SCOTT, COX & ASSOCIATES, INC. consulting engineers • surveyors

January 30, 2020

Town of Lyons
432 5th Avenue
PO Box 49
Lyons, CO 80540

Reference: Drainage Conformance Letter
Tract A – Lyons Valley Park Filing No. 8 – Lyons, Colorado
Scott, Cox & Associates Project No. 19165B

To Whom It May Concern:

This drainage conformance letter is submitted as the final drainage report of the existing and proposed conditions for the property located at Tract A, Lyons Valley Park Filing No. 8, Lyons, Colorado. The site is located in the northeast quarter of Section 20, Township 3 North, Range 70 West of the 6th Principal Meridian in the Town of Lyons, Boulder County, State of Colorado. The site is bounded by St. Vrain Creek to the east, undeveloped hillside to the south and east, and residential housing to the north.

This report is being prepared to accompany the Site Development Plan application for the project. The purpose of this drainage conformance letter is to address specific drainage issues related to the proposed site changes. This study meets the requirements set forth in the Lyons Construction and Design Standards (LCDS).

EXISTING ON-SITE DRAINAGE

The 3.89-acre site is currently undeveloped. The site generally flows to the northeast and discharges into the Saint Vrain Creek.

Reference the "Final Drainage Report for Lyons Valley Park Filing No. 8, Lyons, Colorado" prepared by Hurst & Associates, Inc. dated May 30, 2007.

PROPOSED ON-SITE DRAINAGE

The Grading Plan shows the proposed site plan, on-site grading and overland flow directions. Under proposed conditions, the subdivision will be the drainage basin and the subdivision will be broken into six (6) major drainage sub-basins.

Sub-basin B consists of the southwest region of the site extending up the hill to the south. Runoff from within this basin is directed via overland flow to a drainage swale running through the center of sub-basin B and discharges into McConnell Drive. Drainage from this basin flows north along the swale, and ultimately draining into McConnell Drive to the north.

Sub-basin C consists of the southern region of the site extending up the hill to the south. Runoff from within this basin is directed via overland flow into drainage swale in sub-basin B or to the trail. Drainage from this basin drains north and west through the drainage swale or straight north to the trail. The drainage swale discharges into McConnell Drive and the trail drains north into the St. Vrain Creek.

Sub-basin D consists of the southeast region of the site extending up the hill to the south. Runoff from within this basin is directed via overland flow to a Carter Drive on the north end of sub-basin D. Drainage from this basin flows north through Carter Drive, and ultimately draining into St. Vrain Creek to the north.

Sub-basin E consists of the center of the site. Runoff from within this basin is separated by a ridge through the center of the site. Runoff on the northwest side of the ridge is directed via overland flow to McConnell Drive. Runoff on the southeast side of the ridge is directed via overland flow to Carter Drive

Sub-basin F consists of the southwest region of the site extending up the hill to the south. Runoff from within this basin is directed via overland flow to a drainage swale running through the center of sub-basin B and discharges into McConnell Drive. Drainage from this basin flows north along the swale, and ultimately draining into McConnell Drive to the north.

Sub-basin L consists of the northern region with Carter Drive and McConnell Drive. Runoff from within this basin is directed via overland flow to McConnell Drive or Carter Drive. Drainage from this basin flows, and ultimately draining into the McConnell Drive to the north.

DRAINAGE DESIGN CRITERIA

The existing and proposed conditions for the entire site were analyzed for the 2 and 100-year storm events. The results are shown in the following Table 1 and the relevant calculation sheets are included with this letter.

TABLE 1
RUNOFF CALCULATIONS SUMMARY

Drainage Basin	Area (acres)	2-Year Peak Runoff (cfs)	100-Year Peak Runoff (cfs)
B	11.30	0.00	12.77
C	4.80	0.86	7.59
D	12.20	2.95	20.80
E	3.61	5.97	21.26
F	2.78	4.00	15.12
L	1.30	1.35	5.23

The drainage concept for Lyons Valley Park is to convey the developed runoff from the project site to the St. Vrain Creek. The minor storm runoff will be conveyed by a storm sewer system where it will outfall to a porous landscape detention pond prior to entering the St. Vrain Creek. The portion of McConnell Drive that drains away from Lyons Valley Park will drain down McConnell Drive to an existing inlet. The existing inlet is part of Lyons Valley Park storm sewer system that drains directly into the detention pond on the northeast side of the site. A swale conveys the major storm flows exceeding the capacity of the storm sewer system to St. Vrain Creek.

Under these changes, no change in the 2-year or 100-year peak flows is anticipated. It is our conclusion that the peak runoff for the initial and major storm events from the tributary basin can be conveyed directly to the major drainage system without adverse impact to upstream, surrounding, or downstream properties and facilities.

STORM WATER QUALITY

The Lyons Valley Park Filing No. 7 Master Drainage Plan and Report provide details for the storm sewer system and associated storm water quality improvements that were constructed as part of Filing No. 7. The storm drainage system collects storm water runoff from Filing No. 7 and 8, which includes the subject property. The storm sewer system discharges into porous landscape detention area that is located on a portion of Outload A Lyons Valley Park Filing

No. 7. This porous landscape detention area provides water quality for both Filing No. 7 and 8. The exact size and volume required for treatment of these two filings was not clearly defined in the plans or report associated with these two filings.

Our inspection of this water quality basin revealed that the facility was operating correctly, but in need of some routine maintenance. This included some debris removal at the limited release outlet structure and basin bottom. The walls surrounding the basin appeared to be in good condition, although some of the blocks were dislodged. Overall, the water quality basin appears to be functioning as designed, which will accommodate the development associated with this project.

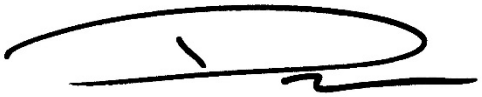
CONCLUSIONS

The primary consideration for this project was to design a drainage plan for the site to accommodate the proposed development plan without having an adverse impact on the surrounding properties. The drainage plan handles runoff from 2-year and 100-year storm events. All analyses were performed in accordance with the Town of Lyons Storm Drainage Criteria Addendum and the Urban Drainage & Flood Control District (UDFCD) Storm Drainage Criteria Manual.

Should you have any questions or comments regarding this letter kindly give me a call.

Sincerely,

SCOTT, COX & ASSOCIATES, INC.



Donald P. Ash, P.E.
Chief Civil Engineer

Enclosures: Runoff Calculations
Hurst Report dated May 30, 2007

TABLE 2-1
RAINFALL ITENSITY-DURATION TABLES
LYONS, COLORADO

RETURN PERIOD = 2 YEARS					RETURN PERIOD=100 YEARS				
Duration (min)	Total Depth (in)	Incremental Depth (in)	Design Rain (in)	Intensity (in/hr)	Duration (min)	Total Depth (in)	Incremental Depth (in)	Design Rain (in)	Intensity (in/hr)
10	0.47	0.47	0.06	2.82	10	1.21	1.21	0.18	7.26
20	.68	.21	.09	2.05	20	1.78	0.57	.19	5.34
30	.82	.14	.21	1.64	30	2.12	.34	.57	4.24
40	.91	.09	.47	1.37	40	2.31	.19	1.21	3.47
50	.98	.07	.14	1.18	50	2.50	.19	.034	3.01
60	1.04	.06	.07	1.04	60	2.68	.18	.19	2.68
70	1.08	.04	.04	.093	70	2.81	.13	.13	2.41
80	1.12	.04	.04	.84	80	2.88	.07	.07	2.16
90	1.16	.04	.04	.77	90	2.93	.05	.05	1.96
100	1.20	.04	.04	.72	100	2.98	.05	.05	1.79
110	1.23	.03	.03	.67	110	3.03	.05	.05	1.65
120	1.26	.03	.03	.63	120	3.08	.05	.05	1.54
130	1.29	.03	.03	.59	130	3.13	.05	.05	1.44
140	1.32	.03	.03	56	140	3.18	.05	.05	1.36
150	1.35	.03	.03	.54	150	3.23	.05	.05	1.29
160	1.37	.02	.02	.51	160	3.28	.05	.05	1.23
170	1.39	.02	.02	.49	170	3.32	.04	.04	1.17
180	1.41	.02	.02	.47	180	3.36	.04	.04	1.12
TOTAL		**1.41**	**1.41**		**TOTAL**		**3.36**	**3.36**	

From NOAA Atlas, volume III, Colorado 1973.

TABLE 2-2

Allowable Use of Streets and of Cross Street Flow as Part of Drainage system During Minor and Major Storm Runoff

Street Classification	**Minor Storm Runoff (Maximum roadway encroachment)**	**Major Storm runoff (Allowable depth & inundation)**
Local	No Curb overtopping; where no curbing exists, encroachment shall not extend over property lines. Flow may spread to crown of street.	Inundation: Residential dwellings, public, commercial and industrial buildings shall not be inundated at ground line, unless buildings are flood-proofed. Depth or water over gutter flowline shall not exceed 18"
Collector	No curb overtopping: (same as above) Flow spread must leave at least one lane free of water.	(Same as above)
Arterial	No curb overtopping: (Same as above). Flow spread must leave at least one lane free of water in each direction.	Inundation: (same as above). Depth of water at street crown shall not exceed 6", to allow operation of emergency vehicles. Dept of water over gutter flowline shall not exceed 18".

Allowable Cross Street Flow

Local	Where cross pans allowed, depth of flow shall not exceed 6".	Depth of water over gutter flowline shall not exceed 18"
Collector, Arterial	None	Depth of water at crown shall not exceed 6".

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Overall Drainage Plan

Lyons Valley Park
Lyons , Colorado

Project #: 19165B
Date: 1/31/2020
By: DPA

	Runoff Coefficients						Initial Overland Time (t_i) $t_i=1.8(1.1-C_5)L^{1/2}S^{-1/3}$			Travel Time (t_t) t_t=Length/(Velocity*60)					t_c Computed	t_c Urbanized Check		t_c Final	Rainfall Intensities (in/hr)				Flow Rates (cfs)			
Municipality: Boulder County Parcel Name	Parcel Size	C_2	C_5	C_{10}	C_{100}	% Impervious	Overland Flow (L_o) (ft)	Slope (ft/ft)	t_i (min)	Length (ft)	Slope (ft/ft)	Cv	Velocity (ft/s)	t_t (min)	Time of Conc $t_i + t_t = t_c$	Total Length (ft)	t_c=(L/180)+10 (min)	Minimum t_c=5 min	I_2	I_5	I_{10}	I_{100}	Q_2	Q_5	Q_{10}	Q_{100}
Basin B	11.30	0.00	0.01		0.20	40.00	1410.0	0.290	24.4	0	0.0001	7	0.07	0.0	24.4	1410	17.8	17.8	2.2			5.7	0.00	0.00	0.00	12.77
Basin C	4.80	0.08	0.10		0.28	40.00	910.0	0.370	16.6	380	0.0550	7	1.64	3.9	20.5	1290	17.2	17.2	2.3			5.7	0.86	0.00	0.00	7.59
Basin D	12.20	0.11	0.13		0.31	40.00	865.0	0.380	15.6	900	0.0520	7	1.60	9.4	24.9	1765	19.8	19.8	2.2			5.5	2.95	0.00	0.00	20.80
Basin E	3.61	0.58	0.63		0.78	40.00	310.0	0.120	6.6	540	0.0300	7	1.21	7.4	14.0	850	14.7	14.0	2.9			7.6	5.97	0.00	0.00	21.26
Basin F	2.78	0.48	0.53		0.68	40.00	275.0	0.160	6.9	285	0.0410	7	1.42	3.4	10.2	560	13.1	10.2	3.0			8.0	4.00	0.00	0.00	15.12
Basin L	1.30	0.40	0.45		0.60	40.00	35.0	0.020	5.6	755	0.0100	7	0.70	18.0	23.6	790	14.4	14.4	2.6			6.7	1.35	0.00	0.00	5.23
	35.99																									

FINAL DRAINAGE REPORT
LYONS VALLEY PARK
FILING NO. 8
LYONS, COLORADO

Prepared For:
Lyons Valley Park, Inc.
5757 Central Avenue
Suite 400
Boulder CO, 80301

Prepared By:
Hurst & Associates, Inc.
4999 Pearl East Circle
Suite 106
Boulder, CO 80301

Job Number 2210-02
May 30, 2007

TABLE OF CONTENTS

INTRODUCTION

Lyons Valley Park, Filing 8 is a proposed 39.9 acre development containing 90 single-family residential lots and 28 multi-family units. The project site is located along the south side of McConnell Drive between U.S. 36 and Estes Court in the Town of Lyons, Boulder County, Colorado. The project site is currently vacant and covered with native grasses. The majority of the runoff from the site drains to Lyons Valley Park, Filing 7. These flows and the runoff from the project site drain easterly into the adjacent St. Vrain Creek located on the southwest side of U.S. 36.

The intent of this report is to present the drainage and grading design for Lyons Valley Park, Filing 8.

DRAINAGE CONCEPT

The drainage concept for Lyons Valley Park, Filing 8 is to convey the developed runoff from the project site to the St. Vrain Creek. The minor storm runoff will be conveyed by a storm sewer system and connect to Filing 7 storm sewer system where it will outfall to a porous landscape detention pond prior to entering the St. Vrain Creek. The portion of McConnell Drive (which includes Flood Court) that drains away from Lyons Valley Park, Filing 7, will drain down McConnell Dive to an existing inlet. The existing inlet is part of Lyons Valley Park, Filing 6 storm sewer system that drains directly into the detention pond on the northeast side of the site. Swale A-A adjacent to Lot 12 of Block 1, Filing 7 conveys the major storm flows exceeding the capacity of the storm sewer system to St. Vrain Creek.

HYDROLOGIC/HYDRAULIC ANALYSIS

The rational method as presented in the *Urban Drainage and Flood Control Criteria Manual* (1984) and the Town of Lyons' *Manual of Design Criteria and Standard Specifications*

for the Construction of Public Improvements (1986) was used to determine the minor and major storm runoff. Drainage basins were defined by the proposed grading and the locations of the proposed inlets and storm pipes. The time of concentration (T_c) for each basin was computed considering the inlet time and the travel time in storm sewers or streets. The calculated times of concentration (T_c) were used to determine the peak flows using the intensity-duration-frequency curves for the Town of Lyons, Colorado. The site's minor storm drainage system including the storm sewer pipes and inlets is designed using a 2-year recurrence interval and the major storm drainage system is designed using a 100-year recurrence interval. The basin runoff calculations are located in **Appendix A**. Storm sewers were analyzed using the Hydroflow 2005 computer package (see **Appendix B**). Street and swale capacities were analyzed using Manning's equation (see **Appendices C and D**).

APPENDIX A

RUNOFF CALCULATIONS

Runoff Coefficients
Lyons Valley Park
Job Number: 221002

LAND USE CHARACTERISTICS		RUNOFF COEFFICIENTS		
		C_2	C_5	C_{100}
1	Single Family Residential	0.40	0.45	0.60
2	Lawns, Sandy Soil	0.00	0.01	0.20
3	Multi-Unit (attached)	0.60	0.65	0.80

BASIN	AREA acres	SFR acres	Lawns acres	Multi-Unit acres	WEIGHTED COEFFICIENTS		
					C_2	C_5	C_{100}
A	11.1	3.32	7.78	0.00	0.12	0.14	0.32
B	11.3	0.11	11.19	0.00	0.00	0.01	0.20
C	4.8	0.98	3.82	0.00	0.08	0.10	0.28
D	12.2	3.29	8.91	0.00	0.11	0.13	0.31
E	3.61	0.31	0.00	3.30	0.58	0.63	0.78
F	2.78	1.60	0.00	1.17	0.48	0.53	0.68
G	0.51	0.51	0.00	0.00	0.40	0.45	0.60
H	2.36	1.71	0.65	0.00	0.29	0.33	0.49
I	1.87	1.87	0.00	0.00	0.40	0.45	0.60
J	1.21	1.21	0.00	0.00	0.40	0.45	0.60
K	2.14	2.14	0.00	0.00	0.40	0.45	0.60
L	1.30	1.30	0.00	0.00	0.40	0.45	0.60
M	1.46	1.46	0.00	0.00	0.40	0.45	0.60
N	1.43	1.43	0.00	0.00	0.40	0.45	0.60
O	1.54	1.54	0.00	0.00	0.40	0.45	0.60
P	4.16	4.16	0.00	0.00	0.40	0.45	0.60
Q	1.66	1.66	0.00	0.00	0.40	0.45	0.60
R	0.56	0.56	0.00	0.00	0.40	0.45	0.60
S	0.59	0.59	0.00	0.00	0.40	0.45	0.60

Time of Concentration
Lyons Valley Park
Job Number: 221002

Sub-basin Data			Overland Flow			Travel Time in Channel					T_c Check		
Basin	C_5	Area (acres)	Length (ft)	Slope (%)	T_i (fig.3-1) (mins)	Length (ft)	Slope (%)	Velocity (ft/sec) (fig.3-2)	T_t (mins)	T_c (mins)	Total Length (ft)	T_c = (L/180)+10 (mins)	Final T_c (min = 5 mins)
A	0.14	11.10	1200	37.0	17.9	385	4.5	4.2	1.5	19.5	1585	18.8	18.8
B	0.01	11.30	1410	29.0	23.9	0	0.0	0.0	0.0	23.9	1410	17.8	17.8
C	0.10	4.80	910	37.0	16.3	380	5.5	4.7	1.3	17.6	1410	17.8	17.6
D	0.13	12.20	865	38.0	15.3	900	5.2	4.5	3.3	18.6	1765	19.8	18.6
E	0.63	3.61	310	12.0	6.5	540	3.0	3.4	2.6	9.1	850	14.7	9.1
F	0.53	2.78	275	16.0	6.7	285	4.1	4.0	1.2	7.9	560	13.1	7.9
G	0.45	0.51	35	2.0	5.5	415	1.9	2.7	2.6	8.1	450	12.5	8.1
H	0.33	2.36	45	2.0	7.4	825	1.9	2.0	6.9	14.3	870	14.8	14.3
I	0.45	1.87	215	7.0	9.0	430	0.5	1.5	4.8	13.7	645	13.6	13.6
J	0.45	1.21	70	2.0	7.8	770	1.9	2.7	4.8	12.5	840	14.7	12.5
K	0.45	2.14	225	4.4	10.7	325	0.8	1.8	3.0	13.7	550	13.1	13.1
L	0.45	1.30	35	2.0	5.5	755	1.0	2.0	6.3	11.8	790	14.4	11.8
M	0.45	1.46	40	2.0	5.9	735	1.2	2.2	5.6	11.4	775	14.3	11.4
N	0.45	1.43	210	3.3	11.4	150	0.5	1.5	1.7	13.1	360	12.0	12.0
O	0.45	1.54	90	2.0	8.8	475	2.5	2.4	3.3	12.1	565	13.1	12.1
P	0.45	4.16	220	4.5	10.5	605	0.8	1.8	5.6	16.1	825	14.6	14.6
Q	0.45	1.66	70	2.0	7.8	835	0.7	1.7	8.2	16.0	905	15.0	15.0
R	0.45	0.56	40	2.0	5.9	425	4.5	4.2	1.7	7.6	465	12.6	7.6
S	0.45	0.59	220	20	6.4	135	1.4	2.3	1.0	7.4	355	12.0	7.4

Bain Runoff Summary
Lyons Valley Park
Job Number: 221002

Basin	Total Area (acres)	Weighted Runoff		T_c (mins)	Intensity		Design Flow	
		C_2	C_{100}		I_2 (in/hr)	I_{100} (in/hr)	Q_2 (cfs)	Q_{100} (cfs)
A	11.10	0.12	0.32	18.8	2.15	5.50	2.86	19.51
B	11.30	0.00	0.20	17.8	2.20	5.65	0.10	13.02
C	4.80	0.08	0.28	17.6	2.25	5.65	0.89	7.65
D	12.20	0.11	0.31	18.6	2.20	5.50	2.90	20.66
E	3.61	0.58	0.78	9.1	2.85	7.55	6.00	21.35
F	2.78	0.48	0.68	7.9	3.00	8.00	4.04	15.21
G	0.51	0.40	0.60	8.1	2.95	7.90	0.60	2.42
H	2.36	0.29	0.49	14.3	2.45	6.15	1.68	7.11
I	1.87	0.40	0.60	13.6	2.50	6.35	1.87	7.12
J	1.21	0.40	0.60	12.5	2.55	6.50	1.23	4.72
K	2.14	0.40	0.60	13.1	2.50	6.40	2.14	8.22
L	1.30	0.40	0.60	11.8	2.60	6.70	1.35	5.23
M	1.46	0.40	0.60	11.4	2.65	6.75	1.55	5.91
N	1.43	0.40	0.60	12.0	2.60	6.60	1.49	5.66
O	1.54	0.40	0.60	12.1	2.60	6.55	1.60	6.05
P	4.16	0.40	0.60	14.6	2.40	6.15	3.99	15.35
Q	1.66	0.40	0.60	15.0	2.35	6.05	1.56	6.03
R	0.56	0.40	0.60	7.6	3.05	8.10	0.68	2.70
S	0.59	0.40	0.60	7.4	3.05	8.15	0.72	2.89
The following are from the Final Drainage Report of Lyons Valley Park Filing No. 6								
6A	3.28	0.40	0.60	13.9	2.40	6.35	3.15	12.50
6B	1.66	0.40	0.60	12.3	2.52	6.70	1.67	6.67
6C	1.52	0.40	0.60	11.5	2.60	6.85	1.58	6.25
6D	1.50	0.40	0.60	12.3	2.52	6.70	1.51	6.03

Note: All Intensities are from the City of Lyons Intensity-Duration Curve, Figure 2-1, except for the 100-year intensities with times of concentration less than 10 minutes. These intensities are from the Boulder County Time-Intensity-Frequency Curve for Zone 1 (Figure 502).

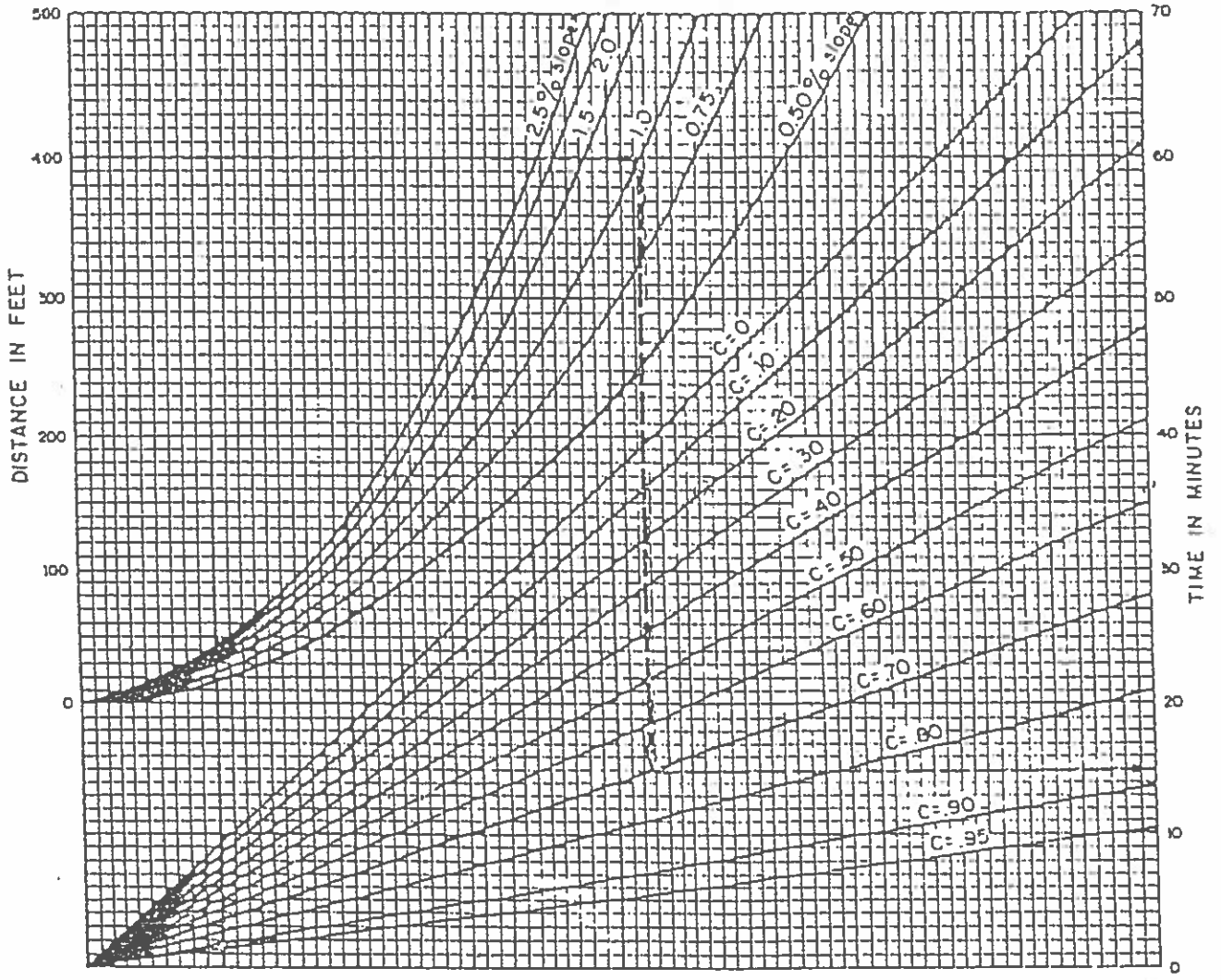
RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	RUNOFF COEFFICIENTS FREQUENCY 2	5	10	100
Business:					
Commercial Areas	95	.87	.87	.88	.89
Neighborhood Areas	70	.60	.65	.70	.80
Residential:					
Single-Family	Figure-603	.40	.45	.50	.60
Multi-Unit (detached)	50	.45	.50	.60	.70
Multi-Unit (attached)	70	.60	.65	.70	.80
1/2 Acre Lot or Larger	Figure-603	.30	.35	.40	.60
Apartments	70	.65	.70	.70	.80
Industrial:					
Light Areas	80	.71	.72	.76	.82
Heavy Areas	90	.80	.80	.85	.90
Parks, Cemetaries	7	.10	.10	.35	.60
Playgrounds	13	.15	.25	.35	.65
Schools	50	.45	.50	.60	.70
Railroad Yard Areas	40	.40	.45	.50	.60
Undeveloped Areas:					
Historic Flow Analysis Greenbelts, Agricultural	2	(see "Lawns")			
Offsite Flow Analysis (when land use not defined)	45	.43	.47	.55	.65
Streets:					
Paved	100	.87	.88	.90	.93
Gravel	13	.15	.25	.35	.65
Drives and Walks	96	.87	.87	.88	.89
Roofs	90	.80	.85	.90	.90
Lawns, Sandy Soil	0	.00	.01	.05	.20
Lawns, Clayey Soil	0	.05	.10	.20	.40

NOTE: The Rational Formula coefficients do not apply for larger basins where the time-of-concentration exceeds 60 minutes.

BOULDER COUNTY STORM DRAINAGE CRITERIA MANUAL	FIGURE 601

OVERLAND TIME OF FLOW



THE ABOVE CURVES ARE A SOLUTION OF THE FOLLOWING EQUATION:

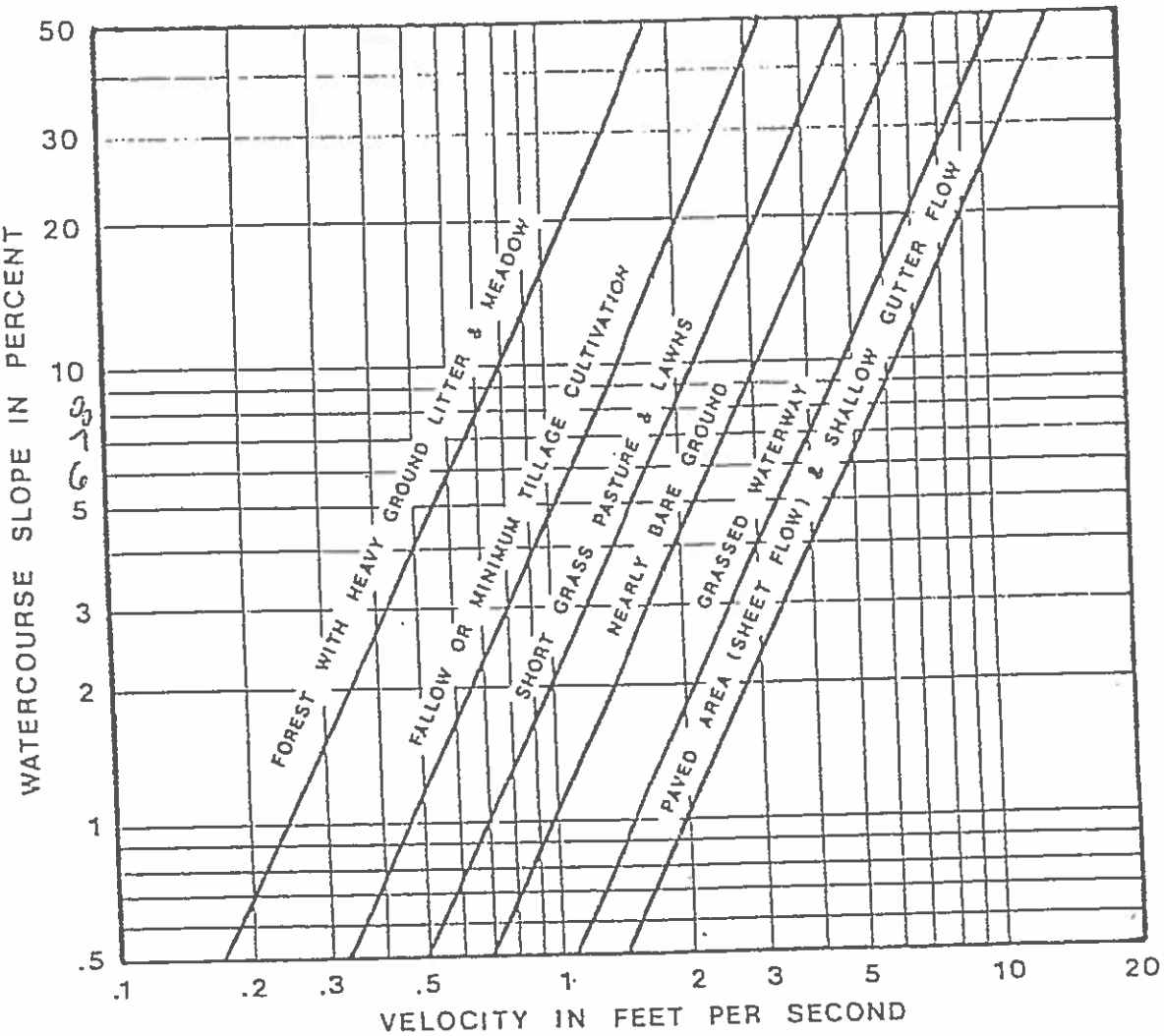
$$t_i = \frac{1.8\,(1.1 - C_5)\sqrt{L}}{\sqrt[3]{S}}$$

where: t_i = initial flow time (min.)
S = slope of basin (%)
C_5 = runoff coeficient for 5 year frequency (Table 601)
L = length of basin (ft.)

Notes:
1. The curves are for use with the Rational Method, see Text Section 602.
2. The curves shall not be used for distances in excess of 500.

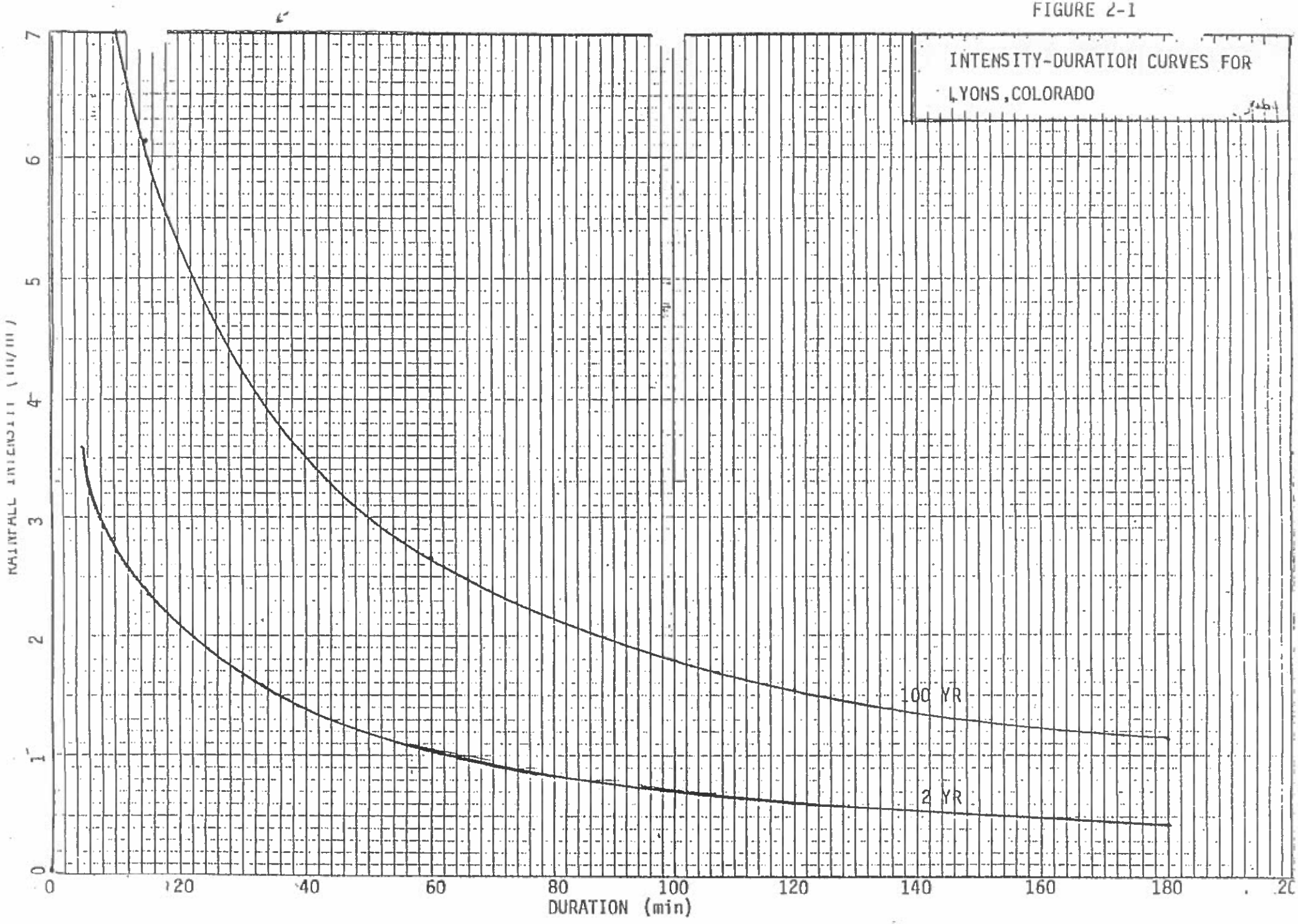
WRC ENG.	REFERENCE: "Urban Storm Drainage Criteria Manual" DRCOG, Denver, Colorado 1969

TRAVEL TIME VELOCITY FOR RATIONAL METHOD



REFERENCE: "Urban Hydrology For Small Watersheds" Technical Release No. 55, USDA, SCS Jan. 1975.

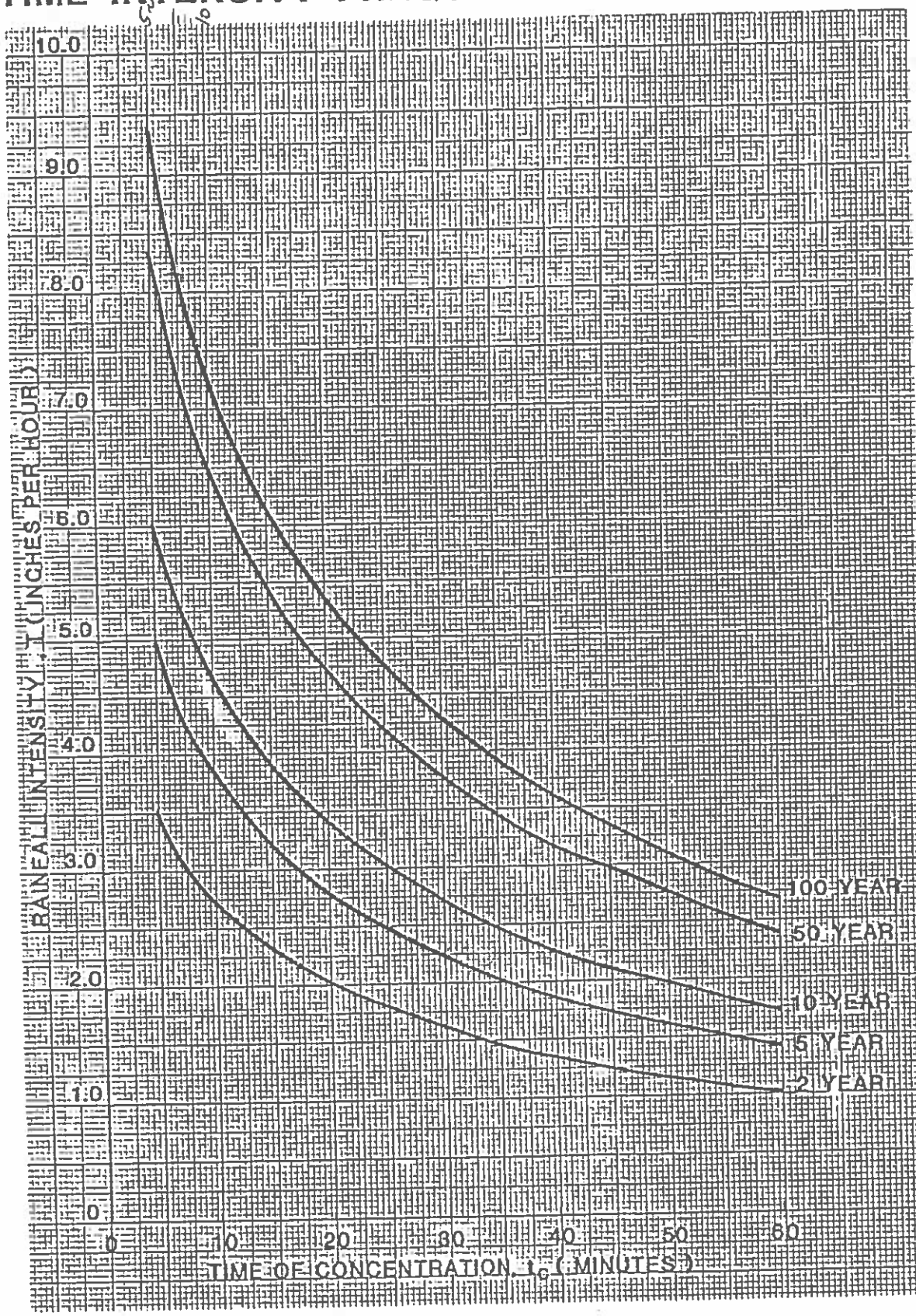
FIGURE 2-1


INTENSITY-DURATION CURVES FOR
LYONS, COLORADO
RAINFALL INTENSITY (IN/HR)
0
1
2
3
4
5
6
7
0
20
40
60
80
100
120
140
160
180
DURATION (min)
100 YR
2 YR

BOULDER COUNTY
STORM DRAINAGE CRITERIA MANUAL

FIGURE 502

TIME-INTENSITY-FREQUENCY CURVES ZONE I



WRC ENG.

REFERENCE: WRC TM-1 NOV. 1983

APPENDIX B

STORM SEWER SYSTEM & INLET DESIGN

Inlet Analysis
Lyons Valley Park
Job Number: 221002

Considering Type "R" Curb Inlets

Structure Number	Contributing Basins	Area (acres)	C_2	T_C (min)	I_2 (in/hr)	Q_2 (cfs)	Street Slope (%)	Inlet Type	Capacity (cfs)
S-2	L, Q	2.96	0.40	15.0	2.35	2.8	0.00	Sump - 5' Type R	5.0
S-4	M, N	2.89	0.40	12.0	2.60	3.0	0.00	Sump - 5' Type R	5.0
S-6	P	4.16	0.40	14.6	2.40	4.0	0.50	Cont. - 10' Type R	5.4
S-16	D	12.20	0.11	18.6	2.20	2.9	0.00	Sump - 5' Type R	5.0
S-18	J, K	3.35	0.40	13.1	2.50	3.4	0.00	Sump - 5' Type R	5.0
S-19	E, F	6.39	0.54	9.1	2.85	9.8	0.00	Sump - 10' Type R	10.5
S-22	I, R	2.43	0.40	13.6	2.50	2.4	0.00	Sump - 5' Type R	5.0
S-26	C, S	5.39	0.12	17.6	2.25	1.4	0.00	Sump - 5' Type R	5.0

Considering Type '13' Grate Inlets

Structure Number	Contributing Basins	Q_2 (cfs)	Inlet Type	Capacity (cfs)
S-7	O	1.60	Type 13	5.6

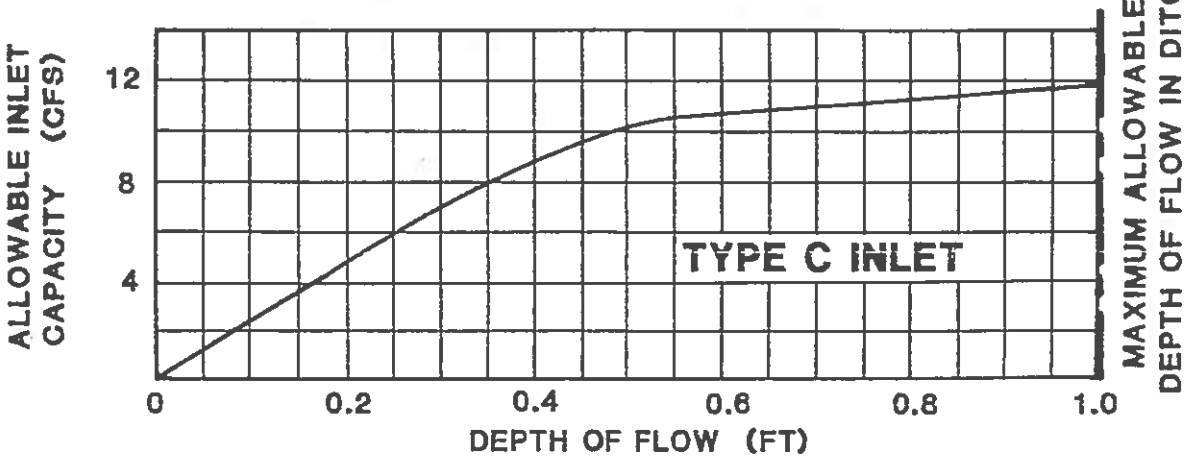
Type 13 Grate Capacity Calculations

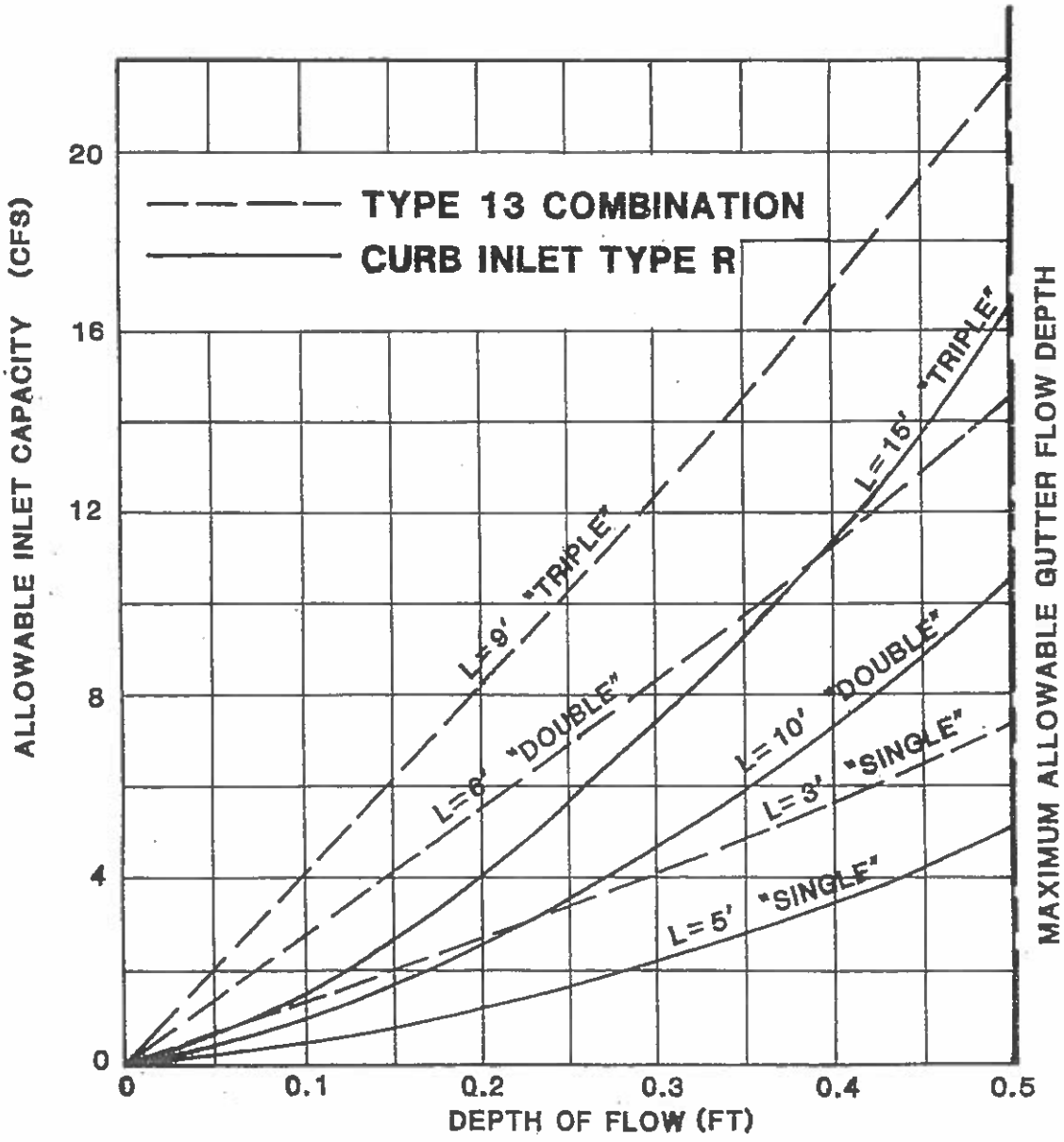
Orifice Equation: $Q = 0.60 * A * (2gh)^{1/2}$

Type 13 Opening Area =	2.32 s.f.
Blockage	50%
Minimum head =	1.0 feet
Capacity =	**5.6 cfs**

ALLOWABLE INLET CAPACITY

SUMP CONDITIONS - ALL INLETS

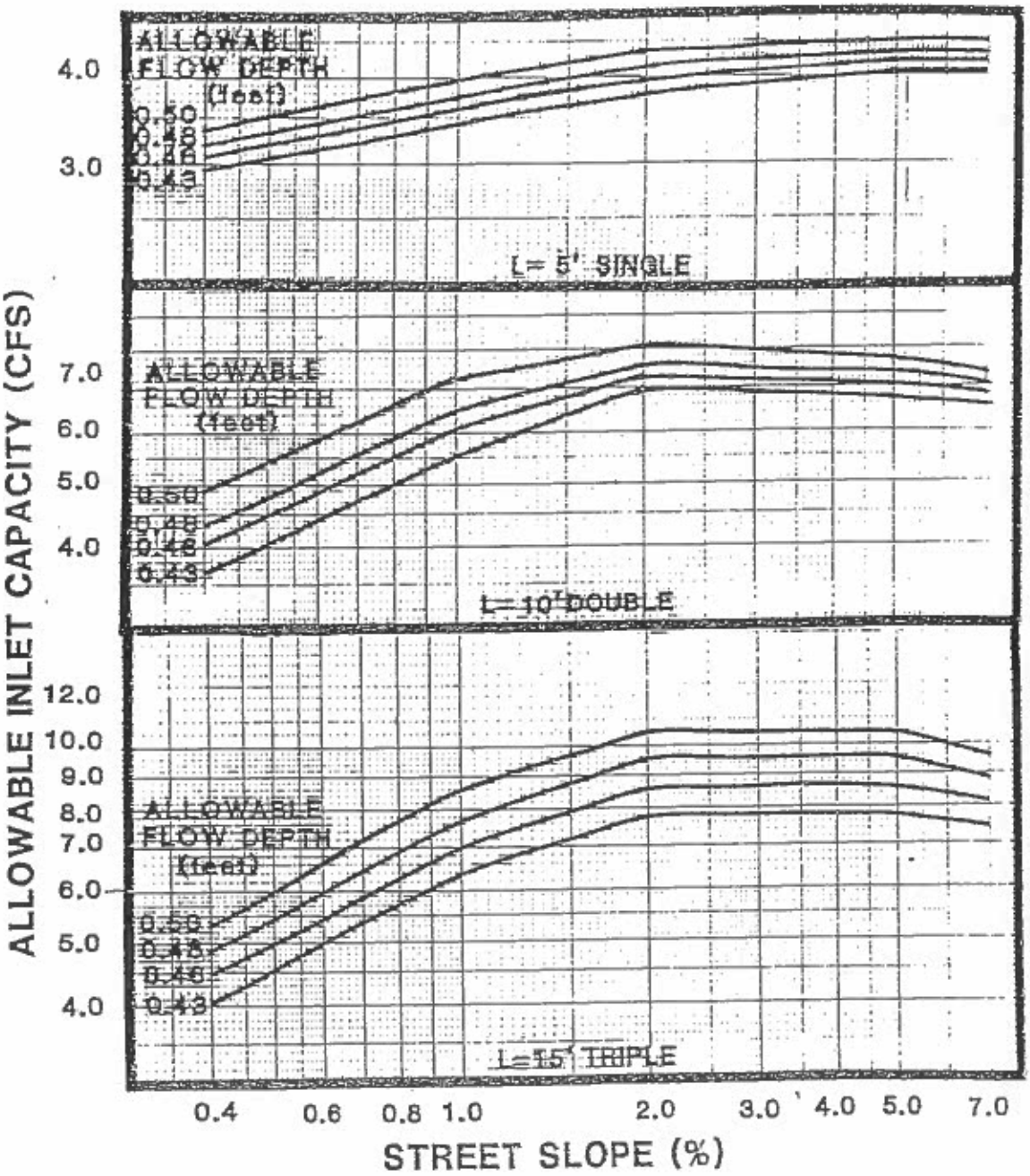




REFERENCE: WRC ENGINEERING, INC., TM-2 FEB 1984

ALLOWABLE INLET CAPACITY

TYPE - R CURB OPENING ON A CONTINUOUS GRADE

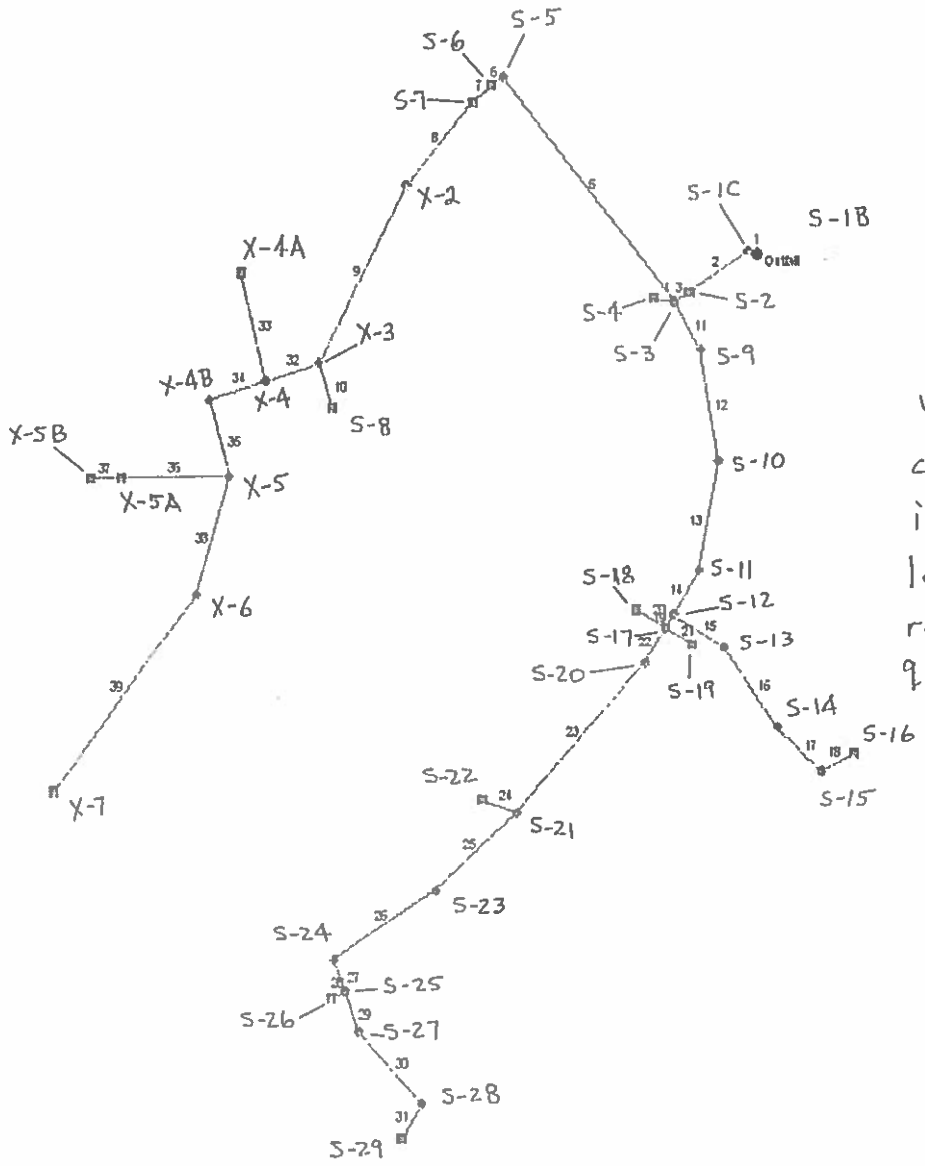


NOTES:

1. Maximum inlet capacity at maximum allowable flow depth. Proportionally reduce for other depths.
2. Allowable capacity =
   88% (L=5')
   92% (L=10')
   95% (L=15')

Hydraflow Numbers	Structure Number	Contributing Basins	Drainage Area (acres)	C_2	T_t Pipe		Routed T_c			T_c (min)	I_2 (in/hr)	2-Yr. Design Flow (cfs)
					Slope (ft/ft)	Length (ft)	Route	T_i (min)	T_t (min)			
31	S-29 to S-28	B	11.30	0.00	0.0050	44.88	B	17.8	0.0	17.8	2.20	0.10
30	S-28 to S-27	B	11.30	0.00	0.0702	111.89	S-29	17.8	0.5	18.4	2.20	0.10
29	S-27 to S-25	B	11.30	0.00	0.0696	45.95	S-28	18.4	0.5	18.8	2.15	0.09
28	S-26 to S-25	C, S	5.39	0.12	0.0050	19.05	C	17.6	0.0	17.6	2.25	1.42
							S	7.4	0.0			
27	S-25 to S-24	B, C, S	16.69	0.04	0.0152	38.09	S-26	17.6	0.1	19.1	2.15	1.45
							S-27	18.8	0.2			
26	S-24 to S-23	B, C, S	16.69	0.04	0.0496	149.27	S-25	19.1	0.1	19.2	2.15	1.45
25	S-23 to S-21	B, C, S	16.69	0.04	0.0628	134.36	S-24	19.2	0.4	19.6	2.15	1.45
24	S-22 to S-21	I, R	2.43	0.40	0.0050	45.33	I	13.6	0.0	13.6	2.50	2.43
							R	7.6	0.0			
23	S-21 to S-20	B, C, I, R, S	19.12	0.09	0.0398	231.02	S-23	19.6	0.3	19.9	2.10	3.45
							S-22	13.6	0.2			
22	S-20 to S-17	B, C, I, R, S	19.12	0.09	0.0504	48.42	S-21	19.9	0.5	20.4	2.10	3.45
21	S-19 to S-17	E, F	6.39	0.54	0.0100	38.52	E	9.1	0.0	9.1	2.85	9.84
							F	7.9	0.0			
20	S-18 to S-17	J, K	3.35	0.40	0.0111	42.34	J	12.5	0.0	13.1	2.50	3.35
							K	13.1	0.0			
19	S-17 to S-12	B, C, E, F, I, J, K, R, S	28.86	0.22	0.0200	18.88	S-20	20.4	0.1	20.5	2.10	13.52
							S-19	9.1	0.1			
							S-18	13.1	0.2			
18	S-16 to S-15	D	12.20	0.11	0.0050	44.10	D	18.6	0.0	18.6	2.20	2.90
17	S-15 to S-14	D	12.20	0.11	0.0050	73.73	S-16	18.6	0.2	18.8	2.15	2.83
16	S-14 to S-13	D	12.20	0.11	0.0050	109.82	S-15	18.8	0.4	19.2	2.15	2.83
15	S-13 to S-12	D	12.20	0.11	0.0148	74.53	S-14	19.2	0.6	19.8	2.10	2.77
14	S-12 to S-11	B, C, D, E, F, I, J, K, R, S	41.06	0.19	0.0100	59.13	S-17	20.5	0.0	20.5	2.10	16.28
							S-13	19.8	0.3			
13	S-11 to S-10	B, C, D, E, F, I, J, K, R, S	41.06	0.19	0.0100	126.43	S-12	20.5	0.1	20.7	2.10	16.28
12	S-10 to S-9	B, C, D, E, F, I, J, K, R, S	41.06	0.19	0.0100	126.43	S-11	20.7	0.3	21.0	2.05	15.89
11	S-9 to S-3	B, C, D, E, F, I, J, K, R, S	41.06	0.19	0.0134	61.86	S-10	21.0	0.3	21.3	2.05	15.89
39	X-7 to X-6	6C	1.52	0.40	0.0267	284.05	*6C*	11.5	0.0	11.5	2.60	1.58
38	X-6 to X-5	6C	1.52	0.40	0.0279	140.71	*S-7*	11.5	0.9	12.4	2.55	1.55
37	X-5B to X-5A	6D	1.50	0.40	0.0100	37.00	*6D*	12.3	0.0	12.3	2.52	1.51
36	X-5A to X-5	6B, 6D	3.16	0.40	0.0214	135.31	*6B*	12.3	0.0	12.5	2.55	3.22
							S-5B	12.3	0.2			
35	X-5 to X-4B	6B, 6C, 6D	4.68	0.40	0.0127	90.24	*S-6*	12.4	0.4	12.9	2.50	4.68
							S-5A	12.5	0.4			
34	X-4B to X-4	6B, 6C, 6D	4.68	0.40	0.0178	71.82	*S-5*	12.9	0.3	13.1	2.50	4.68
33	X-4A to X-4	6A	3.28	0.40	0.0051	124.10	*6A*	13.9	0.0	13.9	2.45	3.21
32	X-4 to X-3	6A, 6B, 6C, 6D	7.96	0.40	0.0076	68.73	*S-4A*	13.9	0.6	14.5	2.40	7.64
							S-4B	13.1	0.2			
10	S-8 to X-3	H	2.36	0.29	0.0237	51.55	H	14.3	0.0	14.3	2.45	1.68
9	X-3 to X-2	H, 6A, 6B, 6C, 6D	10.32	0.37	0.0080	226.33	S-8	14.3	0.2	14.7	2.40	9.28
							X-4	14.5	0.2			
8	X-2 to S-7	H, 6A, 6B, 6C, 6D	10.32	0.37	0.0348	124.36	X-3	14.7	0.7	15.4	2.35	9.09
7	S-7 to S-6	H, O, 6A, 6B, 6C, 6D	11.86	0.38	0.010	29.88	X-2	15.4	0.2	15.7	2.35	10.54
							O	12.1	0.0			
6	S-6 to S-5	H, O, P, 6A, 6B, 6C, 6D	16.02	0.38	0.0057	17.68	S-7	15.7	0.1	15.8	2.35	14.45
							P	14.6	0.0			
5	S-5 to S-3	H, O, P, 6A, 6B, 6C, 6D	16.02	0.38	0.005	332.22	S-6	15.8	0.1	15.8	2.35	14.45
4	S-4 to S-3	M, N	2.89	0.40	0.0325	26.17	M	11.4	0.0	12.0	2.60	3.01
							N	12.0	0.0			
3	S-3 to S-2	B, C, D, E, F, H, I, J, K, M, N, O, P, R, S, 6A, 6B, 6C, 6D	59.97	0.25	0.0073	20.59	S-9	21.3	0.1	21.5	2.05	30.87
							S-5	15.8	1.1			
							S-4	12.0	0.1			
2	S-2 to S-1C	B, C, D, E, F, H, I, J, K, L, M, N, O, P, Q, R, S, 6A, 6B, 6C, 6D	62.93	0.26	0.0117	86.32	S-3	21.5	0.0	21.5	2.05	33.30
							L	11.8	0.0			
							Q	15.0	0.0			
1	S-1C to S-1B	B, C, D, E, F, H, I, J, K, L, M, N, O, P, Q, R, S, 6A, 6B, 6C, 6D	62.93	0.26	0.0698	11.89	S-2	21.5	0.2	21.7	2.05	33.30

Hydraflow Plan View



NORTH

NOTE:

The hydraulic grade line was started at the downstream crown of pipe. (5292.50) This is the same elevation as the low point in the top of the retaining wall of the water quality pond.

Project File: Lyons_Valley_Park_F2.stm	No. Lines: 39	03-06-2006

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	11.9	-167.2	MH	33.30	0.00	0.00	0.0	5290.00	6.98	5290.83	30	Cir	0.013	0.74	5295.00	S-1C to S-1B
2	1	86.3	-44.5	Curb	33.30	0.00	0.00	0.0	5291.03	1.17	5292.04	30	Cir	0.013	0.50	5298.71	S-2 to S-1C
3	2	20.6	0.7	MH	30.87	0.00	0.00	0.0	5292.24	0.73	5292.39	30	Cir	0.013	1.00	5299.45	S-3 to S-2
4	3	26.2	40.0	Curb	3.01	0.00	0.00	0.0	5293.54	3.25	5294.39	15	Cir	0.013	1.00	5298.66	S-4 to S-3
5	3	332.2	81.0	MH	14.45	0.00	0.00	0.0	5292.79	0.50	5294.45	24	Cir	0.013	1.00	5300.94	S-5 to S-3
6	5	17.7	-87.0	Curb	14.45	0.00	0.00	0.0	5294.65	0.57	5294.75	24	Cir	0.013	0.50	5300.20	S-6 to S-5
7	6	29.9	-1.0	Grate	10.54	0.00	0.00	0.0	5294.95	1.00	5295.25	24	Cir	0.013	0.50	5299.50	S-7 to S-6
8	7	124.4	-10.0	MH	9.09	0.00	0.00	0.0	5295.75	3.48	5300.08	18	Cir	0.013	0.27	5305.22	X-2 to S-7
9	8	226.3	-13.0	MH	9.28	0.00	0.00	0.0	5300.17	0.80	5301.99	18	Cir	0.013	0.78	5309.06	X-3 to X-2
10	9	51.6	-48.0	Grate	1.68	0.00	0.00	0.0	5302.34	2.37	5303.56	15	Cir	0.013	1.00	5308.00	S-8 to X-3
11	3	61.9	-90.0	MH	15.89	0.00	0.00	0.0	5292.79	1.34	5293.62	24	Cir	0.013	0.41	5300.00	S-9 to S-3
12	11	126.4	21.0	MH	15.89	0.00	0.00	0.0	5293.82	1.00	5295.08	24	Cir	0.013	0.41	5301.50	S-10 to S-9
13	12	126.4	21.0	MH	16.28	0.00	0.00	0.0	5295.28	1.00	5296.54	24	Cir	0.013	0.41	5303.00	S-11 to S-10
14	13	59.1	21.0	MH	16.28	0.00	0.00	0.0	5296.74	1.00	5297.33	24	Cir	0.013	1.00	5304.01	S-12 to S-11
15	14	74.6	-89.0	MH	2.77	0.00	0.00	0.0	5298.08	1.48	5299.18	15	Cir	0.013	0.40	5304.21	S-13 to S-12
16	15	109.8	20.0	MH	2.83	0.00	0.00	0.0	5299.38	0.50	5299.93	15	Cir	0.013	0.21	5304.92	S-14 to S-13
17	16	73.7	-10.0	MH	2.83	0.00	0.00	0.0	5300.13	0.50	5300.50	15	Cir	0.013	0.95	5305.80	S-15 to S-14
18	17	44.1	-69.0	Curb	2.90	0.00	0.00	0.0	5300.70	0.50	5300.92	15	Cir	0.013	1.00	5305.34	S-16 to S-15
19	14	18.8	0.0	MH	13.52	0.00	0.00	0.0	5297.83	2.02	5298.21	18	Cir	0.013	1.00	5304.47	S-17 to S-12
20	19	42.3	88.0	Curb	3.35	0.00	0.00	0.0	5298.76	1.11	5299.23	15	Cir	0.013	1.00	5303.67	S-18 to S-17
21	19	38.5	-90.0	Curb	9.84	0.00	0.00	0.0	5298.51	1.01	5298.90	18	Cir	0.013	1.00	5303.61	S-19 to S-17

Project File: Lyons_Valley_Park_F2.stm | Number of lines: 38 | Date: 03-04-2006

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
22	19	48.4	0.0	MH	3.45	0.00	0.00	0.0	5298.76	5.04	5301.20	15	Cir	0.013	0.25	5305.84	S-20 to S-17
23	22	231.0	12.0	MH	3.45	0.00	0.00	0.0	5301.40	4.01	5310.66	15	Cir	0.013	0.92	5316.00	S-21 to S-20
24	23	45.3	65.0	Curb	2.43	0.00	0.00	0.0	5310.86	0.51	5311.09	15	Cir	0.013	1.00	5315.53	S-22 to S-21
25	23	134.4	5.0	MH	1.45	0.00	0.00	0.0	5310.86	6.28	5319.30	15	Cir	0.013	0.21	5323.94	S-23 to S-21
26	25	149.3	10.0	MH	1.45	0.00	0.00	0.0	5319.50	4.96	5326.90	15	Cir	0.013	0.99	5331.54	S-24 to S-23
27	26	38.1	-80.0	MH	1.45	0.00	0.00	0.0	5327.10	1.52	5327.68	15	Cir	0.013	1.00	5333.10	S-25 to S-24
28	27	19.1	90.0	Curb	1.42	0.00	0.00	0.0	5327.88	0.53	5327.98	15	Cir	0.013	1.00	5332.42	S-26 to S-25
29	27	46.0	0.0	MH	0.09	0.00	0.00	0.0	5327.88	6.96	5331.08	15	Cir	0.013	0.46	5335.72	S-27 to S-25
30	29	111.9	-24.0	MH	0.10	0.00	0.00	0.0	5331.28	7.03	5339.14	15	Cir	0.013	0.99	5345.05	S-28 to S-27
31	30	44.9	80.0	Grate	0.10	0.00	0.00	0.0	5339.34	0.49	5339.56	15	Cir	0.013	1.00	5342.00	S-29 to S-28
32	9	68.7	45.0	MH	7.64	0.00	0.00	0.0	5302.09	0.76	5302.61	18	Cir	0.013	1.00	5311.49	X-4 to X-3
33	32	124.1	92.0	Curb	3.21	0.00	0.00	0.0	5302.71	0.52	5303.36	15	Cir	0.013	1.00	5306.86	X-4A to X-4
34	32	71.8	0.0	MH	4.68	0.00	0.00	0.0	5302.71	1.78	5303.99	18	Cir	0.013	1.00	5311.74	X-4B to X-4
35	34	90.2	-90.0	MH	4.68	0.00	0.00	0.0	5304.09	1.27	5305.24	18	Cir	0.013	1.00	5312.71	X-5 to X-4B
36	35	135.3	106.0	Curb	3.22	0.00	0.00	0.0	5305.34	2.14	5308.23	15	Cir	0.013	0.50	5311.62	X-5A to X-5
37	36	37.0	0.0	Curb	1.51	0.00	0.00	0.0	5308.43	1.00	5308.80	15	Cir	0.013	1.00	5312.05	X-5B to X-5A
38	35	140.7	33.0	MH	1.55	0.00	0.00	0.0	5305.34	2.79	5309.26	15	Cir	0.013	0.43	5314.36	X-6 to X-5

Project File: Lyons_Valley_Park_F2.stm | Number of lines: 38 | Date: 03-04-2006

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	S-1C to S-1B	33.30	30 c	11.9	5290.00	5290.83	6.981	5292.50	5292.76	0.77	5292.76	End
2	S-2 to S-1C	33.30	30 c	86.3	5291.03	5292.04	1.170	5293.09	5293.97	0.52	5293.97	1
3	S-3 to S-2	30.87	30 c	20.6	5292.24	5292.39	0.728	5294.40	5294.45	0.79	5295.24	2
4	S-4 to S-3	3.01	15 c	26.2	5293.54	5294.39	3.248	5295.94*	5296.00*	0.09	5296.09	3
5	S-5 to S-3	14.45	24 c	332.2	5292.79	5294.45	0.500	5295.71*	5297.06*	0.33	5297.39	3
6	S-6 to S-5	14.45	24 c	17.7	5294.65	5294.75	0.566	5297.39*	5297.46*	0.16	5297.63	5
7	S-7 to S-6	10.54	24 c	29.9	5294.95	5295.25	1.003	5297.78*	5297.85*	0.09	5297.93	6
8	X-2 to S-7	9.09	18 c	124.4	5295.75	5300.08	3.482	5297.93	5301.23	n/a	5301.23	7
9	X-3 to X-2	9.28	18 c	226.3	5300.17	5301.99	0.804	5301.41	5303.18	0.46	5303.64	8
10	S-8 to X-3	1.68	15 c	51.6	5302.34	5303.56	2.367	5304.21	5304.21	0.11	5304.32	9
11	S-9 to S-3	15.89	24 c	61.9	5292.79	5293.62	1.342	5295.64*	5295.94*	0.16	5296.11	3
12	S-10 to S-9	15.89	24 c	126.4	5293.82	5295.08	0.997	5296.11	5296.57	0.25	5296.83	11
13	S-11 to S-10	16.28	24 c	126.4	5295.28	5296.54	0.997	5297.03	5297.97	0.29	5297.97	12
14	S-12 to S-11	16.28	24 c	59.1	5296.74	5297.33	0.998	5298.27	5298.76	0.71	5298.76	13
15	S-13 to S-12	2.77	15 c	74.6	5298.08	5299.18	1.475	5299.40	5299.85	n/a	5299.85	14
16	S-14 to S-13	2.83	15 c	109.8	5299.38	5299.93	0.501	5300.09	5300.64	0.05	5300.69	15
17	S-15 to S-14	2.83	15 c	73.7	5300.13	5300.50	0.502	5300.85	5301.21	0.23	5301.44	16
18	S-16 to S-15	2.90	15 c	44.1	5300.70	5300.92	0.498	5301.59	5301.69	0.21	5301.90	17
19	S-17 to S-12	13.52	18 c	18.8	5297.83	5298.21	2.021	5298.95*	5299.81*	0.91	5300.72	14
20	S-18 to S-17	3.35	15 c	42.3	5298.76	5299.23	1.111	5301.51*	5301.63*	0.12	5301.74	19
21	S-19 to S-17	9.84	18 c	38.5	5298.51	5298.90	1.013	5301.15*	5301.48*	0.48	5301.97	19
22	S-20 to S-17	3.45	15 c	48.4	5298.76	5301.20	5.040	5301.50	5301.94	n/a	5301.94	19
23	S-21 to S-20	3.45	15 c	231.0	5301.40	5310.66	4.008	5302.14	5311.40	n/a	5311.40	22
24	S-22 to S-21	2.43	15 c	45.3	5310.86	5311.09	0.507	5311.66	5311.75	0.21	5311.96	23
25	S-23 to S-21	1.45	15 c	134.4	5310.86	5319.30	6.282	5311.70	5319.78	n/a	5319.78	23
26	S-24 to S-23	1.45	15 c	149.3	5319.50	5326.90	4.957	5319.93	5327.38	n/a	5327.38	25
27	S-25 to S-24	1.45	15 c	38.1	5327.10	5327.68	1.523	5327.53	5328.16	n/a	5328.16	26
28	S-26 to S-25	1.42	15 c	19.1	5327.88	5327.98	0.525	5328.35	5328.46	0.17	5328.63	27
29	S-27 to S-25	0.09	15 c	46.0	5327.88	5331.08	6.965	5328.33	5331.20	n/a	5331.20	27
30	S-28 to S-27	0.10	15 c	111.9	5331.28	5339.14	7.025	5331.35	5339.27	n/a	5339.27	29
31	S-29 to S-28	0.10	15 c	44.9	5339.34	5339.56	0.491	5339.47	5339.69	n/a	5339.72	30
32	X-4 to X-3	7.64	18 c	68.7	5302.09	5302.61	0.757	5303.95*	5304.31*	0.29	5304.60	9

Project File: Lyons_Valley_Park_F2.stm | Number of lines: 38 | Run Date: 03-04-2006

NOTES: c = cir; e = ellip; b = box; Return period = 2 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
33	X-4A to X-4	3.21	15 c	124.1	5302.71	5303.36	0.524	5304.78*	5305.09*	0.11	5305.20	32
34	X-4B to X-4	4.68	18 c	71.8	5302.71	5303.99	1.783	5304.78	5304.83	0.33	5305.16	32
35	X-5 to X-4B	4.68	18 c	90.2	5304.09	5305.24	1.275	5305.38	5306.07	n/a	5306.07	34
36	X-5A to X-5	3.22	15 c	135.3	5305.34	5308.23	2.136	5306.30	5308.95	n/a	5308.95	35
37	X-5B to X-5A	1.51	15 c	37.0	5308.43	5308.80	0.999	5309.23	5309.29	n/a	5309.29	36
38	X-6 to X-5	1.55	15 c	140.7	5305.34	5309.26	2.786	5306.38	5309.76	n/a	5309.76	35

Project File: Lyons_Valley_Park_F2.stm | Number of lines: 38 | Run Date: 03-04-2006

NOTES: c = cir; e = ellip; b = box; Return period = 2 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	30	33.30	5290.00	5292.50	2.50	4.91	6.79	0.72	5293.22	0.660	11.9	5290.83	5292.76	1.93**	4.06	8.19	1.04	5293.80	0.744	0.702	n/a	0.74	0.77
2	30	33.30	5291.03	5293.09	2.06	4.32	7.71	0.92	5294.01	0.655	86.3	5292.04	5293.97	1.93**	4.06	8.19	1.04	5295.01	0.744	0.699	n/a	0.50	0.52
3	30	30.87	5292.24	5294.40	2.16	4.50	6.85	0.73	5295.13	0.522	20.6	5292.39	5294.45	2.06	4.32	7.14	0.79	5295.24	0.563	0.542	0.112	1.00	0.79
4	15	3.01	5293.54	5295.94	1.25	1.23	2.45	0.09	5296.03	0.217	26.2	5294.39	5296.00	1.25	1.23	2.45	0.09	5296.09	0.217	0.217	0.057	1.00	0.09
5	24	14.45	5292.79	5295.71	2.00	3.14	4.60	0.33	5296.03	0.408	332	5294.45	5297.06	2.00	3.14	4.60	0.33	5297.39	0.408	0.408	1.356	1.00	0.33
6	24	14.45	5294.65	5297.39	2.00	3.14	4.60	0.33	5297.72	0.408	17.7	5294.75	5297.46	2.00	3.14	4.60	0.33	5297.79	0.408	0.408	0.072	0.50	0.16
7	24	10.54	5294.95	5297.78	2.00	3.14	3.36	0.18	5297.96	0.217	29.9	5295.25	5297.85	2.00	3.14	3.35	0.17	5298.02	0.217	0.217	0.065	0.50	0.09
8	18	9.09	5295.75	5297.93	1.50	1.77	5.14	0.41	5298.35	0.750	124	5300.08	5301.23	1.15**	1.45	6.25	0.61	5301.84	0.856	0.803	n/a	0.27	0.16
9	18	9.28	5300.17	5301.41	1.24	1.56	5.94	0.55	5301.96	0.770	226	5301.99	5303.18	1.19	1.50	6.19	0.59	5303.77	0.835	0.802	1.816	0.78	0.46
10	15	1.68	5302.34	5304.21	1.25	1.23	1.37	0.03	5304.24	0.068	51.6	5303.56	5304.21	0.65	0.64	2.61	0.11	5304.32	0.238	0.153	0.079	1.00	0.11
11	24	15.89	5292.79	5295.64	2.00	3.14	5.06	0.40	5296.03	0.494	61.9	5293.62	5295.94	2.00	3.14	5.06	0.40	5296.34	0.494	0.494	0.305	0.41	0.16
12	24	15.89	5293.82	5296.11	2.00	3.14	5.06	0.40	5296.50	0.494	126	5295.08	5296.57	1.49	2.51	6.32	0.62	5297.19	0.601	0.547	0.692	0.41	0.25
13	24	16.28	5295.28	5297.03	1.75	2.92	5.58	0.48	5297.52	0.469	126	5296.54	5297.97	1.43**	2.40	6.78	0.71	5298.68	0.701	0.585	n/a	0.41	0.29
14	24	16.28	5296.74	5298.27	1.53	2.57	6.33	0.62	5298.89	0.599	59.1	5297.33	5298.76	1.43**	2.40	6.78	0.71	5299.47	0.701	0.650	n/a	1.00	0.71
15	15	2.77	5298.08	5299.40	1.25	1.23	2.26	0.08	5299.47	0.184	74.6	5299.18	5299.85	0.67**	0.66	4.17	0.27	5300.12	0.595	0.389	n/a	0.40	n/a
16	15	2.83	5299.38	5300.09	0.71*	0.72	3.92	0.24	5300.33	0.501	110	5299.93	5300.64	0.71	0.72	3.93	0.24	5300.88	0.504	0.502	0.551	0.21	0.05
17	15	2.83	5300.13	5300.85	0.72	0.73	3.87	0.23	5301.08	0.486	73.7	5300.50	5301.21	0.71	0.72	3.95	0.24	5301.45	0.511	0.498	0.367	0.95	0.23
18	15	2.90	5300.70	5301.59	0.89	0.94	3.09	0.15	5301.74	0.273	44.1	5300.92	5301.69	0.76	0.79	3.69	0.21	5301.90	0.421	0.347	0.153	1.00	0.21
19	18	13.52	5297.83	5298.95	1.12*	1.41	9.57	1.42	5300.37	2.020	18.8	5298.21	5299.81	1.50	1.77	7.65	0.91	5300.72	1.658	1.839	0.346	1.00	0.91
20	15	3.35	5298.76	5301.51	1.25	1.23	2.73	0.12	5301.63	0.269	42.3	5299.23	5301.63	1.25	1.23	2.73	0.12	5301.74	0.269	0.269	0.114	1.00	0.12
21	18	9.84	5298.51	5301.15	1.50	1.77	5.57	0.48	5301.63	0.878	38.5	5298.90	5301.48	1.50	1.77	5.57	0.48	5301.97	0.878	0.878	0.338	1.00	0.48

Project File: Lyons_Valley_Park_F2.stm | Number of lines: 38 | Run Date: 03-04-2006

Notes: * Normal depth assumed.; ** Critical depth.; j-Line contains hyd. jump.

Hydraulic Grade Line Computations

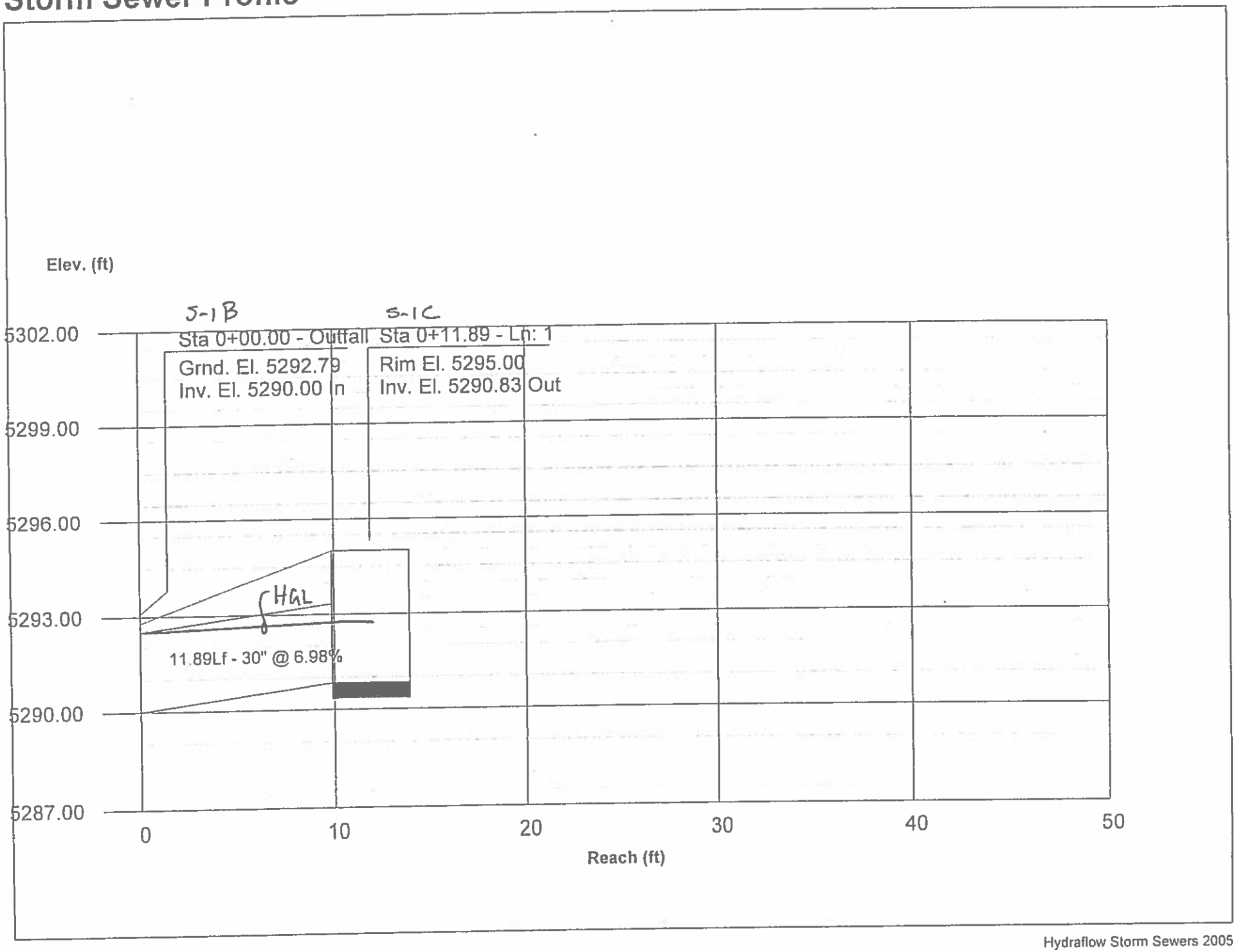
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
22	15	3.45	5298.76	5301.50	1.25	1.23	2.81	0.12	5301.63	0.286	48.4	5301.20	5301.94	0.74**	0.76	4.54	0.32	5302.26	0.650	0.468	n/a	0.25	n/a
23	15	3.45	5301.40	5302.14	0.74	0.76	4.56	0.32	5302.46	0.658	231	5310.66	5311.40	0.74**	0.76	4.54	0.32	5311.72	0.650	0.654	n/a	0.92	n/a
24	15	2.43	5310.86	5311.66	0.80	0.83	2.92	0.13	5311.80	0.257	45.3	5311.09	5311.75	0.66	0.66	3.71	0.21	5311.96	0.476	0.366	0.166	1.00	0.21
25	15	1.45	5310.86	5311.70	0.84	0.88	1.65	0.04	5311.74	0.080	134	5319.30	5319.78	0.48**	0.44	3.32	0.17	5319.95	0.508	0.294	n/a	0.21	0.04
26	15	1.45	5319.50	5319.93	0.43	0.38	3.85	0.23	5320.16	0.764	149	5326.90	5327.38	0.48**	0.44	3.32	0.17	5327.55	0.508	0.636	n/a	0.99	0.17
27	15	1.45	5327.10	5327.53	0.43	0.38	3.85	0.23	5327.76	0.764	38.1	5327.68	5328.16	0.48**	0.44	3.32	0.17	5328.33	0.508	0.636	n/a	1.00	0.17
28	15	1.42	5327.88	5328.35	0.47*	0.43	3.34	0.17	5328.53	0.522	19.1	5327.98	5328.46	0.48**	0.43	3.27	0.17	5328.63	0.495	0.508	0.097	1.00	0.17
29	15	0.09	5327.88	5328.33	0.45	0.40	0.22	0.00	5328.34	0.002	46.0	5331.08	5331.20	0.12**	0.06	1.50	0.03	5331.24	0.528	0.265	n/a	0.46	0.02
30	15	0.10	5331.28	5331.35	0.07*	0.03	3.74	0.22	5331.57	6.688	112	5339.14	5339.27	0.13**	0.07	1.54	0.04	5339.30	0.523	3.605	n/a	0.99	n/a
31	15	0.10	5339.34	5339.47	0.13*	0.07	1.49	0.03	5339.50	0.476	44.9	5339.56	5339.69	0.13**	0.07	1.50	0.04	5339.72	0.491	0.484	0.217	1.00	0.04
32	18	7.64	5302.09	5303.95	1.50	1.77	4.32	0.29	5304.24	0.530	68.7	5302.61	5304.31	1.50	1.77	4.32	0.29	5304.60	0.529	0.529	0.364	1.00	0.29
33	15	3.21	5302.71	5304.78	1.25	1.23	2.62	0.11	5304.89	0.247	124	5303.36	5305.09	1.25	1.23	2.62	0.11	5305.20	0.247	0.247	0.307	1.00	0.11
34	18	4.68	5302.71	5304.78	1.50	1.77	2.65	0.11	5304.89	0.199	71.8	5303.99	5304.83	0.84	1.02	4.59	0.33	5305.16	0.545	0.372	0.267	1.00	0.33
35	18	4.68	5304.09	5305.38	1.29	1.61	2.90	0.13	5305.51	0.184	90.2	5305.24	5306.07	0.83**	1.00	4.69	0.34	5306.41	0.577	0.381	n/a	1.00	n/a
36	15	3.22	5305.34	5306.30	0.96	1.01	3.18	0.16	5306.46	0.282	135	5308.23	5308.95	0.72**	0.73	4.41	0.30	5309.25	0.630	0.456	n/a	0.50	0.15
37	15	1.51	5308.43	5309.23	0.80	0.83	1.83	0.05	5309.28	0.101	37.0	5308.80	5309.29	0.49**	0.45	3.37	0.18	5309.47	0.512	0.306	n/a	1.00	n/a
38	15	1.55	5305.34	5306.38	1.04	1.09	1.42	0.03	5306.42	0.056	141	5309.26	5309.76	0.50**	0.46	3.40	0.18	5309.94	0.514	0.285	n/a	0.43	n/a

Project File: Lyons_Valley_Park_F2.stm | Number of lines: 38 | Run Date: 03-04-2006

Notes: * Normal depth assumed.; ** Critical depth.; j-Line contains hyd. jump.

Storm Sewer Profile

Proj. file: Lyons_Valley_Park_F2.stm



Storm Sewer Profile

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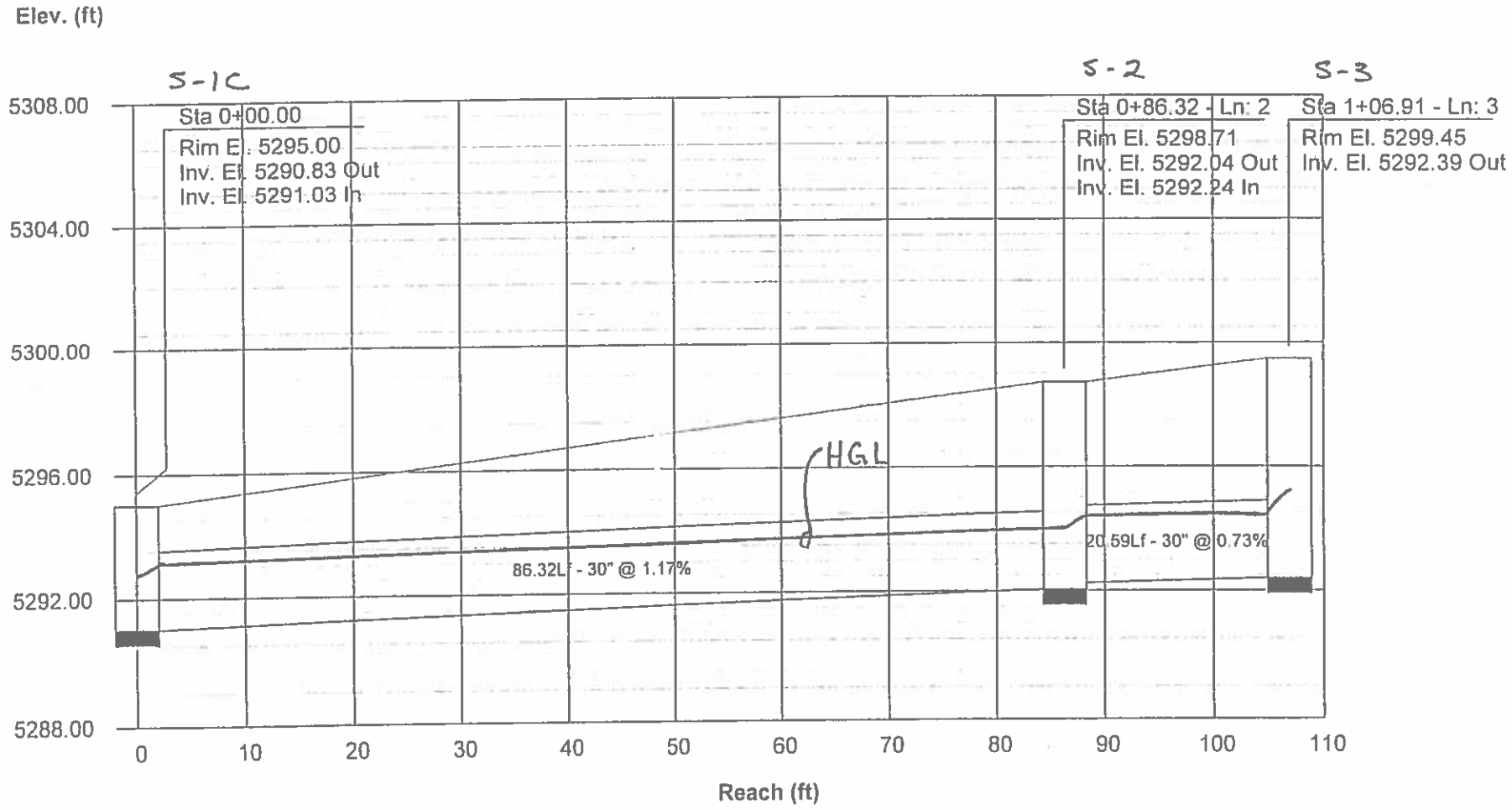

Storm Sewer Profile

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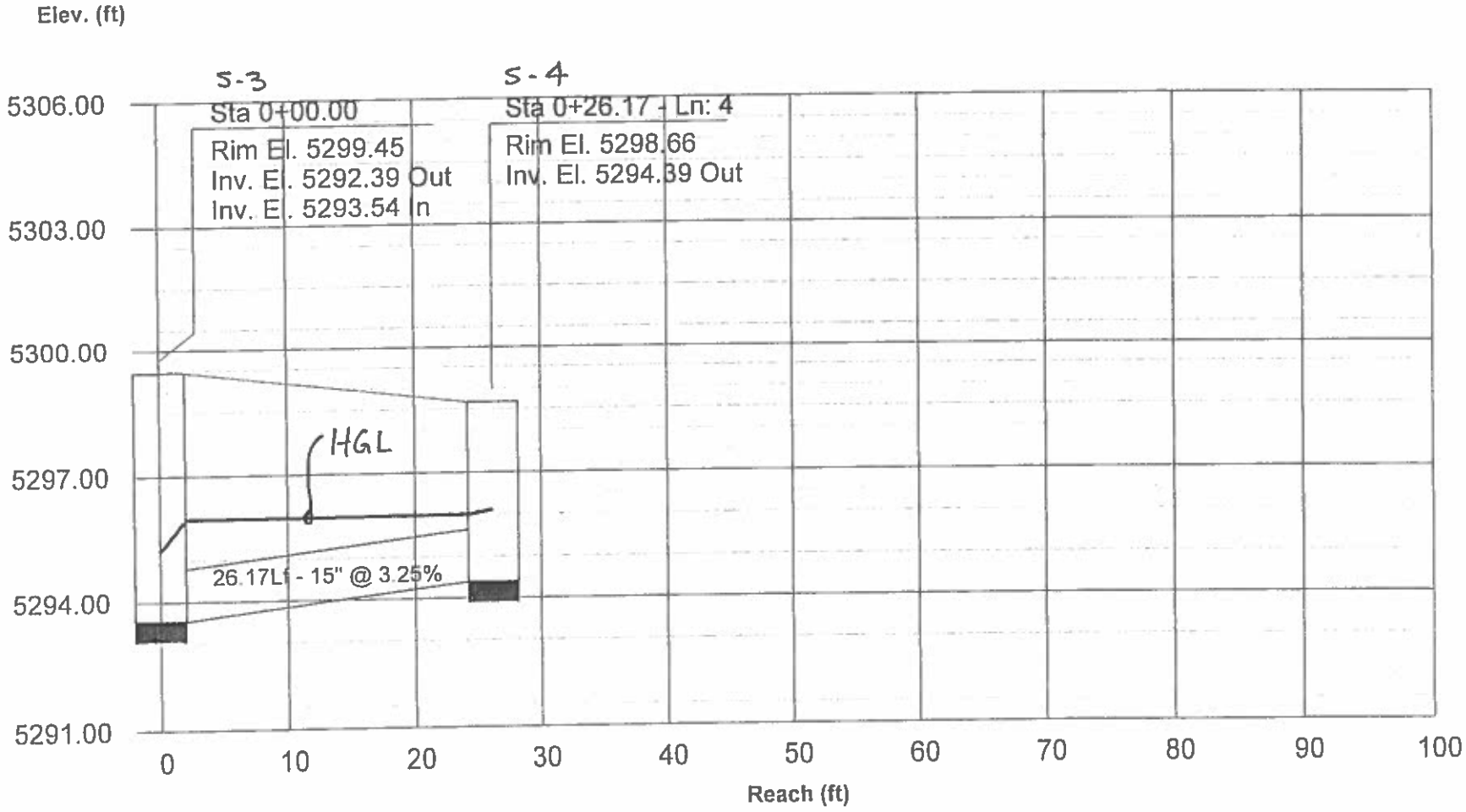

Storm Sewer Profile

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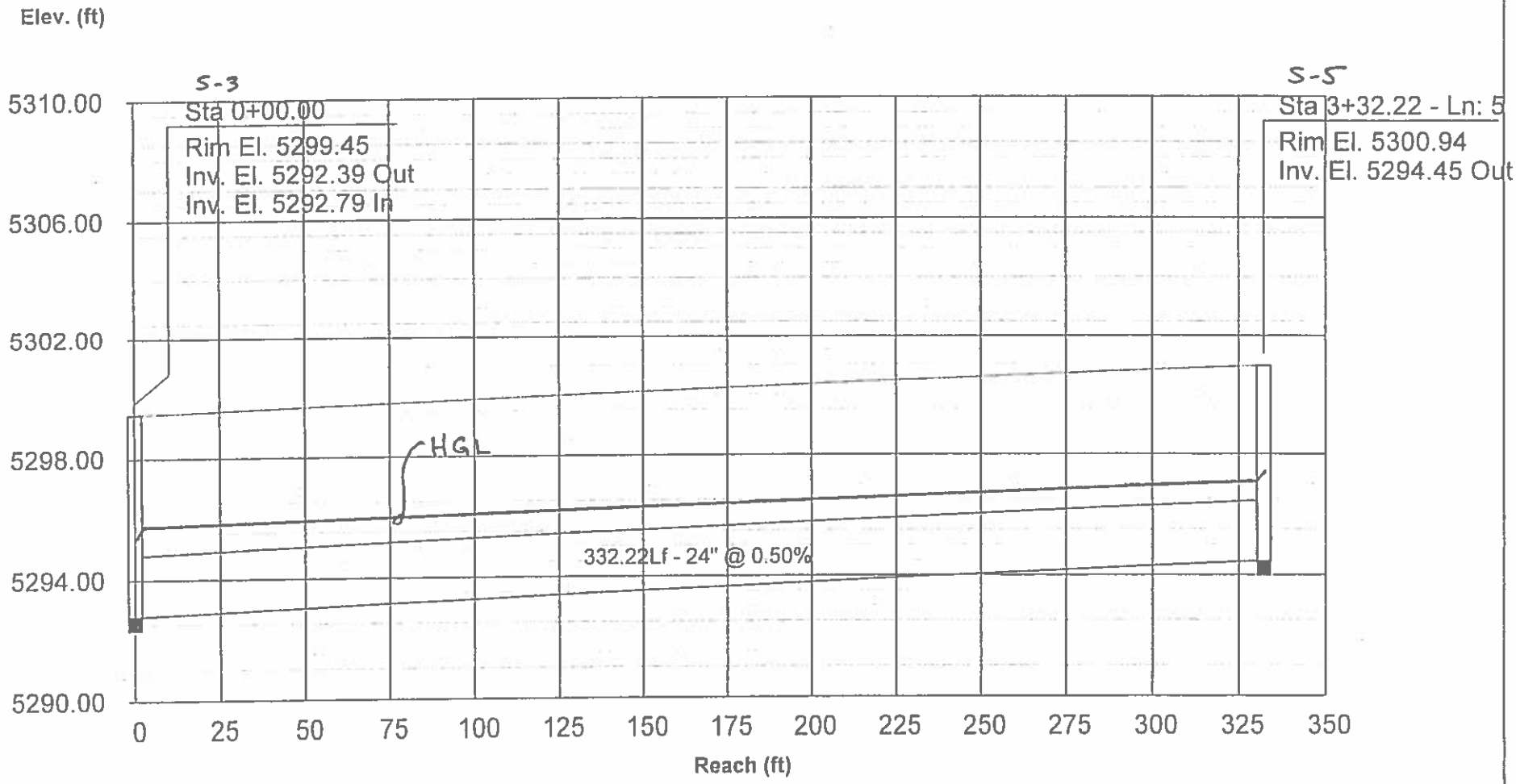

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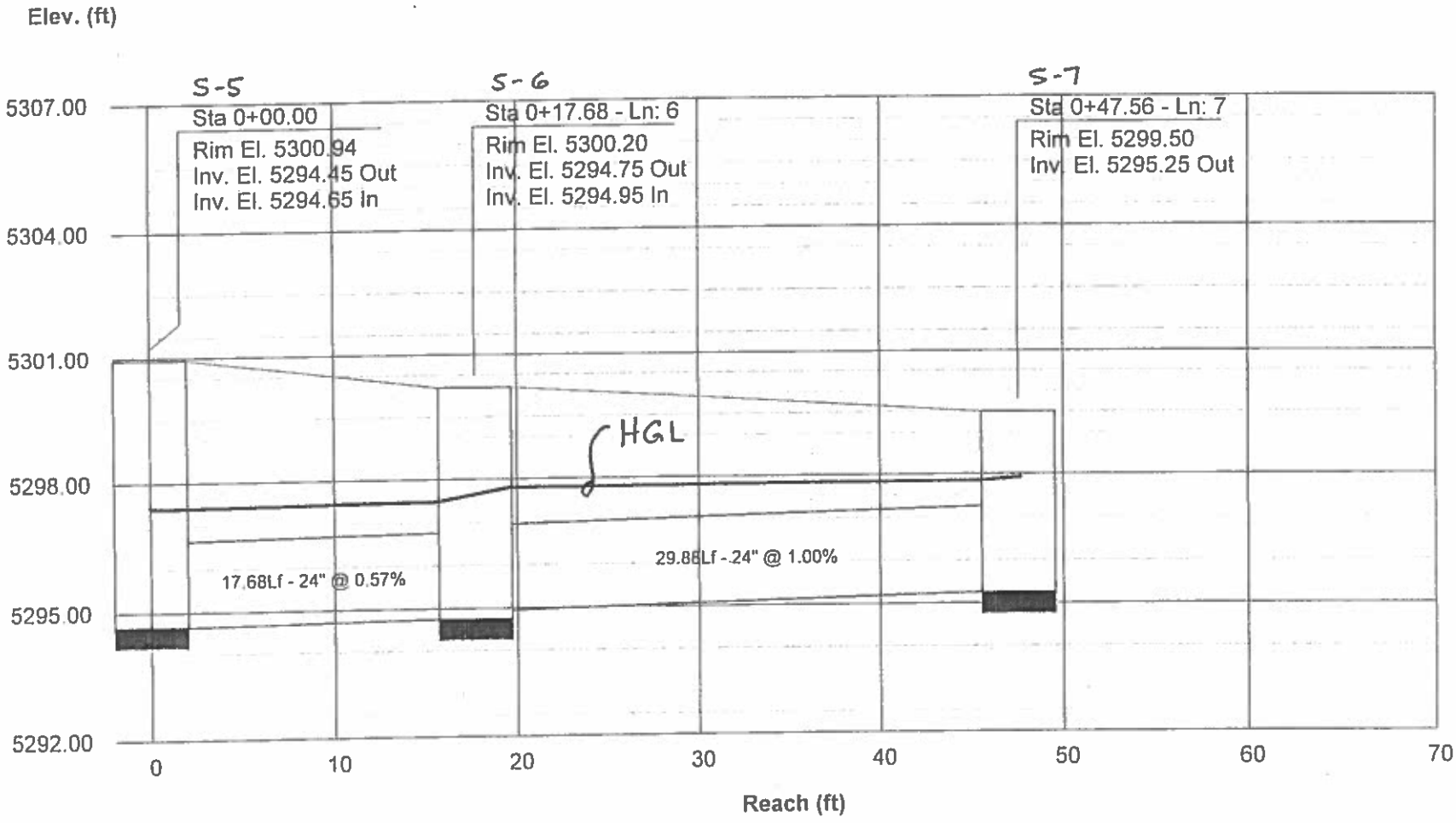

Storm Sewer Profile

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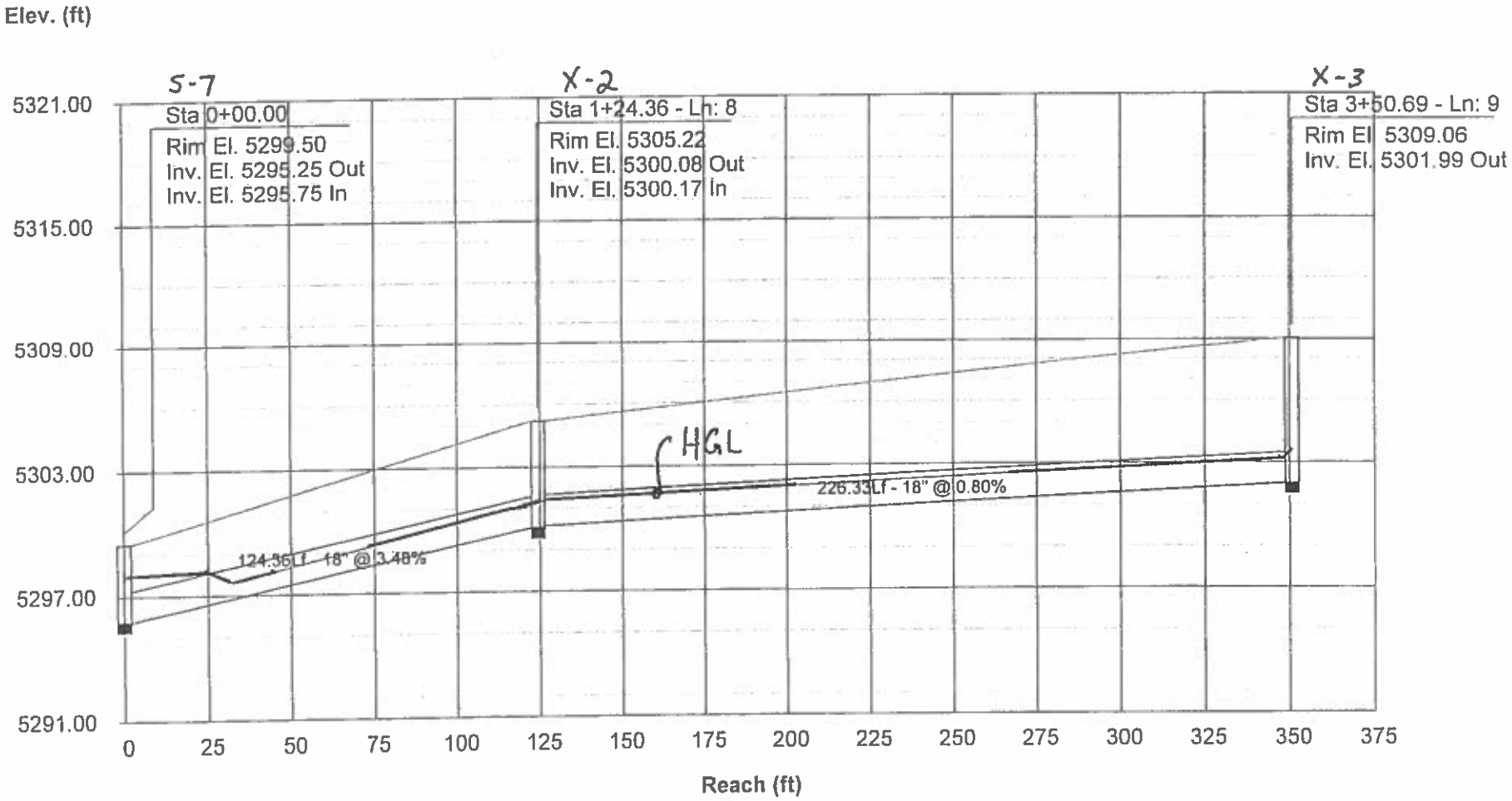

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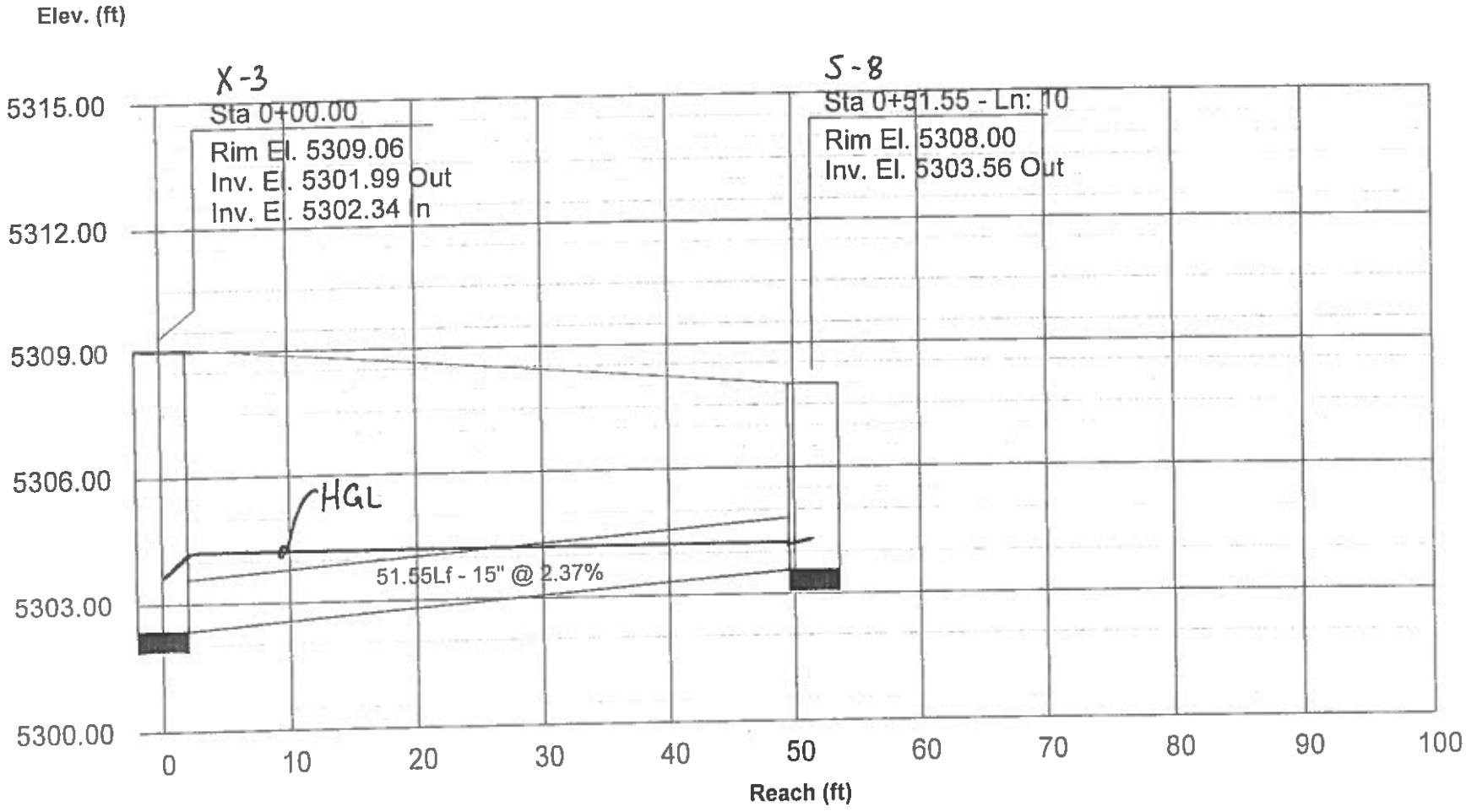

Storm Sewer Profile

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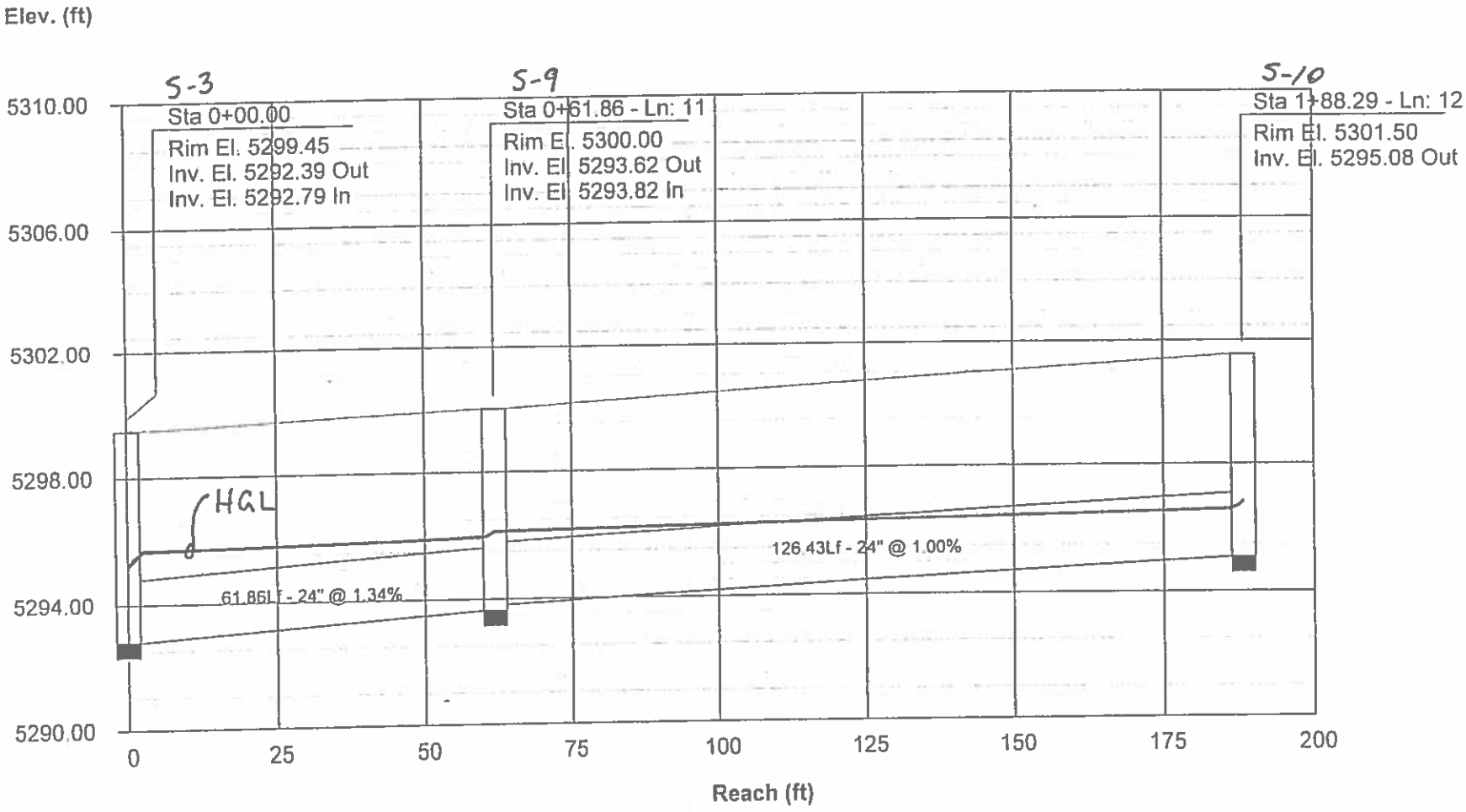
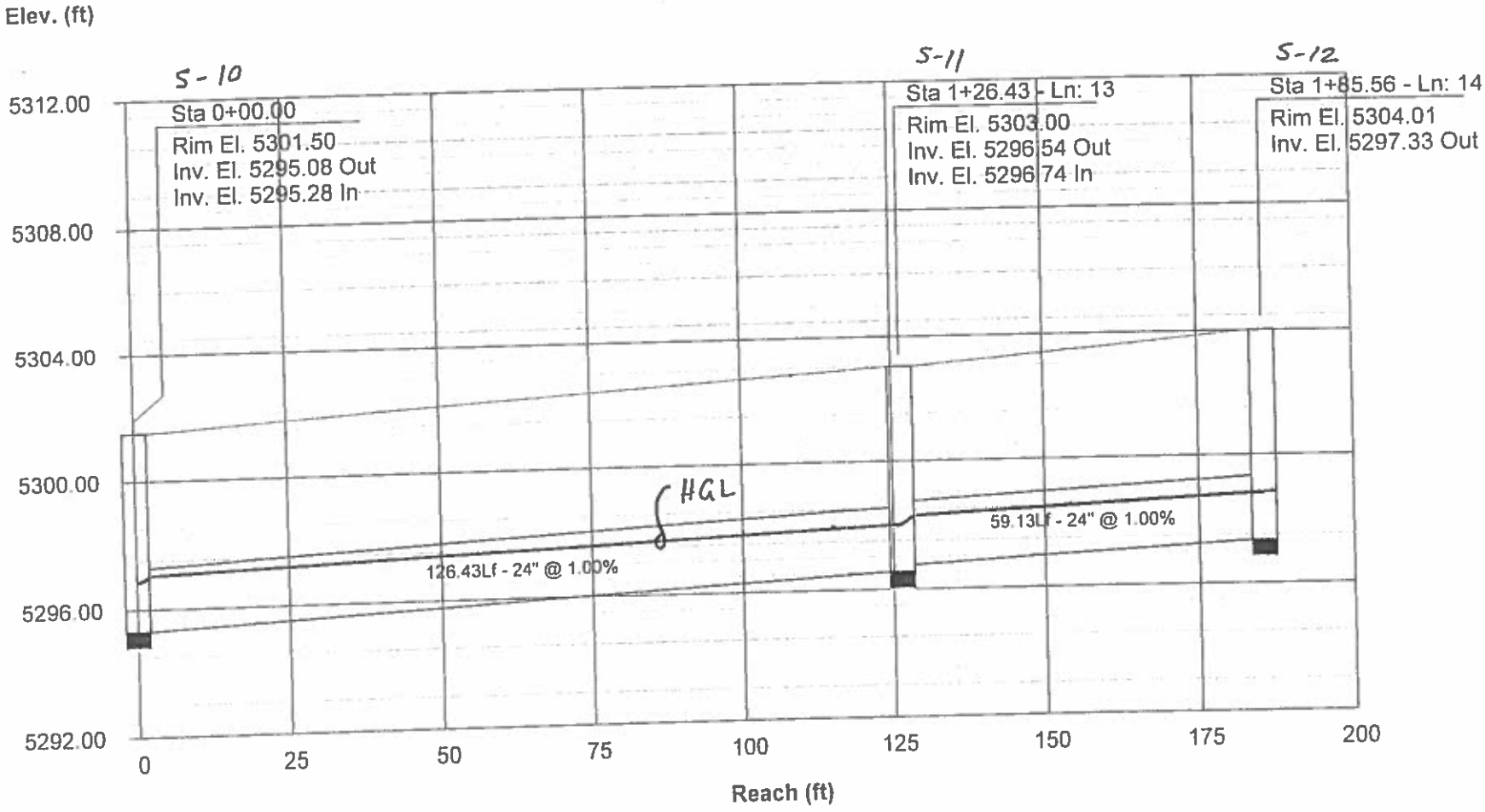
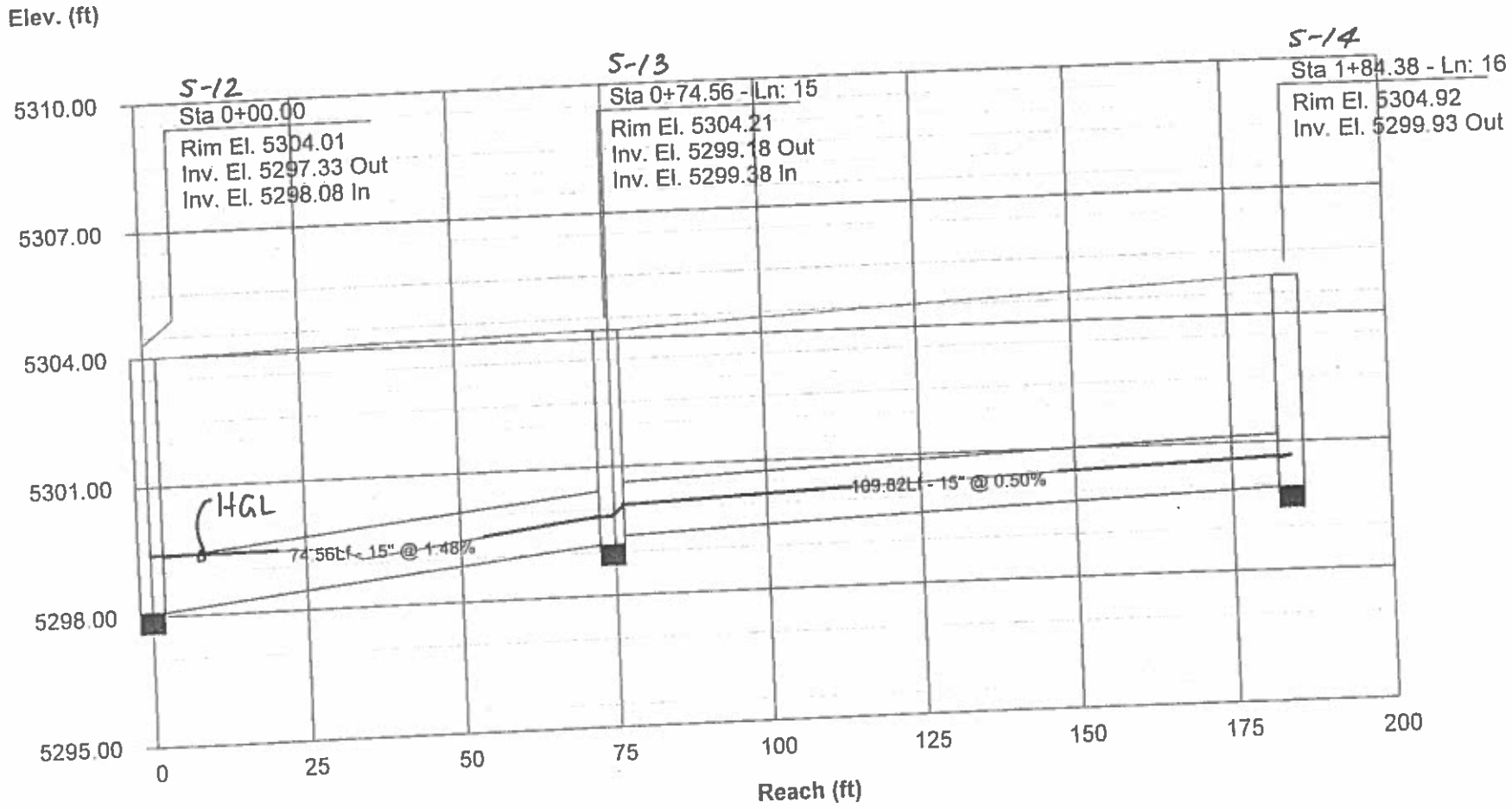


Storm Sewer Profile

Proj. file: Lyons_Valley_Park_F2.stm

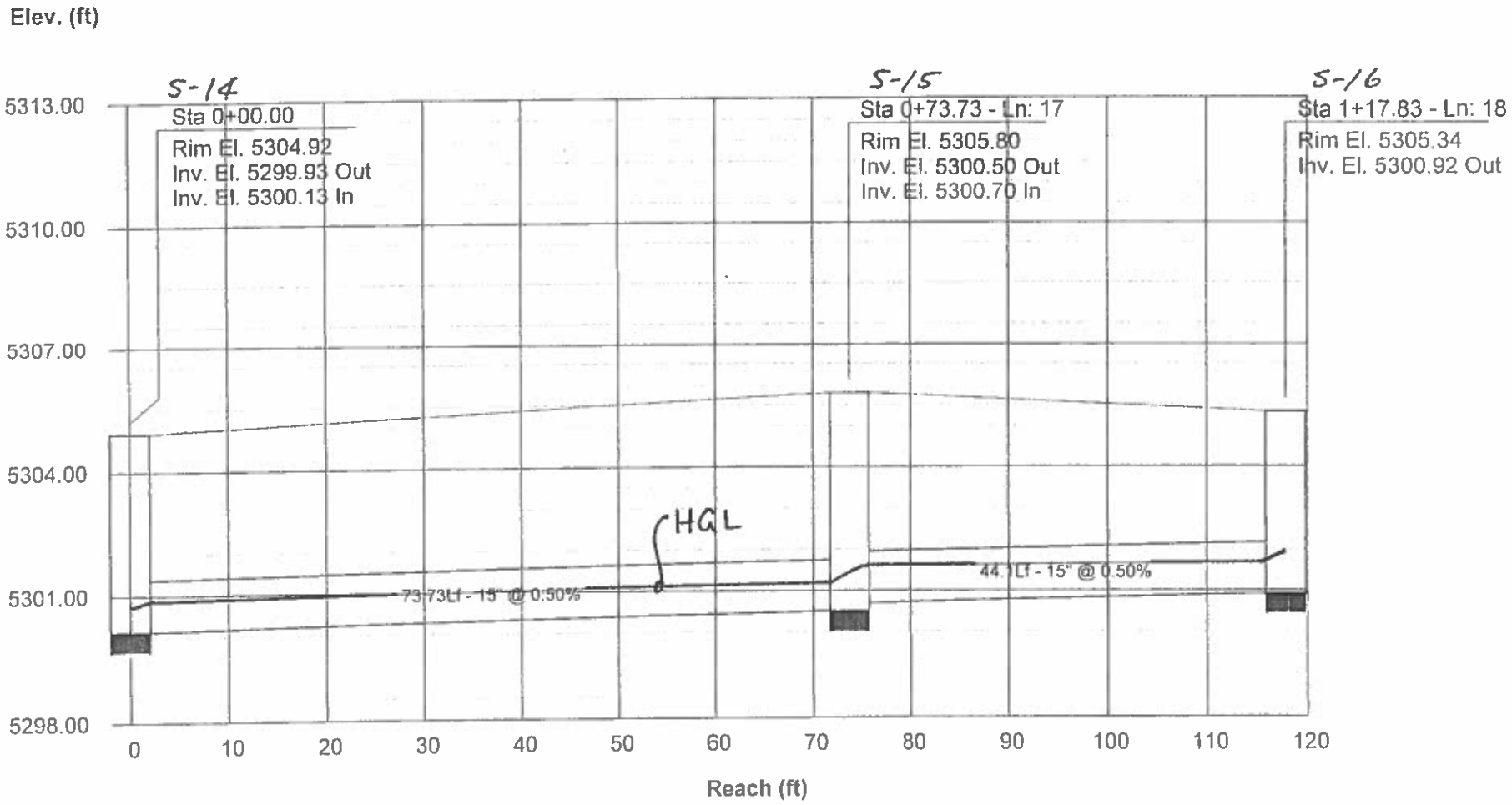


Storm Sewer Profile



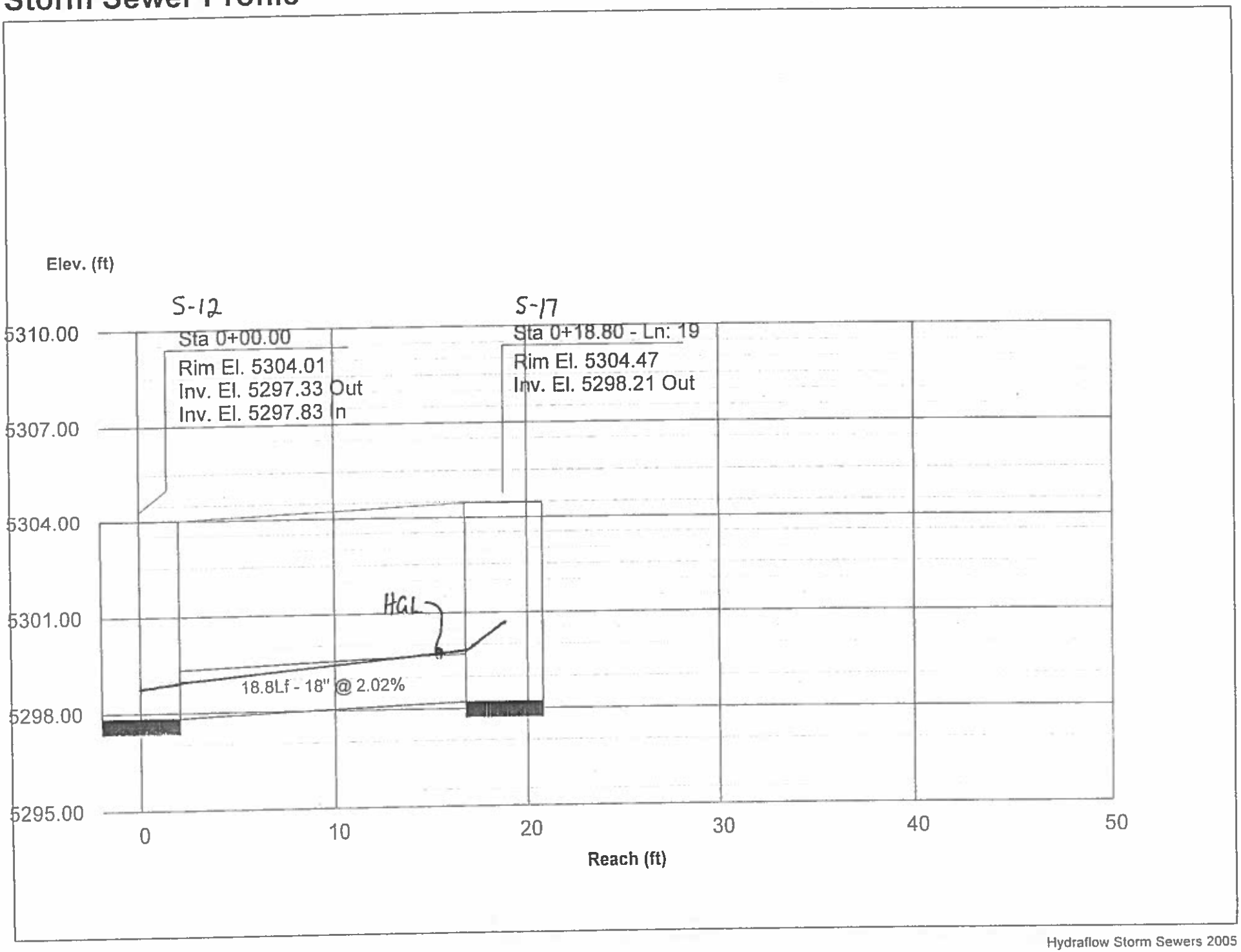
Storm Sewer Profile

Proj. file: Lyons_Valley_Park_F2.stm



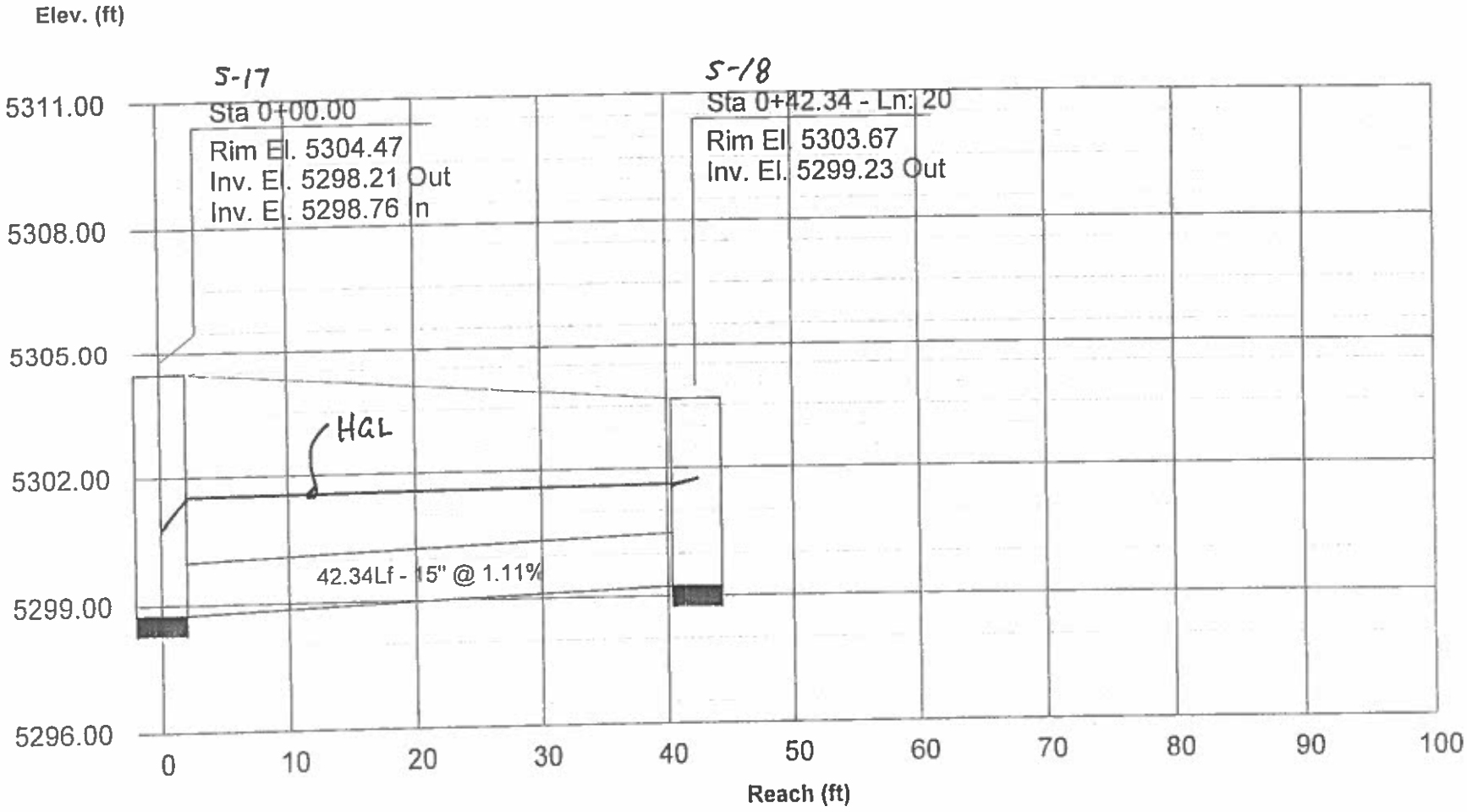
Storm Sewer Profile

Proj. file: Lyons_Valley_Park_F2.stm



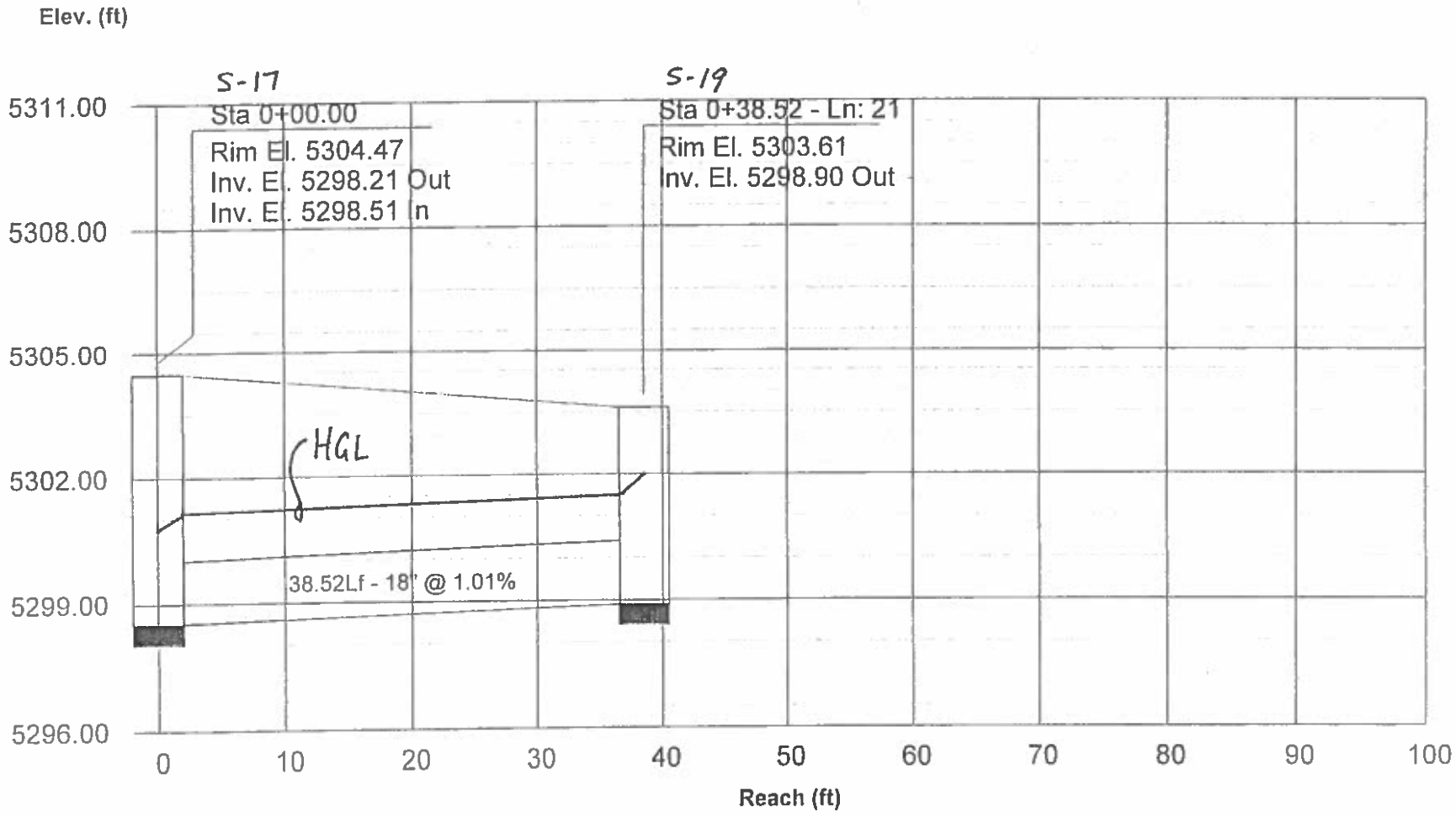
Storm Sewer Profile

Proj. file: Lyons_Valley_Park_F2.stm



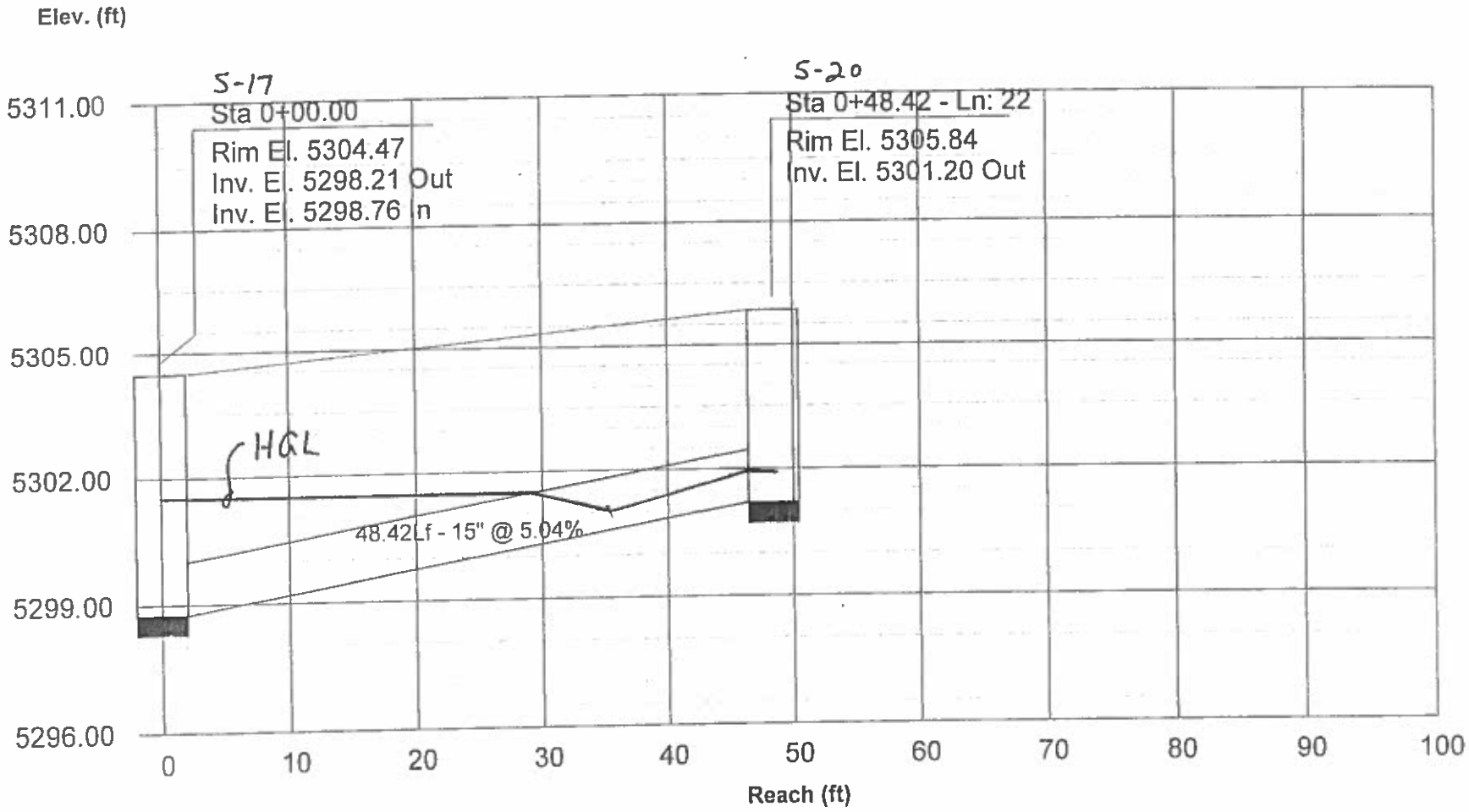
Storm Sewer Profile

Proj. file: Lyons_Valley_Park_F2.stm



Storm Sewer Profile

Proj. file: Lyons_Valley_Park_F2.stm



Storm Sewer Profile

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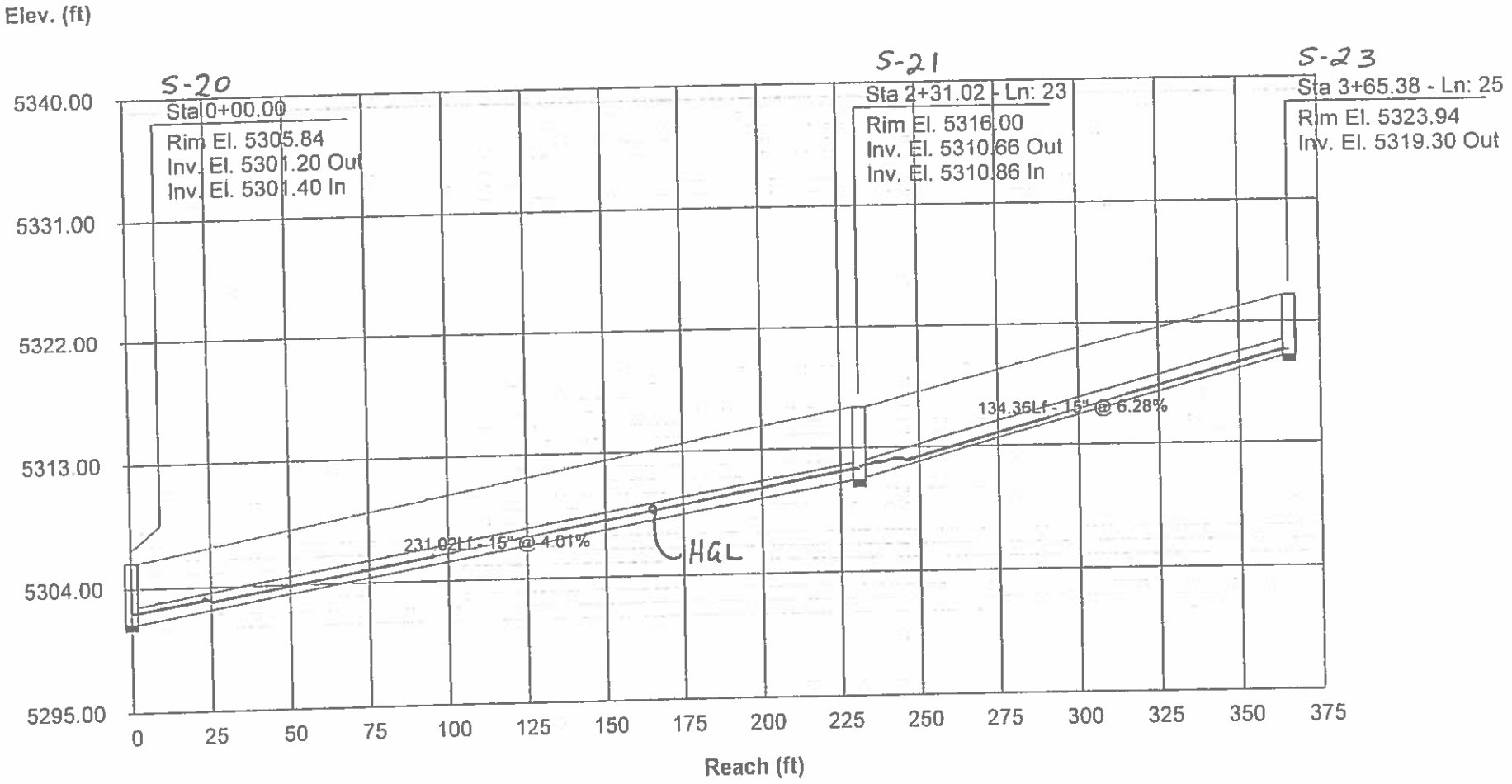

Storm Sewer Profile

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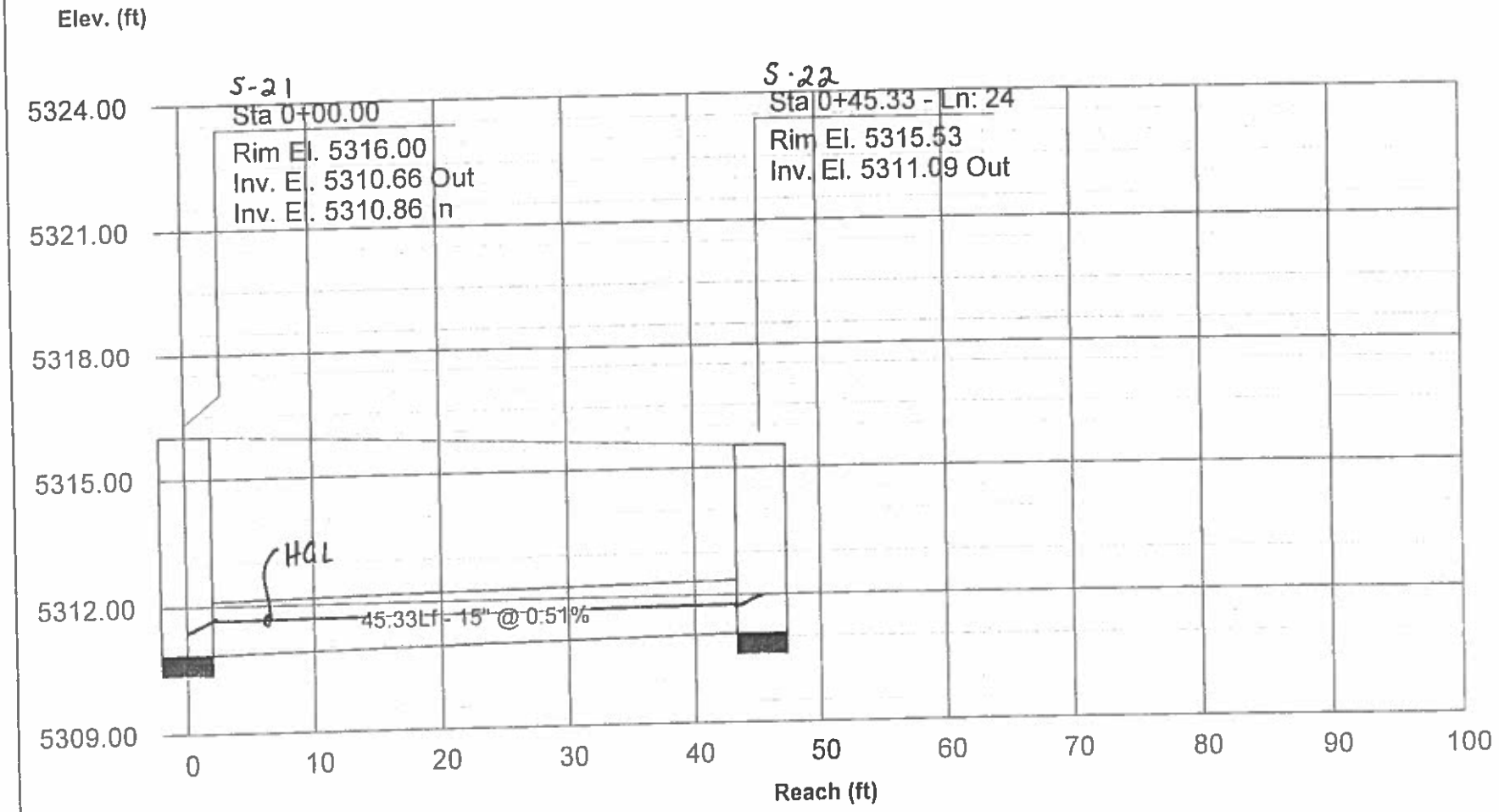

Storm Sewer Profile

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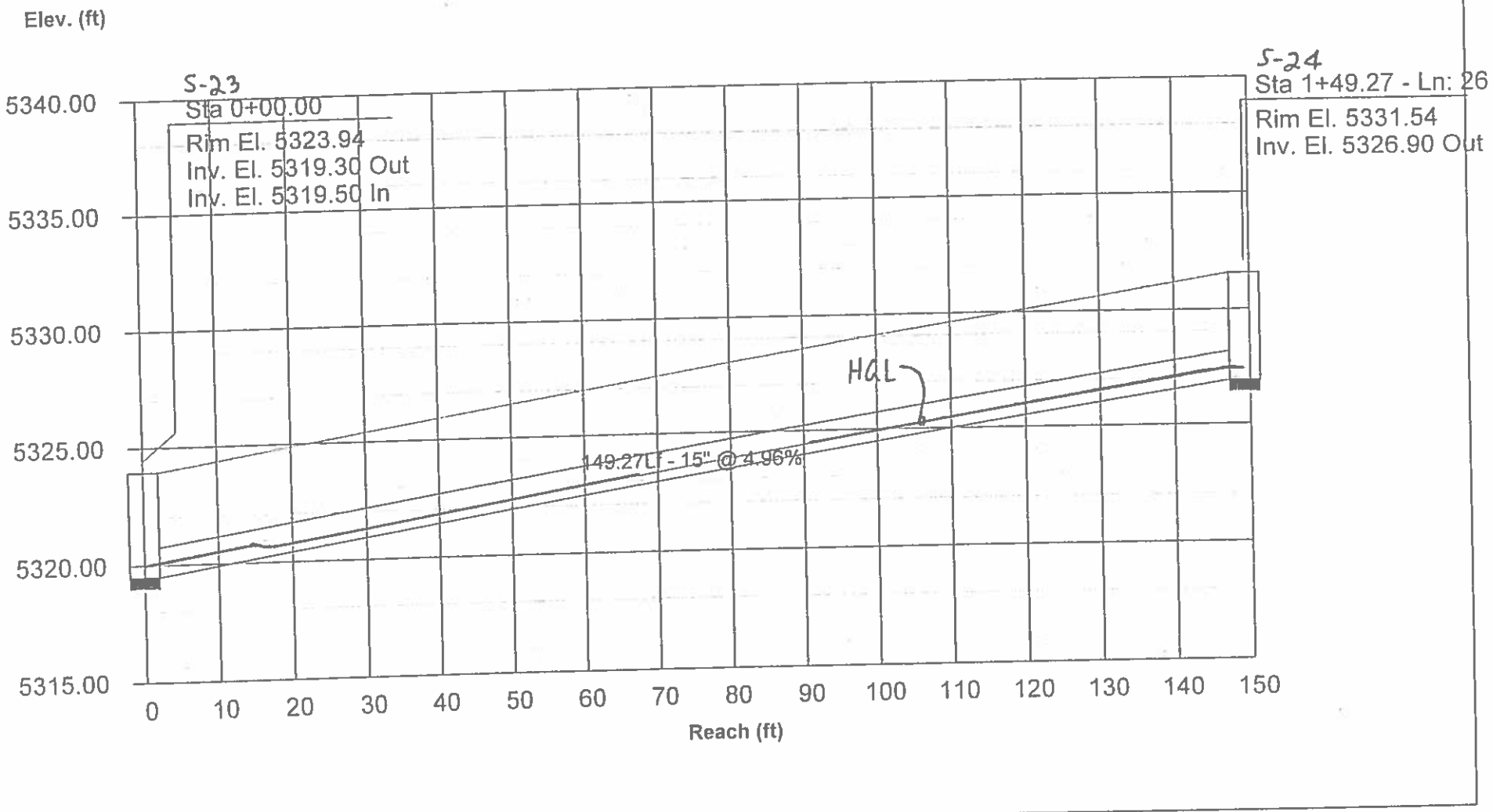

Storm Sewer Profile

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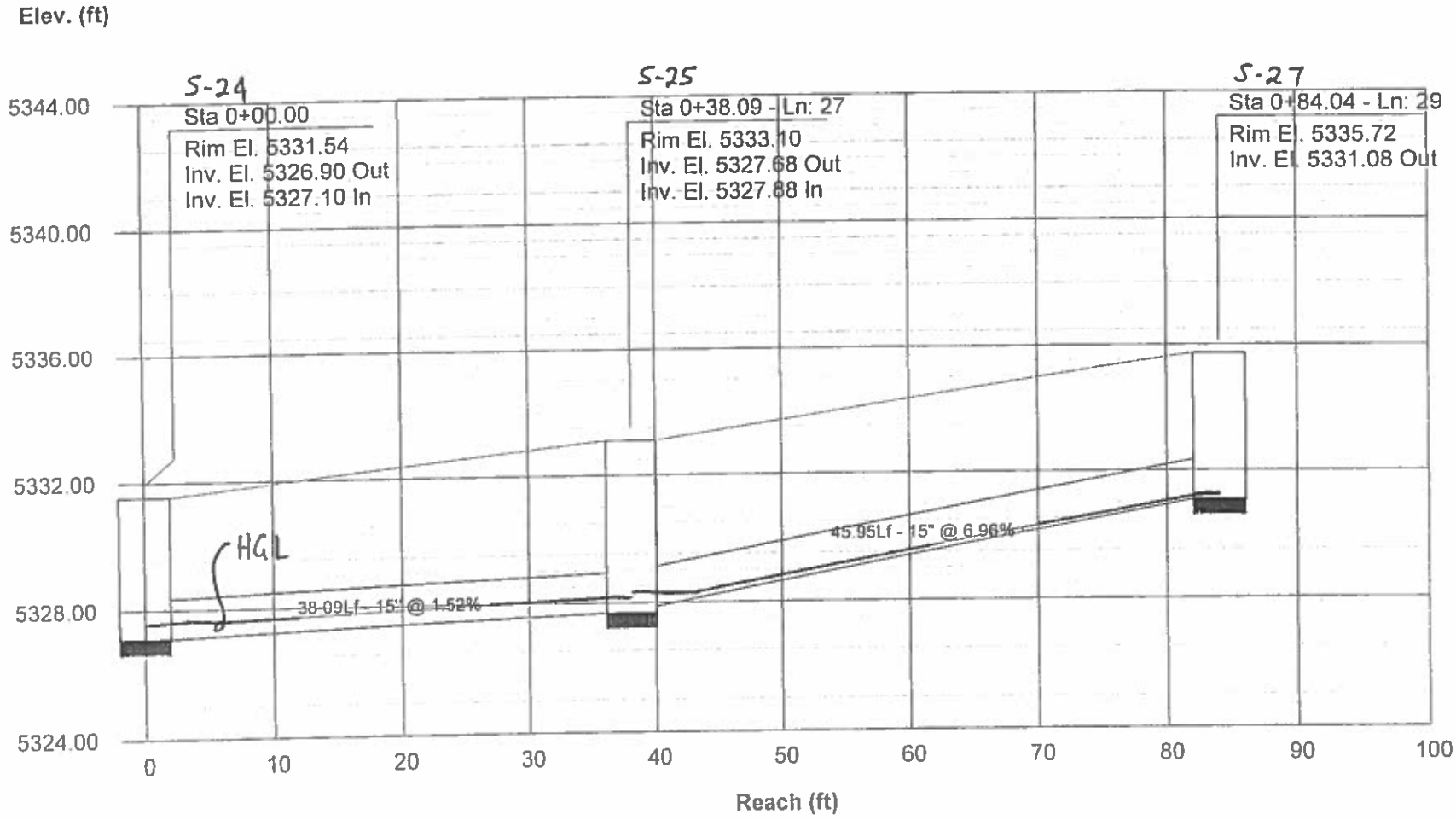

Storm Sewer Profile

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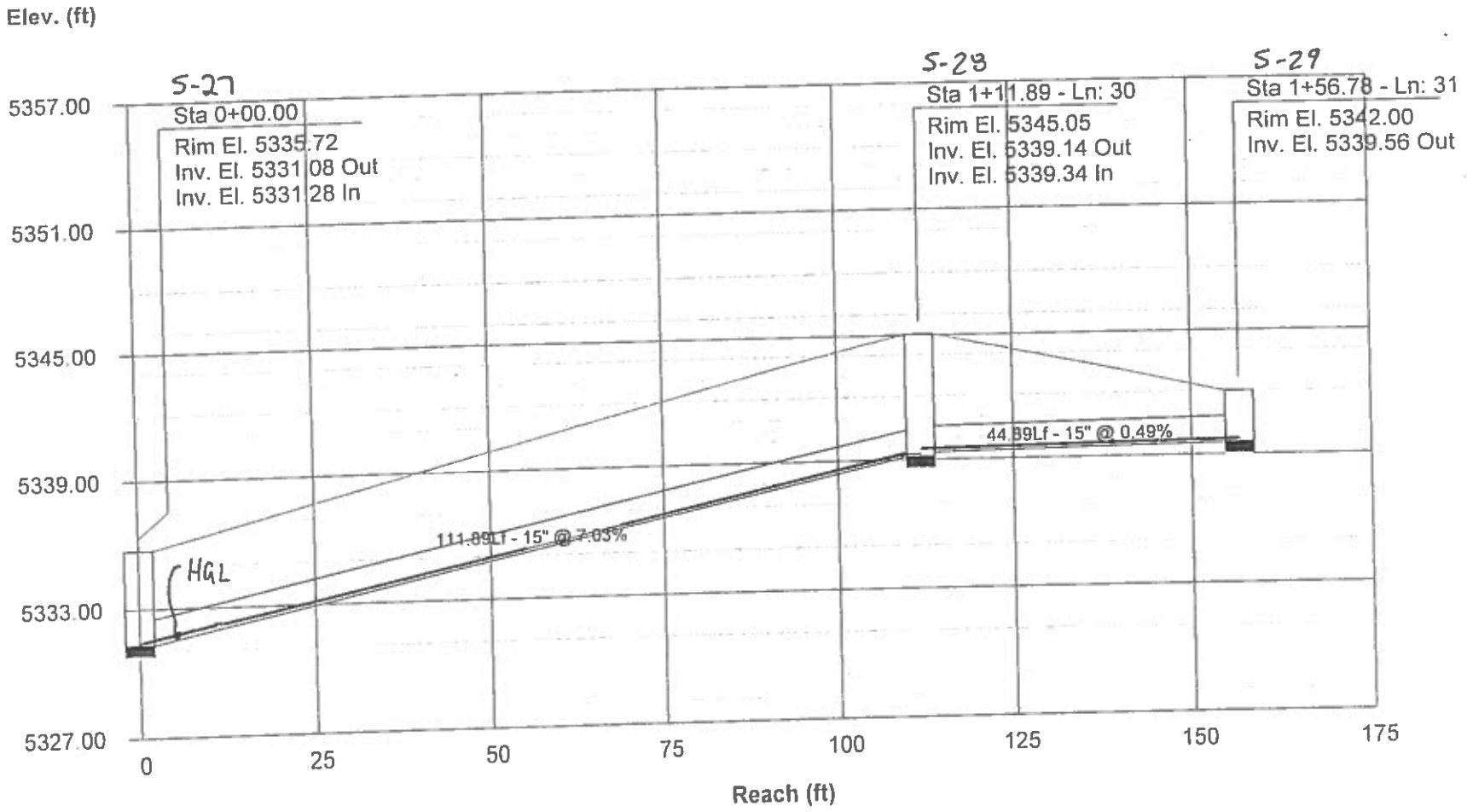
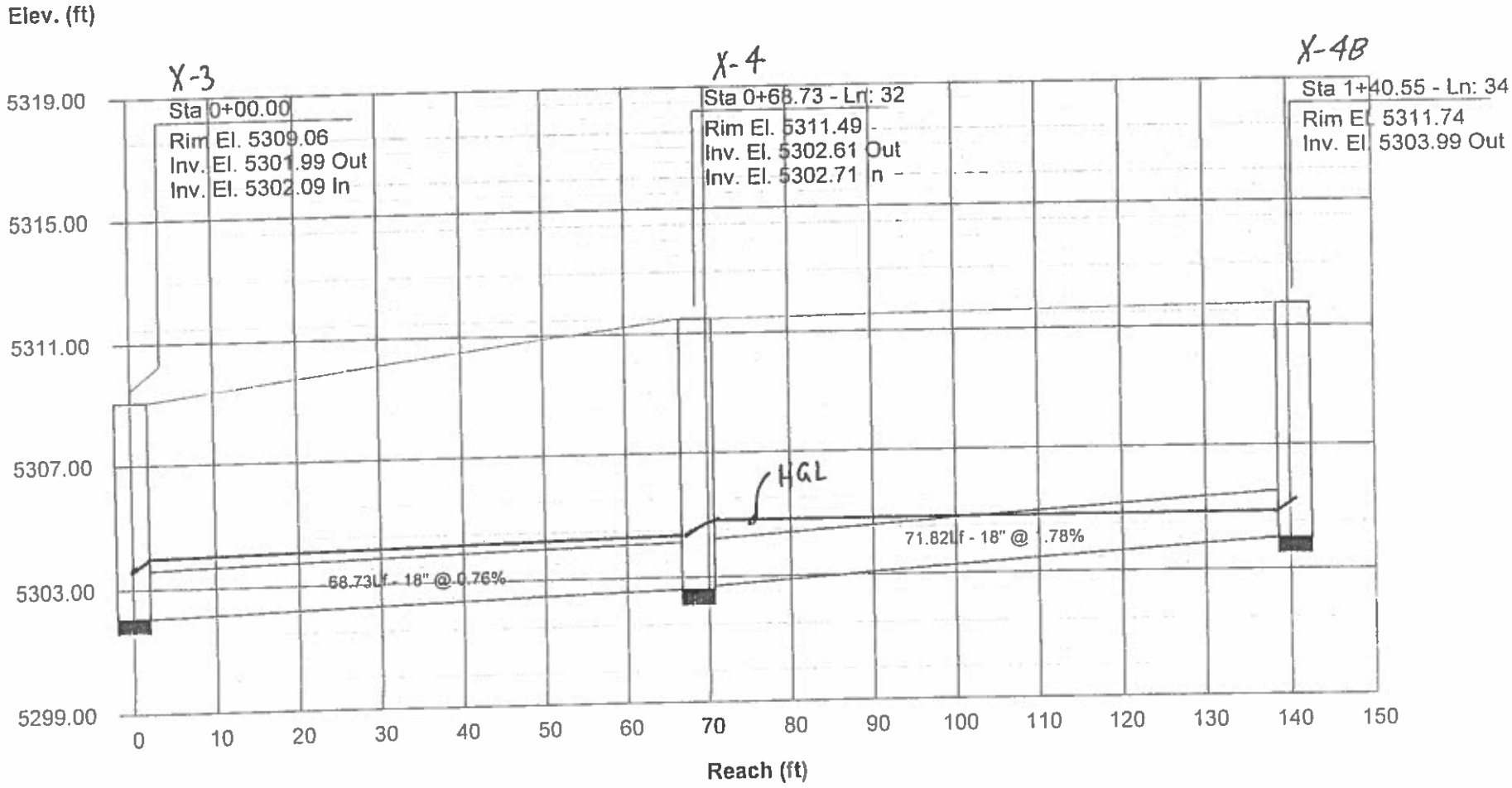


Storm Sewer Profile

Proj. file: Lyons_Valley_Park_F2.stm



Storm Sewer Profile

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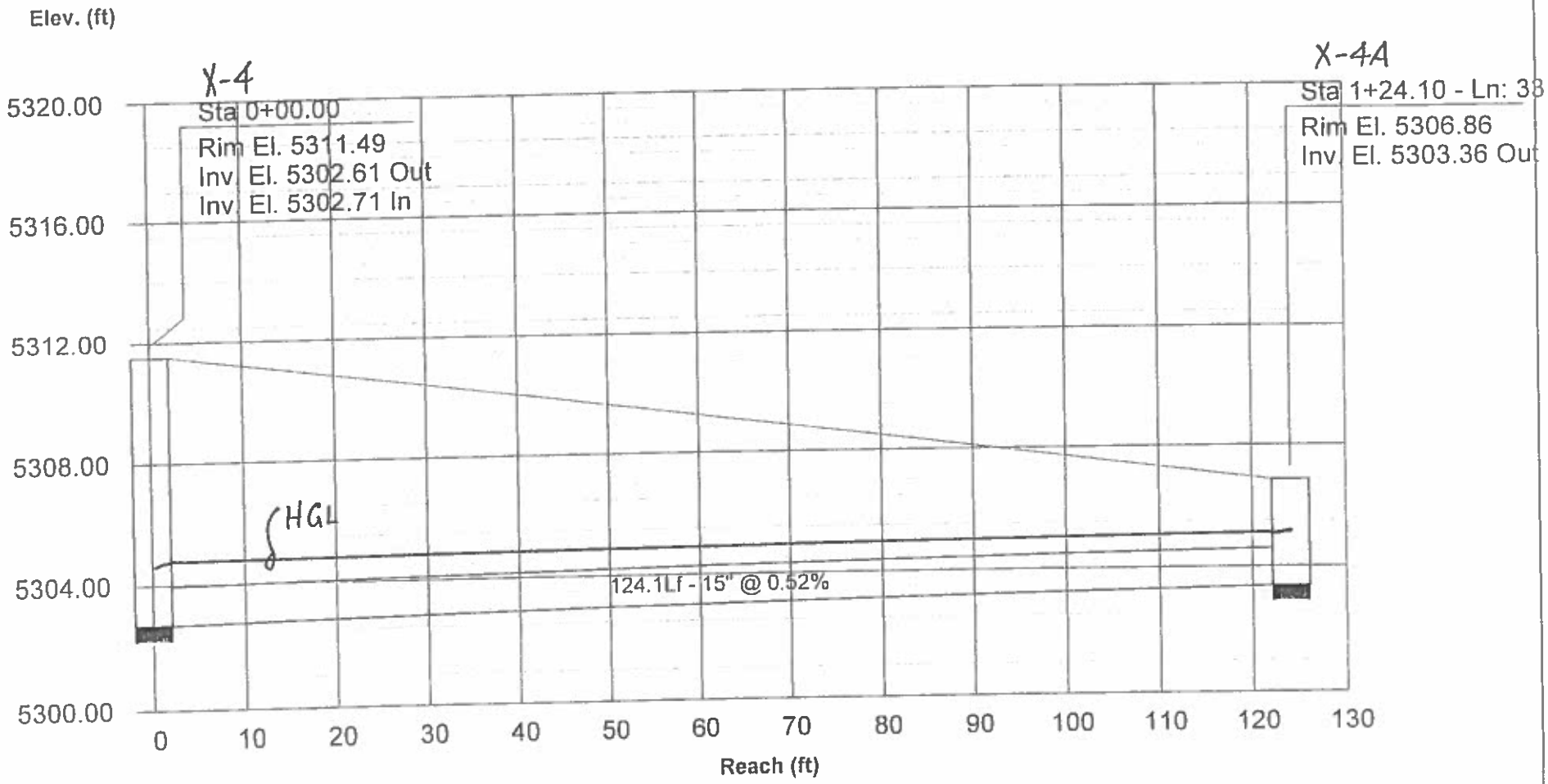
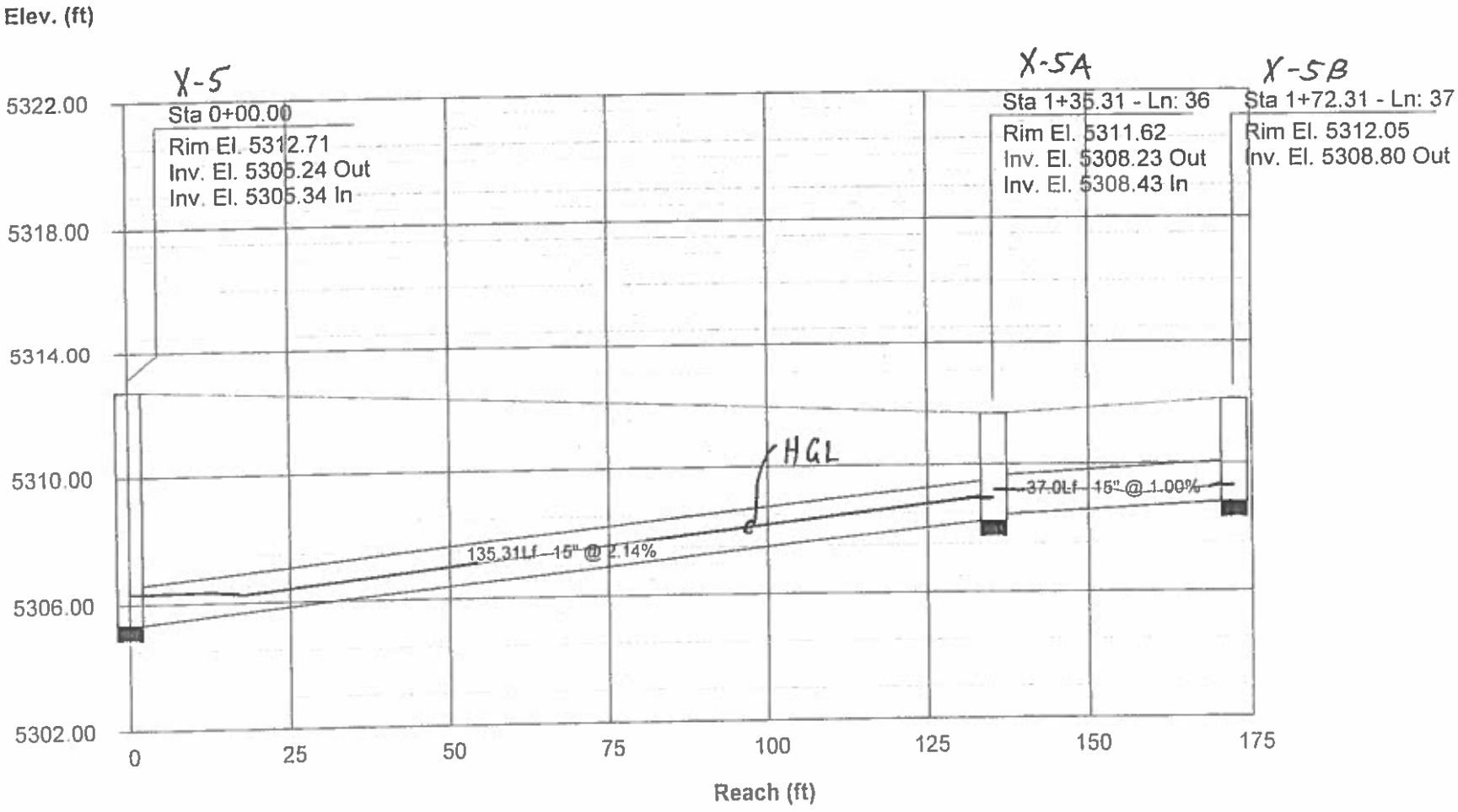


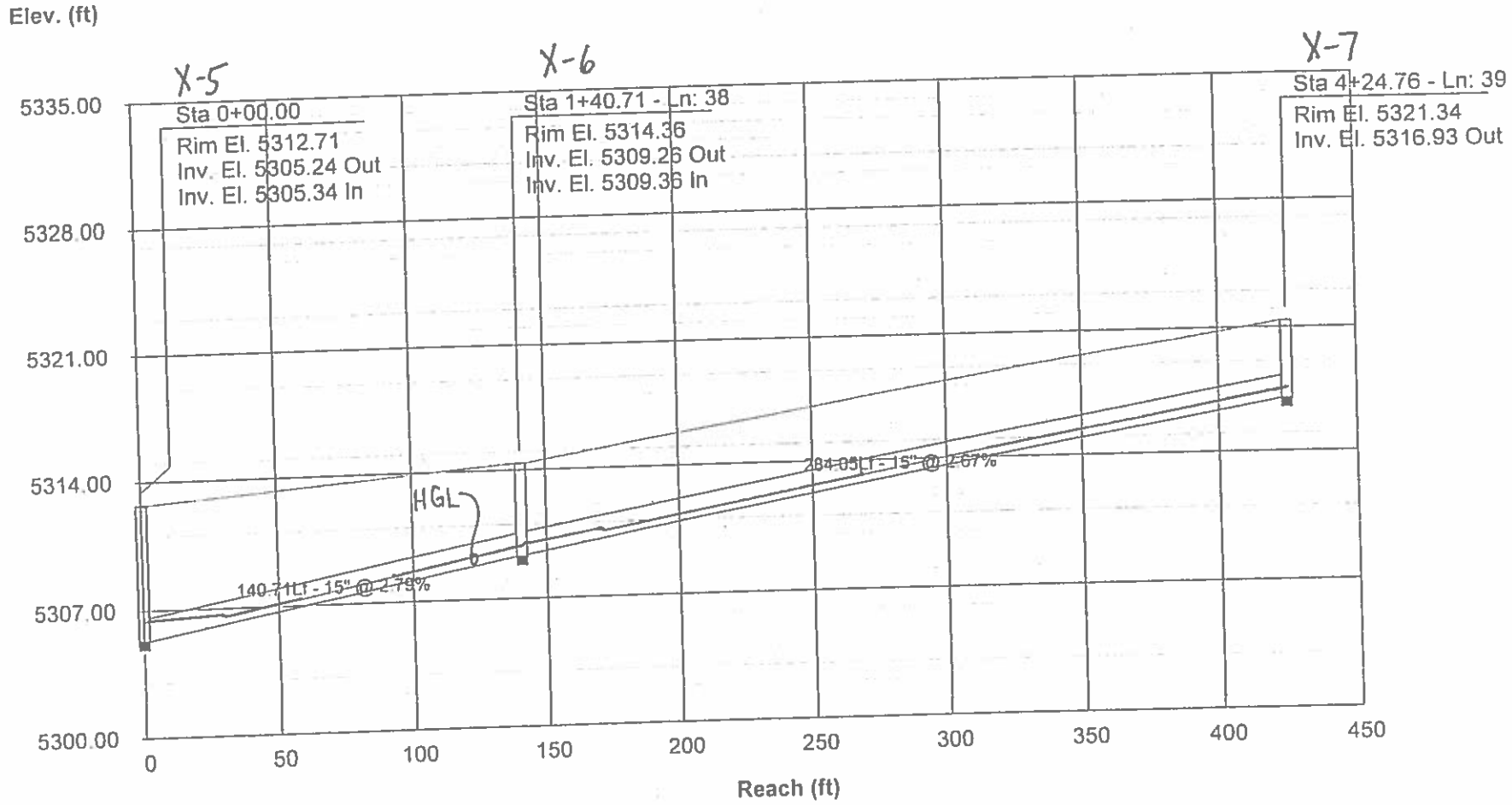
Storm Sewer Profile

Proj. file: Lyons_Valley_Park_F2.stm



Proj. file: Lyons_Valley_Park_F2.stm

Storm Sewer Profile



APPENDIX C

STREET CAPACITY ANALYSIS

Minor Storm Street Analysis
Lyons Valley Park
Job Number: 221002

Lyons Valley Park Filing No. 7 Minor Storm Street Analysis

Basin	Q_2 (cfs)	Curb Type	Street Name	Slope (%)	Gutter Capacity (cfs)
L	1.35	Mountable	McConnell Drive	1.20	4.00
M	1.55	Mountable	McConnell Drive	1.20	4.00
N	1.49	Mountable	McConnell Drive	0.50	2.58
P	3.99	Vertical	McConnell Drive	0.50	9.10
Q	1.56	Mountable	McConnell Drive	0.50	2.58

Note: McConnell Drive of Filing No. 7 has adequate capacity to convey the minor storm flows.

HURST & ASSOCIATES, INC.
CONSULTING ENGINEERS
4999 Pearl East Circle, Suite 106
Boulder, Colorado 80301 (303) 449-9105

JOB 2210-2 – LYONS VALLEY PARK FILING NO. 7

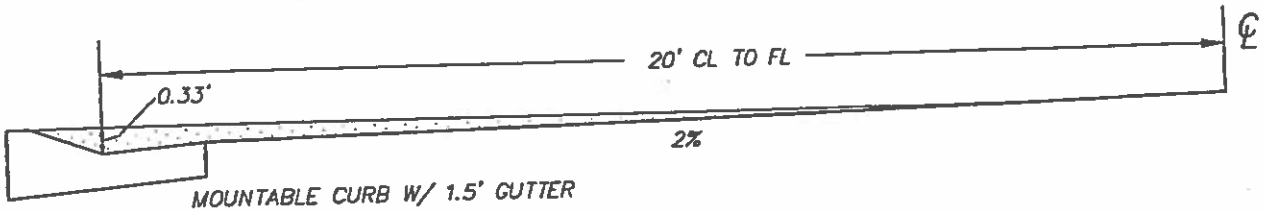
CALCULATED BY TA DATE 08/05/05

CHECKED BY _____ DATE _____

SCALE: NTS SHEET NO. ____ OF ____

STREET CAPACITY ANALYSIS: MINOR STORM EVENT

McCONNELL DRIVE



$$Q_{allow.} = \frac{1.486}{n}(A)\left(\frac{A}{W.P.}\right)^{2/3} S^{1/2} * \text{Reduction Factor}$$

DOWNSTREAM END OF BASINS N & Q

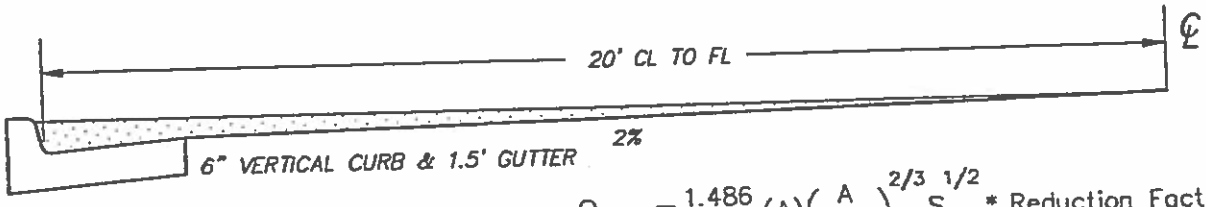
AREA:	1.57 S.F.
WET PERIMETER:	12.52 FEET
n:	0.016
SLOPE:	0.50%
REDUCTION FACTOR:	1.00
HALF STREET CAPACITY:	2.58 CFS

DOWNSTREAM END OF BASINS M & L

AREA:	1.57 S.F.
WET PERIMETER:	12.52 FEET
n:	0.016
SLOPE:	1.20%
REDUCTION FACTOR:	1.00
HALF STREET CAPACITY:	4.00 CFS

STREET CAPACITY ANALYSIS: MINOR STORM EVENT

McCONNELL DRIVE (BETWEEN EXISTING McCONNELL DR & INLET S-6)



$$Q_{allow.} = \frac{1.486}{n}(A)\left(\frac{A}{W.P.}\right)^{2/3} S^{1/2} * \text{Reduction Factor}$$

AREA:	4.07 S.F.
WET PERIMETER:	20.50 FEET
n:	0.016
SLOPE:	0.50%
REDUCTION FACTOR:	1.00
HALF STREET CAPACITY:	9.10 CFS

Major Storm Street Analysis
Lyons Valley Park
Job Number: 221002

Downstream End of Basins	Street	Slope (%)	Contributing Basins	Area (acres)	T_C (min)	C_{100}	I_{100} (in/hr)	Q_{100} (cfs)	Captured Flows (cfs)	Required Capacity (cfs)	Street Capacity (cfs)	R.O.W Plus 5 ft Each Side Capacity (cfs)
N, Q	McConnell Dr. (NW of Low Point)	0.50	H, N, O, P, Q, 6A, 6B, 6C, 6D	19.11	16.9	0.59	5.70	63.88	15.18	48.70	40.87	67.44
L, M	McConnell Dr. (SE of Low Point)	1.20	B, C, D, E, F, I, J, K, L, M, R, S	43.82	21.5	0.38	5.15	86.17	20.56	65.60	63.32	104.46

Note: During the 100-year storm event, runoff will spread outside of the right-of-way but stay within 5 feet of the right-of-way.

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JOB 2210-2 – LYONS VALLEY PARK FILING NO. 7

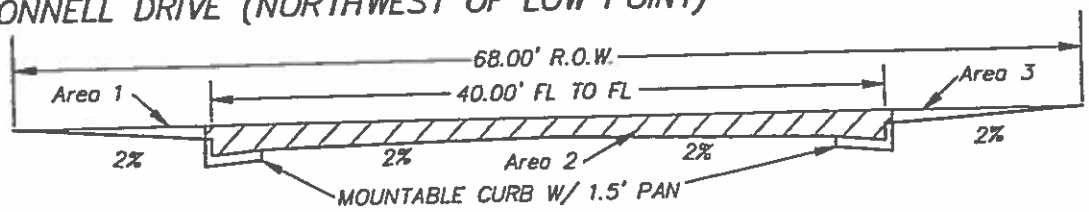
CALCULATED BY TA DATE 08/05/05

CHECKED BY _____ DATE _____

SCALE: NTS SHEET NO. _____ OF _____

STREET CAPACITY ANALYSIS: MAJOR STORM EVENT

McCONNELL DRIVE (NORTHWEST OF LOW POINT)



$$Q_{allow.} = \frac{1.486}{n}(A)\left(\frac{A}{W.P.}\right)^{2/3} S^{1/2} * \text{Reduction Factor}$$

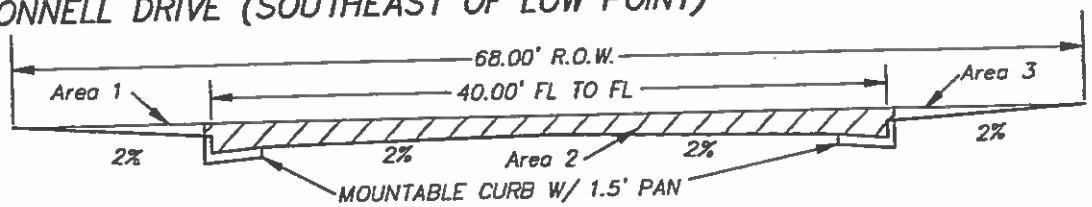
AREA 1 & 3:	1.73 S.F.
WET PERIMETER:	13.17 FEET
n:	0.035
SLOPE:	0.50%
REDUCTION FACTOR:	1.00
AREA 1 & 3 CAPACITIES:	1.34 CFS

AREA 2:	12.81 S.F.
WET PERIMETER:	41.89 FEET
n:	0.016
SLOPE:	0.50%
REDUCTION FACTOR:	1.00
AREA 2 CAPACITY:	38.19 CFS

FULL STREET CAPACITY = 40.87 CFS

STREET CAPACITY ANALYSIS: MAJOR STORM EVENT

McCONNELL DRIVE (SOUTHEAST OF LOW POINT)



$$Q_{allow.} = \frac{1.486}{n}(A)\left(\frac{A}{W.P.}\right)^{2/3} S^{1/2} * \text{Reduction Factor}$$

AREA 1 & 3:	1.73 S.F.
WET PERIMETER:	13.17 FEET
n:	0.035
SLOPE:	1.20%
REDUCTION FACTOR:	1.00
AREA 1 & 3 CAPACITIES:	2.08 CFS

AREA 2:	12.81 S.F.
WET PERIMETER:	41.89 FEET
n:	0.016
SLOPE:	1.20%
REDUCTION FACTOR:	1.00
AREA 2 CAPACITY:	59.16 CFS

FULL STREET CAPACITY = 63.32 CFS

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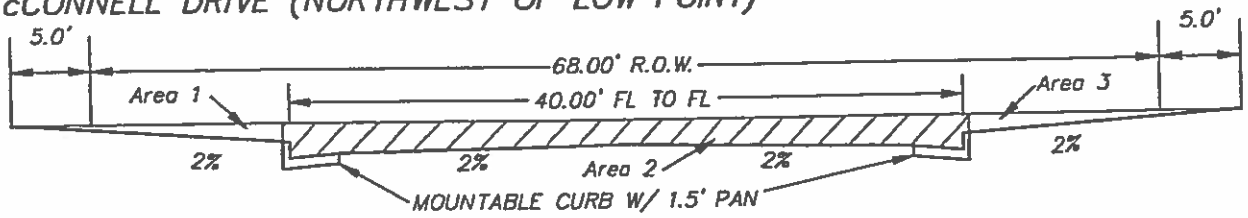
JOB 2210-2 – LYONS VALLEY PARK FILING NO. 7
CALCULATED BY TA DATE 08/05/05
CHECKED BY DATE
SCALE: NTS SHEET NO. OF

STREET CAPACITY ANALYSIS: MAJOR STORM EVENT

McCONNELL DRIVE (NORTHWEST OF LOW POINT)



$$Q_{allow.} = \frac{1.486}{n}(A)\left(\frac{A}{W.P.}\right)^{2/3} S^{1/2} * \text{Reduction Factor}$$

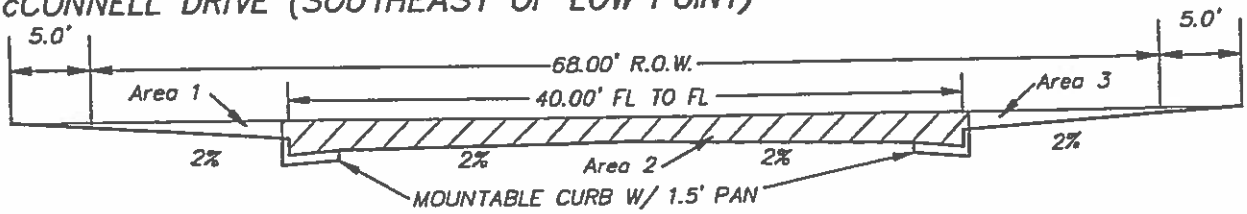
AREA 1 & 3:	3.30 S.F.
WET PERIMETER:	18.17 FEET
n:	0.035
SLOPE:	0.50%
REDUCTION FACTOR:	1.00
AREA 1 & 3 CAPACITIES:	3.18 CFS

FULL STREET CAPACITY = 67.44 CFS

AREA 2:	16.98 S.F.
WET PERIMETER:	41.89 FEET
n:	0.016
SLOPE:	0.50%
REDUCTION FACTOR:	1.00
AREA 2 CAPACITY:	61.08 CFS

STREET CAPACITY ANALYSIS: MAJOR STORM EVENT

McCONNELL DRIVE (SOUTHEAST OF LOW POINT)



$$Q_{allow.} = \frac{1.486}{n}(A)\left(\frac{A}{W.P.}\right)^{2/3} S^{1/2} * \text{Reduction Factor}$$

AREA 1 & 3:	3.30 S.F.
WET PERIMETER:	18.17 FEET
n:	0.035
SLOPE:	1.20%
REDUCTION FACTOR:	1.00
AREA 1 & 3 CAPACITIES: CFS	4.92

FULL STREET CAPACITY = 104.46 CFS

AREA 2:	16.98 S.F.
WET PERIMETER:	41.89 FEET
n:	0.016
SLOPE:	1.20%
REDUCTION FACTOR:	1.00
AREA 2 CAPACITY:	94.62 CFS

APPENDIX D

SWALE ANALYSIS

Swale Analysis
Lyons Valley Park
Job Number: 221002

Swale A (100-Year Swale Analysis)	
Contributing Basins:	B, C, D, E, F, H, I, J, K, L, M, N, O, P, Q, R, S, 6A, 6B, 6C, 6D
Area (acres) :	62.93
C_{100} :	0.46
Time of concentration (min.) :	21.5
I_{100} :	5.15
Q_{100} (cfs) :	148.46
Captured Flows (cfs) :	41.69
Design flow (Q_{100}) (cfs):	106.77
Manning's n:	0.030
Slope of channel (S) (ft/ft):	0.040
Slope of channel bank (z:1) (entre z):	6
Base width (b) (ft)	12
Normal Depth (y_n) (ft):	0.84
Area (A) (ft^2):	14.41
Wetted Perimeter (P) (ft):	22.27
Capacity (cfs):	106.77
Top Width (ft):	22.13
Normal velocity (v_n) (fps):	7.4
Required Freeboard (ft):	1.85
Froude Number:	1.62
Minimum Swale depth (ft):	1.50
Area (A) (ft^2):	31.50
Wetted Perimeter (P) (ft):	30.25
Minimum Swale Capacity (ft):	320.61

Note 1. : The time of concentration was taken from the pipe analysis section.

Note 2. : The captured flows is the summation of the minor storm flows from the contributing basins. At least this amount of runoff will be captured by the pipe system.

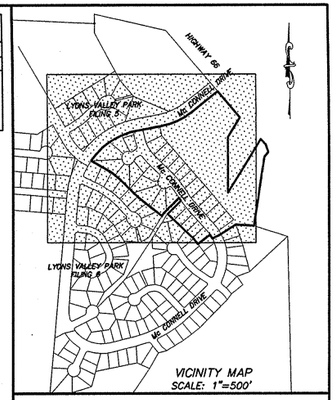
Swale Analysis
Lyons Valley Park
Job Number: 221002

Swale B (100-Year Swale Analysis)	
Contributing Basins:	H, O, 6A, 6B, 6C, 6D
Area (acres) :	11.86
C_{100} :	0.58
Time of concentration (min.) :	14.7
I_{100} :	2.40
Q_{100} (cfs) :	16.46
Captured Flows (cfs) :	11.19
Design flow (Q_{100}) (cfs):	5.27
Manning's n:	0.030
Minimum Slope of channel (S) (ft/ft):	0.019
Slope of channel bank (z:1) (entre z):	6
Normal Depth (y_n) (ft):	0.55
Area (A) (ft^2):	1.84
Wetted Perimeter (P) (ft):	6.73
Capacity (cfs):	5.27
Top Width (ft):	6.64
Normal velocity (v_n) (fps):	2.9
Minimum Swale depth (ft):	1.00
Area (A) (ft^2):	6.00
Wetted Perimeter (P) (ft):	12.17
Minimum Swale Capacity (ft):	25.57

Note 1.: The time of concentration was taken from the pipe analysis section.
Note 2.: The captured flows is the summation of the minor storm flows from the contributing

BASIN RUNOFF SUMMARY

BASIN	TOTAL AREA (AC)	WEIGHTED COEFFICIENTS C2	C100	INTENSITY (IN/HR) I2	I100	PEAK FLOW (CFS) Q2	Q100
N	1.43	0.40	0.60	2.60	6.60	1.49	5.66
O	1.54	0.40	0.60	2.60	6.55	1.60	6.05
P	4.16	0.40	0.60	2.40	6.15	3.99	15.35
Q	1.66	0.40	0.60	2.35	6.05	1.56	6.03

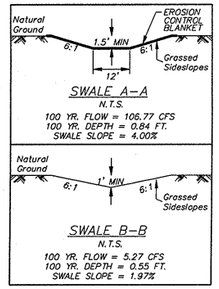


VICINITY MAP
SCALE: 1"=500'

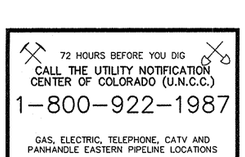
LEGEND

- Manhole
- Existing Manhole
- 5' Type 'R' Inlet
- 10' Type 'R' Inlet
- 15' Type 'R' Inlet
- Outlet Box
- Flared End Section
- Storm Pipe
- Existing Storm Pipe
- Existing Contours
- Proposed Contours
- Floodplain
- Basin Boundary
- Retaining Wall
- Flow Arrow
- S-28 Structure Number
- A 4.84 ac. Basin Designation

NOTE: ALL INLETS ARE 5' TYPE 'R' UNLESS OTHERWISE NOTED.



SWALE A–A
N.T.S.
100 YR. FLOW = 106.77 CFS
100 YR. DEPTH = 0.84 FT.
SWALE SLOPE = 4.00%



SWALE B–B
N.T.S.
100 YR. FLOW = 5.27 CFS
100 YR. DEPTH = 0.55 FT.
SWALE SLOPE = 1.97%

72 HOURS BEFORE YOU DIG
CALL THE UTILITY NOTIFICATION CENTER OF COLORADO (U.N.C.C.)
1–800–922–1987
GAS, ELECTRIC, TELEPHONE, CATV AND PANHANDLE EASTERN PIPELINE LOCATIONS

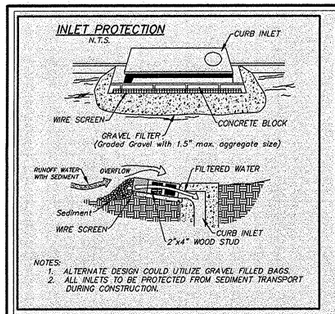
MATCH TO SHEET 2

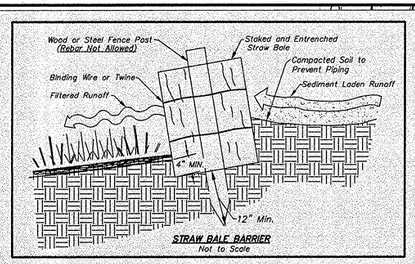
GRAPHIC SCALE
60 0 30 60 120 240
(IN FEET)
1 inch = 60 ft.

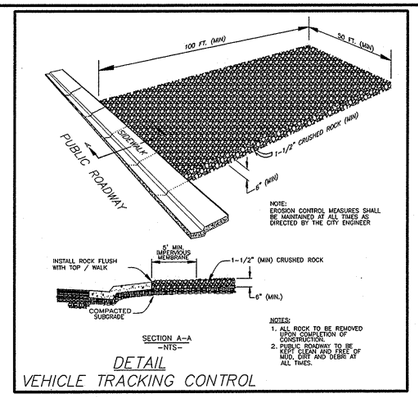
LYONS VALLEY PARK FILING NO. 7 MASTER DRAINAGE PLAN

SCALE	HOR. 1"=60' VERT. N/A
DESIGN/APPR.	OCH
DRAWN BY	DB
DATE	05/24/06

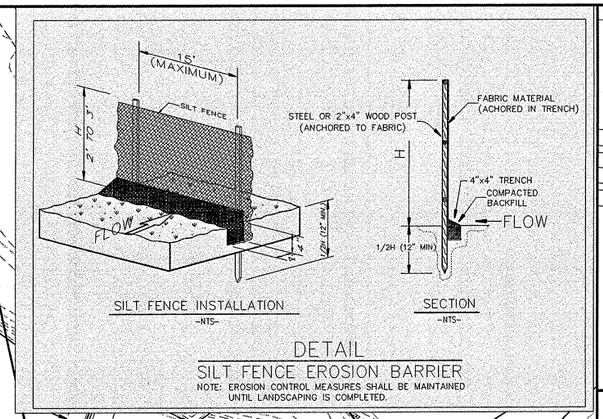
HURST & ASSOCIATES, INC
CONSULTING ENGINEERS
4999 Pearl East Circle, Suite 106
Boulder, Colorado 80301 (303) 449-9105



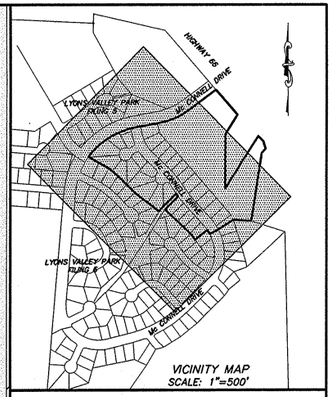




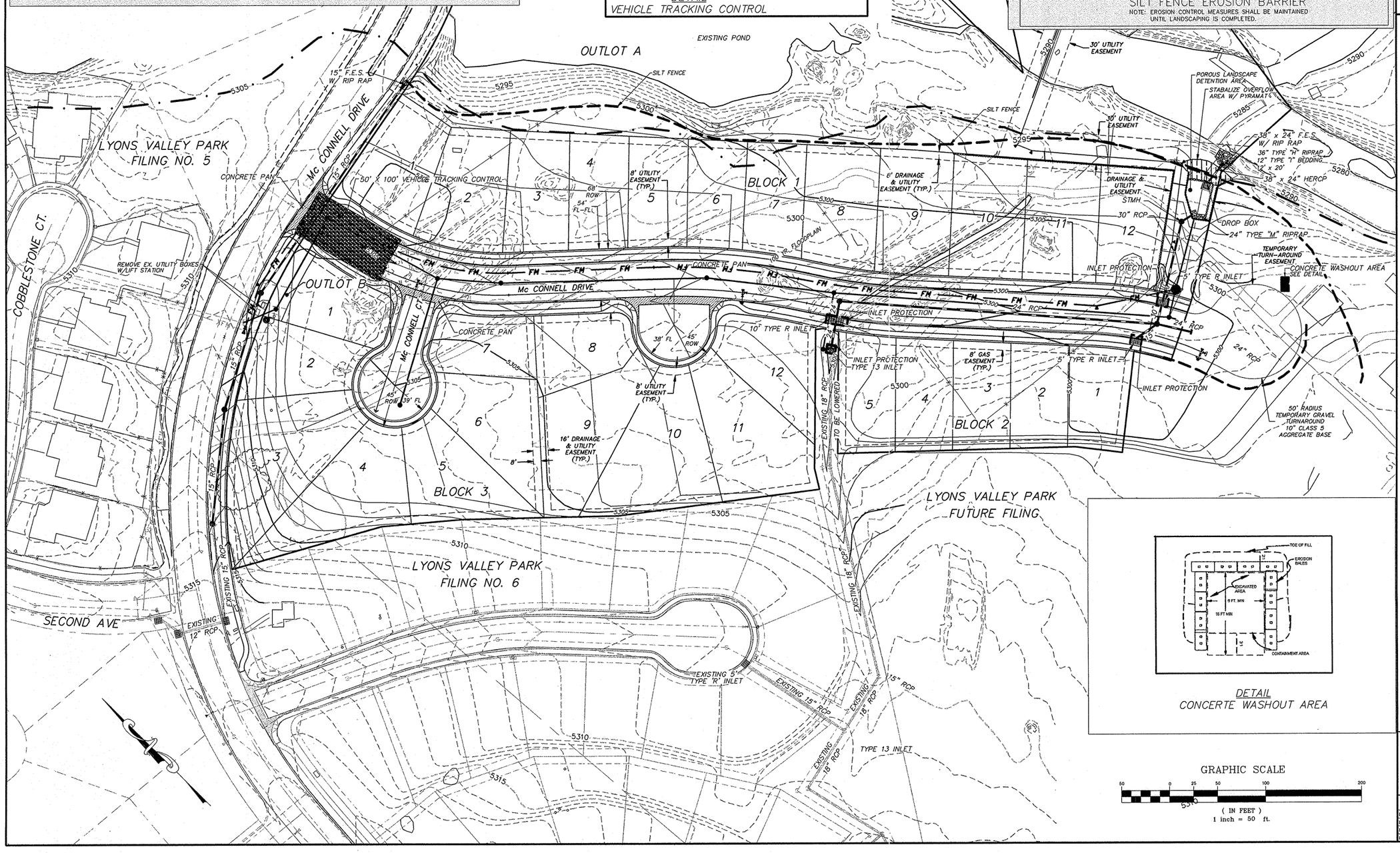
DETAIL
VEHICLE TRACKING CONTROL



DETAIL
SILT FENCE EROSION BARRIER
NOTE: EROSION CONTROL MEASURES SHALL BE MAINTAINED UNTIL LANDSCAPING IS COMPLETED.



VICINITY MAP
SCALE: 1"=500'



DETAIL
CONCERTE WASHOUT AREA

GRAPHIC SCALE
50 0 25 50 100 200
(IN FEET)
1 inch = 50 ft.

LEGEND

- Manhole
- Thrust Block
- Water Valve
- Fire Hydrant
- Plug
- Proposed Waterline
- Existing Waterline
- Proposed Sewerline
- Existing Sewerline
- Proposed Stormline
- Existing Stormline
- W — Water Service
- S — Sewer Service
- 10' Type 'R' Inlet
- 5' Type 'R' Inlet
- Outlet Box
- Retaining Wall
- Silt Fence

ALL UTILITIES ARE PROPOSED UNLESS OTHERWISE NOTED

72 HOURS BEFORE YOU DIG
CALL THE UTILITY NOTIFICATION CENTER OF COLORADO (U.N.C.C.)
1-800-922-1987
GAS, ELECTRIC, TELEPHONE, CATV AND PANHANDLE EASTERN PIPELINE LOCATIONS

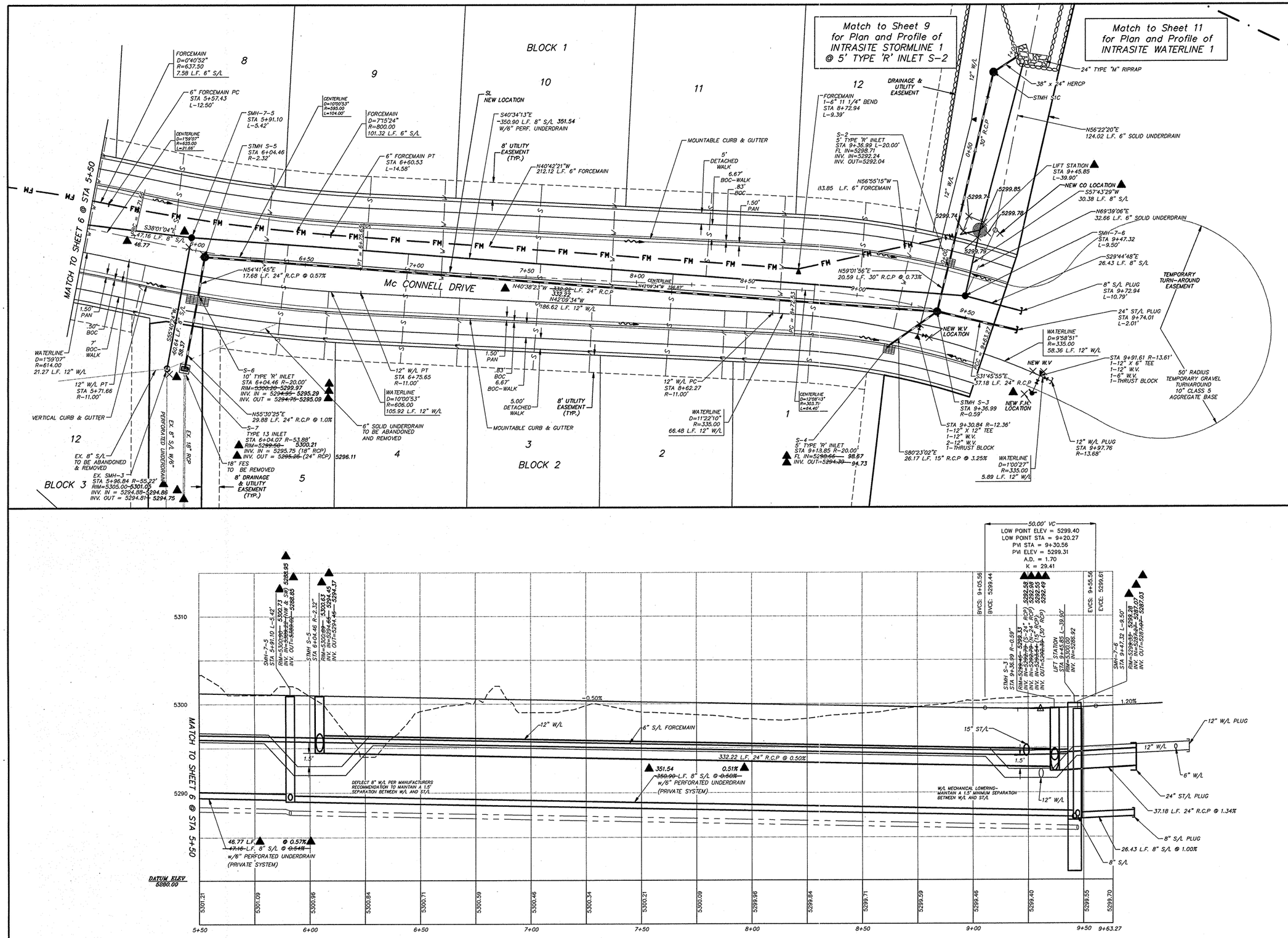
REVISED 5/11/06

LYONS VALLEY PARK FILING NO. 7 STORM WATER MANAGEMENT PLAN

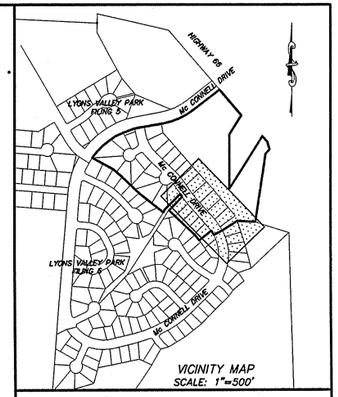
SCALE	HOR. 1"=50' VERT. N/A
DESIGN/APPR.	OCH
DRAWN BY	DB
DATE	05/24/06

HURST & ASSOCIATES, INC.
CONSULTING ENGINEERS
4999 Pearl East Circle, Suite 106
Boulder, Colorado 80301 (303) 449-2105

FILE G:\22102\FILING 7\CONST-F7\ASBUILTS\102-F7SHEWMP5 OF 14



MC CONNELL DRIVE



VICINITY MAP
SCALE: 1"=500'

LEGEND

- Manhole
- Thrust Block
- Water Valve
- Fire Hydrant
- Plug
- Proposed Waterline
- Existing Waterline
- Proposed Sewerline
- Existing Sewerline
- Proposed Stormline
- Existing Stormline
- W — Water Service
- S — Sewer Service
- FM — Poposed Forcemain
- 10' Type 'R' Inlet
- 5' Type 'R' Inlet
- Outlet Box
- Retaining Wall

ALL UTILITIES ARE PROPOSED UNLESS OTHERWISE NOTED

AS-BUILT BY
HURST & ASSOCIATES, INC.
CONSULTING ENGINEERS
8/29/07

BASED ON AS-BUILT SURVEY INFORMATION PROVIDED BY CIVIL ARTS-DREXEL

72 HOURS BEFORE YOU DIG
CALL THE UTILITY NOTIFICATION CENTER OF COLORADO (U.N.C.C.)
1-800-922-1987
GAS, ELECTRIC, TELEPHONE, CATV AND PANHANDLE EASTERN PIPELINE LOCATIONS

LYONS VALLEY PARK FILING NO. 7

Plan & Profile of Utilities

Mc CONNELL DRIVE
Sta 5+50 - 9+63.27

SCALE HOR.	1"=20'
SCALE VERT.	1"=5'
DESIGN/APPR.	OCH
DRAWN BY	DB
DATE	05/24/06

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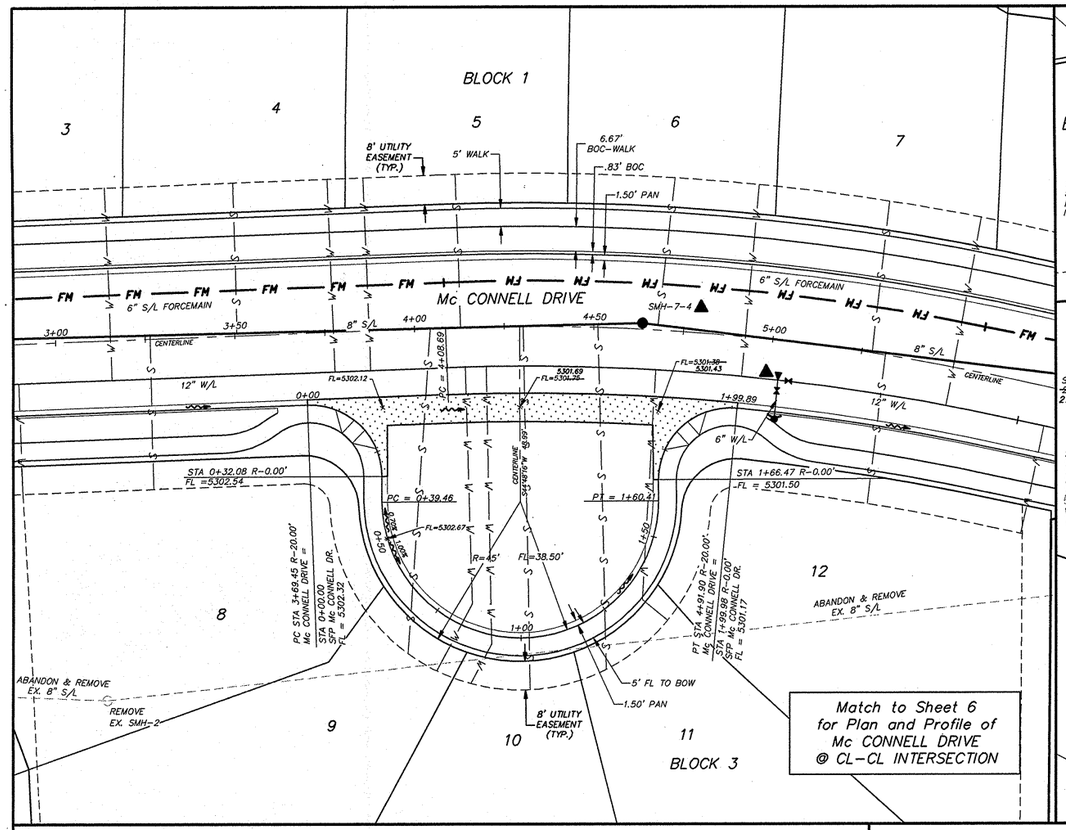
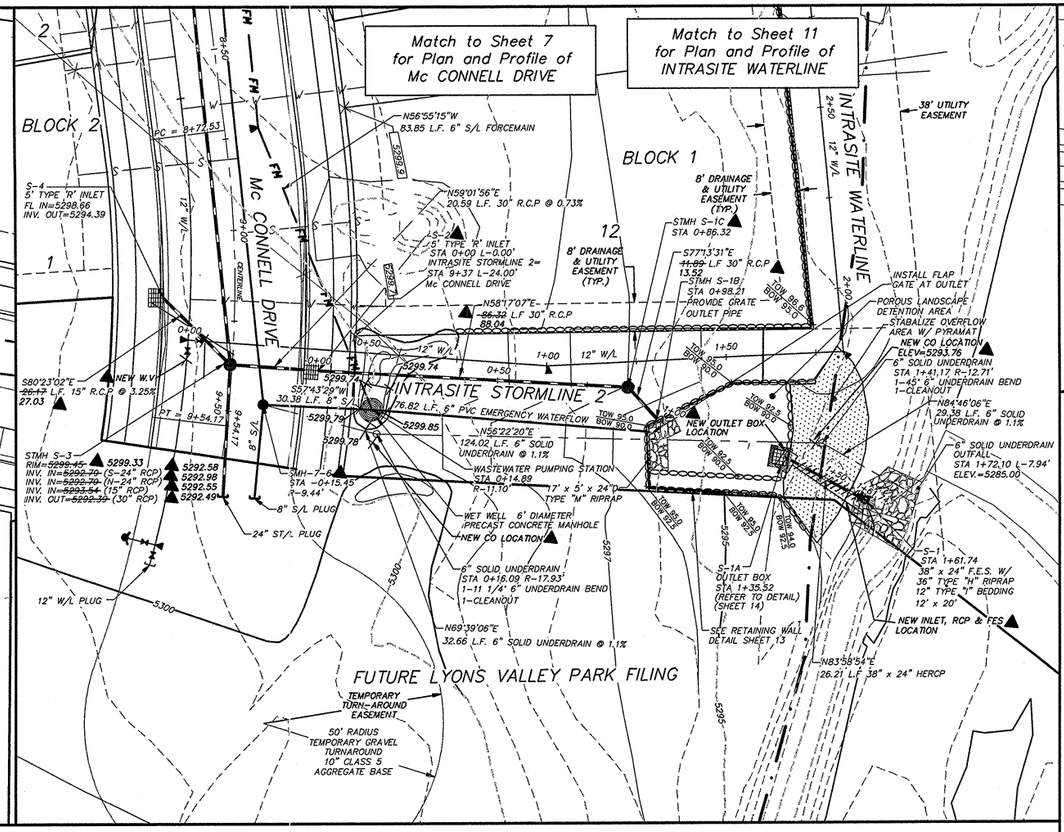
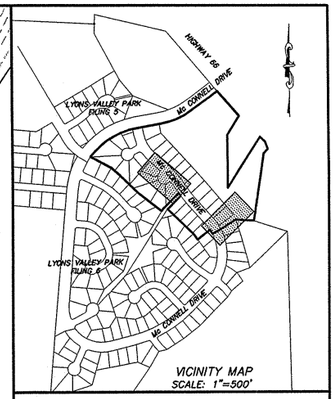
CONSULTING ENGINEERS
4999 Pearl East Circle, Suite 106
Boulder, Colorado 80301 (303) 449-9105

FILE G:\22102\FILING 7\CONST-F7\ASBUILTS\102-F7-SHEET 7 OF 14







LEGEND

- Manhole
- Thrust Block
- Water Valve
- Fire Hydrant
- Plug
- Proposed Waterline
- Existing Waterline
- Proposed Sewerline
- Existing Sewerline
- Proposed Stormline
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- W — Water Service
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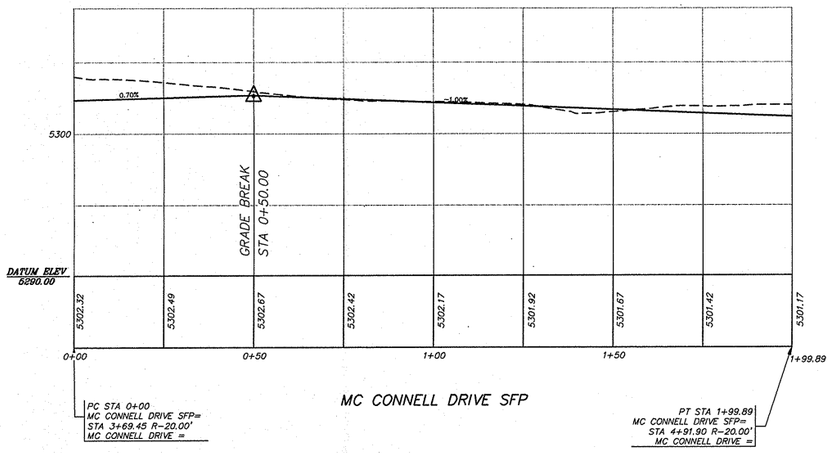
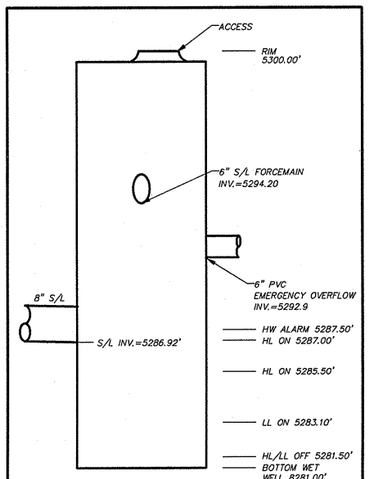


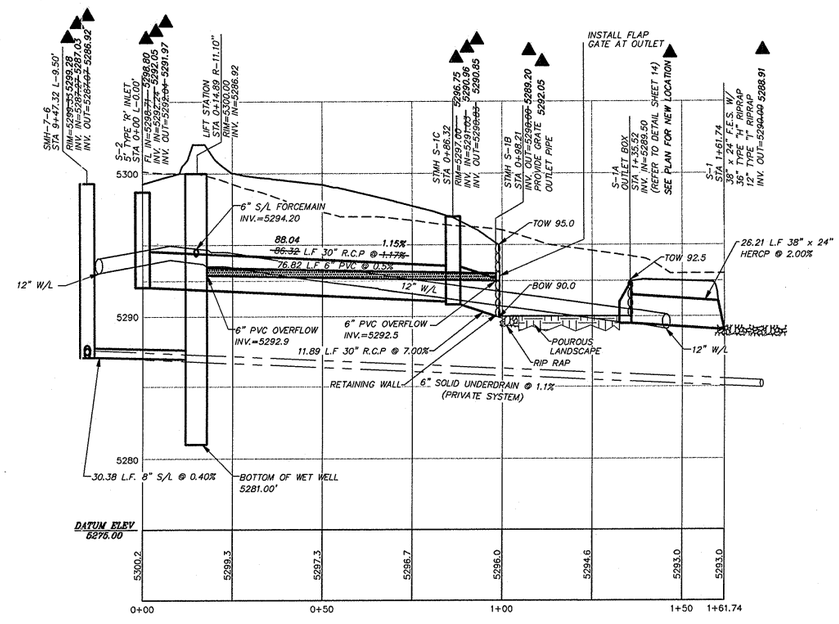
MC CONNELL DRIVE SFP



PUMP STATION NOTES:

1. WET WELL DESIGN PER SEPT. 4, 1998 DESIGN REPORT / SITE PERMIT BY KEITH BELL ASSOCIATES.
2. PUMP STATION - SMITH & LOVELESS WET WELL MOUNTED SUBMERSIBLE PUMP STATION SUPPLIED AND INSTALLED BY FALCON SUPPLY WITH 2-230 gpm PUMPS @ 38 FEET TDH (DESIGN) PROVIDE SHOP DRAWINGS FOR REVIEW PRIOR TO ORDERING EQUIPMENT. REVISED FOR GORMAN RUPP PACKAGE STATION
3. PROVIDE 3 PHASE POWER TO SITE. PRIMARY SERVICE TOWN OF LYONS & BACK-UP SERVICE CITY OF LONGMONT ELECTRICAL SYSTEM, WHICH PARALLELS HIGHWAY COLORADO 66

PUMP STATION DETAIL
N.T.S.



INTRASITE STORMLINE 2

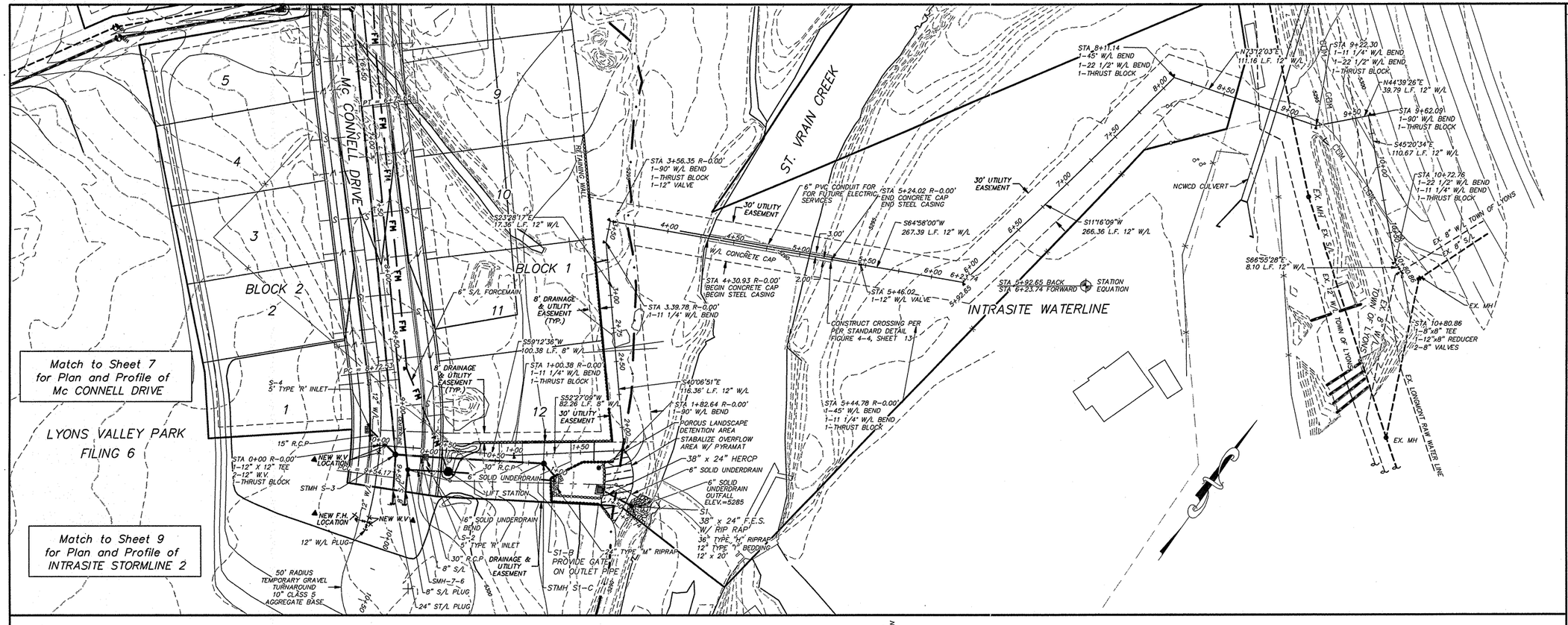
LYONS VALLEY PARK FILING NO. 7

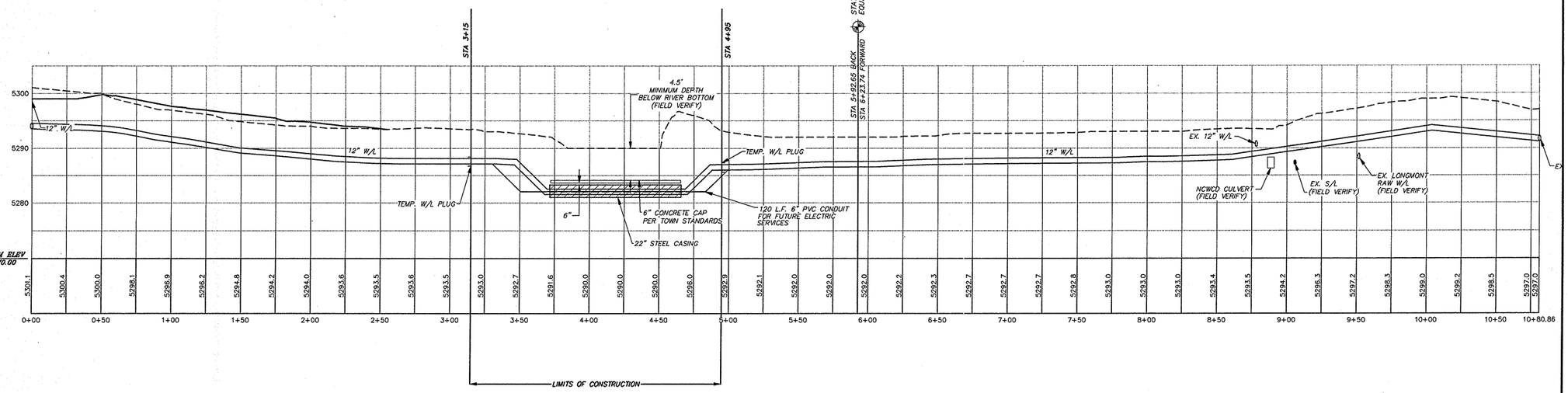
Plan & Profile of Utilities
Mc CONNELL DRIVE SPF
Sta 0+00 - 1+99.89
INTRASITE STORMLINE 2
Sta 0+00 - 1+76.44

SCALE HOR. 1"=20' VERT. 1"=5'	
DESIGN/APPR.	JJ
DRAWN BY	DB
DATE	08/23/07

HURST & ASSOCIATES, INC.
CONSULTING ENGINEERS
4999 Pearl East Circle, Suite 106
Boulder, Colorado 80301 (303) 449-9105

FILE G:\22102\FILING 7\CONST-F7\ASBUILTS\102-F7SHEET 9 OF 14





INTRASITE WATERLINE

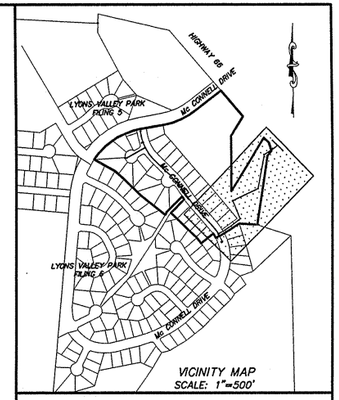
NOTES:

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH DEPARTMENT OF THE ARMY NATIONWIDE PERMIT NO. 12, CORPS FILE NO. 200680056, WATERLINE AND NATIONWIDE PERMIT NO. 33, CORPS FILE NO. 200680057, TEMPORARY CONSTRUCTION.
2. COORDINATE CONSTRUCTION AS IDENTIFIED IN ATTACHED PERMIT APPLICATION LETTER.
3. PROVIDE AND INSTALL 22" STEEL CASING WITH A MINIMUM WALL THICKNESS OF 0.344".
4. PROVIDE AND INSTALL 12" WATERLINE, VALVES, FITTINGS PER TOWN OF LYONS CONSTRUCTION STANDARDS. WATERLINE – AWWA C-900, CL 200 PVC OR AWWA C151, CL 51.
5. PROVIDE AND INSTALL 6" PVC CONDUIT (AWWA C-900, CL 150) WITH TRACER WIRE FOR FUTURE ELECTRIC SERVICE.
6. INSTALL 6" CONCRETE CAP PER TOWN OF LYONS STANDARDS.
7. DIVERT STREAM, CONTROL WATER, AND RESTORE WETLANDS AS NECESSARY TO COMPLETE CONSTRUCTION IN ACCORDANCE WITH PERMIT.

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.



LEGEND

- Manhole
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- Fire Hydrant
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- Existing Stormline
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- 10' Type 'R' Inlet
- 5' Type 'R' Inlet

ALL UTILITIES ARE PROPOSED UNLESS OTHERWISE NOTED

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8/29/07

BASED ON AS-BUILT SURVEY INFORMATION PROVIDED BY CIVIL ARTS-DREXEL

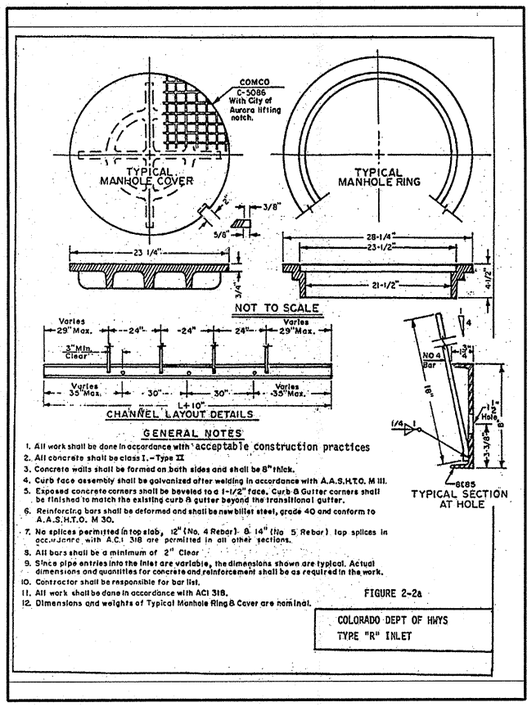
72 HOURS BEFORE YOU DIG
CALL THE UTILITY NOTIFICATION CENTER OF COLORADO (U.N.C.C.)
1-800-922-1987
GAS, ELECTRIC, TELEPHONE, CATV AND PANHANDLE EASTERN PIPELINE LOCATIONS

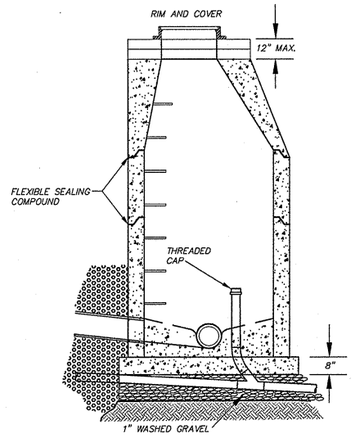
LYONS VALLEY PARK
FILING NO. 7
Plan & Profile of Utilities
INTRASITE WATERLINE
Sta 0+00 – 10+37.97

SCALE	HOR. 1"=40' VERT. 1"=10'
DESIGN/APPR.	JJ
DRAWN BY	DB
DATE	05/24/06

HURST & ASSOCIATES, INC. CONSULTING ENGINEERS 4509 Pearl East Circle, Suite 106 Boulder, Colorado 80301 (303) 449-9105

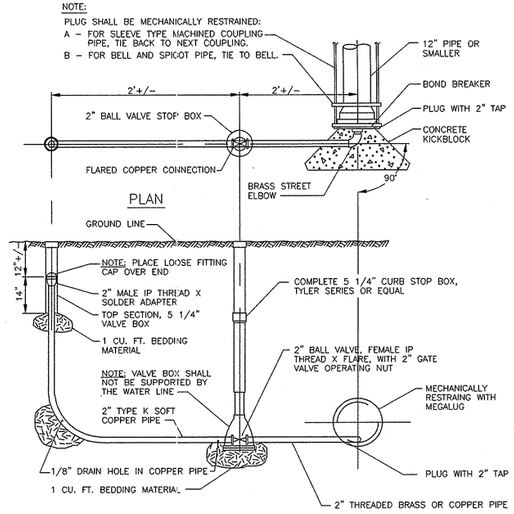
FILE G:\22102\FILING 7\CONST-F7\ASBUILTS\102-F7-SHEET 11 OF 14





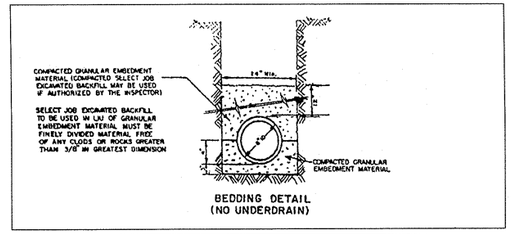
MANHOLE DETAIL / UNDERDRAIN

NO SCALE

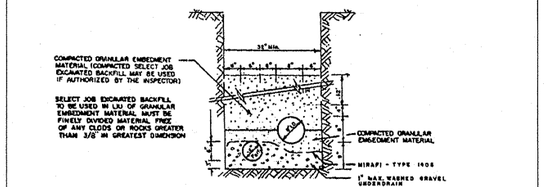


TEMPORARY BLOWOFF DETAIL

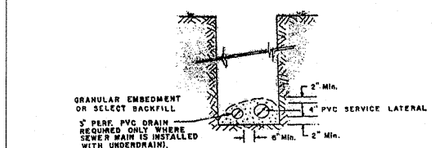
NO SCALE



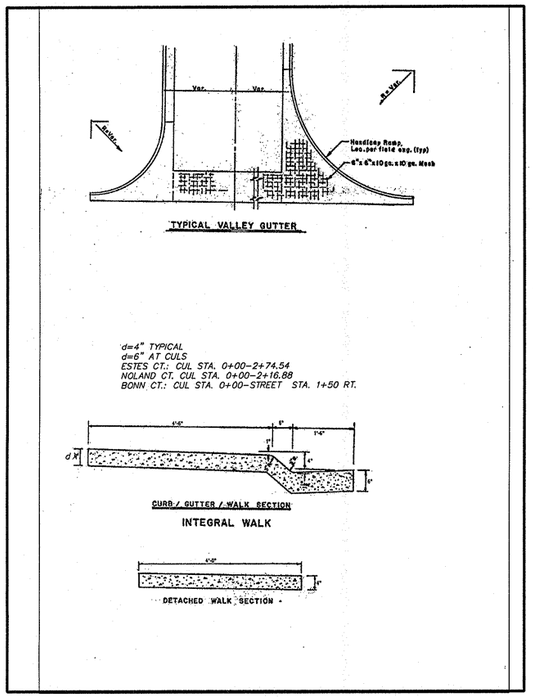
BEDDING DETAIL
(NO UNDERDRAIN)



BEDDING DETAIL
UNDERDRAIN



SERVICE LATERAL
DETAIL



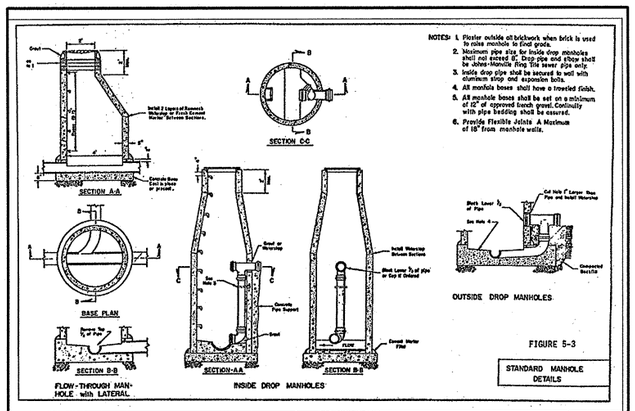


FIGURE 5-3

STANDARD MANHOLE DETAILS

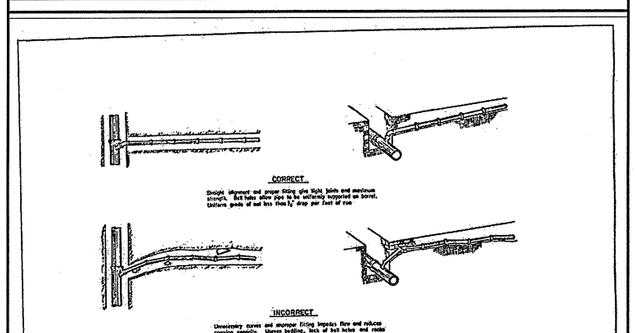
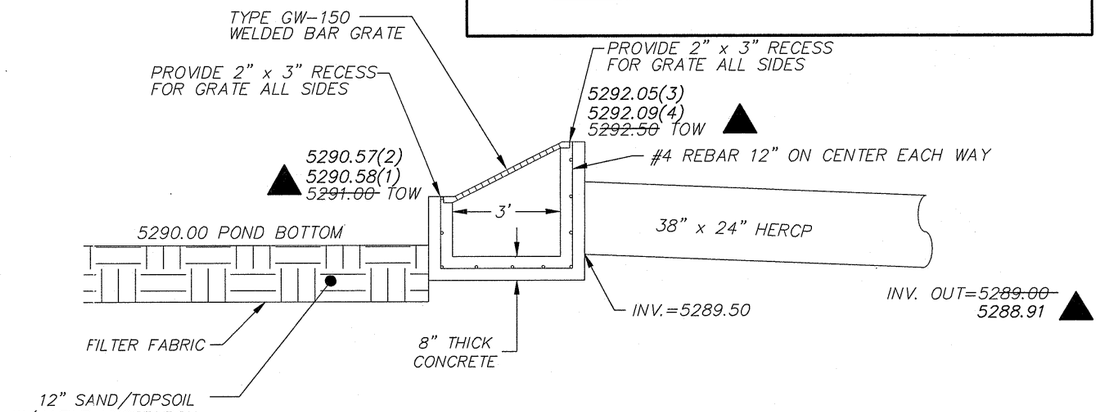
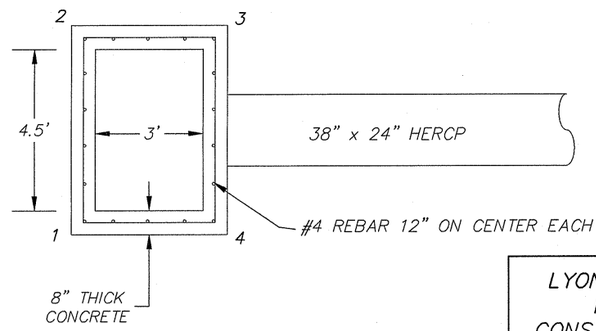


FIGURE 5-5

TYPICAL SEWER SERVICE LINE INSTALLATION





OUTLET BOX DETAIL

20 SCALE

▲ AS-BUILT BY
HURST & ASSOCIATES, INC.
CONSULTING ENGINEERS
8/29/07
BASED ON AS-BUILT SURVEY INFORMATION PROVIDED BY CIVIL ARTS-DREXEL

LYONS VALLEY PARK
FILING NO. 7
CONSTRUCTION DETAILS

SCALE	HOR. N/A VERT. N/A
DESIGN/APPR.	OCH
DRAWN BY	DB
DATE	05/24/06

HURST & ASSOCIATES, INC.
CONSULTING ENGINEERS
4999 Pearl East Circle, Suite 106
Boulder, Colorado 80301 (303) 449-8105

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