SANITARY SEWER CAPACITY ANALYSIS

PREPARED FOR

PRYOR ROAD AND 3RD STREET
LEE'S SUMMIT, MISSOURI

JUNE 2017

OA PROJECT NO. 017-0717

OLSSON ASSOCIATES

TABLE OF CONTENTS

BACKGROUND

The proposed development is located northwest of the NW Pryor Road and SW 1st Street intersection in Lee's Summit, Missouri. The site will consist of a new fire station, commercial development, and residential development. A capacity analysis was performed on the existing sanitary sewer near the proposed development. The purpose of the analysis is to compare two proposed sanitary sewer routes for the site and determine if the downstream sanitary sewer can accommodate the anticipated future flows.

Route 1 will route flow from the proposed development along Pryor Road and discharge to MH 28-119 just north of the NW Pryor Road and SW 1st Street. The existing sanitary sewer downstream of this manhole consists of 8" mains that discharge to a 30" interceptor at MH 36-351.

Route 2 will route flow to the southwest from the proposed development and discharge to MH 28-208 north of the SW 1st Street and SW Whitlock Drive intersection. The existing sanitary sewer downstream of this consists of 8" and 10" mains that discharge to a 36" interceptor at MH 28-355. A layout of each route is shown in Appendix A.

METHODOLOGY

Two separate analyses were performed. The first looked at the existing sanitary sewer system with current design flow conditions. Design flows were calculated per Section 6501.C.4 of the City of Lee's Summit, Missouri Design Criteria using the Wastewater Design Flow Curve in Figure 6501-1. All information used for the existing sanitary sewer system was taken from the City's GIS. Where there were discrepancies between the reported pipe slopes and reported inverts in the GIS, the reported invert elevations and reported pipe lengths were used. Collection system sub-basins were developed based on the existing sanitary sewer map and are shown on the map in Appendix A. For the analysis, it was assumed that all sub-basins were residential and Manning's Equation was used to determine current pipe flow capacities.

The second analysis looked at anticipated future flow conditions. Each route has a different ultimate developable area, resulting in a different anticipated future flow for each. It was assumed that the land fronting Pryor Road will be commercial, and the remaining land will be residential. With this assumption, Route 1 has a developable area of approximately 10 acres of commercial development located in the southeast corner of the lot. Route 2 has a much larger

developable area of approximately 56 acres of residential development and 14 acres of commercial development, covering the majority of the south half of the lot. However, the developable area for Route 2 excludes a small region of commercial development in the southeast corner of the lot which would likely require routing to Route 1. These areas are shown on the map in Appendix A.

Design flows for the proposed site were determined using a combination of the method described above and the equivalent dwelling unit (EDU) method as described in Section 6501.C.2 of the Design Criteria. Once a design peak flow rate was determined for each area, it was added to the existing flow rate at each pipe downstream of the development. It was assumed that all flow corresponding to each area would be routed to the same location.

Hydraulic Grade Lines (HGL) were also calculated for each analysis using a flow modeling extension in AutoCAD Civil 3D. For the model, it was assumed that the flow at the downstream end of the main discharged to open air. A route is considered inadequate if the HGL elevation is higher than the manhole rim elevation at any point. The HGL model for each analysis is shown in Appendix C.

EXISTING CONDITIONS

Route 1 does not have sufficient capacity to accommodate existing design flow conditions. The HGL rises above the rim of MH 36-246 and MH 36-007 signifying an overflow event. The HGL is also within one foot of the rim at MH 28-113. Results of the analysis are shown in Table 1 of Appendix B, and the HGL is shown in Figure 1 of Appendix C.

Route 2 has sufficient capacity for current design flow conditions. Results of the Route 2 analysis are included in Table 2 of Appendix B.

PROPOSED CONDITIONS

Route 1 does not have the capacity to accommodate the anticipated future design flows. The HGL rises above the rim of MH 36-246, MH 36-007, MH 36-009, MH 28-113, and MH 28-111. The results of the proposed conditions analysis for Route 1 are shown in Table 3 in Appendix B, and the HGL model is shown in Figure 2 of Appendix C.

Route 2 does not have the capacity to accommodate the anticipated future design flows. The

HGL rises above the rim of MH 28-341. The results for the Route 2 analysis are shown in Table 4 of Appendix B, and the HGL model is shown in Figure 4 of Appendix C.

PROPOSED IMPROVEMENTS

For Route 1, increasing the capacity of the downstream section of the existing main will be necessary in both the existing and proposed flow conditions to eliminate overflows at manholes. An additional analysis was performed for the existing flow conditions and the proposed flow conditions on Route 1 to determine the improvements necessary to accommodate each.

Approximately 800 linear feet of 8" main from MH 36-351 to MH 36-009 will need to be improved to a 10" main to accommodate existing flow and eliminate manhole overflows.

Approximately 1,050 linear feet of 8" main from MH 36-351 to MH 36-010 will need to be improved to a 10" main to accommodate proposed flows without manhole overflows. The results of this analysis are shown in Table 5 of Appendix B, and the HGL model is included in Figure 3 of Appendix C.

Route 2 currently has the capacity to accommodate the existing design flows. However, it does not have sufficient capacity for proposed flow conditions. Approximately 375 linear feet of 8" main from MH 28-355 to MH 28-187 will need to be improved to a 10" main to accommodate proposed flows without manhole overflows. The results of the proposed flow analysis are shown in Table 6 of Appendix B, and the HGL model is included in Figure 5 of Appendix C.

APPENDIX A

Proposed Sanitary Sewer Layout

ROUTE 2 - 14 ACRES COMMERCIAL DEVELOPMENT

ROUTE 2 - 48 ACRES RESIDENTIAL DEVELOPMENT

ROUTE 1 - 10 ACRES COMMERCIAL DEVELOPMENT

APPROXIMATE FIRE STATION LOCATION

ROUTE 2 - 8.25 ACRES RESIDENTIAL DEVELOPMENT

ROUTE 2

ROUTE 1

NW PRYOR ST.

AREA 1 21.30 ACRES

AREA C 17.20 ACRES

MH 28-208

MH 28-209

MH 28-210

AREA A 11.30 ACRES

MH 28-119

MH 28-118

MH 28-189

MH 28-188

MH 28-187

MH 28-345

MH 28-341

MH 28-342

MH 28-344

MH 28-343

AREA B 3.68 ACRES

MH 28-355

MH 28-186

MH 28-117

AREA 2 4.67 ACRES

AREA 3 10.60 ACRES

AREA 6 17.50 ACRES

MH 28-116

MH 28-115

MH 28-112

AREA 4 0.95 ACRES

AREA 5 24.50 ACRES

MH 28-111

MH 28-113

SW 3RD ST.

MH 36-009

MH 36-350

AREA 8 4.37 ACRES

MH 36-010

AREA 7 4.03 ACRES

MH 36-008

MH 36-351

MH 36-246

MH 36-007

AREA 9 34.20 ACRES

NW PRYOR ST.

LEGEND

- EXISTING MANHOLE
- SUB-BASIN BOUNDARY
- EXISTING SANITARY SEWER
- PROPOSED ROUTE 1
- PROPOSED ROUTE 2
- ROUTE 1 COMMERCIAL DRAINAGE AREA
- ROUTE 2 COMMERCIAL DRAINAGE AREA
- ROUTE 2 RESIDENTIAL DRAINAGE AREA
- APPROXIMATE FIRE STATION LOCATION

N

0' 100' 200' 400'

SCALE IN FEET

DWG: F:\2017\0501-1000\017-0717\40-Design\Exhibits\Drainage Area Exhibit_Flow Curve.dwg
DATE: Jun 12, 2017 2:00pm
XREFS:
USER: tjurgens

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REVISIONS

REV. NO.	DATE	REVISIONS DESCRIPTION	BY

PROPOSED SANITARY SEWER LAYOUT

SANITARY SEWER CAPACITY ANALYSIS

LEE'S SUMMIT, MISSOURI

2017

drawn by:
checked by:
approved by:
QA/QC by:
project no.: 017-0717
drawing no.:
date: 6-13-2017

APPENDIX A

APPENDIX B

Sanitary Sewer Capacity Analysis Results

Table 1 - Route 1, Existing Flow, Existing Main

Pipe No.	Drainage Area (acre)	Cumulative Drainage Area (acre)	Design Flow Rate (cfs/acre)	Design Flow Rate (cfs)	Design Flow Rate (gpd)	US MH	DS MH	US Invert	DS Invert	US MH Rim Elev.	Slope (%)	Pipe Diam. (in)	Pipe Length	Pipe Capacity (cfs)	Pipe Capacity (gpd)	Percent Pipe Capacity (%)	US MH HGL Elev.
1	21.30	21.30	0.0290	0.62	399,230	28-119	28-118	950.17	949.53	955.41	0.49%	8	130.00	0.850	549,614	72.6%	950.62
2	4.67	25.97	0.0285	0.74	478,368	28-118	28-117	949.40	947.60	953.08	0.77%	8	234.36	1.062	686,490	69.7%	949.83
3	0.00	25.97	0.0285	0.74	478,368	28-117	28-116	947.41	944.88	951.15	0.63%	8	399.60	0.964	623,286	76.7%	947.87
4	0.00	25.97	0.0285	0.74	478,368	28-116	28-115	944.75	941.88	951.48	6.52%	8	44.05	3.094	1,999,436	23.9%	945.16
5	10.60	36.57	0.0270	0.99	638,167	28-115	28-112	941.68	929.48	950.84	6.92%	8	176.23	3.189	2,061,008	31.0%	942.15
6	0.95	37.52	0.0270	1.01	654,745	28-112	28-111	929.20	921.79	938.40	5.83%	8	127.20	2.925	1,890,624	34.6%	929.68
7	24.50	62.02	0.0250	1.55	1,002,115	28-111	28-113	920.87	913.80	931.61	2.56%	8	276.30	1.939	1,253,022	80.0%	926.48
8	17.50	79.52	0.0240	1.91	1,233,483	28-113	36-010	913.55	907.81	921.50	2.61%	8	220.19	1.957	1,264,727	97.5%	920.91
9	4.03	83.55	0.0235	1.96	1,268,995	36-010	36-009	902.39	900.40	927.21	0.80%	8	249.27	1.083	699,892	181.3%	914.19
10	0.00	83.55	0.0235	1.96	1,268,995	36-009	36-008	900.20	898.20	908.00	0.80%	8	250.00	1.084	700,623	181.1%	906.51
11	4.37	87.92	0.0235	2.07	1,335,368	36-008	36-007	898.00	879.79	905.20	8.24%	8	221.10	3.478	2,248,020	59.4%	898.63
12	34.20	122.12	0.0225	2.75	1,775,885	36-007	36-246	878.14	870.50	885.00	5.01%	8	152.47	2.713	1,753,453	101.3%	888.33
13	0.00	122.12	0.0225	2.75	1,775,885	36-246	36-350	870.00	867.50	877.00	1.82%	8	137.38	1.635	1,056,691	168.1%	878.22
14	0.00	122.12	0.0225	2.75	1,775,885	36-350	36-351	867.75	866.95	874.50	2.49%	8	32.13	1.912	1,236,031	143.7%	869.45

Table 2 - Route 2, Existing Flow, Existing Main

Pipe No.	Drainage Area (acre)	Cumulative Drainage Area (acre)	Design Flow Rate (cfs/acre)	Design Flow Rate (cfs)	Design Flow Rate (gpd)	US MH	DS MH	US Invert	DS Invert	US MH Rim Elev.	Slope (%)	Pipe Diam. (in)	Pipe Length	Pipe Capacity (cfs)	Pipe Capacity (gpd)	Percent Pipe Capacity (%)
1	0.00	0.00	0.0300	0.00	0	28-208	28-209	901.40	893.59	908.35	4.40%	8	177.50	2.542	1,643,107	0.0%
2	0.00	0.00	0.0300	0.00	0	28-209	28-210	893.39	891.41	901.12	1.46%	8	135.40	1.466	947,246	0.0%
3	11.30	11.30	0.0300	0.34	219,101	28-210	28-345	891.21	886.20	912.80	5.39%	8	93.00	2.813	1,818,097	12.1%
4	0.00	11.30	0.0300	0.34	219,101	28-345	28-344	883.50	875.70	891.50	6.55%	10	119.10	5.556	3,591,179	6.1%
5	0.00	11.30	0.0300	0.34	219,101	28-344	28-343	875.50	872.00	883.00	4.27%	10	82.00	4.486	2,899,163	7.6%
6	3.68	14.98	0.0300	0.45	290,455	28-343	28-342	871.80	869.00	882.04	2.59%	10	108.00	3.496	2,259,502	12.9%
7	0.00	14.98	0.0300	0.45	290,455	28-342	28-341	868.80	867.33	875.70	0.97%	10	151.40	2.139	1,382,743	21.0%
8	0.00	14.98	0.0300	0.45	290,455	28-341	28-189	867.13	862.06	870.37	2.77%	8	183.30	2.016	1,302,754	22.3%
9	17.20	32.18	0.0275	0.88	571,958	28-189	28-188	861.40	860.34	876.44	3.57%	8	29.73	2.288	1,479,092	38.7%
10	0.00	32.18	0.0275	0.88	571,958	28-188	28-187	860.14	852.61	870.00	3.62%	8	208.00	2.306	1,490,409	38.4%
11	0.00	32.18	0.0275	0.88	571,958	28-187	28-186	852.41	844.43	866.90	2.48%	8	322.00	1.908	1,233,142	46.4%
12	0.00	32.18	0.0275	0.88	571,958	28-186	28-355	844.23	840.72	858.88	6.75%	8	52.01	3.149	2,034,931	28.1%

= Manhole Overflow

Table 3 - Route 1, Proposed Flow, Existing Main

Pipe No.	Drainage Area (acre)	Cumulative Drainage Area (acre)	Design Flow Rate (cfs/acre)	Design Flow Rate (cfs)	Design Flow Rate (gpd)	US MH	DS MH	US Invert	DS Invert	US MH Rim Elev.	Slope (%)	Pipe Diam. (in)	Pipe Length	Pipe Capacity (cfs)	Pipe Capacity (gpd)	Percent Pipe Capacity (%)	US MH HGL Elev.
NA	10.23	NA	NA	0.16	104,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	21.30	21.30	0.0290	0.78	503,230	28-119	28-118	950.17	949.53	955.41	0.49%	8	130.00	0.850	549,614	91.6%	950.81
2	4.67	25.97	0.0285	0.90	582,368	28-118	28-117	949.40	947.60	953.08	0.77%	8	234.36	1.062	686,490	84.8%	949.93
3	0.00	25.97	0.0285	0.90	582,368	28-117	28-116	947.41	944.88	951.15	0.63%	8	399.60	0.964	623,286	93.4%	947.98
4	0.00	25.97	0.0285	0.90	582,368	28-116	28-115	944.75	941.88	951.48	6.52%	8	44.05	3.094	1,999,436	29.1%	945.20
5	10.60	36.57	0.0270	1.15	742,167	28-115	28-112	941.68	929.48	950.84	6.92%	8	176.23	3.189	2,061,008	36.0%	942.19
6	0.95	37.52	0.0270	1.17	758,745	28-112	28-111	929.20	921.79	938.40	5.83%	8	127.20	2.925	1,890,624	40.1%	934.79
7	24.50	62.02	0.0250	1.71	1,106,115	28-111	28-113	920.87	913.80	931.61	2.56%	8	276.30	1.939	1,253,022	88.3%	933.38
8	17.50	79.52	0.0240	2.07	1,337,483	28-113	36-010	913.55	907.81	921.50	2.61%	8	220.19	1.957	1,264,727	105.8%	926.59
9	4.03	83.55	0.0235	2.12	1,372,995	36-010	36-009	902.39	900.40	927.21	0.80%	8	249.27	1.083	699,892	196.2%	918.75
10	0.00	83.55	0.0235	2.12	1,372,995	36-009	36-008	900.20	898.20	908.00	0.80%	8	250.00	1.084	700,623	196.0%	919.46
11	4.37	87.92	0.0235	2.23	1,439,368	36-008	36-007	898.00	879.79	905.20	8.24%	8	221.10	3.478	2,248,020	64.0%	900.43
12	34.20	122.12	0.0225	2.91	1,879,885	36-007	36-246	878.14	870.50	885.00	5.01%	8	152.47	2.713	1,753,453	107.2%	891.50
13	0.00	122.12	0.0225	2.91	1,879,885	36-246	36-350	870.00	867.50	877.00	1.82%	8	137.38	1.635	1,056,691	177.9%	880.57
14	0.00	122.12	0.0225	2.91	1,879,885	36-350	36-351	867.75	866.95	874.50	2.49%	8	32.13	1.912	1,236,031	152.1%	870.26

Table 4 - Route 2, Proposed Flow, Existing Main

Pipe No.	Drainage Area (acre)	Cumulative Drainage Area (acre)	Design Flow Rate (cfs/acre)	Design Flow Rate (cfs)	Design Flow Rate (gpd)	US MH	DS MH	US Invert	DS Invert	US MH Rim Elev.	Slope (%)	Pipe Diam. (in)	Pipe Length	Pipe Capacity (cfs)	Pipe Capacity (gpd)	Percent Pipe Capacity (%)	US MH HGL Elev.
Proposed Com.	14.00	NA	NA	0.21	135,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Proposed Res.	48.00	NA	0.0260	1.25	806,604	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	0.00	0.00	0.0300	1.46	941,604	28-208	28-209	901.40	893.59	908.35	4.40%	8	177.50	2.542	1,643,107	57.3%	901.97
2	0.00	0.00	0.0300	1.46	941,604	28-209	28-210	893.39	891.41	901.12	1.46%	8	135.40	1.466	947,246	99.4%	893.96
3	11.30	11.30	0.0300	1.80	1,160,705	28-210	28-345	891.21	886.20	912.80	5.39%	8	93.00	2.813	1,818,097	63.8%	891.82
4	0.00	11.30	0.0300	1.80	1,160,705	28-345	28-344	883.50	875.70	891.50	6.55%	10	119.10	5.556	3,591,179	32.3%	884.10
5	0.00	11.30	0.0300	1.80	1,160,705	28-344	28-343	875.50	872.00	883.00	4.27%	10	82.00	4.486	2,899,163	40.0%	876.10
6	3.68	14.98	0.0300	1.91	1,232,058	28-343	28-342	871.80	869.00	882.04	2.59%	10	108.00	3.496	2,259,502	54.5%	875.20
7	0.00	14.98	0.0300	1.91	1,232,058	28-342	28-341	868.80	867.33	875.70	0.97%	10	151.40	2.139	1,382,743	89.1%	874.39
8	0.00	14.98	0.0300	1.91	1,232,058	28-341	28-189	867.13	862.06	870.37	2.77%	8	183.30	2.016	1,302,754	94.6%	873.10
Proposed Res.	8.25	NA	0.0300	0.25	159,963	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	17.20	32.18	0.0275	2.59	1,673,525	28-189	28-188	861.40	860.34	876.44	3.57%	8	29.73	2.288	1,479,092	113.1%	868.34
10	0.00	32.18	0.0275	2.59	1,673,525	28-188	28-187	860.14	852.61	870.00	3.62%	8	208.00	2.306	1,490,409	112.3%	866.44
11	0.00	32.18	0.0275	2.59	1,673,525	28-187	28-186	852.41	844.43	866.90	2.48%	8	322.00	1.908	1,233,142	135.7%	857.72
12	0.00	32.18	0.0275	2.59	1,673,525	28-186	28-355	844.23	840.72	858.88	6.75%	8	52.01	3.149	2,034,931	82.2%	844.88

= Manhole Overflow

Table 5 - Route 1, Proposed Flow, Proposed Main Sizing

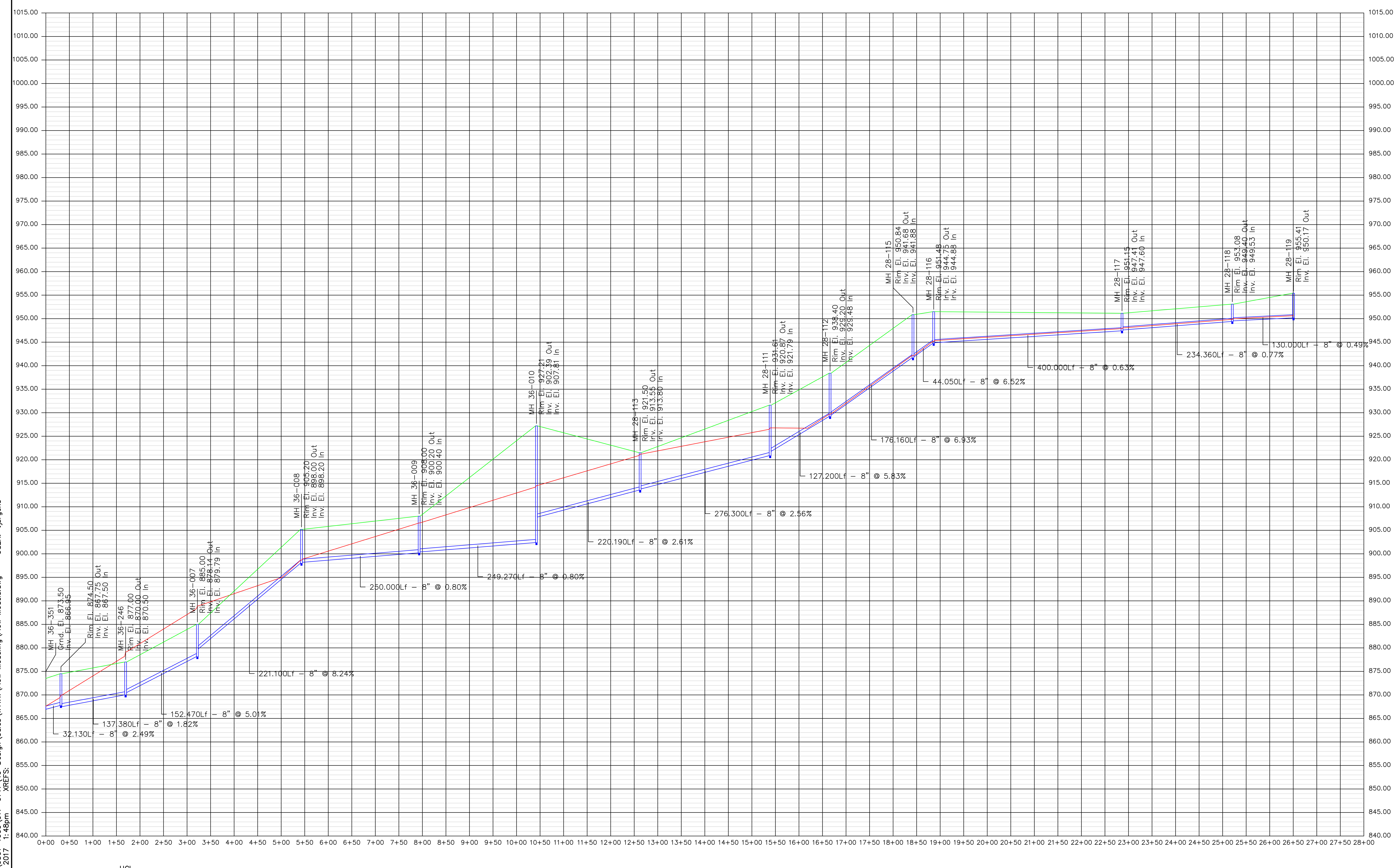
Pipe No.	Drainage Area (acre)	Cumulative Drainage Area (acre)	Design Flow Rate (cfs/acre)	Design Flow Rate (cfs)	Design Flow Rate (gpd)	US MH	DS MH	US Invert	DS Invert	US MH Rim Elev.	Slope (%)	Pipe Diam. (in)	Pipe Length	Pipe Capacity (cfs)	Pipe Capacity (gpd)	Percent Pipe Capacity (%)	US MH HGL Elev.
NA	10.23	NA	NA	0.16	104,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	21.30	21.30	0.0290	0.78	503,230	28-119	28-118	950.17	949.53	955.41	0.49%	8	130.00	0.850	549,614	91.6%	950.81
2	4.67	25.97	0.0285	0.90	582,368	28-118	28-117	949.40	947.60	953.08	0.77%	8	234.36	1.062	686,490	84.8%	949.93
3	0.00	25.97	0.0285	0.90	582,368	28-117	28-116	947.41	944.88	951.15	0.63%	8	399.60	0.964	623,286	93.4%	947.98
4	0.00	25.97	0.0285	0.90	582,368	28-116	28-115	944.75	941.88	951.48	6.52%	8	44.05	3.094	1,999,436	29.1%	945.20
5	10.60	36.57	0.0270	1.15	742,167	28-115	28-112	941.68	929.48	950.84	6.92%	8	176.23	3.189	2,061,008	36.0%	942.19
6	0.95	37.52	0.0270	1.17	758,745	28-112	28-111	929.20	921.79	938.40	5.83%	8	127.20	2.925	1,890,624	40.1%	929.71
7	24.50	62.02	0.0250	1.71	1,106,115	28-111	28-113	920.87	913.80	931.61	2.56%	8	276.30	1.939	1,253,022	88.3%	923.10
8	17.50	79.52	0.0240	2.07	1,337,483	28-113	36-010	913.55	907.81	921.50	2.61%	8	220.19	1.957	1,264,727	105.8%	916.32
9	4.03	83.55	0.0235	2.12	1,372,995	36-010	36-009	902.39	900.40	927.21	0.80%	10	249.27	1.940	1,253,826	109.5%	904.65
10	0.00	83.55	0.0235	2.12	1,372,995	36-009	36-008	900.20	898.20	908.00	0.80%	10	250.00	1.942	1,255,135	109.4%	901.78
11	4.37	87.92	0.0235	2.23	1,439,368	36-008	36-007	898.00	879.79	905.20	8.24%	10	221.10	6.231	4,027,228	35.7%	898.67
12	34.20	122.12	0.0225	2.91	1,879,885	36-007	36-246	878.14	870.50	885.00	5.01%	10	152.47	4.860	3,141,233	59.8%	878.88
13	0.00	122.12	0.0225	2.91	1,879,885	36-246	36-350	870.00	867.50	877.00	1.82%	10	137.38	2.929	1,893,014	99.3%	871.74
14	0.00	122.12	0.0225	2.91	1,879,885	36-350	36-351	867.75	866.95	874.50	2.49%	10	32.13	3.426	2,214,294	84.9%	868.49

Table 6 - Route 2, Proposed Flow, Proposed Main

Pipe No.	Drainage Area (acre)	Cumulative Drainage Area (acre)	Design Flow Rate (cfs/acre)	Design Flow Rate (cfs)	Design Flow Rate (gpd)	US MH	DS MH	US Invert	DS Invert	US MH Rim Elev.	Slope (%)	Pipe Diam. (in)	Pipe Length	Pipe Capacity (cfs)	Pipe Capacity (gpd)	Percent Pipe Capacity (%)	US MH HGL Elev.
Proposed Com.	14.00	NA	NA	0.21	135,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Proposed Res.	48.00	NA	0.0260	1.25	806,604	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	0.00	0.00	0.0300	1.46	941,604	28-208	28-209	901.40	893.59	908.35	4.40%	8	177.50	2.542	1,643,107	57.3%	901.97
2	0.00	0.00	0.0300	1.46	941,604	28-209	28-210	893.39	891.41	901.12	1.46%	8	135.40	1.466	947,246	99.4%	893.96
3	11.30	11.30	0.0300	1.80	1,160,705	28-210	28-345	891.21	886.20	912.80	5.39%	8	93.00	2.813	1,818,097	63.8%	891.82
4	0.00	11.30	0.0300	1.80	1,160,705	28-345	28-344	883.50	875.70	891.50	6.55%	10	119.10	5.556	3,591,179	32.3%	884.10
5	0.00	11.30	0.0300	1.80	1,160,705	28-344	28-343	875.50	872.00	883.00	4.27%	10	82.00	4.486	2,899,163	40.0%	876.10
6	3.68	14.98	0.0300	1.91	1,232,058	28-343	28-342	871.80	869.00	882.04	2.59%	10	108.00	3.496	2,259,502	54.5%	872.42
7	0.00	14.98	0.0300	1.91	1,232,058	28-342	28-341	868.80	867.33	875.70	0.97%	10	151.40	2.139	1,382,743	89.1%	869.42
8	0.00	14.98	0.0300	1.91	1,232,058	28-341	28-189	867.13	862.06	870.37	2.77%	8	183.30	2.016	1,302,754	94.6%	867.75
Proposed Res.	8.25	NA	0.0300	0.25	159,963	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	17.20	32.18	0.0275	2.59	1,673,525	28-189	28-188	861.40	860.34	876.44	3.57%	8	29.73	2.288	1,479,092	113.1%	862.05
10	0.00	32.18	0.0275	2.59	1,673,525	28-188	28-187	860.14	852.61	870.00	3.62%	8	208.00	2.306	1,490,409	112.3%	860.79
11	0.00	32.18	0.0275	2.59	1,673,525	28-187	28-186	852.41	844.43	866.90	2.48%	10	322.00	3.418	2,209,119	75.8%	853.12
12	0.00	32.18	0.0275	2.59	1,673,525	28-186	28-355	844.23	840.72	858.88	6.75%	10	52.01	5.640	3,645,489	45.9%	844.94

= Manhole Overflow

APPENDIX C
Flow Models



MH 36-351
Grnd. El. 873.50
Inv. El. 866.95
Rim El. 874.50
Inv. El. 867.75 Out
Inv. El. 867.50 In
MH 36-246
Rim El. 877.00
Inv. El. 870.00 Out
Inv. El. 870.50 In
MH 36-007
Rim El. 885.00
Inv. El. 878.14 Out
Inv. El. 879.79 In
MH 36-008
Rim El. 905.20
Inv. El. 898.00 Out
Inv. El. 898.20 In
MH 36-009
Rim El. 908.00
Inv. El. 900.20 Out
Inv. El. 900.40 In
MH 36-010
Rim El. 927.21
Inv. El. 902.39 Out
Inv. El. 907.81 In
MH 28-113
Rim El. 921.50
Inv. El. 913.55 Out
Inv. El. 913.80 In
MH 28-111
Rim El. 931.61
Inv. El. 920.87 Out
Inv. El. 921.79 In
MH 28-112
Rim El. 938.40
Inv. El. 929.20 Out
Inv. El. 929.48 In
MH 28-115
Rim El. 950.84
Inv. El. 941.68 Out
Inv. El. 941.88 In
MH 28-116
Rim El. 951.48
Inv. El. 944.75 Out
Inv. El. 944.88 In
MH 28-117
Rim El. 951.15
Inv. El. 947.41 Out
Inv. El. 947.60 In
MH 28-118
Rim El. 953.08
Inv. El. 949.40 Out
Inv. El. 949.53 In
MH 28-119
Rim El. 955.41
Inv. El. 950.17 Out
32.130Lf – 8" @ 2.49%
137.380Lf – 8" @ 1.82%
152.470Lf – 8" @ 5.01%
221.100Lf – 8" @ 8.24%
250.000Lf – 8" @ 0.80%
249.270Lf – 8" @ 0.80%
220.190Lf – 8" @ 2.61%
276.300Lf – 8" @ 2.56%
127.200Lf – 8" @ 5.83%
176.160Lf – 8" @ 6.93%
44.050Lf – 8" @ 6.52%
400.000Lf – 8" @ 0.63%
234.360Lf – 8" @ 0.77%
130.000Lf – 8" @ 0.49%
HGL

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1

MH 36-351
Grnd. El. 873.50
Inv. El. 866.95

Rim El. 874.50
Inv. El. 867.75 Out
Inv. El. 867.50 In

MH 36-246
Rim El. 877.00
Inv. El. 870.00 Out
Inv. El. 870.50 In

MH 36-007
Rim El. 885.00
Inv. El. 878.44 Out
Inv. El. 879.79 In

MH 36-008
Rim El. 905.20
Inv. El. 898.00 Out
Inv. El. 898.20 In

MH 36-009
Rim El. 908.00
Inv. El. 900.20 Out
Inv. El. 900.40 In

MH 36-010
Rim El. 927.21
Inv. El. 902.39 Out
Inv. El. 907.81 In

MH 28-113
Rim El. 921.50
Inv. El. 913.55 Out
Inv. El. 913.80 In

MH 28-111
Rim El. 931.61
Inv. El. 920.87 Out
Inv. El. 921.79 In

MH 28-112
Rim El. 938.40
Inv. El. 928.20 Out
Inv. El. 929.48 In

MH 28-115
Rim El. 950.84
Inv. El. 941.68 Out
Inv. El. 941.88 In

MH 28-116
Rim El. 951.48
Inv. El. 944.75 Out
Inv. El. 944.88 In

MH 28-117
Rim El. 951.15
Inv. El. 947.41 Out
Inv. El. 947.60 In

MH 28-118
Rim El. 953.08
Inv. El. 949.40 Out
Inv. El. 949.53 In

MH 28-119
Rim El. 955.41
Inv. El. 950.17 Out

32.130Lf – 8" @ 2.49%
137.380Lf – 8" @ 1.82%
152.470Lf – 8" @ 5.01%
221.100Lf – 8" @ 8.24%
250.000Lf – 8" @ 0.80%
249.270Lf – 8" @ 0.80%
220.190Lf – 8" @ 2.61%
276.300Lf – 8" @ 2.56%
127.200Lf – 8" @ 5.83%
176.160Lf – 8" @ 6.93%
44.050Lf – 8" @ 6.52%
400.000Lf – 8" @ 0.63%
234.360Lf – 8" @ 0.77%
130.000Lf – 8" @ 0.49%

HGL

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MH 36-351
Grnd El. 873.50
Inv. El. 868.45

MH 36-350
Rim El. 874.50
Inv. El. 867.75 Out
Inv. El. 867.50 In

MH 36-246
Rim El. 877.00
Inv. El. 870.00 Out
Inv. El. 870.50 In

MH 36-007
Rim El. 885.00
Inv. El. 878.14 Out
Inv. El. 879.79 In

MH 36-008
Rim El. 905.20
Inv El. 898.00 Out
Inv El. 898.20 In

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Rim El. 905.00
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Inv. El. 944.88 In

MH 28-117
Rim El. 951.15
Inv. El. 947.41 Out
Inv. El. 947.60 In

MH 28-118
Rim El. 953.08
Inv. El. 949.40 Out
Inv. El. 949.53 In

MH 28-119
Rim El. 955.41
Inv. El. 950.17 Out

32.130Lf – 10" @ 2.49%
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130.000Lf – 8" @ 0.49%

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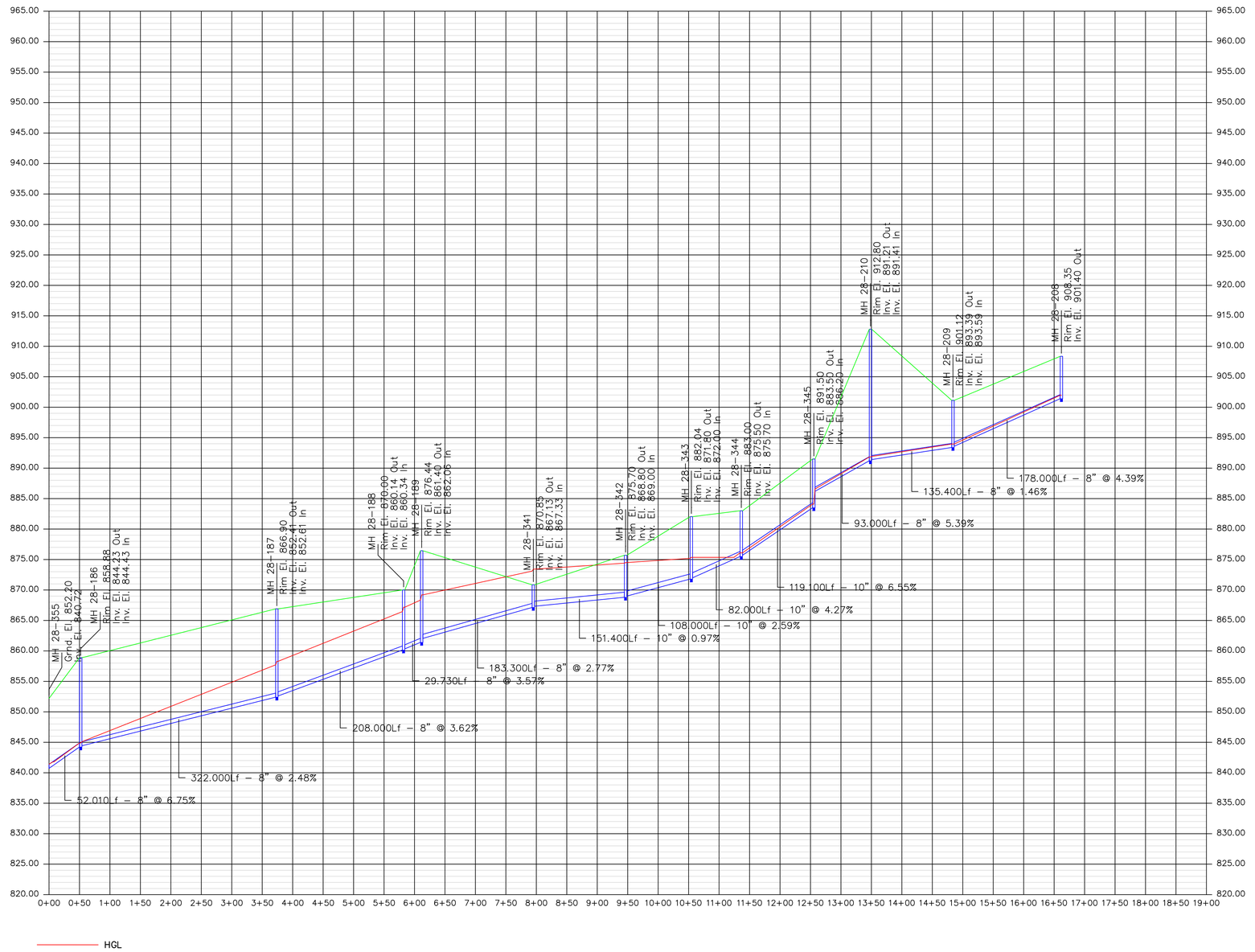

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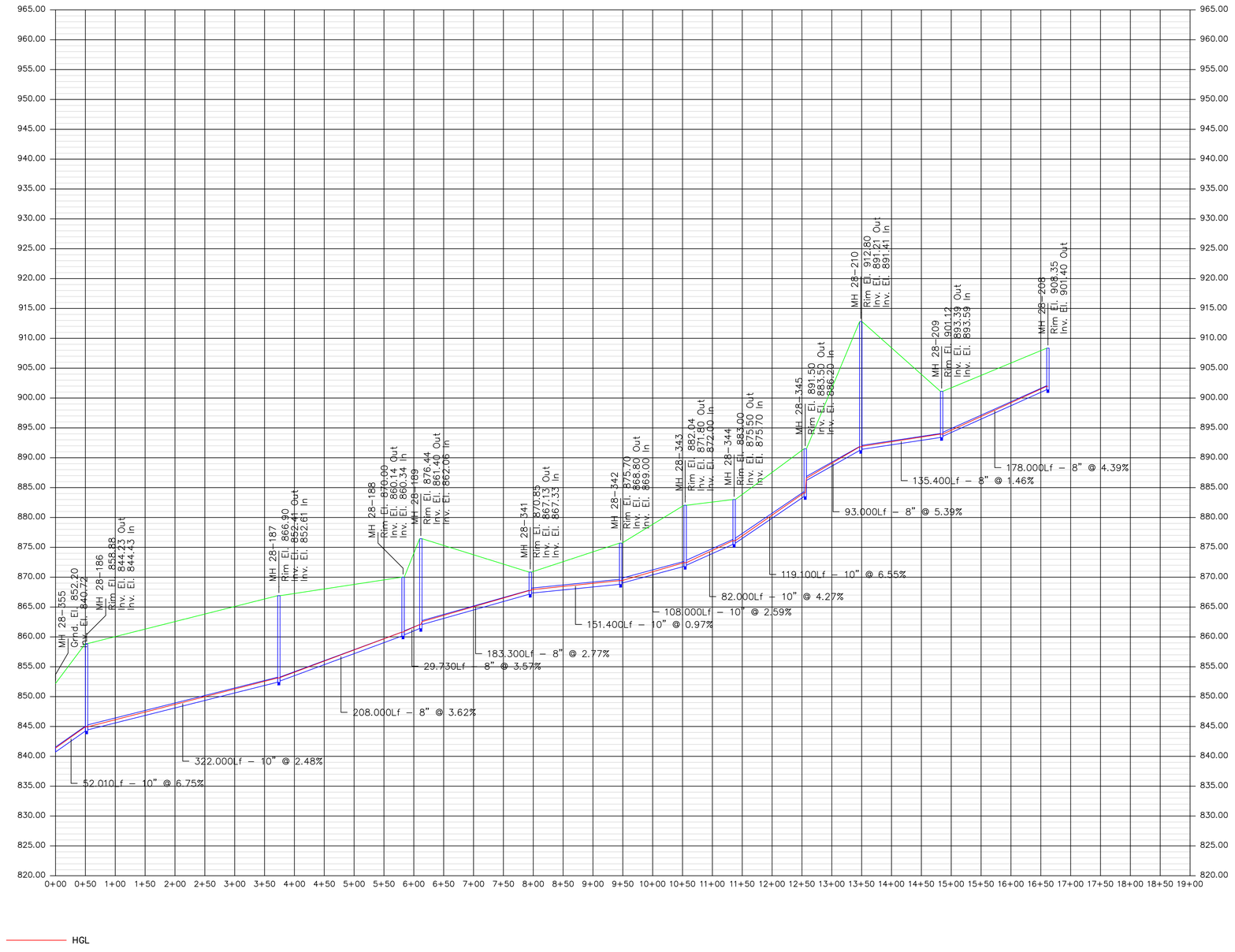

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