REVISED – 03-10-00 CITY & DCSD COMMENTS
REVISED – 04-07-00 CITY COMMENTS
REVISED – 04-25-00 CITY COMMENTS

HYDRAULICS / DETAILS

AVONDALE HEIGHTS

Phase Four – Plat Five

January 2000 97-7230M

STORM SEWER HYDRAULICS

Job Name: AVONDALE HEIGHTS PLAT FIVE Date: 12/17/99
Prepared by: JWS Checked by: RF Revised: 03/07/00
Job No: 7230 Sheet No: 2

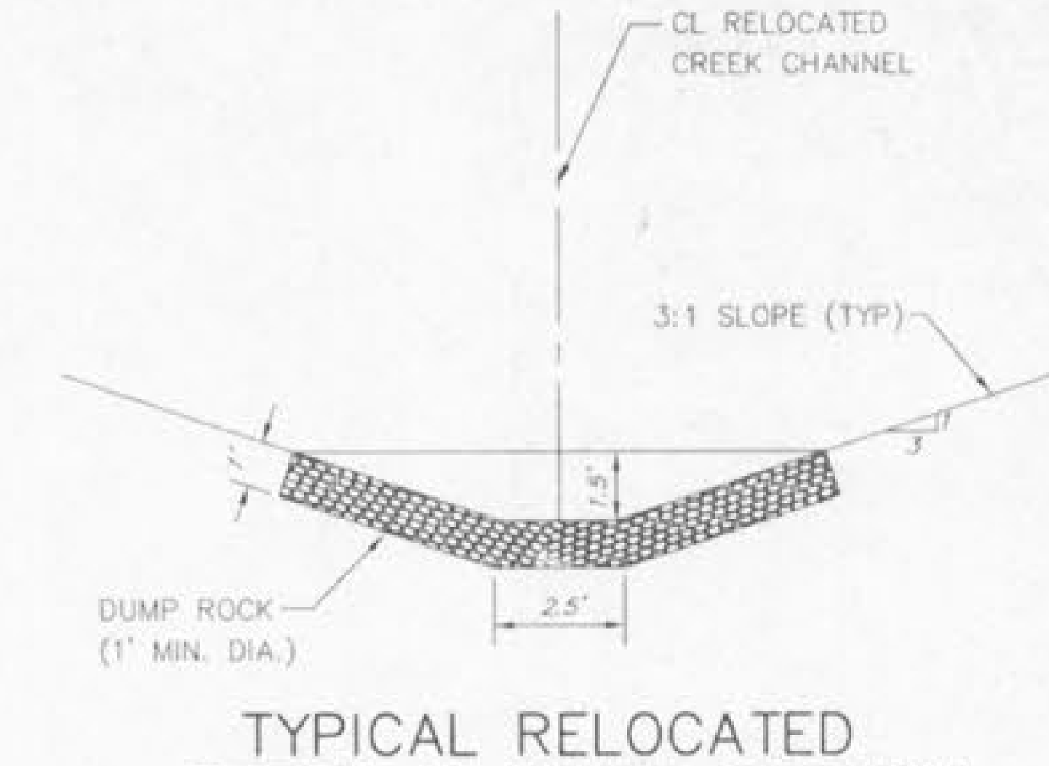
Upper Str. Type	Structr. Number Upr	Structr. Number Lowr	Len. in ft.	Q in c.f.s.	Total Q c.f.s.	Pipe Size in.	Const. Grade	V in f.p.s.	Vh in ft.	Q x Vh	Hyd. Grade	Flow Line Elevation Upper	Flow Line Elevation Lower	Top of Structure Elevation Upper	Top of Structure Elevation Lower	Free Board	Hydraulic Grade Line Upper	Hydraulic Grade Line Lower	Frict. Loss	Curve Loss ft.	Junc. Loss ft.	Entr. Loss ft.	Angle (5 ø)	Turn Loss ft.	Capacity c.f.s.	Q/Cap.	Normal Depth ft.
T	57	56	35	3.64	3.64	15	8.80%	2.97	0.14	0.50	0.32%	520.99	517.91	526.08	526.08	4.73	521.35	519.16	0.11		0.25	0.14			19.16	0.19	0.36
AI	56	52	105	1.58	5.22	15	4.00%	4.25	0.28	1.47	0.65%	517.71	513.51	526.08	522.00	6.92	518.26	515.50	0.69				75	0.20	12.92	0.40	0.55
T	55	54	97	2.67	2.67	12	1.00%	3.40	0.18	0.48	0.56%	519.49	518.52	524.00	523.92	3.87	520.13	519.52	0.54		0.02	0.18	15	0.03	3.56	0.75	0.64
CI	54	53	35	1.08	3.75	15	3.00%	3.06	0.14	0.54	0.34%	518.32	517.27	523.92	524.33	4.40	518.81	518.52	0.12		0.04		15	0.03	11.19	0.34	0.49
CI	53	52	142.36	0.29	4.04	15	2.50%	3.29	0.17	0.68	0.39%	517.07	513.51	524.33	522.00	5.81	517.61	515.50	0.56		0.35		15	0.20	10.22	0.40	0.54
AI	52	51	120.74	0.55	9.81	18	1.00%	5.55	0.48	4.69	0.87%	513.31	512.10	522.00	518.10	6.50	514.95	513.90	1.05		0.55		20	0.11	10.52	0.93	1.14
AI	51	50	224	2.75	12.56	18	3.90%	7.11	0.78	9.85	1.43%	511.90	503.16	518.10	508.30	4.20	512.74	504.98	3.20		0.65		40	0.34	20.75	0.61	0.84
AI	50	49	58	2.56	15.12	18	12.00%	8.56	1.14	17.19	2.07%	502.96	496.00	508.30		3.32	503.62	498.67	1.20						36.39	0.42	0.66
T	61	60	213	4.01	4.01	12	4.50%	5.11	0.40	1.62	1.27%	512.45	502.86	518.00	508.00	5.04	512.96	503.86	2.70			0.40	90	0.28	7.56	0.53	0.51
AI	60	47	195	1.21	5.22	15	1.00%	4.25	0.28	1.47	0.65%	502.66	500.71	508.00	508.50	4.14	503.51	501.93	1.27		1.99		90	0.22	6.46	0.81	0.85
T	48	47	178	2.43	2.43	12	6.00%	3.09	0.15	0.36	0.47%	511.39	500.71	515.74	508.50	3.99	511.75	503.28	0.83		1.99	0.15	15	0.22	8.73	0.28	0.36
AI	47	46	41	0.61	8.26	12	11.00%	10.52	1.72	14.19	5.37%	500.51	496.00	508.50		5.22	501.12	498.67	2.20						11.82	0.70	0.61
T	45	41	137	4.54	4.54	12	2.50%	5.78	0.52	2.36	1.62%	521.21	517.79	526.20	522.50	4.31	521.89	519.58	2.22			0.52	90	0.60	5.63	0.81	0.68
T	44	43	142	3.43	3.43	12	2.50%	4.37	0.30	1.02	0.93%	523.20	519.65	528.30	524.50	4.54	523.76	521.21	1.32		0.29	0.30			5.63	0.61	0.56
AI	43	42	106	2.67	6.10	15	1.00%	4.97	0.38	2.34	0.89%	519.45	518.39	524.50	523.50	3.29	520.92	519.97	0.95		0.07		15	0.07	6.46	0.94	0.96
AI	42	41	40	2.16	8.26	18	1.00%	4.67	0.34	2.80	0.62%	518.19	517.79	523.50	523.00	3.53	519.83	519.58	0.25		0.20		90	0.60	10.50	0.79	0.99
AI	41	40	130	4.22	17.02	24	1.00%	5.42	0.46	7.76	0.57%	517.59	516.29	523.00	523.90	3.42	519.03	518.29	0.74				40	0.20	22.62	0.75	1.28
MH	40	39	23		17.02	24	1.00%	5.42	0.46	7.76	0.57%	516.09	515.86	523.90	523.06	5.61	517.99	517.86	0.13		0.37		40	0.20	22.62	0.75	1.28
CI	39	38	35	3.43	20.45	24	1.00%	6.51	0.66	13.46	0.82%	515.66	515.31	523.06	523.06	5.20	517.60	517.31	0.29		0.48		5	0.04	22.62	0.90	1.48
CI	38	37	120	3.70	24.15	24	1.35%	7.69	0.92	22.16	1.14%	515.11	513.49	523.06		5.75	516.86	515.49	1.37						26.28	0.92	1.50
T	59	58	60	28.33	28.33	30	1.00%	5.77	0.52	14.65	0.48%	495.00	494.40	500.92		3.73	497.19	496.90	0.29			0.52			41.02	0.69	1.53
T	29	28	38	0.90	0.90	15	1.00%	0.73	0.01	0.01	0.02%	541.43	541.05	546.47	545.88	4.16	542.31	542.30	0.01		0.05	0.01	40	0.00	6.46	0.14	0.31
CI	28	27	29	1.08	1.98	15	1.00%	1.61	0.04	0.08	0.09%	540.85	540.56	545.88	545.80	3.58	541.84	541.81	0.03				35	0.02	6.46	0.31	0.46
MH	27	22	239		1.98	15	4.00%	1.61	0.04	0.08	0.09%	540.36	530.80	545.80	537.35	3.99	540.69	533.65	0.22				15	0.94	12.92	0.15	0.33
T	26	25	50	148.32	148.32	54	1.00%	9.33	1.35	200.30	0.57%	534.88	534.38		541.88		539.16	538.88	0.28			1.35	25	0.41	196.65	0.75	2.88
AI	25	24	160		148.32	54	1.00%	9.33	1.35	200.30	0.57%	534.18	532.58	541.88	542.00	3.00	537.99	537.08	0.91		0.13		60	0.74	196.65	0.75	2.88
AI	24	23	132	3.67	151.99	54	1.00%	9.56	1.42	215.54	0.60%	532.38	531.06	542.00	539.73	4.92	536.35	535.56	0.79		0.03		80	0.92	196.65	0.77	2.93
CI	23	22	114	0.92	152.91	54	1.50%	9.61	1.44	219.48	0.60%	530.86	529.15	539.73	537.35	4.17	534.34	533.65	0.69		0.11		80	0.94	240.85	0.63	2.57
CI	22	21	35.03	0.95	155.84	54	1.00%	9.80	1.49	232.34	0.63%	528.95	528.60	537.35	537.32	3.70	533.32	533.10	0.22		0.02		45	0.70	196.56	0.79	3.02
CI	21	20	45	0.45	156.29	54	3.11%	9.83	1.50	234.36	0.63%	528.40	527.00	537.32	534.59	4.22	531.78	531.50	0.28		0.04		50	0.75	346.86	0.45	2.12
CI	20	19	45	0.92	157.21	54	2.58%	9.88	1.52	238.52	0.64%	526.80	525.64	534.59	534.59	3.09	530.43	530.14	0.29		0.03		50	0.76	315.73	0.50	2.21
CI	19	18	89	0.84	158.05	54	8.36%	9.94	1.53	242.36	0.65%	525.44	518.00	534.59		4.45	527.06	523.04	0.57						568.57	0.28	1.62
T	33	32	110	1.45	1.45	12	1.00%	1.85	0.05	0.08	0.17%	535.18	534.08	539.74	539.00	4.12	535.62	535.08	0.18		0.09	0.05	70	0.03	3.56	0.41	0.44
AI	32	31	165	0.58	2.03	12	2.30%	2.58	0.10	0.21	0.32%	533.88	530.08	539.00	535.10	3.92	534.30	531.08	0.54		0.25		5	0.01	5.41	0.38	0.42
AI	31	30	66	1.16	3.19	12	18.00%	4.06	0.26	0.82	0.80%	529.88	518.00	535.10		4.02	530.19	523.04	0.53						15.12	0.21	0.31
T	340	339	137.79	1.95	1.95	15	4.23%	1.59	0.04	0.08	0.09%	543.96	538.13	550.10	544.38	5.83	544.27	539.38	0.13			0.04		0.32	13.29	0.15	0.31
T	36	35	154	5.28	5.28	15	1.90%	4.30	0.29	1.52	0.67%	543.93	541.00	549.00	549.60	4.38	544.62	542.25	1.03		0.34	0.29			8.91	0.59	0.69
AI	35	339	130	1.53	6.81	15	1.90%	5.55	0.48	3.26	1.11%	540.80	538.33	549.60	544.38	7.35	541.61	540.17	1.44		0.71		85	0.32	8.90	0.76	0.81
CI	339	337	139.57	0.53	9.29	15	3.11%	7.57	0.89	8.27	2.07%	538.13	533.79	544.38	540.38	4.21	538.98	535.04	2.89				85	0.60	11.39	0.82	0.85
T	34	337	20	2.27	2.27	18	2.00%	1.29	0.03	0.06	0.05%	534.39	533.99	540.90	540.38	5.58	535.32	535.31	0.01		0.15	0.03		0.60	14.86	0.15	0.39
CI	337	336	44	0.95	12.52	24	1.64%	7.08	0.78	9.76	1.42%	533.79	533.07	540.38	540.22	5.04	535.19	534.56	0.63						10.50	1.19	1.50
CI	336	335	110.04	1.00	13.52	24	1.18%	4.30	0.29	3.89	0.36%	532.87	531.57	540.22		5.79	534.15	533.57	0.39						22.62	0.60	1.10
T	16	7	267	2.53	2.53	12	2.30%	3.22	0.16	0.41	0.50%	527.41	521.27	532.50	528.86	4.61	527.89	525.52	1.35			0.16	90	0.40	5.40	0.47	0.48
T	15	7	25	3.19	3.19	12	19.90%	4.06	0.26	0.82	0.80%	526.25	521.27	531.60	528.20	5.05	526.55	525.52	0.20			0.26	10	0.40	15.90	0.20	0.30
T	14	11	80	3.67	3.67	12	1.70%	4.67	0.34	1.24	1.06%	530.85	529.49	535.90	535.90	3.31	532.59	531.74	0.85			0.34	90	0.24	4.65	0.79	0.67
T	13	12	36	26.06	26.06	27	5.50%	6.55	0.67	17.38	0.71%	534.94	532.96		540.50		535.86	535.21	0.25			0.67			72.63	0.36	0.92
AI	12	11	30		26.06	27	10.90%	6.55	0.67	17.38	0.71%	532.76	529.49	540.50	535.90	5.29	533.53	531.74	0.21		0.53			0.24	102.25	0.25	0.77
CI	11	10	127	1.93	31.66	27	1.50%	7.96	0.98	31.17	1.05%	529.29	527.38	535.90	534.51	4.16	530.96	529.63	1.33		0.27				37.98	0.83	1.55
CI	10	9	35	2.19	33.85	27	2.00%	8.51	1.13	38.10	1.19%	527.18	526.48	534.51	534.51	4.88	529.15	528.73	0.42		0.22				43.80	0.77	1.46
AI	9	8	143	1.69	35.54	27	2.70%	8.94	1.24	44.09	1.32%	526.28	522.42	534.51	529.66	5.78	527.69	525.81	1.88						50.88	0.70	1.37
AI	8	7	90.57	2.40	37.94	36	1.05%	5.37	0.45	16.97	0.32%	522.22	521.27	529.66	528.86	3.85	525.81	525.52	0.29		0.37		65	0.40	68.31	0.56	1.59
AI	7	6	126	2.75	46.41	36	1.00%	6.57	0.67	31.07	0.48%	521.07	519.81	528.86	528.18	3.34	524.75	524.14	0.61		0.11		85	0.45	66.70	0.70	1.83
CI	6	5	45	1.87	48.28	36	1.00%	6.83	0.72	34.97	0.52%	519.61	519.16	528.18	528.18	4.04	523.59	523.35	0.24		0.05				66.70	0.72	1.89
CI	5	4	47	0.90	49.18	36	2.04%	6.96	0.75	36.97	0.54%	518.96	518.00	528.18		4.83	523.30	523.04	0.26				25	0.23	95.32	0.52	1.50
T	3	2	61	214.43	214.43	60	1.00%	10.92	1.85	397.11	0.68%	517.06	516.45	525.92	523.20	4.06	521.86	521.45	0.41			1.85	80	1.20	260.44	0.82	3.45
MH	2	1	16		214.43	60	1.00%	10.92	1.85	397.11	0.68%	516.25	516.09	523.20		1.75	521.20	521.09	0.11						260.44	0.82	3.45

NOTE: AI=Area Inlet, M=Manhole, T=Terminal Structure, CI=Curb Inlet, DCI= Double Curb Inlet, SCI=Skewed Curb Inlet, TP=Tangent Point, EP= End of Pipe, DS=Outfall Structure
n=0.013 For RCP, 0.024 For CMP. For Drainage Areas, P.I. & Bypass, See Drainage Area Map.

TYPICAL YARD SWALE

Maximum Discharge (Q) = 4.00 cfs
Maximum Velocity (V) = 4.00 ft/sec
N = 0.030 (grass)
Maximum side slopes = 3 (horizontal) :1 (vertical)

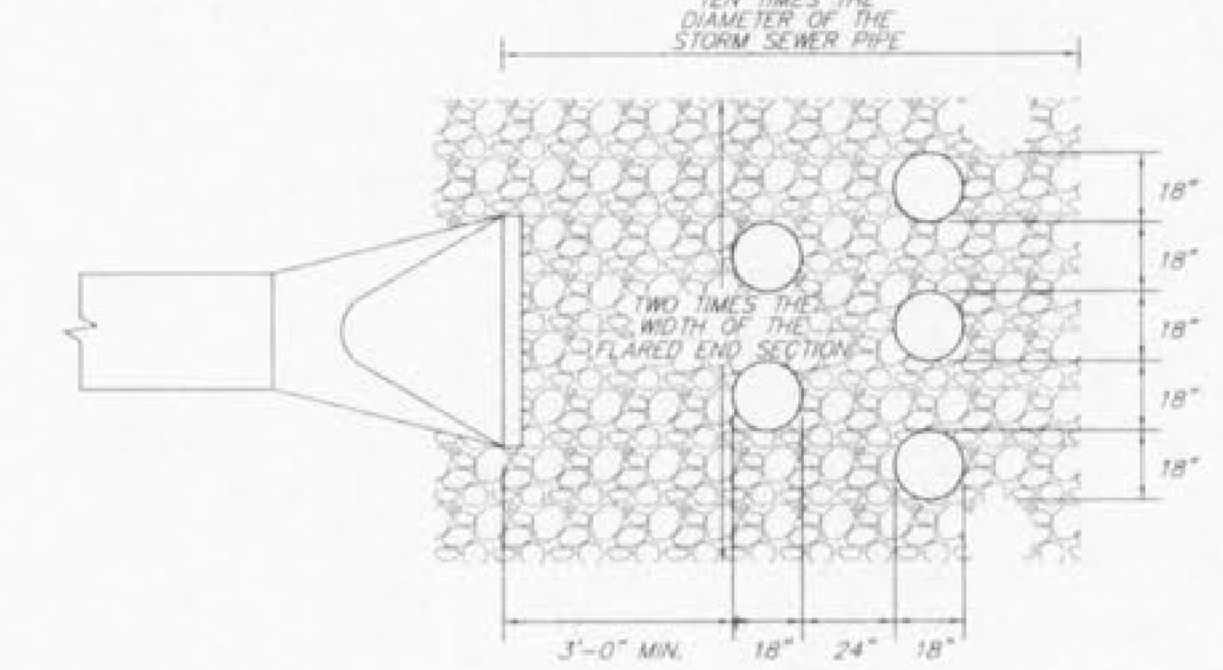
Longitudinal Slope (%)	Discharge (cfs)	Velocity (ft/sec)	Depth (ft)
0.5	4	1.89481682	0.838852789
1.0	4	2.4572734	0.736618511
2.0	4	3.118668934	0.646843926
3.0	4	3.71000035	0.599490621
4.0	3.51071886	4	0.54088807
5.0	2.51206592	4	0.457535601
6.0	1.91099329	4	0.399060698
7.0	1.516488	4	0.355491209
8.0	1.24122656	4	0.321613971
9.0	1.04021299	4	0.294422173
10.0	0.888149422	4	0.242052296

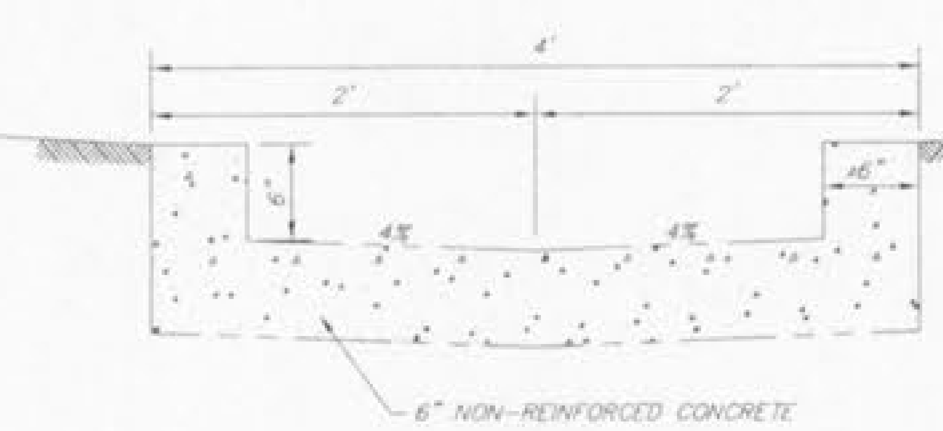


TYPICAL RELOCATED CREEK CHANNEL SECTION

NO SCALE

Structure	Street Grade	Capacity	Inflow	Bypass
CI 5	Low	4.00	1.72	–
CI 6	Low	4.00	0.90	–
CI 10	Low	4.00	1.69	–
CI 11	Low	4.00	2.19	–
CI 16	2%	1.90	0.16	–
CI 19	5%	0.85	0.84	–
CI 20	5%	0.85	0.16	–
CI 21	2%	1.90	0.45	–
CI 22	2%	1.90	0.34	–
CI 23	2%	1.90	0.58	–
CI 28	4%	1.25	1.08	–
CI 29	4%	1.25	0.90	–
CI 53	4%	1.25	0.29	–
CI 54	4%	1.25	1.08	–

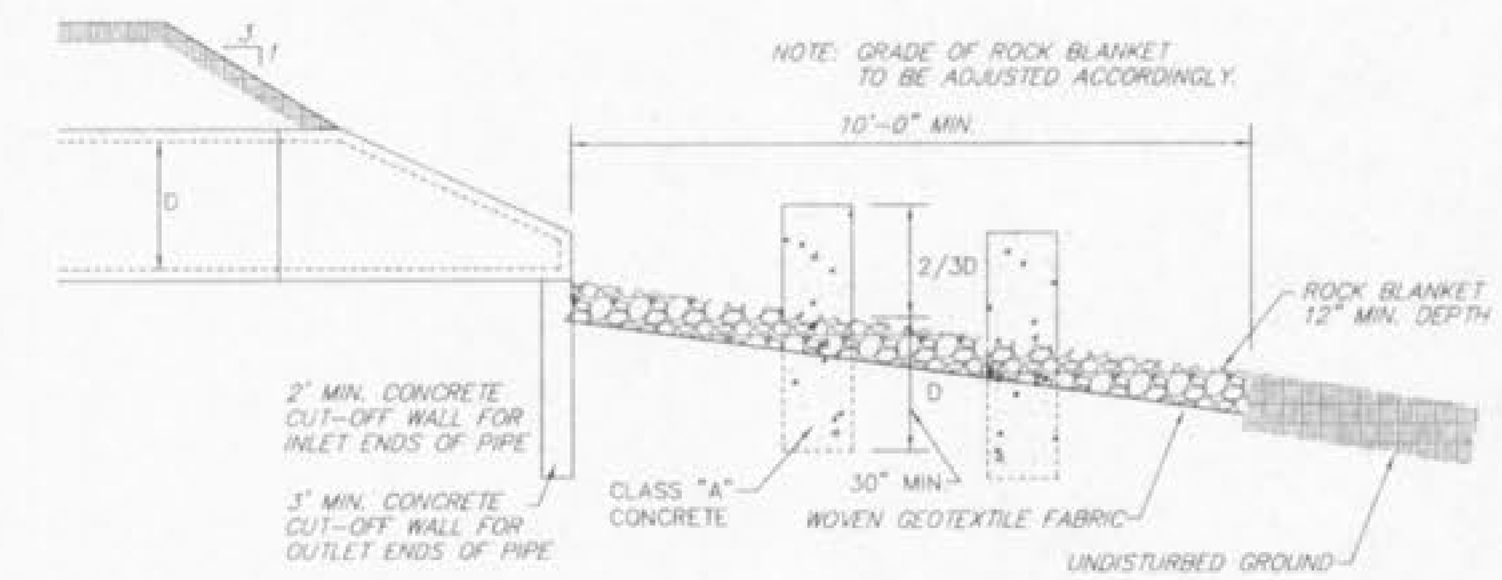




NOTES:
1. A MINIMUM 1% SLOPE SHALL BE PROVIDED.
2. CONSTRUCTION JOINTS SHALL BE PROVIDED EVERY 20 FEET.
3. EXPANSION JOINTS SHALL BE PROVIDED EVERY 100 FEET.

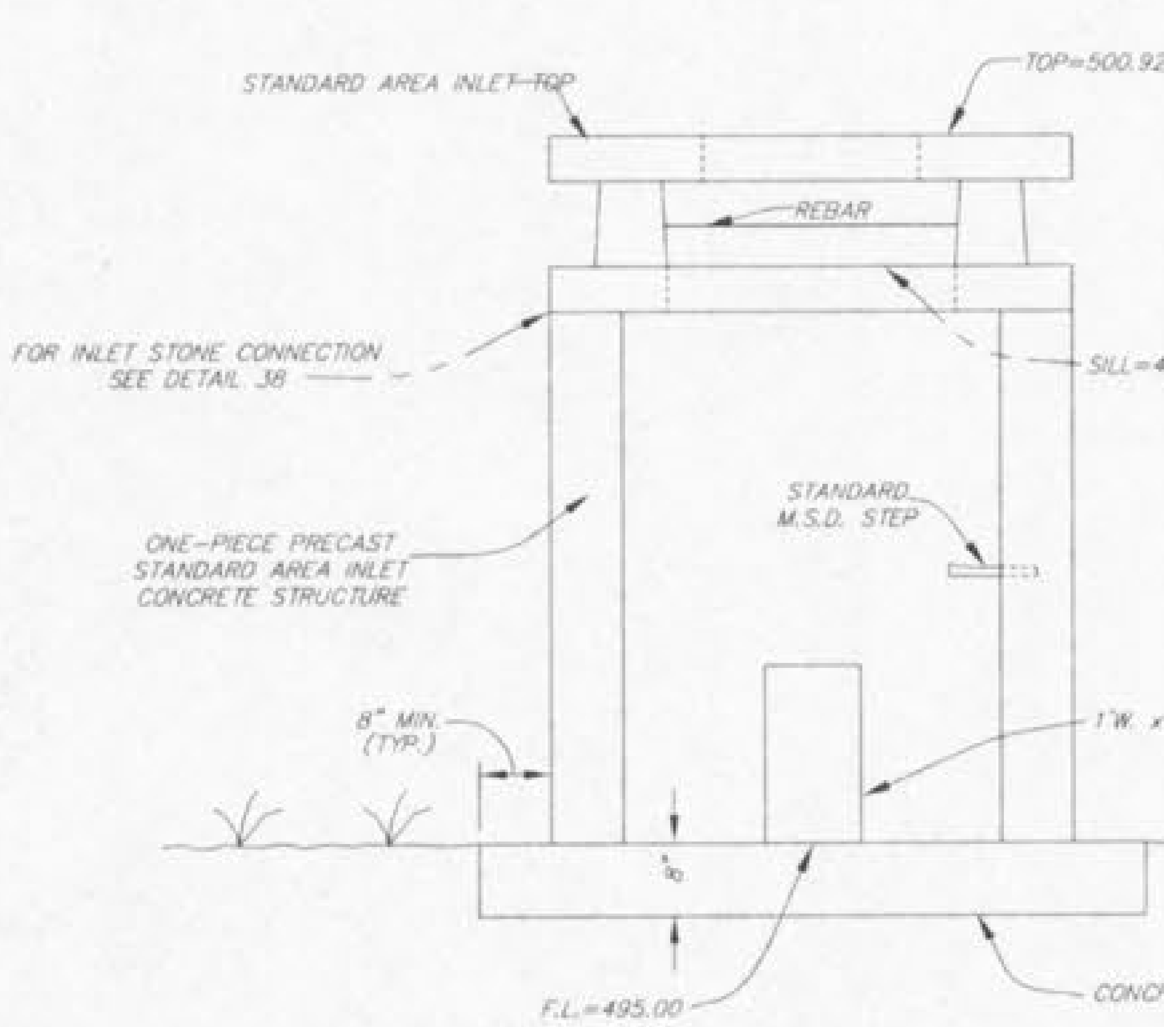
CONCRETE SWALE

NOT TO SCALE

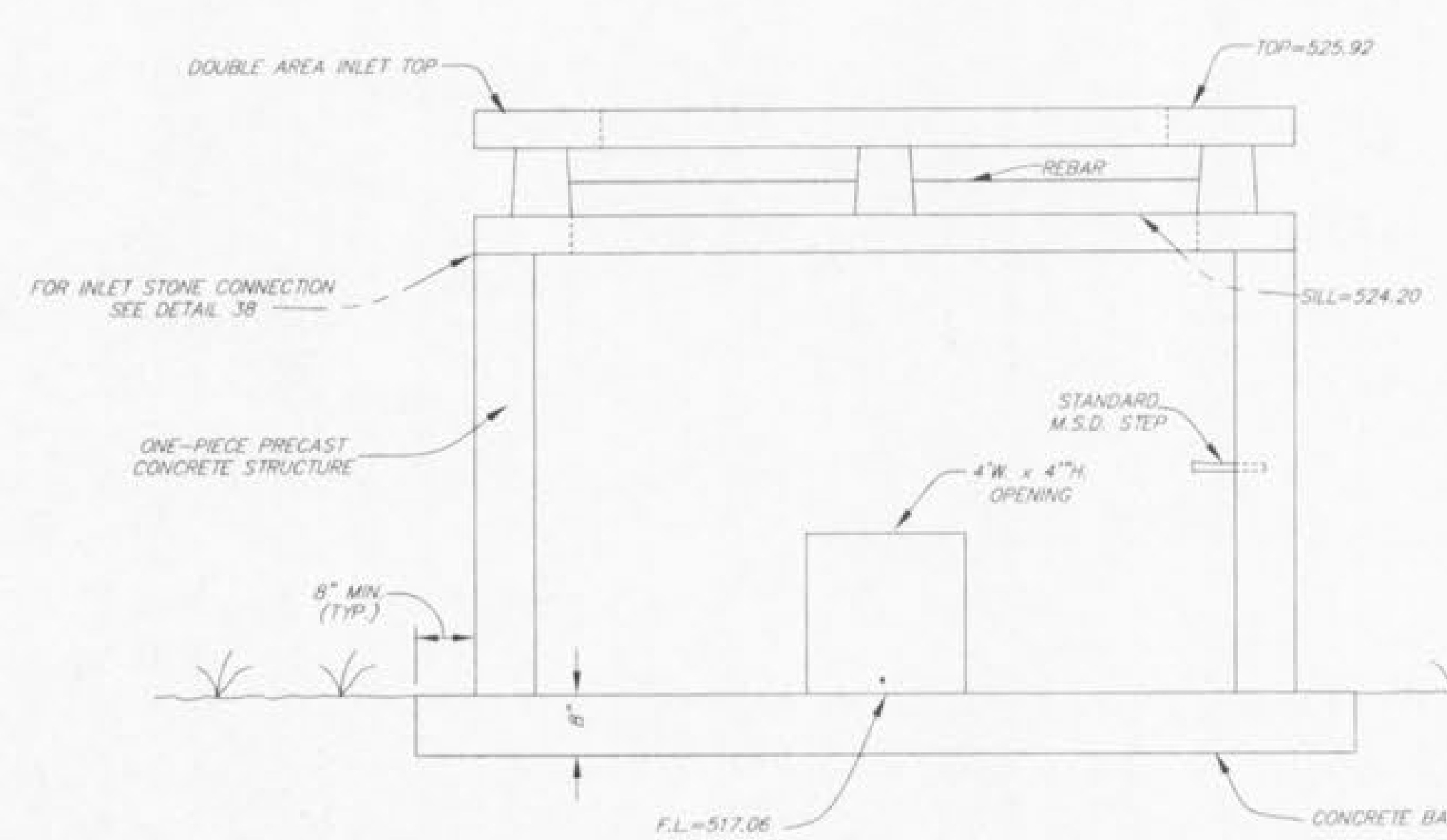


ENERGY DISSIPATORS

N.T.S.



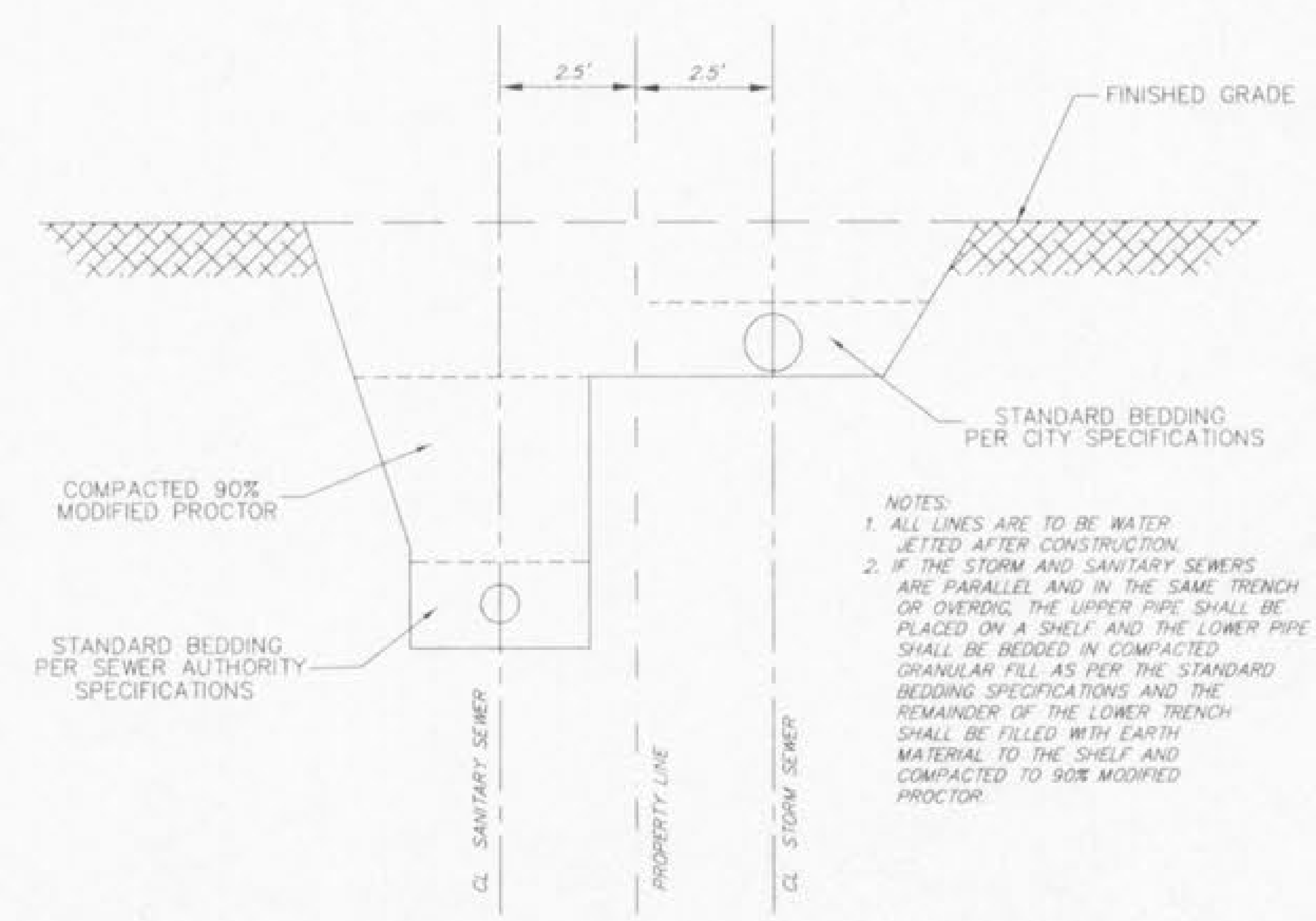
DETENTION BASIN "B"



DETENTION BASIN "A"

OVERFLOW STRUCTURE DETAIL

(NOTE: NO BRICK ALLOWED) NOT TO SCALE



NOTES:
1. ALL LINES ARE TO BE WATER JETTED AFTER CONSTRUCTION.
2. IF THE STORM AND SANITARY SEWERS ARE PARALLEL AND IN THE SAME TRENCH OR OVERDIG, THE UPPER PIPE SHALL BE PLACED ON A SHELF AND THE LOWER PIPE SHALL BE BEDDED IN COMPACTED GRANULAR FILL AS PER THE STANDARD BEDDING SPECIFICATIONS AND THE REMAINDER OF THE LOWER TRENCH SHALL BE FILLED WITH EARTH MATERIAL TO THE SHELF AND COMPACTED TO 90% MODIFIED PROCTOR.

SANITARY AND STORM SEWER TRENCH DETAIL

(FOR PARALLEL LINES) NO SCALE