

STORAGE CALCULATIONS (100 YR RAINFALL EVENT)
STORM DATA REFERENCE: CITY STANDARD RAINFALL INTENSITY-FIGURE 1 FOR 100 YEAR STORM FREQUENCY

ALLOWABLE DISCHARGE FROM SURFACE DETENTION POND = 7.18-4.59 = 2.59 CFS
(REFER ORIFICE CALCULATIONS THIS SHEET)
TOTAL DETAINED AREA= 1.95 ACRES (DRAINAGE AREAS "DA-A", "DA-B", "DA-C", "DA-D" & "DA-E")

TIME (Min)	C x Cf	I100	TOTAL AREA (Acres)	Q (CFS)	INFLOW (CF)	OUTFLOW (CF)	STORAGE (CF)
10	0.90	9.80	1.95	17.20	10319.40	1,554.00	8,765
20	0.90	8.30	1.95	14.57	17479.80	2,331.00	15,149
30	0.90	6.90	1.95	12.11	21797.10	3,108.00	18,689
40	0.90	5.80	1.95	10.18	24429.60	3,885.00	20,545
50	0.90	5.00	1.95	8.78	26325.00	4,662.00	21,663
60	0.90	4.50	1.95	7.90	28431.00	5,439.00	22,992
70	0.90	4.00	1.95	7.02	29484.00	6,216.00	23,268
80	0.90	3.70	1.95	6.49	31168.80	6,993.00	24,176
90	0.90	3.50	1.95	6.14	33169.50	7,770.00	25,400
100	0.90	3.40	1.95	5.97	35820.00	8,547.00	27,255
110	0.90	3.20	1.95	5.62	37065.60	9,324.00	27,742

REQUIRED STORAGE VOLUME SUMMARY:
REQUIRED STORAGE VOLUME= INFLOW-OUTFLOW
INFLOW= STORM DURATION X RESPECTIVE PEAK DISCHARGE X 60 SEC./MIN
OUTFLOW= HALF OF THE RESPECTIVE INFLOW DURATION X CONTROL RELEASE DISCHARGE X 60 SEC./MIN

100 YEAR STORM EVENT @ 110 MIN.
INFLOW = 37065.60 CF
OUTFLOW = 9324.00 CF
REQUIRED DETENTION SYSTEM STORAGE = INFLOW-OUTFLOW= 27,742 CF
PROVIDED VOLUME (WITH 2' FREE BOARD): 45,905 CF

STORAGE CALCULATIONS (50 YR RAINFALL EVENT)
STORM DATA REFERENCE: CITY STANDARD RAINFALL INTENSITY-FIGURE 1 FOR 50 YEAR STORM FREQUENCY

ALLOWABLE DISCHARGE FROM SURFACE DETENTION POND = 6.48-4.21 = 2.27 CFS
(REFER ORIFICE CALCULATIONS THIS SHEET)
TOTAL DETAINED AREA= 1.95 ACRES (DRAINAGE AREAS "DA-A", "DA-B", "DA-C", "DA-D" & "DA-E")

TIME (Min)	C x Cf	I50	TOTAL AREA (Acres)	Q (CFS)	INFLOW (CF)	OUTFLOW (CF)	STORAGE (CF)
10	0.90	9.00	1.95	15.80	9477.00	1,362.00	8,115
20	0.90	7.50	1.95	13.16	15795.00	2,043.00	13,752
30	0.90	6.20	1.95	10.88	19685.80	2,724.00	16,862
40	0.90	5.25	1.95	9.21	22113.00	3,405.00	18,708
50	0.90	4.50	1.95	7.90	23692.50	4,086.00	19,607
60	0.90	3.90	1.95	6.84	24640.20	4,767.00	19,873
70	0.90	3.48	1.95	6.11	25651.08	5,448.00	20,203
80	0.90	3.17	1.95	5.56	26704.08	6,129.00	20,575
90	0.90	2.90	1.95	5.09	27483.30	6,810.00	20,673
100	0.90	2.60	1.95	4.56	27378.00	7,491.00	19,887

REQUIRED STORAGE VOLUME SUMMARY:
REQUIRED STORAGE VOLUME= INFLOW-OUTFLOW
INFLOW= STORM DURATION X RESPECTIVE PEAK DISCHARGE X 60 SEC./MIN
OUTFLOW= HALF OF THE RESPECTIVE INFLOW DURATION X CONTROL RELEASE DISCHARGE X 60 SEC./MIN

50 YEAR STORM EVENT @ 90 MIN.
INFLOW = 27483.30 CF
OUTFLOW = 6810.00 CF
REQUIRED DETENTION SYSTEM STORAGE = INFLOW-OUTFLOW= 20,673 CF
PROVIDED VOLUME (WITH 2' FREE BOARD): 45,905 CF

STORAGE CALCULATIONS (25 YR RAINFALL EVENT)
STORM DATA REFERENCE: CITY STANDARD RAINFALL INTENSITY-FIGURE 1 FOR 25 YEAR STORM FREQUENCY

ALLOWABLE DISCHARGE FROM SURFACE DETENTION POND = 5.84-3.88 = 1.96 CFS
(REFER ORIFICE CALCULATIONS THIS SHEET)
TOTAL DETAINED AREA= 1.95 ACRES (DRAINAGE AREAS "DA-A", "DA-B", "DA-C", "DA-D" & "DA-E")

TIME (Min)	C x Cf	I25	TOTAL AREA (Acres)	Q (CFS)	INFLOW (CF)	OUTFLOW (CF)	STORAGE (CF)
10	0.90	8.30	1.95	14.57	8739.90	1,176.00	7,564
20	0.90	6.75	1.95	11.85	14215.50	1,764.00	12,452
30	0.90	5.50	1.95	9.65	17374.50	2,352.00	15,023
40	0.90	4.50	1.95	7.90	19654.00	2,940.00	16,714
50	0.90	4.00	1.95	7.02	21060.00	3,528.00	17,532
60	0.90	3.50	1.95	6.14	22113.00	4,116.00	17,997
70	0.90	3.25	1.95	5.70	23655.80	4,704.00	18,952
80	0.90	2.95	1.95	5.18	24850.80	5,292.00	19,559
90	0.90	2.60	1.95	4.56	24640.20	5,880.00	18,760
100	0.90	2.30	1.95	4.04	24219.00	6,468.00	17,751
110	0.90	2.10	1.95	3.69	24324.30	7,056.00	17,268

REQUIRED STORAGE VOLUME SUMMARY:
REQUIRED STORAGE VOLUME= INFLOW-OUTFLOW
INFLOW= STORM DURATION X RESPECTIVE PEAK DISCHARGE X 60 SEC./MIN
OUTFLOW= HALF OF THE RESPECTIVE INFLOW DURATION X CONTROL RELEASE DISCHARGE X 60 SEC./MIN

25 YEAR STORM EVENT @ 80 MIN.
INFLOW = 24850.80 CF
OUTFLOW = 5292.00 CF
REQUIRED DETENTION SYSTEM STORAGE = INFLOW-OUTFLOW= 19,559 CF
PROVIDED VOLUME (WITH 2' FREE BOARD): 45,905 CF

STORAGE CALCULATIONS (10 YR RAINFALL EVENT)
STORM DATA REFERENCE: CITY STANDARD RAINFALL INTENSITY-FIGURE 1 FOR 10 YEAR STORM FREQUENCY

ALLOWABLE DISCHARGE FROM SURFACE DETENTION POND = 4.93-3.74 = 1.19 CFS
(REFER ORIFICE CALCULATIONS THIS SHEET)
TOTAL DETAINED AREA= 1.95 ACRES (DRAINAGE AREAS "DA-A", "DA-B", "DA-C", "DA-D" & "DA-E")

TIME (Min)	C x Cf	I10	TOTAL AREA (Acres)	Q (CFS)	INFLOW (CF)	OUTFLOW (CF)	STORAGE (CF)
10	0.90	8.00	1.95	14.04	8424.00	714.00	7,710
20	0.90	5.70	1.95	10.00	12004.20	1,071.00	10,933
30	0.90	4.50	1.95	7.90	14215.50	1,428.00	12,788
40	0.90	3.80	1.95	6.67	16005.60	1,785.00	14,221
50	0.90	3.30	1.95	5.79	17374.50	2,142.00	15,233
60	0.90	2.90	1.95	5.09	18322.20	2,499.00	15,823
70	0.90	2.60	1.95	4.56	19164.60	2,856.00	16,309
80	0.90	2.40	1.95	4.21	20217.60	3,213.00	17,005
90	0.90	2.20	1.95	3.86	20849.40	3,570.00	17,279
100	0.90	2.00	1.95	3.51	21060.00	3,927.00	17,133
110	0.90	1.80	1.95	3.16	20849.40	4,284.00	16,565

REQUIRED STORAGE VOLUME SUMMARY:
REQUIRED STORAGE VOLUME= INFLOW-OUTFLOW
INFLOW= STORM DURATION X RESPECTIVE PEAK DISCHARGE X 60 SEC./MIN
OUTFLOW= HALF OF THE RESPECTIVE INFLOW DURATION X CONTROL RELEASE DISCHARGE X 60 SEC./MIN

10 YEAR STORM EVENT @ 90 MIN.
INFLOW = 20849.40 CF
OUTFLOW = 3570.00 CF
REQUIRED DETENTION SYSTEM STORAGE = INFLOW-OUTFLOW= 17,279 CF
PROVIDED VOLUME (WITH 2' FREE BOARD): 45,905 CF

STORAGE CALCULATIONS (5 YR RAINFALL EVENT)
STORM DATA REFERENCE: CITY STANDARD RAINFALL INTENSITY-FIGURE 1 FOR 5 YEAR STORM FREQUENCY

ALLOWABLE DISCHARGE FROM SURFACE DETENTION POND = 4.32-3.23 = 1.09 CFS
(REFER ORIFICE CALCULATIONS THIS SHEET)
TOTAL DETAINED AREA= 1.95 ACRES (DRAINAGE AREAS "DA-A", "DA-B", "DA-C", "DA-D" & "DA-E")

TIME (Min)	C x Cf	I5	TOTAL AREA (Acres)	Q (CFS)	INFLOW (CF)	OUTFLOW (CF)	STORAGE (CF)
10	0.90	6.90	1.95	12.11	7265.70	654.00	6,612
20	0.90	5.00	1.95	8.78	10530.00	981.00	9,549
30	0.90	3.90	1.95	6.84	12320.10	1,308.00	11,012
40	0.90	3.30	1.95	5.79	13899.60	1,635.00	12,265
50	0.90	2.90	1.95	4.91	14742.00	1,962.00	12,780
60	0.90	2.50	1.95	4.39	15795.00	2,289.00	13,506
70	0.90	2.20	1.95	3.86	16216.20	2,616.00	13,600
80	0.90	2.00	1.95	3.51	16848.00	2,943.00	13,905
90	0.90	1.90	1.95	3.33	18006.30	3,270.00	14,736
100	0.90	1.70	1.95	2.98	17901.00	3,597.00	14,304
110	0.90	1.50	1.95	2.63	17374.50	3,924.00	13,451

REQUIRED STORAGE VOLUME SUMMARY:
REQUIRED STORAGE VOLUME= INFLOW-OUTFLOW
INFLOW= STORM DURATION X RESPECTIVE PEAK DISCHARGE X 60 SEC./MIN
OUTFLOW= HALF OF THE RESPECTIVE INFLOW DURATION X CONTROL RELEASE DISCHARGE X 60 SEC./MIN

5 YEAR STORM EVENT @ 110 MIN.
INFLOW = 18006.30 CF
OUTFLOW = 3270.00 CF
REQUIRED DETENTION SYSTEM STORAGE = INFLOW-OUTFLOW= 14,736 CF
PROVIDED VOLUME (WITH 2' FREE BOARD): 45,905 CF

ORIFICE EQUATION
 $Q = C_x A_x (2gxH)^{1/2}$
WHERE
Q = RATE OF DISCHARGE (FT³/S)
A = ORIFICE AREA (FT²)
C = ORIFICE COEFFICIENT (USUALLY ABOUT 0.6)
g = GRAVITATIONAL CONSTANT (32.2 FT/S²)
H = DEPTH OF WATER ABOVE THE CENTROID OF THE ORIFICE (FT)

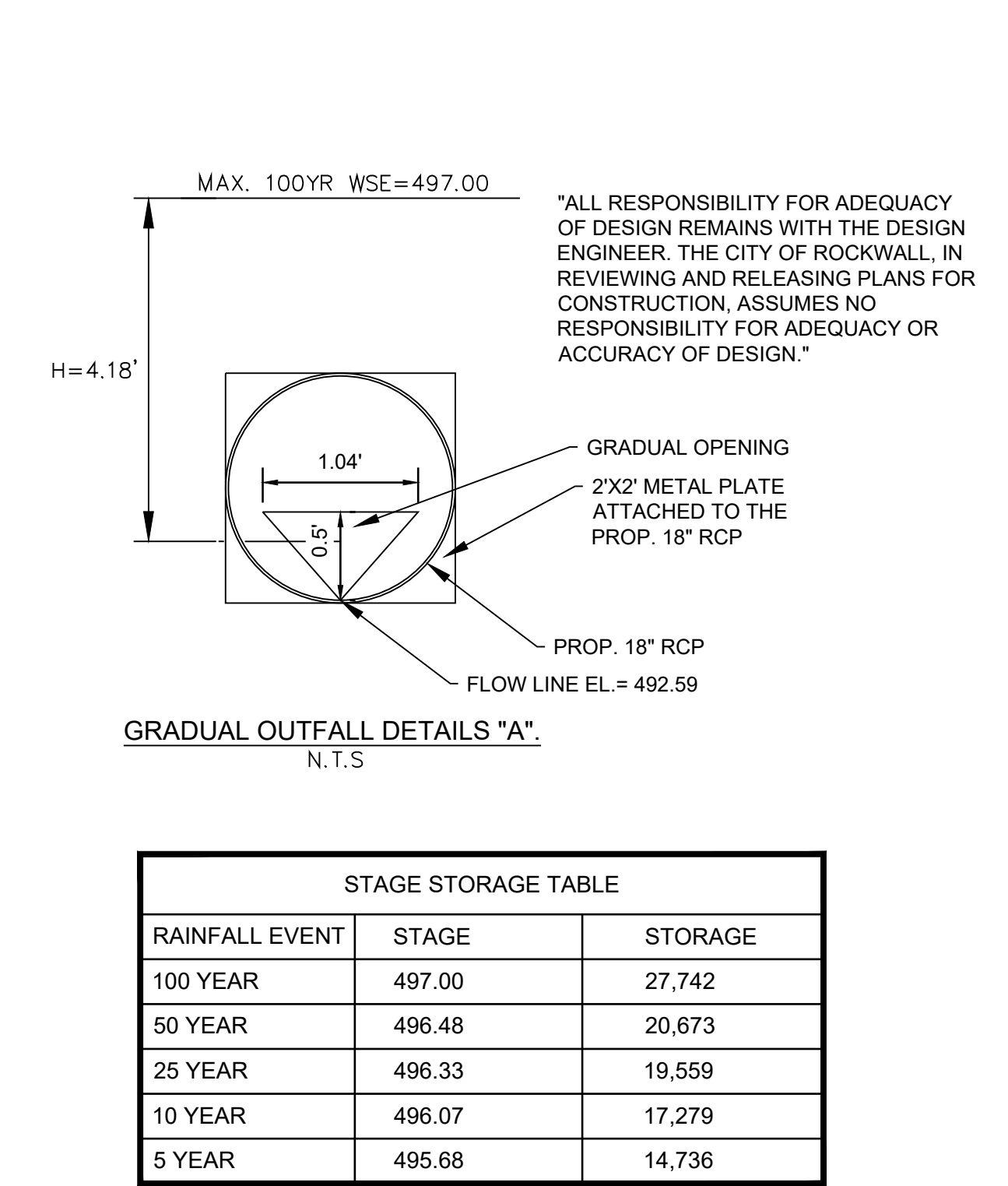
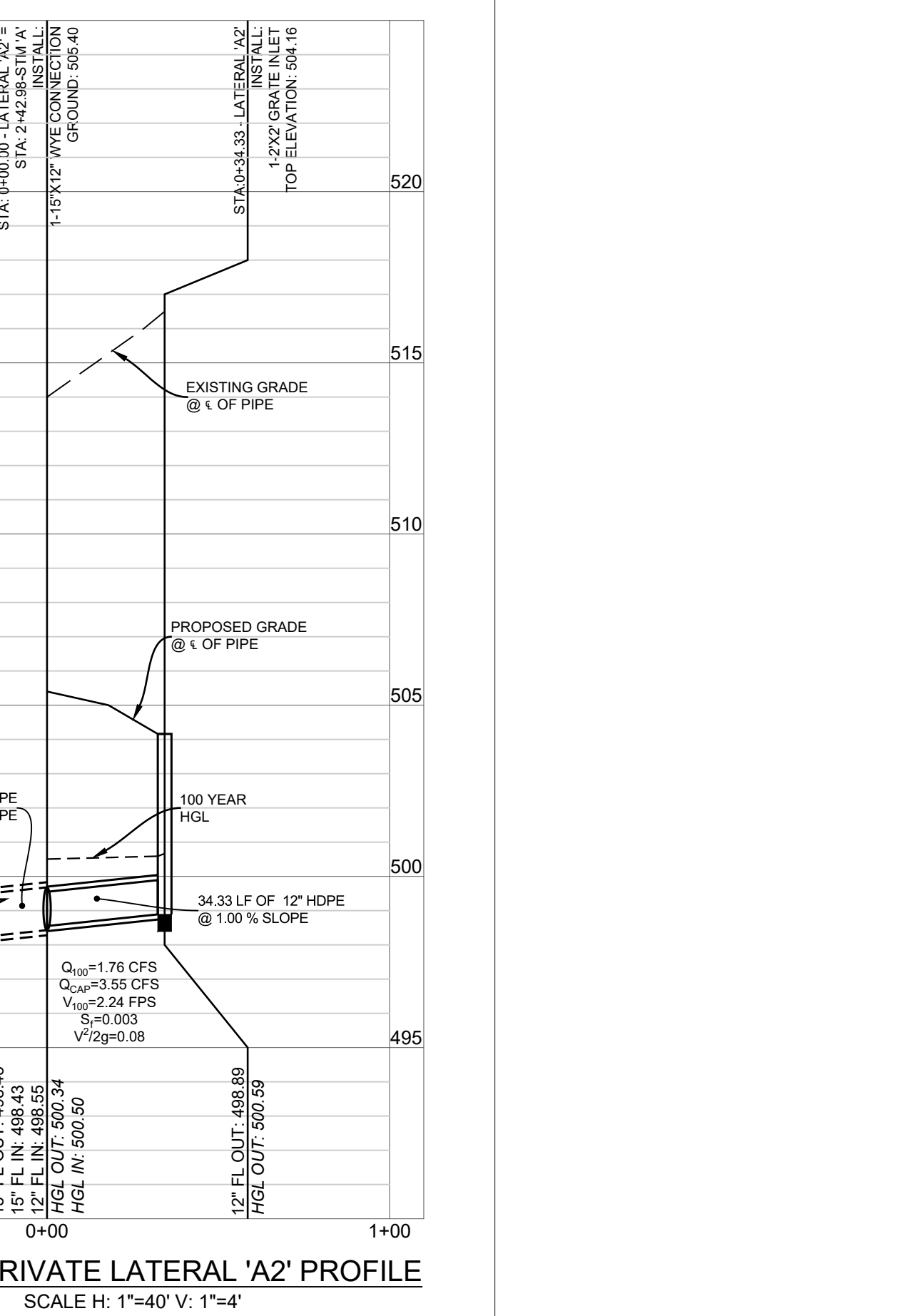
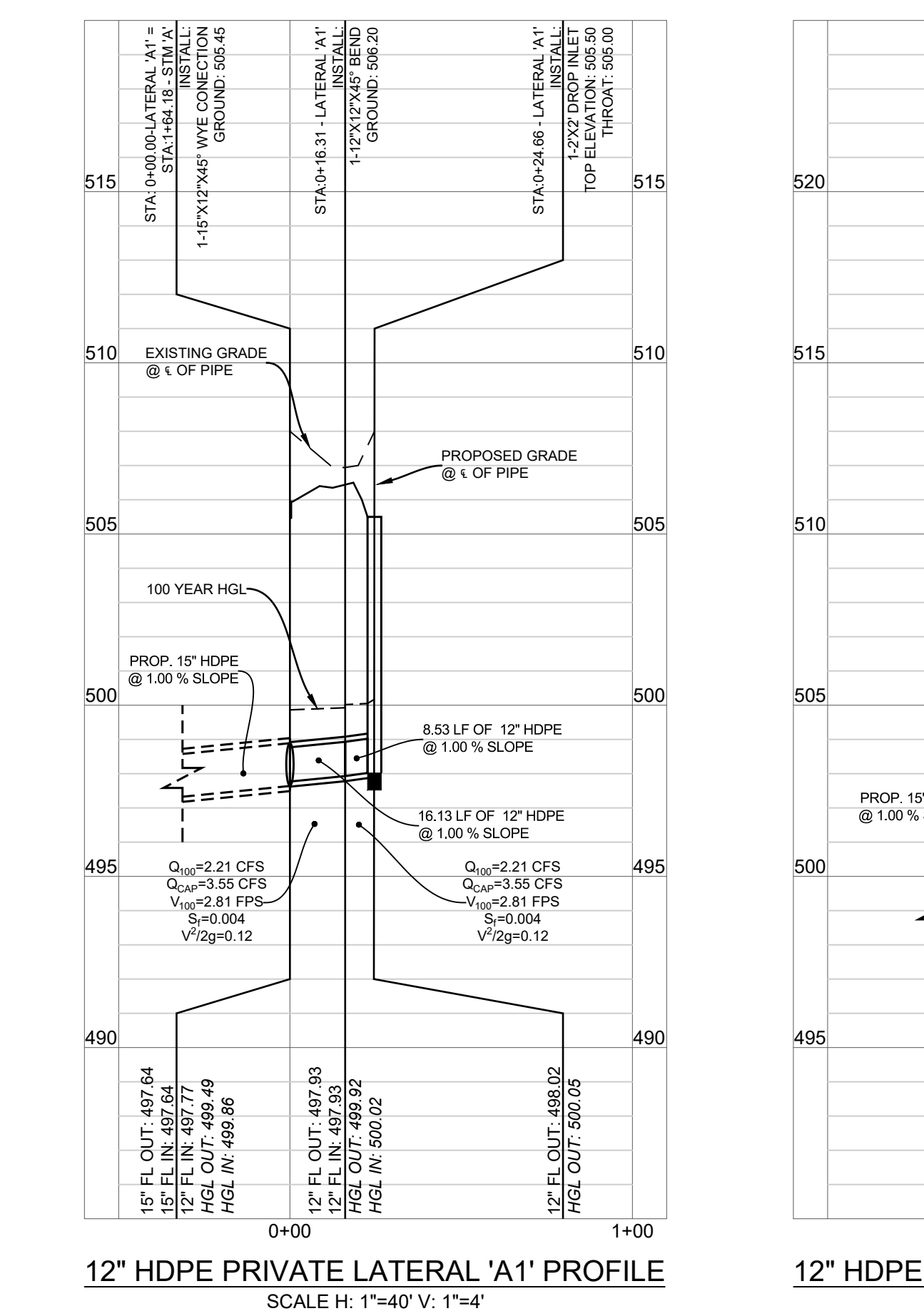
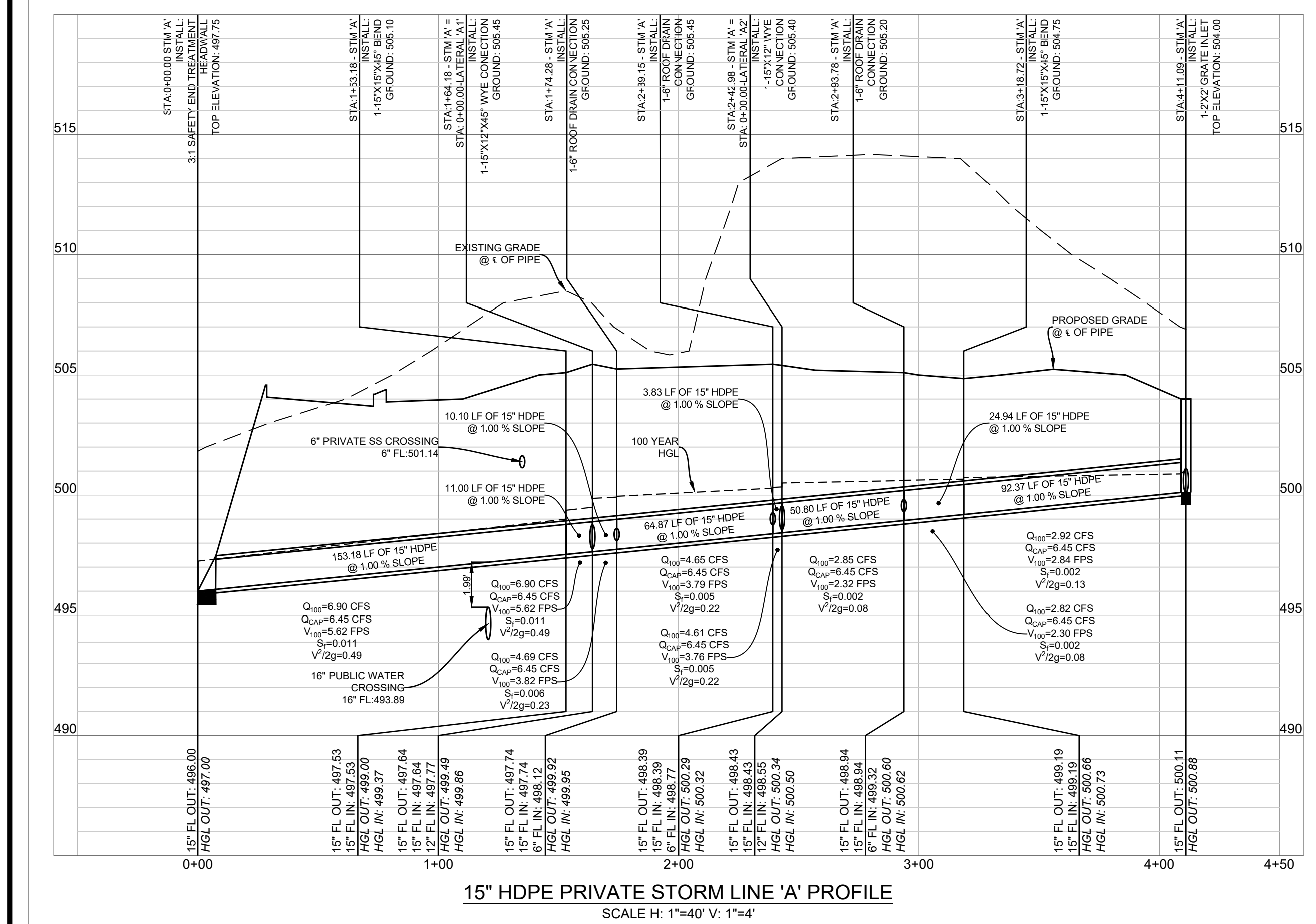
100 YRS ORIFICE CALCULATIONS FOR SURFACE DETENTION POND
USING ORIFICE EQUATION:
Q=2.59 CFS
H (AVG. DEPTH OF WATER)= 4.18 FT
 $A = \frac{Q}{C_x(2gxH)^{1/2}} = \frac{2.59}{0.6 \times (2 \times 32.2 \times 4.18)^{1/2}} = 0.26 \text{ FT}^2$
AREA PROVIDED= 0.26 S.F.

50 YRS ORIFICE CALCULATIONS FOR SURFACE DETENTION POND
USING ORIFICE EQUATION:
H (AVG. DEPTH OF WATER)= 3.3 FT
 $Q = \frac{C_x A_x (2gxH)^{1/2}}{60} = \frac{0.6 \times 0.26 \times (2 \times 32.2 \times 3.3)^{1/2}}{60} = 2.27 \text{ CFS}$

25 YRS ORIFICE CALCULATIONS FOR SURFACE DETENTION POND
USING ORIFICE EQUATION:
H (AVG. DEPTH OF WATER)= 2.45 FT
 $Q = \frac{C_x A_x (2gxH)^{1/2}}{60} = \frac{0.6 \times 0.26 \times (2 \times 32.2 \times 2.45)^{1/2}}{60} = 1.96 \text{ CFS}$

10 YRS ORIFICE CALCULATIONS FOR SURFACE DETENTION POND
USING ORIFICE EQUATION:
H (AVG. DEPTH OF WATER)= 0.90 FT
 $Q = \frac{C_x A_x (2gxH)^{1/2}}{60} = \frac{0.6 \times 0.26 \times (2 \times 32.2 \times 0.90)^{1/2}}{60} = 1.19 \text{ CFS}$

5 YRS ORIFICE CALCULATIONS FOR SURFACE DETENTION POND
USING ORIFICE EQUATION:
H (AVG. DEPTH OF WATER)= 0.76 FT
 $Q = \frac{C_x A_x (2gxH)^{1/2}}{60} = \frac{0.6 \times 0.26 \times (2 \times 32.2 \times 0.76)^{1/2}}{60} = 1.09 \text{ CFS}$



HYDRAULIC CALCULATION FOR PRIVATE STORMLINE 'A'															
STATION	LENGTH	TOTAL FLOW	CAPACITY	VELOCITY	PIPE SIZE	PIPE SLOPE	INVERT ELEVATION (DS)	INVERT ELEVATION (US)	HGL (DS)	HGL (US)	GROUND RIM (DS)	GROUND RIM (UP)			
1+53.18	0+00.00	153.18	6.90	6.45	5.62	15.00	1.00	496.00	497.53	497.25	499.00	497.72	505.10	0.011	0.49
1+64.18	1+53.18	11.00	6.90	6.45	5.62	15.00	1.00	497.53	497.64	499.37	499.49	505.10	505.45	0.011	0.49
1+74.28	1+64.18	10.10	4.69	6.45	3.82	15.00	0.99	497.64	497.74	499.86	499.92	505.45	505.25	0.006	0.23
2+39.15	1+74.28	64.87	4.65	6.45	3.79	15.00	1.00	497.74	498.39	499.95	500.29	505.25	505.45	0.005	0.22
2+42.98	2+39.15	3.83	4.61	6.45	3.76	15.00	1.01	498.39	498.43	500.32	500.34	505.45	505.48	0.005	0.22
2+92.78	2+42.98	50.80	2.85	6.45	2.32	15.00	1.00	498.43	498.94	500.50	500.60	505.40	505.20	0.002	0.08
3+18.72	2+92.78	24.94	2.82	6.45	2.30	15.00	1.00	498.94	499.19	500.62	500.66	504.75	504.75	0.002	0.08
4+11.09	3+18.72	92.37	2.82	6.45	2.92	15.00	1.00	499.19	500.11	500.73	500.88	504.75	504.00	0.002	0.13
0+16.13	0+00.00	16.13	2.21	3.55	2.81	12.00	0.99	497.77	497.93	499.86	499.92	505.45	506.20	0.004	0.12
0+24.66	0+16.13	8.53	2.21	3.55	2.81	12.00	1.06	497.93	498.02	500.02	500.05	506.20	505.50	0.004	0.12
0+34.33	0+00.00	34.33	1.76	3.55	2.24	12.00	0.99	498.55	498.89	500.50	500.59	505.40	504.16	0.003	0.08

HYDRAULIC CALCULATION FOR PRIVATE STORMLINE 'A1'															
STATION	LENGTH	TOTAL FLOW	CAPACITY	VELOCITY	PIPE SIZE	PIPE SLOPE	INVERT ELEVATION (DS)	INVERT ELEVATION (US)	HGL (DS)	HGL (US)	GROUND RIM (DS)	GROUND RIM (UP)			
0+16.13	0+00.00	16.13	2.21	3.55	2.81	12.00	0.99	497.77	497.93	499.86	499.92	505.45	506.20	0.004	0.12
0+24.66	0+16.13	8.53	2.21	3.55	2.81	12.00	1.06	497.93	498.02	500.02	500.05	506.20	505.50	0.004	0.12

HYDRAULIC CALCULATION FOR PRIVATE STORMLINE 'A2'															
STATION	LENGTH	TOTAL FLOW	CAPACITY	VELOCITY	PIPE SIZE	PIPE SLOPE	INVERT ELEVATION (DS)	INVERT ELEVATION (US)	HGL (DS)	HGL (US)	GROUND RIM (DS)	GROUND RIM (UP)			
0+34.33	0+00.00	34.33	1.76	3.55	2.24	12.00	0.99	498.55	498.89	500.50	500.59	505.40	504.16	0.003	0.08

AS-BUILT DRAWINGS:
TO THE BEST OF OUR KNOWLEDGE TRIANGLE ENGINEERING LLC., HEREBY STATES THAT THIS PLAN IS AS-BUILT. THE INFORMATION PROVIDED IS BASED ON SURVEYING AT THE SITE AND INFORMATION PROVIDED BY THE CONTRACTOR.

KARTAVYA S. PATEL, P.E. NO. 97534

RECORD DRAWING

DETENTION CALCS & STORM PROFILE

KIDDIE ACADEMY
NEC OF N. LAKESHORE DRIVE & E. FORK ROAD
CITY OF ROCKWALL
ROCKWALL COUNTY, TEXAS

TRIANGLE ENGINEERING LLC

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Planning | Civil Engineering | Construction Management

DESIGN/DRAWN	DATE	SCALE	PROJECT NO.	SHEET NO.
KP	DS	08/23/16	SEE SCALE BAR	028-16

12/03/2019

TX PE FIRM #11525

6.2