

Oak Creek Glen Meadows 2nd
Wichita, Sedgwick County, Kansas
November 2013

Drainage Improvement Narrative:

The future Glen Meadows 2nd development is south of the Oak Creek Office Park and is a 12 acre parcel planned for 22 single family lots of approximately 15,000 SF in size. The site drainage was analyzed with the HEC-HMS software and the SCS CN method for routing the runoff through future retention ponds (South Reservoir and North Reservoir). The model for this project is part of a comprehensive stormwater model that is being updated for the overall Oak Creek Development to reflect planning changes. An existing condition runoff CN of 84 for Hydrologic Soil Group D was used for an average pastureland condition. A post development runoff CN of 88 was used representing the combination of residential lots of approximately 1/3 acre and the proposed pond area. The area to be developed drains to a natural watercourse that is piped underneath Chateau Parkway in an existing 48" RCP internally through the overall development. This drainage analysis was submitted as part of the Oak Creek Office Park drainage plan. See the enclosed Drainage Map.

The future Glen Meadows development drainage area is 17.03 acres in size and drains to this 48" culvert. The existing time of concentration is approximately 20.2 minutes. In the developed condition, the site will be collected in an urban stormsewer system and piped to a retention pond. The time of concentration will be reduced to approximately 15 minutes.

The resulting pre and post peak 100-year runoff rates for the North Basin are 111.3 and 133.0 cfs respectively. A retention pond (North Reservoir) of approximately 0.7 acres will be developed in Reserve C at the low area of the subdivision to attenuate site runoff. An upstream existing pond (South Reservoir) discharges 47.5 cfs during the 100-year event. The total 100-year pre peak runoff rate of 158.8 cfs will be reduced by 6.9 cfs making the allowable discharge rate only 151.9 cfs from the north retention pond. This will account for the Office Park's non-attenuated runoff described below. The north retention pond will have a post peak 100-year inflow rate of 164.3 cfs.

The existing pond (South Reservoir) will be increased in size to approximately 0.7 acres. This pond will discharge into the north retention pond at a rate of 32.8 cfs during the 100-year event. This 32.8 cfs is included in the 164.3 cfs post peak 100-year inflow rate. The normal water level of the future south pond will be at elevation 1388.0. The post 100-year runoff will raise the pond level 1.4 feet to elevation 1389.4.

The existing headwall in the north pond will be altered and used to regulate the post development 100-year peak runoff rate to 112.4 cfs. The normal water level of the future north retention pond will be at elevation 1374.7. The post 100-year runoff will raise the

pond level 3.6 feet to elevation 1378.3. This future retention pond can serve for the logically developed area drainage into it as well as address the excess runoff from the office park site. The pond routing computational results for the 2, 5, 10 and 25 year 24-hour precipitation events are also enclosed and tabularized on the Drainage Map. All developed headwall discharges are less than the pre condition discharges for each precipitation event.

Water Quality treatment will be provided with use of the North Reservoir. This wet pond will allow the removal of at least 80% of the post-development total suspended solids load. The water quality volume necessary to achieve this was calculated to be 0.90 ac-ft. The actual volume of the pond at static level is 1.50 ac-ft, which is greater than the required water quality volume. So the pond volume is adequate to meet the water quality treatment requirements for the proposed disturbed area.

A preliminary grading plan for the subdivision is also enclosed in this Drainage Report.

The following discussion is from the drainage analysis for the Oak Creek Office Park. The Oak Creek Office Park on 21st Street and west of Greenwich Road is a portion of the planned Oak Creek 3rd Addition which is part of the Oak Creek Development Master Plan. The proposed plat lies in the NE ¼, Section 9, T27S, R2E. An approved Drainage Plan for the Oak Creek 3rd Addition is on file with the City of Wichita. This Drainage Report will also address the planned development of the Oak Creek Office Park along 21st Street.

The office park site plan area is approximately 3.34 acres. Runoff will be collected in a stormwater inlet and piped to the existing stormsewer system in 21st Street. Excess runoff will be retained in the parking lot as much as possible.

The existing condition is undeveloped land with planted pine trees for sale. The soil on-site is comprised primarily of Goessel silty clay, Irwin silty clay loan and Rosehill silty clay which are all classified in the Hydrologic Soil Group as D soils.

An existing vacant lands Rational Method runoff coefficient C of 0.52, 0.54, 0.59, 0.61 and 0.68 is applicable for the 2, 5, 10, 25 and 100 storms respectively. The time of concentration is approximately 15 minutes. Peak runoff rates from the 2, 5, 10, 25 and 100 year recurrence interval precipitation events would generate 6.6, 8.3, 10.2, 12.3 and 16.7 cfs respectively.

The post development condition of the office park site with the planned impervious area would represent a weighted C value of 0.67, 0.70, 0.75, 0.76 and 0.82 for the 2, 5, 10, 25 and 100 storms respectively considering lawns, roofs and parking lots. The time of concentration would be reduced to approximately 10 minutes. Correspondingly, the recurrence interval storms would generate 10.1, 12.7, 15.2, 18.1 and 23.6 cfs respectively.

The increased difference in these peak runoff rates between pre and post developed conditions for the 100-year storm is 6.9 cfs. This excess runoff rate is planned to be accounted for in the future retention pond system in the Glen Meadows residential development to the south as was previously conceptually presented in the approved Stormwater Master Plan.

Acceptable best management practices (BMPs) will be employed in the final drainage design before and during construction.

References

Design of Urban Highway Drainage – The State of the Art, by Reitz & Jens, Inc., April 1980.

Drainage of Highway Pavements, Hydraulic Engineering Circular #12, by Tye Engineering, Inc., March 1984.

Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation, City of Wichita, Kansas, 1985.

Soil Survey of Sedgwick County, Kansas, US Department of Agriculture, Soil Conservation Service, 1979.



Project 13438-002 GLEN MEADOWS

Date 12/12

Item WATER QUALITY PROTECTION VOLUME

By TRK

$$WQ_v = \frac{PRA}{12}$$

Eq. 4-24

$$P = 1.2''$$

$$A = 17.03 \text{ AC}$$

$$R_v = R_{vu}U + R_{vd}D + R_{vi}I$$

Eq. 4-26

HYDROLOGIC SOIL GROUP = D

FROM USDA WEB SOIL SURVEY

$$R_{vu} = 0.05 \quad R_{vd} = 0.25 \quad R_{vi} = 0.95$$

FROM TABLE 4-13

SITE LAND COVER	AREA (AC)
PAVEMENT (IMPERVIOUS)	1.6
POND (IMPERVIOUS)	0.7
RESIDENTIAL 1/3 AC LOTS	14.7
	17

RESIDENTIAL 1/3 AC LOT = 30% IMPERVIOUS

FROM APPENDIX C, TABLE C-1

$$\text{IMPERVIOUS AREA} = 1.6 + 0.7 + 14.7(.30) = 6.71 \text{ AC}$$

$$I = \frac{6.71 \text{ AC}}{17.03 \text{ AC}} = 39.4\% = 0.394$$

$$U = 0\% = 0$$

NO UNDISTURBED COVER POST DEVELOPMENT

$$D = 60.6\% = 0.606$$

~~$$R_v = 0.25(0) + 0.05(0)$$~~

$$R_v = 0.05(0) + 0.25(.606) + 0.95(.394) = 0.53$$

$$WQ_v = \frac{(1.2 \text{ in})(0.53)(17.03 \text{ AC})}{12} = 0.90 \text{ AC-FT}$$

POND VOLUME AT STATIC LEVEL = 1.50 AC-FT

$$1.50 > 0.90$$

POND HAS NECESSARY VOLUME FOR WATER QUALITY PROTECTION

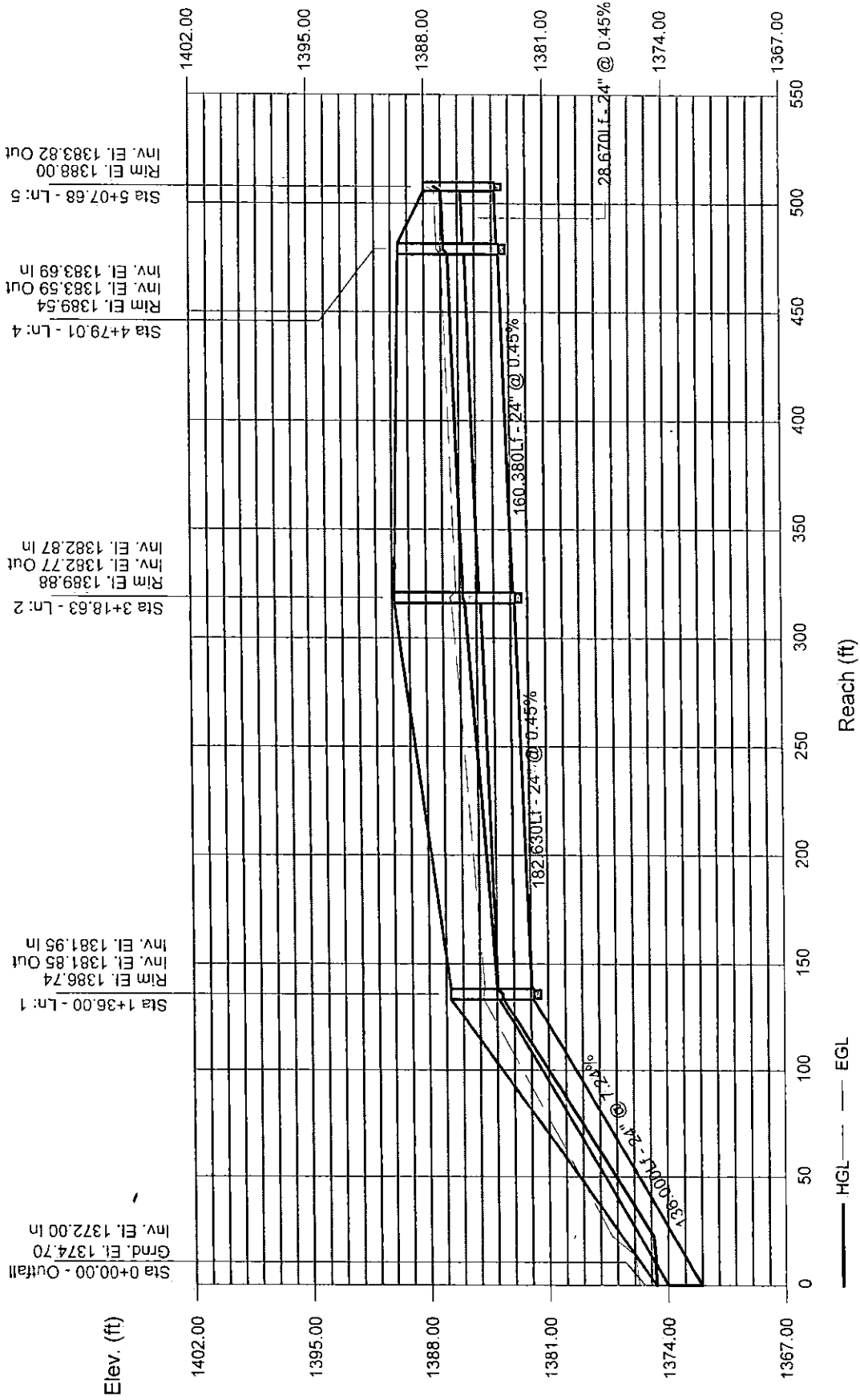
13438 Glen Meadows SWS

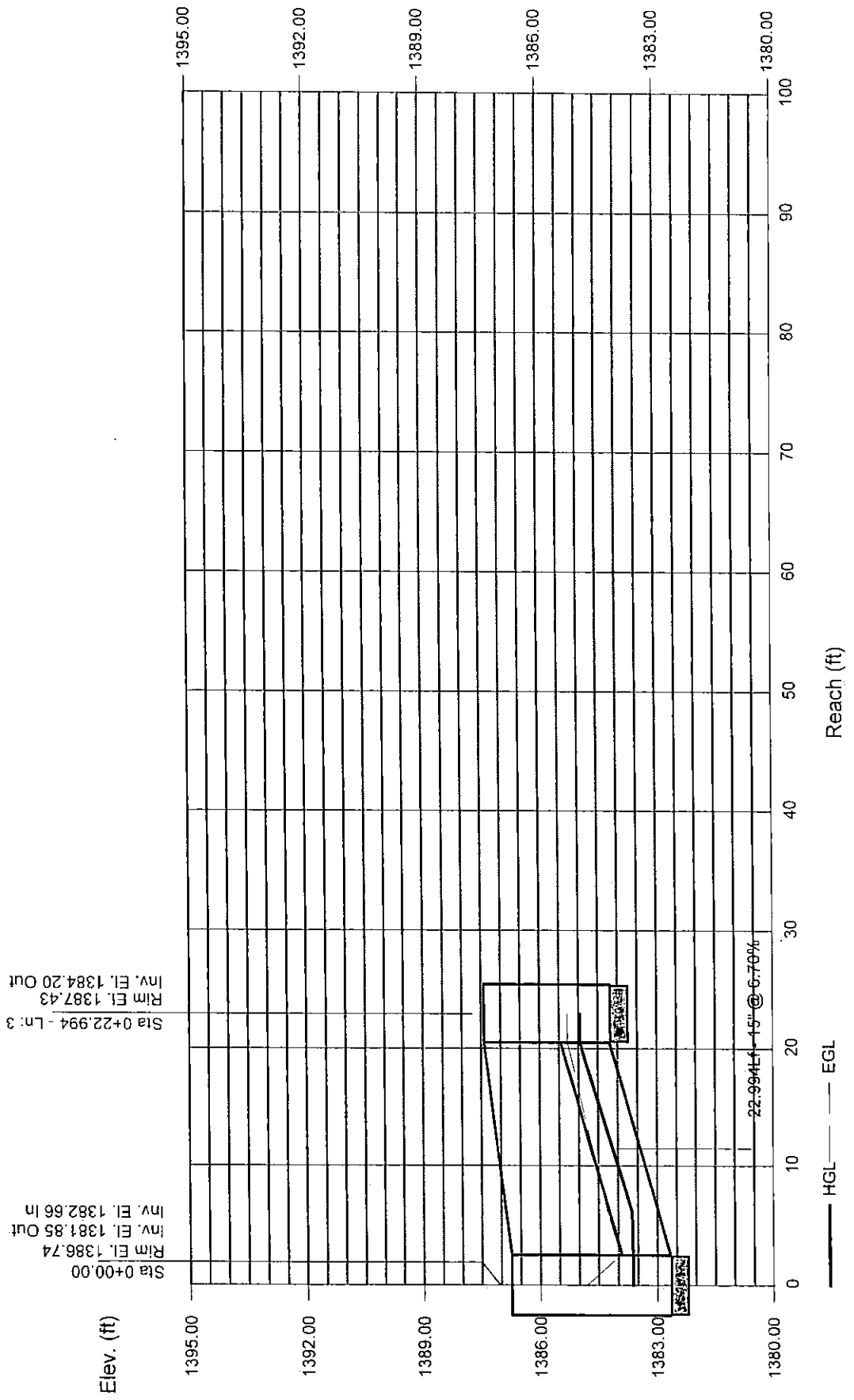


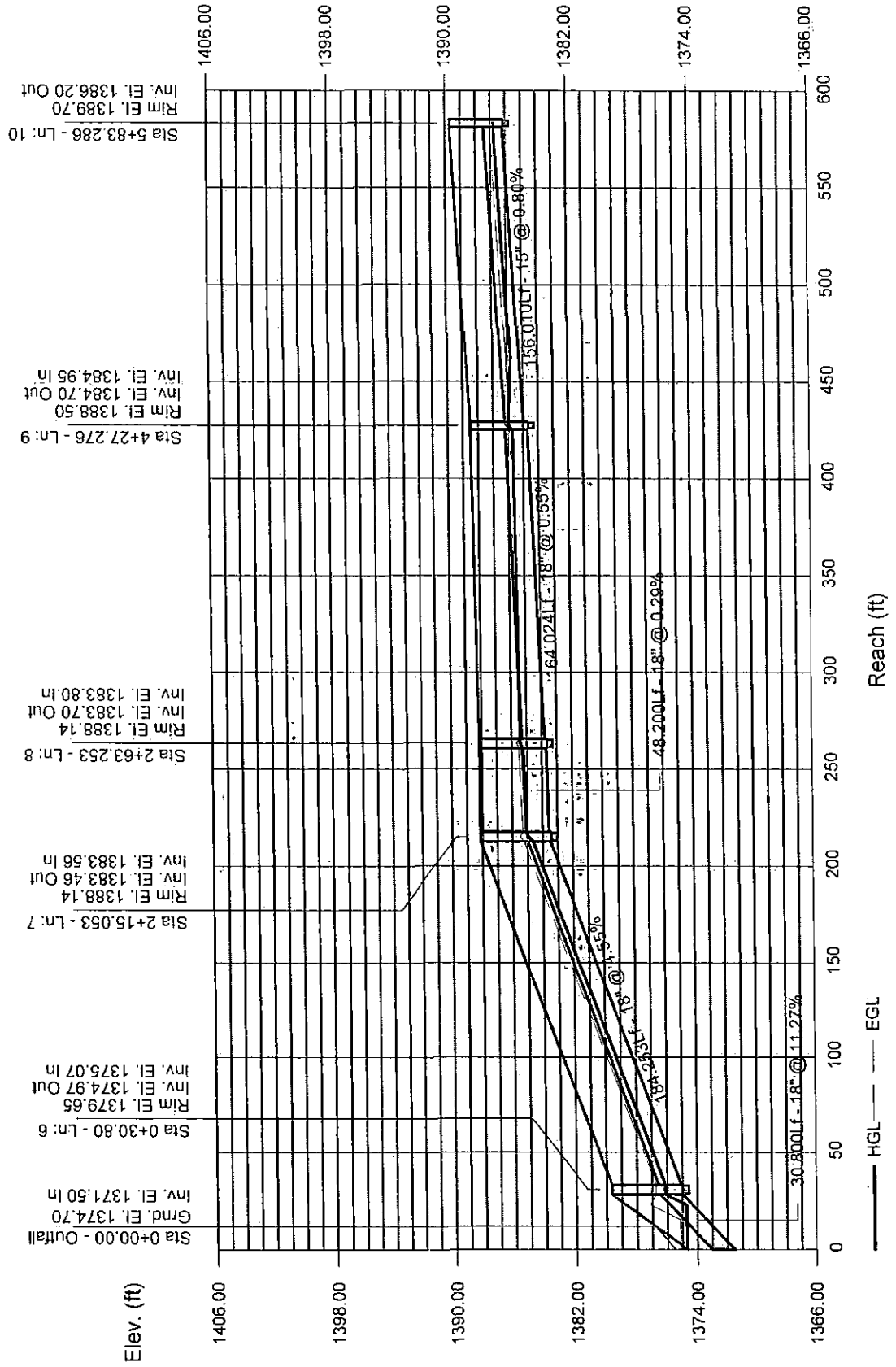
Project File: 13438 Glen Meadows SWS.stm

Number of lines: 15

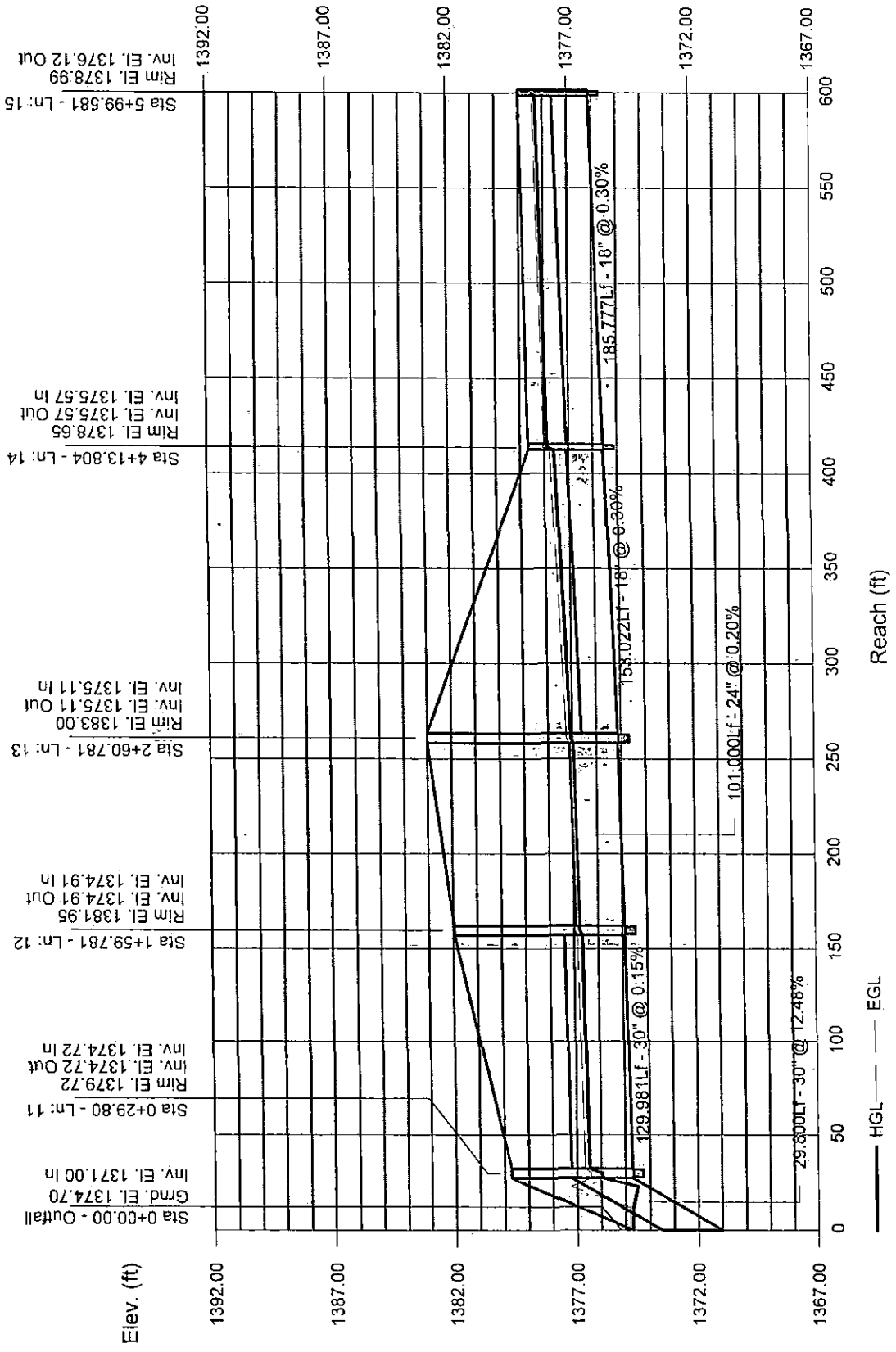
Date: 12/12/2013







Storm Sewer Profile



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 Shape	N Value (n)	J-Loss Coeff (K)
1	End	136.000	126.590	MH	0.00	0.00	0.00	0.0	1372.00	7.24	1381.85	24	Cir	0.013	1.00	1386.74
2	1	182.630	-14.392	MH	6.20	0.00	0.00	11.0	1381.95	0.45	1382.77	24	Cir	0.013	0.15	1389.88 1B
3	1	22.994	-90.156	Curb	3.50	0.00	0.00	8.0	1382.66	6.70	1384.20	15	Cir	0.013	1.00	1387.43 1C
4	2	160.380	-0.141	MH	0.00	0.00	0.00	0.0	1382.87	0.45	1383.59	24	Cir	0.013	0.62	1389.54
5	4	28.670	34.632	DrGrt	15.90	0.00	0.00	15.0	1383.69	0.45	1383.82	24	Cir	0.013	1.00	1388.00 From Detention Pon
6	End	30.800	-147.202	MH	0.00	0.00	0.00	0.0	1371.50	11.27	1374.97	18	Cir	0.013	0.43	1379.65
7	6	184.253	-22.016	Curb	2.00	0.00	0.00	7.0	1375.07	4.55	1383.46	18	Cir	0.013	0.50	1388.14 2D
8	7	48.200	-10.558	Curb	2.80	0.00	0.00	7.0	1383.56	0.29	1383.70	18	Cir	0.013	0.50	1388.14 2C
9	8	164.024	-1.195	DrGrt	2.00	0.00	0.00	14.0	1383.80	0.55	1384.70	18	Cir	0.013	1.50	1388.50 2B
10	9	156.010	-89.671	DrGrt	2.40	0.00	0.00	12.0	1384.95	0.80	1386.20	15	Cir	0.013	1.00	1389.70 2A
11	End	29.800	-112.876	MH	0.00	0.00	0.00	0.0	1371.00	12.48	1374.72	30	Cir	0.013	0.15	1379.72
12	11	129.981	0.133	Curb	2.60	0.00	0.00	10.0	1374.72	0.15	1374.91	30	Cir	0.013	0.53	1381.95 3D
13	12	101.000	17.621	Curb	4.40	0.00	0.00	10.0	1374.91	0.20	1375.11	24	Cir	0.013	0.52	1383.00 3C
14	13	153.022	17.384	DrGrt	1.20	0.00	0.00	7.0	1375.11	0.30	1375.57	18	Cir	0.013	1.50	1378.65 3B
15	14	185.777	-103.245	DrGrt	5.00	0.00	0.00	14.0	1375.57	0.30	1376.12	18	Cir	0.013	1.00	1378.99 3A

13438 Glen Meadows SWS

Number of lines: 15

Date: 12/12/2013

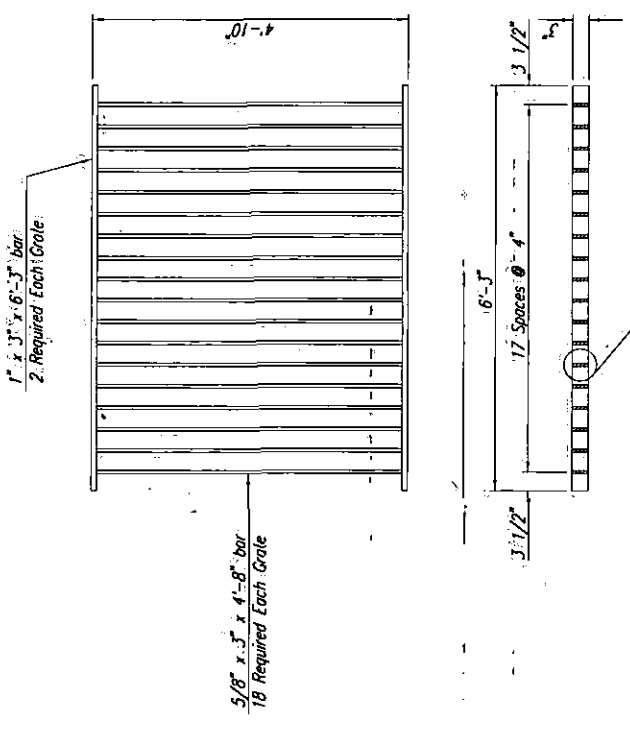
Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet:		Grate Inlet			Gutter					Inlet		Byp Line No.		
							Ht (ft)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw. (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)		Depth (ft)	Spread (ft)
1		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	Off
2		6.20*	0.00	0.00	6.20	MH	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	Off
3		3.50*	0.00	1.33	2.17	Curb	6.0	5.00	0.00	0.00	0.030	0.00	0.00	0.031	0.031	0.016	0.22	7.16	7.16	2.0	Off
4		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	Sag	0.00	0.00	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
5		15.90*	0.00	15.90	0.00	DrGrt	0.0	0.00	12.25	3.50	Sag	2.00	0.020	0.020	0.013	0.52	55.81	55.81	0.0	0.0	Off
6		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
7	2D	2.00*	0.00	2.00	0.00	Curb	6.0	5.00	0.00	0.00	Sag	4.17	0.031	0.031	0.013	0.17	5.45	5.45	2.0	0.0	Off
8	2C	2.80*	0.00	2.80	0.00	Curb	6.0	5.00	0.00	0.00	Sag	4.17	0.031	0.031	0.013	0.21	6.82	6.82	2.0	0.0	Off
9	2B	2.00*	0.00	2.00	0.00	DrGrt	0.0	0.00	5.81	2.25	Sag	2.00	0.020	0.020	0.013	0.17	19.39	19.39	0.0	0.0	Off
10	2A	2.40*	0.00	2.40	0.00	DrGrt	0.0	0.00	5.81	2.25	Sag	2.00	0.020	0.020	0.013	0.19	21.56	21.56	0.0	0.0	Off
11		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
12		2.60*	2.47	5.07	0.00	Curb	6.0	5.00	0.00	0.00	Sag	4.17	0.031	0.031	0.013	0.31	10.13	10.13	2.0	0.0	Off
13		4.40*	0.00	1.93	2.47	Curb	6.0	5.00	0.00	0.00	0.011	4.17	0.031	0.031	0.016	0.29	9.42	9.42	2.0	12	Off
14		1.20*	0.00	1.20	0.00	DrGrt	0.0	0.00	4.00	2.00	Sag	2.00	0.020	0.020	0.013	0.14	15.56	15.56	0.0	0.0	Off
15		5.00*	0.00	5.00	0.00	DrGrt	0.0	0.00	4.00	2.00	Sag	2.00	0.020	0.020	0.013	0.35	37.12	37.12	0.0	0.0	Off

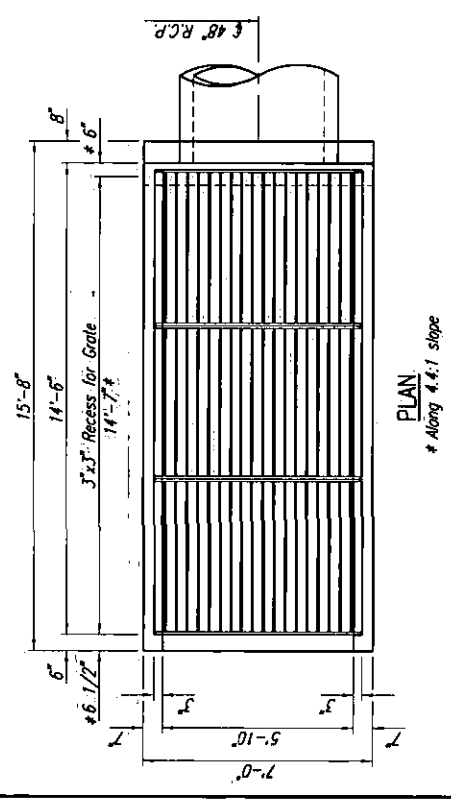
13438 Glen Meadows SWS
 Number of lines: 15
 Run Date: 12/12/2013

NOTES: Inlet N-Values = 0.016; Known Qs only; * Indicates Known Q added. All curb inlets are Horiz throat.

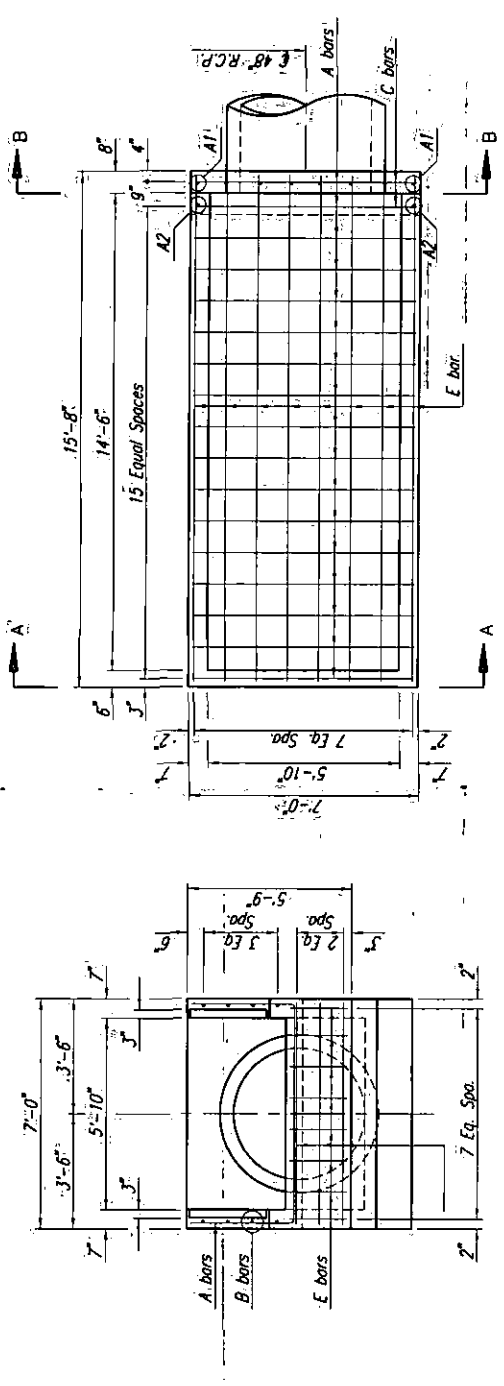
Line	To Line	Line Length (ft)	Incr Area (sq ft)	Total Area (sq ft)	Runoff Coeff	Incr CVA	Total CVA	Inlet Time (min)	Time Conc (min)	Rfial Inlet	Total Runoff (cfs)	Admi Flow (cfs)	Total Flow (cfs)	Capac Full (cfs)	Veloc (ft/s)	Pipe Size (in)	Slope (%)	Invert Elev (ft)	Inv Elev (ft)	HGL Dn (ft)	HGL Up (ft)	Cmd/Rm ID
1	Outfall	136.000	0.00	0.00	0.00	0.00	0.00	0.0	16.1	0.0	0.00	0.00	25.60	60.87	8.42	24	7.24	1372.00	1381.95	1374.70	1383.63	1374.70
2	1	182.630	0.00	0.00	0.00	0.00	0.00	11.0	15.6	0.0	0.00	6.20	22.10	15.16	7.04	24	0.45	1381.95	1382.77	1383.95	1385.69	1386.74
3	1	22.994	0.00	0.00	0.00	0.00	0.00	8.0	8.0	0.0	3.50	3.50	3.50	16.71	3.98	15	6.70	1382.66	1384.20	1383.63	1384.95	1386.74
4	2	160.380	0.00	0.00	0.00	0.00	0.00	0.0	15.1	0.0	0.00	0.00	15.90	15.15	5.06	24	0.45	1382.87	1383.59	1385.81	1386.60	1389.88
5	4	28.670	0.00	0.00	0.00	0.00	0.00	15.0	15.0	0.0	15.90	15.90	15.90	15.23	5.06	24	0.45	1383.69	1383.82	1386.85	1386.99	1389.54
6	Outfall	30.800	0.00	0.00	0.00	0.00	0.00	0.0	15.9	0.0	0.00	0.00	9.20	35.25	5.71	18	11.27	1371.50	1374.97	1374.70	1376.14	1374.70
7	6	184.253	0.00	0.00	0.00	0.00	0.00	7.0	15.3	0.0	2.00	2.00	9.20	22.41	6.51	18	4.55	1375.07	1383.46	1376.14	1384.63	1379.65
8	7	48.200	0.00	0.00	0.00	0.00	0.00	7.0	15.1	0.0	2.80	2.80	7.20	5.66	4.07	18	0.29	1383.56	1383.70	1385.06	1385.29	1388.14
9	8	164.024	0.00	0.00	0.00	0.00	0.00	14.0	14.0	0.0	2.00	2.00	4.40	7.78	3.01	18	0.55	1383.80	1384.70	1385.42	1385.70	1388.14
10	9	156.010	0.00	0.00	0.00	0.00	0.00	12.0	12.0	0.0	2.40	2.40	2.40	5.78	3.08	15	0.80	1384.95	1386.20	1385.99	1386.82	1388.50
11	Outfall	29.800	0.00	0.00	0.00	0.00	0.00	0.0	17.1	0.0	0.00	0.00	13.20	14.90	4.12	30	2.48	1371.00	1374.72	1374.70	1375.94	1374.70
12	11	129.981	0.00	0.00	0.00	0.00	0.00	10.0	16.3	0.0	2.60	2.60	13.20	15.68	3.58	30	0.15	1374.72	1374.91	1376.48	1376.67	1379.72
13	12	101.000	0.00	0.00	0.00	0.00	0.00	10.0	15.8	0.0	4.40	4.40	10.60	10.06	3.48	24	0.20	1374.91	1375.11	1376.77	1376.96	1381.95
14	13	153.022	0.00	0.00	0.00	0.00	0.00	7.0	15.1	0.0	1.20	1.20	6.20	5.76	3.51	18	0.30	1375.11	1375.57	1377.06	1377.60	1383.00
15	14	185.777	0.00	0.00	0.00	0.00	0.00	14.0	14.0	0.0	5.00	5.00	5.00	5.71	2.83	18	0.30	1375.57	1376.12	1377.88	1378.30	1378.65



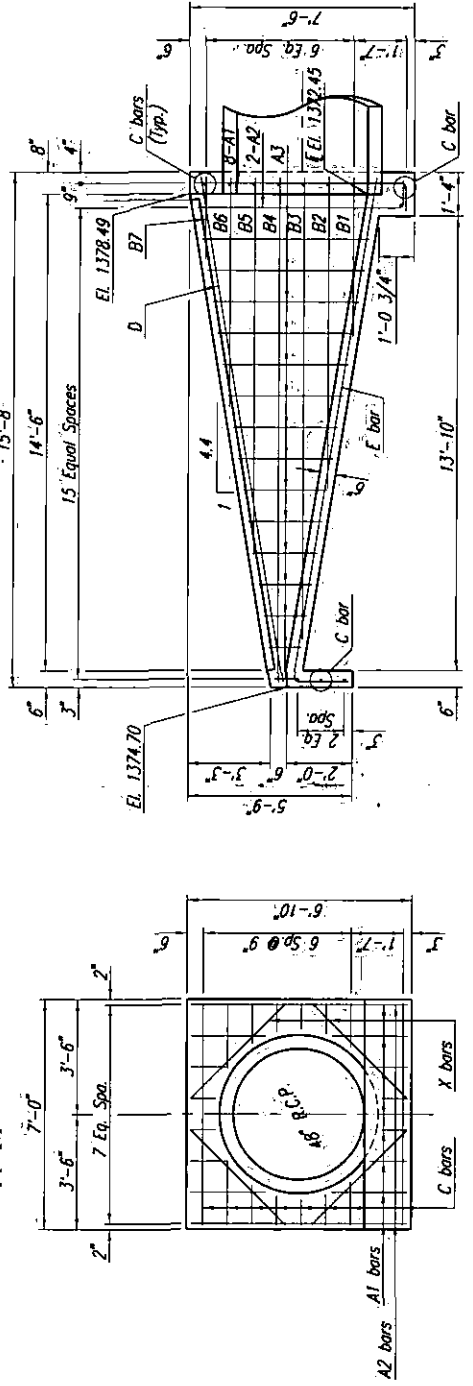
WELDED STRUCTURAL STEEL GRATE
 Weight, 663 Lbs. Each
 (3 Required)
 Reuse existing Structural Steel Grates
 * For information only



PLAN
 * Along 4:1 slope



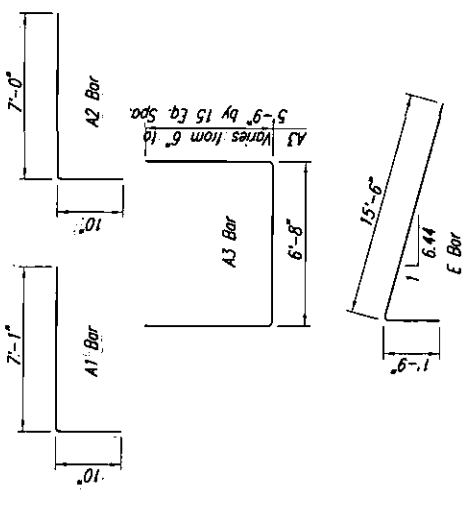
VIEW A-A



SECTION

RE-BAR SCHEDULE			
Mark	Shape	No.	Length
A1	8	7-3	38.74
A2	2	7-2	9.57
A3	16	Varies	Varies
B1	2	5-1	6.79
B2	2	10'-8 1/2"	14.20
B3	2	15-4"	20.49
B4	2	13-4"	17.81
B5	2	9'-8 1/2"	12.75
B6	2	5-9"	7.68
B7	2	1'-11 1/2"	2.62
C	12	6-9"	54.11
D	2	15-6"	20.71
E	8	17-3"	92.18
X	4	4'-0"	10.69
Total Rebars			518 Lbs.
Concrete			6.02 C.Y.

All Concrete Reinforcement to be #4 bars.



BENDING DIAGRAMS

CONCRETE HEADWALL NOTES

- CONCRETE:** Bevel all exposed edges with a 3/4" triangular mending or finish with an approved edging tool. Concrete shall have a minimum 28 day compressive strength of 4,000 p.s.i. All pipes shall be flush cut prior to being cast into the headwall.
- REINFORCING STEEL:** All dimensions relative to reinforcing steel are to centerline of bar unless otherwise noted. All clearances shall be 2" unless otherwise noted. All reinforcing steel shall conform to A.S.T.M. designation A615 Grade 60 and shall be epoxy coated.
- PAYMENT:** A deduction in concrete quantities has been made for the pipe opening. The P.C. Headwall (48") shall be paid for at the unit price per each including concrete, reinforcing steel, structural steel, galvanizing, excavation, backfilling and all other miscellaneous materials, labor, tools, equipment and incidentals necessary to complete the work. Quantities shown are for information only.

Revision	By	Date
GLEN MADDOX AND ASSOCIATES STORM WATER DRAIN NO. 359		
HEADWALL DETAILS (48 IN)		
GARY HANZEN, P.E., CITY ENGINEER CITY OF WICHITA, PROJECT NO. 488-34634 PROFESSIONAL ENGINEERING CONSULTANTS, P.A. 303 SOUTH TOPEKA, WICHITA, KS 67202 316-262-2911 - www.pec.com		
Designed by: BHM		Sheet No. 15-13438-002
Drawn by: BUS		Sheet: September 2013
		Sheet 21 of 21