October 30, 2020

Mark Gray
Town of Keenesburg Public Works
91 W. Broadway Avenue
Keenesburg, CO 80643

Re: Final Drainage Letter – Lot 5, Market Street Business Park Subdivision
Kum & Go #2906 – Keenesburg, CO
Olsson Project Number 020-2538

Mr. Gray:

This letter is to serve as a statement of Lot 5's compliance with the Final Drainage Report for Market Street Business Park Subdivision prepared by Western Engineering Consultants inc LLC, dated July 23, 2020 (the REPORT). The REPORT provides hydrologic and hydraulic analysis for the development located at the northwest corner of Interstate 76 and Market Street in Keenesburg, CO.

Basin L5 within the REPORT contains the developed Lot 5 in the southeast corner of the site to the south of the proposed Veterans Drive. The REPORT anticipates future development within Lot 5 to reach 90% imperviousness. The anticipated developed hydrology from the REPORT is summarized in Table 1.

Table 1: Anticipated (future) Developed Imperviousness from the REPORT

Drainage Area Description	Total Area (Acres)	Tc (minutes)	Percent Impervious	5-YR Flow (cfs)	100-YR Flow (cfs)
L5	2.71	5.69	90%	7.55	19.78

Planned development within Lot 5 consists of a convenience store, 2 fueling canopies, and associated drives/parking. Sub drainage areas L5-A through L5-D on the Proposed Drainage Area map attached encompasses the planned development within Lot 5. Table 2 shows calculated imperviousness and 100-year flow rate for the planned development within lot 5.

Table 2: Calculated Developed Imperviousness for Planned Development

Drainage Area Description	Total Area (Acres)	Tc (minutes)	Percent Impervious	5-YR Flow (cfs)	100-YR Flow (cfs)
L5	2.71	5.00	74%	6.33	18.36

Sub-basins of Lot 5 are shown on the included exhibit showing the drainage area, "C" value, and peak runoff for the developed lot. Sub-basin L5-4 flows to the north R-O-W into a grate inlet constructed as part of the Market Street Business Park Subdivision improvements. The additional flow into the grate inlet is 1.7 cfs. The remainder of Lot 5's sub-basins drain into a

proposed inlet the REPORT denotes for Lot 5 storm sewer connection. A detention facility will be constructed in conjunction with Market Street Business Park Subdivision improvements which will provide water quality and runoff attenuation for the planned improvements on Lot 5. The detention facility will be located directly south of Lot 5.

By inspection of calculated Lot 5 developed imperviousness & time of concentration compared to the REPORT's anticipated developed imperviousness & time of concentration for the development of Lot 5, the planned improvements will produce less peak runoff than anticipated by the REPORT. Therefore, construction of the planned improvements on Lot 5 according to the attached Proposed Drainage Basins map will not adversely impact downstream infrastructure.

OWNER'S STATEMENT

Kum & Go, LC hereby certifies that the drainage facilities for Lot 5, Market Street Business Park Subdivision, will be constructed according to the design presented in this report. I understand that the Town of Keenesburg does not and shall not assume liability for the drainage facilities designed and/or certified by my engineer. I understand that the Town of Keenesburg reviews drainage plans but cannot, on behalf of Lot 5, Market Street Business Park Subdivision, guarantee that final drainage design review will absolve Kum & Go, LC and/or their successor and/or assigns of future liability for improper design. I further understand that approval of the Plat and/or Development Permit does not imply approval of my engineer's drainage design.

Attest:

Ryan Halder _____ _____

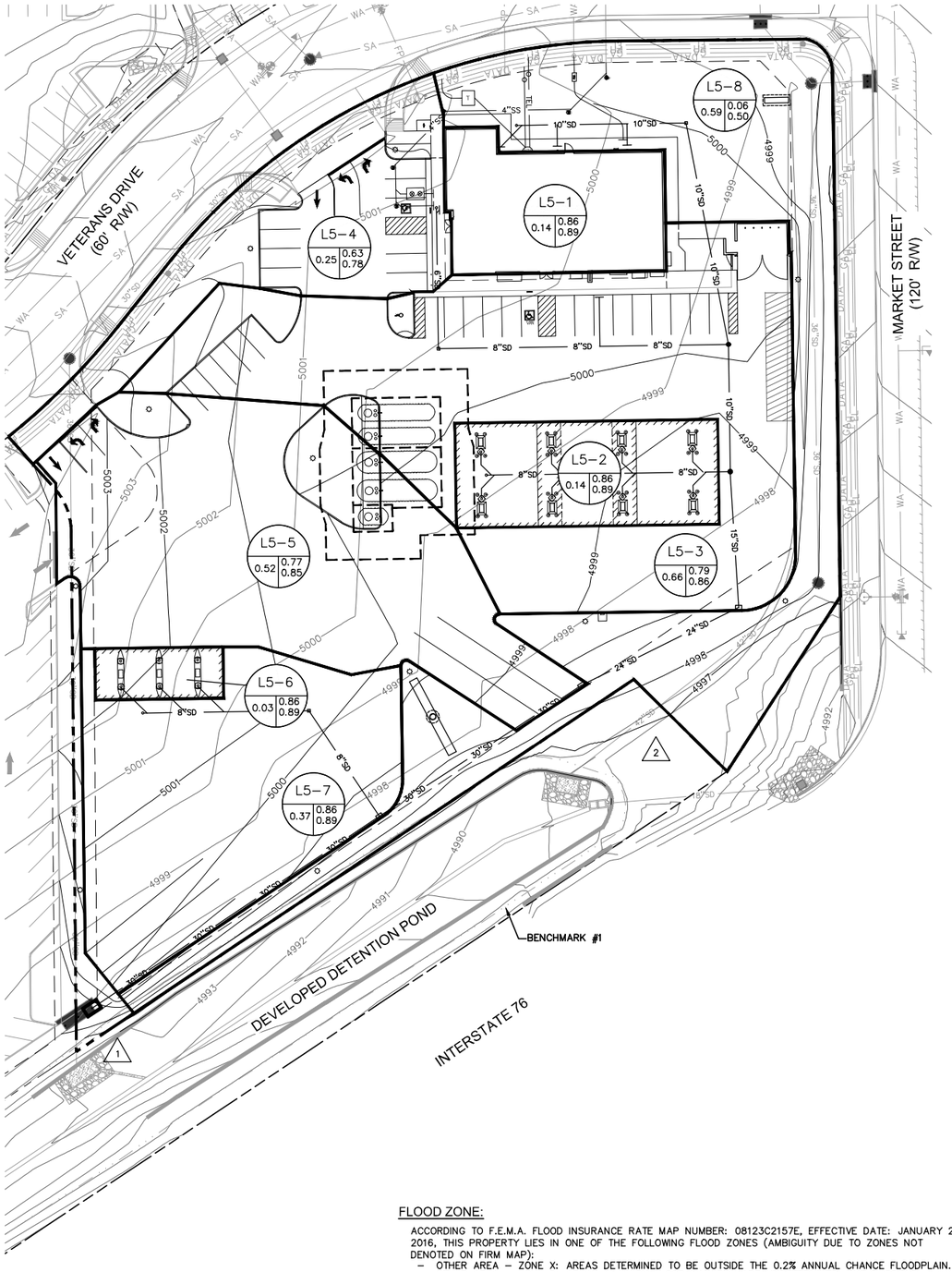
Name of Responsible Party Authorized Signature

Kum & Go, L.C.

ENGINEER'S STATEMENT

I hereby certify that this report & plan for the final drainage design of Lot 5, Market Street Business Park Subdivision, was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Keenesburg Standards and Specifications for the Design and Construction of Public and Private Improvements for the Responsible Parties thereof. I understand that the Town of Keenesburg does not and shall not assume liability for drainage facilities designed by others.

Josh Erramouspe
Registered Professional Engineer
State of Colorado No. 42141



DRAINAGE BASIN RATIONAL CALCULATIONS									
BASIN NAME	AREA (ACRES)	% IMP	C 5-YR	C 100-YR	Tc (min)	I 5-YR (in/hr)	I 100-YR (in/hr)	Q 5-YR (cfs)	Q 100-YR (cfs)
L5-1	0.14	100%	0.86	0.89	5	3.73	8.71	0.45	1.09
L5-2	0.14	100%	0.86	0.89	5	3.73	8.71	0.45	1.09
L5-3	0.66	92%	0.79	0.86	5	3.73	8.71	1.94	4.95
L5-4	0.25	72%	0.63	0.78	5	3.73	8.71	0.58	1.70
L5-5	0.52	90%	0.77	0.85	5	3.73	8.71	1.50	3.86
L5-6	0.03	100%	0.86	0.89	5	3.73	8.71	0.10	0.23
L5-7	0.37	100%	0.86	0.89	5	3.73	8.71	1.18	2.88
L5-8	0.59	3%	0.06	0.50	5	3.73	8.71	0.13	2.55

Table 6-4. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
A	$C_A = 0.84i^{1.302}$	$C_A = 0.86i^{1.276}$	$C_A = 0.87i^{1.232}$	$C_A = 0.88i^{1.124}$	$C_A = 0.85i+0.025$	$C_A = 0.78i+0.110$	$C_A = 0.65i+0.254$
B	$C_B = 0.84i^{1.169}$	$C_B = 0.86i^{1.088}$	$C_B = 0.81i+0.057$	$C_B = 0.63i+0.249$	$C_B = 0.56i+0.328$	$C_B = 0.47i+0.426$	$C_B = 0.37i+0.536$
C/D	$C_{C/D} = 0.83i^{1.122}$	$C_{C/D} = 0.82i+0.035$	$C_{C/D} = 0.74i+0.132$	$C_{C/D} = 0.56i+0.319$	$C_{C/D} = 0.49i+0.393$	$C_{C/D} = 0.41i+0.484$	$C_{C/D} = 0.32i+0.588$

HYDROLOGIC CALCULATIONS

SUMMARY RUNOFF TABLE			
DESIGN POINT	CONTRIBUTING AREA (ACRES)	FLOW 5YR (CFS)	PEAK FLOW 100YR (CFS)
1	2.11	6.19	15.81
2	0.59	0.13	2.55

LEGEND

- PROPOSED BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- DRAINAGE AREA BOUNDARY
- 5000 PROPOSED DEVELOPMENT MASS GRADING CONTOUR
- 5000 PROPOSED CONTOUR
- BREAK IN GRADE
- BENCHMARK
- L5-1 BASIN NAME
- 0.24 BASIN AREA
- 0.00 5 YR RUNOFF COEFFICIENT
- 0.85 100 YR RUNOFF COEFFICIENT
- # DESIGN POINT DESIGNATION

Know what's **below.** **Call** before you dig.
CALL 811 SEVENTY-TWO HOURS PRIOR TO DIGGING, GRADING OR EXCAVATING FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

TOWN PLANNING APPROVAL

FLOOD ZONE:

ACCORDING TO F.E.M.A. FLOOD INSURANCE RATE MAP NUMBER: 08123C2157E, EFFECTIVE DATE: JANUARY 20, 2016, THIS PROPERTY LIES IN ONE OF THE FOLLOWING FLOOD ZONES (AMBIGUITY DUE TO ZONES NOT DENOTED ON FIRM MAP):
- OTHER AREA – ZONE X: AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.
- OTHER AREA – ZONE D: AREAS IN WHICH FLOOD HAZARDS ARE UNDETERMINED, BUT POSSIBLE.

BENCHMARKS:

BM#1-3" BRASS CAP IN CONCRETE, STAMPED "NATIONAL GEODETIC SURVEY ACD1" LYING FIVE FEET WEST OF A CONCRETE IRRIGATION DITCH NEAR THE INTERSECTION OF COUNTY ROAD 18 AND NORTH CEDAR STREET, AND THIRTY FEET NORTH OF THE CENTERLINE OF COUNTY ROAD 18.
ELEV.=5015.39 (NAVD 88)

BM#2-#5 REBAR WITH RED PLASTIC CAP SET FLUSH WITH THE GROUND ALONG THE SOUTH SIDE OF THE PROJECT ON THE SOUTH SIDE THE PROJECT BETWEEN PIPPIN LANE AND THE ON RAMP.
ELEV.=4996.68 (NAVD 88)

N W E S
1" = 30'
0' 15' 30' 60'
SCALE IN FEET

olsson
www.olsson.com
1880 Fall River Dr., Suite 200
Loveland, CO 80538
TEL: 970.461.7733

Kum & Go
1459 Grand Avenue
Des Moines, Iowa
50309
P: 515-226-0128
F: 515-223-9873

#2906 - KEENESBURG, CO
240 MARKET STREET

PROPOSED DRAINAGE BASINS

KG PROJECT TEAM:
RDM: TOM CARRICO
SDM: RYAN HALDER
CPM: PERRY DEPHILLIPS

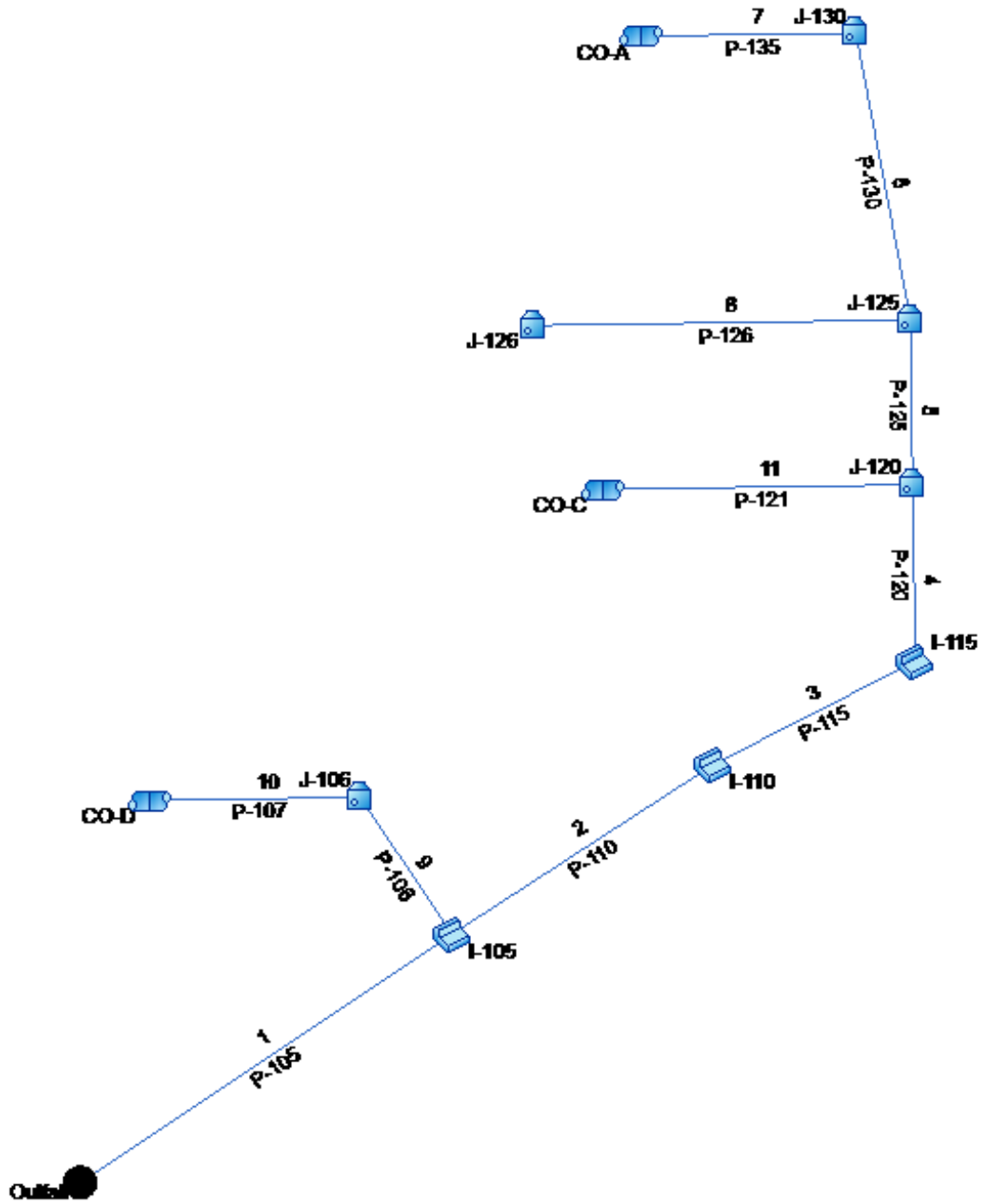
REVISION DESCRIPTION	DATE
△	

DATE: 10/23/2020

SHEET NUMBER:
EXHIBIT 1

DWG: F:\2020\2501-3000\020-2538\40-Design\Calcs\GNCV\STORM\C_PSTM_0202538.dwg
DATE: Oct 29, 2020 9:39am
XREFS: C_TBLK-PRE-0202538 C_PBASE_0202538 C_DBASE_0202538 C_FUTIL_0202538 C_XBASE-0202538
USER: cwelmer

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 5 YR ANALYSIS.stm	Number of lines: 11	Date: 10/29/2020

MyReport

Line No.	Line ID	Line Length (ft)	Line Size (in)	n-val Pipe	Invert Dn (ft)	Invert Up (ft)	Line Slope (%)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Vel Ave (ft/s)	Defl Ang (Deg)	J-Loss Coeff	Minor Loss (ft)	Energy Loss (ft)	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	
1	P-105	161.600	30	0.012	4992.48	4993.37	0.55	4998.02	4998.48	4993.22	4994.20	4.78	-33.707	1.50 z	0.45	0.000	0.00	6.21	32.97	
2	P-110	112.600	30	0.012	4993.57	4994.13	0.50	4998.48	4998.18	4994.25	4994.87	4.40	0.765	0.50 z	0.13	0.000	0.00	5.00	31.33	
3	P-115	82.090	24	0.012	4994.33	4994.74	0.50	4998.18	4998.25	4994.94	4995.40	4.12	5.921	1.37 z	n/a	0.000	0.00	3.52	17.32	
4	P-120	63.600	15	0.012	4994.94	4995.26	0.50	4998.25	4998.76	4995.41	4995.74	3.48	-63.814	1.00 z	n/a	0.000	0.00	1.50	4.96	
5	P-125	59.490	10	0.012	4995.67	4996.26	0.99	4998.76	5000.16	4996.06	4996.72	3.82	0.007	1.00 z	n/a	0.000	0.00	1.05	2.36	
6	P-130	105.436	10	0.012	4996.46	4997.51	1.00	5000.16	4999.90	4996.72	4997.80	2.91	-9.997	0.99 z	n/a	0.000	0.00	0.45	2.37	
7	P-135	76.893	10	0.012	4997.71	4998.86	1.50	4999.90	5000.88	4997.93	4999.15	3.25	-80.000	1.00 z	n/a	0.000	0.45	0.45	2.90	
8	P-126	135.682	8	0.012	4996.66	4998.15	1.10	5000.16	5000.41	4996.97	4998.51	3.44	-89.997	1.00 z	n/a	0.000	0.60	0.60	1.37	
9	P-106	59.400	8	0.012	4994.70	4995.88	1.99	4998.48	5000.67	4994.81	4996.02	2.31	-90.118	0.87 z	0.04	0.000	0.00	0.10	1.84	
10	P-107	75.700	8	0.012	4996.08	4997.59	1.99	5000.67	5001.76	4996.19	4997.73	2.31	-57.004	1.00 z	0.05	0.000	0.10	0.10	1.85	
11	P-121	111.660	8	0.012	4995.87	4996.99	1.00	4998.76	4999.66	4996.14	4997.30	3.10	-89.994	1.00 z	n/a	0.000	0.45	0.45	1.31	

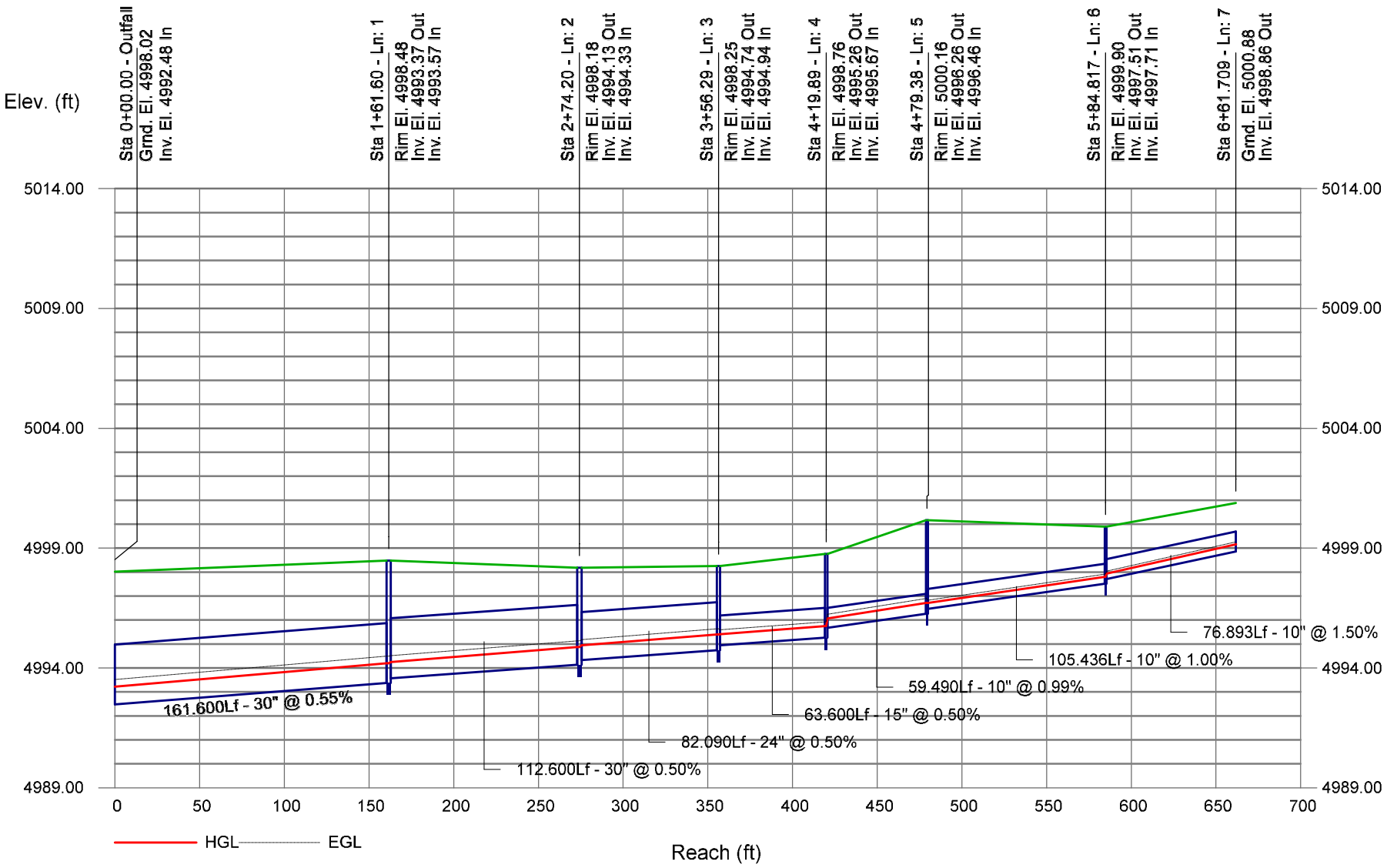
Project File: 5 YR ANALYSIS.stm | Number of lines: 11 | Date: 10/29/2020

NOTES: ** Critical depth

Storm Sewer Profile

Proj. file: 5 YR ANALYSIS.stm

STORM LINE 100



Storm Sewer Profile

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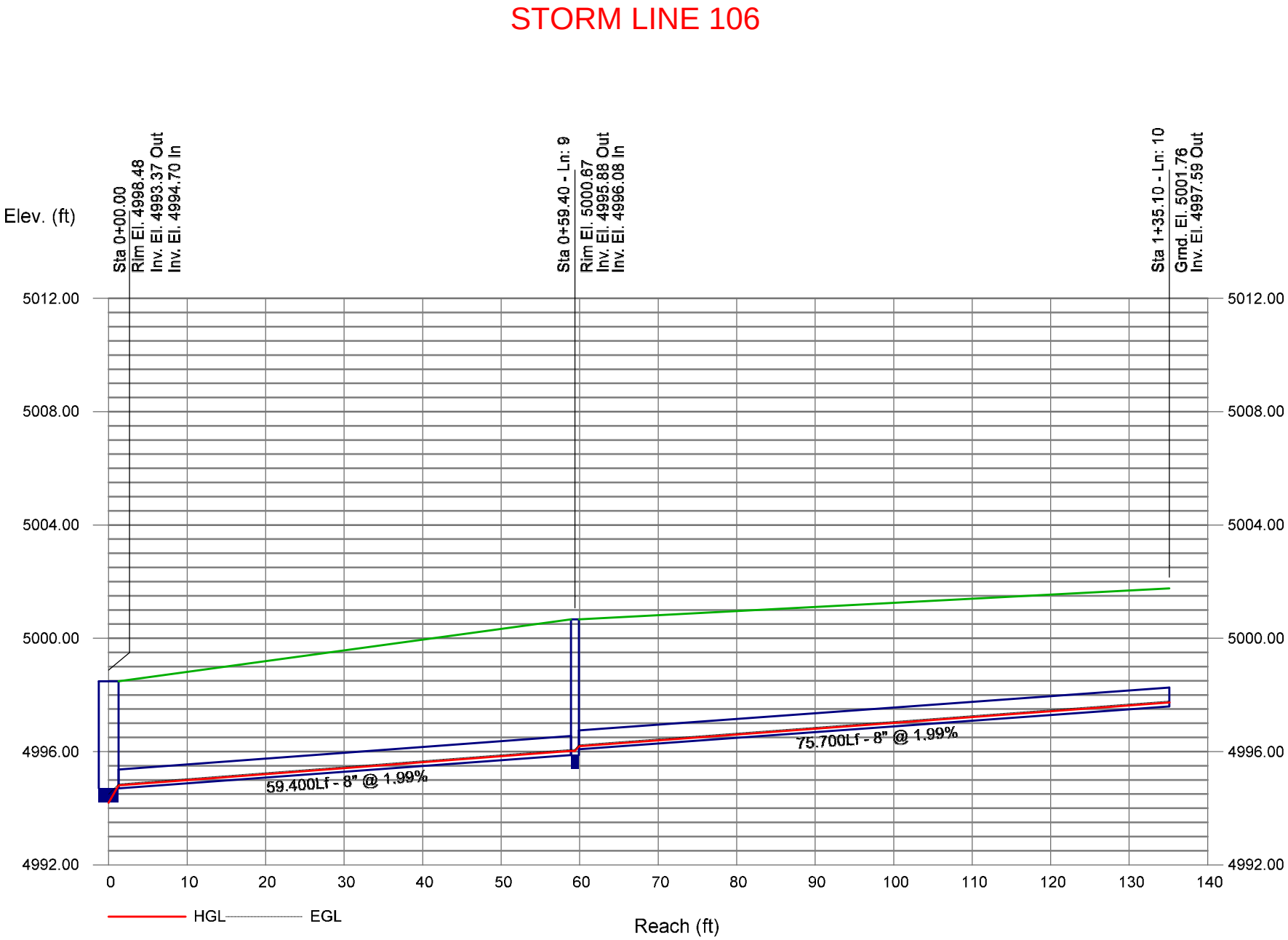
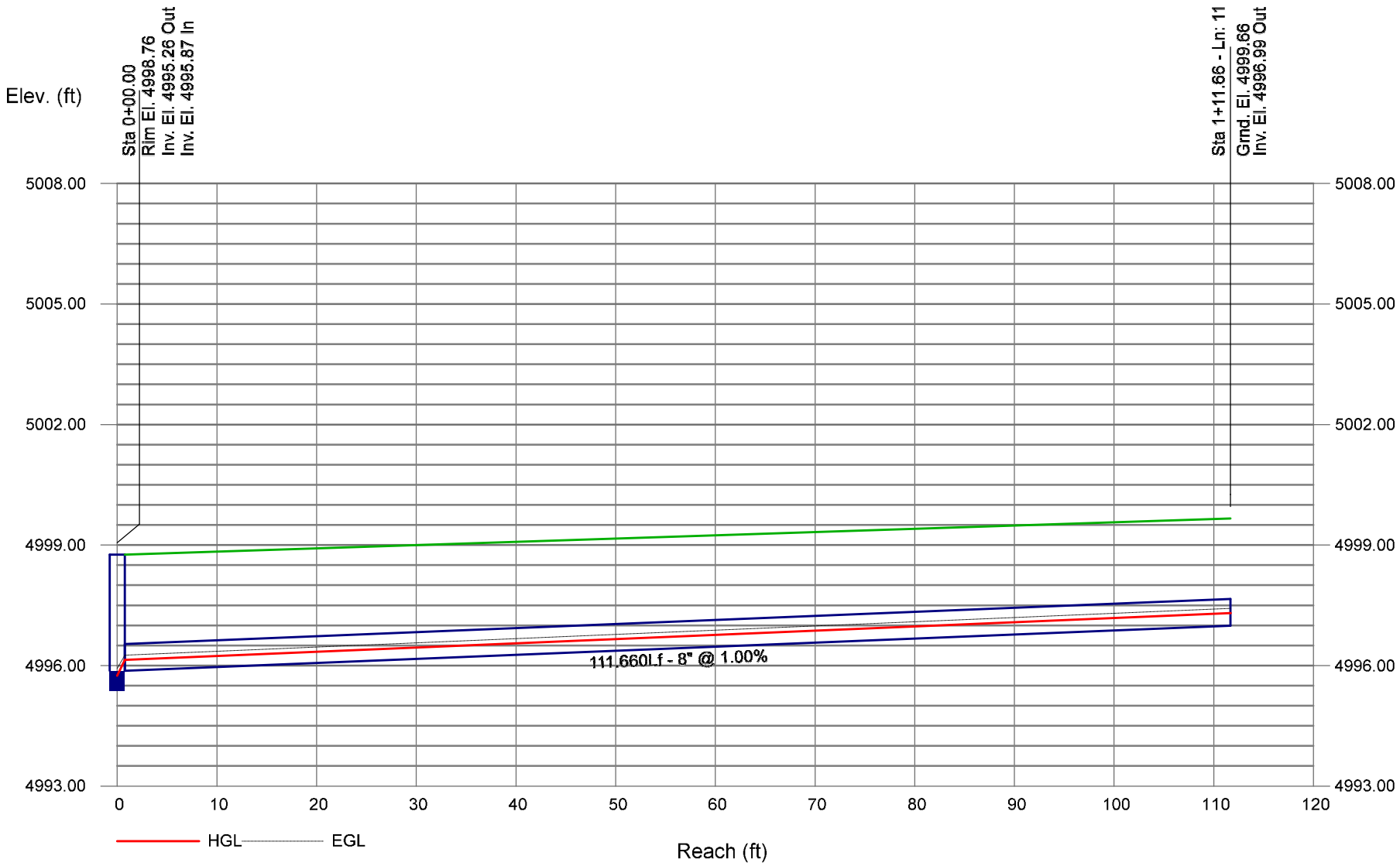


Storm Sewer Profile

Proj. file: 5 YR ANALYSIS.stm

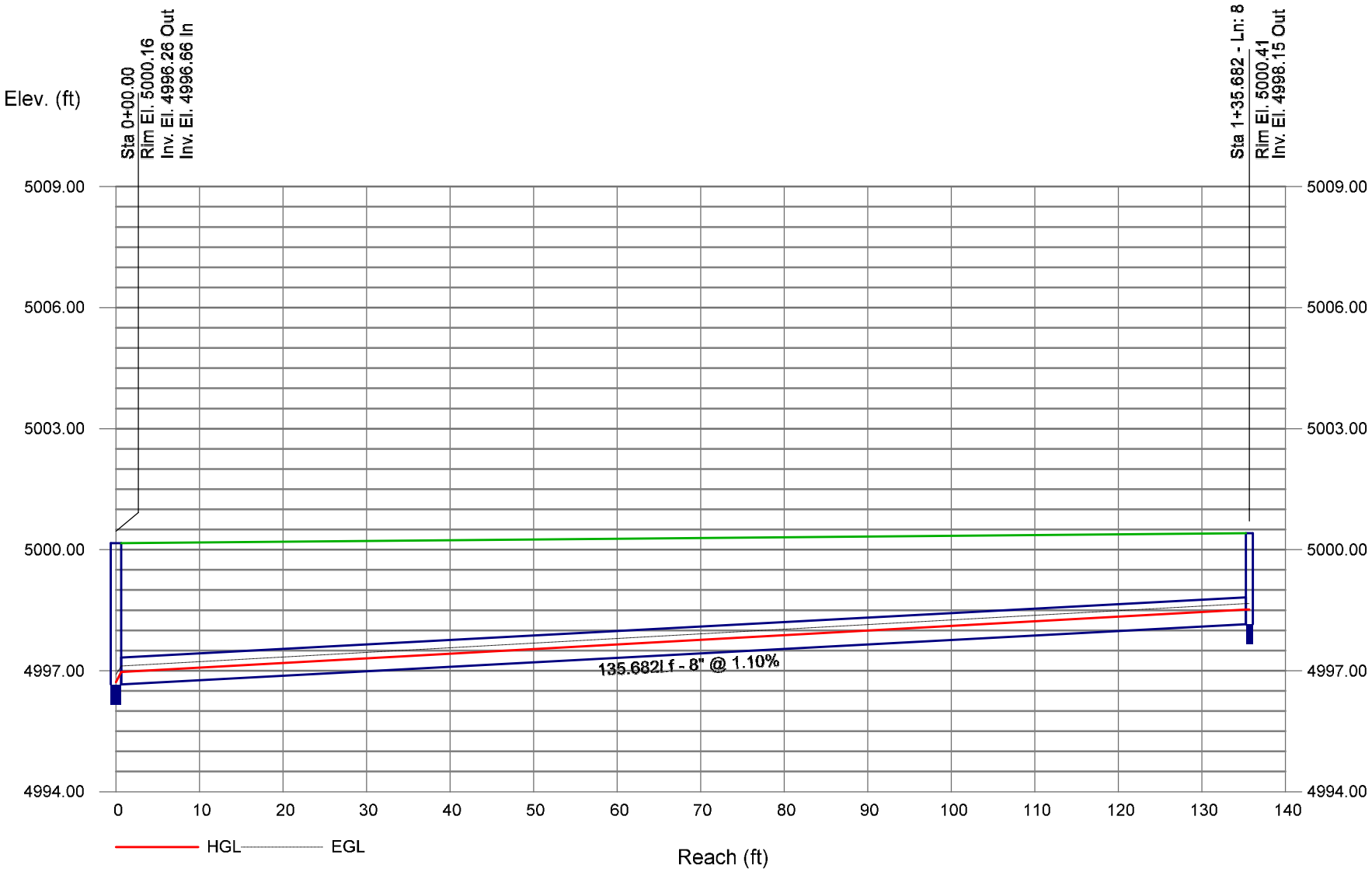
STORM LINE 121



Storm Sewer Profile

Proj. file: 5 YR ANALYSIS.stm

STORM LINE 126



MyReport

Line No.	Line ID	Line Length (ft)	Line Size (in)	n-val Pipe	Invert Dn (ft)	Invert Up (ft)	Line Slope (%)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	HGL Dn (ft)	HGL Up (ft)	Vel Ave (ft/s)	Defl Ang (Deg)	J-Loss Coeff	Minor Loss (ft)	Energy Loss (ft)	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	
1	P-105	161.600	30	0.012	4992.48	4993.37	0.55	4998.02	4998.48	4996.75	4996.91	2.81	-33.707	1.50	0.18	0.156	0.00	13.81	32.97	
2	P-110	112.600	30	0.012	4993.57	4994.13	0.50	4998.48	4998.18	4997.09	4997.16	2.28	0.765	0.50	0.04	0.071	0.00	11.17	31.33	
3	P-115	82.090	24	0.012	4994.33	4994.74	0.50	4998.18	4998.25	4997.20	4997.28	2.37	5.921	1.37	0.12	0.076	0.00	7.45	17.32	
4	P-120	63.600	15	0.012	4994.94	4995.26	0.50	4998.25	4998.76	4997.40	4997.47	1.91	-63.814	1.00	0.06	0.071	0.00	2.34	4.96	
5	P-125	59.490	10	0.012	4995.67	4996.26	0.99	4998.76	5000.16	4997.53	4997.69	2.29	0.007	1.00	0.08	0.165	0.00	1.25	2.36	
6	P-130	105.436	10	0.012	4996.46	4997.51	1.00	5000.16	4999.90	4997.77	4998.02	2.54	-9.997	0.99	0.15	0.339	0.00	1.09	2.37	
7	P-135	76.893	10	0.012	4997.71	4998.86	1.50	4999.90	5000.88	4998.17	4999.32	3.51	-80.000	1.00 z	0.19	0.000	1.09	1.09	2.90	
8	P-126	135.682	8	0.012	4996.66	4998.15	1.10	5000.16	5000.41	4997.77	4998.33 j	1.26	-89.997	1.00 z	n/a	0.384	0.16	0.16	1.37	
9	P-106	59.400	8	0.012	4994.70	4995.88	1.99	4998.48	5000.67	4997.09	4997.11	0.66	-90.118	0.87	0.01	0.018	0.00	0.23	1.84	
10	P-107	75.700	8	0.012	4996.08	4997.59	1.99	5000.67	5001.76	4997.12	4997.81 j	1.47	-57.004	1.00 z	n/a	0.220	0.23	0.23	1.85	
11	P-121	111.660	8	0.012	4995.87	4996.99	1.00	4998.76	4999.66	4997.53	4998.30	3.12	-89.994	1.00	0.15	0.775	1.09	1.09	1.31	

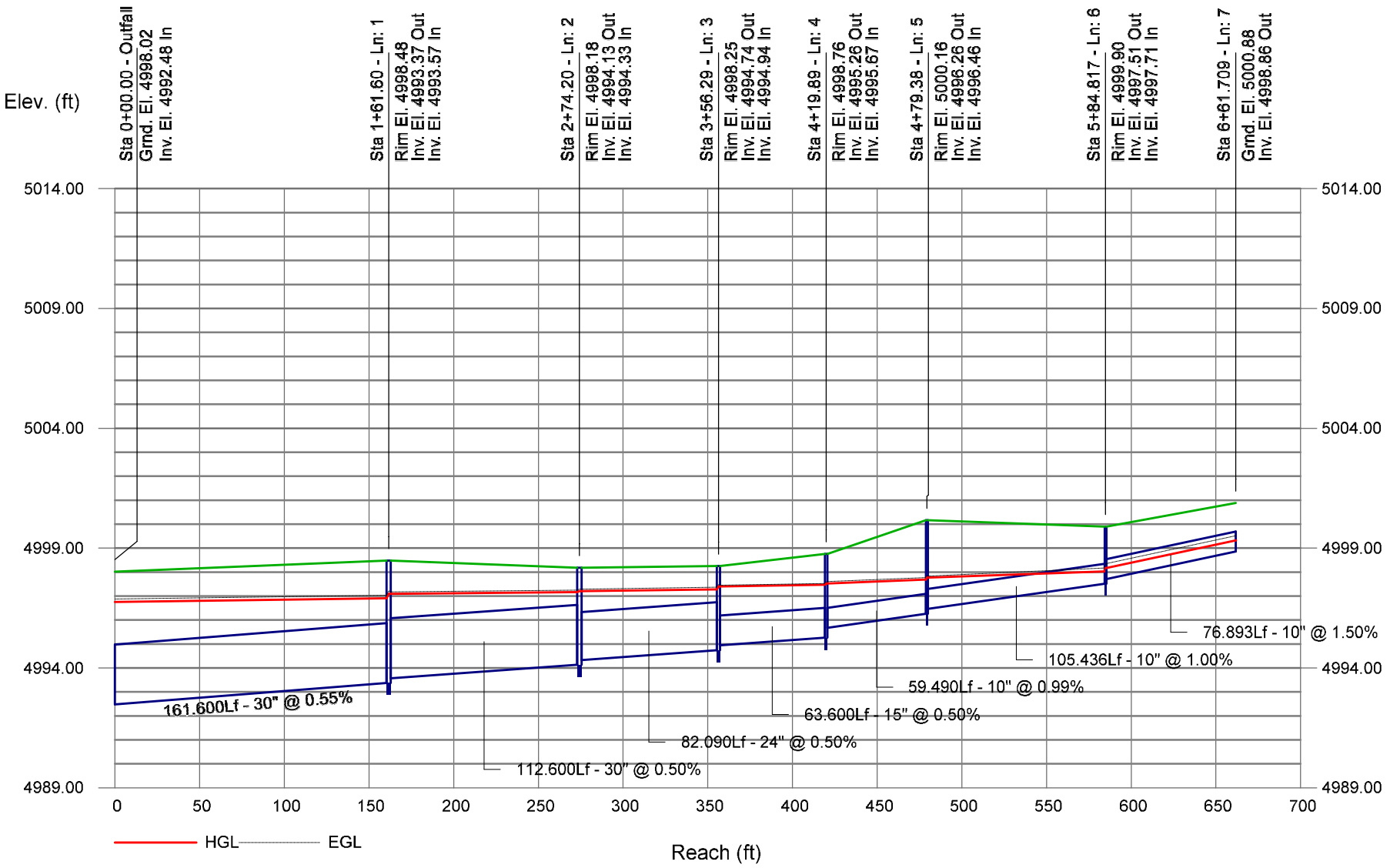
Project File: 100 YR ANALYSIS.stm | Number of lines: 11 | Date: 10/29/2020

NOTES: ** Critical depth

Storm Sewer Profile

Proj. file: 100 YR ANALYSIS.stm

STORM LINE 100



Storm Sewer Profile

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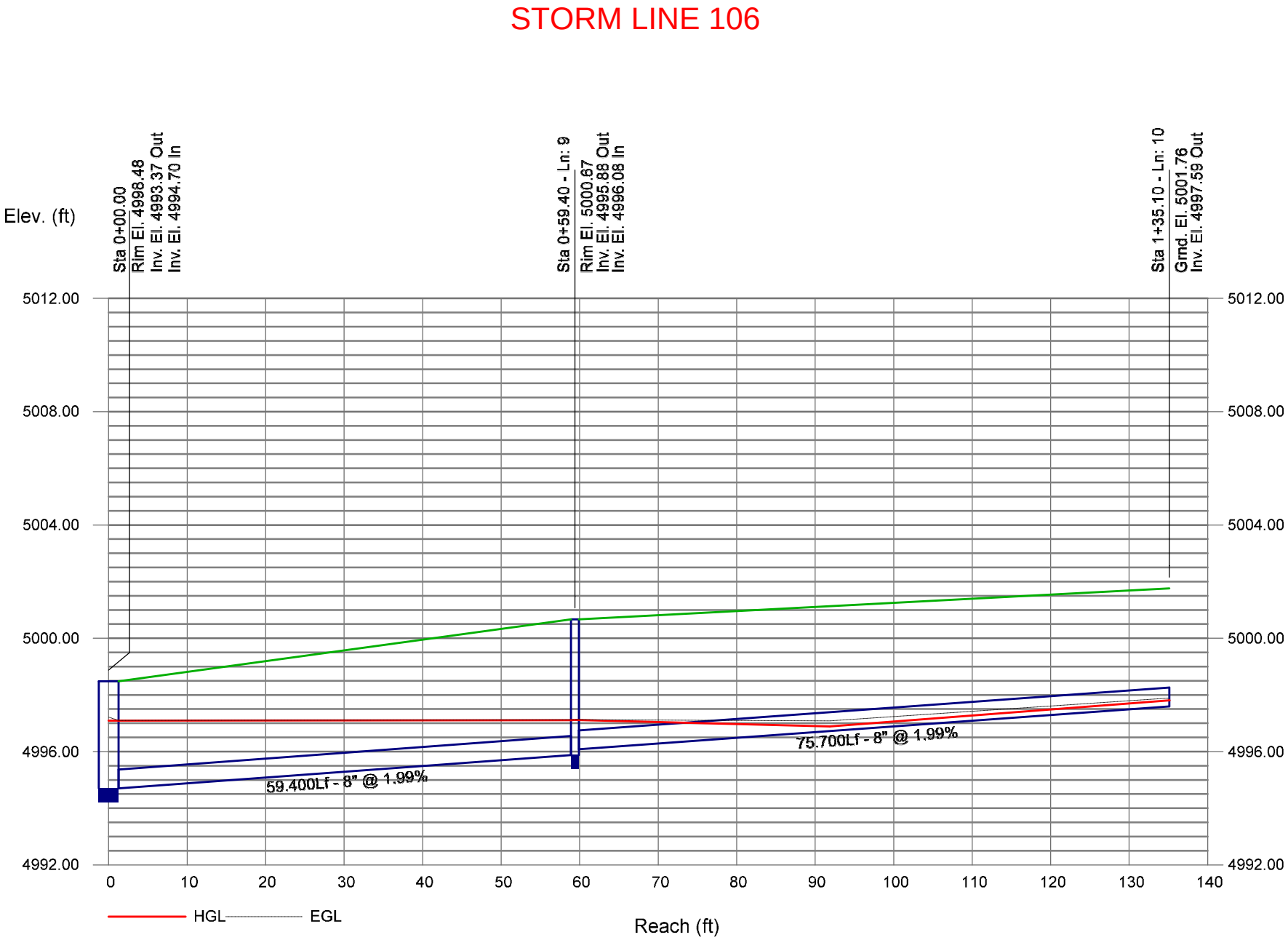
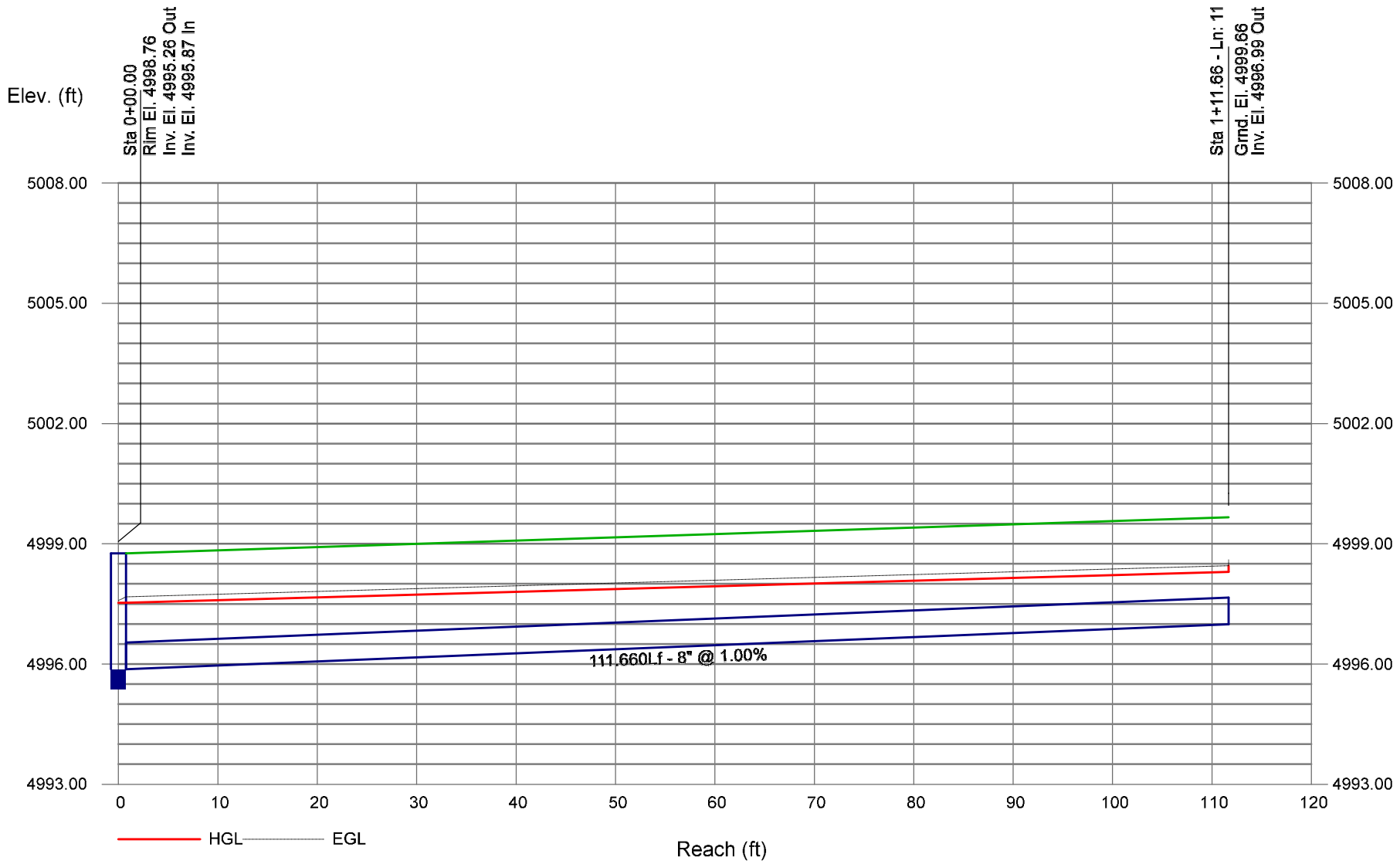


Storm Sewer Profile

Proj. file: 100 YR ANALYSIS.stm

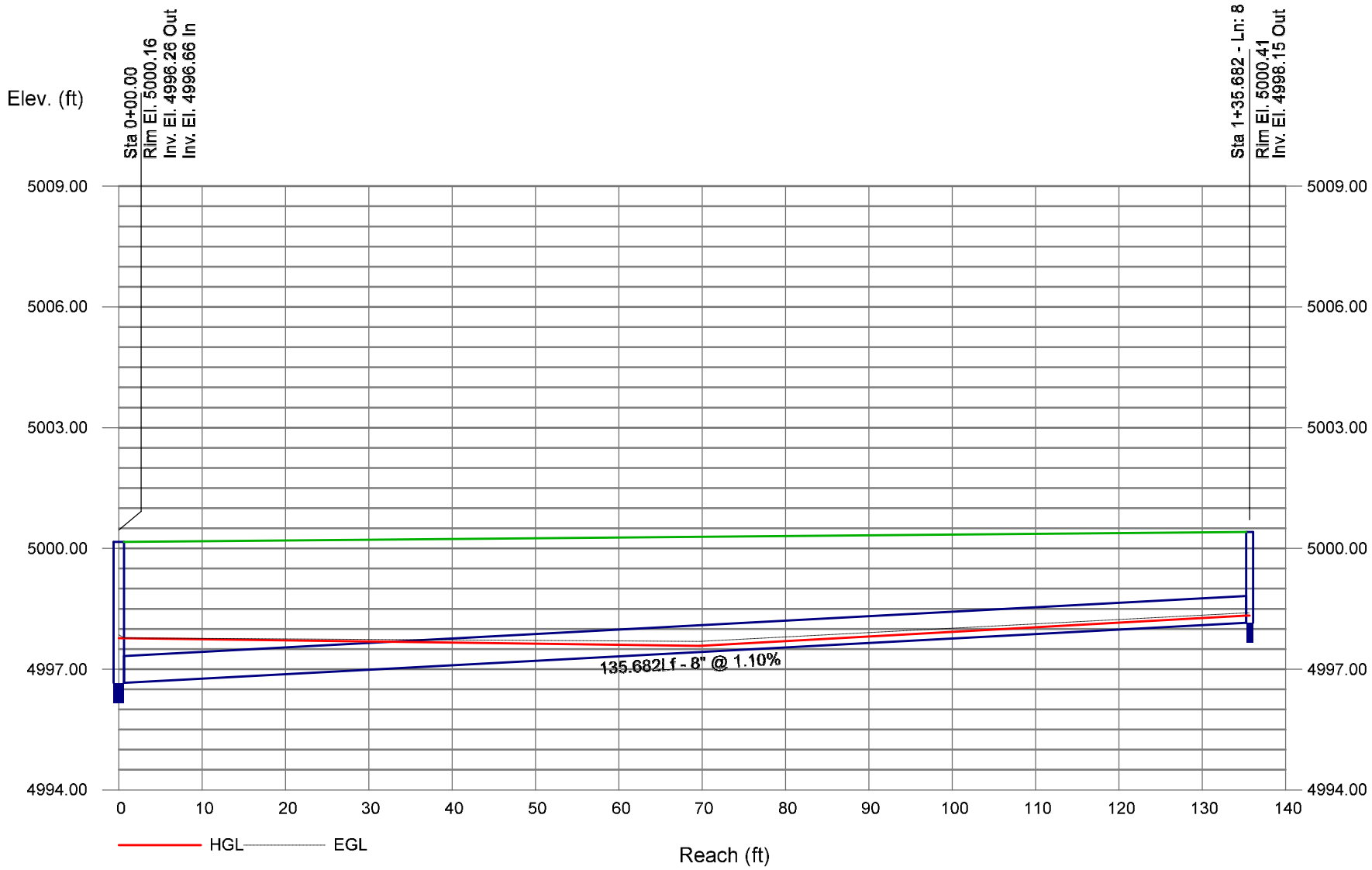
STORM LINE 121



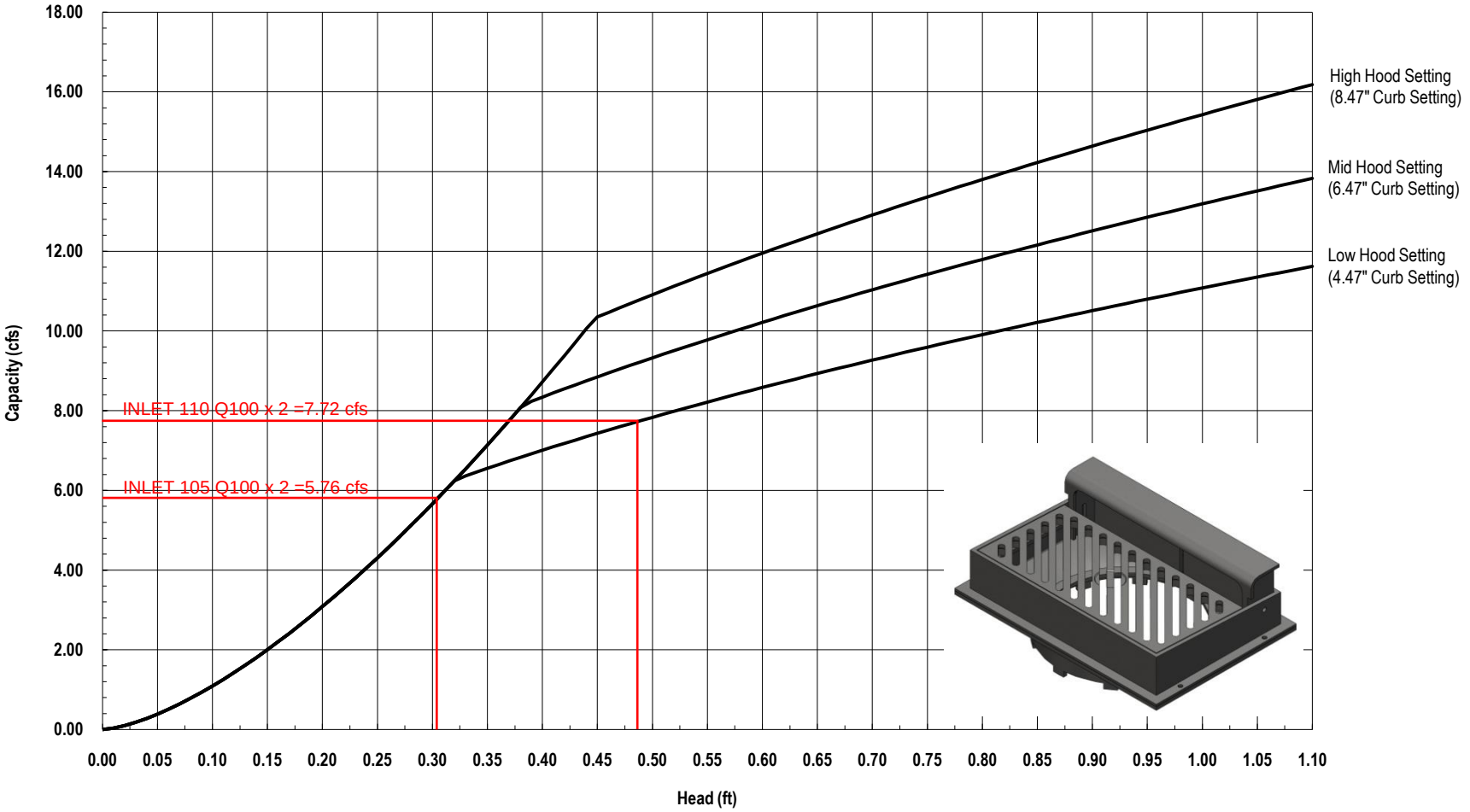
Storm Sewer Profile

Proj. file: 100 YR ANALYSIS.stm

STORM LINE 126

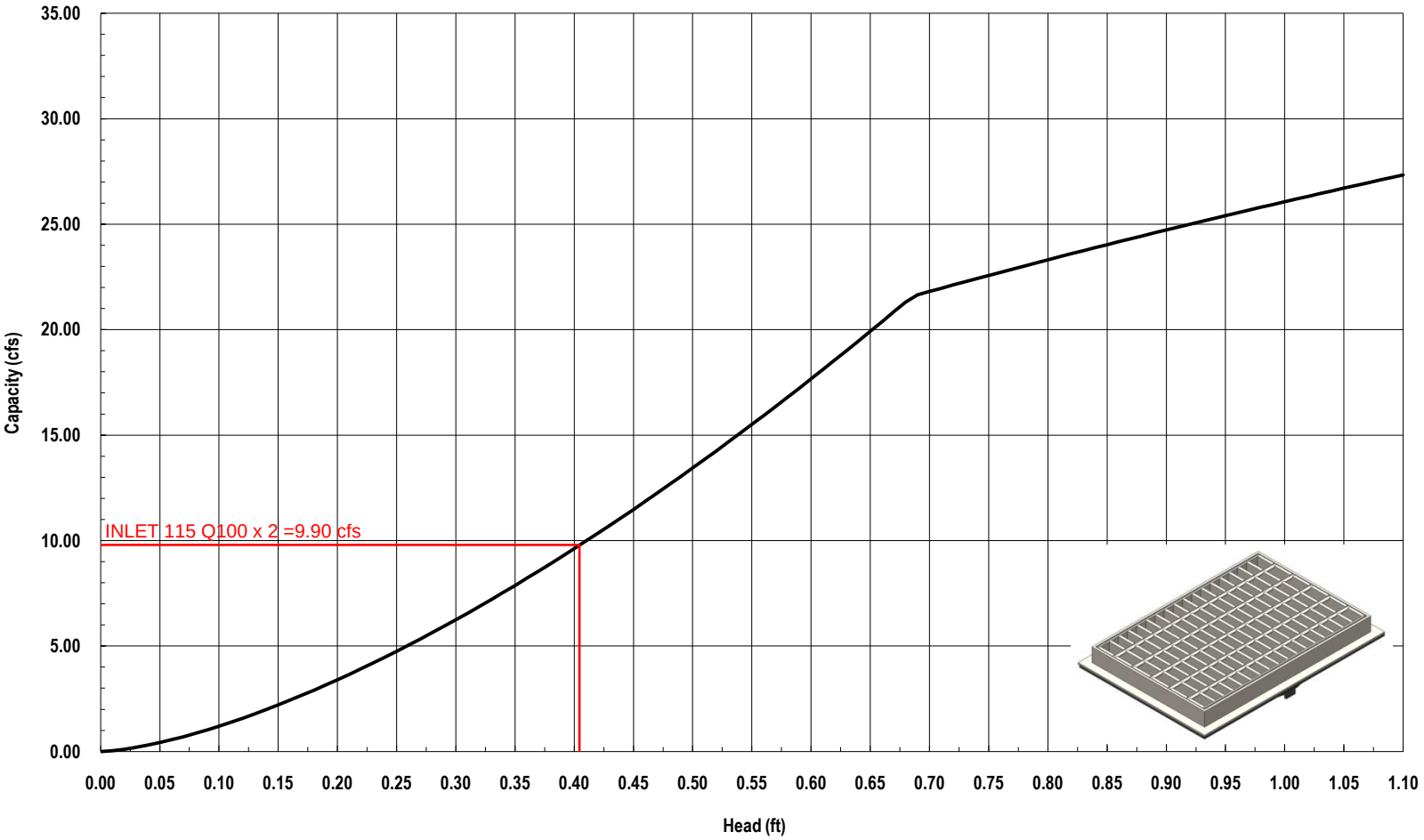


Nyloplast 2' x 3' Curb Inlet Diagonal Grate Inlet Capacity Chart



Nyloplast®
3130 Verona Avenue • Buford, GA 30518
(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490

Nyloplast 2' x 3' Steel Bar / MAG Grate Inlet Capacity Chart



Nyloplast®
3130 Verona Avenue • Buford, GA 30518
(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490

These pages are taken from Final Drainage Report for Market Street Business Park Subdivision, Submitted by Western Enginering Consultants inc LLC. 07/23/2020

STANDARD FORM SF-2
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)
100 Year Storm Event

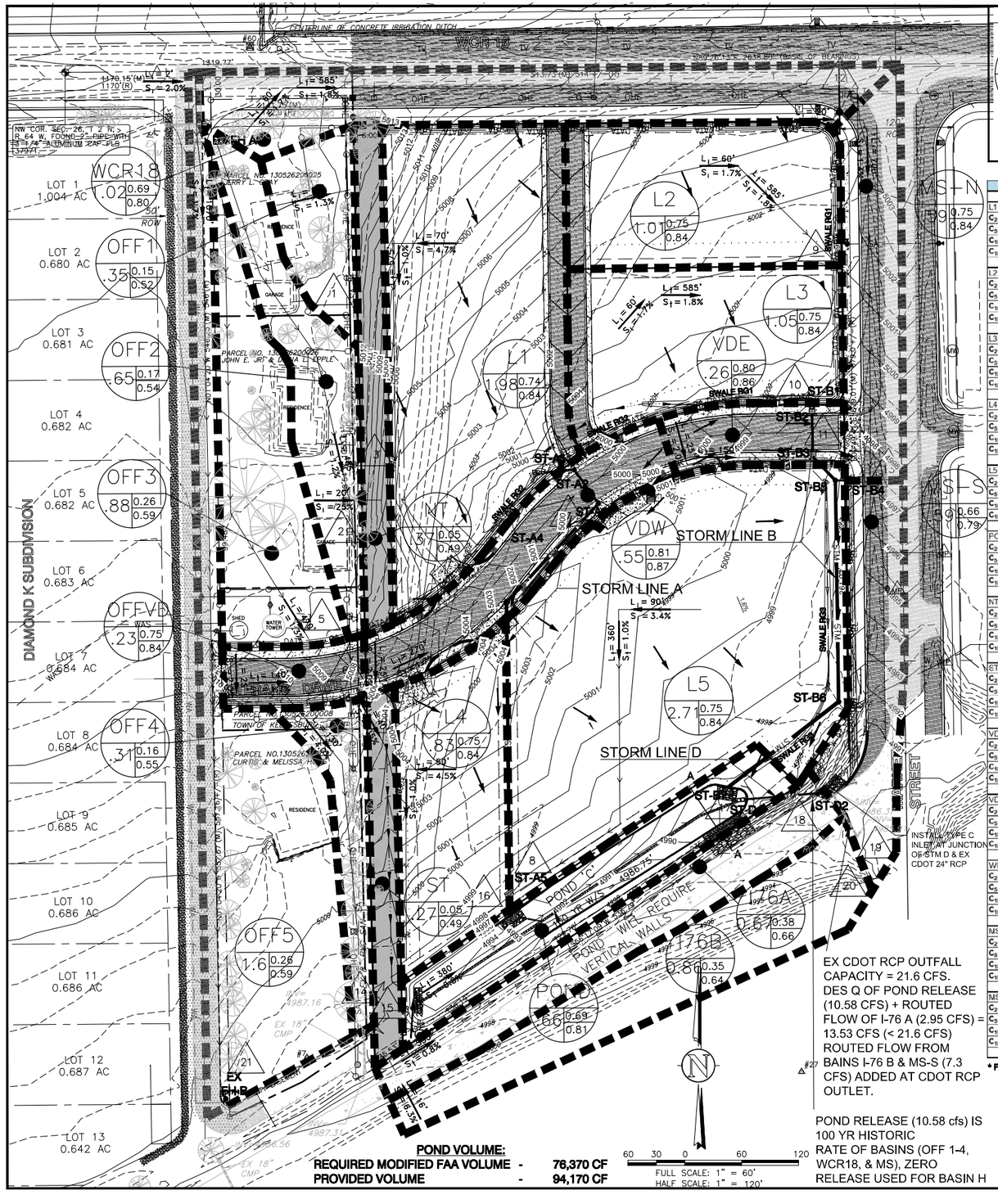
Subdivision: Market Street Business Park Subdivision

Calculated by: BWM **WECI Job No.:** 0187.003.00

Checked by: CFC **Date:** July 23, 2020

		Direct Runoff							Routed Runoff				
Structure Type (Page)	Design Pt.	Area Design Point	Area (ac)	Runoff Coeff. (C)	T_C (min)	C*A (ac)	I (in/hr)	Q (cfs)	T_C (min)	C*A (ac)	I (in/hr)	Q (cfs)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	
	1	OFF 1	0.35	0.52	14.2	0.18	6.2	1.1					
	2	OFF 2	0.65	0.54	22.8	0.35	4.9	1.7					
	3	NT	0.37	0.49	5.5	0.18	8.8	1.6					
ST-A2	4	L1	1.98	0.84	5.0	1.66	9.0	14.9	22.8	2.37	4.9	11.5	<< Flow at Type R inlet ST-A2 (Basins OFF1, OFF2. NT, L1)
	5	OFF 3	0.88	0.59	21.6	0.52	5.0	2.6					
	6	OFF VD	0.23	0.84	5.0	0.19	9.0	1.7					
ST-A3	7	VDW	0.55	0.87	5.0	0.48	9.0	4.3	22.8	3.56	4.9	17.3	<< Flow at Type R inlet ST-A3 (Basins OFF3, OFF VD, VDW)
	16	L4	0.83	0.84	5.0	0.69	9.0	6.3					
ST-A5	8	L5	2.71	0.84	5.7	2.27	8.7	19.8	22.8	6.52	4.9	31.8	<< Flow at Type R inlet ST-A5 (Basins L4, L5)
STM A **Forebay 2**									**22.8**	**6.52**	**4.9**	**31.8**	<< Flow at Forebay 2 ST-A6
	9	L2	1.01	0.84	5.0	0.85	9.0	7.7					
ST-B2	10	L3	1.05	0.84	5.0	0.88	9.0	7.9	5.0	1.73	9.0	15.6	<< Flow at Type R inlet ST-B2 (Basins L2, L3)
ST-B3	11	VDE	0.26	0.86	5.0	0.23	9.0	2.0	5.0	1.96	9.0	17.6	<< Flow at Type R inlet ST-B3 (Basin VDE)
	12	WCR 18	1.02	0.80	8.0	0.82	7.8	6.4					
ST-B5	13	MS-N	0.59	0.84	5.8	0.50	8.7	4.3	8.0	3.27	7.8	25.6	<< Flow at Type R inlet ST-B4 -> ST-B5 (Basins WCR 18, MS-N)
STM B **Forebay 3**									**8.0**	**3.27**	**7.8**	**25.6**	<< Flow at Forebay 3 ST-B7
	14	OFF 4	0.44	0.55	18.6	0.24	5.4	1.3					
	15	ST	0.27	0.49	7.3	0.13	8.1	1.1	18.6	0.37	5.4	2.0	<< Flow at Forebay 1 (Basins OFF4, ST)
Forebay 1									**18.6**	**0.37**	**5.4**	**2.0**	<< Flow at Forebay 1
ST-D1	17	POND	0.66	0.81	8.6	0.53	7.6	4.0	8.6	0.53	7.6	4.0	<< Flow at Pond Outlet ST-D1 (Basin POND)
Pond Outlet									22.8	10.70	4.9	52.1	<< Un-Restricted Flow at Pond Outlet
Pond Outlet									**22.8**	**10.70**	**4.9**	**10.6**	10.58
ST-D2	18	I-76 A	0.67	0.66	12.0	0.44	6.7	3.0	12.0	0.44	6.7	3.0	<< Un-Restricted Flow at FES ST-D2 (Basins I-76 A)
STM D **EX STM**									**22.8**	**11.14**	**4.9**	**13.5**	<< Un-Restricted Flow at FES to Connect to EX System
	19	I-76 B	0.86	0.64	10.2	0.55	7.1	3.9					
	20	MS-S	0.59	0.79	6.9	0.47	8.2	3.8	10.2	1.02	7.1	7.3	<< Un-Restricted Flow added to EX System (Basins I-76 B, MS-S)
EX STM									**22.8**	**12.15**	**4.9**	**20.8**	<< Total Flow through EX System

These pages are taken from Final Drainage Report for Market Street Business Park Subdivision, Submitted by Western Enginering Consultants inc LLC. 07/23/2020



DEVELOPED DRAINAGE LEGEND

B1 — Sub-basin Designation
3.2 XX C5 XX C100 — Area in Acres
PROPOSED DRAINAGE PATTERN
DEVELOPED BASIN
1 — DESIGN POINT
Existing Drainage Pattern

L - INITIAL LENGTH
S - INTIAL SLOPE
L - TRAVEL LENGTH
S - TRAVEL SLOPE
* AVERAGE SLOPE INCLUDES ROOF SLOPE OF 8.33%

$L_i = L_I / S_i = S_I$

$L_t = L_T / S_t = S_T$

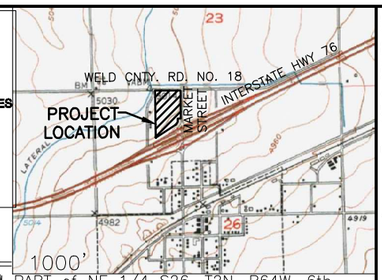
DEVELOPED DRAINAGE TABLE

Developed Runoff Table - Market Street Business Park Subdivision

BASIN	Impervious	C-YR	I	A	Q(A*B*C*D*E)	cfs	DESIGN POINT
L1							
C_2 (UDFCD 2018)	86.72	0.72	2.91	1.98	4.13	cfs	4
C_5	86.72	0.74	3.87	1.98	5.68	cfs	
C_{10}	86.72	0.77	4.78	1.98	7.29	cfs	
C_{100}	86.72	0.84	9.02	1.98	14.93	cfs	
L2							
C_2 (UDFCD 2018)	87.93	0.73	2.91	1.01	2.14	cfs	9
C_5	87.93	0.75	3.87	1.01	2.94	cfs	
C_{10}	87.93	0.78	4.78	1.01	3.77	cfs	
C_{100}	87.93	0.84	9.02	1.01	7.67	cfs	
L3							
C_2 (UDFCD 2018)	86.00	0.73	2.91	1.05	2.22	cfs	10
C_5	86.00	0.75	3.87	1.05	3.04	cfs	
C_{10}	86.00	0.78	4.78	1.05	3.90	cfs	
C_{100}	86.00	0.84	9.02	1.05	7.93	cfs	
L4							
C_2 (UDFCD 2018)	87.43	0.72	2.91	0.83	1.74	cfs	16
C_5	87.43	0.75	3.87	0.83	2.39	cfs	
C_{10}	87.43	0.78	4.78	0.83	3.07	cfs	
C_{100}	87.43	0.84	9.02	0.83	6.26	cfs	
L5							
C_2 (UDFCD 2018)	87.23	0.72	2.81	2.71	5.49	cfs	8
C_5	87.23	0.75	3.73	2.71	7.55	cfs	
C_{10}	87.23	0.77	4.62	2.71	9.69	cfs	
C_{100}	87.23	0.84	8.71	2.71	19.78	cfs	
FOND							
C_2 (UDFCD 2018)	79.89	0.65	2.46	0.56	1.07	cfs	17
C_5	79.89	0.69	3.27	0.56	1.47	cfs	
C_{10}	79.89	0.72	4.04	0.56	1.91	cfs	
C_{100}	79.89	0.81	7.63	0.56	4.04	cfs	
NT							
C_2 (UDFCD 2018)	2.00	0.01	2.84	0.37	0.01	cfs	3
C_5	2.00	0.05	3.77	0.37	0.07	cfs	
C_{10}	2.00	0.15	4.66	0.37	0.26	cfs	
C_{100}	2.00	0.49	8.79	0.37	1.58	cfs	
ST							
C_2 (UDFCD 2018)	2.00	0.01	2.80	0.27	0.01	cfs	15
C_5	2.00	0.05	3.45	0.27	0.05	cfs	
C_{10}	2.00	0.15	4.27	0.27	0.17	cfs	
C_{100}	2.00	0.49	8.05	0.27	1.05	cfs	
VDW							
C_2 (UDFCD 2018)	95.45	0.79	2.91	0.55	1.27	cfs	7
C_5	95.45	0.81	3.87	0.55	1.73	cfs	
C_{10}	95.45	0.84	4.78	0.55	2.21	cfs	
C_{100}	95.45	0.87	9.02	0.55	4.34	cfs	
VDE							
C_2 (UDFCD 2018)	93.86	0.78	2.91	0.26	0.59	cfs	11
C_5	93.86	0.80	3.87	0.26	0.81	cfs	
C_{10}	93.86	0.82	4.78	0.26	1.03	cfs	
C_{100}	93.86	0.86	9.02	0.26	2.04	cfs	
WCR 18							
C_2 (UDFCD 2018)	79.90	0.65	2.52	1.02	1.71	cfs	12
C_5	79.90	0.69	3.35	1.02	2.34	cfs	
C_{10}	79.90	0.71	4.14	1.02	3.01	cfs	
C_{100}	79.90	0.80	7.81	1.02	6.40	cfs	
MS-N							
C_2 (UDFCD 2018)	87.82	0.73	2.79	0.59	1.21	cfs	13
C_5	87.82	0.75	3.71	0.59	1.65	cfs	
C_{10}	87.82	0.78	4.50	0.59	2.12	cfs	
C_{100}	87.82	0.84	8.65	0.59	4.31	cfs	
MS-S							
C_2 (UDFCD 2018)	76.32	0.63	2.65	0.59	0.99	cfs	19
C_5	76.32	0.66	3.52	0.59	1.36	cfs	
C_{10}	76.32	0.70	4.36	0.59	1.79	cfs	
C_{100}	76.32	0.79	8.22	0.59	3.84	cfs	

* FOR BASINS OFF 1-5, OFF VD, & I-76 A&B SEE SHEETS C4.00 & C4.01

PORTIONS OR ALL OF SWALES RG1, RG2, AND RG3 TO REMAIN UNTIL FINAL LOT DEVELOPMENT CAPTURES AND DIRECTS INDIVIDUAL LOT RUNOFF TO STORM LINES A, B, OR POND 'C' AS APPROVED UNDER EACH LOT'S INDIVIDUAL STORM PLAN



PART of NE 1/4 S26, T2N, R64W, 6th PM
SHOWN VICINITY MAP TAKEN FROM USGS QUAD – KEENESBURG 40104–A5

NOTES

THIS PLAN IS INTENDED AS THE FINAL DRAINAGE PLAN FOR MARKET STREET BUSINESS PARK SUBDIVISION.

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SYMBOL LEGEND

45 DEG BEND
22.5 DEG BEND
RESTRAINED PLUG
RESTRAINED TEE
WATER METER
RESTRAINED CROSS
FIRE HYDRANT
RESTRAINED WATER VALVE
PIPE CROSSOVER
MANHOLE
EXISTING ASPHALT
PROPOSED ASPHALT PAVING

LINETYPE LEGEND

LOT / PROPERTY LINE
RIGHT OF WAY LINE
SETBACK
EASEMENT
TO BE ABANDONED LOT LINE
EXISTING BUILDING, CURB
EDGE of ASPHALT
CHAINLINK FENCE
WIRE FENCE
POND WQ W/S
SWALE
EXISTING SWALE
EXISTING OVERHEAD ELEC
EXISTING ELECTICAL LINE
EXISTING STORM LINE
EXISTING SANITARY LINE
EXISTING WATER LINE
EXISTING GAS LINE
EXISTING FIBER OPTIC LINE
EXISTING TELEPHONE LINE
PROPOSED SANITARY LINE
PROPOSED SANITARY SERVICE
PROPOSED STORM LINE
PROPOSED WATER LINE
PROPOSED WATER SERVICE
PROPOSED GAS LINE
PROPOSED ELECTRIC LINE
PROPOSED TELEPHONE LINE

Western Engineering Consultants, inc LLC
127 S. DENVER AVE
FT. LUPTON, CO 80621
www.westernenci.com
email@westernenci.com
(720) 685-9951
FAX (720) 294-1330

No.	REVISION	DATE	BY
0	PRELIM/FINAL PLAT SUBMITTAL	08/06/19	CFC
1	UPDATED DRAINAGE-TOWN SUBMITTAL	09/16/19	CFC
2	RESUBMITTAL PER TOWN COMMENTS	10/30/19	CFC
3	KDM & GD LOT REQUESTS	06/09/20	CFC
4	RESUBMITTAL PER TOWN COMMENTS	07/23/20	CFC

KEENE LAND, LLC
CONTACT: RICK ROBERTSON
8537 WCR 51
KEENESBURG, CO 80643
(303)961-0031

FINAL DRAINAGE PLAN
MARKET STREET BUSINESS PARK SUBDIVISION
TOWN of KEENESBURG, WELD COUNTY, COLORADO

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07/23/20
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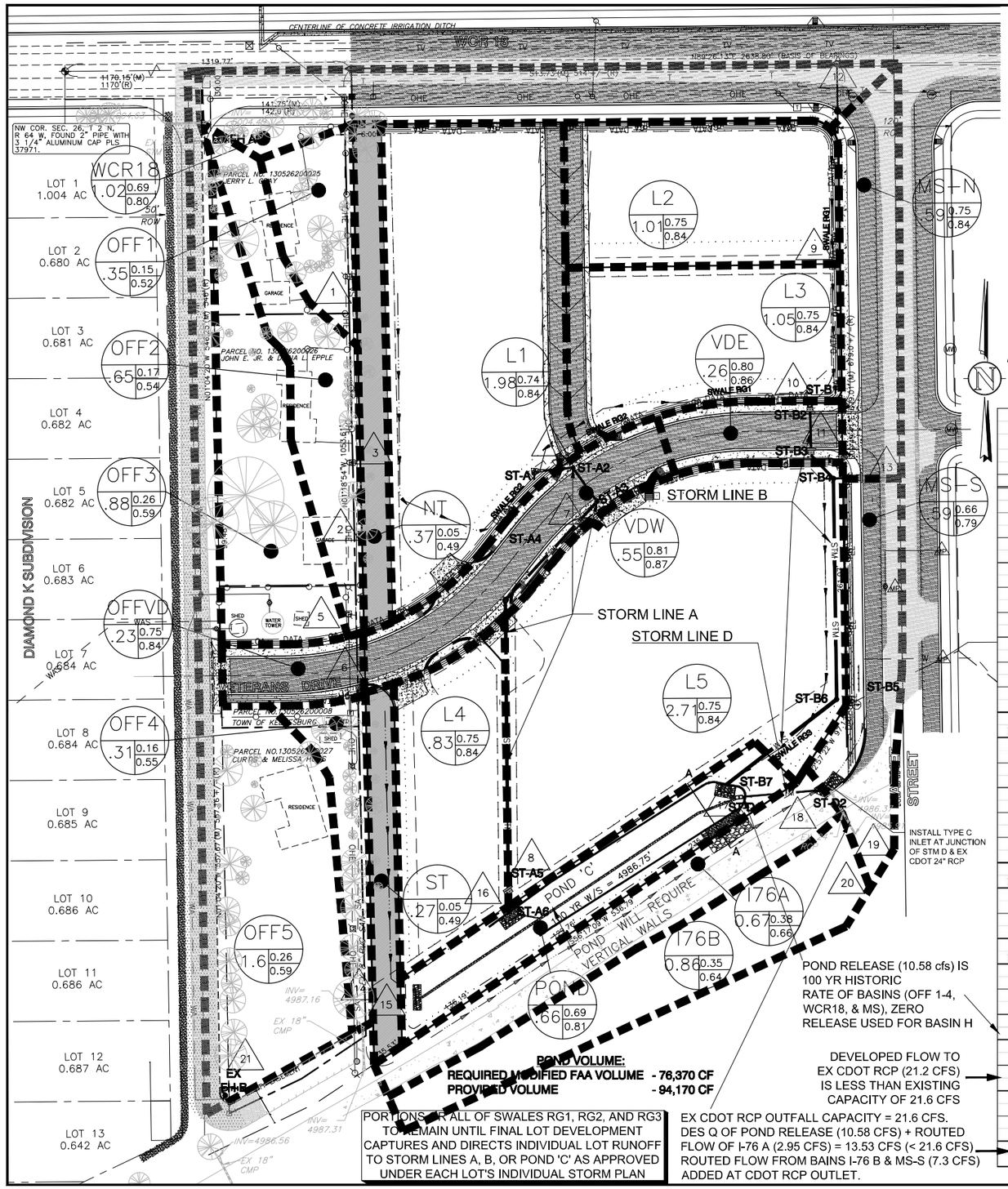
INITIAL PLAN RELEASE: 08/06/19
DESIGNED BY: CFC
DRAWN BY: CFC
CHECKED BY: CFC
PROJECT NO. 01-0187.003.00
DOC CON # C4.02-FNLDRNG
SHT C4.02

T:\0187_003_00-KEENE LAND-MARKET BUS PARK\Dwg\CDs\0187_003-WECI-CDS-4.00.dwg, C4.02-FINAL DRNG, 7/23/2020 7:09:33 PM, DWG To PDF.pc3, WEC 24"36, WEC 24"36

These pages are taken from Final Drainage Report for Market Street Business Park Subdivision, Submitted by Western Enginering Consultants inc LLC. 07/23/2020



STORM SYSTEM DATA TABLE

SYSTEM	ITEM	DESCRIPTION	QUANT.
STORM LINE A			
	PIPES:	24" RCP	61 LF
		30" RCP	68 LF
		36" RCP	404 LF
	INLETS:	CDOT 5' TYPE R	2
		CDOT 10' TYPE R	1
	MHs:	60" DIA	1
STORM LINE B			
	PIPES:	18" RCP	32 LF
		24" RCP	46 LF
		30" RCP	36 LF
		36" RCP	238 LF
		42" RCP	142 LF
	INLETS:	CDOT 5' TYPE R	2
		CDOT 10' TYPE R	1
	MHs:	60" DIA	2
STORM LINE D			
	PIPES:	18" RCP	71 LF
	INLETS:	OUTLET STRUCTURE	1
		TYPE C @ EX CDOT STM	1

60 30 0 60 120
FULL SCALE: 1" = 60'
HALF SCALE: 1" = 120'

NO TOPOGRAPHY SHOWN THIS SHEET FOR CLARITY OF STORM SYSTEM COMPONENTS.

ROUTED RATIONAL RUNOFF Q

Structure Type (Page)	Design Pt.	Direct Runoff Area Design Point	Area (ac)	Runoff Coeff (C)	T_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Routed Runoff T_c (min)	C*A (ac)	I (in/hr)	Q (cfs)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	1	OFF 1	0.35	0.52	14.2	0.18	6.2	1.1				
	2	OFF 2	0.65	0.54	22.8	0.35	4.9	1.7				
	3	NT	0.37	0.49	5.5	0.18	8.8	1.6				
ST-A2	4	L1	1.98	0.84	5.0	1.66	9.0	14.9				
									22.8	2.37	4.9	11.5
	5	OFF 3	0.88	0.59	21.6	0.52	5.0	2.6				
	6	OFF VD	0.23	0.84	5.0	0.19	9.0	1.7				
ST-A3	7	VDW	0.55	0.87	5.0	0.48	9.0	4.3				
									22.8	3.56	4.9	17.3
	16	L4	0.83	0.84	5.0	0.69	9.0	6.3				
ST-A5	8	L5	2.71	0.84	5.7	2.27	8.7	19.8				
									22.8	6.52	4.9	31.8
STM A Forebay 2									**22.8**	**6.52**	**4.9**	**31.8**
	9	L2	1.01	0.84	5.0	0.85	9.0	7.7				
ST-B2	10	L3	1.05	0.84	5.0	0.88	9.0	7.9				
									5.0	1.73	9.0	15.6
ST-B3	11	VDE	0.26	0.86	5.0	0.23	9.0	2.0				
									5.0	1.96	9.0	17.6
	12	WCR 18	1.02	0.80	8.0	0.82	7.8	6.4				
ST-B5	13	MS-N	0.59	0.84	5.8	0.50	8.7	4.3				
									8.0	3.27	7.8	25.6
STM B Forebay 3									**8.0**	**3.27**	**7.8**	**25.6**
	14	OFF 4	0.44	0.55	18.6	0.24	5.4	1.3				
	15	ST	0.27	0.49	7.3	0.13	8.1	1.1				
									18.6	0.37	5.4	2.0
Forebay 1									**18.6**	**0.37**	**5.4**	**2.0**
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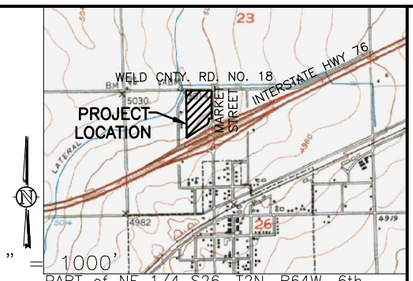
STM D EX STM									**22.8**	**11.14**	**4.9**	**13.5**
	19	I-76 B	0.86	0.64	10.2	0.55	7.1	3.9				
	20	MS-S	0.59	0.79	6.9	0.47	8.2	3.8				
									10.2	1.02	7.1	7.3
EX STM									**22.8**	**12.15**	**4.9**	**20.8**

* FULLY DEVELOPED FLOW TO OUTLET STRUCTURE
** RESTRICTED FLOW OUT OF OUTLET STRUCTURE



PART of NE 1/4 S26, T2N, R64W, 6th PM
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SYMBOL LEGEND

- 45 DEG BEND
- 22.5 DEG BEND
- RESTRAINED PLUG
- RESTRAINED TEE
- WATER METER
- RESTRAINED CROSS
- FIRE HYDRANT
- RESTRAINED WATER VALVE
- PIPE CROSSOVER
- MANHOLE
- EXISTING ASPHALT
- PROPOSED ASPHALT PAVING

LINETYPE LEGEND

- LOT / PROPERTY LINE
- RIGHT OF WAY LINE
- SETBACK
- EASEMENT
- TO BE ABANDONED LOT LINE
- EXISTING BUILDING, CURB
- EDGE of ASPHALT
- CHAINLINK FENCE
- WIRE FENCE
- POND WQ W/S
- SWALE
- EXISTING SWALE
- EXISTING OVERHEAD ELEC
- EXISTING ELECTICAL LINE
- EXISTING STORM LINE
- EXISTING SANITARY LINE
- EXISTING WATER LINE
- EXISTING GAS LINE
- EXISTING FIBER OPTIC LINE
- EXISTING TELEPHONE LINE
- PROPOSED SANITARY LINE
- PROPOSED SANITARY SERVICE
- PROPOSED STORM LINE
- PROPOSED WATER LINE
- PROPOSED WATER SERVICE
- PROPOSED GAS LINE
- PROPOSED ELECTRIC LINE
- PROPOSED TELEPHONE LINE

Western Engineering Consultants, inc LLC
127 S. DENVER AVE
FT. LUPTON, CO 80621
www.westernenci.com
email@westernenci.com
(720) 685-9951
FAX (720) 294-1330

No.	REVISION	DATE	BY
1	UPDATED DRAINAGE–TOWN SUBMITTAL	09/16/19	CFC
2	RESUBMITTAL PER TOWN COMMENTS	03/27/20	CFC
3	RESUBMITTAL	07/23/20	CFC
4	RESUBMITTAL PER TOWN COMMENTS	07/22/22	CFC

KEENE LAND, LLC
CONTACT: RICK ROBERTSON
8537 WCR 51
KEENESBURG, CO 80643
(303)961-0031

STORM SYSTEM PLAN
MARKET STREET BUSINESS PARK SUBDIVISION
TOWN of KEENESBURG, WELD COUNTY, COLORADO

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COLORADO REGISTERED CHRISTIN F. DOW 33802 APPROVAL 07/22/22 PROFESSIONAL ENGINEER
ONLY VALID FOR CONSTRUCTION IF SEAL, SIGNATURE & DATE ARE SHOWN

INITIAL PLAN RELEASE: 08/16/19
DESIGNED BY: CFC
DRAWN BY: CFC
CHECKED BY: CFC
PROJECT NO. 01-0187.003.00
DOC CON # C4.02A-STMDES
SHT C4.02A

T:\0187_003_00\KEENE LAND\MARKET BUS PARK\Dwg\CDs\0187_003-WECI-CDS-4.00.dwg, C4.02A-STM SYSTEM, 7/23/2020 7:09:47 PM, DWG To PDF.pc3, WEC 24"36, WEC 24"36

LEGEND:

ENERGY GRADE LINE

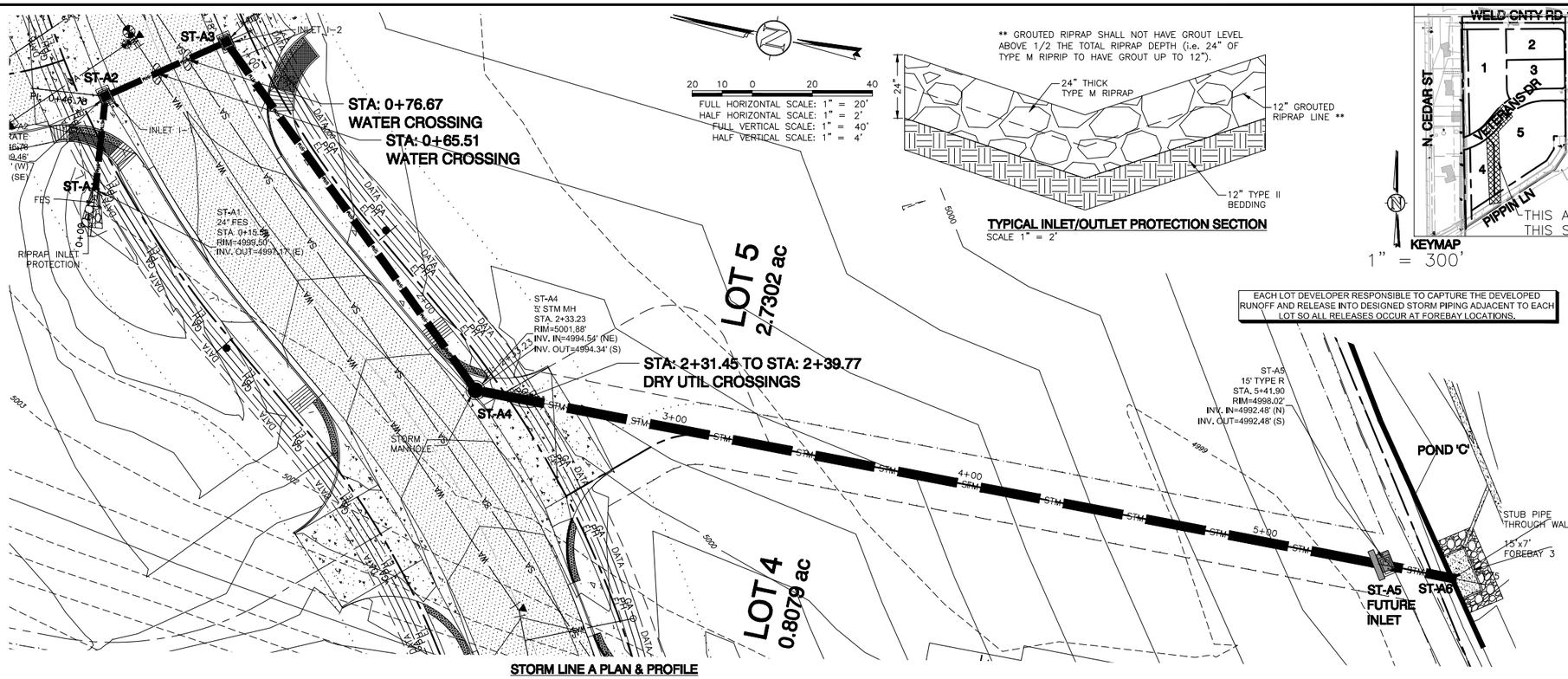
HYDRAULIC GRADE LINE

NOTE:

SEE ALSO FINAL DRAINAGE REPORT PREPARED BY WESTERN ENGINEERING CONSULTANTS DATED JULY 22, 2020 FOR RIPRAP CALCULATIONS.

CONTRACTOR TO HAVE GEOTECHNICAL ENGINEER INSPECT SUBGRADE CONDITIONS PRIOR TO PLACEMENT OF RIPRAP BEDDING AND RIPRAP.

ALL STORM SEWER PIPE SHALL BE CLASS III RCP UNDER PUBLIC ROADWAYS. ADS OR APPROVED EQUAL MAY BE USED OUTSIDE PUBLIC ROADWAY.



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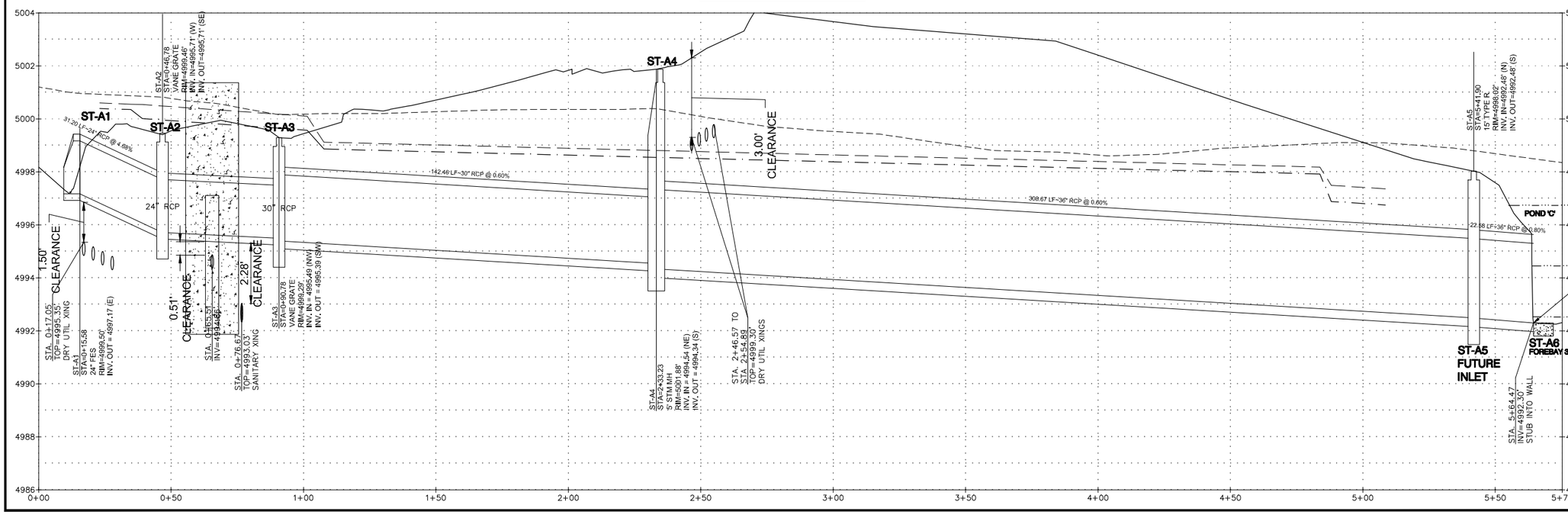
FULL HORIZONTAL SCALE: 1" = 20'
HALF HORIZONTAL SCALE: 1" = 2'
FULL VERTICAL SCALE: 1" = 40'
HALF VERTICAL SCALE: 1" = 4'

TYPICAL INLET/OUTLET PROTECTION SECTION
SCALE 1" = 2'

STORM LINE A PLAN & PROFILE



127 S. DEWEY AVE
FT. LUPTON, CO 80621
www.westernenci.com
email@westernenci.com
(720) 685-9951
FAX (720) 294-1330
Western Engineering Consultants, inc LLC

No.	REVISION	DATE	BY
0	PRELIM/FINAL PLAT SUBMITTAL	08/06/19	CFC
1	UPDATED DRAINAGE - TOWN SUBMITTAL	09/16/19	CFC
2	PRELIM/FINAL PLAT SUBMITTAL	06/30/20	CFC
3	RESUBMITTAL PER TOWN COMMENTS	07/22/20	CFC

KEENE LAND, LLC
CONTACT: RICK ROBERTSON
8537 WCR 51
KEENESBURG, CO 80643
(303)961-0031

STORM LINE 'A' PLAN & PROFILE
MARKET STREET BUSINESS PARK SUBDIVISION
TOWN of KEENESBURG, WELD COUNTY, COLORADO

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07/22/20
PROFESSIONAL ENGINEER
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INITIAL PLAN RELEASE: 08/06/19
DESIGNED BY: CFC
DRAWN BY: CFC
CHECKED BY: CFC
PROJECT NO. 01-0187.003.00
DOC CON # C4.03-STMP&P
SHT C4.03

T:\0187_003_00\KEENE LAND\MARKET BUS PARK\Dwg\CDs\0187_003-WECI-CDS-4.00.dwg, C4.03-STM P&P, 7/23/2020 7:10:03 PM, DWG To PDF.pc3, WEC 24"36, WEC 24"36