85	16.00	389.97	405.97	102096		
306	17.86	16.00	390.47	406.47	102502		
307	17.87	16.00	390.97	406.97	102909		
308	17.89	16.00	391.47	407.47	103317		
309	17.90	16.00	391.97	407.97	103725		
310	17.91	16.00	392.47	408.47	104133		
311	17.92	16.00	392.98	408.98	104542		
312	17.94	16.00	393.48	409.48	104952		
313	17.95	16.00	393.98	409.98	105362		
314	17.96	16.00	394.49	410.49	105772		
315	17.97	16.00	394.99	410.99	106183		
316	17.99	16.00	395.50	411.50	106595	Total Exc.	107007
317	18.00	16.00	396.00	412.00	107007	Total Bkfl.	112128

Pipe Number	105	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	12	1	12.01	16.00	192.22	208.22	208
End Cover	14	2	12.02	16.00	192.45	208.45	417
Length	250	3	12.02	16.00	192.67	208.67	625
Increment	0.01	4	12.03	16.00	192.90	208.90	834
Pipe Size	24	5	12.04	16.00	193.12	209.12	1043
		6	12.05	16.00	193.35	209.35	1253
		7	12.06	16.00	193.57	209.57	1462
		8	12.06	16.00	193.80	209.80	1672
		9	12.07	16.00	194.02	210.02	1882
		10	12.08	16.00	194.25	210.25	2092
		11	12.09	16.00	194.47	210.47	2303
		12	12.10	16.00	194.70	210.70	2514
		13	12.10	16.00	194.92	210.92	2724
		14	12.11	16.00	195.15	211.15	2936
		15	12.12	16.00	195.37	211.37	3147
		16	12.13	16.00	195.60	211.60	3359
		17	12.14	16.00	195.83	211.83	3570
		18	12.14	16.00	196.05	212.05	3782
		19	12.15	16.00	196.28	212.28	3995
		20	12.16	16.00	196.51	212.51	4207
		21	12.17	16.00	196.73	212.73	4420
		22	12.18	16.00	196.96	212.96	4633
		23	12.18	16.00	197.19	213.19	4846
		24	12.19	16.00	197.41	213.41	5060
		25	12.20	16.00	197.64	213.64	5273
		26	12.21	16.00	197.87	213.87	5487
		27	12.22	16.00	198.09	214.09	5701
		28	12.22	16.00	198.32	214.32	5915
		29	12.23	16.00	198.55	214.55	6130
		30	12.24	16.00	198.78	214.78	6345
		31	12.25	16.00	199.01	215.01	6560
		32	12.26	16.00	199.23	215.23	6775
		33	12.26	16.00	199.46	215.46	6990
		34	12.27	16.00	199.69	215.69	7206
		35	12.28	16.00	199.92	215.92	7422
		36	12.29	16.00	200.15	216.15	7638
		37	12.30	16.00	200.38	216.38	7855
		38	12.30	16.00	200.60	216.60	8071
		39	12.31	16.00	200.83	216.83	8288
		40	12.32	16.00	201.06	217.06	8505
		41	12.33	16.00	201.29	217.29	8722
		42	12.34	16.00	201.52	217.52	8940
		43	12.34	16.00	201.75	217.75	9158
		44	12.35	16.00	201.98	217.98	9376
		45	12.36	16.00	202.21	218.21	9594
		46	12.37	16.00	202.44	218.44	9812
		47	12.38	16.00	202.67	218.67	10031
		48	12.38	16.00	202.90	218.90	10250
		49	12.39	16.00	203.13	219.13	10469
		50	12.40	16.00	203.36	219.36	10688
		51	12.41	16.00	203.59	219.59	10908

52	12.42	16.00	203.82	219.82	11128
53	12.42	16.00	204.05	220.05	11348
54	12.43	16.00	204.28	220.28	11568
55	12.44	16.00	204.51	220.51	11789
56	12.45	16.00	204.74	220.74	12009
57	12.46	16.00	204.98	220.98	12230
58	12.46	16.00	205.21	221.21	12452
59	12.47	16.00	205.44	221.44	12673
60	12.48	16.00	205.67	221.67	12895
61	12.49	16.00	205.90	221.90	13117
62	12.50	16.00	206.13	222.13	13339
63	12.50	16.00	206.37	222.37	13561
64	12.51	16.00	206.60	222.60	13784
65	12.52	16.00	206.83	222.83	14006
66	12.53	16.00	207.06	223.06	14230
67	12.54	16.00	207.30	223.30	14453
68	12.54	16.00	207.53	223.53	14676
69	12.55	16.00	207.76	223.76	14900
70	12.56	16.00	207.99	223.99	15124
71	12.57	16.00	208.23	224.23	15348
72	12.58	16.00	208.46	224.46	15573
73	12.58	16.00	208.69	224.69	15797
74	12.59	16.00	208.93	224.93	16022
75	12.60	16.00	209.16	225.16	16248
76	12.61	16.00	209.39	225.39	16473
77	12.62	16.00	209.63	225.63	16699
78	12.62	16.00	209.86	225.86	16924
79	12.63	16.00	210.10	226.10	17151
80	12.64	16.00	210.33	226.33	17377
81	12.65	16.00	210.56	226.56	17603
82	12.66	16.00	210.80	226.80	17830
83	12.66	16.00	211.03	227.03	18057
84	12.67	16.00	211.27	227.27	18285
85	12.68	16.00	211.50	227.50	18512
86	12.69	16.00	211.74	227.74	18740
87	12.70	16.00	211.97	227.97	18968
88	12.70	16.00	212.21	228.21	19196
89	12.71	16.00	212.44	228.44	19424
90	12.72	16.00	212.68	228.68	19653
91	12.73	16.00	212.91	228.91	19882
92	12.74	16.00	213.15	229.15	20111
93	12.74	16.00	213.39	229.39	20341
94	12.75	16.00	213.62	229.62	20570
95	12.76	16.00	213.86	229.86	20800
96	12.77	16.00	214.09	230.09	21030
97	12.78	16.00	214.33	230.33	21260
98	12.78	16.00	214.57	230.57	21491
99	12.79	16.00	214.80	230.80	21722
100	12.80	16.00	215.04	231.04	21953

101	12.81	16.00	215.28	231.28	22184
102	12.82	16.00	215.51	231.51	22416
103	12.82	16.00	215.75	231.75	22647
104	12.83	16.00	215.99	231.99	22879
105	12.84	16.00	216.23	232.23	23112
106	12.85	16.00	216.46	232.46	23344
107	12.86	16.00	216.70	232.70	23577
108	12.86	16.00	216.94	232.94	23810
109	12.87	16.00	217.18	233.18	24043
110	12.88	16.00	217.41	233.41	24276
111	12.89	16.00	217.65	233.65	24510
112	12.90	16.00	217.89	233.89	24744
113	12.90	16.00	218.13	234.13	24978
114	12.91	16.00	218.37	234.37	25212
115	12.92	16.00	218.61	234.61	25447
116	12.93	16.00	218.85	234.85	25682
117	12.94	16.00	219.08	235.08	25917
118	12.94	16.00	219.32	235.32	26152
119	12.95	16.00	219.56	235.56	26388
120	12.96	16.00	219.80	235.80	26624
121	12.97	16.00	220.04	236.04	26860
122	12.98	16.00	220.28	236.28	27096
123	12.98	16.00	220.52	236.52	27332
124	12.99	16.00	220.76	236.76	27569
125	13.00	16.00	221.00	237.00	27806
126	13.01	16.00	221.24	237.24	28043
127	13.02	16.00	221.48	237.48	28281
128	13.02	16.00	221.72	237.72	28519
129	13.03	16.00	221.96	237.96	28757
130	13.04	16.00	222.20	238.20	28995
131	13.05	16.00	222.44	238.44	29233
132	13.06	16.00	222.68	238.68	29472
133	13.06	16.00	222.92	238.92	29711
134	13.07	16.00	223.17	239.17	29950
135	13.08	16.00	223.41	239.41	30189
136	13.09	16.00	223.65	239.65	30429
137	13.10	16.00	223.89	239.89	30669
138	13.10	16.00	224.13	240.13	30909
139	13.11	16.00	224.37	240.37	31149
140	13.12	16.00	224.61	240.61	31390
141	13.13	16.00	224.86	240.86	31631
142	13.14	16.00	225.10	241.10	31872
143	13.14	16.00	225.34	241.34	32113
144	13.15	16.00	225.58	241.58	32355
145	13.16	16.00	225.83	241.83	32597
146	13.17	16.00	226.07	242.07	32839
147	13.18	16.00	226.31	242.31	33081
148	13.18	16.00	226.55	242.55	33324
149	13.19	16.00	226.80	242.80	33566

150	13.20	16.00	227.04	243.04	33810
151	13.21	16.00	227.28	243.28	34053
152	13.22	16.00	227.53	243.53	34296
153	13.22	16.00	227.77	243.77	34540
154	13.23	16.00	228.01	244.01	34784
155	13.24	16.00	228.26	244.26	35028
156	13.25	16.00	228.50	244.50	35273
157	13.26	16.00	228.75	244.75	35518
158	13.26	16.00	228.99	244.99	35763
159	13.27	16.00	229.23	245.23	36008
160	13.28	16.00	229.48	245.48	36253
161	13.29	16.00	229.72	245.72	36499
162	13.30	16.00	229.97	245.97	36745
163	13.30	16.00	230.21	246.21	36991
164	13.31	16.00	230.46	246.46	37238
165	13.32	16.00	230.70	246.70	37484
166	13.33	16.00	230.95	246.95	37731
167	13.34	16.00	231.19	247.19	37979
168	13.34	16.00	231.44	247.44	38226
169	13.35	16.00	231.68	247.68	38474
170	13.36	16.00	231.93	247.93	38722
171	13.37	16.00	232.18	248.18	38970
172	13.38	16.00	232.42	248.42	39218
173	13.38	16.00	232.67	248.67	39467
174	13.39	16.00	232.91	248.91	39716
175	13.40	16.00	233.16	249.16	39965
176	13.41	16.00	233.41	249.41	40214
177	13.42	16.00	233.65	249.65	40464
178	13.42	16.00	233.90	249.90	40714
179	13.43	16.00	234.15	250.15	40964
180	13.44	16.00	234.39	250.39	41214
181	13.45	16.00	234.64	250.64	41465
182	13.46	16.00	234.89	250.89	41716
183	13.46	16.00	235.14	251.14	41967
184	13.47	16.00	235.38	251.38	42218
185	13.48	16.00	235.63	251.63	42470
186	13.49	16.00	235.88	251.88	42722
187	13.50	16.00	236.13	252.13	42974
188	13.50	16.00	236.37	252.37	43226
189	13.51	16.00	236.62	252.62	43479
190	13.52	16.00	236.87	252.87	43732
191	13.53	16.00	237.12	253.12	43985
192	13.54	16.00	237.37	253.37	44238
193	13.54	16.00	237.62	253.62	44492
194	13.55	16.00	237.86	253.86	44746
195	13.56	16.00	238.11	254.11	45000
196	13.57	16.00	238.36	254.36	45254
197	13.58	16.00	238.61	254.61	45509
198	13.58	16.00	238.86	254.86	45764

199	13.59	16.00	239.11	255.11	46019
200	13.60	16.00	239.36	255.36	46274
201	13.61	16.00	239.61	255.61	46530
202	13.62	16.00	239.86	255.86	46786
203	13.62	16.00	240.11	256.11	47042
204	13.63	16.00	240.36	256.36	47298
205	13.64	16.00	240.61	256.61	47555
206	13.65	16.00	240.86	256.86	47812
207	13.66	16.00	241.11	257.11	48069
208	13.66	16.00	241.36	257.36	48326
209	13.67	16.00	241.61	257.61	48584
210	13.68	16.00	241.86	257.86	48842
211	13.69	16.00	242.11	258.11	49100
212	13.70	16.00	242.36	258.36	49358
213	13.70	16.00	242.62	258.62	49617
214	13.71	16.00	242.87	258.87	49876
215	13.72	16.00	243.12	259.12	50135
216	13.73	16.00	243.37	259.37	50394
217	13.74	16.00	243.62	259.62	50654
218	13.74	16.00	243.87	259.87	50914
219	13.75	16.00	244.13	260.13	51174
220	13.76	16.00	244.38	260.38	51434
221	13.77	16.00	244.63	260.63	51695
222	13.78	16.00	244.88	260.88	51956
223	13.78	16.00	245.13	261.13	52217
224	13.79	16.00	245.39	261.39	52478
225	13.80	16.00	245.64	261.64	52740
226	13.81	16.00	245.89	261.89	53002
227	13.82	16.00	246.15	262.15	53264
228	13.82	16.00	246.40	262.40	53526
229	13.83	16.00	246.65	262.65	53789
230	13.84	16.00	246.91	262.91	54052
231	13.85	16.00	247.16	263.16	54315
232	13.86	16.00	247.41	263.41	54578
233	13.86	16.00	247.67	263.67	54842
234	13.87	16.00	247.92	263.92	55106
235	13.88	16.00	248.17	264.17	55370
236	13.89	16.00	248.43	264.43	55635
237	13.90	16.00	248.68	264.68	55899
238	13.90	16.00	248.94	264.94	56164
239	13.91	16.00	249.19	265.19	56429
240	13.92	16.00	249.45	265.45	56695
241	13.93	16.00	249.70	265.70	56961
242	13.94	16.00	249.96	265.96	57226
243	13.94	16.00	250.21	266.21	57493
244	13.95	16.00	250.47	266.47	57759
245	13.96	16.00	250.72	266.72	58026
246	13.97	16.00	250.98	266.98	58293
247	13.98	16.00	251.23	267.23	58560

248	13.98	16.00	251.49	267.49	58828		
249	13.99	16.00	251.74	267.74	59095	Total Exc.	59363
250	14.00	16.00	252.00	268.00	59363	Total Bkfl.	60900

Pipe Number	106	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	9	1	9.01	16.00	117.26	133.26	133
End Cover	12	2	9.02	16.00	117.53	133.53	267
Length	250	3	9.04	16.00	117.79	133.79	401
Increment	0.01	4	9.05	16.00	118.06	134.06	535
Pipe Size	24	5	9.06	16.00	118.32	134.32	669
		6	9.07	16.00	118.59	134.59	804
		7	9.08	16.00	118.86	134.86	938
		8	9.10	16.00	119.12	135.12	1074
		9	9.11	16.00	119.39	135.39	1209
		10	9.12	16.00	119.65	135.65	1345
		11	9.13	16.00	119.92	135.92	1480
		12	9.14	16.00	120.19	136.19	1617
		13	9.16	16.00	120.46	136.46	1753
		14	9.17	16.00	120.72	136.72	1890
		15	9.18	16.00	120.99	136.99	2027
		16	9.19	16.00	121.26	137.26	2164
		17	9.20	16.00	121.53	137.53	2302
		18	9.22	16.00	121.80	137.80	2439
		19	9.23	16.00	122.07	138.07	2578
		20	9.24	16.00	122.34	138.34	2716
		21	9.25	16.00	122.61	138.61	2854
		22	9.26	16.00	122.88	138.88	2993
		23	9.28	16.00	123.15	139.15	3132
		24	9.29	16.00	123.42	139.42	3272
		25	9.30	16.00	123.69	139.69	3412
		26	9.31	16.00	123.96	139.96	3552
		27	9.32	16.00	124.23	140.23	3692
		28	9.34	16.00	124.50	140.50	3832
		29	9.35	16.00	124.78	140.78	3973
		30	9.36	16.00	125.05	141.05	4114
		31	9.37	16.00	125.32	141.32	4255
		32	9.38	16.00	125.60	141.60	4397
		33	9.40	16.00	125.87	141.87	4539
		34	9.41	16.00	126.14	142.14	4681
		35	9.42	16.00	126.42	142.42	4823
		36	9.43	16.00	126.69	142.69	4966
		37	9.44	16.00	126.97	142.97	5109
		38	9.46	16.00	127.24	143.24	5252
		39	9.47	16.00	127.52	143.52	5396
		40	9.48	16.00	127.79	143.79	5540
		41	9.49	16.00	128.07	144.07	5684
		42	9.50	16.00	128.34	144.34	5828
		43	9.52	16.00	128.62	144.62	5973
		44	9.53	16.00	128.89	144.89	6118
		45	9.54	16.00	129.17	145.17	6263
		46	9.55	16.00	129.45	145.45	6408
		47	9.56	16.00	129.73	145.73	6554
		48	9.58	16.00	130.00	146.00	6700
		49	9.59	16.00	130.28	146.28	6846
		50	9.60	16.00	130.56	146.56	6993
		51	9.61	16.00	130.84	146.84	7140

52	9.62	16.00	131.12	147.12	7287
53	9.64	16.00	131.40	147.40	7434
54	9.65	16.00	131.68	147.68	7582
55	9.66	16.00	131.96	147.96	7730
56	9.67	16.00	132.24	148.24	7878
57	9.68	16.00	132.52	148.52	8027
58	9.70	16.00	132.80	148.80	8175
59	9.71	16.00	133.08	149.08	8324
60	9.72	16.00	133.36	149.36	8474
61	9.73	16.00	133.64	149.64	8623
62	9.74	16.00	133.92	149.92	8773
63	9.76	16.00	134.20	150.20	8924
64	9.77	16.00	134.49	150.49	9074
65	9.78	16.00	134.77	150.77	9225
66	9.79	16.00	135.05	151.05	9376
67	9.80	16.00	135.33	151.33	9527
68	9.82	16.00	135.62	151.62	9679
69	9.83	16.00	135.90	151.90	9831
70	9.84	16.00	136.19	152.19	9983
71	9.85	16.00	136.47	152.47	10135
72	9.86	16.00	136.75	152.75	10288
73	9.88	16.00	137.04	153.04	10441
74	9.89	16.00	137.32	153.32	10594
75	9.90	16.00	137.61	153.61	10748
76	9.91	16.00	137.90	153.90	10902
77	9.92	16.00	138.18	154.18	11056
78	9.94	16.00	138.47	154.47	11211
79	9.95	16.00	138.75	154.75	11365
80	9.96	16.00	139.04	155.04	11520
81	9.97	16.00	139.33	155.33	11676
82	9.98	16.00	139.62	155.62	11831
83	10.00	16.00	139.90	155.90	11987
84	10.01	16.00	140.19	156.19	12143
85	10.02	16.00	140.48	156.48	12300
86	10.03	16.00	140.77	156.77	12457
87	10.04	16.00	141.06	157.06	12614
88	10.06	16.00	141.35	157.35	12771
89	10.07	16.00	141.64	157.64	12929
90	10.08	16.00	141.93	157.93	13087
91	10.09	16.00	142.22	158.22	13245
92	10.10	16.00	142.51	158.51	13403
93	10.12	16.00	142.80	158.80	13562
94	10.13	16.00	143.09	159.09	13721
95	10.14	16.00	143.38	159.38	13881
96	10.15	16.00	143.67	159.67	14040
97	10.16	16.00	143.96	159.96	14200
98	10.18	16.00	144.25	160.25	14361
99	10.19	16.00	144.55	160.55	14521
100	10.20	16.00	144.84	160.84	14682

101	10.21	16.00	145.13	161.13	14843
102	10.22	16.00	145.43	161.43	15004
103	10.24	16.00	145.72	161.72	15166
104	10.25	16.00	146.01	162.01	15328
105	10.26	16.00	146.31	162.31	15491
106	10.27	16.00	146.60	162.60	15653
107	10.28	16.00	146.90	162.90	15816
108	10.30	16.00	147.19	163.19	15979
109	10.31	16.00	147.49	163.49	16143
110	10.32	16.00	147.78	163.78	16306
111	10.33	16.00	148.08	164.08	16471
112	10.34	16.00	148.37	164.37	16635
113	10.36	16.00	148.67	164.67	16800
114	10.37	16.00	148.97	164.97	16965
115	10.38	16.00	149.26	165.26	17130
116	10.39	16.00	149.56	165.56	17295
117	10.40	16.00	149.86	165.86	17461
118	10.42	16.00	150.16	166.16	17627
119	10.43	16.00	150.46	166.46	17794
120	10.44	16.00	150.75	166.75	17961
121	10.45	16.00	151.05	167.05	18128
122	10.46	16.00	151.35	167.35	18295
123	10.48	16.00	151.65	167.65	18463
124	10.49	16.00	151.95	167.95	18631
125	10.50	16.00	152.25	168.25	18799
126	10.51	16.00	152.55	168.55	18967
127	10.52	16.00	152.85	168.85	19136
128	10.54	16.00	153.15	169.15	19305
129	10.55	16.00	153.45	169.45	19475
130	10.56	16.00	153.75	169.75	19645
131	10.57	16.00	154.06	170.06	19815
132	10.58	16.00	154.36	170.36	19985
133	10.60	16.00	154.66	170.66	20156
134	10.61	16.00	154.96	170.96	20327
135	10.62	16.00	155.26	171.26	20498
136	10.63	16.00	155.57	171.57	20670
137	10.64	16.00	155.87	171.87	20841
138	10.66	16.00	156.17	172.17	21014
139	10.67	16.00	156.48	172.48	21186
140	10.68	16.00	156.78	172.78	21359
141	10.69	16.00	157.09	173.09	21532
142	10.70	16.00	157.39	173.39	21705
143	10.72	16.00	157.70	173.70	21879
144	10.73	16.00	158.00	174.00	22053
145	10.74	16.00	158.31	174.31	22227
146	10.75	16.00	158.61	174.61	22402
147	10.76	16.00	158.92	174.92	22577
148	10.78	16.00	159.23	175.23	22752
149	10.79	16.00	159.53	175.53	22928

150	10.80	16.00	159.84	175.84	23103
151	10.81	16.00	160.15	176.15	23280
152	10.82	16.00	160.45	176.45	23456
153	10.84	16.00	160.76	176.76	23633
154	10.85	16.00	161.07	177.07	23810
155	10.86	16.00	161.38	177.38	23987
156	10.87	16.00	161.69	177.69	24165
157	10.88	16.00	162.00	178.00	24343
158	10.90	16.00	162.31	178.31	24521
159	10.91	16.00	162.62	178.62	24700
160	10.92	16.00	162.93	178.93	24879
161	10.93	16.00	163.24	179.24	25058
162	10.94	16.00	163.55	179.55	25238
163	10.96	16.00	163.86	179.86	25417
164	10.97	16.00	164.17	180.17	25598
165	10.98	16.00	164.48	180.48	25778
166	10.99	16.00	164.79	180.79	25959
167	11.00	16.00	165.10	181.10	26140
168	11.02	16.00	165.42	181.42	26321
169	11.03	16.00	165.73	181.73	26503
170	11.04	16.00	166.04	182.04	26685
171	11.05	16.00	166.35	182.35	26868
172	11.06	16.00	166.67	182.67	27050
173	11.08	16.00	166.98	182.98	27233
174	11.09	16.00	167.30	183.30	27416
175	11.10	16.00	167.61	183.61	27600
176	11.11	16.00	167.92	183.92	27784
177	11.12	16.00	168.24	184.24	27968
178	11.14	16.00	168.55	184.55	28153
179	11.15	16.00	168.87	184.87	28338
180	11.16	16.00	169.19	185.19	28523
181	11.17	16.00	169.50	185.50	28708
182	11.18	16.00	169.82	185.82	28894
183	11.20	16.00	170.13	186.13	29080
184	11.21	16.00	170.45	186.45	29267
185	11.22	16.00	170.77	186.77	29454
186	11.23	16.00	171.09	187.09	29641
187	11.24	16.00	171.40	187.40	29828
188	11.26	16.00	171.72	187.72	30016
189	11.27	16.00	172.04	188.04	30204
190	11.28	16.00	172.36	188.36	30392
191	11.29	16.00	172.68	188.68	30581
192	11.30	16.00	173.00	189.00	30770
193	11.32	16.00	173.32	189.32	30959
194	11.33	16.00	173.64	189.64	31149
195	11.34	16.00	173.96	189.96	31339
196	11.35	16.00	174.28	190.28	31529
197	11.36	16.00	174.60	190.60	31720
198	11.38	16.00	174.92	190.92	31910

199	11.39	16.00	175.24	191.24	32102
200	11.40	16.00	175.56	191.56	32293
201	11.41	16.00	175.88	191.88	32485
202	11.42	16.00	176.20	192.20	32677
203	11.44	16.00	176.53	192.53	32870
204	11.45	16.00	176.85	192.85	33063
205	11.46	16.00	177.17	193.17	33256
206	11.47	16.00	177.49	193.49	33449
207	11.48	16.00	177.82	193.82	33643
208	11.50	16.00	178.14	194.14	33837
209	11.51	16.00	178.47	194.47	34032
210	11.52	16.00	178.79	194.79	34227
211	11.53	16.00	179.12	195.12	34422
212	11.54	16.00	179.44	195.44	34617
213	11.56	16.00	179.77	195.77	34813
214	11.57	16.00	180.09	196.09	35009
215	11.58	16.00	180.42	196.42	35205
216	11.59	16.00	180.74	196.74	35402
217	11.60	16.00	181.07	197.07	35599
218	11.62	16.00	181.40	197.40	35797
219	11.63	16.00	181.72	197.72	35994
220	11.64	16.00	182.05	198.05	36192
221	11.65	16.00	182.38	198.38	36391
222	11.66	16.00	182.70	198.70	36590
223	11.68	16.00	183.03	199.03	36789
224	11.69	16.00	183.36	199.36	36988
225	11.70	16.00	183.69	199.69	37188
226	11.71	16.00	184.02	200.02	37388
227	11.72	16.00	184.35	200.35	37588
228	11.74	16.00	184.68	200.68	37789
229	11.75	16.00	185.01	201.01	37990
230	11.76	16.00	185.34	201.34	38191
231	11.77	16.00	185.67	201.67	38393
232	11.78	16.00	186.00	202.00	38595
233	11.80	16.00	186.33	202.33	38797
234	11.81	16.00	186.66	202.66	39000
235	11.82	16.00	186.99	202.99	39203
236	11.83	16.00	187.32	203.32	39406
237	11.84	16.00	187.66	203.66	39610
238	11.86	16.00	187.99	203.99	39814
239	11.87	16.00	188.32	204.32	40018
240	11.88	16.00	188.65	204.65	40223
241	11.89	16.00	188.99	204.99	40428
242	11.90	16.00	189.32	205.32	40633
243	11.92	16.00	189.66	205.66	40839
244	11.93	16.00	189.99	205.99	41045
245	11.94	16.00	190.32	206.32	41251
246	11.95	16.00	190.66	206.66	41458
247	11.96	16.00	190.99	206.99	41665

248	11.98	16.00	191.33	207.33	41872		
249	11.99	16.00	191.66	207.66	42080	Total Exc.	42288
250	12.00	16.00	192.00	208.00	42288	Total Bkfl.	42116

Pipe Number	107	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	6	1	6.01	16.00	60.19	76.19	76
End Cover	9	2	6.02	16.00	60.38	76.38	153
Length	253	3	6.04	16.00	60.57	76.57	229
Increment	0.01	4	6.05	16.00	60.76	76.76	306
Pipe Size	24	5	6.06	16.00	60.95	76.95	383
		6	6.07	16.00	61.14	77.14	460
		7	6.08	16.00	61.33	77.33	537
		8	6.09	16.00	61.53	77.53	615
		9	6.11	16.00	61.72	77.72	693
		10	6.12	16.00	61.91	77.91	770
		11	6.13	16.00	62.10	78.10	849
		12	6.14	16.00	62.30	78.30	927
		13	6.15	16.00	62.49	78.49	1005
		14	6.17	16.00	62.68	78.68	1084
		15	6.18	16.00	62.88	78.88	1163
		16	6.19	16.00	63.07	79.07	1242
		17	6.20	16.00	63.27	79.27	1321
		18	6.21	16.00	63.46	79.46	1401
		19	6.23	16.00	63.66	79.66	1480
		20	6.24	16.00	63.85	79.85	1560
		21	6.25	16.00	64.05	80.05	1640
		22	6.26	16.00	64.24	80.24	1721
		23	6.27	16.00	64.44	80.44	1801
		24	6.28	16.00	64.63	80.63	1882
		25	6.30	16.00	64.83	80.83	1962
		26	6.31	16.00	65.03	81.03	2043
		27	6.32	16.00	65.23	81.23	2125
		28	6.33	16.00	65.42	81.42	2206
		29	6.34	16.00	65.62	81.62	2288
		30	6.36	16.00	65.82	81.82	2370
		31	6.37	16.00	66.02	82.02	2452
		32	6.38	16.00	66.22	82.22	2534
		33	6.39	16.00	66.41	82.41	2616
		34	6.40	16.00	66.61	82.61	2699
		35	6.42	16.00	66.81	82.81	2782
		36	6.43	16.00	67.01	83.01	2865
		37	6.44	16.00	67.21	83.21	2948
		38	6.45	16.00	67.41	83.41	3031
		39	6.46	16.00	67.61	83.61	3115
		40	6.47	16.00	67.81	83.81	3199
		41	6.49	16.00	68.02	84.02	3283
		42	6.50	16.00	68.22	84.22	3367
		43	6.51	16.00	68.42	84.42	3451
		44	6.52	16.00	68.62	84.62	3536
		45	6.53	16.00	68.82	84.82	3621
		46	6.55	16.00	69.02	85.02	3706
		47	6.56	16.00	69.23	85.23	3791
		48	6.57	16.00	69.43	85.43	3876
		49	6.58	16.00	69.63	85.63	3962
		50	6.59	16.00	69.84	85.84	4048
		51	6.60	16.00	70.04	86.04	4134

52	6.62	16.00	70.25	86.25	4220
53	6.63	16.00	70.45	86.45	4307
54	6.64	16.00	70.66	86.66	4393
55	6.65	16.00	70.86	86.86	4480
56	6.66	16.00	71.07	87.07	4567
57	6.68	16.00	71.27	87.27	4655
58	6.69	16.00	71.48	87.48	4742
59	6.70	16.00	71.68	87.68	4830
60	6.71	16.00	71.89	87.89	4918
61	6.72	16.00	72.10	88.10	5006
62	6.74	16.00	72.30	88.30	5094
63	6.75	16.00	72.51	88.51	5182
64	6.76	16.00	72.72	88.72	5271
65	6.77	16.00	72.93	88.93	5360
66	6.78	16.00	73.13	89.13	5449
67	6.79	16.00	73.34	89.34	5539
68	6.81	16.00	73.55	89.55	5628
69	6.82	16.00	73.76	89.76	5718
70	6.83	16.00	73.97	89.97	5808
71	6.84	16.00	74.18	90.18	5898
72	6.85	16.00	74.39	90.39	5988
73	6.87	16.00	74.60	90.60	6079
74	6.88	16.00	74.81	90.81	6170
75	6.89	16.00	75.02	91.02	6261
76	6.90	16.00	75.23	91.23	6352
77	6.91	16.00	75.44	91.44	6444
78	6.92	16.00	75.65	91.65	6535
79	6.94	16.00	75.87	91.87	6627
80	6.95	16.00	76.08	92.08	6719
81	6.96	16.00	76.29	92.29	6811
82	6.97	16.00	76.50	92.50	6904
83	6.98	16.00	76.72	92.72	6997
84	7.00	16.00	76.93	92.93	7090
85	7.01	16.00	77.14	93.14	7183
86	7.02	16.00	77.36	93.36	7276
87	7.03	16.00	77.57	93.57	7370
88	7.04	16.00	77.78	93.78	7463
89	7.06	16.00	78.00	94.00	7557
90	7.07	16.00	78.21	94.21	7652
91	7.08	16.00	78.43	94.43	7746
92	7.09	16.00	78.64	94.64	7841
93	7.10	16.00	78.86	94.86	7936
94	7.11	16.00	79.08	95.08	8031
95	7.13	16.00	79.29	95.29	8126
96	7.14	16.00	79.51	95.51	8221
97	7.15	16.00	79.73	95.73	8317
98	7.16	16.00	79.94	95.94	8413
99	7.17	16.00	80.16	96.16	8509
100	7.19	16.00	80.38	96.38	8606

101	7.20	16.00	80.60	96.60	8702
102	7.21	16.00	80.81	96.81	8799
103	7.22	16.00	81.03	97.03	8896
104	7.23	16.00	81.25	97.25	8993
105	7.25	16.00	81.47	97.47	9091
106	7.26	16.00	81.69	97.69	9189
107	7.27	16.00	81.91	97.91	9286
108	7.28	16.00	82.13	98.13	9385
109	7.29	16.00	82.35	98.35	9483
110	7.30	16.00	82.57	98.57	9581
111	7.32	16.00	82.79	98.79	9680
112	7.33	16.00	83.01	99.01	9779
113	7.34	16.00	83.23	99.23	9879
114	7.35	16.00	83.46	99.46	9978
115	7.36	16.00	83.68	99.68	10078
116	7.38	16.00	83.90	99.90	10178
117	7.39	16.00	84.12	100.12	10278
118	7.40	16.00	84.35	100.35	10378
119	7.41	16.00	84.57	100.57	10479
120	7.42	16.00	84.79	100.79	10579
121	7.43	16.00	85.02	101.02	10680
122	7.45	16.00	85.24	101.24	10782
123	7.46	16.00	85.46	101.46	10883
124	7.47	16.00	85.69	101.69	10985
125	7.48	16.00	85.91	101.91	11087
126	7.49	16.00	86.14	102.14	11189
127	7.51	16.00	86.36	102.36	11291
128	7.52	16.00	86.59	102.59	11394
129	7.53	16.00	86.81	102.81	11497
130	7.54	16.00	87.04	103.04	11600
131	7.55	16.00	87.27	103.27	11703
132	7.57	16.00	87.49	103.49	11806
133	7.58	16.00	87.72	103.72	11910
134	7.59	16.00	87.95	103.95	12014
135	7.60	16.00	88.18	104.18	12118
136	7.61	16.00	88.40	104.40	12223
137	7.62	16.00	88.63	104.63	12327
138	7.64	16.00	88.86	104.86	12432
139	7.65	16.00	89.09	105.09	12537
140	7.66	16.00	89.32	105.32	12643
141	7.67	16.00	89.55	105.55	12748
142	7.68	16.00	89.78	105.78	12854
143	7.70	16.00	90.01	106.01	12960
144	7.71	16.00	90.24	106.24	13066
145	7.72	16.00	90.47	106.47	13173
146	7.73	16.00	90.70	106.70	13279
147	7.74	16.00	90.93	106.93	13386
148	7.75	16.00	91.16	107.16	13493
149	7.77	16.00	91.39	107.39	13601

150	7.78	16.00	91.62	107.62	13708
151	7.79	16.00	91.85	107.85	13816
152	7.80	16.00	92.09	108.09	13924
153	7.81	16.00	92.32	108.32	14033
154	7.83	16.00	92.55	108.55	14141
155	7.84	16.00	92.79	108.79	14250
156	7.85	16.00	93.02	109.02	14359
157	7.86	16.00	93.25	109.25	14468
158	7.87	16.00	93.49	109.49	14578
159	7.89	16.00	93.72	109.72	14687
160	7.90	16.00	93.96	109.96	14797
161	7.91	16.00	94.19	110.19	14908
162	7.92	16.00	94.43	110.43	15018
163	7.93	16.00	94.66	110.66	15129
164	7.94	16.00	94.90	110.90	15240
165	7.96	16.00	95.13	111.13	15351
166	7.97	16.00	95.37	111.37	15462
167	7.98	16.00	95.61	111.61	15574
168	7.99	16.00	95.84	111.84	15686
169	8.00	16.00	96.08	112.08	15798
170	8.02	16.00	96.32	112.32	15910
171	8.03	16.00	96.55	112.55	16022
172	8.04	16.00	96.79	112.79	16135
173	8.05	16.00	97.03	113.03	16248
174	8.06	16.00	97.27	113.27	16362
175	8.08	16.00	97.51	113.51	16475
176	8.09	16.00	97.75	113.75	16589
177	8.10	16.00	97.99	113.99	16703
178	8.11	16.00	98.23	114.23	16817
179	8.12	16.00	98.47	114.47	16932
180	8.13	16.00	98.71	114.71	17046
181	8.15	16.00	98.95	114.95	17161
182	8.16	16.00	99.19	115.19	17276
183	8.17	16.00	99.43	115.43	17392
184	8.18	16.00	99.67	115.67	17507
185	8.19	16.00	99.91	115.91	17623
186	8.21	16.00	100.15	116.15	17740
187	8.22	16.00	100.40	116.40	17856
188	8.23	16.00	100.64	116.64	17973
189	8.24	16.00	100.88	116.88	18089
190	8.25	16.00	101.12	117.12	18207
191	8.26	16.00	101.37	117.37	18324
192	8.28	16.00	101.61	117.61	18442
193	8.29	16.00	101.85	117.85	18559
194	8.30	16.00	102.10	118.10	18677
195	8.31	16.00	102.34	118.34	18796
196	8.32	16.00	102.59	118.59	18914
197	8.34	16.00	102.83	118.83	19033
198	8.35	16.00	103.08	119.08	19152

199	8.36	16.00	103.32	119.32	19272
200	8.37	16.00	103.57	119.57	19391
201	8.38	16.00	103.81	119.81	19511
202	8.40	16.00	104.06	120.06	19631
203	8.41	16.00	104.31	120.31	19751
204	8.42	16.00	104.55	120.55	19872
205	8.43	16.00	104.80	120.80	19993
206	8.44	16.00	105.05	121.05	20114
207	8.45	16.00	105.30	121.30	20235
208	8.47	16.00	105.55	121.55	20357
209	8.48	16.00	105.79	121.79	20478
210	8.49	16.00	106.04	122.04	20600
211	8.50	16.00	106.29	122.29	20723
212	8.51	16.00	106.54	122.54	20845
213	8.53	16.00	106.79	122.79	20968
214	8.54	16.00	107.04	123.04	21091
215	8.55	16.00	107.29	123.29	21214
216	8.56	16.00	107.54	123.54	21338
217	8.57	16.00	107.79	123.79	21462
218	8.58	16.00	108.04	124.04	21586
219	8.60	16.00	108.29	124.29	21710
220	8.61	16.00	108.54	124.54	21835
221	8.62	16.00	108.80	124.80	21959
222	8.63	16.00	109.05	125.05	22084
223	8.64	16.00	109.30	125.30	22210
224	8.66	16.00	109.55	125.55	22335
225	8.67	16.00	109.81	125.81	22461
226	8.68	16.00	110.06	126.06	22587
227	8.69	16.00	110.31	126.31	22714
228	8.70	16.00	110.57	126.57	22840
229	8.72	16.00	110.82	126.82	22967
230	8.73	16.00	111.07	127.07	23094
231	8.74	16.00	111.33	127.33	23221
232	8.75	16.00	111.58	127.58	23349
233	8.76	16.00	111.84	127.84	23477
234	8.77	16.00	112.09	128.09	23605
235	8.79	16.00	112.35	128.35	23733
236	8.80	16.00	112.61	128.61	23862
237	8.81	16.00	112.86	128.86	23991
238	8.82	16.00	113.12	129.12	24120
239	8.83	16.00	113.38	129.38	24249
240	8.85	16.00	113.63	129.63	24379
241	8.86	16.00	113.89	129.89	24509
242	8.87	16.00	114.15	130.15	24639
243	8.88	16.00	114.41	130.41	24769
244	8.89	16.00	114.66	130.66	24900
245	8.91	16.00	114.92	130.92	25031
246	8.92	16.00	115.18	131.18	25162
247	8.93	16.00	115.44	131.44	25293

248	8.94	16.00	115.70	131.70	25425		
249	8.95	16.00	115.96	131.96	25557		
250	8.96	16.00	116.22	132.22	25689		
251	8.98	16.00	116.48	132.48	25822		
252	8.99	16.00	116.74	132.74	25955	Total Exc.	26088
253	9.00	16.00	117.00	133.00	26088	Total Bkfl.	24243

Pipe Number	108	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	5	1	5.01	16.00	45.15	61.15	61
End Cover	6	2	5.02	16.00	45.30	61.30	122
Length	92	3	5.03	16.00	45.46	61.46	184
Increment	0.01	4	5.04	16.00	45.61	61.61	246
Pipe Size	24	5	5.05	16.00	45.76	61.76	307
		6	5.07	16.00	45.92	61.92	369
		7	5.08	16.00	46.07	62.07	431
		8	5.09	16.00	46.22	62.22	494
		9	5.10	16.00	46.38	62.38	556
		10	5.11	16.00	46.53	62.53	618
		11	5.12	16.00	46.69	62.69	681
		12	5.13	16.00	46.84	62.84	744
		13	5.14	16.00	47.00	63.00	807
		14	5.15	16.00	47.15	63.15	870
		15	5.16	16.00	47.31	63.31	933
		16	5.17	16.00	47.47	63.47	997
		17	5.18	16.00	47.62	63.62	1060
		18	5.20	16.00	47.78	63.78	1124
		19	5.21	16.00	47.93	63.93	1188
		20	5.22	16.00	48.09	64.09	1252
		21	5.23	16.00	48.25	64.25	1317
		22	5.24	16.00	48.41	64.41	1381
		23	5.25	16.00	48.56	64.56	1446
		24	5.26	16.00	48.72	64.72	1510
		25	5.27	16.00	48.88	64.88	1575
		26	5.28	16.00	49.04	65.04	1640
		27	5.29	16.00	49.19	65.19	1705
		28	5.30	16.00	49.35	65.35	1771
		29	5.32	16.00	49.51	65.51	1836
		30	5.33	16.00	49.67	65.67	1902
		31	5.34	16.00	49.83	65.83	1968
		32	5.35	16.00	49.99	65.99	2034
		33	5.36	16.00	50.15	66.15	2100
		34	5.37	16.00	50.31	66.31	2166
		35	5.38	16.00	50.47	66.47	2233
		36	5.39	16.00	50.63	66.63	2299
		37	5.40	16.00	50.79	66.79	2366
		38	5.41	16.00	50.95	66.95	2433
		39	5.42	16.00	51.11	67.11	2500
		40	5.43	16.00	51.28	67.28	2567
		41	5.45	16.00	51.44	67.44	2635
		42	5.46	16.00	51.60	67.60	2702
		43	5.47	16.00	51.76	67.76	2770
		44	5.48	16.00	51.92	67.92	2838
		45	5.49	16.00	52.09	68.09	2906
		46	5.50	16.00	52.25	68.25	2974
		47	5.51	16.00	52.41	68.41	3043
		48	5.52	16.00	52.58	68.58	3111
		49	5.53	16.00	52.74	68.74	3180
		50	5.54	16.00	52.90	68.90	3249
		51	5.55	16.00	53.07	69.07	3318

52	5.57	16.00	53.23	69.23	3387		
53	5.58	16.00	53.40	69.40	3457		
54	5.59	16.00	53.56	69.56	3526		
55	5.60	16.00	53.73	69.73	3596		
56	5.61	16.00	53.89	69.89	3666		
57	5.62	16.00	54.06	70.06	3736		
58	5.63	16.00	54.22	70.22	3806		
59	5.64	16.00	54.39	70.39	3877		
60	5.65	16.00	54.56	70.56	3947		
61	5.66	16.00	54.72	70.72	4018		
62	5.67	16.00	54.89	70.89	4089		
63	5.68	16.00	55.06	71.06	4160		
64	5.70	16.00	55.22	71.22	4231		
65	5.71	16.00	55.39	71.39	4302		
66	5.72	16.00	55.56	71.56	4374		
67	5.73	16.00	55.73	71.73	4446		
68	5.74	16.00	55.89	71.89	4518		
69	5.75	16.00	56.06	72.06	4590		
70	5.76	16.00	56.23	72.23	4662		
71	5.77	16.00	56.40	72.40	4734		
72	5.78	16.00	56.57	72.57	4807		
73	5.79	16.00	56.74	72.74	4880		
74	5.80	16.00	56.91	72.91	4953		
75	5.82	16.00	57.08	73.08	5026		
76	5.83	16.00	57.25	73.25	5099		
77	5.84	16.00	57.42	73.42	5172		
78	5.85	16.00	57.59	73.59	5246		
79	5.86	16.00	57.76	73.76	5320		
80	5.87	16.00	57.93	73.93	5394		
81	5.88	16.00	58.10	74.10	5468		
82	5.89	16.00	58.27	74.27	5542		
83	5.90	16.00	58.44	74.44	5616		
84	5.91	16.00	58.62	74.62	5691		
85	5.92	16.00	58.79	74.79	5766		
86	5.93	16.00	58.96	74.96	5841		
87	5.95	16.00	59.13	75.13	5916		
88	5.96	16.00	59.31	75.31	5991		
89	5.97	16.00	59.48	75.48	6067		
90	5.98	16.00	59.65	75.65	6142		
91	5.99	16.00	59.83	75.83	6218	Total Exc.	6294
92	6.00	16.00	60.00	76.00	6294	Total Bkfl.	5304

Pipe Number	109	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	0	1	0.30	16.00	1.29	17.29	17
End Cover	21	2	0.60	16.00	2.76	18.76	36
Length	70	3	0.90	16.00	4.41	20.41	56
Increment	0.3	4	1.20	16.00	6.24	22.24	79
Pipe Size	24	5	1.50	16.00	8.25	24.25	103
		6	1.80	16.00	10.44	26.44	129
		7	2.10	16.00	12.81	28.81	158
		8	2.40	16.00	15.36	31.36	190
		9	2.70	16.00	18.09	34.09	224
		10	3.00	16.00	21.00	37.00	261
		11	3.30	16.00	24.09	40.09	301
		12	3.60	16.00	27.36	43.36	344
		13	3.90	16.00	30.81	46.81	391
		14	4.20	16.00	34.44	50.44	441
		15	4.50	16.00	38.25	54.25	496
		16	4.80	16.00	42.24	58.24	554
		17	5.10	16.00	46.41	62.41	616
		18	5.40	16.00	50.76	66.76	683
		19	5.70	16.00	55.29	71.29	754
		20	6.00	16.00	60.00	76.00	830
		21	6.30	16.00	64.89	80.89	911
		22	6.60	16.00	69.96	85.96	997
		23	6.90	16.00	75.21	91.21	1088
		24	7.20	16.00	80.64	96.64	1185
		25	7.50	16.00	86.25	102.25	1287
		26	7.80	16.00	92.04	108.04	1395
		27	8.10	16.00	98.01	114.01	1509
		28	8.40	16.00	104.16	120.16	1629
		29	8.70	16.00	110.49	126.49	1756
		30	9.00	16.00	117.00	133.00	1889
		31	9.30	16.00	123.69	139.69	2029
		32	9.60	16.00	130.56	146.56	2175
		33	9.90	16.00	137.61	153.61	2329
		34	10.20	16.00	144.84	160.84	2490
		35	10.50	16.00	152.25	168.25	2658
		36	10.80	16.00	159.84	175.84	2834
		37	11.10	16.00	167.61	183.61	3017
		38	11.40	16.00	175.56	191.56	3209
		39	11.70	16.00	183.69	199.69	3409
		40	12.00	16.00	192.00	208.00	3617
		41	12.30	16.00	200.49	216.49	3833
		42	12.60	16.00	209.16	225.16	4058
		43	12.90	16.00	218.01	234.01	4292
		44	13.20	16.00	227.04	243.04	4535
		45	13.50	16.00	236.25	252.25	4788
		46	13.80	16.00	245.64	261.64	5049
		47	14.10	16.00	255.21	271.21	5320
		48	14.40	16.00	264.96	280.96	5601
		49	14.70	16.00	274.89	290.89	5892
		50	15.00	16.00	285.00	301.00	6193
		51	15.30	16.00	295.29	311.29	6505

52	15.60	16.00	305.76	321.76	6826	
53	15.90	16.00	316.41	332.41	7159	
54	16.20	16.00	327.24	343.24	7502	
55	16.50	16.00	338.25	354.25	7856	
56	16.80	16.00	349.44	365.44	8222	
57	17.10	16.00	360.81	376.81	8598	
58	17.40	16.00	372.36	388.36	8987	
59	17.70	16.00	384.09	400.09	9387	
60	18.00	16.00	396.00	412.00	9799	
61	18.30	16.00	408.09	424.09	10223	
62	18.60	16.00	420.36	436.36	10659	
63	18.90	16.00	432.81	448.81	11108	
64	19.20	16.00	445.44	461.44	11570	
65	19.50	16.00	458.25	474.25	12044	
66	19.80	16.00	471.24	487.24	12531	
67	20.10	16.00	484.41	500.41	13032	
68	20.40	16.00	497.76	513.76	13545	
69	20.70	16.00	511.29	527.29	14073	Total Exc. 14614
70	21.00	16.00	525.00	541.00	14614	Total Bkfl. 14843

Pipe Number	110	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	21	1	21.01	16.00	525.30	541.30	541
End Cover	22	2	21.01	16.00	525.61	541.61	1083
Length	152	3	21.02	16.00	525.91	541.91	1625
Increment	0.01	4	21.03	16.00	526.21	542.21	2167
Pipe Size	24	5	21.03	16.00	526.51	542.51	2710
		6	21.04	16.00	526.82	542.82	3252
		7	21.05	16.00	527.12	543.12	3795
		8	21.05	16.00	527.42	543.42	4339
		9	21.06	16.00	527.73	543.73	4883
		10	21.07	16.00	528.03	544.03	5427
		11	21.07	16.00	528.33	544.33	5971
		12	21.08	16.00	528.64	544.64	6516
		13	21.09	16.00	528.94	544.94	7061
		14	21.09	16.00	529.25	545.25	7606
		15	21.10	16.00	529.55	545.55	8151
		16	21.11	16.00	529.85	545.85	8697
		17	21.11	16.00	530.16	546.16	9243
		18	21.12	16.00	530.46	546.46	9790
		19	21.13	16.00	530.77	546.77	10337
		20	21.13	16.00	531.07	547.07	10884
		21	21.14	16.00	531.37	547.37	11431
		22	21.14	16.00	531.68	547.68	11979
		23	21.15	16.00	531.98	547.98	12527
		24	21.16	16.00	532.29	548.29	13075
		25	21.16	16.00	532.59	548.59	13624
		26	21.17	16.00	532.90	548.90	14172
		27	21.18	16.00	533.20	549.20	14722
		28	21.18	16.00	533.51	549.51	15271
		29	21.19	16.00	533.81	549.81	15821
		30	21.20	16.00	534.12	550.12	16371
		31	21.20	16.00	534.42	550.42	16922
		32	21.21	16.00	534.73	550.73	17472
		33	21.22	16.00	535.03	551.03	18023
		34	21.22	16.00	535.34	551.34	18575
		35	21.23	16.00	535.65	551.65	19126
		36	21.24	16.00	535.95	551.95	19678
		37	21.24	16.00	536.26	552.26	20231
		38	21.25	16.00	536.56	552.56	20783
		39	21.26	16.00	536.87	552.87	21336
		40	21.26	16.00	537.17	553.17	21889
		41	21.27	16.00	537.48	553.48	22443
		42	21.28	16.00	537.79	553.79	22996
		43	21.28	16.00	538.09	554.09	23550
		44	21.29	16.00	538.40	554.40	24105
		45	21.30	16.00	538.71	554.71	24660
		46	21.30	16.00	539.01	555.01	25215
		47	21.31	16.00	539.32	555.32	25770
		48	21.32	16.00	539.63	555.63	26326
		49	21.32	16.00	539.93	555.93	26881
		50	21.33	16.00	540.24	556.24	27438
		51	21.34	16.00	540.55	556.55	27994

52	21.34	16.00	540.85	556.85	28551
53	21.35	16.00	541.16	557.16	29108
54	21.36	16.00	541.47	557.47	29666
55	21.36	16.00	541.78	557.78	30224
56	21.37	16.00	542.08	558.08	30782
57	21.38	16.00	542.39	558.39	31340
58	21.38	16.00	542.70	558.70	31899
59	21.39	16.00	543.01	559.01	32458
60	21.39	16.00	543.31	559.31	33017
61	21.40	16.00	543.62	559.62	33577
62	21.41	16.00	543.93	559.93	34137
63	21.41	16.00	544.24	560.24	34697
64	21.42	16.00	544.55	560.55	35257
65	21.43	16.00	544.85	560.85	35818
66	21.43	16.00	545.16	561.16	36379
67	21.44	16.00	545.47	561.47	36941
68	21.45	16.00	545.78	561.78	37503
69	21.45	16.00	546.09	562.09	38065
70	21.46	16.00	546.40	562.40	38627
71	21.47	16.00	546.71	562.71	39190
72	21.47	16.00	547.01	563.01	39753
73	21.48	16.00	547.32	563.32	40316
74	21.49	16.00	547.63	563.63	40880
75	21.49	16.00	547.94	563.94	41444
76	21.50	16.00	548.25	564.25	42008
77	21.51	16.00	548.56	564.56	42573
78	21.51	16.00	548.87	564.87	43137
79	21.52	16.00	549.18	565.18	43703
80	21.53	16.00	549.49	565.49	44268
81	21.53	16.00	549.80	565.80	44834
82	21.54	16.00	550.11	566.11	45400
83	21.55	16.00	550.42	566.42	45966
84	21.55	16.00	550.73	566.73	46533
85	21.56	16.00	551.04	567.04	47100
86	21.57	16.00	551.35	567.35	47667
87	21.57	16.00	551.66	567.66	48235
88	21.58	16.00	551.97	567.97	48803
89	21.59	16.00	552.28	568.28	49371
90	21.59	16.00	552.59	568.59	49940
91	21.60	16.00	552.90	568.90	50509
92	21.61	16.00	553.21	569.21	51078
93	21.61	16.00	553.52	569.52	51648
94	21.62	16.00	553.83	569.83	52217
95	21.63	16.00	554.14	570.14	52788
96	21.63	16.00	554.45	570.45	53358
97	21.64	16.00	554.76	570.76	53929
98	21.64	16.00	555.07	571.07	54500
99	21.65	16.00	555.38	571.38	55071
100	21.66	16.00	555.70	571.70	55643

101	21.66	16.00	556.01	572.01	56215
102	21.67	16.00	556.32	572.32	56787
103	21.68	16.00	556.63	572.63	57360
104	21.68	16.00	556.94	572.94	57933
105	21.69	16.00	557.25	573.25	58506
106	21.70	16.00	557.57	573.57	59080
107	21.70	16.00	557.88	573.88	59654
108	21.71	16.00	558.19	574.19	60228
109	21.72	16.00	558.50	574.50	60802
110	21.72	16.00	558.81	574.81	61377
111	21.73	16.00	559.13	575.13	61952
112	21.74	16.00	559.44	575.44	62528
113	21.74	16.00	559.75	575.75	63103
114	21.75	16.00	560.06	576.06	63679
115	21.76	16.00	560.38	576.38	64256
116	21.76	16.00	560.69	576.69	64832
117	21.77	16.00	561.00	577.00	65409
118	21.78	16.00	561.31	577.31	65987
119	21.78	16.00	561.63	577.63	66564
120	21.79	16.00	561.94	577.94	67142
121	21.80	16.00	562.25	578.25	67721
122	21.80	16.00	562.57	578.57	68299
123	21.81	16.00	562.88	578.88	68878
124	21.82	16.00	563.19	579.19	69457
125	21.82	16.00	563.51	579.51	70037
126	21.83	16.00	563.82	579.82	70617
127	21.84	16.00	564.13	580.13	71197
128	21.84	16.00	564.45	580.45	71777
129	21.85	16.00	564.76	580.76	72358
130	21.86	16.00	565.07	581.07	72939
131	21.86	16.00	565.39	581.39	73520
132	21.87	16.00	565.70	581.70	74102
133	21.88	16.00	566.02	582.02	74684
134	21.88	16.00	566.33	582.33	75266
135	21.89	16.00	566.64	582.64	75849
136	21.89	16.00	566.96	582.96	76432
137	21.90	16.00	567.27	583.27	77015
138	21.91	16.00	567.59	583.59	77599
139	21.91	16.00	567.90	583.90	78183
140	21.92	16.00	568.22	584.22	78767
141	21.93	16.00	568.53	584.53	79352
142	21.93	16.00	568.85	584.85	79936
143	21.94	16.00	569.16	585.16	80522
144	21.95	16.00	569.48	585.48	81107
145	21.95	16.00	569.79	585.79	81693
146	21.96	16.00	570.11	586.11	82279
147	21.97	16.00	570.42	586.42	82865
148	21.97	16.00	570.74	586.74	83452
149	21.98	16.00	571.05	587.05	84039

150	21.99	16.00	571.37	587.37	84626	
151	21.99	16.00	571.68	587.68	85214	Total Exc. 85802
152	22.00	16.00	572.00	588.00	85802	Total Bkfl. 91707

Pipe Number	111	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation		
Begin Cover	2.5	1	2.50	16.00	16.25	32.25	32		
End Cover	2.5	2	2.50	16.00	16.25	32.25	65		
Length	15	3	2.50	16.00	16.25	32.25	97		
Increment	0	4	2.50	16.00	16.25	32.25	129		
Pipe Size	24	5	2.50	16.00	16.25	32.25	161		
		6	2.50	16.00	16.25	32.25	194		
		7	2.50	16.00	16.25	32.25	226		
		8	2.50	16.00	16.25	32.25	258		
		9	2.50	16.00	16.25	32.25	290		
		10	2.50	16.00	16.25	32.25	323		
		11	2.50	16.00	16.25	32.25	355		
		12	2.50	16.00	16.25	32.25	387		
		13	2.50	16.00	16.25	32.25	419		
		14	2.50	16.00	16.25	32.25	452	Total Exc.	484
		15	2.50	16.00	16.25	32.25	484	Total Bkfl.	268

Pipe Number	112	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation		
Begin Cover	4	1	4.00	16.00	32.00	48.00	48		
End Cover	4	2	4.00	16.00	32.00	48.00	96		
Length	50	3	4.00	16.00	32.00	48.00	144		
Increment	0	4	4.00	16.00	32.00	48.00	192		
Pipe Size	24	5	4.00	16.00	32.00	48.00	240		
		6	4.00	16.00	32.00	48.00	288		
		7	4.00	16.00	32.00	48.00	336		
		8	4.00	16.00	32.00	48.00	384		
		9	4.00	16.00	32.00	48.00	432		
		10	4.00	16.00	32.00	48.00	480		
		11	4.00	16.00	32.00	48.00	528		
		12	4.00	16.00	32.00	48.00	576		
		13	4.00	16.00	32.00	48.00	624		
		14	4.00	16.00	32.00	48.00	672		
		15	4.00	16.00	32.00	48.00	720		
		16	4.00	16.00	32.00	48.00	768		
		17	4.00	16.00	32.00	48.00	816		
		18	4.00	16.00	32.00	48.00	864		
		19	4.00	16.00	32.00	48.00	912		
		20	4.00	16.00	32.00	48.00	960		
		21	4.00	16.00	32.00	48.00	1008		
		22	4.00	16.00	32.00	48.00	1056		
		23	4.00	16.00	32.00	48.00	1104		
		24	4.00	16.00	32.00	48.00	1152		
		25	4.00	16.00	32.00	48.00	1200		
		26	4.00	16.00	32.00	48.00	1248		
		27	4.00	16.00	32.00	48.00	1296		
		28	4.00	16.00	32.00	48.00	1344		
		29	4.00	16.00	32.00	48.00	1392		
		30	4.00	16.00	32.00	48.00	1440		
		31	4.00	16.00	32.00	48.00	1488		
		32	4.00	16.00	32.00	48.00	1536		
		33	4.00	16.00	32.00	48.00	1584		
		34	4.00	16.00	32.00	48.00	1632		
		35	4.00	16.00	32.00	48.00	1680		
		36	4.00	16.00	32.00	48.00	1728		
		37	4.00	16.00	32.00	48.00	1776		
		38	4.00	16.00	32.00	48.00	1824		
		39	4.00	16.00	32.00	48.00	1872		
		40	4.00	16.00	32.00	48.00	1920		
		41	4.00	16.00	32.00	48.00	1968		
		42	4.00	16.00	32.00	48.00	2016		
		43	4.00	16.00	32.00	48.00	2064		
		44	4.00	16.00	32.00	48.00	2112		
		45	4.00	16.00	32.00	48.00	2160		
		46	4.00	16.00	32.00	48.00	2208		
		47	4.00	16.00	32.00	48.00	2256		
		48	4.00	16.00	32.00	48.00	2304		
		49	4.00	16.00	32.00	48.00	2352	Total Exc.	2400
		50	4.00	16.00	32.00	48.00	2400	Total Bkfl.	1760

Pipe Number	113	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation		
Begin Cover	2.5	1	2.50	16.00	16.25	32.25	32		
End Cover	2.5	2	2.50	16.00	16.25	32.25	65		
Length	15	3	2.50	16.00	16.25	32.25	97		
Increment	0	4	2.50	16.00	16.25	32.25	129		
Pipe Size	24	5	2.50	16.00	16.25	32.25	161		
		6	2.50	16.00	16.25	32.25	194		
		7	2.50	16.00	16.25	32.25	226		
		8	2.50	16.00	16.25	32.25	258		
		9	2.50	16.00	16.25	32.25	290		
		10	2.50	16.00	16.25	32.25	323		
		11	2.50	16.00	16.25	32.25	355		
		12	2.50	16.00	16.25	32.25	387		
		13	2.50	16.00	16.25	32.25	419		
		14	2.50	16.00	16.25	32.25	452	Total Exc.	484
		15	2.50	16.00	16.25	32.25	484	Total Bkfl.	268

Pipe Number	114	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation		
Begin Cover	4	1	4.00	16.00	32.00	48.00	48		
End Cover	4	2	4.00	16.00	32.00	48.00	96		
Length	50	3	4.00	16.00	32.00	48.00	144		
Increment	0	4	4.00	16.00	32.00	48.00	192		
Pipe Size	24	5	4.00	16.00	32.00	48.00	240		
		6	4.00	16.00	32.00	48.00	288		
		7	4.00	16.00	32.00	48.00	336		
		8	4.00	16.00	32.00	48.00	384		
		9	4.00	16.00	32.00	48.00	432		
		10	4.00	16.00	32.00	48.00	480		
		11	4.00	16.00	32.00	48.00	528		
		12	4.00	16.00	32.00	48.00	576		
		13	4.00	16.00	32.00	48.00	624		
		14	4.00	16.00	32.00	48.00	672		
		15	4.00	16.00	32.00	48.00	720		
		16	4.00	16.00	32.00	48.00	768		
		17	4.00	16.00	32.00	48.00	816		
		18	4.00	16.00	32.00	48.00	864		
		19	4.00	16.00	32.00	48.00	912		
		20	4.00	16.00	32.00	48.00	960		
		21	4.00	16.00	32.00	48.00	1008		
		22	4.00	16.00	32.00	48.00	1056		
		23	4.00	16.00	32.00	48.00	1104		
		24	4.00	16.00	32.00	48.00	1152		
		25	4.00	16.00	32.00	48.00	1200		
		26	4.00	16.00	32.00	48.00	1248		
		27	4.00	16.00	32.00	48.00	1296		
		28	4.00	16.00	32.00	48.00	1344		
		29	4.00	16.00	32.00	48.00	1392		
		30	4.00	16.00	32.00	48.00	1440		
		31	4.00	16.00	32.00	48.00	1488		
		32	4.00	16.00	32.00	48.00	1536		
		33	4.00	16.00	32.00	48.00	1584		
		34	4.00	16.00	32.00	48.00	1632		
		35	4.00	16.00	32.00	48.00	1680		
		36	4.00	16.00	32.00	48.00	1728		
		37	4.00	16.00	32.00	48.00	1776		
		38	4.00	16.00	32.00	48.00	1824		
		39	4.00	16.00	32.00	48.00	1872		
		40	4.00	16.00	32.00	48.00	1920		
		41	4.00	16.00	32.00	48.00	1968		
		42	4.00	16.00	32.00	48.00	2016		
		43	4.00	16.00	32.00	48.00	2064		
		44	4.00	16.00	32.00	48.00	2112		
		45	4.00	16.00	32.00	48.00	2160		
		46	4.00	16.00	32.00	48.00	2208		
		47	4.00	16.00	32.00	48.00	2256		
		48	4.00	16.00	32.00	48.00	2304		
		49	4.00	16.00	32.00	48.00	2352	Total Exc.	2400
		50	4.00	16.00	32.00	48.00	2400	Total Bkfl.	1760

Pipe Number	115	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation		
Begin Cover	4	1	4.02	16.00	32.29	48.29	48		
End Cover	5	2	4.05	16.00	32.57	48.57	97		
Length	42	3	4.07	16.00	32.86	48.86	146		
Increment	0.02	4	4.10	16.00	33.15	49.15	195		
Pipe Size	24	5	4.12	16.00	33.44	49.44	244		
		6	4.14	16.00	33.73	49.73	294		
		7	4.17	16.00	34.03	50.03	344		
		8	4.19	16.00	34.32	50.32	394		
		9	4.21	16.00	34.62	50.62	445		
		10	4.24	16.00	34.91	50.91	496		
		11	4.26	16.00	35.21	51.21	547		
		12	4.29	16.00	35.51	51.51	599		
		13	4.31	16.00	35.81	51.81	650		
		14	4.33	16.00	36.11	52.11	703		
		15	4.36	16.00	36.41	52.41	755		
		16	4.38	16.00	36.72	52.72	808		
		17	4.40	16.00	37.02	53.02	861		
		18	4.43	16.00	37.33	53.33	914		
		19	4.45	16.00	37.63	53.63	968		
		20	4.48	16.00	37.94	53.94	1022		
		21	4.50	16.00	38.25	54.25	1076		
		22	4.52	16.00	38.56	54.56	1130		
		23	4.55	16.00	38.87	54.87	1185		
		24	4.57	16.00	39.18	55.18	1240		
		25	4.60	16.00	39.50	55.50	1296		
		26	4.62	16.00	39.81	55.81	1352		
		27	4.64	16.00	40.13	56.13	1408		
		28	4.67	16.00	40.44	56.44	1464		
		29	4.69	16.00	40.76	56.76	1521		
		30	4.71	16.00	41.08	57.08	1578		
		31	4.74	16.00	41.40	57.40	1636		
		32	4.76	16.00	41.72	57.72	1693		
		33	4.79	16.00	42.05	58.05	1751		
		34	4.81	16.00	42.37	58.37	1810		
		35	4.83	16.00	42.69	58.69	1868		
		36	4.86	16.00	43.02	59.02	1927		
		37	4.88	16.00	43.35	59.35	1987		
		38	4.90	16.00	43.68	59.68	2046		
		39	4.93	16.00	44.01	60.01	2107		
		40	4.95	16.00	44.34	60.34	2167		
		41	4.98	16.00	44.67	60.67	2228	Total Exc.	2289
		42	5.00	16.00	45.00	61.00	2289	Total Bkfl.	1778

Pipe Number	116	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	0	1	0.04	16.00	0.18	16.18	16
End Cover	4	2	0.09	16.00	0.36	16.36	33
Length	91	3	0.13	16.00	0.54	16.54	49
Increment	0.04	4	0.18	16.00	0.73	16.73	66
Pipe Size	24	5	0.22	16.00	0.93	16.93	83
		6	0.26	16.00	1.12	17.12	100
		7	0.31	16.00	1.33	17.33	117
		8	0.35	16.00	1.53	17.53	135
		9	0.40	16.00	1.74	17.74	152
		10	0.44	16.00	1.95	17.95	170
		11	0.48	16.00	2.17	18.17	189
		12	0.53	16.00	2.39	18.39	207
		13	0.57	16.00	2.61	18.61	226
		14	0.62	16.00	2.84	18.84	244
		15	0.66	16.00	3.07	19.07	263
		16	0.70	16.00	3.31	19.31	283
		17	0.75	16.00	3.55	19.55	302
		18	0.79	16.00	3.79	19.79	322
		19	0.84	16.00	4.04	20.04	342
		20	0.88	16.00	4.29	20.29	362
		21	0.92	16.00	4.54	20.54	383
		22	0.97	16.00	4.80	20.80	404
		23	1.01	16.00	5.07	21.07	425
		24	1.05	16.00	5.33	21.33	446
		25	1.10	16.00	5.60	21.60	468
		26	1.14	16.00	5.88	21.88	490
		27	1.19	16.00	6.16	22.16	512
		28	1.23	16.00	6.44	22.44	534
		29	1.27	16.00	6.72	22.72	557
		30	1.32	16.00	7.01	23.01	580
		31	1.36	16.00	7.31	23.31	603
		32	1.41	16.00	7.60	23.60	627
		33	1.45	16.00	7.91	23.91	651
		34	1.49	16.00	8.21	24.21	675
		35	1.54	16.00	8.52	24.52	700
		36	1.58	16.00	8.83	24.83	724
		37	1.63	16.00	9.15	25.15	750
		38	1.67	16.00	9.47	25.47	775
		39	1.71	16.00	9.80	25.80	801
		40	1.76	16.00	10.12	26.12	827
		41	1.80	16.00	10.46	26.46	853
		42	1.85	16.00	10.79	26.79	880
		43	1.89	16.00	11.13	27.13	907
		44	1.93	16.00	11.48	27.48	935
		45	1.98	16.00	11.82	27.82	963
		46	2.02	16.00	12.18	28.18	991
		47	2.07	16.00	12.53	28.53	1019
		48	2.11	16.00	12.89	28.89	1048
		49	2.15	16.00	13.25	29.25	1077
		50	2.20	16.00	13.62	29.62	1107
		51	2.24	16.00	13.99	29.99	1137

52	2.29	16.00	14.37	30.37	1167	
53	2.33	16.00	14.75	30.75	1198	
54	2.37	16.00	15.13	31.13	1229	
55	2.42	16.00	15.52	31.52	1261	
56	2.46	16.00	15.91	31.91	1293	
57	2.51	16.00	16.30	32.30	1325	
58	2.55	16.00	16.70	32.70	1358	
59	2.59	16.00	17.10	33.10	1391	
60	2.64	16.00	17.51	33.51	1424	
61	2.68	16.00	17.91	33.91	1458	
62	2.73	16.00	18.33	34.33	1493	
63	2.77	16.00	18.75	34.75	1527	
64	2.81	16.00	19.17	35.17	1563	
65	2.86	16.00	19.59	35.59	1598	
66	2.90	16.00	20.02	36.02	1634	
67	2.95	16.00	20.45	36.45	1671	
68	2.99	16.00	20.89	36.89	1707	
69	3.03	16.00	21.33	37.33	1745	
70	3.08	16.00	21.78	37.78	1783	
71	3.12	16.00	22.22	38.22	1821	
72	3.16	16.00	22.68	38.68	1859	
73	3.21	16.00	23.13	39.13	1899	
74	3.25	16.00	23.59	39.59	1938	
75	3.30	16.00	24.06	40.06	1978	
76	3.34	16.00	24.52	40.52	2019	
77	3.38	16.00	24.99	40.99	2060	
78	3.43	16.00	25.47	41.47	2101	
79	3.47	16.00	25.95	41.95	2143	
80	3.52	16.00	26.43	42.43	2186	
81	3.56	16.00	26.92	42.92	2229	
82	3.60	16.00	27.41	43.41	2272	
83	3.65	16.00	27.90	43.90	2316	
84	3.69	16.00	28.40	44.40	2360	
85	3.74	16.00	28.90	44.90	2405	
86	3.78	16.00	29.41	45.41	2451	
87	3.82	16.00	29.92	45.92	2497	
88	3.87	16.00	30.43	46.43	2543	
89	3.91	16.00	30.95	46.95	2590	
90	3.96	16.00	31.47	47.47	2637	Total Exc. 2685
91	4.00	16.00	32.00	48.00	2685	Total Bkfl. 1352

Pipe Number	117	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	0	1	0.16	16.00	0.67	16.67	17
End Cover	20	2	0.32	16.00	1.38	17.38	34
Length	125	3	0.48	16.00	2.15	18.15	52
Increment	0.16	4	0.64	16.00	2.97	18.97	71
Pipe Size	24	5	0.80	16.00	3.84	19.84	91
		6	0.96	16.00	4.76	20.76	112
		7	1.12	16.00	5.73	21.73	134
		8	1.28	16.00	6.76	22.76	156
		9	1.44	16.00	7.83	23.83	180
		10	1.60	16.00	8.96	24.96	205
		11	1.76	16.00	10.14	26.14	231
		12	1.92	16.00	11.37	27.37	259
		13	2.08	16.00	12.65	28.65	287
		14	2.24	16.00	13.98	29.98	317
		15	2.40	16.00	15.36	31.36	349
		16	2.56	16.00	16.79	32.79	381
		17	2.72	16.00	18.28	34.28	416
		18	2.88	16.00	19.81	35.81	451
		19	3.04	16.00	21.40	37.40	489
		20	3.20	16.00	23.04	39.04	528
		21	3.36	16.00	24.73	40.73	569
		22	3.52	16.00	26.47	42.47	611
		23	3.68	16.00	28.26	44.26	655
		24	3.84	16.00	30.11	46.11	701
		25	4.00	16.00	32.00	48.00	749
		26	4.16	16.00	33.95	49.95	799
		27	4.32	16.00	35.94	51.94	851
		28	4.48	16.00	37.99	53.99	905
		29	4.64	16.00	40.09	56.09	961
		30	4.80	16.00	42.24	58.24	1020
		31	4.96	16.00	44.44	60.44	1080
		32	5.12	16.00	46.69	62.69	1143
		33	5.28	16.00	49.00	65.00	1208
		34	5.44	16.00	51.35	67.35	1275
		35	5.60	16.00	53.76	69.76	1345
		36	5.76	16.00	56.22	72.22	1417
		37	5.92	16.00	58.73	74.73	1492
		38	6.08	16.00	61.29	77.29	1569
		39	6.24	16.00	63.90	79.90	1649
		40	6.40	16.00	66.56	82.56	1732
		41	6.56	16.00	69.27	85.27	1817
		42	6.72	16.00	72.04	88.04	1905
		43	6.88	16.00	74.85	90.85	1996
		44	7.04	16.00	77.72	93.72	2089
		45	7.20	16.00	80.64	96.64	2186
		46	7.36	16.00	83.61	99.61	2286
		47	7.52	16.00	86.63	102.63	2388
		48	7.68	16.00	89.70	105.70	2494
		49	7.84	16.00	92.83	108.83	2603
		50	8.00	16.00	96.00	112.00	2715
		51	8.16	16.00	99.23	115.23	2830

52	8.32	16.00	102.50	118.50	2949
53	8.48	16.00	105.83	121.83	3070
54	8.64	16.00	109.21	125.21	3196
55	8.80	16.00	112.64	128.64	3324
56	8.96	16.00	116.12	132.12	3456
57	9.12	16.00	119.65	135.65	3592
58	9.28	16.00	123.24	139.24	3731
59	9.44	16.00	126.87	142.87	3874
60	9.60	16.00	130.56	146.56	4021
61	9.76	16.00	134.30	150.30	4171
62	9.92	16.00	138.09	154.09	4325
63	10.08	16.00	141.93	157.93	4483
64	10.24	16.00	145.82	161.82	4645
65	10.40	16.00	149.76	165.76	4811
66	10.56	16.00	153.75	169.75	4980
67	10.72	16.00	157.80	173.80	5154
68	10.88	16.00	161.89	177.89	5332
69	11.04	16.00	166.04	182.04	5514
70	11.20	16.00	170.24	186.24	5700
71	11.36	16.00	174.49	190.49	5891
72	11.52	16.00	178.79	194.79	6086
73	11.68	16.00	183.14	199.14	6285
74	11.84	16.00	187.55	203.55	6488
75	12.00	16.00	192.00	208.00	6696
76	12.16	16.00	196.51	212.51	6909
77	12.32	16.00	201.06	217.06	7126
78	12.48	16.00	205.67	221.67	7348
79	12.64	16.00	210.33	226.33	7574
80	12.80	16.00	215.04	231.04	7805
81	12.96	16.00	219.80	235.80	8041
82	13.12	16.00	224.61	240.61	8281
83	13.28	16.00	229.48	245.48	8527
84	13.44	16.00	234.39	250.39	8777
85	13.60	16.00	239.36	255.36	9033
86	13.76	16.00	244.38	260.38	9293
87	13.92	16.00	249.45	265.45	9558
88	14.08	16.00	254.57	270.57	9829
89	14.24	16.00	259.74	275.74	10105
90	14.40	16.00	264.96	280.96	10386
91	14.56	16.00	270.23	286.23	10672
92	14.72	16.00	275.56	291.56	10963
93	14.88	16.00	280.93	296.93	11260
94	15.04	16.00	286.36	302.36	11563
95	15.20	16.00	291.84	307.84	11871
96	15.36	16.00	297.37	313.37	12184
97	15.52	16.00	302.95	318.95	12503
98	15.68	16.00	308.58	324.58	12827
99	15.84	16.00	314.27	330.27	13158
100	16.00	16.00	320.00	336.00	13494

101	16.16	16.00	325.79	341.79	13836	
102	16.32	16.00	331.62	347.62	14183	
103	16.48	16.00	337.51	353.51	14537	
104	16.64	16.00	343.45	359.45	14896	
105	16.80	16.00	349.44	365.44	15262	
106	16.96	16.00	355.48	371.48	15633	
107	17.12	16.00	361.57	377.57	16011	
108	17.28	16.00	367.72	383.72	16394	
109	17.44	16.00	373.91	389.91	16784	
110	17.60	16.00	380.16	396.16	17180	
111	17.76	16.00	386.46	402.46	17583	
112	17.92	16.00	392.81	408.81	17992	
113	18.08	16.00	399.21	415.21	18407	
114	18.24	16.00	405.66	421.66	18829	
115	18.40	16.00	412.16	428.16	19257	
116	18.56	16.00	418.71	434.71	19691	
117	18.72	16.00	425.32	441.32	20133	
118	18.88	16.00	431.97	447.97	20581	
119	19.04	16.00	438.68	454.68	21035	
120	19.20	16.00	445.44	461.44	21497	
121	19.36	16.00	452.25	468.25	21965	
122	19.52	16.00	459.11	475.11	22440	
123	19.68	16.00	466.02	482.02	22922	
124	19.84	16.00	472.99	488.99	23411	Total Exc. 23907
125	20.00	16.00	480.00	496.00	23907	Total Bkfl. 24098

Pipe Number	118	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	0	1	0.15	34.38	0.84	35.22	35
End Cover	14	2	0.30	34.38	1.73	36.10	71
Length	94	3	0.45	34.38	2.66	37.03	108
Increment	0.15	4	0.60	34.38	3.63	38.01	146
Pipe Size	42	5	0.74	34.38	4.65	39.03	185
		6	0.89	34.38	5.71	40.09	225
		7	1.04	34.38	6.82	41.20	267
		8	1.19	34.38	7.97	42.35	309
		9	1.34	34.38	9.17	43.54	353
		10	1.49	34.38	10.41	44.78	397
		11	1.64	34.38	11.69	46.07	443
		12	1.79	34.38	13.02	47.40	491
		13	1.94	34.38	14.40	48.77	540
		14	2.09	34.38	15.82	50.19	590
		15	2.23	34.38	17.28	51.65	641
		16	2.38	34.38	18.78	53.16	695
		17	2.53	34.38	20.34	54.71	749
		18	2.68	34.38	21.93	56.31	806
		19	2.83	34.38	23.57	57.95	864
		20	2.98	34.38	25.26	59.63	923
		21	3.13	34.38	26.98	61.36	985
		22	3.28	34.38	28.76	63.13	1048
		23	3.43	34.38	30.57	64.95	1113
		24	3.57	34.38	32.44	66.81	1179
		25	3.72	34.38	34.34	68.72	1248
		26	3.87	34.38	36.29	70.67	1319
		27	4.02	34.38	38.29	72.66	1391
		28	4.17	34.38	40.33	74.70	1466
		29	4.32	34.38	42.41	76.79	1543
		30	4.47	34.38	44.54	78.91	1622
		31	4.62	34.38	46.71	81.09	1703
		32	4.77	34.38	48.93	83.30	1786
		33	4.91	34.38	51.19	85.56	1872
		34	5.06	34.38	53.49	87.87	1960
		35	5.21	34.38	55.84	90.22	2050
		36	5.36	34.38	58.24	92.61	2143
		37	5.51	34.38	60.68	95.05	2238
		38	5.66	34.38	63.16	97.53	2335
		39	5.81	34.38	65.69	100.06	2435
		40	5.96	34.38	68.26	102.63	2538
		41	6.11	34.38	70.87	105.25	2643
		42	6.26	34.38	73.53	107.91	2751
		43	6.40	34.38	76.24	110.61	2862
		44	6.55	34.38	78.99	113.36	2975
		45	6.70	34.38	81.78	116.16	3091
		46	6.85	34.38	84.62	118.99	3210
		47	7.00	34.38	87.50	121.88	3332
		48	7.15	34.38	90.43	124.80	3457
		49	7.30	34.38	93.40	127.77	3585
		50	7.45	34.38	96.41	130.79	3715
		51	7.60	34.38	99.47	133.85	3849

52	7.74	34.38	102.58	136.95	3986	
53	7.89	34.38	105.72	140.10	4126	
54	8.04	34.38	108.92	143.29	4270	
55	8.19	34.38	112.15	146.53	4416	
56	8.34	34.38	115.44	149.81	4566	
57	8.49	34.38	118.76	153.14	4719	
58	8.64	34.38	122.13	156.51	4875	
59	8.79	34.38	125.55	159.92	5035	
60	8.94	34.38	129.00	163.38	5199	
61	9.09	34.38	132.51	166.88	5366	
62	9.23	34.38	136.05	170.43	5536	
63	9.38	34.38	139.65	174.02	5710	
64	9.53	34.38	143.28	177.66	5888	
65	9.68	34.38	146.96	181.34	6069	
66	9.83	34.38	150.69	185.06	6254	
67	9.98	34.38	154.46	188.83	6443	
68	10.13	34.38	158.27	192.65	6636	
69	10.28	34.38	162.13	196.50	6832	
70	10.43	34.38	166.03	200.41	7033	
71	10.57	34.38	169.98	204.35	7237	
72	10.72	34.38	173.97	208.35	7445	
73	10.87	34.38	178.01	212.38	7658	
74	11.02	34.38	182.09	216.46	7874	
75	11.17	34.38	186.21	220.58	8095	
76	11.32	34.38	190.38	224.75	8319	
77	11.47	34.38	194.59	228.97	8548	
78	11.62	34.38	198.85	233.22	8782	
79	11.77	34.38	203.15	237.53	9019	
80	11.91	34.38	207.50	241.87	9261	
81	12.06	34.38	211.89	246.26	9507	
82	12.21	34.38	216.32	250.70	9758	
83	12.36	34.38	220.80	255.18	10013	
84	12.51	34.38	225.32	259.70	10273	
85	12.66	34.38	229.89	264.27	10537	
86	12.81	34.38	234.50	268.88	10806	
87	12.96	34.38	239.16	273.54	11080	
88	13.11	34.38	243.86	278.24	11358	
89	13.26	34.38	248.61	282.98	11641	
90	13.40	34.38	253.40	287.77	11929	
91	13.55	34.38	258.23	292.61	12221	
92	13.70	34.38	263.11	297.49	12519	
93	13.85	34.38	268.03	302.41	12821	Total Exc. 13128
94	14.00	34.38	273.00	307.38	13128	Total Bkfl. 10887

Pipe Number	119	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	16	1	16.00	34.38	344.00	378.38	378
End Cover	16	2	16.00	34.38	344.00	378.38	757
Length	53	3	16.00	34.38	344.00	378.38	1135
Increment	0	4	16.00	34.38	344.00	378.38	1514
Pipe Size	42	5	16.00	34.38	344.00	378.38	1892
		6	16.00	34.38	344.00	378.38	2270
		7	16.00	34.38	344.00	378.38	2649
		8	16.00	34.38	344.00	378.38	3027
		9	16.00	34.38	344.00	378.38	3405
		10	16.00	34.38	344.00	378.38	3784
		11	16.00	34.38	344.00	378.38	4162
		12	16.00	34.38	344.00	378.38	4541
		13	16.00	34.38	344.00	378.38	4919
		14	16.00	34.38	344.00	378.38	5297
		15	16.00	34.38	344.00	378.38	5676
		16	16.00	34.38	344.00	378.38	6054
		17	16.00	34.38	344.00	378.38	6432
		18	16.00	34.38	344.00	378.38	6811
		19	16.00	34.38	344.00	378.38	7189
		20	16.00	34.38	344.00	378.38	7568
		21	16.00	34.38	344.00	378.38	7946
		22	16.00	34.38	344.00	378.38	8324
		23	16.00	34.38	344.00	378.38	8703
		24	16.00	34.38	344.00	378.38	9081
		25	16.00	34.38	344.00	378.38	9459
		26	16.00	34.38	344.00	378.38	9838
		27	16.00	34.38	344.00	378.38	10216
		28	16.00	34.38	344.00	378.38	10595
		29	16.00	34.38	344.00	378.38	10973
		30	16.00	34.38	344.00	378.38	11351
		31	16.00	34.38	344.00	378.38	11730
		32	16.00	34.38	344.00	378.38	12108
		33	16.00	34.38	344.00	378.38	12486
		34	16.00	34.38	344.00	378.38	12865
		35	16.00	34.38	344.00	378.38	13243
		36	16.00	34.38	344.00	378.38	13622
		37	16.00	34.38	344.00	378.38	14000
		38	16.00	34.38	344.00	378.38	14378
		39	16.00	34.38	344.00	378.38	14757
		40	16.00	34.38	344.00	378.38	15135
		41	16.00	34.38	344.00	378.38	15513
		42	16.00	34.38	344.00	378.38	15892
		43	16.00	34.38	344.00	378.38	16270
		44	16.00	34.38	344.00	378.38	16649
		45	16.00	34.38	344.00	378.38	17027
		46	16.00	34.38	344.00	378.38	17405
		47	16.00	34.38	344.00	378.38	17784
		48	16.00	34.38	344.00	378.38	18162
		49	16.00	34.38	344.00	378.38	18540
		50	16.00	34.38	344.00	378.38	18919
		51	16.00	34.38	344.00	378.38	19297

52	16.00	34.38	344.00	378.38	19676	Total Exc.	20054
53	16.00	34.38	344.00	378.38	20054	Total Bkfl.	20055

Pipe Number	120	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation		
Begin Cover	9	1	9.18	34.38	134.81	169.18	169		
End Cover	15	2	9.36	34.38	139.18	173.55	343		
Length	33	3	9.55	34.38	143.62	177.99	521		
Increment	0.18	4	9.73	34.38	148.12	182.49	703		
Pipe Size	42	5	9.91	34.38	152.69	187.07	890		
		6	10.09	34.38	157.33	191.70	1082		
		7	10.27	34.38	162.03	196.40	1278		
		8	10.45	34.38	166.80	201.17	1480		
		9	10.64	34.38	171.63	206.01	1686		
		10	10.82	34.38	176.53	210.91	1896		
		11	11.00	34.38	181.50	215.88	2112		
		12	11.18	34.38	186.53	220.91	2333		
		13	11.36	34.38	191.63	226.01	2559		
		14	11.55	34.38	196.80	231.17	2790		
		15	11.73	34.38	202.03	236.40	3027		
		16	11.91	34.38	207.33	241.70	3269		
		17	12.09	34.38	212.69	247.07	3516		
		18	12.27	34.38	218.12	252.49	3768		
		19	12.45	34.38	223.62	257.99	4026		
		20	12.64	34.38	229.18	263.55	4290		
		21	12.82	34.38	234.81	269.18	4559		
		22	13.00	34.38	240.50	274.88	4834		
		23	13.18	34.38	246.26	280.64	5114		
		24	13.36	34.38	252.09	286.46	5401		
		25	13.55	34.38	257.98	292.35	5693		
		26	13.73	34.38	263.94	298.31	5991		
		27	13.91	34.38	269.96	304.34	6296		
		28	14.09	34.38	276.05	310.43	6606		
		29	14.27	34.38	282.21	316.59	6923		
		30	14.45	34.38	288.43	322.81	7246		
		31	14.64	34.38	294.72	329.10	7575		
		32	14.82	34.38	301.08	335.45	7910	Total Exc.	8252
		33	15.00	34.38	307.50	341.88	8252	Total Bkfl.	7829

Pipe Number	121	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	15	1	15.00	34.38	307.50	341.88	342
End Cover	15	2	15.00	34.38	307.50	341.88	684
Length	56	3	15.00	34.38	307.50	341.88	1026
Increment	0	4	15.00	34.38	307.50	341.88	1368
Pipe Size	42	5	15.00	34.38	307.50	341.88	1709
		6	15.00	34.38	307.50	341.88	2051
		7	15.00	34.38	307.50	341.88	2393
		8	15.00	34.38	307.50	341.88	2735
		9	15.00	34.38	307.50	341.88	3077
		10	15.00	34.38	307.50	341.88	3419
		11	15.00	34.38	307.50	341.88	3761
		12	15.00	34.38	307.50	341.88	4103
		13	15.00	34.38	307.50	341.88	4444
		14	15.00	34.38	307.50	341.88	4786
		15	15.00	34.38	307.50	341.88	5128
		16	15.00	34.38	307.50	341.88	5470
		17	15.00	34.38	307.50	341.88	5812
		18	15.00	34.38	307.50	341.88	6154
		19	15.00	34.38	307.50	341.88	6496
		20	15.00	34.38	307.50	341.88	6838
		21	15.00	34.38	307.50	341.88	7179
		22	15.00	34.38	307.50	341.88	7521
		23	15.00	34.38	307.50	341.88	7863
		24	15.00	34.38	307.50	341.88	8205
		25	15.00	34.38	307.50	341.88	8547
		26	15.00	34.38	307.50	341.88	8889
		27	15.00	34.38	307.50	341.88	9231
		28	15.00	34.38	307.50	341.88	9573
		29	15.00	34.38	307.50	341.88	9914
		30	15.00	34.38	307.50	341.88	10256
		31	15.00	34.38	307.50	341.88	10598
		32	15.00	34.38	307.50	341.88	10940
		33	15.00	34.38	307.50	341.88	11282
		34	15.00	34.38	307.50	341.88	11624
		35	15.00	34.38	307.50	341.88	11966
		36	15.00	34.38	307.50	341.88	12308
		37	15.00	34.38	307.50	341.88	12649
		38	15.00	34.38	307.50	341.88	12991
		39	15.00	34.38	307.50	341.88	13333
		40	15.00	34.38	307.50	341.88	13675
		41	15.00	34.38	307.50	341.88	14017
		42	15.00	34.38	307.50	341.88	14359
		43	15.00	34.38	307.50	341.88	14701
		44	15.00	34.38	307.50	341.88	15043
		45	15.00	34.38	307.50	341.88	15384
		46	15.00	34.38	307.50	341.88	15726
		47	15.00	34.38	307.50	341.88	16068
		48	15.00	34.38	307.50	341.88	16410
		49	15.00	34.38	307.50	341.88	16752
		50	15.00	34.38	307.50	341.88	17094
		51	15.00	34.38	307.50	341.88	17436

52	15.00	34.38	307.50	341.88	17778		
53	15.00	34.38	307.50	341.88	18119		
54	15.00	34.38	307.50	341.88	18461		
55	15.00	34.38	307.50	341.88	18803	Total Exc.	19145
56	15.00	34.38	307.50	341.88	19145	Total Bkfl.	18942

Pipe Number	122	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation
Begin Cover	16	1	16.00	34.38	344.00	378.38	378
End Cover	16	2	16.00	34.38	344.00	378.38	757
Length	150	3	16.00	34.38	344.00	378.38	1135
Increment	0	4	16.00	34.38	344.00	378.38	1514
Pipe Size	42	5	16.00	34.38	344.00	378.38	1892
		6	16.00	34.38	344.00	378.38	2270
		7	16.00	34.38	344.00	378.38	2649
		8	16.00	34.38	344.00	378.38	3027
		9	16.00	34.38	344.00	378.38	3405
		10	16.00	34.38	344.00	378.38	3784
		11	16.00	34.38	344.00	378.38	4162
		12	16.00	34.38	344.00	378.38	4541
		13	16.00	34.38	344.00	378.38	4919
		14	16.00	34.38	344.00	378.38	5297
		15	16.00	34.38	344.00	378.38	5676
		16	16.00	34.38	344.00	378.38	6054
		17	16.00	34.38	344.00	378.38	6432
		18	16.00	34.38	344.00	378.38	6811
		19	16.00	34.38	344.00	378.38	7189
		20	16.00	34.38	344.00	378.38	7568
		21	16.00	34.38	344.00	378.38	7946
		22	16.00	34.38	344.00	378.38	8324
		23	16.00	34.38	344.00	378.38	8703
		24	16.00	34.38	344.00	378.38	9081
		25	16.00	34.38	344.00	378.38	9459
		26	16.00	34.38	344.00	378.38	9838
		27	16.00	34.38	344.00	378.38	10216
		28	16.00	34.38	344.00	378.38	10595
		29	16.00	34.38	344.00	378.38	10973
		30	16.00	34.38	344.00	378.38	11351
		31	16.00	34.38	344.00	378.38	11730
		32	16.00	34.38	344.00	378.38	12108
		33	16.00	34.38	344.00	378.38	12486
		34	16.00	34.38	344.00	378.38	12865
		35	16.00	34.38	344.00	378.38	13243
		36	16.00	34.38	344.00	378.38	13622
		37	16.00	34.38	344.00	378.38	14000
		38	16.00	34.38	344.00	378.38	14378
		39	16.00	34.38	344.00	378.38	14757
		40	16.00	34.38	344.00	378.38	15135
		41	16.00	34.38	344.00	378.38	15513
		42	16.00	34.38	344.00	378.38	15892
		43	16.00	34.38	344.00	378.38	16270
		44	16.00	34.38	344.00	378.38	16649
		45	16.00	34.38	344.00	378.38	17027
		46	16.00	34.38	344.00	378.38	17405
		47	16.00	34.38	344.00	378.38	17784
		48	16.00	34.38	344.00	378.38	18162
		49	16.00	34.38	344.00	378.38	18540
		50	16.00	34.38	344.00	378.38	18919
		51	16.00	34.38	344.00	378.38	19297

52	16.00	34.38	344.00	378.38	19676
53	16.00	34.38	344.00	378.38	20054
54	16.00	34.38	344.00	378.38	20432
55	16.00	34.38	344.00	378.38	20811
56	16.00	34.38	344.00	378.38	21189
57	16.00	34.38	344.00	378.38	21567
58	16.00	34.38	344.00	378.38	21946
59	16.00	34.38	344.00	378.38	22324
60	16.00	34.38	344.00	378.38	22703
61	16.00	34.38	344.00	378.38	23081
62	16.00	34.38	344.00	378.38	23459
63	16.00	34.38	344.00	378.38	23838
64	16.00	34.38	344.00	378.38	24216
65	16.00	34.38	344.00	378.38	24594
66	16.00	34.38	344.00	378.38	24973
67	16.00	34.38	344.00	378.38	25351
68	16.00	34.38	344.00	378.38	25730
69	16.00	34.38	344.00	378.38	26108
70	16.00	34.38	344.00	378.38	26486
71	16.00	34.38	344.00	378.38	26865
72	16.00	34.38	344.00	378.38	27243
73	16.00	34.38	344.00	378.38	27621
74	16.00	34.38	344.00	378.38	28000
75	16.00	34.38	344.00	378.38	28378
76	16.00	34.38	344.00	378.38	28757
77	16.00	34.38	344.00	378.38	29135
78	16.00	34.38	344.00	378.38	29513
79	16.00	34.38	344.00	378.38	29892
80	16.00	34.38	344.00	378.38	30270
81	16.00	34.38	344.00	378.38	30648
82	16.00	34.38	344.00	378.38	31027
83	16.00	34.38	344.00	378.38	31405
84	16.00	34.38	344.00	378.38	31784
85	16.00	34.38	344.00	378.38	32162
86	16.00	34.38	344.00	378.38	32540
87	16.00	34.38	344.00	378.38	32919
88	16.00	34.38	344.00	378.38	33297
89	16.00	34.38	344.00	378.38	33675
90	16.00	34.38	344.00	378.38	34054
91	16.00	34.38	344.00	378.38	34432
92	16.00	34.38	344.00	378.38	34811
93	16.00	34.38	344.00	378.38	35189
94	16.00	34.38	344.00	378.38	35567
95	16.00	34.38	344.00	378.38	35946
96	16.00	34.38	344.00	378.38	36324
97	16.00	34.38	344.00	378.38	36702
98	16.00	34.38	344.00	378.38	37081
99	16.00	34.38	344.00	378.38	37459
100	16.00	34.38	344.00	378.38	37838

101	16.00	34.38	344.00	378.38	38216	
102	16.00	34.38	344.00	378.38	38594	
103	16.00	34.38	344.00	378.38	38973	
104	16.00	34.38	344.00	378.38	39351	
105	16.00	34.38	344.00	378.38	39729	
106	16.00	34.38	344.00	378.38	40108	
107	16.00	34.38	344.00	378.38	40486	
108	16.00	34.38	344.00	378.38	40865	
109	16.00	34.38	344.00	378.38	41243	
110	16.00	34.38	344.00	378.38	41621	
111	16.00	34.38	344.00	378.38	42000	
112	16.00	34.38	344.00	378.38	42378	
113	16.00	34.38	344.00	378.38	42756	
114	16.00	34.38	344.00	378.38	43135	
115	16.00	34.38	344.00	378.38	43513	
116	16.00	34.38	344.00	378.38	43892	
117	16.00	34.38	344.00	378.38	44270	
118	16.00	34.38	344.00	378.38	44648	
119	16.00	34.38	344.00	378.38	45027	
120	16.00	34.38	344.00	378.38	45405	
121	16.00	34.38	344.00	378.38	45783	
122	16.00	34.38	344.00	378.38	46162	
123	16.00	34.38	344.00	378.38	46540	
124	16.00	34.38	344.00	378.38	46919	
125	16.00	34.38	344.00	378.38	47297	
126	16.00	34.38	344.00	378.38	47675	
127	16.00	34.38	344.00	378.38	48054	
128	16.00	34.38	344.00	378.38	48432	
129	16.00	34.38	344.00	378.38	48810	
130	16.00	34.38	344.00	378.38	49189	
131	16.00	34.38	344.00	378.38	49567	
132	16.00	34.38	344.00	378.38	49946	
133	16.00	34.38	344.00	378.38	50324	
134	16.00	34.38	344.00	378.38	50702	
135	16.00	34.38	344.00	378.38	51081	
136	16.00	34.38	344.00	378.38	51459	
137	16.00	34.38	344.00	378.38	51837	
138	16.00	34.38	344.00	378.38	52216	
139	16.00	34.38	344.00	378.38	52594	
140	16.00	34.38	344.00	378.38	52973	
141	16.00	34.38	344.00	378.38	53351	
142	16.00	34.38	344.00	378.38	53729	
143	16.00	34.38	344.00	378.38	54108	
144	16.00	34.38	344.00	378.38	54486	
145	16.00	34.38	344.00	378.38	54864	
146	16.00	34.38	344.00	378.38	55243	
147	16.00	34.38	344.00	378.38	55621	
148	16.00	34.38	344.00	378.38	56000	
149	16.00	34.38	344.00	378.38	56378	Total Exc. 56756

150	16.00	34.38	344.00	378.38	56756	Total Bkfl. 56760

Pipe Number	123	Interval	Cover	BoxArea	TrapArea	Total Area	Excavation		
Begin Cover	16	1	16.00	34.38	344.00	378.38	378		
End Cover	16	2	16.00	34.38	344.00	378.38	757		
Length	10	3	16.00	34.38	344.00	378.38	1135		
Increment	0	4	16.00	34.38	344.00	378.38	1514		
Pipe Size	42	5	16.00	34.38	344.00	378.38	1892		
		6	16.00	34.38	344.00	378.38	2270		
		7	16.00	34.38	344.00	378.38	2649		
		8	16.00	34.38	344.00	378.38	3027		
		9	16.00	34.38	344.00	378.38	3405	Total Exc.	3784
		10	16.00	34.38	344.00	378.38	3784	Total Bkfl.	3784

Computation

Job No. 08821-010-044

HDR

Project	Southeast Rhoenix Regional Drainage Basin Project	Computed	JKE	Date	8/5/99
Subject	FCD PCN 630-01-30	Checked		Date	
Task	Quantities and Structural Costs	Page	1	of	6

Spillway Walls

Excavation	1017 cy	$4.00 /cy	$4,068.00
Backfill	735 cy	$20.00 /cy	$14,700.00
Concrete	272 cy	$230.00 /cy	$62,560.00
Reinforcing	37.638 kip	$400.00 /kip	$15,055.20
		Total	$96,383.20
		+5%	$101,202.36
Wall Length = 2 @ 156.75			
		Total /foot	$322.81

Overflow Weir Structure

Excavation	156.15 cy	$4.00 /cy	$624.60
Backfill	109 cy	$20.00 /cy	$2,180.00
Concrete	15.75 cy	$230.00 /cy	$3,622.50
Reinforcing	4.173 kip	$400.00 /kip	$1,669.20
Plates	0.537 kip	$400.00 /kip	$214.80
Grating	89.69 sy	$200.00 /sy	$17,938.00
		Total	$26,249.10
		+5%	$27,561.56

Gate Structure 100

Excavation	195.94 cy	$4.00 /cy	$783.76
Backfill	83.23 cy	$20.00 /cy	$1,664.60
Concrete	8.04 cy	$230.00 /cy	$1,849.20
Reinforcing	3.032 kip	$400.00 /kip	$1,212.80
		Total	$5,510.36
		+5%	$5,785.88

Gate Structure 101

Excavation	281.74 cy	$4.00 /cy	$1,126.96
Backfill	101.68 cy	$20.00 /cy	$2,033.60
Concrete	8.04 cy	$230.00 /cy	$1,849.20
Reinforcing	2.912 kip	$400.00 /kip	$1,164.80
		Total	$6,174.56
		+5%	$6,483.29

Gate Structure 102

Excavation	58.37 cy	$4.00 /cy	$233.48
Backfill	38.43 cy	$20.00 /cy	$768.60
Concrete	8.04 cy	$230.00 /cy	$1,849.20
Reinforcing	2.912 kip	$400.00 /kip	$1,164.80
		Total	$4,016.08
		+5%	$4,216.88

Computation

Job No. 08821-010-044

HDR

Project	Southeast Rhoenix Regional Drainage Basin Project	Computed	JKE	Date	8/5/99
Subject	FCD PCN 630-01-30	Checked		Date	
Task	Quantities and Structural Costs	Page	2	of	6

Gate Structure 103			
Excavation	58.37 cy	$4.00 /cy	$233.48
Backfill	38.43 cy	$20.00 /cy	$768.60
Concrete	8.04 cy	$230.00 /cy	$1,849.20
Reinforcing	2.912 kip	$400.00 /kip	$1,164.80
		Total	$4,016.08
		+5%	$4,216.88
Gate Structure 104			
Excavation	67.39 cy	$4.00 /cy	$269.56
Backfill	42.52 cy	$20.00 /cy	$850.40
Concrete	7.92 cy	$230.00 /cy	$1,821.60
Reinforcing	3.132 kip	$400.00 /kip	$1,252.80
		Total	$4,194.36
		+5%	$4,404.08
Gate Structure 105			
Excavation	336.79 cy	$4.00 /cy	$1,347.16
Backfill	111.71 cy	$20.00 /cy	$2,234.20
Concrete	8.82 cy	$230.00 /cy	$2,028.60
Reinforcing	3.08 kip	$400.00 /kip	$1,232.00
		Total	$6,841.96
		+5%	$7,184.06
Gate Structure 106			
Excavation	454.12 cy	$4.00 /cy	$1,816.48
Backfill	224.97 cy	$20.00 /cy	$4,499.40
Concrete	33.04 cy	$230.00 /cy	$7,599.20
Reinforcing	7.039 kip	$400.00 /kip	$2,815.60
		Total	$16,730.68
		+5%	$17,567.21
Spillway			
Concrete	1670 cy	$230.00 /cy	$384,100.00
Reinforcing	134.92 kip	$400.00 /kip	$53,968.00
		Total	$438,068.00
		+5%	$459,971.40
Total Area = 10020 sy		Total/SY	$45.50

Computation

Job No. 08821-010-044

HDR

Project	Southeast Rhoenix Regional Drainage Basin Project	Computed	JKE	Date	8/5/99
Subject	FCD PCN 630-01-30	Checked		Date	
Task	Quantities and Structural Costs	Page	3	of	6

Inlet Structure 1-4

Inlet Structure 1			
Concrete	3.24 cy	$230.00 /cy	$745.20
Reinforcing	0.394 kip	$400.00 /kip	$157.60
Plates	0.628 kip	$400.00 /kip	$251.20
		Total	$1,154.00
		+5%	$1,211.70
Inlet Structure 2			
Concrete	3.31 cy	$230.00 /cy	$761.30
Reinforcing	0.394 kip	$400.00 /kip	$157.60
Plates	0.628 kip	$400.00 /kip	$251.20
		Total	$1,170.10
		+5%	$1,228.61
Inlet Structure 3			
Concrete	4.55 cy	$230.00 /cy	$1,046.50
Reinforcing	0.53 kip	$400.00 /kip	$212.00
Plates	0.569 kip	$400.00 /kip	$227.60
		Total	$1,486.10
		+5%	$1,560.41
Inlet Structure 4			
Concrete	4.55 cy	$230.00 /cy	$1,046.50
Reinforcing	0.53 kip	$400.00 /kip	$212.00
Plates	0.569 kip	$400.00 /kip	$227.60
		Total	$1,486.10
		+5%	$1,560.41
Average Cost			$1,390.28

Inlet Structure 5

Concrete	3.15 cy	$230.00 /cy	$724.50
Reinforcing	0.477 kip	$400.00 /kip	$190.80
Plates	0.628 kip	$400.00 /kip	$251.20
		Total	$1,166.50
		+5%	$1,224.83

Inlet Structure 6

Concrete	3.4 cy	$230.00 /cy	$782.00
Reinforcing	0.379 kip	$400.00 /kip	$151.60
Plates	0.929 kip	$400.00 /kip	$371.60
		Total	$1,305.20
		+5%	$1,370.46

Computation

Job No. 08821-010-044

HDR

Project	Southeast Rhoenix Regional Drainage Basin Project	Computed	JKE	Date	8/5/99
Subject	FCD PCN 630-01-30	Checked		Date	
Task	Quantities and Structural Costs	Page	4	of	6

Outlet Structure with Riprap

Outlet Structure 1			
Concrete	1.95 cy	$230.00 /cy	$448.50
Reinforcing	0.347 kip	$400.00 /kip	$138.80
Plates	0.628 kip	$400.00 /kip	$251.20
Riprap	5.4 cy	$50.00 /cy	$270.00
		Total	$1,108.50
		+5%	$1,163.93
Outlet Structure 3			
Concrete	2.29 cy	$230.00 /cy	$526.70
Reinforcing	0.364 kip	$400.00 /kip	$145.60
Plates	0.503 kip	$400.00 /kip	$201.20
Riprap	5.4 cy	$50.00 /cy	$270.00
		Total	$1,143.50
		+5%	$1,200.68
Outlet Structure 4			
Concrete	2.29 cy	$230.00 /cy	$526.70
Reinforcing	0.364 kip	$400.00 /kip	$145.60
Plates	0.503 kip	$400.00 /kip	$201.20
Riprap	5.4 cy	$50.00 /cy	$270.00
		Total	$1,143.50
		+5%	$1,200.68
Outlet Structure with Riprap Average			$1,188.43

Outlet Structure without Riprap

Outlet Structure 2			
Concrete	2.04 cy	$230.00 /cy	$469.20
Reinforcing	0.352 kip	$400.00 /kip	$140.80
Plates	0.628 kip	$400.00 /kip	$251.20
		Total	$861.20
		+5%	$904.26
Outlet Structure 5			
Concrete	2.15 cy	$230.00 /cy	$494.50
Reinforcing	0.357 kip	$400.00 /kip	$142.80
Plates	0.628 kip	$400.00 /kip	$251.20
		Total	$888.50
		+5%	$932.93
Outlet Structure Average			$918.59

Lowflow Channel Lining

Channel Lining			
Concrete	78.48 cy	$230.00 /cy	$18,050.40
Reinforcing	9.433 kip	$400.00 /kip	$3,773.20
		Total	$21,823.60
		+5%	$22,914.78
Channel Transition			
Concrete	17.48 cy	$230.00 /cy	$4,020.40
Reinforcing	1.976 kip	$400.00 /kip	$790.40
		Total	$4,810.80
		+5%	$5,051.34
Outlet Apron			
Concrete	3.22 cy	$230.00 /cy	$740.60
Reinforcing	0.368 kip	$400.00 /kip	$147.20
		Total	$887.80
		+5%	$932.19
		Total Cost	$28,898.31
Lowflow Channel Length = 1589 ft		Cost/LF	$18.19

Access Ramp

Concrete	45.7 cy	$230.00 /cy	$10,511.00
Reinforcing	5.035 kip	$400.00 /kip	$2,014.00
		Total	$12,525.00
		+5%	$13,151.25
Access Ramp Area = 548.5 SY		Cost/SY	$23.98

Headwall No. 5 Outlet Apron

Concrete	7 cy	$230.00 /cy	$1,610.00
Reinforcing	0.5 kip	$400.00 /kip	$200.00
		Total	$1,810.00
		+5%	$1,900.50
Outlet Appron Area =62 SY		Cost/SY	$30.65

Cutoff Wall

Concrete	55.6 cy	$230.00 /cy	$12,788.00
Reinforcing	5.1 kip	$400.00 /kip	$2,040.00
		Total	$14,828.00
		+5%	$15,569.40
Cutoff Wall Length =1200 ft		Cost/ft	$12.97

Computation

Job No. 08821-010-044

HDR

Project	Southeast Rhoenix Regional Drainage Basin Project	Computed	JKE	Date	8/5/99
Subject	FCD PCN 630-01-30	Checked		Date	
Task	Quantities and Structural Costs	Page	6	of	6

Corrugated Metal Pipe

3 -36" Pipes	648 ft	$75.00 /ft	$48,600.00
6 Headwalls			
Concrete	12.48 cy	$230.00 /cy	$2,870.40
Reinforcement	900 lbs	$0.04 /lbs	$36.00
Barriers	6 ea	$2,000.00 /ea	$12,000.00
Riprap Outlet	11.7 cy	$50.00 /cy	$585.00
Inlet Apron			
Concrete	7.8 cy	$230.00 /cy	$1,794.00
Reinforcement	0.885 lbs	$0.04 /lbs	$0.04
		Total	$65,885.44
		+5%	$69,179.71
		Cost per foot	$106.76

3" Copper Water Line

Pipe	275 ft	$50.00 /ft	$13,750.00
Propeller Meters	2 ea	$1,000.00 /ea	$2,000.00
Gate Valves	4 ea	$350.00 /ea	$1,400.00
Valve Boxes	2 ea	$6,000.00 /ea	$12,000.00
		Total	$29,150.00
		+5%	$30,607.50
		Cost per foot	$111.30

4" Ductile Iron Pipe Water Line

4" DIP	1262 ft	$35.00 /ft	$44,170.00
Vault	1 ea	$8,000.00 /ea	$8,000.00
Backflow Preventor	1 ea	$3,000.00 /ea	$3,000.00
		Total	$55,170.00
		+5%	$57,928.50
		Cost per foot	$45.90

Asphalt Concrete Pavement

Area = 111109 sf = 12345.5 sy
Pump Station Parking = 500 sy
Total = 12845.5 sy

Aggregate Base

O& M Road Area	12345.5 sy
Access Ramp Area	548.5 sy
Total	12894 sy
@ 6" thick	2149 cy

Pump Station Parking Vol = 80 cy

Total	2229 cy

File	Quantities.xls	Job No.		No.	

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed	BKV	Date	8/6/99
Subject	FCD PCN 630-01-30	Checked		Date	
Task	Concrete Quantities	Sheet	1	Of	34

Description		Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Spillway Walls:			HIEGHT AVE		THICKNESS			
Wall 1	Footing	8.00	5.75	46.00	1.00	10	460	17.04
	Key	8.00	1.00	8.00	1.00	10	80	2.96
	Panel 1	8.00	6.97	55.76	1.17	1	65	2.41
	Panel 11	8.00	7.68	61.40	1.17	1	72	2.65
	Panel 12	8.00	7.63	61.00	1.17	1	71	2.64
	Panel 13	8.00	7.57	60.52	1.17	1	71	2.62
	Panel 14	8.00	7.51	60.04	1.17	1	70	2.59
	Panel 15	8.00	7.46	59.64	1.17	1	70	2.58
	Panel 16	8.00	7.39	59.12	1.17	1	69	2.55
	Panel 17	8.00	7.33	58.60	1.17	1	68	2.53
	Panel 18	8.00	7.28	58.20	1.17	1	68	2.51
	Panel 19	8.00	7.22	57.72	1.17	1	67	2.49
TOTAL							***1231***	***45.58***
Wall 2	Footing	8.00	6.75	54.00	1.00	2	108	4.00
	Key	8.00	1.00	8.00	1.00	2	16	0.59
	Panel 2	8.00	8.91	71.28	1.17	1	83	3.08
	Panel 10	8.00	9.23	73.84	1.17	1	86	3.19
TOTAL							***293***	***10.86***
Wall 3	Footing	8.00	8.50	68.00	1.33	2	181	6.72
	Key	8.00	1.00	8.00	1.00	2	16	0.59
	Panel 3	8.00	10.85	86.80	1.17	1	101	3.75
	Panel 9	8.00	11.29	90.32	1.17	1	105	3.90
	Footing	6.00	8.50	51.00	1.33	1	68	2.52
	Key	6.00	1.00	6.00	1.00	1	6	0.22
	Panel 4	6.00	12.54	75.24	1.17	1	88	3.25
TOTAL							***566***	***20.95***
Wall 4	Footing	6.39	9.75	62.26	1.33	1 2	166	6.15
	Key	6.39	1.00	6.39	1.00	1 2	13	0.47
	Panel 5	6.39	14.04	89.65	1.17	1	105	3.87
	Footing	8.00	9.75	78.00	1.33	1 2	208	7.70
	Key	8.00	1.00	8.00	1.00	1 2	16	0.59
	Panel 8	8.00	13.35	106.80	1.17	1	125	4.61
TOTAL							***632***	***23.41***
Wall 5	Footing	8.00	12.50	100.00	2.00	2	400	14.81
	Key	8.00	1.00	8.00	1.00	2	16	0.59
	Panel 6	8.00	15.79	126.32	1.17	1	147	5.46
	Panel 7	8.00	15.41	123.28	1.17	1	144	5.33
TOTAL							***707***	***26.19***

File Quantities.xls | Job No. | No.

Computation

HDR

Project: Southeast Phoenix Regional Drainage Basin Project | Computed: BKV | Date: 8/6/99

Subject: FCD PCN 630-01-30 | Checked: | Date:

Task: Concrete Quantities | Sheet: 2 | Of: 34

Description		Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Steps	6 to 7	12.50	2.32	29.00	1.00	1	29	1.07
	7 to 8	12.50	4.67 4.00	58.33	1.00	1	58	2.16
	8 to 9	9.75	4.00	39.00	1.00	1	39	1.44
	9 to 10	8.50	4.33 4.00	36.83	1.00	1	37	1.36
	10 to 11	6.75	1.83	12.35	1.00	1	12	0.46
	11 to 12	6.75	1.34	9.04	1.00	1	9	0.33
	12 to 13	6.75	1.33	8.98	1.00	1	9	0.33
	13 to 14	6.75	1.33	8.98	1.00	1	9	0.33
	14 to 15	6.75	1.34	9.04	1.00	1	9	0.33
	15 to 16	6.75	1.33	8.98	1.00	1	9	0.33
	16 to 17	6.75	1.33	8.98	1.00	1	9	0.33
	17 to 18	6.75	1.34	9.04	1.00	1	9	0.33
	18 to 19	6.75	1.33	8.98	1.00	1	9	0.33
TOTAL							*248*	*9.17*
TOTAL FOR 1 WALL								*136*
TOTAL FOR BOTH WALLS								*272*

5 x 5

Spillway Slab:

4' & 2' TOE DOWN

502 x (4+2) . 5 = 1506 55.8

2:1 Ramp	400.00	40.25	16099.69	0.50	1	8050	298.14
10:1 Ramp	400.00	5.02	2009.98	0.50	1	1005	37.22
6:1 Ramp	400.00	69.95	27980.71	0.50	1	13990	518.16
30:1 Ramp	400.00	30.02	12006.66	0.50	1	6003	222.35
Apron	484.00	51.00	24684.00	0.50	1	12342	457.11
5:1 Ramp	484.00	15.30	7403.78	0.50	1	3702	137.11
TOTAL						*45092*	*1670.09*

502

Overflow Weir Structure

Short Walls extend to edge SIDE WALLS	10.00	11.50	115.00	1.00	2	230	8.52
Back Wall stop at short walls	10.00	11.50	115.00	1.00	1	115	4.26
Front Wall stop at shourt walls	10.00	9.18 .5	91.83	1.00	1	92	3.40
Pipe inlet			13.64	1.00	-1	-14	-0.51
Footing	11.00	13.00	2.00	1.00	1	2	0.07
TOTAL						*425*	*15.75*

Water Quality Pump Station

Roof	10.00	12.00	120.00	1.00	1	120	4.44
Roof Hatch	8.50	3.00	25.50	-1.00	1	-26	-0.94
Short Walls extend to edge	10.00	31.50	315.00	1.00	2	630	23.33
Long Walls stop at short walls	10.00	31.50	315.00	1.00	2	630	23.33
Footing	14.00	12.00	2.00	4.75	1	10	0.35
TOTAL						*1364*	*50.52*

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Subject	FCD PCN 630-01-30	Checked	Date
Task	Concrete Quantities	Sheet 3	Of 34

Description		Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Evacuation Pump Station								
Roof		12.00	12.00	144.00	1.00	1	144	5.33
Roof Hatch		8.00	4.50	36.00	-1.00	1	-36	-1.33
Short Walls extend to edge		12.00	32.50	390.00	1.00	2	780	28.89
Long Walls stop at short walls		10.00	32.50	325.00	1.00	2	650	24.07
Footing		14.00	14.00	2.00	4.75	1	10	0.35
TOTAL							***1548***	***57.31***
Structure 100								
Roof	Circular Top	7 8.00	-	38.5 ~~50.27~~	0.67	1	25.8 ~~34~~	.95 ~~1.24~~
	Hatch 30x33"	2.75 3.25	2.50	8.13	0.67	-1	-5	-0.20
Vault	Walls	5.25	6.00	31.50	1.00	4	126	4.67
	Chamfers	-	-	0.50	5.25	4	11	0.39
	24" pipe WALL THICK	2.4 2.00	-	3.14 4.5	1.00	-2	-6 -9	-0.23 -.33
Floor		7.67	7.67	58.78	1.00	1	59	2.18
TOTAL							***217***	***8.04*** 7.66
Structure 101								
Roof	Circular Top	7 8.00	-	50.27	0.67	1	34	1.24
	Hatch 30x33	2.75 3.25	2.50	8.13	0.67	-1	-5	-0.20
Vault	Walls	5.25	6.00	31.50	1.00	4	126	4.67
	Chamfers	-	-	0.50	5.25	4	11	0.39
	24" pipe WALL THICK	2.4 2.00	-	3.14	1.00	-2	-6	-0.23
Floor		7.67	7.67	58.78	1.00	1	59	2.18
TOTAL							***217***	***8.04***
Structure 102								
Roof	Circular Top	7 8.00	-	50.27	0.67	1	34	1.24
	Hatch 30x33	2.75 3.25	2.50	8.13	0.67	-1	-5	-0.20
Vault	Walls	5.25	6.00	31.50	1.00	4	126	4.67
	Chamfers	-	-	0.50	5.25	4	11	0.39
	24" pipe WALL THICK	2.4 2.00	-	3.14	1.00	-2	-6	-0.23
Floor		7.67	7.67	58.78	1.00	1	59	2.18
TOTAL							***217***	***8.04***

File Quantities.xls | Job No. | No.

Computation

HDR

Project: Southeast Phoenix Regional Drainage Basin Project | Computed: BKV | Date: 8/6/99

Subject: FCD PCN 630-01-30 | Checked: | Date:

Task: Concrete Quantities | Sheet: 4 | of: 34

Description			Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Structure 103									
Roof	Circular Top		7 8.00	-	50.27	0.67	1	34	1.24
	Hatch	30x33	2.75 3.25	2.50	8.13	0.67	-1	-5	-0.20
Vault	Walls		5.25	6.00	31.50	1.00	4	126	4.67
	Chamfers		-	-	0.50	5.25	4	11	0.39
	24" pipe	WALL THICK	2.4 2.00	-	3.14	1.00	-2	-6	-0.23
Floor			7.67	7.67	58.78	1.00	1	59	2.18
TOTAL								***217***	***8.04***
Structure 104									
Roof	Circular Top		7 8.00	-	50.27	0.67	1	34	1.24
	Hatch	30x33	2.75 3.25	2.50	8.13	0.67	-1	-5	-0.20
Vault	Walls		5.25	6.00	31.50	1.00	4	126	4.67
	Chamfers		-	-	0.50	5.25	4	11	0.39
	24" pipe	WALL THICK	2.4 2.00	-	3.14	1.00	-3	-9	-0.35
Floor			7.67	7.67	58.78	1.00	1	59	2.18
TOTAL								***214***	***7.92***
Structure 105									
Roof	Circular Top		7 8.00	-	50.27	0.67	1	34	1.24
	Hatch	30x33	2.75 3.25	2.50	8.13	0.67	-1	-5	-0.20
Vault	Walls		5.25	6.00	31.50	1.00	4	126	4.67
	Chamfers		-	-	0.50	5.25	3	8	0.29
	Large Chamfer		-	-	? 4.50	5.25	1	24	0.88
	24" pipe	WALL THICK	2.4 2.00	-	3.14	1.00	-2	-6	-0.23
Floor			7.67	7.67	58.78	1.00	1	59	2.18
TOTAL								***238***	***8.82***
Structure 106		WHY SO MASSIVE ??							
Roof	Circular Top		10.8 ≈ 11 8.00	-	50.27	0.67 1	1	34	1.24
	Hatch	4.5' x 2.5'	4.5 3.25	2.50	8.13	0.67 1	-1	-5	-0.20
Vault	Thick Walls		8.50	12.50	106.25	2.75	2	584	21.64
	Thin Walls		8.50	6.00	51.00	2.25	2	230	8.50
	Chamfers		-	-	0.50	5.25	4	11	0.39
	42" pipe	WALL THICK	4.15 3.50	-	9.62	1.00 2.75	-2	-19	-0.71
Floor			7.67 12.5	7.67 12.5	58.78	1.00	1	59	2.18
TOTAL								***892***	***33.04***

File Quantities.xls | Job No. | No.

Computation

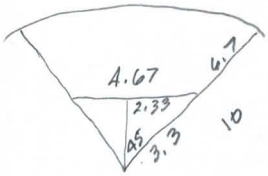
HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Subject	FCD PCN 630-01-30	Checked	Date
Task	Concrete Quantities	Sheet 5	Of 34

$A_{\bigcirc} = \frac{\pi R^2}{4} = 78.54$

$A_{\triangledown} = \frac{1}{2}(2.33)^2 = 2.71$

75.83



Description	Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Inlet Structure 1							
Wing Walls	2.65	5.50	14.58	0.50	2	15	0.54
Side Walls	4.00	5.50	22.00	0.50	2	22	0.81
Back Wall	5.67	5.50	31.17	0.50	1	16	0.58
Front Wall	5.67	1.30	7.37	0.50	1	4	0.14
Pipe	2.4 2.00	-	3.14	0.50	-2 -1	-3	-0.12
Floor		75.83	108.67	0.25	1	27	1.01
Back Turndown	4.67 5.67		1.42	0.75	1	1	0.04
Side Turndowns	6.7 8.21		2.05	0.75	2	3	0.11
Front Turndown	15.71 19.02		4.76	0.75	1	4	0.13
TOTAL						***80***	***3.24***
Inlet Structure 2							
Wing Walls	2.65	5.50	14.58	0.50	2	15	0.54
Side Walls	4.00	5.50	22.00	0.50	2	22	0.81
Back Wall	5.67	5.50	31.17	0.50	1	16	0.58
Front Wall	5.67	1.37	7.76	0.50	1	4	0.14
Pipe	2.4 2.00	-	3.14	0.50	-1	-2	-0.06
Floor		75.83	108.67	0.25	1	27	1.01
Back Turndown	4.67 5.67		1.42	0.75	1	1	0.04
Side Turndowns	6.7 8.21		2.05	0.75	2	3	0.11
Front Turndown	15.71 19.02		4.76	0.75	1	4	0.13
TOTAL						***82***	***3.31***
Inlet Structure 3							
Wing Walls	2.65	8.00	21.21	0.50	2	21	0.79
Side Walls	4.00	8.00	32.00	0.50	2	32	1.19
Back Wall	5.67	8.00	45.33	0.50	1	23	0.84
Front Wall	5.67	4.79	27.14	0.50	1	14	0.50
Pipe	2.4 2.00	-	3.14	0.50	-1	-2	-0.06
Floor			108.67	0.25	1	27	1.01
Back Turndown	5.67	0.25	1.42	0.75	1	1	0.04
Side Turndowns	8.21	0.25	2.05	0.75	2	3	0.11
Front Turndown	19.02	0.25	4.76	0.75	1	4	0.13
TOTAL						***115***	***4.55***
Inlet Structure 4							
Wing Walls	2.65	8.00	21.21	0.50	2	21	0.79
Side Walls	4.00	8.00	32.00	0.50	2	32	1.19
Back Wall	5.67	8.00	45.33	0.50	1	23	0.84
Front Wall	5.67	4.79	27.14	0.50	1	14	0.50
Pipe	2.4 2.00	-	3.14	0.50	-1	-2	-0.06
Floor			108.67	0.25	1	27	1.01
Back Turndown	5.67	0.25	1.42	0.75	1	1	0.04
Side Turndowns	8.21	0.25	2.05	0.75	2	3	0.11
Front Turndown	19.02	0.25	4.76	0.75	1	4	0.13
TOTAL						***115***	***4.55***

NO CONC APRON

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Project	FCD PCN 630-01-30	Checked	Date
Task	Concrete Quantities	Sheet 6	Of 34

Description	Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Inlet Structure 5							
		5.5					
Wing Walls	2.65	8.00	21.21	0.50	2	21	0.79
Side Walls	4.00	8.00	32.00	0.50	2	32	1.19
Back Wall	5.67	8.00	45.33	0.50	1	23	0.84
Front Wall	5.67	3.75	21.25	0.50	1	11	0.39
Pipe	2.4 2.00	- 2	3.14	0.50	-1	-2	-0.06
TOTAL						***85***	***3.15***
Inlet Structure 6							
Wing Walls	2.65	7.58	20.11	0.50	2	20	0.74
Side Walls	6.00	7.58	45.50	0.50	2	46	1.69
Back Wall	7.00	7.58	53.08	0.50	1	27	0.98
Front Wall	7.00	1.25	8.77	0.50	1	4	0.16
42' Pipe WALL THICKNESS	4.15 3.50	- 1.5	9.62	0.50	-1	-5	-0.18
TOTAL						***92***	***3.40***
Outlet Structure 1							
Wing Walls	2.65	5.50	14.58	0.50	2	15	0.54
Side Walls	4.00	5.50	22.00	0.50	2	22	0.81
Back Wall	5.67	5.50	31.17	0.50	1	16	0.58
Front Wall	5.67	1.25 2	7.08	0.50	1	4	0.13
Pipe	2.4 2.00	-	3.14	0.50	-2 -1	-3	-0.12
TOTAL						***53***	***1.95***
Outlet Structure 2							
Wing Walls	2.65	5.50	14.58	0.50	2	15	0.54
Side Walls	4.00	5.50	22.00	0.50	2	22	0.81
Back Wall	5.67	5.50	31.17	0.50	1	16	0.58
Front Wall	5.67	1.55 2	8.78	0.50	1	4	0.16
Pipe	2.4 2.00	-	3.14	0.50	-1	-2	-0.06
TOTAL						***55***	***2.04***
Outlet Structure 3							
Wing Walls	2.65	5.50	14.58	0.50	2	15	0.54
Side Walls	4.00	5.50	22.00	0.50	2	22	0.81
Back Wall	5.67	5.50	31.17	0.50	1	16	0.58
Front Wall	5.67	3.59 2	20.34	0.50	1	10	0.38
Pipe	1.3 1.00	-	0.79	0.50	-1	0	-0.01
TOTAL						***62***	***2.29***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Subject	FCD PCN 630-01-30	Checked	Date
Task	Concrete Quantities	Sheet 7	Of 34

Description	Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Outlet Structure 4							
Wing Walls	2.65	5.50	14.58	0.50	2	15	0.54
Side Walls	4.00	5.50	22.00	0.50	2	22	0.81
Back Wall	5.67	5.50	31.17	0.50	1	16	0.58
Front Wall	5.67	3.59 2	20.34	0.50	1	10	0.38
Pipe	1.3 1.00	-	0.79	0.50	-1	0	-0.01
TOTAL						***62***	***2.29***
Outlet Structure 5							
Wing Walls	2.65	6.00	15.91	0.50	2	16	0.59
Side Walls	4.00	6.00	24.00	0.50	2	24	0.89
Back Wall	5.67	6.00	34.00	0.50	1	17	0.63
Front Wall	5.67	1.00 2	5.67	0.50	1	3	0.10
Pipe	2.4 2.00	-	3.14	0.50	-1	-2	-0.06
TOTAL						***58***	***2.15***
Outlet Apron for Inlet Structures 5 and 6							
Floor	?		308.00	0.25 .365	1	77	2.85
Back Turndown	22.58 6.19	0.25	1.55	0.75	1	1	0.04
Side Turndowns	24.15 & 21.01 21.01	0.25 .33	5.25	0.75 .67	2	8	0.29
Front Turndown	5.00	0.25	1.25	0.75	1	1	0.03
TOTAL						***77***	***3.22***
Inlet for Temporary Ditch inlet & OUTLET headwalls?							
Floor			? 767.71	0.25 .33	1	192	7.11
Back Turndown	20 30.00	0.25	7.50	0.75	1	6	0.21
Side Turndowns	36 20.00	0.25 .33	5.00	0.75 .67	2	8	0.28
Front Turndown	20 30.00	0.25	7.50	0.75	1	6	0.21
TOTAL						***192***	***7.80***
Transition for Low Flow Channel							
Floor			1741.00	0.25	1	435	16.12
Back Turndown	40.00	0.25	10.00	0.75	1	8	0.28
Side Turndowns	76.00	0.25	19.00	0.75	2	29	1.06
Front Turndown	4.00	0.25	1.00	0.75	1	1	0.03
TOTAL						***435***	***17.48***
Low Flow Channel							
Floor			6356 6160.00	0.25 .33	1	1540	57.04
Back Turndown	4.00	0.25	1.00	0.75	1	1	0.03
Side Turndowns	1589 1540.00	0.25 .33	385.00	0.75 .67	2	578	21.39
Front Turndown	4.00	0.25	1.00	0.75	1	1	0.03
TOTAL						***1540***	***78.48***
Access Ramp							
Floor			4936.00	0.25	1	1234	45.70
TOTAL						***1234***	***45.70***

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Subject	FCD PCN 630-01-30	Checked	Date
Task	Miscellaneous Quantities	Sheet 8	of 34

Spillway:

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	423.08						
Across Top	400.00						

Weir Structure Weir:

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate	10.00	0.67	6.67	15.30	1	102	0.102
Top Plate	10.00	0.67	6.67	15.30	1	102	0.102
Rack Plates	2.25	0.50	1.13	10.20	29	333	0.333
							0.537
W 6x9	10.00			9.00			0.090
Grating	10.25	8.75	89.69				

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	40.00						

Inlet Structure 1

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate L 3x3x1/4"	4.50			4.90	1	22	0.022
Top Plate	4.50	1.17	5.25	10.20	1	54	0.054
Rack Plates	5.60	0.17	0.93	20.40	29	553	0.553
							0.628

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	18.97						

Inlet Structure 2

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate L 3x3x1/4"	4.50			4.90	1	22	0.022
Top Plate	4.50	1.17	5.25	10.20	1	54	0.054
Rack Plates	5.60	0.17	0.93	20.40	29	553	0.553
							0.628

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	18.97						

Inlet Structure 3

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate L 3x3x1/4"	4.50			4.90	1	22	0.022
Top Plate	4.50	1.17	5.25	10.20	1	54	0.054
Rack Plates	5.00	0.17	0.83	20.40	29	493	0.493
							0.569

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	18.97						

Inlet Structure 4

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate L 3x3x1/4"	4.50			4.90	1	22	0.022
Top Plate	4.50	1.17	5.25	10.20	1	54	0.054
Rack Plates	5.00	0.17	0.83	20.40	29	493	0.493
							0.569

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	18.97						

Inlet Structure 5

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate L 3x3x1/4"	4.50			4.90	1	22	0.022
Top Plate	4.50	1.17	5.25	10.20	1	54	0.054
Rack Plates	5.60	0.17	0.93	20.40	29	553	0.553
							0.628

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	18.97						

Inlet Structure 6

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate L 3x3x1/4"	5.83			4.90	1	29	0.029
Top Plate	5.83	1.17	6.81	10.20	1	69	0.069
Rack Plates	8.43	0.17	1.40	20.40	29	831	0.831
							0.929

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	24.30						

Outlet Structure 1

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate L 3x3x1/4"	4.50			4.90	1	22	0.022
Top Plate	4.50	1.17	5.25	10.20	1	54	0.054
Rack Plates	5.60	0.17	0.93	20.40	29	553	0.553
							0.628

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	18.97						

Outlet Structure 2

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate L 3x3x1/4"	4.50			4.90	1	22	0.022
Top Plate	4.50	1.17	5.25	10.20	1	54	0.054
Rack Plates	5.60	0.17	0.93	20.40	29	553	0.553
							0.628

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	18.97						

Outlet Structure 3

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate L 3x3x1/4"	4.50			4.90	1	22	0.022
Top Plate	4.50	1.17	5.25	10.20	1	54	0.054
Rack Plates	4.33	0.17	0.72	20.40	29	427	0.427
							0.503

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	18.97						

Outlet Structure 4

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate L 3x3x1/4"	4.50			4.90	1	22	0.022
Top Plate	4.50	1.17	5.25	10.20	1	54	0.054
Rack Plates	4.33	0.17	0.72	20.40	29	427	0.427
							0.503

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	18.97						

Outlet Structure 5

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Base Plate L 3x3x1/4"	4.50			4.90	1	22	0.022
Top Plate	4.50	1.17	5.25	10.20	1	54	0.054
Rack Plates	5.60	0.17	0.93	20.40	29	553	0.553
							0.628

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Weight (lbs)	Weight (kips)
Handrail Top of Walls	18.97						

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Sub	FCD PCN 630-01-30	Checked	Date
Task	Reinforcement Quantities	Sheet 11	of 34

Description			Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Spillway Retaining Walls										
Wall 1	Footing	Key Vertical Hooks	5	1.043	9	3.83	35	0.036	10	0.360
		Key Cont. Bars	5	1.043	2	8.00	16	0.017	10	0.167
		Bottom Transverse	5	1.043	9	5.42	49	0.051	10	0.508
		Bottom Long.	4	0.668	6	8.00	48	0.032	10	0.321
		Top Transverse	5	1.043	9	5.42	49	0.051	10	0.508
		Bottom Long.	4	0.668	9	8.00	72	0.048	10	0.481
	Panel 1	Dowels	5	1.043	9	5.58	50	0.052	2	0.105
		Vertical	5	1.043	9	6.80	61	0.064	2	0.128
		Horizontal	4	0.668	10	8.00	80	0.053	2	0.107
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 11	Dowels	5	1.043	9	5.58	50	0.052	2	0.105
		Vertical	5	1.043	9	7.51	68	0.070	2	0.141
		Horizontal	4	0.668	11	8.00	88	0.059	2	0.118
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 12	Dowels	5	1.043	9	5.58	50	0.052	2	0.105
		Vertical	5	1.043	9	7.46	67	0.070	2	0.140
		Horizontal	4	0.668	10	8.00	80	0.053	2	0.107
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 13	Dowels	5	1.043	9	5.58	50	0.052	2	0.105
		Vertical	5	1.043	9	7.40	67	0.069	2	0.139
		Horizontal	4	0.668	10	8.00	80	0.053	2	0.107
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 14	Dowels	5	1.043	9	5.58	50	0.052	2	0.105
		Vertical	5	1.043	9	7.34	66	0.069	2	0.138
		Horizontal	4	0.668	10	8.00	80	0.053	2	0.107
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 15	Dowels	5	1.043	9	5.58	50	0.052	2	0.105
		Vertical	5	1.043	9	7.29	66	0.068	2	0.137
		Horizontal	4	0.668	10	8.00	80	0.053	2	0.107
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 16	Dowels	5	1.043	9	5.58	50	0.052	2	0.105
		Vertical	5	1.043	9	7.22	65	0.068	2	0.136
		Horizontal	4	0.668	10	8.00	80	0.053	2	0.107
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 17	Dowels	5	1.043	9	5.58	50	0.052	2	0.105
		Vertical	5	1.043	9	7.16	64	0.067	2	0.134
		Horizontal	4	0.668	10	8.00	80	0.053	2	0.107
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 18	Dowels	5	1.043	9	5.58	50	0.052	2	0.105
		Vertical	5	1.043	9	7.11	64	0.067	2	0.133
		Horizontal	4	0.668	10	8.00	80	0.053	2	0.107
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 19	Dowels	5	1.043	9	5.58	50	0.052	2	0.105
		Vertical	5	1.043	9	7.05	63	0.066	2	0.132
		Horizontal	4	0.668	10	8.00	80	0.053	2	0.107
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
Total										***5.961***

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Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Sub	FCD PCN 630-01-30	Checked	Date
Task	Reinforcement Quantities	Sheet 12	Of 34

Description			Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Wall 2	Footing	Key Vertical Hooks	5	1.043	9	3.83	35	0.036	2	0.072
		Key Cont. Bars	5	1.043	2	8.00	16	0.017	2	0.033
		Bottom Transverse	5	1.043	9	6.42	58	0.060	2	0.120
		Bottom Long.	4	0.668	6	8.00	48	0.032	2	0.064
		Top Transverse	5	1.043	9	6.42	58	0.060	2	0.120
		Bottom Long.	4	0.668	9	8.00	72	0.048	2	0.096
	Panel 2	Dowels	7	2.044	9	5.58	50	0.103	2	0.205
		Vertical	5	1.043	9	8.71	78	0.082	2	0.164
		Horizontal	4	0.668	12	8.00	96	0.064	2	0.128
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 10	Dowels	7	2.044	9	5.58	50	0.103	2	0.205
		Vertical	5	1.043	9	10.68	96	0.100	2	0.201
		Horizontal	4	0.668	15	8.00	120	0.080	2	0.160
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
Total										***1.596***
Wall 3	Footing	Key Vertical Hooks	5	1.043	9	3.83	35	0.036	2	0.072
		Key Cont. Bars	5	1.043	2	8.00	16	0.017	2	0.033
		Bottom Transverse	5	1.043	9	8.17	74	0.077	2	0.153
		Bottom Long.	4	0.668	6	8.00	48	0.032	2	0.064
		Top Transverse	7	2.044	9	8.17	74	0.150	2	0.300
		Bottom Long.	4	0.668	9	8.00	72	0.048	2	0.096
	Panel 3	Dowels	8	2.670	9	5.58	50	0.134	2	0.268
		Vertical	5	1.043	9	10.68	96	0.100	2	0.201
		Horizontal	4	0.668	15	8.00	120	0.080	2	0.160
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 9	Dowels	8	2.670	9	5.58	50	0.134	2	0.268
		Vertical	5	1.043	9	11.12	100	0.104	2	0.209
		Horizontal	4	0.668	15	8.00	120	0.080	2	0.160
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Footing	Key Vertical Hooks	5	1.043	9	3.83	35	0.036	1	0.036
		Key Cont. Bars	5	1.043	2	6.00	12	0.013	1	0.013
		Bottom Transverse	5	1.043	9	8.17	74	0.077	1	0.077
		Bottom Long.	4	0.668	6	6.00	36	0.024	1	0.024
		Top Transverse	7	2.044	9	8.17	74	0.150	1	0.150
		Bottom Long.	4	0.668	9	6.00	54	0.036	1	0.036
	Panel 4	Dowels	8	2.670	9	5.58	50	0.134	2	0.268
		Vertical	5	1.043	9	12.37	111	0.116	2	0.232
		Horizontal	4	0.668	17	6.00	102	0.068	2	0.136
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
Total										***2.998***

File Quantities.xls | Job No. | No.

Computation

HDR

Project: Southeast Phoenix Regional Drainage Basin Project | Computed: BKV | Date: 8/6/99

Sub: FCD PCN 630-01-30 | Checked: | Date:

Task: Reinforcement Quantities | Sheet: 13 | Of: 34

Description			Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Wall 4	Footing	Key Vertical Hooks	5	1.043	9	3.83	35	0.036	2	0.072
		Key Cont. Bars	5	1.043	2	6.39	13	0.013	2	0.027
		Bottom Transverse	6	1.502	9	9.42	85	0.127	2	0.255
		Bottom Long.	5	1.043	6	6.39	38	0.040	2	0.080
		Top Transverse	8	2.670	9	9.42	85	0.226	2	0.453
		Bottom Long.	5	1.043	9	8.00	72	0.075	2	0.150
	Panel 5	Dowels	7	2.044	17	5.58	95	0.194	2	0.388
		Vertical	7	2.044	9	13.87	125	0.255	2	0.510
		Horizontal	4	0.668	19	6.39	121	0.081	2	0.162
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Footing	Key Vertical Hooks	5	1.043	9	3.83	35	0.036	1	0.036
		Key Cont. Bars	5	1.043	2	8.00	16	0.017	1	0.017
		Bottom Transverse	6	1.502	9	9.42	85	0.127	1	0.127
		Bottom Long.	5	1.043	6	8.00	48	0.050	1	0.050
		Top Transverse	8	2.670	9	9.42	85	0.226	1	0.226
		Bottom Long.	5	1.043	9	8.00	72	0.075	1	0.075
	Panel 8	Dowels	7	2.044	17	5.58	95	0.194	2	0.388
		Vertical	7	2.044	9	13.18	119	0.243	2	0.485
		Horizontal	4	0.668	18	8.00	144	0.096	2	0.192
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
Total										***3.719***
Wall 5	Footing	Key Vertical Hooks	5	1.043	9	3.83	35	0.036	2	0.072
		Key Cont. Bars	5	1.043	2	8.00	16	0.017	2	0.033
		Bottom Transverse	6	1.502	9	8.17	74	0.110	2	0.221
		Bottom Long.	6	1.502	6	8.00	48	0.072	2	0.144
		Top Transverse	9	3.400	9	8.17	74	0.250	2	0.500
		Bottom Long.	6	1.502	9	8.00	72	0.108	2	0.216
	Panel 6	Dowels	8	2.670	17	5.58	95	0.253	2	0.507
		Vertical	7	2.044	9	-0.17	-2	-0.003	2	-0.006
		Horizontal	4	0.668	0	8.00	0	0.000	2	0.000
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
	Panel 7	Dowels	8	2.670	17	5.58	95	0.253	2	0.507
		Vertical	7	2.044	9	-0.17	-2	-0.003	2	-0.006
		Horizontal	4	0.668	0	8.00	0	0.000	2	0.000
		Cap	4	0.668	9	2.17	20	0.013	1	0.013
Total										***2.214***

File	Quantities.xls	Job No.		No.	

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed	BKV	Date	8/6/99
Sub	FCD PCN 630-01-30	Checked		Date	
Task	Reinforcement Quantities	Sheet	14	Of	34

Description			Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Steps	6 to 7	"Z" Bars	5	1.043	17	3.57	61	0.063	2	0.127
		Cont. Bars	5	1.043	4	12.17	49	0.051	2	0.102
	7 to 8	"Z" Bars	5	1.043	17	5.25	89	0.093	2	0.186
		Cont. Bars	5	1.043	6	12.17	73	0.076	2	0.152
	8 to 9	"Z" Bars	5	1.043	17	5.25	89	0.093	2	0.186
		Cont. Bars	5	1.043	6	9.42	57	0.059	2	0.118
	9 to 10	"Z" Bars	5	1.043	17	5.25	89	0.093	2	0.186
		Cont. Bars	5	1.043	6	8.17	49	0.051	2	0.102
	10 to 11	"Z" Bars	5	1.043	17	3.08	52	0.055	2	0.109
		Cont. Bars	5	1.043	4	6.42	26	0.027	2	0.054
	11 to 12	"Z" Bars	5	1.043	17	2.59	44	0.046	2	0.092
		Cont. Bars	5	1.043	3	5.42	16	0.017	2	0.034
	12 to 13	"Z" Bars	5	1.043	17	2.58	44	0.046	2	0.091
		Cont. Bars	5	1.043	3	5.42	16	0.017	2	0.034
	13 to 14	"Z" Bars	5	1.043	17	2.58	44	0.046	2	0.091
		Cont. Bars	5	1.043	3	5.42	16	0.017	2	0.034
	14 to 15	"Z" Bars	5	1.043	17	2.59	44	0.046	2	0.092
		Cont. Bars	5	1.043	3	5.42	16	0.017	2	0.034
	15 to 16	"Z" Bars	5	1.043	17	2.58	44	0.046	2	0.091
		Cont. Bars	5	1.043	3	5.42	16	0.017	2	0.034
	16 to 17	"Z" Bars	5	1.043	17	2.58	44	0.046	2	0.091
		Cont. Bars	5	1.043	3	5.42	16	0.017	2	0.034
	17 to 18	"Z" Bars	5	1.043	17	2.59	44	0.046	2	0.092
		Cont. Bars	5	1.043	3	5.42	16	0.017	2	0.034
	18 to 19	"Z" Bars	5	1.043	17	2.58	44	0.046	2	0.091
		Cont. Bars	5	1.043	3	5.42	16	0.017	2	0.034
Total										***2.326***
TOTAL FOR 1 WALL										***18.814***
TOTAL FOR BOTH WALLS										***37.628***

Description	Length (ft)	Width (ft)	Area (ft²)	Weight (lbs/ft²)	# of Locations	Total Wt. (kips)
Spillway Slab						
2:1 Ramp	400.00	40.25	#######	1.50	1	24.09
10:1 Ramp	400.00	5.02	2009.98	1.50	1	3.01
6:1 Ramp	400.00	69.95	#######	1.50	1	41.86
30:1 Ramp	400.00	30.02	#######	1.50	1	17.96
Apron	484.00	51.00	#######	1.50	1	36.93
5:1 Ramp	484.00	15.30	7403.78	1.50	1	11.08
TOTAL						***134.92***

File Quantities.xls | Job No. | No.

Computation

HDR

Project: Southeast Phoenix Regional Drainage Basin Project | Computed: BKV | Date: 8/6/99

Sub: FCD PCN 630-01-30 | Checked: | Date:

Task: Reinforcement Quantities | Sheet: 15 | of: 34

Description			Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Overflow Weir Structure										
End Walls		Horizontal	6	1.502	13	9.67	126	0.189	4	0.755
		Vertical	6	1.502	11	12.58	138	0.208	4	0.832
		Cap	4	0.668	11	1.67	18	0.012	1	0.012
Total										1.599
Back Wall		Horizontal	6	1.502	13	11.67	152	0.228	2	0.456
		Vertical	6	1.502	13	12.58	164	0.246	2	0.491
		Cap	4	0.668	13	1.67	22	0.014	1	0.014
Total										0.961
Front Wall		Horizontal	6	1.502	12	9.67	116	0.174	2	0.348
		Vertical	6	1.502	13	10.92	142	0.213	2	0.426
		Cap	4	0.668	13	1.67	22	0.014	1	0.014
Total										0.789
Floor	Long Steel		6	1.502	11	12.50	138	0.207	2	0.413
	Short Steel		6	1.502	13	10.50	137	0.205	2	0.410
Total										0.823
TOTAL										***4.173***
Water Quality Pump Station										
Roof	Top Long Bars		9	3.400	6	11.67	70	0.238	1	0.238
			9	3.400	5	11.67	58	0.198	1	0.198
	Bottom Long Bars		9	3.400	6	14.00	84	0.286	1	0.286
			9	3.400	5	14.00	70	0.238	1	0.238
	Top Long Cutoff Bars		9	3.400	7	2.08	15	0.050	2	0.099
	Bottom Long Cutoff Bats		9	3.400	7	2.58	18	0.061	2	0.123
	Top Short Bars		9	3.400	4	9.67	39	0.131	2	0.263
	Bottom Short Bars		9	3.400	4	12.00	48	0.163	2	0.326
	Top Short Cutoff Bars		9	3.400	17	3.42	58	0.197	1	0.197
			9	3.400	17	3.08	52	0.178	1	0.178
	Bottom Short Cutoff Bats		9	3.400	17	3.92	67	0.226	1	0.226
			9	3.400	17	3.58	61	0.207	1	0.207
	Cont. Edge Bars, Long Side		4	0.668	2	12.67	25	0.017	2	0.034
	Cont. Edge Bars, Short Side		4	0.668	2	10.67	21	0.014	2	0.029
	Corner Crack Bars		4	0.668	4	4.00	16	0.011	4	0.043
										2.686
Walls	Long Horizontal		9	3.400	63	14.00	882	2.999	4	11.995
	Short Horizontal		9	3.400	63	12.00	756	2.570	4	10.282
	Vertical		4	0.668	124	34.08	4226	2.823	1	2.823
										25.100
Floor	Long Steel		6	1.502	29	14.50	421	0.632	2	1.263
	Short Steel		6	1.502	25	12.50	313	0.469	2	0.939
										2.202
TOTAL										***29.988***

File	Quantities.xls	Job No.		No.	

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed	BKV	Date	8/6/99
Sub	FCD PCN 630-01-30	Checked		Date	
Task	Reinforcement Quantities	Sheet	16	Of	34

Description		Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Evacuation Pump Station									
Roof	Top Long Bars	9	3.400	4	11.67	47	0.159	1	0.159
		9	3.400	4	11.67	47	0.159	1	0.159
	Bottom Long Bars	9	3.400	4	14.00	56	0.190	1	0.190
		9	3.400	4	14.00	56	0.190	1	0.190
	Top Long Cutoff Bars	9	3.400	0	2.08	0	0.000	2	0.000
	Bottom Long Cutoff Bats	9	3.400	0	2.58	0	0.000	2	0.000
	Top Short Bars	9	3.400	0	9.67	0	0.000	2	0.000
	Bottom Short Bars	9	3.400	0	12.00	0	0.000	2	0.000
	Top Short Cutoff Bars	9	3.400	17	4.08	69	0.236	1	0.236
		9	3.400	17	4.08	69	0.236	1	0.236
	Bottom Short Cutoff Bats	9	3.400	17	4.58	78	0.265	1	0.265
		9	3.400	17	4.58	78	0.265	1	0.265
	Cont. Edge Bars, Long Side	4	0.668	2	12.67	25	0.017	2	0.034
	Cont. Edge Bars, Short Side	4	0.668	2	12.67	25	0.017	2	0.034
	Corner Crack Bars	4	0.668	4	4.00	16	0.011	4	0.043
									1.810
Walls	Long Horizontal	9	3.400	65	14.00	910	3.094	4	12.376
	Short Horizontal	9	3.400	65	14.00	910	3.094	4	12.376
	Vertical	4	0.668	124	35.08	4350	2.906	1	2.906
									27.658
Floor	Long Steel	6	1.502	29	14.50	421	0.632	2	1.263
	Short Steel	6	1.502	29	14.50	421	0.632	2	1.263
									2.526
TOTAL									***31.995***
Structure 100									
Roof	Top Bars	6	1.502	13	6.67	87	0.130	2	0.260
	Bottom Bars	8	2.670	13	6.67	87	0.231	2	0.463
	Opening Bars	6	1.502	8	6.67	53	0.080	1	0.080
	Corner Crack Bars	4	0.668	8	3.58	29	0.019	1	0.019
Walls	Horizontal	5	1.043	9	8.67	78	0.081	8	0.651
	Vertical	5	1.043	11	5.67	62	0.065	8	0.520
	Diagonal	4	0.668	9	5.00	45	0.030	8	0.240
Footing		5	1.043	12	7.17	86	0.090	4	0.359
Holes	Diagonal	5	1.043	16	6.00	96	0.100	2	0.200
	Vertical	5	1.043	8	5.67	45	0.047	2	0.095
	Horizontal	5	1.043	8	8.67	69	0.072	2	0.145
TOTAL									***3.032***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Sub	FCD PCN 630-01-30	Checked	Date
Task	Reinforcement Quantities	Sheet 17	Of 34

Description		Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Structure 101									
Roof	Top Bars	6	1.502	13	6.67	87	0.130	2	0.260
	Bottom Bars	8	2.670	13	6.67	87	0.231	2	0.463
	Opening Bars	6	1.502	8	6.67	53	0.080	1	0.080
	Corner Crack Bars	4	0.668	8	3.58	29	0.019	1	0.019
Walls	Horizontal	5	1.043	9	8.67	78	0.081	8	0.651
	Vertical	5	1.043	11	5.67	62	0.065	8	0.520
	Diagonal	4	0.668	9	5.00	45	0.030	4	0.120
Footing		5	1.043	12	7.17	86	0.090	4	0.359
Holes	Diagonal	5	1.043	16	6.00	96	0.100	2	0.200
	Vertical	5	1.043	8	5.67	45	0.047	2	0.095
	Horizontal	5	1.043	8	8.67	69	0.072	2	0.145
TOTAL									***2.912***
Structure 102									
Roof	Top Bars	6	1.502	13	6.67	87	0.130	2	0.260
	Bottom Bars	8	2.670	13	6.67	87	0.231	2	0.463
	Opening Bars	6	1.502	8	6.67	53	0.080	1	0.080
	Corner Crack Bars	4	0.668	8	3.58	29	0.019	1	0.019
Walls	Horizontal	5	1.043	9	8.67	78	0.081	8	0.651
	Vertical	5	1.043	11	5.67	62	0.065	8	0.520
	Diagonal	4	0.668	9	5.00	45	0.030	4	0.120
Footing		5	1.043	12	7.17	86	0.090	4	0.359
Holes	Diagonal	5	1.043	16	6.00	96	0.100	2	0.200
	Vertical	5	1.043	8	5.67	45	0.047	2	0.095
	Horizontal	5	1.043	8	8.67	69	0.072	2	0.145
TOTAL									***2.912***
Structure 103									
Roof	Top Bars	6	1.502	13	6.67	87	0.130	2	0.260
	Bottom Bars	8	2.670	13	6.67	87	0.231	2	0.463
	Opening Bars	6	1.502	8	6.67	53	0.080	1	0.080
	Corner Crack Bars	4	0.668	8	3.58	29	0.019	1	0.019
Walls	Horizontal	5	1.043	9	8.67	78	0.081	8	0.651
	Vertical	5	1.043	11	5.67	62	0.065	8	0.520
	Diagonal	4	0.668	9	5.00	45	0.030	4	0.120
Footing		5	1.043	12	7.17	86	0.090	4	0.359
Holes	Diagonal	5	1.043	16	6.00	96	0.100	2	0.200
	Vertical	5	1.043	8	5.67	45	0.047	2	0.095
	Horizontal	5	1.043	8	8.67	69	0.072	2	0.145
TOTAL									***2.912***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Sub	FCD PCN 630-01-30	Checked	Date
Task	Reinforcement Quantities	Sheet 18	Of 34

Description		Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Structure 104									
Roof	Top Bars	6	1.502	13	6.67	87	0.130	2	0.260
	Bottom Bars	8	2.670	13	6.67	87	0.231	2	0.463
	Opening Bars	6	1.502	8	6.67	53	0.080	1	0.080
	Corner Crack Bars	4	0.668	8	3.58	29	0.019	1	0.019
Walls	Horizontal	5	1.043	9	8.67	78	0.081	8	0.651
	Vertical	5	1.043	11	5.67	62	0.065	8	0.520
	Diagonal	4	0.668	9	5.00	45	0.030	4	0.120
Footing		5	1.043	12	7.17	86	0.090	4	0.359
Holes	Diagonal	5	1.043	16	6.00	96	0.100	3	0.300
	Vertical	5	1.043	8	5.67	45	0.047	3	0.142
	Horizontal	5	1.043	8	8.67	69	0.072	3	0.217
TOTAL									***3.132***
Structure 105									
Roof	Top Bars	6	1.502	13	6.67	87	0.130	2	0.260
	Bottom Bars	8	2.670	13	6.67	87	0.231	2	0.463
	Opening Bars	6	1.502	8	6.67	53	0.080	1	0.080
	Corner Crack Bars	4	0.668	8	3.58	29	0.019	1	0.019
Walls	Horizontal	5	1.043	9	8.67	78	0.081	8	0.651
	Vertical	5	1.043	11	5.67	62	0.065	8	0.520
	Diagonal, short	4	0.668	9	5.00	45	0.030	4	0.120
	Diagonal, long	4	0.668	9	7.00	63	0.042	4	0.168
Footing		5	1.043	12	7.17	86	0.090	4	0.359
Holes	Diagonal	5	1.043	16	6.00	96	0.100	2	0.200
	Vertical	5	1.043	8	5.67	45	0.047	2	0.095
	Horizontal	5	1.043	8	8.67	69	0.072	2	0.145
TOTAL									***3.080***
Structure 106									
Roof	Top Bars	8	2.670	19	9.67	184	0.490	2	0.981
	Bottom Bars	8	2.670	19	9.67	184	0.490	2	0.981
	Opening Bars	8	2.670	8	7.00	56	0.150	2	0.299
	Corner Crack Bars	6	1.502	8	5.50	44	0.066	2	0.132
Walls	Horizontal	5	1.043	14	14.17	198	0.207	8	1.655
	Vertical	5	1.043	18	9.08	164	0.171	8	1.364
	Diagonal	4	0.668	14	10.00	140	0.094	4	0.374
Footing		5	1.043	20	7.17	143	0.149	4	0.598
Holes	Diagonal	5	1.043	16	8.00	128	0.134	2	0.267
	Vertical	5	1.043	8	9.08	73	0.076	2	0.152
	Horizontal	5	1.043	8	14.17	113	0.118	2	0.236
TOTAL									***7.039***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Sub	FCD PCN 630-01-30	Checked	Date
Task	Reinforcement Quantities	Sheet 19	Of 34

Description		Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Inlet Structure 1									
Wings	Horizontal	4	0.668	6	2.50	15	0.010	2	0.020
	Vertical	4	0.668	3	5.08	15	0.010	2	0.020
Sides	Horizontal	4	0.668	6	5.67	34	0.023	2	0.045
	Vertical	4	0.668	5	5.08	25	0.017	2	0.034
Back	Horizontal	4	0.668	6	5.33	32	0.021	1	0.021
	Vertical	4	0.668	5	5.08	25	0.017	1	0.017
Front	Horizontal	4	0.668	2	5.33	11	0.007	1	0.007
	Vertical	4	0.668	5	0.97	5	0.003	1	0.003
Corners		4	0.668	6	4.00	24	0.016	4	0.064
Apron		4x4 W1.4xW1.4	0.310			150		1	0.046
Holes	Diagonal	4	0.668	4	6.00	24	0.016	2	0.032
	Vertical	4	0.668	8	5.08	41	0.027	2	0.054
	Horizontal	4	0.668	4	5.33	21	0.014	2	0.029
TOTAL									***0.394***
Inlet Structure 2									
Wings	Horizontal	4	0.668	6	2.50	15	0.010	2	0.020
	Vertical	4	0.668	3	5.08	15	0.010	2	0.020
Sides	Horizontal	4	0.668	6	5.67	34	0.023	2	0.045
	Vertical	4	0.668	5	5.08	25	0.017	2	0.034
Back	Horizontal	4	0.668	6	5.33	32	0.021	1	0.021
	Vertical	4	0.668	5	5.08	25	0.017	1	0.017
Front	Horizontal	4	0.668	2	5.33	11	0.007	1	0.007
	Vertical	4	0.668	5	1.04	5	0.003	1	0.003
Corners		4	0.668	6	4.00	24	0.016	4	0.064
Apron		4x4 W1.4xW1.4	0.310			150		1	0.046
Holes	Diagonal	4	0.668	4	6.00	24	0.016	2	0.032
	Vertical	4	0.668	8	5.08	41	0.027	2	0.054
	Horizontal	4	0.668	4	5.33	21	0.014	2	0.029
TOTAL									***0.394***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Sub	FCD PCN 630-01-30	Checked	Date
Task	Reinforcement Quantities	Sheet 20	Of 34

Description		Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Inlet Structure 3									
Wings	Horizontal	4	0.668	8	2.50	20	0.013	2	0.027
	Vertical	4	0.668	3	7.67	23	0.015	2	0.031
Sides	Horizontal	4	0.668	8	5.67	45	0.030	2	0.061
	Vertical	4	0.668	5	7.67	38	0.026	2	0.051
Back	Horizontal	4	0.668	8	5.33	43	0.029	1	0.029
	Vertical	4	0.668	5	7.67	38	0.026	1	0.026
Front	Horizontal	4	0.668	5	5.33	27	0.018	1	0.018
	Vertical	4	0.668	5	4.46	22	0.015	1	0.015
Corners		4	0.668	8	4.00	32	0.021	4	0.086
Apron		4x4 W1.4xW1.4	0.310			150		1	0.046
Holes	Diagonal	4	0.668	4	6.00	24	0.016	2	0.032
	Vertical	4	0.668	8	7.67	61	0.041	2	0.082
	Horizontal	4	0.668	4	5.33	21	0.014	2	0.029
TOTAL									***0.530***
Inlet Structure 4									
Wings	Horizontal	4	0.668	8	2.50	20	0.013	2	0.027
	Vertical	4	0.668	3	7.67	23	0.015	2	0.031
Sides	Horizontal	4	0.668	8	5.67	45	0.030	2	0.061
	Vertical	4	0.668	5	7.67	38	0.026	2	0.051
Back	Horizontal	4	0.668	8	5.33	43	0.029	1	0.029
	Vertical	4	0.668	5	7.67	38	0.026	1	0.026
Front	Horizontal	4	0.668	5	5.33	27	0.018	1	0.018
	Vertical	4	0.668	5	4.46	22	0.015	1	0.015
Apron		4x4 W1.4xW1.4	0.310			150		1	0.046
Corners		4	0.668	8	4.00	32	0.021	4	0.086
Holes	Diagonal	4	0.668	4	6.00	24	0.016	2	0.032
	Vertical	4	0.668	8	7.67	61	0.041	2	0.082
	Horizontal	4	0.668	4	5.33	21	0.014	2	0.029
TOTAL									***0.530***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed	BKV	Date	8/6/99
Sub	FCD PCN 630-01-30	Checked		Date	
Task	Reinforcement Quantities	Sheet	21	Of	34

Description		Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Inlet Structure 5									
Wings	Horizontal	4	0.668	8	2.50	20	0.013	2	0.027
	Vertical	4	0.668	3	7.67	23	0.015	2	0.031
Sides	Horizontal	4	0.668	8	5.67	45	0.030	2	0.061
	Vertical	4	0.668	5	7.67	38	0.026	2	0.051
Back	Horizontal	4	0.668	8	5.33	43	0.029	1	0.029
	Vertical	4	0.668	5	7.67	38	0.026	1	0.026
Front	Horizontal	4	0.668	4	5.33	21	0.014	1	0.014
	Vertical	4	0.668	5	3.42	17	0.011	1	0.011
Corners		4	0.668	8	4.00	32	0.021	4	0.086
Holes	Diagonal	4	0.668	4	6.00	24	0.016	2	0.032
	Vertical	4	0.668	8	7.67	61	0.041	2	0.082
	Horizontal	4	0.668	4	5.33	21	0.014	2	0.029
TOTAL									***0.477***
Inlet Structure 6									
Wings	Horizontal	4	0.668	8	2.50	20	0.013	2	0.027
	Vertical	4	0.668	3	7.25	22	0.015	2	0.029
Sides	Horizontal	4	0.668	8	7.67	61	0.041	2	0.082
	Vertical	4	0.668	5	7.25	36	0.024	2	0.048
Back	Horizontal	4	0.668	8	6.67	53	0.036	1	0.036
	Vertical	4	0.668	5	7.25	36	0.024	1	0.024
Front	Horizontal	4	0.668	2	6.67	13	0.009	1	0.009
	Vertical	4	0.668	5	0.92	5	0.003	1	0.003
Corners		4	0.668	8	4.00	32	0.021	4	0.086
	Horizontal	4	0.668	4	6.67	27	0.018	2	0.036
TOTAL									***0.379***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Sub	FCD PCN 630-01-30	Checked	Date
Task	Reinforcement Quantities	Sheet 22	Of 34

Description		Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Outlet Structure 1									
Wings	Horizontal	4	0.668	6	2.50	15	0.010	2	0.020
	Vertical	4	0.668	3	5.08	15	0.010	2	0.020
Sides	Horizontal	4	0.668	6	5.67	34	0.023	2	0.045
	Vertical	4	0.668	5	5.08	25	0.017	2	0.034
Back	Horizontal	4	0.668	6	5.33	32	0.021	1	0.021
	Vertical	4	0.668	5	5.08	25	0.017	1	0.017
Front	Horizontal	4	0.668	2	5.33	11	0.007	1	0.007
	Vertical	4	0.668	5	0.92	5	0.003	1	0.003
Corners		4	0.668	6	4.00	24	0.016	4	0.064
Holes	Diagonal	4	0.668	4	6.00	24	0.016	2	0.032
	Vertical	4	0.668	8	5.08	41	0.027	2	0.054
	Horizontal	4	0.668	4	5.33	21	0.014	2	0.029
TOTAL									***0.347***
Outlet Structure 2									
Wings	Horizontal	4	0.668	6	2.50	15	0.010	2	0.020
	Vertical	4	0.668	3	5.08	15	0.010	2	0.020
Sides	Horizontal	4	0.668	6	5.67	34	0.023	2	0.045
	Vertical	4	0.668	5	5.08	25	0.017	2	0.034
Back	Horizontal	4	0.668	6	5.33	32	0.021	1	0.021
	Vertical	4	0.668	5	5.08	25	0.017	1	0.017
Front	Horizontal	4	0.668	3	5.33	16	0.011	1	0.011
	Vertical	4	0.668	5	1.22	6	0.004	1	0.004
Corners		4	0.668	6	4.00	24	0.016	4	0.064
Holes	Diagonal	4	0.668	4	6.00	24	0.016	2	0.032
	Vertical	4	0.668	8	5.08	41	0.027	2	0.054
	Horizontal	4	0.668	4	5.33	21	0.014	2	0.029
TOTAL									***0.352***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Sub	FCD PCN 630-01-30	Checked	Date
Task	Reinforcement Quantities	Sheet 23	Of 34

Description		Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Outlet Structure 3									
Wings	Horizontal	4	0.668	6	2.50	15	0.010	2	0.020
	Vertical	4	0.668	3	5.17	16	0.010	2	0.021
Sides	Horizontal	4	0.668	6	5.67	34	0.023	2	0.045
	Vertical	4	0.668	5	5.17	26	0.017	2	0.035
Back	Horizontal	4	0.668	6	5.33	32	0.021	1	0.021
	Vertical	4	0.668	5	5.17	26	0.017	1	0.017
Front	Horizontal	4	0.668	4	5.33	21	0.014	1	0.014
	Vertical	4	0.668	5	3.26	16	0.011	1	0.011
Corners		4	0.668	6	4.00	24	0.016	4	0.064
Holes	Diagonal	4	0.668	4	6.00	24	0.016	2	0.032
	Vertical	4	0.668	8	5.17	41	0.028	2	0.055
	Horizontal	4	0.668	4	5.33	21	0.014	2	0.029
TOTAL									***0.364***
Outlet Structure 4									
Wings	Horizontal	4	0.668	6	2.50	15	0.010	2	0.020
	Vertical	4	0.668	3	5.17	16	0.010	2	0.021
Sides	Horizontal	4	0.668	6	5.67	34	0.023	2	0.045
	Vertical	4	0.668	5	5.17	26	0.017	2	0.035
Back	Horizontal	4	0.668	6	5.33	32	0.021	1	0.021
	Vertical	4	0.668	5	5.17	26	0.017	1	0.017
Front	Horizontal	4	0.668	4	5.33	21	0.014	1	0.014
	Vertical	4	0.668	5	3.26	16	0.011	1	0.011
Corners		4	0.668	6	4.00	24	0.016	4	0.064
Holes	Diagonal	4	0.668	4	6.00	24	0.016	2	0.032
	Vertical	4	0.668	8	5.17	41	0.028	2	0.055
	Horizontal	4	0.668	4	5.33	21	0.014	2	0.029
TOTAL									***0.364***

File Quantities.xls | Job No. | No.

Computation

HDR

Project: Southeast Phoenix Regional Drainage Basin Project | Computed: BKV | Date: 8/6/99

Sub: FCD PCN 630-01-30 | Checked: | Date:

Task: Reinforcement Quantities | Sheet: 24 | Of: 34

Description		Size	Weight (lbs/ft)	# of Bars	Length (ft)	Total LF (ft)	Total Weight (kips)	# of Locations	Total Wt. (kips)
Outlet Structure 5									
Wings	Horizontal	4	0.668	6	2.50	15	0.010	2	0.020
	Vertical	4	0.668	3	5.67	17	0.011	2	0.023
Sides	Horizontal	4	0.668	6	5.67	34	0.023	2	0.045
	Vertical	4	0.668	5	5.67	28	0.019	2	0.038
Back	Horizontal	4	0.668	6	5.33	32	0.021	1	0.021
	Vertical	4	0.668	5	5.67	28	0.019	1	0.019
Front	Horizontal	4	0.668	1	5.33	5	0.004	1	0.004
	Vertical	4	0.668	5	0.67	3	0.002	1	0.002
Corners		4	0.668	6	4.00	24	0.016	4	0.064
Holes	Diagonal	4	0.668	4	6.00	24	0.016	2	0.032
	Vertical	4	0.668	8	5.67	45	0.030	2	0.061
	Horizontal	4	0.668	4	5.33	21	0.014	2	0.029
TOTAL									***0.357***
Outlet Apron for Inlet Structures 5 and 6									
Apron		4x4 W4.7xW4.7	1.020			361		1	0.368
TOTAL									***0.368***
Inlet for Temporary Ditch									
Apron		4x4 W4.7xW4.7	1.020			868		1	0.885
TOTAL									***0.885***
Transition for Low Flow Channel									
Apron		4x4 W4.7xW4.7	1.020			1937		1	1.976
TOTAL									***1.976***
Low Flow Channel									
Apron		4x4 W4.7xW4.7	1.020			9248		1	9.433
TOTAL									***9.433***
Access Ramp									
Apron		4x4 W4.7xW4.7	1.020			4936		1	5.035
TOTAL									***5.035***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Project	FCD PCN 630-01-30	Checked	Date
Task	Structural Excavation	Sheet 25	of 34

Description				Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Spillway Walls										
Wall 1	Footing	Neatline		8.00	5.75	46.00	0.00	10	0	0.00
		+ 18" width		8.00	8.75	70.00	1.00	10	700	25.93
	Key			8.00	1.00	8.00	1.00	10	80	2.96
	Panel 1	toe	bottom + 18"	8.00	3.33	26.67				
			top (0.75:1)	8.00	4.08	32.67	1.00			
			Average			29.67	1.00	1	30	1.10
		heel	bottom + 18"	8.00	5.42	43.33				
			top (0.75:1)	8.00	9.89	79.15	5.97			
			Average			61.24	5.97	1	366	13.54
	Panel 11	toe	bottom + 18"	8.00	3.33	26.67				
			top (0.75:1)	8.00	4.08	32.67	1.00			
			Average			29.67	1.00	1	30	1.10
		heel	bottom + 18"	8.00	5.42	43.33				
			top (0.75:1)	8.00	10.42	83.38	6.68			
			Average			63.36	6.68	1	423	15.66
	Panel 12	toe	bottom + 18"	8.00	3.33	26.67				
			top (0.75:1)	8.00	4.59	36.69	1.67			
			Average			31.68	1.67	1	53	1.96
		heel	bottom + 18"	8.00	5.42	43.33				
			top (0.75:1)	8.00	10.39	83.08	6.63			
			Average			63.21	6.63	1	419	15.51
	Panel 13	toe	bottom + 18"	8.00	3.33	26.67				
			top (0.75:1)	8.00	4.58	36.66	1.67			
			Average			31.66	1.67	1	53	1.95
		heel	bottom + 18"	8.00	5.42	43.33				
			top (0.75:1)	8.00	10.34	82.72	6.57			
			Average			63.03	6.57	1	414	15.33
	Panel 14	toe	bottom + 18"	8.00	3.33	26.67				
			top (0.75:1)	8.00	4.58	36.66	1.67			
			Average			31.66	1.67	1	53	1.95
		heel	bottom + 18"	8.00	5.42	43.33				
			top (0.75:1)	8.00	10.30	82.36	6.51			
			Average			62.85	6.51	1	409	15.14
	Panel 15	toe	bottom + 18"	8.00	3.33	26.67				
			top (0.75:1)	8.00	4.59	36.69	1.67			
			Average			31.68	1.67	1	53	1.96
		heel	bottom + 18"	8.00	5.42	43.33				
			top (0.75:1)	8.00	10.26	82.06	6.46			
			Average			62.70	6.46	1	405	14.99
	Panel 16	toe	bottom + 18"	8.00	3.33	26.67				
			top (0.75:1)	8.00	4.58	36.66	1.67			
			Average			31.66	1.67	1	53	1.95
		heel	bottom + 18"	8.00	5.42	43.33				
			top (0.75:1)	8.00	10.21	81.67	6.39			
			Average			62.50	6.39	1	399	14.79

Not Reviewed

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Project	FCD PCN 630-01-30	Checked	Date
Task	Structural Excavation	Sheet 26	of 34

Description				Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
	Panel 17	toe	bottom + 18"	8.00	3.33	26.67				
			top (0.75:1)	8.00	4.58	36.66	1.67			
			Average			31.66	1.67	1	53	1.95
		heel	bottom + 18"	8.00	5.42	43.33				
			top (0.75:1)	8.00	10.16	81.28	6.33			
			Average			62.31	6.33	1	394	14.60
	Panel 18	toe	bottom + 18"	8.00	3.33	26.67				
			top (0.75:1)	8.00	4.59	36.69	1.67			
			Average			31.68	1.67	1	53	1.96
		heel	bottom + 18"	8.00	5.42	43.33				
			top (0.75:1)	8.00	10.12	80.98	6.28			
			Average			62.16	6.28	1	390	14.45
	Panel 19	toe	bottom + 18"	8.00	3.33	26.67				
			top (0.75:1)	8.00	4.58	36.66	1.67			
			Average			31.66	1.67	1	53	1.95
		heel	bottom + 18"	8.00	5.42	43.33				
			top (0.75:1)	8.00	10.08	80.62	6.22			
			Average			61.98	6.22	1	385	14.27
TOTAL									***5265***	***195.00***
Wall 2	Footing	Neatline		8.00	6.75	54.00	0.00	2	0	0.00
		+ 18" width		8.00	9.75	78.00	1.00	2	156	5.78
	Key			8.00	1.00	8.00	1.00	2	16	0.59
	Panel 2	toe	bottom + 18"	8.00	3.83	30.67				0.00
			top (0.75:1)	8.00	4.58	36.67	1.00			
			Average			33.67	1.00	1	34	
		heel	bottom + 18"	8.00	5.92	47.33				
			top (0.75:1)	8.00	11.85	94.79	7.91			
			Average			71.06	7.91	1	562	
	Panel 10	toe	bottom + 18"	8.00	3.83	30.67				
			top (0.75:1)	8.00	5.27	42.16	1.92			
			Average			36.41	1.92	1	70	2.58
		heel	bottom + 18"	8.00	5.92	47.33				
			top (0.75:1)	8.00	12.09	96.71	8.23			
			Average			72.02	8.23	1	593	21.95
TOTAL									***768***	***30.91***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Project	FCD PCN 630-01-30	Checked	Date
Task	Structural Excavation	Sheet 27	of 34

Description				Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	(cu. yds)
Wall 3	Footing	Neatline		8.00	8.50	68.00	0.33	2	45	1.68
		+ 18" width		8.00	11.50	92.00	1.00	2	184	6.81
	Key			8.00	1.00	8.00	1.00	2	16	0.59
	Panel 3	toe	bottom + 18"	8.00	4.33	34.67				0.00
			top (0.75:1)	8.00	5.08	40.67	1.00			
			Average			37.67	1.00	1	38	
		heel	bottom + 18"	8.00	7.17	57.33				
			top (0.75:1)	8.00	14.55	116.43	9.85			
			Average			86.88	9.85	1	856	
	Panel 9	toe	bottom + 18"	8.00	4.33	34.67				
			top (0.75:1)	8.00	6.58	52.67	3.00			
			Average			43.67	3.00	1	131	4.85
		heel	bottom + 18"	8.00	7.17	57.33				
			top (0.75:1)	8.00	14.88	119.07	10.29			
			Average			88.20	10.29	1	908	33.62
	Footing	Neatline		6.00	8.50	51.00	0.33	1	17	0.63
		+ 18" width		6.00	11.50	69.00	1.00	1	69	2.56
	Key			6.00	1.00	6.00	1.00	1	6	0.22
	Panel 4	toe	bottom + 18"	8.00	4.33	34.67				
			top (0.75:1)	8.00	5.08	40.67	1.00			
			Average			37.67	1.00	1	38	1.40
		heel	bottom + 18"	8.00	7.17	57.33				
			top (0.75:1)	8.00	15.82	126.57	11.54			
			Average			91.95	11.54	1	1061	39.30
TOTAL									***2269***	***91.66***
Wall 4	Footing	Neatline		6.39	9.75	62.26	0.33	2	42	1.54
		+ 18" width		6.39	12.75	81.41	1.00	2	163	6.03
	Key			6.39	1.00	6.39	1.00	2	13	0.47
	Panel 5	toe	bottom + 18"	6.39	4.83	30.86				
			top (0.75:1)	6.39	5.58	35.65	1.00			
			Average			33.26	1.00	1	33	1.23
		heel	bottom + 18"	6.39	6.92	44.17				
			top (0.75:1)	6.39	16.70	106.62	13.04			
			Average			75.39	13.04	1	983	36.41
	Footing	Neatline		8.00	9.75	78.00	0.33	2	52	1.93
		+ 18" width		8.00	12.75	102.00	1.00	2	204	7.56
	Key			8.00	1.00	8.00	1.00	2	16	0.59
	Panel 8	toe	bottom + 18"	8.00	4.83	38.67				
			top (0.75:1)	8.00	7.08	56.67	3.00			
			Average			47.67	3.00	1	143	5.30
		heel	bottom + 18"	8.00	6.92	55.33				
			top (0.75:1)	8.00	16.18	129.43	12.35			
			Average			92.38	12.35	1	1141	42.26
TOTAL									***1505***	***103.31***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Project	FCD PCN 630-01-30	Checked	Date
Task	Structural Excavation	Sheet 28	of 34

Description					Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Wall 5	Footing	Neatline			8.00	12.50	100.00	1.00	2	200	7.41
		+ 18" width			8.00	15.50	124.00	1.00	2	248	9.19
	Key				8.00	1.00	8.00	1.00	2	16	0.59
	Panel 6	toe	bottom + 18"		8.00	5.83	46.67				0.00
			top (0.75:1)		8.00	6.58	52.67	1.00			
			Average				49.67	1.00	1	50	
		heel	bottom + 18"		8.00	9.67	77.33				
			top (0.75:1)		8.00	20.76	166.07	14.79			
			Average				121.70	14.79	1	1800	
	Panel 7	toe	bottom + 18"		8.00	5.83	46.67				
			top (0.75:1)		8.00	8.08	64.67	3.00			
			Average				55.67	3.00	1	167	6.19
		heel	bottom + 18"		8.00	9.67	77.33				
			top (0.75:1)		8.00	20.47	163.79	14.41			
			Average				120.56	14.41	1	1737	64.35
TOTAL										***2314***	***87.72***
TOTAL FOR 1 WALL											***509***
TOTAL FOR BOTH WALLS											***1017***
Overflow Weir Structure											
Neat line around floor					11.00	13.00	143.00	0.00	1	0	0.00
Footing + 18" each side					14.00	16.00	224.00				
At Gorund Surface (2:1)			h =	12.50	20.25	22.25	450.56				
Average Area							337.28	12.50	1	4216	156.15
TOTAL										***4216***	***156.15***
Water Quality Pump Station											
Neat line around floor					12.00	14.00	168.00	1.00	1	168	6.22
Footing + 18" each side					15.00	17.00	255.00				
At Gorund Surface (2:1)			h =	33.00	31.50	33.50	1055.25				
Average Area							655.13	33.00	1	21619	800.71
TOTAL										***21787***	***806.93***
Evacuation Pump Station											
Neat line around floor					12.00	12.00	144.00	1.00	1	144	5.33
Footing + 18" each side					15.00	15.00	225.00				
At Gorund Surface (2:1)			h =	34.00	32.00	32.00	1024.00				
Average Area							624.50	34.00	1	21233	786.41
TOTAL										***21377***	***791.74***
Structure 100											
Neat line around floor					7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side					10.67	10.67	113.78				
At Gorund Surface (2:1)			h =	19.75	20.54	20.54	421.96				
Average Area							267.87	19.75	1	5290	195.94
TOTAL										***5290***	***195.94***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Project	FCD PCN 630-01-30	Checked	Date
Task	Structural Excavation	Sheet 29	of 34

Description			Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Structure 101									
Neat line around floor			7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side			10.67	10.67	113.78				
At Gorund Surface (2:1)	h =	24.13	22.73	22.73	516.73				
Average Area					315.25	24.13	1	7607	281.74
TOTAL								***7607***	***281.74***
Structure 102									
Neat line around floor			7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side			10.67	10.67	113.78				
At Gorund Surface (2:1)	h =	9.12	15.23	15.23	231.85				
Average Area					172.81	9.12	1	1576	58.37
TOTAL								***1576***	***58.37***
Structure 103									
Neat line around floor			7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side			10.67	10.67	113.78				
At Gorund Surface (2:1)	h =	9.12	15.23	15.23	231.85				
Average Area					172.81	9.12	1	1576	58.37
TOTAL								***1576***	***58.37***
Structure 104									
Neat line around floor			7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side			10.67	10.67	113.78				
At Gorund Surface (2:1)	h =	10.09	15.71	15.71	246.86				
Average Area					180.32	10.09	1	1819	67.39
TOTAL								***1819***	***67.39***
Structure 105									
Neat line around floor			7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side			10.67	10.67	113.78				
At Gorund Surface (2:1)	h =	26.51	23.92	23.92	572.25				
Average Area					343.01	26.51	1	9093	336.79
TOTAL								***9093***	***336.79***
Structure 106									
Neat line around floor			12.50	13.50	168.75	0.00	1	0	0.00
Footing + 18" each side			15.50	16.50	255.75				
At Gorund Surface (2:1)	h =	23.75	27.38	28.38	776.77				
Average Area					516.26	23.75	1	12261	454.12
TOTAL								***12261***	***454.12***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Project	FCD PCN 630-01-30	Checked	Date
Task	Structural Backfill	Sheet 30	of 34

Description				Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Spillway Walls										
Wall 1	Footing	Neatline		8.00	5.75	46.00	0.00	10	0	0.00
		+ 18" width		8.00	8.75	70.00	1.00	10	700	25.93
	Key			8.00	1.00	8.00	1.00	10	80	2.96
	Panel 1	toe	bottom + 18"	8.00	3.33	26.67				
			top (1:1)	8.00	3.33	26.67	1.00			
			Average			26.67	1.00	1	27	0.99
		heel	bottom + 18"	8.00	5.42	43.33				
			top (1:1)	8.00	5.42	43.33	5.97			
			Average			43.33	5.97	1	259	9.58
	Panel 11	toe	bottom + 18"	8.00	3.33	26.67				
			top (1:1)	8.00	3.33	26.67	1.00			
			Average			26.67	1.00	1	27	0.99
		heel	bottom + 18"	8.00	5.42	43.33				
			top (1:1)	8.00	5.42	43.33	6.68			
			Average			43.33	6.68	1	289	10.71
	Panel 12	toe	bottom + 18"	8.00	3.33	26.67				
			top (1:1)	8.00	3.33	26.67	1.67			
			Average			26.67	1.67	1	45	1.65
		heel	bottom + 18"	8.00	5.42	43.33				
			top (1:1)	8.00	5.42	43.33	6.63			
			Average			43.33	6.63	1	287	10.63
	Panel 13	toe	bottom + 18"	8.00	3.33	26.67				
			top (1:1)	8.00	3.33	26.67	1.67			
			Average			26.67	1.67	1	44	1.64
		heel	bottom + 18"	8.00	5.42	43.33				
			top (1:1)	8.00	5.42	43.33	6.57			
			Average			43.33	6.57	1	284	10.54
	Panel 14	toe	bottom + 18"	8.00	3.33	26.67				
			top (1:1)	8.00	3.33	26.67	1.67			
			Average			26.67	1.67	1	44	1.64
		heel	bottom + 18"	8.00	5.42	43.33				
			top (1:1)	8.00	5.42	43.33	6.51			
			Average			43.33	6.51	1	282	10.44
	Panel 15	toe	bottom + 18"	8.00	3.33	26.67				
			top (1:1)	8.00	3.33	26.67	1.67			
			Average			26.67	1.67	1	45	1.65
		heel	bottom + 18"	8.00	5.42	43.33				
			top (1:1)	8.00	5.42	43.33	6.46			
			Average			43.33	6.46	1	280	10.36
	Panel 16	toe	bottom + 18"	8.00	3.33	26.67				
			top (1:1)	8.00	3.33	26.67	1.67			
			Average			26.67	1.67	1	44	1.64
		heel	bottom + 18"	8.00	5.42	43.33				
			top (1:1)	8.00	5.42	43.33	6.39			
			Average			43.33	6.39	1	277	10.26

Not Reviewed

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Project	FCD PCN 630-01-30	Checked	Date
Task	Structural Backfill	Sheet 31	of 34

Description				Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
	Panel 17	toe	bottom + 18"	8.00	3.33	26.67				
			top (1:1)	8.00	3.33	26.67	1.67			
			Average			26.67	1.67	1	44	1.64
		heel	bottom + 18"	8.00	5.42	43.33				
			top (1:1)	8.00	5.42	43.33	6.33			
			Average			43.33	6.33	1	274	10.15
	Panel 18	toe	bottom + 18"	8.00	3.33	26.67				
			top (1:1)	8.00	3.33	26.67	1.67			
			Average			26.67	1.67	1	45	1.65
		heel	bottom + 18"	8.00	5.42	43.33				
			top (1:1)	8.00	5.42	43.33	6.28			
			Average			43.33	6.28	1	272	10.07
	Panel 19	toe	bottom + 18"	8.00	3.33	26.67				
			top (1:1)	8.00	3.33	26.67	1.67			
			Average			26.67	1.67	1	44	1.64
		heel	bottom + 18"	8.00	5.42	43.33				
			top (1:1)	8.00	5.42	43.33	6.22			
			Average			43.33	6.22	1	269	9.97
TOTAL									***3962***	***146.75***
Wall 2	Footing	Neatline		8.00	6.75	54.00	0.00	2	0	0.00
		+ 18" width		8.00	9.75	78.00	1.00	2	156	5.78
	Key			8.00	1.00	8.00	1.00	2	16	0.59
	Panel 2	toe	bottom + 18"	8.00	3.83	30.67				0.00
			top (1:1)	8.00	3.83	30.67	1.00			
			Average			30.67	1.00	1	31	
		heel	bottom + 18"	8.00	5.92	47.33				
			top (1:1)	8.00	5.92	47.33	7.91			
			Average			47.33	7.91	1	374	
	Panel 10	toe	bottom + 18"	8.00	3.83	30.67				
			top (1:1)	8.00	3.83	30.67	1.92			
			Average			30.67	1.92	1	59	2.18
		heel	bottom + 18"	8.00	5.92	47.33				
			top (1:1)	8.00	5.92	47.33	8.23			
			Average			47.33	8.23	1	390	14.43
TOTAL									***577***	***22.97***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Subject	FCD PCN 630-01-30	Checked	Date
Task	Structural Backfill	Sheet 32	of 34

Description				Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Wall 3	Footing	Neatline		8.00	8.50	68.00	0.33	2	45	1.68
		+ 18" width		8.00	11.50	92.00	1.00	2	184	6.81
	Key			8.00	1.00	8.00	1.00	2	16	0.59
	Panel 3	toe	bottom + 18"	8.00	4.33	34.67				0.00
			top (1:1)	8.00	4.33	34.67	1.00			
			Average			34.67	1.00	1	35	
		heel	bottom + 18"	8.00	7.17	57.33				
			top (1:1)	8.00	7.17	57.33	9.85			
			Average			57.33	9.85	1	565	
	Panel 9	toe	bottom + 18"	8.00	4.33	34.67				
			top (1:1)	8.00	4.33	34.67	3.00			
			Average			34.67	3.00	1	104	3.85
		heel	bottom + 18"	8.00	7.17	57.33				
			top (1:1)	8.00	7.17	57.33	10.29			
			Average			57.33	10.29	1	590	21.85
	Footing	Neatline		6.00	8.50	51.00	0.33	1	17	0.63
		+ 18" width		6.00	11.50	69.00	1.00	1	69	2.56
	Key			6.00	1.00	6.00	1.00	1	6	0.22
	Panel 4	toe	bottom + 18"	8.00	4.33	34.67				
			top (1:1)	8.00	4.33	34.67	1.00			
			Average			34.67	1.00	1	35	1.28
		heel	bottom + 18"	8.00	7.17	57.33				
			top (1:1)	8.00	7.17	57.33	11.54			
			Average			57.33	11.54	1	662	24.50
TOTAL									***1631***	***63.98***
Wall 4	Footing	Neatline		6.39	9.75	62.26	0.33	2	42	1.54
		+ 18" width		6.39	12.75	81.41	1.00	2	163	6.03
	Key			6.39	1.00	6.39	1.00	2	13	0.47
	Panel 5	toe	bottom + 18"	6.39	4.83	30.86				
			top (1:1)	6.39	4.83	30.86	1.00			
			Average			30.86	1.00	1	31	1.14
		heel	bottom + 18"	6.39	6.92	44.17				
			top (1:1)	6.39	6.92	44.17	13.04			
			Average			44.17	13.04	1	576	21.33
	Footing	Neatline		8.00	9.75	78.00	0.33	2	52	1.93
		+ 18" width		8.00	12.75	102.00	1.00	2	204	7.56
	Key			8.00	1.00	8.00	1.00	2	16	0.59
	Panel 8	toe	bottom + 18"	8.00	4.83	38.67				
			top (1:1)	8.00	4.83	38.67	3.00			
			Average			38.67	3.00	1	116	4.30
		heel	bottom + 18"	8.00	6.92	55.33				
			top (1:1)	8.00	6.92	55.33	12.35			
			Average			55.33	12.35	1	683	25.31
TOTAL									***1096***	***70.19***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Project	FCD PCN 630-01-30	Checked	Date
Task	Structural Backfill	Sheet 33	of 34

Description				Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	(cu. yds)
Wall 5	Footing	Neatline		8.00	12.50	100.00	1.00	2	200	7.41
		+ 18" width		8.00	15.50	124.00	1.00	2	248	9.19
	Key			8.00	1.00	8.00	1.00	2	16	0.59
	Panel 6	toe	bottom + 18"	8.00	5.83	46.67				0.00
			top (1:1)	8.00	5.83	46.67	1.00			
			Average			46.67	1.00	1	47	
		heel	bottom + 18"	8.00	9.67	77.33				
			top (1:1)	8.00	9.67	77.33	14.79			
			Average			77.33	14.79	1	1144	
	Panel 7	toe	bottom + 18"	8.00	5.83	46.67				
			top (1:1)	8.00	5.83	46.67	3.00			
			Average			46.67	3.00	1	140	5.19
		heel	bottom + 18"	8.00	9.67	77.33				
			top (1:1)	8.00	9.67	77.33	14.41			
			Average			77.33	14.41	1	1114	41.27
TOTAL									***1654***	***63.64***
TOTAL FOR 1 WALL										***368***
TOTAL FOR BOTH WALLS										***735***

Overflow Weir Structure

Neat line around floor			11.00	13.00	143.00	1.00	1	143	5.30
Footing + 18" each side			14.00	16.00	224.00				
At Gorund Surface (1:1)	h =	12.50	14.00	16.00	224.00				
Average Area					224.00	12.50	1	2800	103.70
TOTAL								***2943***	***109.00***

Water Quality Pump Station

Neat line around floor			12.00	14.00	168.00	1.00	1	168	6.22
Footing + 18" each side			15.00	17.00	255.00				
At Gorund Surface (1:1)	h =	33.00	15.00	17.00	255.00				
Average Area					255.00	33.00	1	8415	311.67
TOTAL								***8583***	***317.89***

Evacuation Pump Station

Neat line around floor			12.00	12.00	144.00	1.00	1	144	5.33
Footing + 18" each side			15.00	15.00	225.00				
At Gorund Surface (1:1)	h =	34.00	15.00	15.00	225.00				
Average Area					225.00	34.00	1	7650	283.33
TOTAL								***7794***	***288.67***

Structure 100

Neat line around floor			7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side			10.67	10.67	113.78				
At Gorund Surface (1:1)	h =	19.75	10.67	10.67	113.78				
Average Area					113.78	19.75	1	2247	83.23
TOTAL								***2247***	***83.23***

File Quantities.xls | Job No. | No.

Computation

HDR

Project	Southeast Phoenix Regional Drainage Basin Project	Computed BKV	Date 8/6/99
Project	FCD PCN 630-01-30	Checked	Date
Task	Structural Backfill	Sheet 34	of 34

Description			Length (ft)	Width (ft)	Area (ft²)	Depth (ft)	# of Locations	Volume (cu. ft)	Volume (cu. yds)
Structure 101									
Neat line around floor			7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side			10.67	10.67	113.78				
At Gorund Surface (1:1)	h =	24.13	10.67	10.67	113.78				
Average Area					113.78	24.13	1	2745	101.68
TOTAL								***2745***	***101.68***
Structure 102									
Neat line around floor			7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side			10.67	10.67	113.78				
At Gorund Surface (1:1)	h =	9.12	10.67	10.67	113.78				
Average Area					113.78	9.12	1	1038	38.43
TOTAL								***1038***	***38.43***
Structure 103									
Neat line around floor			7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side			10.67	10.67	113.78				
At Gorund Surface (1:1)	h =	9.12	10.67	10.67	113.78				
Average Area					113.78	9.12	1	1038	38.43
TOTAL								***1038***	***38.43***
Structure 104									
Neat line around floor			7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side			10.67	10.67	113.78				
At Gorund Surface (1:1)	h =	10.09	10.67	10.67	113.78				
Average Area					113.78	10.09	1	1148	42.52
TOTAL								***1148***	***42.52***
Structure 105									
Neat line around floor			7.67	7.67	58.78	0.00	1	0	0.00
Footing + 18" each side			10.67	10.67	113.78				
At Gorund Surface (1:1)	h =	26.51	10.67	10.67	113.78				
Average Area					113.78	26.51	1	3016	111.71
TOTAL								***3016***	***111.71***
Structure 106									
Neat line around floor			12.50	13.50	168.75	0.00	1	0	0.00
Footing + 18" each side			15.50	16.50	255.75				
At Gorund Surface (1:1)	h =	23.75	15.50	16.50	255.75				
Average Area					255.75	23.75	1	6074	224.97
TOTAL								***6074***	***224.97***

File	Spillway Wall, 8.33'.xls	Job No	00173-097-044	No.

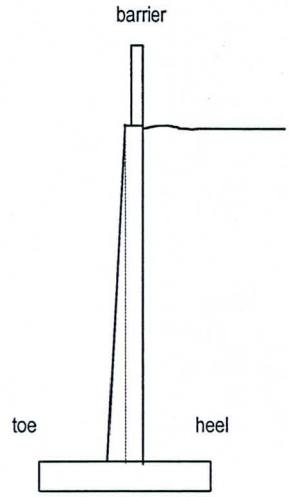
Computation

HDR

Project	48th street Detention Basin	Compute	BKV	Date	8/6/99
Project	Spillway Retaining Wall	Checked		Date	
Task	8'-4" foot wall #1	Sheet	1	Of	8

GEOMETERY:

Wall Height	8.33	ft
Wall Thickness (top)	14.00	in
Wall Thickness (bottom)	14.00	in
Wall Cover	2.00	in
d	12.00	in
Toe Length	1.83	ft
Toe Thickness	12.00	in
Design Toe Cover	3.00	in
Soil Height on toe	0.00	ft
Heel Length	2.75	ft
Heel Thickness	12.00	in
Design Heel Cover	2.00	in
Total Footing Length	5.75	ft
Total Wall Height	9.33	ft
Barrier Width	0	in
Barrier Height	0	in



LOADING:

Surcharge	0.300	kips
Eq. soil height	3.00	ft
Barrier Weight	0.000	kips
Barrier Impact Load	0.000	kip/ft at top of wall
Barrier Impact Load Adjusted for Wall Height	0.000	kip/ft at base of wall

MATERIAL PROPERTIES:

f_y		60.000	ksi
E_s		2.90E+07	psi
f'_c		3.000	ksi
Unit weight of concrete		0.145	kip/ft^3
E_c	w_c^1.5 $33\sqrt{f'_c}$ =	3.16E+06	psi
f_c		1350	psi
f_s		20000	psi
n		9.189	
Unit weight of soil		0.100	kip/ft^3
Horizontial earthquake acceleration (kh)		0.040	g
Vertical earthquake acceleration (kv)		0.027	g
f		28.30	°
b		90.00	°
a		0.00	°
g		35.00	°
Coefficient of Sliding Friction (μ)		0.50	

$$K_a = \frac{\sin^2(b+f)}{(\sin^2(b)\cdot\sin(b-g)\left[1+\left(\frac{\sin(f+g)\cdot\sin(f-a)}{\sin(b-g)\cdot\sin(a+b)}\right)^{1/2}\right]^2} = 0.320$$

$$K_{ae} = K_a + 3/4\ k_h = 0.350$$

Computation

HDR

Project	48th street Detention Basin	Computed BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Overturning and Shear - Case 1	Sheet 2	Of 8

OVERTURNING:

Overturning Moment: (Mo) per foot of wall:

Cause	Force (kips)	Lever Arm (ft)	Moment (k-ft)	Load Factor	Factored Force (kips)	Factored Moment (k-ft)
Soil	1.395	3.111	4.340	1.69	2.357	7.334
Surcharge	0.897	4.667	4.185	2.17	1.947	9.085
Barrier Impact	0.000	9.333	0.000	2.17	0.000	0.000
Total per foot of wall	2.292	Mo =	8.524		4.304	16.419

Righting Moment: (Mr) per foot of wall

Cause	Force (kips)	Lever Arm (ft)	Moment (k-ft)	Load Factor	Factored Force (kips)	Factored Force (k-ft)
Footing	0.834	2.875	2.397	1.300	1.084	3.116
Wall Taper	0.000	1.833	0.000	1.300	0.000	0.000
Wall	1.410	2.417	3.407	1.300	1.833	4.429
Barrier	0.000	3.000	0.000	1.300	0.000	0.000
Surcharge	0.825	4.375	3.609	2.171	1.791	7.836
Soil	2.292	4.375	10.026	1.300	2.979	13.034
Total per foot of w Rv =	5.360	Mr =	19.439		7.687	28.415

Factor of Safety against Overturning: Mr / Mo 2.28 > 2.0 **OK**

SLIDING:

Forces Causing Sliding: (Vs)

Cause	Force (kips)
Soil	1.395
Surcharge	0.897
Total per foot of wall	2.292

Forces Resisting Sliding: (Vr)

Cause	Force (kips)
Footing	0.834
Wall Taper	0.000
Wall	1.410
Surcharge	0.825
Soil	2.292
Total per foot of wall	5.360

Factor of Safety against Sliding: μ Vr / Vs = 1.17 < 1.5 **KEY REQUIRED**

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Soil Pressures	Sheet 4	Of 8

FOOTING SOIL PRESSURES:

Resultant Vertical Force (Rv)		5,360 lbs	
Location of Resultant Force from the toe of the footing (x)	(Mr - Mo) / Rv =	2.04 feet	**OK - Inside middle 1/3**
Soil Pressure = -Rv / A ± Mc / I	Area for 1 foot strip, A =	5.75 ft²	
	I = 1/12 bh^3 =	15.84 ft^4	
	c = Footing width / 2 =	2.88 ft	
	M = Rv * (Footing width / 2 - x) =	4,495 lb•ft	
	-Rv / A =	-932 psf	
	M c / I =	816 psf	
Toe Pressure	-Rv / A - Mc / I =	-1,748 psf	
Heel Pressure	-Rv / A + Mc / I =	-116 psf	

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Stem Design, LFD	Sheet 5	of 8

LATERIAL FORCES:

Cause		Force (kips)		Factor		Load (kips)		Lever Arm (ft)		Moment (kip•ft)
Static	Soil	1.112	x	1.700	=	1.890	x	2.778	=	5.251
	Surcharge	0.801	x	1.700	=	1.361	x	4.167	=	5.671
	Impact on Rail	0.000	x	1.700	=	0.000	x	8.333	=	0.000
	Total	1.913				3.251				10.922
Sesmic	Soil	1.184	x	1.700	=	2.012	x	4.167	=	8.385
	Soil Interia	0.092	x	1.700	=	0.156	x	4.167	=	0.649
	Barrier Interia	0.000	x	1.700	=	0.000	x	8.333	=	0.000
	Wall Interia	0.056	x	1.700	=	0.096	x	4.167	=	0.399
	Wall Taper Interia	0.000	x	1.700	=	0.000	x	2.778	=	0.000
	Total	1.332				2.264				9.433
	Reduced (3/4)	0.999				1.698				7.075

Design Shear and Moment 3.251 kips 10.922 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Stem Width - cover - 1/2 Bar diameter =	11.69 in		
ϕVc	$\phi 2 \sqrt{f'c}\, bd$ =	13.059 kips	3.2514 kips	**OK**

DESIGN STEM FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	88.843		
p reg	$0.85\, f'c / fy\, (1-\sqrt{(1-2\, Rn / 0.85\, f'c)})$ =	0.00151		
p min		0.00333		
4/3 *p* req		0.00201		
p used		0.00201		
As required	pbd =	0.282	in²	
Bar size		5		
Bar Spacing		12.00	in	
Bar diameter		0.625	in	
Bar Area		0.310	in²	
As provided		0.310	in²	**OK** 110%

Temp & Shrinkage steel:

As required	0.0025 b t =	0.420	in²
Inside Face			
Bar size		4	
Bar Spacing		9.00	in
Bar diameter		0.500	in
Bar Area		0.200	in²
As provided		0.267	in²
Outside Face			
Bar size		4	
Bar Spacing		9.00	in
Bar diameter		0.500	in
Bar Area		0.200	in²
As provided		0.267	in²
As Total		0.533	in² **OK**

Computation

HDR

Project 48th street Detention Basin	Compute BKV	Date 8/6/99
Subject Spillway Retaining Wall	Checked	Date
Task Heel Design, LFD Design	Sheet 6	Of 8

LATERIAL FORCES:

Cause		Force (kips)		Factor		Load (kips)
Static	Soil	2.292	x	1.400	=	3.208
	Surcharge	0.825	x	1.400	=	1.155
	Footing	0.399	x	1.400	=	0.558
	Total	3.515				4.922

Design Shear: 4.922 kips

Design Moment: Design Shear x Heel Length / 2 = 6.767 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Footing Depth - cover - 1/2 Bar diameter =	9.69 in				
ϕVc	ϕ2 √f'c bd =	10.824 kips	>	4.9216 kips	OK	220%

DESIGN HEEL FOR MOMENT:

		80.120				
p	0.85 f'c / fy (1-√(1-2 Rn / 0.85 f'c)) =	0.00136				
p min		0.00333				
4/3 *p* req		0.00181				
p used		0.00181				
As required	pbd =	0.210 in²				
Bar size		5				
Bar Spacing		12.00 in				
Bar diameter		0.625 in				
Bar Area		0.310 in²				
As provided		0.310 in²			OK	147%
l d provided		33.00 in		25.00 in	OK	

Temp & Shrinkage steel:

As required	0.0025 b t =	0.360 in²	

Top Face

Bar size	4
Bar Spacing	12.00 in
Bar diameter	0.500 in
Bar Area	0.200 in²
As provided	0.200 in²

Bottom Face

Bar size	4
Bar Spacing	12.00 in
Bar diameter	0.500 in
Bar Area	0.200 in²
As provided	0.200 in²

As Total 0.400 in² OK

Computation

HDR

Project	48th street Detention Basin	Comput	BKV	Date	8/6/99
Subject	Spillway Retaining Wall	Checked		Date	
Task	Toe Design, LFD	Sheet	7	Of	8

LATERIAL FORCES:

Using the soil pressures:

Soil pressure at the toe	1.748 kips
Soil Pressure at the front face of the wall	1.228 kips
Soil Pressure at the back face of wall	0.116 kips

Cause	Force (kips)		Factor		Load (kips)	Lever Arm (ft)	Moment (kip-ft)
Uniform portion of the pressure	3.205	x	1.700	=	5.448	0.92	4.994
Triangular portion	0.477	x	1.700	=	0.811	0.61	0.495
Total	3.682				6.259		5.489

Design Shear: 6.259 kips
Design Moment: 5.489 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Footing Depth - cover - 1/2 Bar diameter =	9.69 in				
ϕVc	$\phi 2\sqrt{f'c}\, bd$ =	10.824 kips	>	6.2586 kips	OK	173%

DESIGN TOE FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	74.098			
p	$0.85\, f'c / fy\, (1-\sqrt{(1-2\, Rn / 0.85\, f'c)})$ =	0.00125			
p min		0.00333			
4/3 *p* req		0.00167			
p used		0.00167			
As required	pbd =	0.194 in²			
Bar size		5			
Bar Spacing		12.00 in			
Bar diameter		0.625 in			
Bar Area		0.310 in²			
As provided		0.310 in²		OK	160%
l d provided		33.00 in		25.00 in	OK

Temp & Shrinkage steel:

As required	0.0025 b t =	0.360 in²	
Top Face			
Bar size		4	
Bar Spacing		12.00 in	
Bar diameter		0.500 in	
Bar Area		0.200 in²	
As provided		0.200 in²	
Bottom Face			
Bar size		4	
Bar Spacing		12.00 in	
Bar diameter		0.500 in	
Bar Area		0.200 in²	
As provided		0.200 in²	
As Total		0.400 in²	OK

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Su	Spillway Retaining Wall	Checked	Date
Task	Summary ASD	Sheet 8	Of 8

VERTICAL WALL MOMENTS:

Height (ft)	Moment Static (kip-ft)	Moment Seismic* (kip-ft)	Moment Max. (kip-ft)	Control Case	Stem d (in)	Reinforcement Size #	Reinforcement @ Spacing (in)	As (in²/ft)	p	As check (in²/ft)		p_{max} check	
8.33	0.000	0.000	0.000	*SEISMIC*	11.69	5	12.00	0.310	0.0022	0.0000	OK	0.0160	OK
7.50	0.062	0.077	0.077	*SEISMIC*	11.69	5	12.00	0.310	0.0022	0.0020	OK	0.0160	OK
6.67	0.269	0.176	0.269	*STATIC*	11.69	5	12.00	0.310	0.0022	0.0068	OK	0.0160	OK
5.83	0.652	0.335	0.652	*STATIC*	11.69	5	12.00	0.310	0.0022	0.0166	OK	0.0160	OK
5.00	1.243	0.591	1.243	*STATIC*	11.69	5	12.00	0.310	0.0022	0.0316	OK	0.0160	OK
4.17	2.074	0.983	2.074	*STATIC*	11.69	5	12.00	0.310	0.0022	0.0528	OK	0.0160	OK
3.33	3.176	1.547	3.176	*STATIC*	11.69	5	12.00	0.310	0.0022	0.0809	OK	0.0160	OK
2.50	4.580	2.322	4.580	*STATIC*	11.69	5	12.00	0.310	0.0022	0.1170	OK	0.0160	OK
1.67	6.318	3.346	6.318	*STATIC*	11.69	5	12.00	0.310	0.0022	0.1618	OK	0.0160	OK
0.83	8.422	4.655	8.422	*STATIC*	11.69	5	12.00	0.310	0.0022	0.2164	OK	0.0160	OK
0.00	10.922	6.289	10.922	*STATIC*	11.69	5	12.00	0.310	0.0022	0.2819	OK	0.0160	OK

* Seismic is reduced by 4/3

$p_{max} = 0.75(.85B_1 f'c/fy)(87{,}000/(87000+fy))$

Wall Temp & Shrinkage Reinforceing:	Size	Spacing	
Inside Face:	4	9.00	in
Outside Face:	4	9.00	in
Footing Top Reinforcing	5	12.00	in
Footing Bottom Reinforcing:	5	12.00	in
Footing Longitudinal Reinforceing:			
Top Face	4	12.00	in
Bottom Face	4	12.00	in

QUANTITIES:

CONCRETE

Description	Volume
Wall	0.360
Wall Taper	0.000
Toe	0.068
Heel / Stem Area	0.145
Key (12x12)	0.037
	0.610 cubic yd / ft

REINFORCEMENT

Description	Size	Length (ft)	Number	Spacing (in)	Weight (lbs)
Wall Cap	4	2.083		12.00	1.39
Wall Outside Vertical	5	8.875		12.00	9.26
Wall Inside Vertical	5	8.875		12.00	9.26
Wall Temp and Shrinkage, Inside Face	4	1.000	12		8.02
Wall Temp and Shrinkage, Outside Fa	4	1.000	12		8.02
Footing, Transverse Top	5	5.250		12.00	5.48
Footing, Transverse Bottom	5	5.250		12.00	5.48
Footing, Longitudinal Top	4	12.000		12.00	8.02
Footing, Longitudinal Bottom	4	12.000		12.00	8.02
Key (12x12)	5	4.667		10.00	5.84
					68.76 lbs / ft

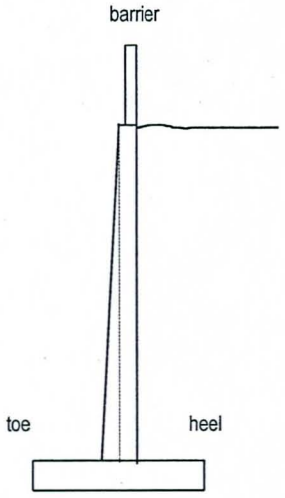
Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	10'-3" foot wall #2	Sheet 1	Of 8

GEOMETERY:

Wall Height	10.25	ft
Wall Thickness (top)	14.00	in
Wall Thickness (bottom)	14.00	in
Wall Cover	2.00	in
d	12.00	in
Toe Length	2.33	ft
Toe Thickness	12.00	in
Design Toe Cover	3.00	in
Soil Height on toe	0.00	ft
Heel Length	3.25	ft
Heel Thickness	12.00	in
Design Heel Cover	2.00	in
Total Footing Length	6.75	ft
Total Wall Height	11.25	ft
Barrier Width	0	in
Barrier Height	0	in



LOADING:

Surcharge	0.300	kips
Eq. soil height	3.00	ft
Barrier Weight	0.000	kips
Barrier Impact Load	0.000	kip/ft at top of wall
Barrier Impact Load Adjusted for Wall Height	0.000	kip/ft at base of wall

MATERIAL PROPERTIES:

f_y		60.000	ksi
E_s		2.90E+07	psi
f'_c		3.000	ksi
Unit weight of concrete		0.145	kip/ft^3
E_c	w_c^1.5 $33\sqrt{f'_c}$ =	3.16E+06	psi
f_c		1350	psi
f_s		20000	psi
n		9.189	
Unit weight of soil		0.100	kip/ft^3
Horizontial earthquake acceleration (kh)		0.040	g
Vertical earthquake acceleration (kv)		0.027	g
f		28.30	°
b		90.00	°
a		0.00	°
g		35.00	°
Coefficient of Sliding Friction (μ)		0.50	

$$Ka = \frac{\sin^2(b+f)}{(\sin^2(b)\cdot\sin(b-g))\left[1+\left(\frac{\sin(f+g)\cdot\sin(f-a)}{\sin(b-g)\cdot\sin(a+b)}\right)^{1/2}\right]^2} = 0.320$$

$$Kae = Ka + 3/4\ kh = 0.350$$

Computation

HDR

Project	48th street Detention Basin	Computed BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Overturning and Shear - Case 1	Sheet 2	Of 8

OVERTURNING:

Overturning Moment: (Mo) per foot of wall:

Cause	Force (kips)	Lever Arm (ft)	Moment (k-ft)	Load Factor	Factored Force (kips)	Factored Moment (k-ft)
Soil	2.027	3.750	7.600	1.69	3.425	12.844
Surcharge	1.081	5.625	6.080	2.17	2.347	13.199
Barrier Impact	0.000	11.250	0.000	2.17	0.000	0.000
Total per foot of wall	3.107	Mo =	13.679		5.771	26.043

Righting Moment: (Mr) per foot of wall

Cause	Force (kips)	Lever Arm (ft)	Moment (k-ft)	Load Factor	Factored Force (kips)	Factored Force (k-ft)
Footing	0.979	3.375	3.303	1.300	1.272	4.294
Wall Taper	0.000	2.333	0.000	1.300	0.000	0.000
Wall	1.734	2.917	5.057	1.300	2.254	6.575
Barrier	0.000	3.500	0.000	1.300	0.000	0.000
Surcharge	0.975	5.125	4.997	2.171	2.117	10.848
Soil	3.331	5.125	17.073	1.300	4.331	22.194
Total per foot of w Rv =	7.019	Mr =	30.430		9.974	43.912

Factor of Safety against Overturning: Mr / Mo 2.22 > 2.0 **OK**

SLIDING:

Forces Causing Sliding: (Vs)

Cause	Force (kips)
Soil	2.027
Surcharge	1.081
Total per foot of wall	3.107

Forces Resisting Sliding: (Vr)

Cause	Force (kips)
Footing	0.979
Wall Taper	0.000
Wall	1.734
Surcharge	0.975
Soil	3.331
Total per foot of wall	7.019

Factor of Safety against Sliding: μ Vr / Vs = 1.13 < 1.5 **KEY REQUIRED**

Computation

HDR

Project 48th street Detention Basin	Compute BKV	Date 8/6/99
Subject Spillway Retaining Wall	Checked	Date
Task Soil Pressures	Sheet 4	Of 8

FOOTING SOIL PRESSURES:

Resultant Vertical Force (Rv)		7,019 lbs	
Location of Resultant Force from the toe of the footing (x)	(Mr - Mo) / Rv =	2.39 feet	**OK - Inside middle 1/3**
Soil Pressure = -Rv / A ± Mc / I	Area for 1 foot strip, A =	6.75 ft²	
	I = 1/12 bh^3 =	25.63 ft^4	
	c = Footing width / 2 =	3.38 ft	
	M = Rv * (Footing width / 2 - x) =	6,938 lb•ft	
	-Rv / A =	-1,040 psf	
	M c / I =	914 psf	
Toe Pressure	-Rv / A - Mc / I =	-1,954 psf	
Heel Pressure	-Rv / A + Mc / I =	-126 psf	

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Stem Design, LFD	Sheet 5	Of 8

LATERIAL FORCES:

Cause		Force (kips)		Factor		Load (kips)		Lever Arm (ft)		Moment (kip•ft)
Static	Soil	1.682	x	1.700	=	2.860	x	3.417	=	9.771
	Surcharge	0.985	x	1.700	=	1.674	x	5.125	=	8.580
	Impact on Rail	0.000	x	1.700	=	0.000	x	10.250	=	0.000
	Total	2.667				4.534				18.351
Sesmic	Soil	1.791	x	1.700	=	3.044	x	5.125	=	15.603
	Soil Interia	0.133	x	1.700	=	0.227	x	5.125	=	1.161
	Barrier Interia	0.000	x	1.700	=	0.000	x	10.250	=	0.000
	Wall Interia	0.069	x	1.700	=	0.118	x	5.125	=	0.604
	Wall Taper Interia	0.000	x	1.700	=	0.000	x	3.417	=	0.000
	Total	1.993				3.389				17.368
	Reduced (3/4)	1.495				2.542				13.026

Design Shear and Moment 4.534 kips 18.351 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Stem Width - cover - 1/2 Bar diameter =	11.56 in			
ϕVc	$\phi 2 \sqrt{f'c}\ bd$ =	12.919 kips	4.5341 kips	**OK**	

DESIGN STEM FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	152.518		
p reg	$0.85\ f'c / fy\ (1-\sqrt{(1-2\ Rn / 0.85\ f'c)})$ =	0.00262		
p min		0.00333		
4/3 *p* req		0.00350		
p used		0.00333		
As required	pbd =	0.463 in²		
Bar size		7		
Bar Spacing		12.00 in		
Bar diameter		0.875 in		
Bar Area		0.600 in²		
As provided		0.600 in²	**OK**	130%
Temp & Shrinkage steel:				
As required	0.0025 b t =	0.420 in²		
Inside Face				
Bar size		4		
Bar Spacing		9.00 in		
Bar diameter		0.500 in		
Bar Area		0.200 in²		
As provided		0.267 in²		
Outside Face				
Bar size		4		
Bar Spacing		9.00 in		
Bar diameter		0.500 in		
Bar Area		0.200 in²		
As provided		0.267 in²		
As Total		0.533 in²	**OK**	

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Heel Design, LFD Design	Sheet 6	Of 8

LATERIAL FORCES:

Cause		Force (kips)		Factor		Load (kips)
Static	Soil	3.331	x	1.400	=	4.664
	Surcharge	0.975	x	1.400	=	1.365
	Footing	0.471	x	1.400	=	0.660
	Total	4.778				6.689

Design Shear: 6.689 kips

Design Moment: Design Shear x Heel Length / 2 = 10.869 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Footing Depth - cover - 1/2 Bar diameter =	9.69 in				
ϕVc	$\phi 2 \sqrt{f'c}\, bd$ =	10.824 kips	>	6.6885 kips	OK	162%

DESIGN HEEL FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	128.682			
p	$0.85\, f'c / fy\, (1-\sqrt{(1-2\, Rn / 0.85\, f'c)})$ =	0.00220			
p min		0.00333			
4/3 *p* req		0.00294			
p used		0.00294			
As required	pbd =	0.341 in²			
Bar size		5			
Bar Spacing		12.00 in			
Bar diameter		0.625 in			
Bar Area		0.310 in²			
As provided		0.310 in²		NO GO	91%
ld provided		39.00 in		25.00 in	OK

Temp & Shrinkage steel:

As required	0.0025 b t =	0.360 in²	
Top Face			
Bar size		4	
Bar Spacing		12.00 in	
Bar diameter		0.500 in	
Bar Area		0.200 in²	
As provided		0.200 in²	
Bottom Face			
Bar size		4	
Bar Spacing		12.00 in	
Bar diameter		0.500 in	
Bar Area		0.200 in²	
As provided		0.200 in²	
As Total		0.400 in²	OK

LATERIAL FORCES:

Using the soil pressures:

Soil pressure at the toe	1.954	kips
Soil Pressure at the front face of the wall	1.322	kips
Soil Pressure at the back face of wall	0.126	kips

Cause	Force (kips)		Factor		Load (kips)	Lever Arm (ft)	Moment (kip-ft)
Uniform portion of the pressure	4.558	x	1.700	=	7.749	1.17	9.041
Triangular portion	0.737	x	1.700	=	1.253	0.78	0.974
Total	5.295				9.002		10.015

Design Shear: 9.002 kips
Design Moment: 10.015 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Footing Depth - cover - 1/2 Bar diameter =	9.69 in				
ϕVc	$\phi 2\sqrt{f'c}\ bd$ =	10.824 kips	>	9.0018 kips	OK	120%

DESIGN TOE FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	106.577				
p	$0.85\ f'c / fy\ (1-\sqrt{(1-2\ Rn / 0.85\ f'c)})$ =	0.00182				
p min		0.00333				
4/3 *p* req		0.00242				
p used		0.00242				
As required	pbd =	0.281	in²			
Bar size		5				
Bar Spacing		12.00	in			
Bar diameter		0.625	in			
Bar Area		0.310	in²			
As provided		0.310	in²		OK	110%
l d provided		39.00	in	25.00	in OK	

Temp & Shrinkage steel:

As required	0.0025 b t =	0.360	in²

Top Face

Bar size	4	
Bar Spacing	12.00	in
Bar diameter	0.500	in
Bar Area	0.200	in²
As provided	0.200	in²

Bottom Face

Bar size	4	
Bar Spacing	12.00	in
Bar diameter	0.500	in
Bar Area	0.200	in²
As provided	0.200	in²

As Total 0.400 in² OK

File	Spillway Wall, 10.25'.xls	Job No.	00173-097-044	No.	

Computation

HDR

Project	48th street Detention Basin	Compute	BKV	Date	8/6/99
Su	Spillway Retaining Wall	Checked		Date	
Task	Summary ASD	Sheet	8	of	8

VERTICAL WALL MOMENTS:

Height (ft)	Moment Static (kip-ft)	Moment Seismic* (kip-ft)	Moment Max. (kip-ft)	Control Case	Stem d (in)	Reinforcement Size #	Reinforcement @ Spacing (in)	As (in²/ft)	p	As check (in²/ft)		p_{max} check	
10.25	0.000	0.000	0.000	*SEISMIC*	11.69	5	12.00	0.310	0.0022	0.0000	OK	0.0160	OK
9.23	0.096	0.131	0.131	*SEISMIC*	11.69	5	12.00	0.310	0.0022	0.0033	OK	0.0160	OK
8.20	0.421	0.305	0.421	*STATIC*	11.69	5	12.00	0.310	0.0022	0.0107	OK	0.0160	OK
7.18	1.036	0.594	1.036	*STATIC*	11.69	5	12.00	0.310	0.0022	0.0263	OK	0.0160	OK
6.15	1.998	1.067	1.998	*STATIC*	11.69	5	12.00	0.310	0.0022	0.0508	OK	0.0160	OK
5.13	3.366	1.794	3.366	*STATIC*	11.69	5	12.00	0.310	0.0022	0.0858	OK	0.0160	OK
4.10	5.199	2.845	5.199	*STATIC*	11.69	5	12.00	0.310	0.0022	0.1329	OK	0.0160	OK
3.08	7.556	4.292	7.556	*STATIC*	11.69	5	12.00	0.310	0.0022	0.1939	OK	0.0160	OK
2.05	10.494	6.203	10.494	*STATIC*	11.69	5	12.00	0.310	0.0022	0.2707	OK	0.0160	OK
1.03	14.073	8.650	14.073	*STATIC*	11.56	7	12.00	0.600	0.0043	0.3693	OK	0.0160	OK
0.00	18.351	11.702	18.351	*STATIC*	11.56	7	12.00	0.600	0.0043	0.4625	OK	0.0160	OK

* Seismic is reduced by 4/3

$p_{max} = 0.75(.85B_1 f'c/fy)(87{,}000/(87000+fy))$

	Size	Spacing	
Wall Temp & Shrinkage Reinforceing:			
Inside Face:	4	9.00	in
Outside Face:	4	9.00	in
Footing Top Reinforcing	5	12.00	in
Footing Bottom Reinforcing:	5	12.00	in
Footing Longitudinal Reinforceing:			
Top Face	4	12.00	in
Bottom Face	4	12.00	in

QUANTITIES:

CONCRETE

Description	Volume
Wall	0.443
Wall Taper	0.000
Toe	0.086
Heel / Stem Area	0.164
Key (12x12)	0.037
	0.730 cubic yd / ft

REINFORCEMENT

Description	Size	Length (ft)	Number	Spacing (in)	Weight (lbs)
Wall Cap	4	2.083		12.00	1.39
Wall Outside Vertical	7	10.792		12.00	22.06
Wall Inside Vertical	5	10.792		12.00	11.26
Wall Temp and Shrinkage, Inside Face	4	1.000	15		10.02
Wall Temp and Shrinkage, Outside Fa	4	1.000	15		10.02
Footing, Transverse Top	5	6.250		12.00	6.52
Footing, Transverse Bottom	5	6.250		12.00	6.52
Footing, Longitudinal Top	4	12.000		12.00	8.02
Footing, Longitudinal Bottom	4	12.000		12.00	8.02
Key (12x12)	5	4.667		10.00	5.84
					89.66 lbs / ft

File	Spillway Wall, 13.33'.xls	Job No	00173-097-044	No.

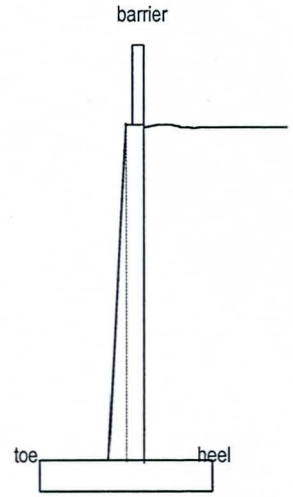
Computation

HDR

Project	48th street Detention Basin	Compute	BKV	Date	8/6/99
Subject	Spillway Retaining Wall	Checked		Date	
Task	13'-4" foot wall #3	Sheet	1	Of	8

GEOMETERY:

Wall Height	13.33	ft
Wall Thickness (top)	14.00	in
Wall Thickness (bottom)	14.00	in
Wall Cover	2.00	in
d	12.00	in
Toe Length	2.83	ft
Toe Thickness	16.00	in
Design Toe Cover	3.00	in
Soil Height on toe	0.00	ft
Heel Length	4.50	ft
Heel Thickness	16.00	in
Design Heel Cover	2.00	in
Total Footing Length	8.50	ft
Total Wall Height	14.67	ft
Barrier Width	0	in
Barrier Height	0	in



LOADING:

Surcharge	0.300	kips
Eq. soil height	3.00	ft
Barrier Weight	0.000	kips
Barrier Impact Load	0.000	kip/ft at top of wall
Barrier Impact Load Adjusted for Wall Height	0.000	kip/ft at base of wall

MATERIAL PROPERTIES:

f_y		60.000	ksi
E_s		2.90E+07	psi
f'_c		3.000	ksi
Unit weight of concrete		0.145	kip/ft^3
E_c	w_c^1.5 $33\sqrt{f'_c}$ =	3.16E+06	psi
f_c		1350	psi
f_s		20000	psi
n		9.189	
Unit weight of soil		0.100	kip/ft^3
Horizontial earthquake acceleration (kh)		0.040	g
Vertical earthquake acceleration (kv)		0.027	g
f		28.30	°
b		90.00	°
a		0.00	°
g		35.00	°
Coefficient of Sliding Friction (μ)		0.50	

$$K_a = \frac{\sin^2(b+f)}{(\sin^2(b)\cdot\sin(b-g))\left[1+\left(\frac{\sin(f+g)\cdot\sin(f-a)}{\sin(b-g)\cdot\sin(a+b)}\right)^{1/2}\right]^2} = 0.320$$

$$K_{ae} = K_a + 3/4\ k_h = 0.350$$

Computation

HDR

Project	48th street Detention Basin	Computed BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Overturning and Shear - Case 1	Sheet 2	Of 8

OVERTURNING:

Overturning Moment: (Mo) per foot of wall:

Cause	Force (kips)	Lever Arm (ft)	Moment (k-ft)	Load Factor	Factored Force (kips)	Factored Moment (k-ft)
Soil	3.444	4.889	16.840	1.69	5.821	28.459
Surcharge	1.409	7.333	10.333	2.17	3.059	22.434
Barrier Impact	0.000	14.667	0.000	2.17	0.000	0.000
Total per foot of wall	4.854	Mo =	27.173		8.880	50.893

Righting Moment: (Mr) per foot of wall

Cause	Force (kips)	Lever Arm (ft)	Moment (k-ft)	Load Factor	Factored Force (kips)	Factored Force (k-ft)
Footing	1.643	4.250	6.984	1.300	2.136	9.079
Wall Taper	0.000	2.833	0.000	1.300	0.000	0.000
Wall	2.256	3.417	7.706	1.300	2.932	10.018
Barrier	0.000	4.000	0.000	1.300	0.000	0.000
Surcharge	1.350	6.250	8.438	2.171	2.931	18.318
Soil	6.000	6.250	37.500	1.300	7.800	48.750
Total per foot of w Rv =	11.249	Mr =	60.628		15.799	86.166

Factor of Safety against Overturning: Mr / Mo 2.23 > 2.0 **OK**

SLIDING:

Forces Causing Sliding: (Vs)

Cause	Force (kips)
Soil	3.444
Surcharge	1.409
Total per foot of wall	4.854

Forces Resisting Sliding: (Vr)

Cause	Force (kips)
Footing	1.643
Wall Taper	0.000
Wall	2.256
Surcharge	1.350
Soil	6.000
Total per foot of wall	11.249

Factor of Safety against Sliding: μ Vr / Vs = 1.16 < 1.5 **KEY REQUIRED**

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Soil Pressures	Sheet 4	Of 8

FOOTING SOIL PRESSURES:

Resultant Vertical Force (Rv)		11,249 lbs	
Location of Resultant Force from the toe of the footing (x)	(Mr - Mo) / Rv =	2.97 feet	**OK - Inside middle 1/3**
Soil Pressure = -Rv / A ± Mc / I	Area for 1 foot strip, A =	8.50 ft²	
	I = 1/12 bh^3 =	51.18 ft^4	
	c = Footing width / 2 =	4.25 ft	
	M = Rv * (Footing width / 2 - x) =	14,353 lb•ft	
	-Rv / A =	-1,323 psf	
	M c / I =	1,192 psf	
Toe Pressure	-Rv / A - Mc / I =	-2,515 psf	
Heel Pressure	-Rv / A + Mc / I =	-131 psf	

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Stem Design, LFD	Sheet 5	Of 8

LATERIAL FORCES:

Cause		Force (kips)		Factor		Load (kips)		Lever Arm (ft)		Moment (kip•ft)
Static	Soil	2.847	x	1.700	=	4.839	x	4.444	=	21.508
	Surcharge	1.281	x	1.700	=	2.178	x	6.667	=	14.518
	Impact on Rail	0.000	x	1.700	=	0.000	x	13.333	=	0.000
	Total	4.128				7.017				36.026
Sesmic	Soil	3.030	x	1.700	=	5.152	x	6.667	=	34.344
	Soil Interia	0.240	x	1.700	=	0.408	x	6.667	=	2.720
	Barrier Interia	0.000	x	1.700	=	0.000	x	13.333	=	0.000
	Wall Interia	0.090	x	1.700	=	0.153	x	6.667	=	1.023
	Wall Taper Interia	0.000	x	1.700	=	0.000	x	4.444	=	0.000
	Total	3.361				5.713				38.086
	Reduced (3/4)	2.520				4.285				28.565

Design Shear and Moment 7.017 kips 36.026 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Stem Width - cover - 1/2 Bar diameter =	11.50 in			
ϕVc	$\phi 2 \sqrt{f'c}\, bd$ =	12.850 kips	7.0171 kips	**OK**	

DESIGN STEM FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	302.679		
p reg	$0.85 f'c / fy (1-\sqrt{(1-2 Rn / 0.85 f'c)})$ =	0.00539		
p min		0.00333		
4/3 *p* req		0.00718		
p used		0.00539		
As required	pbd =	0.743	in²	
Bar size		8		
Bar Spacing		12.00	in	
Bar diameter		1.000	in	
Bar Area		0.790	in²	
As provided		0.790	in²	**OK** 106%
Temp & Shrinkage steel:				
As required	0.0025 b t =	0.420	in²	
Inside Face				
Bar size		4		
Bar Spacing		9.00	in	
Bar diameter		0.500	in	
Bar Area		0.200	in²	
As provided		0.267	in²	
Outside Face				
Bar size		4		
Bar Spacing		9.00	in	
Bar diameter		0.500	in	
Bar Area		0.200	in²	
As provided		0.267	in²	
As Total		0.533	in²	**OK**

LATERIAL FORCES:

Cause		Force (kips)		Factor		Load (kips)
Static	Soil	6.000	x	1.400	=	8.400
	Surcharge	1.350	x	1.400	=	1.890
	Footing	0.870	x	1.400	=	1.218
	Total	8.220				11.508

Design Shear: 11.508 kips
Design Moment: Design Shear x Heel Length / 2 = 25.893 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Footing Depth - cover - 1/2 Bar diameter =	13.56 in				
ϕVc	$\phi 2 \sqrt{f'c}\, bd$ =	15.154 kips	>	11.508 kips	OK	132%

DESIGN HEEL FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	156.409			
p	$0.85\, f'c / fy\, (1-\sqrt{(1-2\, Rn / 0.85\, f'c)})$ =	0.00269			
p min		0.00333			
4/3 *p* req		0.00359			
p used		0.00333			
As required	pbd =	0.543	in^2		
Bar size		7			
Bar Spacing		12.00	in		
Bar diameter		0.875	in		
Bar Area		0.600	in^2		
As provided		0.600	in^2	OK	111%
l d provided		54.00	in	35.00 in	OK

Temp & Shrinkage steel:

As required	0.0025 b t =	0.480	in^2

Top Face

Bar size	5	
Bar Spacing	12.00	in
Bar diameter	0.625	in
Bar Area	0.310	in^2
As provided	0.310	in^2

Bottom Face

Bar size	5	
Bar Spacing	12.00	in
Bar diameter	0.625	in
Bar Area	0.310	in^2
As provided	0.310	in^2

As Total 0.620 in^2 OK

Computation

HDR

Project	48th street Detention Basin	Comput BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Toe Design, LFD	Sheet 7	Of 8

LATERIAL FORCES:

Using the soil pressures:

Soil pressure at the toe	2.515	kips
Soil Pressure at the front face of the wall	1.721	kips
Soil Pressure at the back face of wall	0.131	kips

Cause	Force (kips)		Factor		Load (kips)	Lever Arm (ft)	Moment (kip-ft)
Uniform portion of the pressure	7.127	x	1.700	=	12.115	1.42	17.164
Triangular portion	1.126	x	1.700	=	1.914	0.94	1.807
Total	8.252				14.029		18.971

Design Shear: 14.029 kips
Design Moment: 18.971 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Footing Depth - cover - 1/2 Bar diameter =	13.69	in				
ϕVc	$\phi 2 \sqrt{f'c}\, bd$ =	15.294	kips	>	14.029 kips	OK	109%

DESIGN TOE FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	83.204	
p	$0.85\, f'c / fy\, (1-\sqrt{(1-2\, Rn / 0.85\, f'c)})$ =	0.00141	
p min		0.00333	
4/3 *p* req		0.00188	
p used		0.00188	
As required	pbd =	0.309	in²
Bar size		5	
Bar Spacing		12.00	in
Bar diameter		0.625	in
Bar Area		0.310	in²
As provided		0.310	in²
l d provided		54.00	in

25.00 in — OK

OK — 100%

Temp & Shrinkage steel:

As required	0.0025 b t =	0.480	in²
Top Face			
Bar size		5	
Bar Spacing		12.00	in
Bar diameter		0.625	in
Bar Area		0.310	in²
As provided		0.310	in²
Bottom Face			
Bar size		5	
Bar Spacing		12.00	in
Bar diameter		0.625	in
Bar Area		0.310	in²
As provided		0.310	in²
As Total		0.620	in²

OK

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Summary ASD	Sheet 8	Of 8

VERTICAL WALL MOMENTS:

Height (ft)	Moment Static (kip-ft)	Moment Seismic* (kip-ft)	Moment Max. (kip-ft)	Control Case	Stem d (in)	Reinforcement Size #	Reinforcement @ Spacing (in)	As (in²/ft)	p	As check (in²/ft)		p_{max} check	
13.33	0.000	0.000	0.000	*SEISMIC*	11.69	5	12.00	0.310	0.0022	0.0000	OK	0.0160	OK
12.00	0.167	0.278	0.278	*SEISMIC*	11.63	6	12.00	0.440	0.0032	0.0071	OK	0.0160	OK
10.67	0.753	0.655	0.753	*STATIC*	11.63	6	12.00	0.440	0.0032	0.0192	OK	0.0160	OK
9.33	1.887	1.285	1.887	*STATIC*	11.63	6	12.00	0.440	0.0032	0.0483	OK	0.0160	OK
8.00	3.699	2.322	3.699	*STATIC*	11.63	6	12.00	0.440	0.0032	0.0949	OK	0.0160	OK
6.67	6.318	3.922	6.318	*STATIC*	11.63	6	12.00	0.440	0.0032	0.1627	OK	0.0160	OK
5.33	9.872	6.237	9.872	*STATIC*	11.63	6	12.00	0.440	0.0032	0.2558	OK	0.0160	OK
4.00	14.491	9.425	14.491	*STATIC*	11.63	6	12.00	0.440	0.0032	0.3784	OK	0.0160	OK
2.67	20.304	13.637	20.304	*STATIC*	11.50	8	12.00	0.790	0.0057	0.4600	OK	0.0160	OK
1.33	27.439	19.031	27.439	*STATIC*	11.50	8	12.00	0.790	0.0057	0.5566	OK	0.0160	OK
0.00	36.026	25.758	36.026	*STATIC*	11.50	8	12.00	0.790	0.0057	0.7433	OK	0.0160	OK

* Seismic is reduced by 4/3

$p_{max} = 0.75(.85B_1 f'c/fy)(87{,}000/(87000+fy))$

Wall Temp & Shrinkage Reinforceing:	Size	Spacing	
Inside Face:	4	9.00	in
Outside Face:	4	9.00	in
Footing Top Reinforcing	7	12.00	in
Footing Bottom Reinforcing:	5	12.00	in
Footing Longitudinal Reinforceing:			
Top Face	5	12.00	in
Bottom Face	5	12.00	in

QUANTITIES:

CONCRETE

Description	Volume
Wall	0.576
Wall Taper	0.000
Toe	0.140
Heel / Stem Area	0.280
Key (12x12)	0.037
	1.033 cubic yd / ft

REINFORCEMENT

Description	Size	Length (ft)	Number	Spacing (in)	Weight (lbs)
Wall Cap	4	2.083		12.00	1.39
Wall Outside Vertical	8	14.208		12.00	37.94
Wall Inside Vertical	5	14.208		12.00	14.82
Wall Temp and Shrinkage, Inside Face	4	1.000	19		12.69
Wall Temp and Shrinkage, Outside Fa	4	1.000	19		12.69
Footing, Transverse Top	7	8.000		12.00	16.35
Footing, Transverse Bottom	5	8.000		12.00	8.34
Footing, Longitudinal Top	5	12.000		12.00	12.52
Footing, Longitudinal Bottom	5	12.000		12.00	12.52
Key (12x12)	5	4.667		10.00	5.84
					135.10 lbs / ft

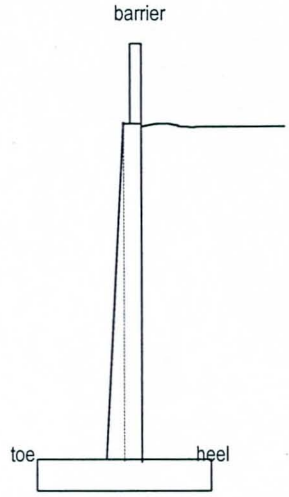
Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	15'-0" foot wall #4	Sheet 1	Of 8

GEOMETERY:

Wall Height	15.00	ft
Wall Thickness (top)	14.00	in
Wall Thickness (bottom)	14.00	in
Wall Cover	2.00	in
d	12.00	in
Toe Length	3.33	ft
Toe Thickness	16.00	in
Design Toe Cover	3.00	in
Soil Height on toe	0.00	ft
Heel Length	5.25	ft
Heel Thickness	16.00	in
Design Heel Cover	2.00	in
Total Footing Length	9.75	ft
Total Wall Height	16.33	ft
Barrier Width	0	in
Barrier Height	0	in



LOADING:

Surcharge	0.300	kips
Eq. soil height	3.00	ft
Barrier Weight	0.000	kips
Barrier Impact Load	0.000	kip/ft at top of wall
Barrier Impact Load Adjusted for Wall Height	0.000	kip/ft at base of wall

MATERIAL PROPERTIES:

f_y		60.000	ksi
E_s		2.90E+07	psi
f'_c		3.000	ksi
Unit weight of concrete		0.145	kip/ft^3
E_c	w_c^1.5 $33\sqrt{f'_c}$ =	3.16E+06	psi
f_c		1350	psi
f_s		20000	psi
n		9.189	
Unit weight of soil		0.100	kip/ft^3
Horizontial earthquake acceleration (kh)		0.040	g
Vertical earthquake acceleration (kv)		0.027	g
f		28.30	°
b		90.00	°
a		0.00	°
g		35.00	°
Coefficient of Sliding Friction (μ)		0.50	

$$Ka = \frac{\sin^2(b+f)}{(\sin^2(b) \cdot \sin(b-g)\left[1+\left(\frac{\sin(f+g)\cdot\sin(f-a)}{\sin(b-g)\cdot\sin(a+b)}\right)^{1/2}\right]^2} = 0.320$$

$$Kae = Ka + 3/4\ kh = 0.350$$

Computation

HDR

Project	48th street Detention Basin	Computed BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Overturning and Shear - Case 1	Sheet 2	Of 8

OVERTURNING:

Overturning Moment: (Mo) per foot of wall:

Cause	Force (kips)	Lever Arm (ft)	Moment (k-ft)	Load Factor	Factored Force (kips)	Factored Moment (k-ft)
Soil	4.272	5.444	23.258	1.69	7.219	39.305
Surcharge	1.569	8.167	12.815	2.17	3.407	27.822
Barrier Impact	0.000	16.333	0.000	2.17	0.000	0.000
Total per foot of wall	5.841	Mo =	36.073		10.626	67.128

Righting Moment: (Mr) per foot of wall

Cause	Force (kips)	Lever Arm (ft)	Moment (k-ft)	Load Factor	Factored Force (kips)	Factored Force (k-ft)
Footing	1.885	4.875	9.189	1.300	2.451	11.946
Wall Taper	0.000	3.333	0.000	1.300	0.000	0.000
Wall	2.538	3.917	9.939	1.300	3.299	12.920
Barrier	0.000	4.500	0.000	1.300	0.000	0.000
Surcharge	1.575	7.125	11.222	2.171	3.419	24.363
Soil	7.875	7.125	56.109	1.300	10.238	72.942
Total per foot of w Rv =	13.873	Mr =	86.459		19.406	122.171

Factor of Safety against Overturning: Mr / Mo 2.40 > 2.0 **OK**

SLIDING:

Forces Causing Sliding: (Vs)

Cause	Force (kips)
Soil	4.272
Surcharge	1.569
Total per foot of wall	5.841

Forces Resisting Sliding: (Vr)

Cause	Force (kips)
Footing	1.885
Wall Taper	0.000
Wall	2.538
Surcharge	1.575
Soil	7.875
Total per foot of wall	13.873

Factor of Safety against Sliding: μ Vr / Vs = 1.19 < 1.5 **KEY REQUIRED**

Computation

HDR

Project	48th street Detention Basin	Compute	BKV	Date	8/6/99
Subject	Spillway Retaining Wall	Checked		Date	
Task	Soil Pressures	Sheet	4	Of	8

FOOTING SOIL PRESSURES:

Resultant Vertical Force (Rv)		13,873	lbs	
Location of Resultant Force from the toe of the footing (x)	(Mr - Mo) / Rv =	3.63	feet	**OK - Inside middle 1/3**
Soil Pressure = -Rv / A ± Mc / I	Area for 1 foot strip, A =	9.75	ft²	
	I = 1/12 bh^3 =	77.24	ft^4	
	c = Footing width / 2 =	4.88	ft	
	M = Rv * (Footing width / 2 - x) =	17,242	lb•ft	
	-Rv / A =	-1,423	psf	
	M c / I =	1,088	psf	
Toe Pressure	-Rv / A - Mc / I =	-2,511	psf	
Heel Pressure	-Rv / A + Mc / I =	-335	psf	

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Stem Design, LFD	Sheet 5	Of 8

LATERIAL FORCES:

Cause		Force (kips)		Factor		Load (kips)		Lever Arm (ft)		Moment (kip•ft)
Static	Soil	3.603	x	1.700	=	6.125	x	5.000	=	30.624
	Surcharge	1.441	x	1.700	=	2.450	x	7.500	=	18.374
	Impact on Rail	0.000	x	1.700	=	0.000	x	15.000	=	0.000
	Total	5.044				8.575				48.998
Sesmic	Soil	3.835	x	1.700	=	6.520	x	7.500	=	48.899
	Soil Interia	0.315	x	1.700	=	0.536	x	7.500	=	4.016
	Barrier Interia	0.000	x	1.700	=	0.000	x	15.000	=	0.000
	Wall Interia	0.102	x	1.700	=	0.173	x	7.500	=	1.294
	Wall Taper Interia	0.000	x	1.700	=	0.000	x	5.000	=	0.000
	Total	4.252				7.228				54.210
	Reduced (3/4)	3.189				5.421				40.657

Design Shear and Moment 8.575 kips 48.998 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Stem Width - cover - 1/2 Bar diameter =	11.56 in			
ϕVc	$\phi 2\sqrt{f'c}\ bd$ =	12.919 kips	8.5747 kips	**OK**	

DESIGN STEM FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	407.227			
p reg	$0.85\ f'c / fy\ (1-\sqrt{(1-2\ Rn / 0.85\ f'c)})$ =	0.00744			
p min		0.00333			
4/3 *p* req		0.00992			
p used		0.00744			
As required	pbd =	1.032	in²		
Bar size		7			
Bar Spacing		6.00	in		
Bar diameter		0.875	in		
Bar Area		0.600	in²		
As provided		1.200	in²	**OK**	116%
Temp & Shrinkage steel:					
As required	0.0025 b t =	0.420	in²		
Inside Face					
Bar size		4			
Bar Spacing		9.00	in		
Bar diameter		0.500	in		
Bar Area		0.200	in²		
As provided		0.267	in²		
Outside Face					
Bar size		4			
Bar Spacing		9.00	in		
Bar diameter		0.500	in		
Bar Area		0.200	in²		
As provided		0.267	in²		
As Total		0.533	in²	**OK**	

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Heel Design, LFD Design	Sheet 6	Of 8

LATERIAL FORCES:

Cause		Force (kips)		Factor		Load (kips)
Static	Soil	7.875	x	1.400	=	11.025
	Surcharge	1.575	x	1.400	=	2.205
	Footing	1.015	x	1.400	=	1.421
	Total	10.465				14.651

Design Shear: 14.651 kips

Design Moment: Design Shear x Heel Length / 2 = 38.459 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Footing Depth - cover - 1/2 Bar diameter =	13.50 in				
ϕVc	$\phi 2 \sqrt{f'c}\, bd$ =	15.084 kips	>	14.651 kips	OK	103%

DESIGN HEEL FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	234.470			
p	$0.85\, f'c / fy\, (1-\sqrt{(1-2\, Rn / 0.85\, f'c)})$ =	0.00411			
p min		0.00333			
4/3 *p* req		0.00547			
p used		0.00411			
As required	pbd =	0.665 in²			
Bar size		8			
Bar Spacing		12.00 in			
Bar diameter		1.000 in			
Bar Area		0.790 in²			
As provided		0.790 in²			OK 119%
ld provided		63.00 in		40.00 in	OK

Temp & Shrinkage steel:

As required	0.0025 b t =	0.480 in²	
Top Face			
Bar size		5	
Bar Spacing		12.00 in	
Bar diameter		0.625 in	
Bar Area		0.310 in²	
As provided		0.310 in²	
Bottom Face			
Bar size		5	
Bar Spacing		12.00 in	
Bar diameter		0.625 in	
Bar Area		0.310 in²	
As provided		0.310 in²	
As Total		0.620 in²	OK

LATERIAL FORCES:

Using the soil pressures:

Soil pressure at the toe	2.511	kips
Soil Pressure at the front face of the wall	1.767	kips
Soil Pressure at the back face of wall	0.335	kips

Cause	Force (kips)		Factor		Load (kips)	Lever Arm (ft)	Moment (kip-ft)
Uniform portion of the pressure	8.370	x	1.700	=	14.230	1.67	23.716
Triangular portion	1.240	x	1.700	=	2.108	1.11	2.343
Total	9.610				16.338		26.058

Design Shear: 16.338 kips
Design Moment: 26.058 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Footing Depth - cover - 1/2 Bar diameter =	13.63	in				
ϕVc	$\phi 2 \sqrt{f'c}\, bd$ =	15.224	kips	<	16.338 kips	NO GOO	93%

DESIGN TOE FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	97.786	
p	$0.85 f'c / fy (1-\sqrt{(1-2 Rn / 0.85 f'c)})$ =	0.00166	
p min		0.00333	
4/3 *p* req		0.00222	
p used		0.00222	
As required	pbd =	0.362	in²
Bar size		6	
Bar Spacing		12.00	in
Bar diameter		0.750	in
Bar Area		0.440	in²
As provided		0.440	in²
l d provided		63.00 in	30.00 in

OK 121%

Temp & Shrinkage steel:

As required 0.0025 b t = 0.480 in²

Top Face

Bar size	5	
Bar Spacing	12.00	in
Bar diameter	0.625	in
Bar Area	0.310	in²
As provided	0.310	in²

Bottom Face

Bar size	5	
Bar Spacing	12.00	in
Bar diameter	0.625	in
Bar Area	0.310	in²
As provided	0.310	in²

As Total 0.620 in² OK

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Su[redacted]	Spillway Retaining Wall	Checked	Date
Task	Summary ASD	Sheet 8	Of 8

VERTICAL WALL MOMENTS:

Height (ft)	Moment Static (kip-ft)	Moment Seismic* (kip-ft)	Moment Max. (kip-ft)	Control Case	Stem d (in)	Reinforcement Size #	Reinforcement @ Spacing (in)	As (in²/ft)	p	As check (in²/ft)		p_{max} check	
15.00	0.000	0.000	0.000	*SEISMIC*	11.69	5	12.00	0.310	0.0022	0.0000	OK	0.0160	OK
13.50	0.214	0.395	0.395	*SEISMIC*	11.56	7	12.00	0.600	0.0043	0.0101	OK	0.0160	OK
12.00	0.980	0.931	0.980	*STATIC*	11.56	7	12.00	0.600	0.0043	0.0252	OK	0.0160	OK
10.50	2.481	1.827	2.481	*STATIC*	11.56	7	12.00	0.600	0.0043	0.0638	OK	0.0160	OK
9.00	4.900	3.303	4.900	*STATIC*	11.56	7	12.00	0.600	0.0043	0.1266	OK	0.0160	OK
7.50	8.422	5.580	8.422	*STATIC*	11.56	7	12.00	0.600	0.0043	0.2189	OK	0.0160	OK
6.00	13.230	8.878	13.230	*STATIC*	11.56	7	12.00	0.600	0.0043	0.3467	OK	0.0160	OK
4.50	19.508	13.416	19.508	*STATIC*	11.56	7	12.00	0.600	0.0043	0.4625	OK	0.0160	OK
3.00	27.439	19.415	27.439	*STATIC*	11.56	7	12.00	0.600	0.0043	0.5533	OK	0.0160	OK
1.50	37.208	27.095	37.208	*STATIC*	11.56	7	6.00	1.200	0.0086	0.7647	OK	0.0160	OK
0.00	48.998	36.676	48.998	*STATIC*	11.56	7	6.00	1.200	0.0086	1.0320	OK	0.0160	OK

* Seismic is reduced by 4/3

$p_{max} = 0.75(.85B_1 f'c/fy)(87{,}000/(87000+fy))$

Wall Temp & Shrinkage Reinforceing:	Size	Spacing	
Inside Face:	4	9.00	in
Outside Face:	4	9.00	in
Footing Top Reinforcing	8	12.00	in
Footing Bottom Reinforcing:	6	12.00	in
Footing Longitudinal Reinforceing:			
Top Face	5	12.00	in
Bottom Face	5	12.00	in

QUANTITIES:

CONCRETE

Description	Volume
Wall	0.648
Wall Taper	0.000
Toe	0.165
Heel / Stem Area	0.317
Key (12x12)	0.037
	1.167 cubic yd / ft

REINFORCEMENT

Description	Size	Length (ft)	Number	Spacing (in)	Weight (lbs)
Wall Cap	4	2.083		12.00	1.39
Wall Outside Vertical	7	15.875		10.91	35.69
Wall Inside Vertical	5	15.875		12.00	16.56
Wall Temp and Shrinkage, Inside Face	4	1.000	21		14.03
Wall Temp and Shrinkage, Outside Fa	4	1.000	21		14.03
Footing, Transverse Top	8	9.250		10.29	28.81
Footing, Transverse Bottom	6	9.250		10.29	16.21
Footing, Longitudinal Top	5	12.000		9.60	15.65
Footing, Longitudinal Bottom	5	12.000		9.00	16.69
Key (12x12)	5	5.111		7.00	9.14
					168.19 lbs / ft

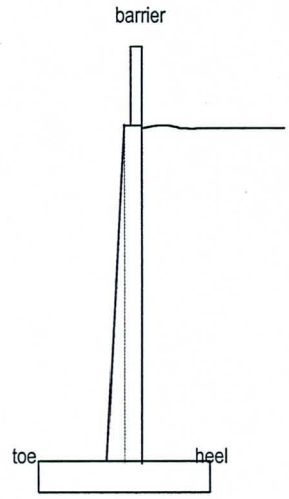
Computation

HDR

Project 48th street Detention Basin	Compute BKV	Date 8/6/99
Project Spillway Retaining Wall	Checked	Date
Task 17'-0" foot wall #4	Sheet 1	Of 8

GEOMETERY:

Wall Height	17.00	ft
Wall Thickness (top)	14.00	in
Wall Thickness (bottom)	14.00	in
Wall Cover	2.00	in
d	12.00	in
Toe Length	4.33	ft
Toe Thickness	24.00	in
Design Toe Cover	3.00	in
Soil Height on toe	0.00	ft
Heel Length	7.00	ft
Heel Thickness	24.00	in
Design Heel Cover	2.00	in
Total Footing Length	12.50	ft
Total Wall Height	19.00	ft
Barrier Width	0	in
Barrier Height	0	in



LOADING:

Surcharge	0.300	kips
Eq. soil height	3.00	ft
Barrier Weight	0.000	kips
Barrier Impact Load	0.000	kip/ft at top of wall
Barrier Impact Load Adjusted for Wall Height	0.000	kip/ft at base of wall

MATERIAL PROPERTIES:

f_y		60.000	ksi
E_s		2.90E+07	psi
f'_c		3.000	ksi
Unit weight of concrete		0.145	kip/ft^3
E_c	w_c^1.5 $33\sqrt{f'_c}$ =	3.16E+06	psi
f_c		1350	psi
f_s		20000	psi
n		9.189	
Unit weight of soil		0.100	kip/ft^3
Horizontial earthquake acceleration (kh)		0.040	g
Vertical earthquake acceleration (kv)		0.027	g
f		28.30	°
b		90.00	°
a		0.00	°
g		35.00	°
Coefficient of Sliding Friction (μ)		0.50	

$$K_a = \frac{\sin^2(b+f)}{\left(\sin^2(b)\cdot\sin(b-g)\right)\left[1+\left(\frac{\sin(f+g)\cdot\sin(f-a)}{\sin(b-g)\cdot\sin(a+b)}\right)^{1/2}\right]^2} = 0.320$$

$$K_{ae} = K_a + 3/4\ k_h = 0.350$$

Computation

HDR

Project	48th street Detention Basin	Computed BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Overturning and Shear - Case 1	Sheet 2	Of 8

OVERTURNING:

Overturning Moment: (Mo) per foot of wall:

Cause	Force (kips)	Lever Arm (ft)	Moment (k-ft)	Load Factor	Factored Force (kips)	Factored Moment (k-ft)
Soil	5.781	6.333	36.610	1.69	9.769	61.871
Surcharge	1.825	9.500	17.342	2.17	3.963	37.649
Barrier Impact	0.000	19.000	0.000	2.17	0.000	0.000
Total per foot of wall	7.606	Mo =	53.952		13.732	99.520

Righting Moment: (Mr) per foot of wall

Cause	Force (kips)	Lever Arm (ft)	Moment (k-ft)	Load Factor	Factored Force (kips)	Factored Force (k-ft)
Footing	3.625	6.250	22.656	1.300	4.713	29.453
Wall Taper	0.000	4.333	0.000	1.300	0.000	0.000
Wall	2.876	4.917	14.140	1.300	3.739	18.381
Barrier	0.000	5.500	0.000	1.300	0.000	0.000
Surcharge	2.100	9.000	18.900	2.171	4.559	41.032
Soil	11.900	9.000	107.100	1.300	15.470	139.230
Total per foot of w Rv =	20.501	Mr =	162.796		28.480	228.096

Factor of Safety against Overturning: Mr / Mo 3.02 > 2.0 **OK**

SLIDING:

Forces Causing Sliding: (Vs)

Cause	Force (kips)
Soil	5.781
Surcharge	1.825
Total per foot of wall	7.606

Forces Resisting Sliding: (Vr)

Cause	Force (kips)
Footing	3.625
Wall Taper	0.000
Wall	2.876
Surcharge	2.100
Soil	11.900
Total per foot of wall	20.501

Factor of Safety against Sliding: μ Vr / Vs = 1.35 < 1.5 **KEY REQUIRED**

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
[redacted]ect	Spillway Retaining Wall	Checked	Date
Task	Soil Pressures	Sheet 4	Of 8

FOOTING SOIL PRESSURES:

Resultant Vertical Force (Rv)		20,501	lbs	
Location of Resultant Force from the toe of the footing (x)	(Mr - Mo) / Rv =	5.31	feet	**OK - Inside middle 1/3**
Soil Pressure = -Rv / A ± Mc / I	Area for 1 foot strip, A =	12.50	ft²	
	I = 1/12 bh^3 =	162.76	ft^4	
	c = Footing width / 2 =	6.25	ft	
	M = Rv * (Footing width / 2 - x) =	19,286	lb•ft	
	-Rv / A =	-1,640	psf	
	M c / I =	741	psf	
Toe Pressure	-Rv / A - Mc / I =	-2,381	psf	
Heel Pressure	-Rv / A + Mc / I =	-899	psf	

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Stem Design, LFD	Sheet 5	Of 8

LATERIAL FORCES:

Cause		Force (kips)		Factor		Load (kips)		Lever Arm (ft)		Moment (kip•ft)
Static	Soil	4.628	x	1.700	=	7.867	x	5.667	=	44.580
	Surcharge	1.633	x	1.700	=	2.777	x	8.500	=	23.601
	Impact on Rail	0.000	x	1.700	=	0.000	x	17.000	=	0.000
	Total	6.261				10.644				68.180
Sesmic	Soil	4.926	x	1.700	=	8.374	x	8.500	=	71.183
	Soil Interia	0.476	x	1.700	=	0.809	x	8.500	=	6.878
	Barrier Interia	0.000	x	1.700	=	0.000	x	17.000	=	0.000
	Wall Interia	0.115	x	1.700	=	0.196	x	8.500	=	1.662
	Wall Taper Interia	0.000	x	1.700	=	0.000	x	5.667	=	0.000
	Total	5.517				9.379				79.724
	Reduced (3/4)	4.138				7.034				59.793

Design Shear and Moment 10.644 kips 68.180 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Stem Width - cover - 1/2 Bar diameter =	11.50 in			
ϕVc	$\phi 2 \sqrt{f'c}$ bd =	12.850 kips	10.644 kips	**OK**	

DESIGN STEM FOR MOMENT:

Rn	Mu / ϕbd² =	572.825		
p reg	0.85 f'c / fy (1-√(1-2 Rn / 0.85 f'c)) =	0.01096		
p min		0.00333		
4/3 *p* req		0.01461		
p used		0.01096		
As required	pbd =	1.513 in²		
Bar size		8		
Bar Spacing		6.00 in		
Bar diameter		1.000 in		
Bar Area		0.790 in²		
As provided		1.580 in²	**OK**	104%
Temp & Shrinkage steel:				
As required	0.0025 b t =	0.420 in²		
Inside Face				
Bar size		4		
Bar Spacing		9.00 in		
Bar diameter		0.500 in		
Bar Area		0.200 in²		
As provided		0.267 in²		
Outside Face				
Bar size		4		
Bar Spacing		9.00 in		
Bar diameter		0.500 in		
Bar Area		0.200 in²		
As provided		0.267 in²		
As Total		0.533 in²	**OK**	

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Subject	Spillway Retaining Wall	Checked	Date
Task	Heel Design, LFD Design	Sheet 6	Of 8

LATERIAL FORCES:

Cause		Force (kips)		Factor		Load (kips)
Static	Soil	11.900	x	1.400	=	16.660
	Surcharge	2.100	x	1.400	=	2.940
	Footing	2.030	x	1.400	=	2.842
	Total	16.030				22.442

Design Shear: 22.442 kips

Design Moment: Design Shear x Heel Length / 2 = 78.547 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Footing Depth - cover - 1/2 Bar diameter =	21.44 in				
ϕVc	$\phi 2 \sqrt{f'c}\, bd$ =	23.952 kips	>	22.442 kips	OK	107%

DESIGN HEEL FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	189.933				
p	$0.85 f'c / fy (1-\sqrt{(1-2 Rn / 0.85 f'c)})$ =	0.00329				
p min		0.00333				
4/3 *p* req		0.00439				
p used		0.00333				
As required	pbd =	0.857	in^2			
Bar size		9				
Bar Spacing		12.00	in			
Bar diameter		1.128	in			
Bar Area		1.000	in^2			
As provided		1.000	in^2		OK	117%
ld provided		84.00	in	45.12 in	OK	

Temp & Shrinkage steel:

As required	0.0025 b t =	0.720	in^2

Top Face

Bar size	6	
Bar Spacing	12.00	in
Bar diameter	0.750	in
Bar Area	0.440	in^2
As provided	0.440	in^2

Bottom Face

Bar size	6	
Bar Spacing	12.00	in
Bar diameter	0.750	in
Bar Area	0.440	in^2
As provided	0.440	in^2

As Total 0.880 in^2 OK

LATERIAL FORCES:

Using the soil pressures:

Soil pressure at the toe	2.381	kips
Soil Pressure at the front face of the wall	1.867	kips
Soil Pressure at the back face of wall	0.899	kips

Cause	Force (kips)		Factor		Load (kips)	Lever Arm (ft)	Moment (kip-ft)
Uniform portion of the pressure	10.316	x	1.700	=	17.537	2.17	37.998
Triangular portion	1.113	x	1.700	=	1.891	1.44	2.732
Total	11.429				19.429		40.730

Design Shear: 19.429 kips
Design Moment: 40.730 kip•ft

CHECK SHEAR AT BASE OF STEM:

d	Footing Depth - cover - 1/2 Bar diameter =	21.63	in				
ϕVc	$\phi 2 \sqrt{f'c}\, bd$ =	24.163	kips	>	19.429 kips	OK	124%

DESIGN TOE FOR MOMENT:

Rn	$Mu / \phi bd^2$ =	46.163	
p	$0.85\, f'c / fy\, (1-\sqrt{(1-2\, Rn / 0.85\, f'c)})$ =	0.00078	
p min		0.00333	
4/3 *p* req		0.00104	
p used		0.00104	
As required	pbd =	0.269	in²
Bar size		6	
Bar Spacing		12.00	in
Bar diameter		0.750	in
Bar Area		0.440	in²
As provided		0.440	in²
l d provided		84.00 in	30.00 in OK

Temp & Shrinkage steel:

As required	0.0025 b t =	0.720	in²
Top Face			
Bar size		6	
Bar Spacing		12.00	in
Bar diameter		0.750	in
Bar Area		0.440	in²
As provided		0.440	in²
Bottom Face			
Bar size		6	
Bar Spacing		12.00	in
Bar diameter		0.750	in
Bar Area		0.440	in²
As provided		0.440	in²
As Total		0.880	in² OK

Computation

HDR

Project	48th street Detention Basin	Compute BKV	Date 8/6/99
Su	Spillway Retaining Wall	Checked	Date
Task	Summary ASD	Sheet 8	Of 8

VERTICAL WALL MOMENTS:

Height (ft)	Moment Static (kip-ft)	Moment Seismic* (kip-ft)	Moment Max. (kip-ft)	Control Case	Stem d (in)	Reinforcement Size #	Reinforcement @ Spacing (in)	As (in²/ft)	p	As check (in²/ft)		p_{max} check	
17.00	0.000	0.000	0.000	*SEISMIC*	11.69	5	12.00	0.310	0.0022	0.0000	OK	0.0160	OK
15.30	0.281	0.630	0.630	*SEISMIC*	11.56	7	12.00	0.600	0.0043	0.0162	OK	0.0160	OK
13.60	1.301	1.452	1.452	*SEISMIC*	11.56	7	12.00	0.600	0.0043	0.0373	OK	0.0160	OK
11.90	3.328	2.787	3.328	*STATIC*	11.56	7	12.00	0.600	0.0043	0.0857	OK	0.0160	OK
10.20	6.629	4.954	6.629	*STATIC*	11.56	7	12.00	0.600	0.0043	0.1718	OK	0.0160	OK
8.50	11.473	8.275	11.473	*STATIC*	11.56	7	12.00	0.600	0.0043	0.2997	OK	0.0160	OK
6.80	18.126	13.069	18.126	*STATIC*	11.56	7	12.00	0.600	0.0043	0.4625	OK	0.0160	OK
5.10	26.855	19.657	26.855	*STATIC*	11.56	7	12.00	0.600	0.0043	0.5409	OK	0.0160	OK
3.40	37.929	28.360	37.929	*STATIC*	11.50	8	12.00	0.790	0.0057	0.7855	OK	0.0160	OK
1.70	51.615	39.497	51.615	*STATIC*	11.50	8	6.00	1.580	0.0114	1.1007	OK	0.0160	OK
0.00	68.180	53.389	68.180	*STATIC*	11.50	8	6.00	1.580	0.0114	1.5125	OK	0.0160	OK

* Seismic is reduced by 4/3

$p_{max} = 0.75(.85B_1 f'c/fy)(87{,}000/(87000+fy))$

Wall Temp & Shrinkage Reinforceing:	Size	Spacing	
Inside Face:	4	9.00	in
Outside Face:	4	9.00	in
Footing Top Reinforcing	9	12.00	in
Footing Bottom Reinforcing:	6	12.00	in
Footing Longitudinal Reinforceing:			
Top Face	6	12.00	in
Bottom Face	6	12.00	in

QUANTITIES:

CONCRETE

Description	Volume
Wall	0.735
Wall Taper	0.000
Toe	0.321
Heel / Stem Area	0.605
Key (12x12)	0.037
	1.698 cubic yd / ft

REINFORCEMENT

Description	Size	Length (ft)	Number	Spacing (in)	Weight (lbs)
Wall Cap	4	2.083		12.00	1.39
Wall Outside Vertical	8	18.542		10.91	54.46
Wall Inside Vertical	5	18.542		12.00	19.34
Wall Temp and Shrinkage, Inside Face	4	1.000	24		16.03
Wall Temp and Shrinkage, Outside Fa	4	1.000	24		16.03
Footing, Transverse Top	9	12.000		10.29	47.60
Footing, Transverse Bottom	6	12.000		10.29	21.03
Footing, Longitudinal Top	6	12.000		9.60	22.53
Footing, Longitudinal Bottom	6	12.000		9.00	24.03
Key (12x12)	5	5.111		7.00	9.14
					231.58 lbs / ft

File	Weir W-Section.xls	Job No.		No.	

Computation

Project	48th street Detention Basin	Computed	BKV	Date	8/6/99
Subj	Wier Structure	Checked		Date	
Task	W-Section Design	Sheet		Of	

Geometry:

Span	10.00	feet
Width of Support	4.00	feet

Loads:

Grating Load	10	psf
Live Load	50	psf
Beam Load	9	plf

Reactions:

End Reaction	280 lbs	1.4 w l / 2	from grating
	1700 lbs	1.7 w l / 2	from Live Load
	252 lbs	1.4 w l / 2	from beam
	2232 lbs	TOTAL	
Shear	2.232 kips	same as reactions for simple span	
Moment	0.700 k-ft	1.4 w l^2 / 8	from grating
	3.500 k-ft	1.7 w l^2 / 8	from Live Load
	0.630 k-ft	1.4 w l^2 / 8	from beam
	4.830 k-ft	TOTAL	
Delta	1458 /EI	1.4 w l^4 / 384 EI	from grating
	8854 /EI	1.7 w l^4 / 384 EI	from Live Load
	1313 /EI	1.4 w l^4 / 384 EI	from beam
	11625 /EI	TOTAL	
Delta Max	0.200 in	L/600	
Required EI	58125		
Required I	2.00 in^4	I = 29,00 ksi	

Solution:

Try W6x9

I =	110 in^4	
Unbraced Length =	10.00 feet	conservative
Design Moment =	4.830 k-ft	Moment
Design Shear =	2.232 kips	Shear
aximum Unbraced Length =	12.00 feet	OK
Permitted Moment =	10.800 k-ft	OK
Permitted Shear =	19.500 kips	OK

LARSA 98 For Windows

Version 5.0

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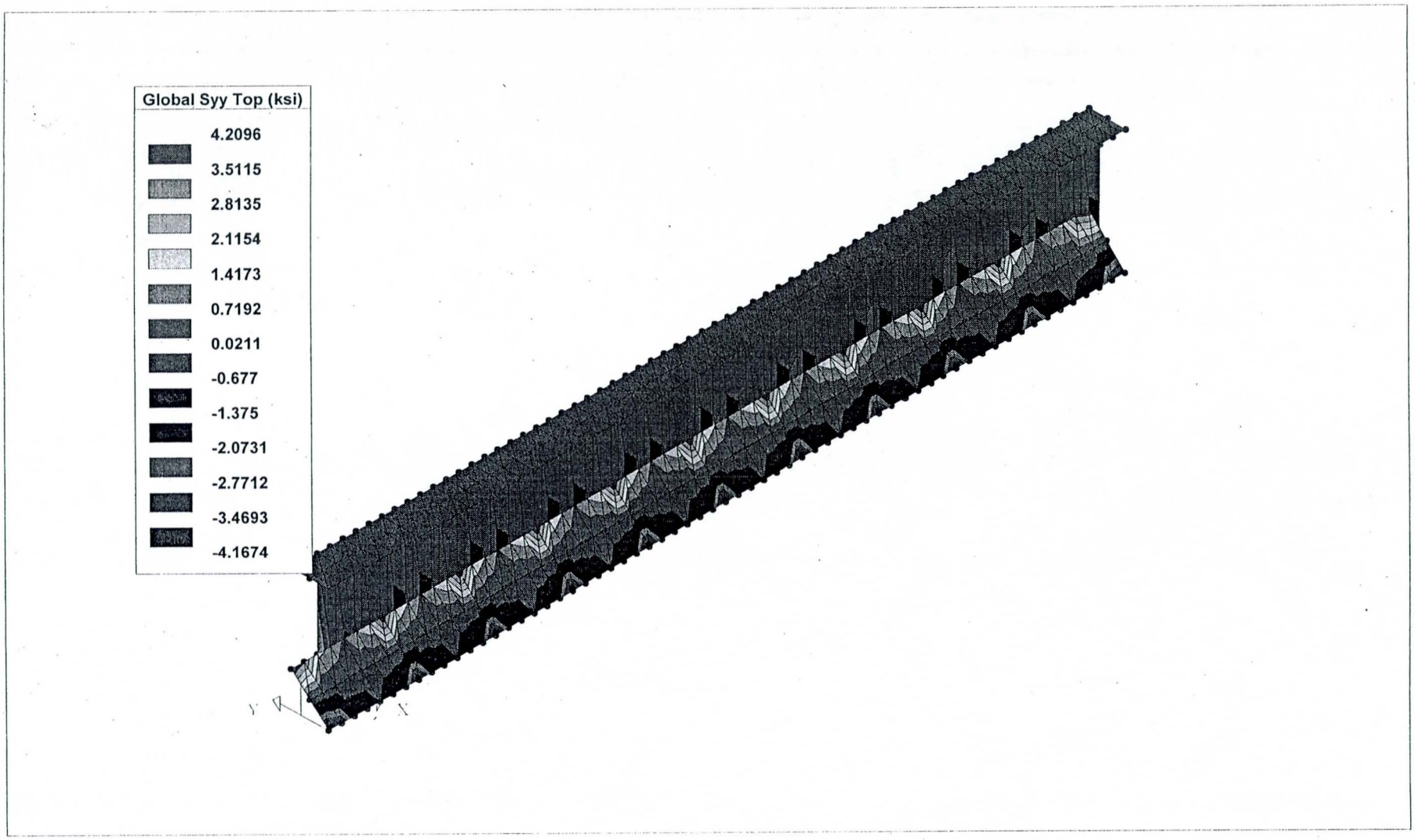
Model Size

Joints	378	Load Cases	1
Slaves	0	Load Combs	0
Members	0	Groups	0
Shells	308	Nonlinear Springs	0
Springs	0	Time History Curves	0
Sections	0	RSA Spectra Curves	0
Materials	1	User Coordinate Sys.	2
Lumped Masses	0	Default Constraints	1, 1, 1, 1, 1, 1

LD Case 1 All Loads->Global Syy Top (ksi)



LARSA 98 For Windows

Version 5.0

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Model Size

Joints	378	Load Cases	1
Slaves	0	Load Combs	0
Members	0	Groups	0
Shells	308	Nonlinear Springs	0
Springs	0	Time History Curves	0
Sections	0	RSA Spectra Curves	0
Materials	1	User Coordinate Sys.	2
Lumped Masses	0	Default Constraints	1, 1, 1, 1, 1, 1

48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Joint Data

Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
1	1	0.0000000	0.0000000	0.0000000	1	1	1	1	1	1	0
2	2	0.0000000	0.2350000	0.2350000	1	1	1	1	1	1	0
3	3	0.0000000	0.4700000	0.4700000	1	1	1	1	1	1	0
4	99	0.3300000	0.0000000	0.0000000	1	1	1	1	1	1	0
5	100	0.3300000	0.2350000	0.2350000	1	1	1	1	1	1	0
6	101	0.3300000	0.4700000	0.4700000	1	1	1	1	1	1	0
7	105	0.6600000	0.0000000	0.0000000	1	1	1	1	1	1	0
8	106	0.6600000	0.2350000	0.2350000	1	1	1	1	1	1	0
9	107	0.6600000	0.4700000	0.4700000	1	1	1	1	1	1	0
10	111	0.9900000	0.0000000	0.0000000	1	1	1	1	1	1	0
11	112	0.9900000	0.2350000	0.2350000	1	1	1	1	1	1	0
12	113	0.9900000	0.4700000	0.4700000	1	1	1	1	1	1	0
13	117	1.3200000	0.0000000	0.0000000	1	1	1	1	1	1	0
14	118	1.3200000	0.2350000	0.2350000	1	1	1	1	1	1	0
15	119	1.3200000	0.4700000	0.4700000	1	1	1	1	1	1	0
16	123	1.6500000	0.0000000	0.0000000	1	1	1	1	1	1	0
17	124	1.6500000	0.2350000	0.2350000	1	1	1	1	1	1	0
18	125	1.6500000	0.4700000	0.4700000	1	1	1	1	1	1	0
19	129	1.9800000	0.0000000	0.0000000	1	1	1	1	1	1	0
20	130	1.9800000	0.2350000	0.2350000	1	1	1	1	1	1	0
21	131	1.9800000	0.4700000	0.4700000	1	1	1	1	1	1	0
22	135	2.3100000	0.0000000	0.0000000	1	1	1	1	1	1	0
23	136	2.3100000	0.2350000	0.2350000	1	1	1	1	1	1	0
24	137	2.3100000	0.4700000	0.4700000	1	1	1	1	1	1	0
25	141	2.6400000	0.0000000	0.0000000	1	1	1	1	1	1	0
26	142	2.6400000	0.2350000	0.2350000	1	1	1	1	1	1	0
27	143	2.6400000	0.4700000	0.4700000	1	1	1	1	1	1	0
28	147	2.9700000	0.0000000	0.0000000	1	1	1	1	1	1	0
29	148	2.9700000	0.2350000	0.2350000	1	1	1	1	1	1	0
30	149	2.9700000	0.4700000	0.4700000	1	1	1	1	1	1	0

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
31	153	3.3000000	0.0000000	0.0000000	1	1	1	1	1	1	0
32	154	3.3000000	0.2350000	0.2350000	1	1	1	1	1	1	0
33	155	3.3000000	0.4700000	0.4700000	1	1	1	1	1	1	0
34	159	3.6300000	0.0000000	0.0000000	1	1	1	1	1	1	0
35	160	3.6300000	0.2350000	0.2350000	1	1	1	1	1	1	0
36	161	3.6300000	0.4700000	0.4700000	1	1	1	1	1	1	0
37	165	3.9600000	0.0000000	0.0000000	1	1	1	1	1	1	0
38	166	3.9600000	0.2350000	0.2350000	1	1	1	1	1	1	0
39	167	3.9600000	0.4700000	0.4700000	1	1	1	1	1	1	0
40	171	4.2900000	0.0000000	0.0000000	1	1	1	1	1	1	0
41	172	4.2900000	0.2350000	0.2350000	1	1	1	1	1	1	0
42	173	4.2900000	0.4700000	0.4700000	1	1	1	1	1	1	0
43	177	4.6200000	0.0000000	0.0000000	1	1	1	1	1	1	0
44	178	4.6200000	0.2350000	0.2350000	1	1	1	1	1	1	0
45	179	4.6200000	0.4700000	0.4700000	1	1	1	1	1	1	0
46	183	4.9500000	0.0000000	0.0000000	1	1	1	1	1	1	0
47	184	4.9500000	0.2350000	0.2350000	1	1	1	1	1	1	0
48	185	4.9500000	0.4700000	0.4700000	1	1	1	1	1	1	0
49	189	5.2800000	0.0000000	0.0000000	1	1	1	1	1	1	0
50	190	5.2800000	0.2350000	0.2350000	1	1	1	1	1	1	0
51	191	5.2800000	0.4700000	0.4700000	1	1	1	1	1	1	0
52	195	5.6100000	0.0000000	0.0000000	1	1	1	1	1	1	0
53	196	5.6100000	0.2350000	0.2350000	1	1	1	1	1	1	0
54	197	5.6100000	0.4700000	0.4700000	1	1	1	1	1	1	0
55	201	5.9400000	0.0000000	0.0000000	1	1	1	1	1	1	0
56	202	5.9400000	0.2350000	0.2350000	1	1	1	1	1	1	0
57	203	5.9400000	0.4700000	0.4700000	1	1	1	1	1	1	0
58	207	6.2700000	0.0000000	0.0000000	1	1	1	1	1	1	0
59	208	6.2700000	0.2350000	0.2350000	1	1	1	1	1	1	0
60	209	6.2700000	0.4700000	0.4700000	1	1	1	1	1	1	0
61	213	6.6000000	0.0000000	0.0000000	1	1	1	1	1	1	0
62	214	6.6000000	0.2350000	0.2350000	1	1	1	1	1	1	0
63	215	6.6000000	0.4700000	0.4700000	1	1	1	1	1	1	0

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
64	219	6.9300000	0.0000000	0.0000000	1	1	1	1	1	1	0
65	220	6.9300000	0.2350000	0.2350000	1	1	1	1	1	1	0
66	221	6.9300000	0.4700000	0.4700000	1	1	1	1	1	1	0
67	225	7.2600000	0.0000000	0.0000000	1	1	1	1	1	1	0
68	226	7.2600000	0.2350000	0.2350000	1	1	1	1	1	1	0
69	227	7.2600000	0.4700000	0.4700000	1	1	1	1	1	1	0
70	231	7.5900000	0.0000000	0.0000000	1	1	1	1	1	1	0
71	232	7.5900000	0.2350000	0.2350000	1	1	1	1	1	1	0
72	233	7.5900000	0.4700000	0.4700000	1	1	1	1	1	1	0
73	237	7.9200000	0.0000000	0.0000000	1	1	1	1	1	1	0
74	238	7.9200000	0.2350000	0.2350000	1	1	1	1	1	1	0
75	239	7.9200000	0.4700000	0.4700000	1	1	1	1	1	1	0
76	243	8.2500000	0.0000000	0.0000000	1	1	1	1	1	1	0
77	244	8.2500000	0.2350000	0.2350000	1	1	1	1	1	1	0
78	245	8.2500000	0.4700000	0.4700000	1	1	1	1	1	1	0
79	249	8.5800000	0.0000000	0.0000000	1	1	1	1	1	1	0
80	250	8.5800000	0.2350000	0.2350000	1	1	1	1	1	1	0
81	251	8.5800000	0.4700000	0.4700000	1	1	1	1	1	1	0
82	255	8.9100000	0.0000000	0.0000000	1	1	1	1	1	1	0
83	256	8.9100000	0.2350000	0.2350000	1	1	1	1	1	1	0
84	257	8.9100000	0.4700000	0.4700000	1	1	1	1	1	1	0
85	261	9.2400000	0.0000000	0.0000000	1	1	1	1	1	1	0
86	262	9.2400000	0.2350000	0.2350000	1	1	1	1	1	1	0
87	263	9.2400000	0.4700000	0.4700000	1	1	1	1	1	1	0
88	267	9.5700000	0.0000000	0.0000000	1	1	1	1	1	1	0
89	268	9.5700000	0.2350000	0.2350000	1	1	1	1	1	1	0
90	269	9.5700000	0.4700000	0.4700000	1	1	1	1	1	1	0
91	273	9.9000000	0.0000000	0.0000000	1	1	1	1	1	1	0
92	274	9.9000000	0.2350000	0.2350000	1	1	1	1	1	1	0
93	275	9.9000000	0.4700000	0.4700000	1	1	1	1	1	1	0
94	279	10.2300000	0.0000000	0.0000000	1	1	1	1	1	1	0
95	280	10.2300000	0.2350000	0.2350000	1	1	1	1	1	1	0
96	281	10.2300000	0.4700000	0.4700000	1	1	1	1	1	1	0

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
97	294	0.0000000	0.4700000	1.6000000	1	1	1	1	1	1	0
98	291	0.0000000	0.0000000	1.6000000	1	1	1	1	1	1	0
99	102	0.1650000	0.2350000	0.2350000	0	0	0	0	0	0	2
100	103	0.1650000	0.0000000	0.0000000	1	1	1	1	1	1	0
101	104	0.1650000	0.4700000	0.4700000	1	1	1	1	1	1	0
102	108	0.4950000	0.2350000	0.2350000	1	1	1	1	1	1	0
103	109	0.4950000	0.0000000	0.0000000	1	1	1	1	1	1	0
104	110	0.4950000	0.4700000	0.4700000	1	1	1	1	1	1	0
105	114	0.8250000	0.2350000	0.2350000	1	1	1	1	1	1	0
106	115	0.8250000	0.0000000	0.0000000	1	1	1	1	1	1	0
107	116	0.8250000	0.4700000	0.4700000	1	1	1	1	1	1	0
108	120	1.1550000	0.2350000	0.2350000	0	0	0	0	0	0	2
109	121	1.1550000	0.0000000	0.0000000	1	1	1	1	1	1	0
110	122	1.1550000	0.4700000	0.4700000	1	1	1	1	1	1	0
111	126	1.4850000	0.2350000	0.2350000	1	1	1	1	1	1	0
112	127	1.4850000	0.0000000	0.0000000	1	1	1	1	1	1	0
113	128	1.4850000	0.4700000	0.4700000	1	1	1	1	1	1	0
114	132	1.8150000	0.2350000	0.2350000	1	1	1	1	1	1	0
115	133	1.8150000	0.0000000	0.0000000	1	1	1	1	1	1	0
116	134	1.8150000	0.4700000	0.4700000	1	1	1	1	1	1	0
117	138	2.1450000	0.2350000	0.2350000	0	0	0	0	0	0	2
118	139	2.1450000	0.0000000	0.0000000	1	1	1	1	1	1	0
119	140	2.1450000	0.4700000	0.4700000	1	1	1	1	1	1	0
120	144	2.4750000	0.2350000	0.2350000	1	1	1	1	1	1	0
121	145	2.4750000	0.0000000	0.0000000	1	1	1	1	1	1	0
122	146	2.4750000	0.4700000	0.4700000	1	1	1	1	1	1	0
123	150	2.8050000	0.2350000	0.2350000	1	1	1	1	1	1	0
124	151	2.8050000	0.0000000	0.0000000	1	1	1	1	1	1	0
125	152	2.8050000	0.4700000	0.4700000	1	1	1	1	1	1	0
126	156	3.1350000	0.2350000	0.2350000	0	0	0	0	0	0	2
127	157	3.1350000	0.0000000	0.0000000	1	1	1	1	1	1	0
128	158	3.1350000	0.4700000	0.4700000	1	1	1	1	1	1	0
129	162	3.4650000	0.2350000	0.2350000	1	1	1	1	1	1	0

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
130	163	3.4650000	0.0000000	0.0000000	1	1	1	1	1	1	0
131	164	3.4650000	0.4700000	0.4700000	1	1	1	1	1	1	0
132	168	3.7950000	0.2350000	0.2350000	1	1	1	1	1	1	0
133	169	3.7950000	0.0000000	0.0000000	1	1	1	1	1	1	0
134	170	3.7950000	0.4700000	0.4700000	1	1	1	1	1	1	0
135	174	4.1250000	0.2350000	0.2350000	0	0	0	0	0	0	2
136	175	4.1250000	0.0000000	0.0000000	1	1	1	1	1	1	0
137	176	4.1250000	0.4700000	0.4700000	1	1	1	1	1	1	0
138	180	4.4550000	0.2350000	0.2350000	1	1	1	1	1	1	0
139	181	4.4550000	0.0000000	0.0000000	1	1	1	1	1	1	0
140	182	4.4550000	0.4700000	0.4700000	1	1	1	1	1	1	0
141	186	4.7850000	0.2350000	0.2350000	1	1	1	1	1	1	0
142	187	4.7850000	0.0000000	0.0000000	1	1	1	1	1	1	0
143	188	4.7850000	0.4700000	0.4700000	1	1	1	1	1	1	0
144	192	5.1150000	0.2350000	0.2350000	0	0	0	0	0	0	2
145	193	5.1150000	0.0000000	0.0000000	1	1	1	1	1	1	0
146	194	5.1150000	0.4700000	0.4700000	1	1	1	1	1	1	0
147	198	5.4450000	0.2350000	0.2350000	1	1	1	1	1	1	0
148	199	5.4450000	0.0000000	0.0000000	1	1	1	1	1	1	0
149	200	5.4450000	0.4700000	0.4700000	1	1	1	1	1	1	0
150	204	5.7750000	0.2350000	0.2350000	1	1	1	1	1	1	0
151	205	5.7750000	0.0000000	0.0000000	1	1	1	1	1	1	0
152	206	5.7750000	0.4700000	0.4700000	1	1	1	1	1	1	0
153	210	6.1050000	0.2350000	0.2350000	0	0	0	0	0	0	2
154	211	6.1050000	0.0000000	0.0000000	1	1	1	1	1	1	0
155	212	6.1050000	0.4700000	0.4700000	1	1	1	1	1	1	0
156	216	6.4350000	0.2350000	0.2350000	1	1	1	1	1	1	0
157	217	6.4350000	0.0000000	0.0000000	1	1	1	1	1	1	0
158	218	6.4350000	0.4700000	0.4700000	1	1	1	1	1	1	0
159	222	6.7650000	0.2350000	0.2350000	1	1	1	1	1	1	0
160	223	6.7650000	0.0000000	0.0000000	1	1	1	1	1	1	0
161	224	6.7650000	0.4700000	0.4700000	1	1	1	1	1	1	0
162	228	7.0950000	0.2350000	0.2350000	0	0	0	0	0	0	2

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
163	229	7.0950000	0.0000000	0.0000000	1	1	1	1	1	1	0
164	230	7.0950000	0.4700000	0.4700000	1	1	1	1	1	1	0
165	234	7.4250000	0.2350000	0.2350000	1	1	1	1	1	1	0
166	235	7.4250000	0.0000000	0.0000000	1	1	1	1	1	1	0
167	236	7.4250000	0.4700000	0.4700000	1	1	1	1	1	1	0
168	240	7.7550000	0.2350000	0.2350000	1	1	1	1	1	1	0
169	241	7.7550000	0.0000000	0.0000000	1	1	1	1	1	1	0
170	242	7.7550000	0.4700000	0.4700000	1	1	1	1	1	1	0
171	246	8.0850000	0.2350000	0.2350000	0	0	0	0	0	0	2
172	247	8.0850000	0.0000000	0.0000000	1	1	1	1	1	1	0
173	248	8.0850000	0.4700000	0.4700000	1	1	1	1	1	1	0
174	252	8.4150000	0.2350000	0.2350000	1	1	1	1	1	1	0
175	253	8.4150000	0.0000000	0.0000000	1	1	1	1	1	1	0
176	254	8.4150000	0.4700000	0.4700000	1	1	1	1	1	1	0
177	258	8.7450000	0.2350000	0.2350000	1	1	1	1	1	1	0
178	259	8.7450000	0.0000000	0.0000000	1	1	1	1	1	1	0
179	260	8.7450000	0.4700000	0.4700000	1	1	1	1	1	1	0
180	264	9.0750000	0.2350000	0.2350000	0	0	0	0	0	0	2
181	265	9.0750000	0.0000000	0.0000000	1	1	1	1	1	1	0
182	266	9.0750000	0.4700000	0.4700000	1	1	1	1	1	1	0
183	270	9.4050000	0.2350000	0.2350000	1	1	1	1	1	1	0
184	271	9.4050000	0.0000000	0.0000000	1	1	1	1	1	1	0
185	272	9.4050000	0.4700000	0.4700000	1	1	1	1	1	1	0
186	276	9.7350000	0.2350000	0.2350000	1	1	1	1	1	1	0
187	277	9.7350000	0.0000000	0.0000000	1	1	1	1	1	1	0
188	278	9.7350000	0.4700000	0.4700000	1	1	1	1	1	1	0
189	282	10.0650000	0.2350000	0.2350000	0	0	0	0	0	0	2
190	283	10.0650000	0.0000000	0.0000000	1	1	1	1	1	1	0
191	284	10.0650000	0.4700000	0.4700000	1	1	1	1	1	1	0
192	287	0.0000000	0.2350000	1.6000000	1	1	1	1	1	1	0
193	288	0.3300000	0.0000000	1.6000000	1	1	1	1	1	1	0
194	289	0.3300000	0.4700000	1.6000000	1	1	1	1	1	1	0
195	290	0.3300000	0.2350000	1.6000000	1	1	1	1	1	1	0

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
196	292	0.1650000	0.2350000	1.6000000	1	1	1	1	1	1	0
197	293	0.1650000	0.0000000	1.6000000	1	1	1	1	1	1	0
198	295	0.1650000	0.4700000	1.6000000	1	1	1	1	1	1	0
199	296	0.6600000	0.0000000	1.6000000	1	1	1	1	1	1	0
200	297	0.6600000	0.4700000	1.6000000	1	1	1	1	1	1	0
201	298	0.6600000	0.2350000	1.6000000	1	1	1	1	1	1	0
202	299	0.4950000	0.2350000	1.6000000	1	1	1	1	1	1	0
203	300	0.4950000	0.0000000	1.6000000	1	1	1	1	1	1	0
204	301	0.4950000	0.4700000	1.6000000	1	1	1	1	1	1	0
205	302	0.9900000	0.0000000	1.6000000	1	1	1	1	1	1	0
206	303	0.9900000	0.4700000	1.6000000	1	1	1	1	1	1	0
207	304	0.9900000	0.2350000	1.6000000	1	1	1	1	1	1	0
208	305	0.8250000	0.2350000	1.6000000	1	1	1	1	1	1	0
209	306	0.8250000	0.0000000	1.6000000	1	1	1	1	1	1	0
210	307	0.8250000	0.4700000	1.6000000	1	1	1	1	1	1	0
211	308	1.3200000	0.0000000	1.6000000	1	1	1	1	1	1	0
212	309	1.3200000	0.4700000	1.6000000	1	1	1	1	1	1	0
213	310	1.3200000	0.2350000	1.6000000	1	1	1	1	1	1	0
214	311	1.1550000	0.2350000	1.6000000	1	1	1	1	1	1	0
215	312	1.1550000	0.0000000	1.6000000	1	1	1	1	1	1	0
216	313	1.1550000	0.4700000	1.6000000	1	1	1	1	1	1	0
217	314	1.6500000	0.0000000	1.6000000	1	1	1	1	1	1	0
218	315	1.6500000	0.4700000	1.6000000	1	1	1	1	1	1	0
219	316	1.6500000	0.2350000	1.6000000	1	1	1	1	1	1	0
220	317	1.4850000	0.2350000	1.6000000	1	1	1	1	1	1	0
221	318	1.4850000	0.0000000	1.6000000	1	1	1	1	1	1	0
222	319	1.4850000	0.4700000	1.6000000	1	1	1	1	1	1	0
223	320	1.9800000	0.0000000	1.6000000	1	1	1	1	1	1	0
224	321	1.9800000	0.4700000	1.6000000	1	1	1	1	1	1	0
225	322	1.9800000	0.2350000	1.6000000	1	1	1	1	1	1	0
226	323	1.8150000	0.2350000	1.6000000	1	1	1	1	1	1	0
227	324	1.8150000	0.0000000	1.6000000	1	1	1	1	1	1	0
228	325	1.8150000	0.4700000	1.6000000	1	1	1	1	1	1	0

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
229	326	2.3100000	0.0000000	1.6000000	1	1	1	1	1	1	0
230	327	2.3100000	0.4700000	1.6000000	1	1	1	1	1	1	0
231	328	2.3100000	0.2350000	1.6000000	1	1	1	1	1	1	0
232	329	2.1450000	0.2350000	1.6000000	1	1	1	1	1	1	0
233	330	2.1450000	0.0000000	1.6000000	1	1	1	1	1	1	0
234	331	2.1450000	0.4700000	1.6000000	1	1	1	1	1	1	0
235	332	2.6400000	0.0000000	1.6000000	1	1	1	1	1	1	0
236	333	2.6400000	0.4700000	1.6000000	1	1	1	1	1	1	0
237	334	2.6400000	0.2350000	1.6000000	1	1	1	1	1	1	0
238	335	2.4750000	0.2350000	1.6000000	1	1	1	1	1	1	0
239	336	2.4750000	0.0000000	1.6000000	1	1	1	1	1	1	0
240	337	2.4750000	0.4700000	1.6000000	1	1	1	1	1	1	0
241	338	2.9700000	0.0000000	1.6000000	1	1	1	1	1	1	0
242	339	2.9700000	0.4700000	1.6000000	1	1	1	1	1	1	0
243	340	2.9700000	0.2350000	1.6000000	1	1	1	1	1	1	0
244	341	2.8050000	0.2350000	1.6000000	1	1	1	1	1	1	0
245	342	2.8050000	0.0000000	1.6000000	1	1	1	1	1	1	0
246	343	2.8050000	0.4700000	1.6000000	1	1	1	1	1	1	0
247	344	3.3000000	0.0000000	1.6000000	1	1	1	1	1	1	0
248	345	3.3000000	0.4700000	1.6000000	1	1	1	1	1	1	0
249	346	3.3000000	0.2350000	1.6000000	1	1	1	1	1	1	0
250	347	3.1350000	0.2350000	1.6000000	1	1	1	1	1	1	0
251	348	3.1350000	0.0000000	1.6000000	1	1	1	1	1	1	0
252	349	3.1350000	0.4700000	1.6000000	1	1	1	1	1	1	0
253	350	3.6300000	0.0000000	1.6000000	1	1	1	1	1	1	0
254	351	3.6300000	0.4700000	1.6000000	1	1	1	1	1	1	0
255	352	3.6300000	0.2350000	1.6000000	1	1	1	1	1	1	0
256	353	3.4650000	0.2350000	1.6000000	1	1	1	1	1	1	0
257	354	3.4650000	0.0000000	1.6000000	1	1	1	1	1	1	0
258	355	3.4650000	0.4700000	1.6000000	1	1	1	1	1	1	0
259	356	3.9600000	0.0000000	1.6000000	1	1	1	1	1	1	0
260	357	3.9600000	0.4700000	1.6000000	1	1	1	1	1	1	0
261	358	3.9600000	0.2350000	1.6000000	1	1	1	1	1	1	0

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
262	359	3.7950000	0.2350000	1.6000000	1	1	1	1	1	1	0
263	360	3.7950000	0.0000000	1.6000000	1	1	1	1	1	1	0
264	361	3.7950000	0.4700000	1.6000000	1	1	1	1	1	1	0
265	362	4.2900000	0.0000000	1.6000000	1	1	1	1	1	1	0
266	363	4.2900000	0.4700000	1.6000000	1	1	1	1	1	1	0
267	364	4.2900000	0.2350000	1.6000000	1	1	1	1	1	1	0
268	365	4.1250000	0.2350000	1.6000000	1	1	1	1	1	1	0
269	366	4.1250000	0.0000000	1.6000000	1	1	1	1	1	1	0
270	367	4.1250000	0.4700000	1.6000000	1	1	1	1	1	1	0
271	368	4.6200000	0.0000000	1.6000000	1	1	1	1	1	1	0
272	369	4.6200000	0.4700000	1.6000000	1	1	1	1	1	1	0
273	370	4.6200000	0.2350000	1.6000000	1	1	1	1	1	1	0
274	371	4.4550000	0.2350000	1.6000000	1	1	1	1	1	1	0
275	372	4.4550000	0.0000000	1.6000000	1	1	1	1	1	1	0
276	373	4.4550000	0.4700000	1.6000000	1	1	1	1	1	1	0
277	374	4.9500000	0.0000000	1.6000000	1	1	1	1	1	1	0
278	375	4.9500000	0.4700000	1.6000000	1	1	1	1	1	1	0
279	376	4.9500000	0.2350000	1.6000000	1	1	1	1	1	1	0
280	377	4.7850000	0.2350000	1.6000000	1	1	1	1	1	1	0
281	378	4.7850000	0.0000000	1.6000000	1	1	1	1	1	1	0
282	379	4.7850000	0.4700000	1.6000000	1	1	1	1	1	1	0
283	380	5.2800000	0.0000000	1.6000000	1	1	1	1	1	1	0
284	381	5.2800000	0.4700000	1.6000000	1	1	1	1	1	1	0
285	382	5.2800000	0.2350000	1.6000000	1	1	1	1	1	1	0
286	383	5.1150000	0.2350000	1.6000000	1	1	1	1	1	1	0
287	384	5.1150000	0.0000000	1.6000000	1	1	1	1	1	1	0
288	385	5.1150000	0.4700000	1.6000000	1	1	1	1	1	1	0
289	386	5.6100000	0.0000000	1.6000000	1	1	1	1	1	1	0
290	387	5.6100000	0.4700000	1.6000000	1	1	1	1	1	1	0
291	388	5.6100000	0.2350000	1.6000000	1	1	1	1	1	1	0
292	389	5.4450000	0.2350000	1.6000000	1	1	1	1	1	1	0
293	390	5.4450000	0.0000000	1.6000000	1	1	1	1	1	1	0
294	391	5.4450000	0.4700000	1.6000000	1	1	1	1	1	1	0

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
295	392	5.9400000	0.0000000	1.6000000	1	1	1	1	1	1	0
296	393	5.9400000	0.4700000	1.6000000	1	1	1	1	1	1	0
297	394	5.9400000	0.2350000	1.6000000	1	1	1	1	1	1	0
298	395	5.7750000	0.2350000	1.6000000	1	1	1	1	1	1	0
299	396	5.7750000	0.0000000	1.6000000	1	1	1	1	1	1	0
300	397	5.7750000	0.4700000	1.6000000	1	1	1	1	1	1	0
301	398	6.2700000	0.0000000	1.6000000	1	1	1	1	1	1	0
302	399	6.2700000	0.4700000	1.6000000	1	1	1	1	1	1	0
303	400	6.2700000	0.2350000	1.6000000	1	1	1	1	1	1	0
304	401	6.1050000	0.2350000	1.6000000	1	1	1	1	1	1	0
305	402	6.1050000	0.0000000	1.6000000	1	1	1	1	1	1	0
306	403	6.1050000	0.4700000	1.6000000	1	1	1	1	1	1	0
307	404	6.6000000	0.0000000	1.6000000	1	1	1	1	1	1	0
308	405	6.6000000	0.4700000	1.6000000	1	1	1	1	1	1	0
309	406	6.6000000	0.2350000	1.6000000	1	1	1	1	1	1	0
310	407	6.4350000	0.2350000	1.6000000	1	1	1	1	1	1	0
311	408	6.4350000	0.0000000	1.6000000	1	1	1	1	1	1	0
312	409	6.4350000	0.4700000	1.6000000	1	1	1	1	1	1	0
313	410	6.9300000	0.0000000	1.6000000	1	1	1	1	1	1	0
314	411	6.9300000	0.4700000	1.6000000	1	1	1	1	1	1	0
315	412	6.9300000	0.2350000	1.6000000	1	1	1	1	1	1	0
316	413	6.7650000	0.2350000	1.6000000	1	1	1	1	1	1	0
317	414	6.7650000	0.0000000	1.6000000	1	1	1	1	1	1	0
318	415	6.7650000	0.4700000	1.6000000	1	1	1	1	1	1	0
319	416	7.2600000	0.0000000	1.6000000	1	1	1	1	1	1	0
320	417	7.2600000	0.4700000	1.6000000	1	1	1	1	1	1	0
321	418	7.2600000	0.2350000	1.6000000	1	1	1	1	1	1	0
322	419	7.0950000	0.2350000	1.6000000	1	1	1	1	1	1	0
323	420	7.0950000	0.0000000	1.6000000	1	1	1	1	1	1	0
324	421	7.0950000	0.4700000	1.6000000	1	1	1	1	1	1	0
325	422	7.5900000	0.0000000	1.6000000	1	1	1	1	1	1	0
326	423	7.5900000	0.4700000	1.6000000	1	1	1	1	1	1	0
327	424	7.5900000	0.2350000	1.6000000	1	1	1	1	1	1	0

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
328	425	7.4250000	0.2350000	1.6000000	1	1	1	1	1	1	0
329	426	7.4250000	0.0000000	1.6000000	1	1	1	1	1	1	0
330	427	7.4250000	0.4700000	1.6000000	1	1	1	1	1	1	0
331	428	7.9200000	0.0000000	1.6000000	1	1	1	1	1	1	0
332	429	7.9200000	0.4700000	1.6000000	1	1	1	1	1	1	0
333	430	7.9200000	0.2350000	1.6000000	1	1	1	1	1	1	0
334	431	7.7550000	0.2350000	1.6000000	1	1	1	1	1	1	0
335	432	7.7550000	0.0000000	1.6000000	1	1	1	1	1	1	0
336	433	7.7550000	0.4700000	1.6000000	1	1	1	1	1	1	0
337	434	8.2500000	0.0000000	1.6000000	1	1	1	1	1	1	0
338	435	8.2500000	0.4700000	1.6000000	1	1	1	1	1	1	0
339	436	8.2500000	0.2350000	1.6000000	1	1	1	1	1	1	0
340	437	8.0850000	0.2350000	1.6000000	1	1	1	1	1	1	0
341	438	8.0850000	0.0000000	1.6000000	1	1	1	1	1	1	0
342	439	8.0850000	0.4700000	1.6000000	1	1	1	1	1	1	0
343	440	8.5800000	0.0000000	1.6000000	1	1	1	1	1	1	0
344	441	8.5800000	0.4700000	1.6000000	1	1	1	1	1	1	0
345	442	8.5800000	0.2350000	1.6000000	1	1	1	1	1	1	0
346	443	8.4150000	0.2350000	1.6000000	1	1	1	1	1	1	0
347	444	8.4150000	0.0000000	1.6000000	1	1	1	1	1	1	0
348	445	8.4150000	0.4700000	1.6000000	1	1	1	1	1	1	0
349	446	8.9100000	0.0000000	1.6000000	1	1	1	1	1	1	0
350	447	8.9100000	0.4700000	1.6000000	1	1	1	1	1	1	0
351	448	8.9100000	0.2350000	1.6000000	1	1	1	1	1	1	0
352	449	8.7450000	0.2350000	1.6000000	1	1	1	1	1	1	0
353	450	8.7450000	0.0000000	1.6000000	1	1	1	1	1	1	0
354	451	8.7450000	0.4700000	1.6000000	1	1	1	1	1	1	0
355	452	9.2400000	0.0000000	1.6000000	1	1	1	1	1	1	0
356	453	9.2400000	0.4700000	1.6000000	1	1	1	1	1	1	0
357	454	9.2400000	0.2350000	1.6000000	1	1	1	1	1	1	0
358	455	9.0750000	0.2350000	1.6000000	1	1	1	1	1	1	0
359	456	9.0750000	0.0000000	1.6000000	1	1	1	1	1	1	0
360	457	9.0750000	0.4700000	1.6000000	1	1	1	1	1	1	0

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Row No	Joint No	X - Coord ft	Y - Coord ft	Z - Coord ft	DOF XT	DOF YT	DOF ZT	DOF XR	DOF YR	DOF ZR	Jt Disp Coor Sys
361	458	9.5700000	0.0000000	1.6000000	1	1	1	1	1	1	0
362	459	9.5700000	0.4700000	1.6000000	1	1	1	1	1	1	0
363	460	9.5700000	0.2350000	1.6000000	1	1	1	1	1	1	0
364	461	9.4050000	0.2350000	1.6000000	1	1	1	1	1	1	0
365	462	9.4050000	0.0000000	1.6000000	1	1	1	1	1	1	0
366	463	9.4050000	0.4700000	1.6000000	1	1	1	1	1	1	0
367	464	9.9000000	0.0000000	1.6000000	1	1	1	1	1	1	0
368	465	9.9000000	0.4700000	1.6000000	1	1	1	1	1	1	0
369	466	9.9000000	0.2350000	1.6000000	1	1	1	1	1	1	0
370	467	9.7350000	0.2350000	1.6000000	1	1	1	1	1	1	0
371	468	9.7350000	0.0000000	1.6000000	1	1	1	1	1	1	0
372	469	9.7350000	0.4700000	1.6000000	1	1	1	1	1	1	0
373	470	10.2300000	0.0000000	1.6000000	1	1	1	1	1	1	0
374	471	10.2300000	0.4700000	1.6000000	1	1	1	1	1	1	0
375	472	10.2300000	0.2350000	1.6000000	1	1	1	1	1	1	0
376	473	10.0650000	0.2350000	1.6000000	1	1	1	1	1	1	0
377	474	10.0650000	0.0000000	1.6000000	1	1	1	1	1	1	0
378	475	10.0650000	0.4700000	1.6000000	1	1	1	1	1	1	0

Degrees Of Freedom: 0=restrained, 1=free
Joint displacement coordinate system may be attached to a joint

Material Property Data

Mat No	Youngs Mod ksi	Shear Mod ksi	Force Density k/in3	Exp Coeff /F*1.0E+6	Fy Yield ksi	Material Name
1	29,000.0000000	11,200.0000000	0.0002836	6.5000000	36.0000000	A36

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Young's modulus is mandatory.
Shear modulus is mandatory.
For non-zero shear area and shear modulus, secondary deflections due to shear are included.
Non-zero density is required if gravitational factors are specified and self-weight is to be considered.
Non-zero thermal coefficient of expansion is required for thermal loads.

Triangular and Quadrilateral Element Data

Row No	Shell No	Joint I	Joint J	Joint K	Joint L	Material No	Thickness in	Element Type
1	63	1	2	102	103	1	0.2500000	S
2	64	103	102	100	99	1	0.2500000	S
3	65	2	3	104	102	1	0.2500000	S
4	66	102	104	101	100	1	0.2500000	S
5	67	99	100	108	109	1	0.2500000	S
6	68	109	108	106	105	1	0.2500000	S
7	69	100	101	110	108	1	0.2500000	S
8	70	108	110	107	106	1	0.2500000	S
9	71	105	106	114	115	1	0.2500000	S
10	72	115	114	112	111	1	0.2500000	S
11	73	106	107	116	114	1	0.2500000	S
12	74	114	116	113	112	1	0.2500000	S
13	75	111	112	120	121	1	0.2500000	S
14	76	121	120	118	117	1	0.2500000	S
15	77	112	113	122	120	1	0.2500000	S
16	78	120	122	119	118	1	0.2500000	S
17	79	117	118	126	127	1	0.2500000	S
18	80	127	126	124	123	1	0.2500000	S
19	81	118	119	128	126	1	0.2500000	S
20	82	126	128	125	124	1	0.2500000	S
21	83	123	124	132	133	1	0.2500000	S
22	84	133	132	130	129	1	0.2500000	S
23	85	124	125	134	132	1	0.2500000	S

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Shell No	Joint I	Joint J	Joint K	Joint L	Material No	Thickness in	Element Type
24	86	132	134	131	130	1	0.2500000	S
25	87	129	130	138	139	1	0.2500000	S
26	88	139	138	136	135	1	0.2500000	S
27	89	130	131	140	138	1	0.2500000	S
28	90	138	140	137	136	1	0.2500000	S
29	91	135	136	144	145	1	0.2500000	S
30	92	145	144	142	141	1	0.2500000	S
31	93	136	137	146	144	1	0.2500000	S
32	94	144	146	143	142	1	0.2500000	S
33	95	141	142	150	151	1	0.2500000	S
34	96	151	150	148	147	1	0.2500000	S
35	97	142	143	152	150	1	0.2500000	S
36	98	150	152	149	148	1	0.2500000	S
37	99	147	148	156	157	1	0.2500000	S
38	100	157	156	154	153	1	0.2500000	S
39	101	148	149	158	156	1	0.2500000	S
40	102	156	158	155	154	1	0.2500000	S
41	103	153	154	162	163	1	0.2500000	S
42	104	163	162	160	159	1	0.2500000	S
43	105	154	155	164	162	1	0.2500000	S
44	106	162	164	161	160	1	0.2500000	S
45	107	159	160	168	169	1	0.2500000	S
46	108	169	168	166	165	1	0.2500000	S
47	109	160	161	170	168	1	0.2500000	S
48	110	168	170	167	166	1	0.2500000	S
49	111	165	166	174	175	1	0.2500000	S
50	112	175	174	172	171	1	0.2500000	S
51	113	166	167	176	174	1	0.2500000	S
52	114	174	176	173	172	1	0.2500000	S
53	115	171	172	180	181	1	0.2500000	S
54	116	181	180	178	177	1	0.2500000	S
55	117	172	173	182	180	1	0.2500000	S
56	118	180	182	179	178	1	0.2500000	S

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Row No	Shell No	Joint I	Joint J	Joint K	Joint L	Material No	Thickness in	Element Type
57	119	177	178	186	187	1	0.2500000	S
58	120	187	186	184	183	1	0.2500000	S
59	121	178	179	188	186	1	0.2500000	S
60	122	186	188	185	184	1	0.2500000	S
61	123	183	184	192	193	1	0.2500000	S
62	124	193	192	190	189	1	0.2500000	S
63	125	184	185	194	192	1	0.2500000	S
64	126	192	194	191	190	1	0.2500000	S
65	127	189	190	198	199	1	0.2500000	S
66	128	199	198	196	195	1	0.2500000	S
67	129	190	191	200	198	1	0.2500000	S
68	130	198	200	197	196	1	0.2500000	S
69	131	195	196	204	205	1	0.2500000	S
70	132	205	204	202	201	1	0.2500000	S
71	133	196	197	206	204	1	0.2500000	S
72	134	204	206	203	202	1	0.2500000	S
73	135	201	202	210	211	1	0.2500000	S
74	136	211	210	208	207	1	0.2500000	S
75	137	202	203	212	210	1	0.2500000	S
76	138	210	212	209	208	1	0.2500000	S
77	139	207	208	216	217	1	0.2500000	S
78	140	217	216	214	213	1	0.2500000	S
79	141	208	209	218	216	1	0.2500000	S
80	142	216	218	215	214	1	0.2500000	S
81	143	213	214	222	223	1	0.2500000	S
82	144	223	222	220	219	1	0.2500000	S
83	145	214	215	224	222	1	0.2500000	S
84	146	222	224	221	220	1	0.2500000	S
85	147	219	220	228	229	1	0.2500000	S
86	148	229	228	226	225	1	0.2500000	S
87	149	220	221	230	228	1	0.2500000	S
88	150	228	230	227	226	1	0.2500000	S
89	151	225	226	234	235	1	0.2500000	S

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Shell No	Joint I	Joint J	Joint K	Joint L	Material No	Thickness in.	Element Type
90	152	235	234	232	231	1	0.2500000	S
91	153	226	227	236	234	1	0.2500000	S
92	154	234	236	233	232	1	0.2500000	S
93	155	231	232	240	241	1	0.2500000	S
94	156	241	240	238	237	1	0.2500000	S
95	157	232	233	242	240	1	0.2500000	S
96	158	240	242	239	238	1	0.2500000	S
97	159	237	238	246	247	1	0.2500000	S
98	160	247	246	244	243	1	0.2500000	S
99	161	238	239	248	246	1	0.2500000	S
100	162	246	248	245	244	1	0.2500000	S
101	163	243	244	252	253	1	0.2500000	S
102	164	253	252	250	249	1	0.2500000	S
103	165	244	245	254	252	1	0.2500000	S
104	166	252	254	251	250	1	0.2500000	S
105	167	249	250	258	259	1	0.2500000	S
106	168	259	258	256	255	1	0.2500000	S
107	169	250	251	260	258	1	0.2500000	S
108	170	258	260	257	256	1	0.2500000	S
109	171	255	256	264	265	1	0.2500000	S
110	172	265	264	262	261	1	0.2500000	S
111	173	256	257	266	264	1	0.2500000	S
112	174	264	266	263	262	1	0.2500000	S
113	175	261	262	270	271	1	0.2500000	S
114	176	271	270	268	267	1	0.2500000	S
115	177	262	263	272	270	1	0.2500000	S
116	178	270	272	269	268	1	0.2500000	S
117	179	267	268	276	277	1	0.2500000	S
118	180	277	276	274	273	1	0.2500000	S
119	181	268	269	278	276	1	0.2500000	S
120	182	276	278	275	274	1	0.2500000	S
121	183	273	274	282	283	1	0.2500000	S
122	184	283	282	280	279	1	0.2500000	S

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Shell No	Joint I	Joint J	Joint K	Joint L	Material No	Thickness in	Element Type
123	185	274	275	284	282	1	0.2500000	S
124	186	282	284	281	280	1	0.2500000	S
125	188	291	287	292	293	1	0.2500000	S
126	189	293	292	290	288	1	0.2500000	S
127	190	287	294	295	292	1	0.2500000	S
128	191	292	295	289	290	1	0.2500000	S
129	192	288	290	299	300	1	0.2500000	S
130	193	300	299	298	296	1	0.2500000	S
131	194	290	289	301	299	1	0.2500000	S
132	195	299	301	297	298	1	0.2500000	S
133	196	296	298	305	306	1	0.2500000	S
134	197	306	305	304	302	1	0.2500000	S
135	198	298	297	307	305	1	0.2500000	S
136	199	305	307	303	304	1	0.2500000	S
137	200	302	304	311	312	1	0.2500000	S
138	201	312	311	310	308	1	0.2500000	S
139	202	304	303	313	311	1	0.2500000	S
140	203	311	313	309	310	1	0.2500000	S
141	204	308	310	317	318	1	0.2500000	S
142	205	318	317	316	314	1	0.2500000	S
143	206	310	309	319	317	1	0.2500000	S
144	207	317	319	315	316	1	0.2500000	S
145	208	314	316	323	324	1	0.2500000	S
146	209	324	323	322	320	1	0.2500000	S
147	210	316	315	325	323	1	0.2500000	S
148	211	323	325	321	322	1	0.2500000	S
149	212	320	322	329	330	1	0.2500000	S
150	213	330	329	328	326	1	0.2500000	S
151	214	322	321	331	329	1	0.2500000	S
152	215	329	331	327	328	1	0.2500000	S
153	216	326	328	335	336	1	0.2500000	S
154	217	336	335	334	332	1	0.2500000	S
155	218	328	327	337	335	1	0.2500000	S

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Shell No	Joint I	Joint J	Joint K	Joint L	Material No	Thickness in	Element Type
156	219	335	337	333	334	1	0.2500000	S
157	220	332	334	341	342	1	0.2500000	S
158	221	342	341	340	338	1	0.2500000	S
159	222	334	333	343	341	1	0.2500000	S
160	223	341	343	339	340	1	0.2500000	S
161	224	338	340	347	348	1	0.2500000	S
162	225	348	347	346	344	1	0.2500000	S
163	226	340	339	349	347	1	0.2500000	S
164	227	347	349	345	346	1	0.2500000	S
165	228	344	346	353	354	1	0.2500000	S
166	229	354	353	352	350	1	0.2500000	S
167	230	346	345	355	353	1	0.2500000	S
168	231	353	355	351	352	1	0.2500000	S
169	232	350	352	359	360	1	0.2500000	S
170	233	360	359	358	356	1	0.2500000	S
171	234	352	351	361	359	1	0.2500000	S
172	235	359	361	357	358	1	0.2500000	S
173	236	356	358	365	366	1	0.2500000	S
174	237	366	365	364	362	1	0.2500000	S
175	238	358	357	367	365	1	0.2500000	S
176	239	365	367	363	364	1	0.2500000	S
177	240	362	364	371	372	1	0.2500000	S
178	241	372	371	370	368	1	0.2500000	S
179	242	364	363	373	371	1	0.2500000	S
180	243	371	373	369	370	1	0.2500000	S
181	244	368	370	377	378	1	0.2500000	S
182	245	378	377	376	374	1	0.2500000	S
183	246	370	369	379	377	1	0.2500000	S
184	247	377	379	375	376	1	0.2500000	S
185	248	374	376	383	384	1	0.2500000	S
186	249	384	383	382	380	1	0.2500000	S
187	250	376	375	385	383	1	0.2500000	S
188	251	383	385	381	382	1	0.2500000	S

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Shell No	Joint I	Joint J	Joint K	Joint L	Material No	Thickness in	Element Type
189	252	380	382	389	390	1	0.2500000	S
190	253	390	389	388	386	1	0.2500000	S
191	254	382	381	391	389	1	0.2500000	S
192	255	389	391	387	388	1	0.2500000	S
193	256	386	388	395	396	1	0.2500000	S
194	257	396	395	394	392	1	0.2500000	S
195	258	388	387	397	395	1	0.2500000	S
196	259	395	397	393	394	1	0.2500000	S
197	260	392	394	401	402	1	0.2500000	S
198	261	402	401	400	398	1	0.2500000	S
199	262	394	393	403	401	1	0.2500000	S
200	263	401	403	399	400	1	0.2500000	S
201	264	398	400	407	408	1	0.2500000	S
202	265	408	407	406	404	1	0.2500000	S
203	266	400	399	409	407	1	0.2500000	S
204	267	407	409	405	406	1	0.2500000	S
205	268	404	406	413	414	1	0.2500000	S
206	269	414	413	412	410	1	0.2500000	S
207	270	406	405	415	413	1	0.2500000	S
208	271	413	415	411	412	1	0.2500000	S
209	272	410	412	419	420	1	0.2500000	S
210	273	420	419	418	416	1	0.2500000	S
211	274	412	411	421	419	1	0.2500000	S
212	275	419	421	417	418	1	0.2500000	S
213	276	416	418	425	426	1	0.2500000	S
214	277	426	425	424	422	1	0.2500000	S
215	278	418	417	427	425	1	0.2500000	S
216	279	425	427	423	424	1	0.2500000	S
217	280	422	424	431	432	1	0.2500000	S
218	281	432	431	430	428	1	0.2500000	S
219	282	424	423	433	431	1	0.2500000	S
220	283	431	433	429	430	1	0.2500000	S
221	284	428	430	437	438	1	0.2500000	S

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Row No	Shell No	Joint I	Joint J	Joint K	Joint L	Material No	Thickness in	Element Type
222	285	438	437	436	434	1	0.2500000	S
223	286	430	429	439	437	1	0.2500000	S
224	287	437	439	435	436	1	0.2500000	S
225	288	434	436	443	444	1	0.2500000	S
226	289	444	443	442	440	1	0.2500000	S
227	290	436	435	445	443	1	0.2500000	S
228	291	443	445	441	442	1	0.2500000	S
229	292	440	442	449	450	1	0.2500000	S
230	293	450	449	448	446	1	0.2500000	S
231	294	442	441	451	449	1	0.2500000	S
232	295	449	451	447	448	1	0.2500000	S
233	296	446	448	455	456	1	0.2500000	S
234	297	456	455	454	452	1	0.2500000	S
235	298	448	447	457	455	1	0.2500000	S
236	299	455	457	453	454	1	0.2500000	S
237	300	452	454	461	462	1	0.2500000	S
238	301	462	461	460	458	1	0.2500000	S
239	302	454	453	463	461	1	0.2500000	S
240	303	461	463	459	460	1	0.2500000	S
241	304	458	460	467	468	1	0.2500000	S
242	305	468	467	466	464	1	0.2500000	S
243	306	460	459	469	467	1	0.2500000	S
244	307	467	469	465	466	1	0.2500000	S
245	308	464	466	473	474	1	0.2500000	S
246	309	474	473	472	470	1	0.2500000	S
247	310	466	465	475	473	1	0.2500000	S
248	311	473	475	471	472	1	0.2500000	S
249	312	99	288	290	100	1	0.5000000	S
250	313	100	290	289	101	1	0.5000000	S
251	314	105	296	298	106	1	0.5000000	S
252	315	106	298	297	107	1	0.5000000	S
253	316	111	302	304	112	1	0.5000000	S
254	317	112	304	303	113	1	0.5000000	S

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Shell No	Joint I	Joint J	Joint K	Joint L	Material No	Thickness in	Element Type
255	318	117	308	310	118	1	0.5000000	S
256	319	118	310	309	119	1	0.5000000	S
257	320	123	314	316	124	1	0.5000000	S
258	321	124	316	315	125	1	0.5000000	S
259	322	129	320	322	130	1	0.5000000	S
260	323	130	322	321	131	1	0.5000000	S
261	324	135	326	328	136	1	0.5000000	S
262	325	136	328	327	137	1	0.5000000	S
263	326	141	332	334	142	1	0.5000000	S
264	327	142	334	333	143	1	0.5000000	S
265	328	147	338	340	148	1	0.5000000	S
266	329	148	340	339	149	1	0.5000000	S
267	330	153	344	346	154	1	0.5000000	S
268	331	154	346	345	155	1	0.5000000	S
269	332	159	350	352	160	1	0.5000000	S
270	333	160	352	351	161	1	0.5000000	S
271	334	165	356	358	166	1	0.5000000	S
272	335	166	358	357	167	1	0.5000000	S
273	336	171	362	364	172	1	0.5000000	S
274	337	172	364	363	173	1	0.5000000	S
275	338	177	368	370	178	1	0.5000000	S
276	339	178	370	369	179	1	0.5000000	S
277	340	183	374	376	184	1	0.5000000	S
278	341	184	376	375	185	1	0.5000000	S
279	342	189	380	382	190	1	0.5000000	S
280	343	190	382	381	191	1	0.5000000	S
281	344	195	386	388	196	1	0.5000000	S
282	345	196	388	387	197	1	0.5000000	S
283	346	201	392	394	202	1	0.5000000	S
284	347	202	394	393	203	1	0.5000000	S
285	348	207	398	400	208	1	0.5000000	S
286	349	208	400	399	209	1	0.5000000	S
287	350	213	404	406	214	1	0.5000000	S

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Row No	Shell No	Joint I	Joint J	Joint K	Joint L	Material No	Thickness in	Element Type
288	351	214	406	405	215	1	0.5000000	S
289	352	219	410	412	220	1	0.5000000	S
290	353	220	412	411	221	1	0.5000000	S
291	354	225	416	418	226	1	0.5000000	S
292	355	226	418	417	227	1	0.5000000	S
293	356	231	422	424	232	1	0.5000000	S
294	357	232	424	423	233	1	0.5000000	S
295	358	237	428	430	238	1	0.5000000	S
296	359	238	430	429	239	1	0.5000000	S
297	360	243	434	436	244	1	0.5000000	S
298	361	244	436	435	245	1	0.5000000	S
299	362	249	440	442	250	1	0.5000000	S
300	363	250	442	441	251	1	0.5000000	S
301	364	255	446	448	256	1	0.5000000	S
302	365	256	448	447	257	1	0.5000000	S
303	366	261	452	454	262	1	0.5000000	S
304	367	262	454	453	263	1	0.5000000	S
305	368	267	458	460	268	1	0.5000000	S
306	369	268	460	459	269	1	0.5000000	S
307	370	273	464	466	274	1	0.5000000	S
308	371	274	466	465	275	1	0.5000000	S

Valid Young's modulus, shear modulus and element thickness must be specified

Load Case 1 - Joint Load Data

Load Case Description: All Loads
Load Case Type..... Static Load
Load Case Status..... Active
Load Case Scale Factor..... 0
X - Gravitational Factor..... 0
Y - Gravitational Factor..... 0
Z - Gravitational Factor..... 0

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Version 5.0
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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Force kips	Y - Force kips	Z - Force kips	X - Mom k-ft	Y - Mom k-ft	Z - Mom k-ft
1	289	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
2	297	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
3	303	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
4	309	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
5	315	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
6	321	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
7	327	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
8	333	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
9	339	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
10	275	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
11	345	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
12	351	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
13	357	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
14	363	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
15	369	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
16	375	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
17	381	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
18	387	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
19	393	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
20	399	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
21	405	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
22	411	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
23	417	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
24	423	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
25	429	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
26	435	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
27	441	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
28	447	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
29	453	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
30	459	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
31	465	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
32	101	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
33	107	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Joint No	X - Force kips	Y - Force kips	Z - Force kips	X - Mom k-ft	Y - Mom k-ft	Z - Mom k-ft
34	113	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
35	119	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
36	125	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
37	131	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
38	137	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
39	143	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
40	149	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
41	155	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
42	161	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
43	167	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
44	173	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
45	179	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
46	185	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
47	191	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
48	197	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
49	203	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
50	209	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
51	215	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
52	221	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
53	227	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
54	233	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
55	239	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
56	245	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
57	251	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
58	257	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
59	263	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000
60	269	0.0000000	-0.0312000	0.0000000	0.0000000	0.0000000	0.0000000

Joint loads acting in directions other than global may be defined on joints with attached joint displacement coordinate systems

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Load Case 1 - Triangular and Quadrilateral Element Load Data

Load Case Description: All Loads
Load Case Type..... Static Load
Load Case Status..... Active
Load Case Scale Factor..... 0
X - Gravitational Factor..... 0
Y - Gravitational Factor..... 0
Z - Gravitational Factor..... 0

Row No	Shell No	Pressure k/ft2	Uniform Temperature F Deg	Temperature Gradient F Deg/ft
1	188	-0.2000000	0.0000000	0.0000000
2	189	-0.2000000	0.0000000	0.0000000
3	190	-0.2000000	0.0000000	0.0000000
4	191	-0.2000000	0.0000000	0.0000000
5	192	-0.2000000	0.0000000	0.0000000
6	193	-0.2000000	0.0000000	0.0000000
7	194	-0.2000000	0.0000000	0.0000000
8	195	-0.2000000	0.0000000	0.0000000
9	196	-0.2000000	0.0000000	0.0000000
10	197	-0.2000000	0.0000000	0.0000000
11	198	-0.2000000	0.0000000	0.0000000
12	199	-0.2000000	0.0000000	0.0000000
13	200	-0.2000000	0.0000000	0.0000000
14	201	-0.2000000	0.0000000	0.0000000
15	202	-0.2000000	0.0000000	0.0000000
16	203	-0.2000000	0.0000000	0.0000000
17	204	-0.2000000	0.0000000	0.0000000
18	205	-0.2000000	0.0000000	0.0000000
19	206	-0.2000000	0.0000000	0.0000000
20	207	-0.2000000	0.0000000	0.0000000
21	208	-0.2000000	0.0000000	0.0000000
22	209	-0.2000000	0.0000000	0.0000000
23	210	-0.2000000	0.0000000	0.0000000
24	211	-0.2000000	0.0000000	0.0000000
25	212	-0.2000000	0.0000000	0.0000000

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Shell No	Pressure k/ft2	Uniform Temperature F Deg	Temperature Gradient F Deg/ft
26	213	-0.2000000	0.0000000	0.0000000
27	214	-0.2000000	0.0000000	0.0000000
28	215	-0.2000000	0.0000000	0.0000000
29	216	-0.2000000	0.0000000	0.0000000
30	217	-0.2000000	0.0000000	0.0000000
31	218	-0.2000000	0.0000000	0.0000000
32	219	-0.2000000	0.0000000	0.0000000
33	220	-0.2000000	0.0000000	0.0000000
34	221	-0.2000000	0.0000000	0.0000000
35	222	-0.2000000	0.0000000	0.0000000
36	223	-0.2000000	0.0000000	0.0000000
37	224	-0.2000000	0.0000000	0.0000000
38	225	-0.2000000	0.0000000	0.0000000
39	226	-0.2000000	0.0000000	0.0000000
40	227	-0.2000000	0.0000000	0.0000000
41	228	-0.2000000	0.0000000	0.0000000
42	229	-0.2000000	0.0000000	0.0000000
43	230	-0.2000000	0.0000000	0.0000000
44	231	-0.2000000	0.0000000	0.0000000
45	232	-0.2000000	0.0000000	0.0000000
46	233	-0.2000000	0.0000000	0.0000000
47	234	-0.2000000	0.0000000	0.0000000
48	235	-0.2000000	0.0000000	0.0000000
49	236	-0.2000000	0.0000000	0.0000000
50	237	-0.2000000	0.0000000	0.0000000
51	238	-0.2000000	0.0000000	0.0000000
52	239	-0.2000000	0.0000000	0.0000000
53	240	-0.2000000	0.0000000	0.0000000
54	241	-0.2000000	0.0000000	0.0000000
55	242	-0.2000000	0.0000000	0.0000000
56	243	-0.2000000	0.0000000	0.0000000
57	244	-0.2000000	0.0000000	0.0000000
58	245	-0.2000000	0.0000000	0.0000000

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Row No	Shell No	Pressure k/ft2	Uniform Temperature F Deg	Temperature Gradient F Deg/ft
59	246	-0.2000000	0.0000000	0.0000000
60	247	-0.2000000	0.0000000	0.0000000
61	248	-0.2000000	0.0000000	0.0000000
62	249	-0.2000000	0.0000000	0.0000000
63	250	-0.2000000	0.0000000	0.0000000
64	251	-0.2000000	0.0000000	0.0000000
65	252	-0.2000000	0.0000000	0.0000000
66	253	-0.2000000	0.0000000	0.0000000
67	254	-0.2000000	0.0000000	0.0000000
68	255	-0.2000000	0.0000000	0.0000000
69	256	-0.2000000	0.0000000	0.0000000
70	257	-0.2000000	0.0000000	0.0000000
71	258	-0.2000000	0.0000000	0.0000000
72	259	-0.2000000	0.0000000	0.0000000
73	260	-0.2000000	0.0000000	0.0000000
74	261	-0.2000000	0.0000000	0.0000000
75	262	-0.2000000	0.0000000	0.0000000
76	263	-0.2000000	0.0000000	0.0000000
77	264	-0.2000000	0.0000000	0.0000000
78	265	-0.2000000	0.0000000	0.0000000
79	266	-0.2000000	0.0000000	0.0000000
80	267	-0.2000000	0.0000000	0.0000000
81	268	-0.2000000	0.0000000	0.0000000
82	269	-0.2000000	0.0000000	0.0000000
83	270	-0.2000000	0.0000000	0.0000000
84	271	-0.2000000	0.0000000	0.0000000
85	272	-0.2000000	0.0000000	0.0000000
86	273	-0.2000000	0.0000000	0.0000000
87	274	-0.2000000	0.0000000	0.0000000
88	275	-0.2000000	0.0000000	0.0000000
89	276	-0.2000000	0.0000000	0.0000000
90	277	-0.2000000	0.0000000	0.0000000
91	278	-0.2000000	0.0000000	0.0000000

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48st Retention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Weir Plates
Engineer: B.K. von Allworden

Row No	Shell No	Pressure k/ft2	Uniform Temperature F Deg	Temperature Gradient F Deg/ft
92	279	-0.2000000	0.0000000	0.0000000
93	280	-0.2000000	0.0000000	0.0000000
94	281	-0.2000000	0.0000000	0.0000000
95	282	-0.2000000	0.0000000	0.0000000
96	283	-0.2000000	0.0000000	0.0000000
97	284	-0.2000000	0.0000000	0.0000000
98	285	-0.2000000	0.0000000	0.0000000
99	286	-0.2000000	0.0000000	0.0000000
100	287	-0.2000000	0.0000000	0.0000000
101	288	-0.2000000	0.0000000	0.0000000
102	289	-0.2000000	0.0000000	0.0000000
103	290	-0.2000000	0.0000000	0.0000000
104	291	-0.2000000	0.0000000	0.0000000
105	292	-0.2000000	0.0000000	0.0000000
106	293	-0.2000000	0.0000000	0.0000000
107	294	-0.2000000	0.0000000	0.0000000
108	295	-0.2000000	0.0000000	0.0000000
109	296	-0.2000000	0.0000000	0.0000000
110	297	-0.2000000	0.0000000	0.0000000
111	298	-0.2000000	0.0000000	0.0000000
112	299	-0.2000000	0.0000000	0.0000000
113	300	-0.2000000	0.0000000	0.0000000
114	301	-0.2000000	0.0000000	0.0000000
115	302	-0.2000000	0.0000000	0.0000000
116	303	-0.2000000	0.0000000	0.0000000
117	304	-0.2000000	0.0000000	0.0000000
118	305	-0.2000000	0.0000000	0.0000000
119	306	-0.2000000	0.0000000	0.0000000
120	307	-0.2000000	0.0000000	0.0000000
121	308	-0.2000000	0.0000000	0.0000000
122	309	-0.2000000	0.0000000	0.0000000
123	310	-0.2000000	0.0000000	0.0000000
124	311	-0.2000000	0.0000000	0.0000000

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Weir Structure

Tuesday July 27 1999, 2:16 pm

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LARSA 98 For Windows

Version 5.0

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Model Size

Joints	378	Load Cases	1
Slaves	0	Load Combs	0
Members	0	Groups	0
Shells	308	Nonlinear Springs	0
Springs	0	Time History Curves	0
Sections	0	RSA Spectra Curves	0
Materials	1	User Coordinate Sys.	2
Lumped Masses	0	Default Constraints	1, 1, 1, 1, 1, 1

48st Detention Basin

Filename: D:\LARSAT~2\48ST\WEIR.TEL
Description: Wier Plates
Engineer: B.K. von Allworden

Support Reactions For Primary Load Cases

Row No	Joint No	LD Case No	X-Force kips	Y-Force kips	Z-Force kips	X-Moment k-ft	Y-Moment k-ft	Z-Moment k-ft
1	102	1	0.0167611	0.0856968	-0.0352113	-0.0971698	0.0019678	0.0000003
2	120	1	-0.0183056	0.2241603	-0.0602118	-0.1431728	0.0001242	0.0000000
3	138	1	-0.0043949	0.1973159	-0.0640384	-0.1443166	-0.0000298	0.0000000
4	156	1	-0.0016548	0.1973609	-0.0647254	-0.1452606	-0.0000249	0.0000000
5	174	1	-0.0007059	0.1981431	-0.0650816	-0.1458531	-0.0000131	0.0000000
6	192	1	0.0000000	0.1983180	-0.0651988	-0.1460545	0.0000000	0.0000000
7	210	1	0.0007059	0.1981431	-0.0650816	-0.1458531	0.0000131	0.0000000
8	228	1	0.0016548	0.1973609	-0.0647254	-0.1452606	0.0000249	0.0000000
9	246	1	0.0043949	0.1973159	-0.0640384	-0.1443166	0.0000298	0.0000000
10	264	1	0.0183056	0.2241603	-0.0602118	-0.1431728	-0.0001242	0.0000000
11	282	1	-0.0167611	0.0856968	-0.0352113	-0.0971698	-0.0019678	-0.0000003

Reactions are relative to the joint displacement coordinate system

< 1.0 OK

BKV

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