MOEHRING & ASSOCIATES ——— **CONSULTING ENGINEERS**

2 November 1988

Ms. Vicki Huang
City Engineer's Office
City of Wichita, Kansas
455 N. Main - 7th Floor
Wichita, KS 67202

Re: Sunridge and Teal Brook Estates
Additions to Wichita, Kansas
Improvement Ghuarantees & Petitions

Dear Vicki:

On the 25th of October, we submitted construction cost estimates and maps for nine (9) segments of work identified as Items A through I.

Per your evaluation and recommendations, we have made the following minor adjustments to the plans and/or construction estimate for each of the 9 items, as follows:

a. The cost estimates for all 9 items reflect a change in the Contract Administration percentage from 20% to 25%.

b. There are no changes in the plan, in the quantities or construction totals for Items A, B, C, D and I, other than the change to 25% Contract Administration.

c. Changes have been made in the plan, construction quanties and construction totals for Items E, F, G and H, as well as the change to 25% Contract Administration.

Additionally, we have prepared for your review, petitions for Items A through I.

As soon as these petitions are approved, we will obtain the appropriate signatures, project initiation fees and proof of ownership, as required.

I appreciate your patience and input in preparing these petitions.

If we may be of further assistance, please advise.

Sincerely,

MOEHRING & ASSOCIATES
CONSULTING ENGINEERS

Don C. Moehring II

DCM:om

433 S. HYDRAULIC ——— WICHITA, KANSAS 67211 ——— 263-8291

SUNRIDGE - TEAL BROOK ADD'NS - System 90

HYDROLOGY DATA COMPILATION

DRAINAGE CONCEPT

A. Initial Data

Use Rational Method - Q = CIA

1. Determine "C" Factors for Sub-Basins

Node	Soil Type	Land Use	C_2	C_{100}
97	B	Res., 2/5 Acre	0.37	0.55
96	B	"	0.37	0.55
95	B	"	0.37	0.55
94	B	"	0.37	0.55
93	B	"	0.37	0.55
92	B	"	0.37	0.55
91	B	"	0.37	0.55
90	(Outlet to Detention Pond #1)			

2. Determine T_c & I for Each Sub-Basin

Node	T_c	I_2	I_{100}
97	t_o=8.33 t_g=4.42 T_c=12.75 Use 15	3.83	7.37
96	15	3.83	7.37
95	15	3.83	7.37
94	t_o=12.5 t_g= 2.2 T_c=14.7 Use 15	3.83	7.37
93	t_o=13.33 t_g= 2.33 T_c=15.66	3.76	7.24
92	15	3.83	7.37
91	15	3.83	7.37
90	(Outlet to Detention Pond #1)		

3. - Determine Area, "A", of Sub-Basins Contributing to each Node

Node	Area (Acres)	
97	(N) 1.78 + 1.87 (E)	= 3.65
96	(N) 0.37 + 1.46 (E)	= 1.83
95	(E) 0.65 + 0.62 (W)	= 1.27
94	(E) 1.84 + 1.09 (W)	= 2.93
93	(N & W) 4.13	= 4.13
92	(E) 0.58 + 0.96 (N)	= 1.54
91	(W & N) 0.99	= 0.99
90	(Outlet to Detention Pond #1)	

4. - Determine Surface Contribution (Q_2) to Each Node

Node	C_2	I_2	A	Q_2
97	0.37	3.83	3.65	5.17
96	0.37	3.83	1.83	2.59
95	0.37	3.83	1.27	1.80
94	0.37	3.83	2.93	4.15
93	0.37	3.76	4.13	5.75
92	0.37	3.83	1.54	2.18
91	0.37	3.83	0.99	1.40
90	(Outlet)			

5. Determine Surface Contribution (Q_{100}) to Each Node

Node	C_{100}	I_{100}	A	Q_{100}
97	0.55	7.37	3.65	14.80
96	0.55	7.37	1.83	7.42
95	0.55	7.37	1.27	5.15
94	0.55	7.37	2.93	11.88
93	0.55	7.24	4.13	16.44
92	0.55	7.37	1.54	6.24
91	0.55	7.37	0.99	4.01
90	(Outlet to Detention Pond #1)			

6. Flood Routing/Inlet Sizing - 2 Year Design Storm

Node	Inlet Condition	Inlet Length	Q_2 Approach	Q_2 Intercept	Q_2 By-Pass	By-Pass To Node
97	Sump	5	5.17	5.17	0	-
96	Sump	5	2.59	2.59	0	-
95	Sump	5	1.80	1.80	0	-
94	Sump	5	4.15	4.15	0	-
93	Sump	5	5.75	5.75	0	-
92	Sump	5	2.18	2.18	0	-
91	Sump	5	1.40	1.40	0	-
90	(Outlet to Detention Pond #1)					

7. Flood Routing/Inlet Sizing - 100 Yr. Design Storm

Node	Inlet Condition	Inlet Length	Q_{100} Approach	Q_{100} Intercept	Q_{100} By-Pass	By-Pass To Node
97	Sump	5	14.80	9.5	5.30	Pond #2
96	Sump	5	7.42	7.42	-	-
95	Sump	5	5.15	5.15	-	-
94	Sump	5	11.88	9.5	2.38	95 & Pond #1
93	Sump	10	16.44	16.44	0	-
92	Sump	5	6.24	6.24		
					0	-
91	Sump	5	4.01	4.01	0	-
90	(Outlet to Detention Pond #1)					

8. Street Flow Depths - 2 Yr. Design Storm

Node	Q_2 Approach	Flow Distribution	Street Slope	Flow Depth	Allowable Depth	Comment
97	5.17	49% (NW) = 2.53	0.38	0.28	0.50	OK
		51% (E) = 2.64	0.53	0.29	0.50	OK
96	2.59	20% (N) = 0.52	0.38	0.16	0.50	OK
		80% (E) = 2.07	0.53	0.25	0.50	OK
95	1.80	51% (E) = 0.92	0.75	0.18	0.50	OK
		49% (W) = 0.88	0.54	0.18	0.50	OK
94	4.15	63% (E) = 2.61	0.75	0.26	0.50	OK
		37% (W) = 1.54	0.65	0.22	0.50	OK
93	5.75	100% (N) = 5.75	0.36	0.41	0.50	OK
92	2.18	38% (E) = 0.83	0.64	0.17	0.30	OK
		62% (N) = 1.35	0.36	0.23	0.30	OK
91	1.40	100% = 1.40	0.44	0.23	0.30	OK
90	(Outlet to Detention Pond #1)					

SYSTEM 90 — 2 YEAR - FREQUENCY

TION — INLET SIZE - CAPACITY — CONDUIT DATA

$\leq Q_2$ to Inlet	Inlet Length	Q_2 Intercept	Q_2 By-Pass	$\leq Q_2$ Pipe	Pipe Size	Velocity (fps)	Length	T.T.	T.T.+ T.C.
2.59	5	2.59	0	2.59	18"	1.47	40	.45	15.45
5.10	5	5.10	0	7.69	24"	2.45	100	.68	16.13
1.80	5	1.80	0	1.80	No Pipe -	Direct Discharge to R.C.B.C.			
4.15	5	4.15	0	4.15	No Pipe -	Direct Discharge to R.C.B.C.			
5.75	10	5.75	0	5.75	30"	1.17	60	.85	16.51
2.09	5	2.09	0	7.84	36"	1.11	225	3.38	19.89
1.22	5	1.22	0	9.06	36"	1.28	180	2.34	22.23

SYSTEM 90 | 100 YR. - FREQUENCY

N | INLET SIZE - CAPACITY | CONDUIT DATA

ΣQ_{100} to Inlet	Inlet Length	Q_{100} Intercept	Q_{100} By-Pass	ΣQ_{100} Pipe	Pipe Size	Velocity (fps)	Length	T.T.	T.T. + T.C.
7.42	5	7.42	0	7.42	18"	4.20	40	0.16	15.16
14.74	5	10.5	4.24 to Pond #2	17.92	24"	5.70	100	0.29	15.45
5.15	5	5.15	0	5.15	No Pipe - Direct Discharge to R.C.B.C.				
11.88	5	9.5	2.38 to Pond # 1	9.5	No Pipe - Direct Discharge to Pond #1				
16.45	10	16.45	0	16.45	30"	3.35	60	0.30	15.96
6.09	5	6.09	0	22.54	36"	3.19	225	1.18	17.14
3.80	5	3.80	0	26.34	36"	3.73	180	0.80	17.94

STRUCTURE HEAD LOSS COMPUTATIONS - SYSTEM 90 (2 Yr. Frequency)

Structure 93 - Curb Inlet - Q_o only

Q_o = 5.75 cfs; D_o = 30"; V_o = 1.17 fps; $V_o^2/2g$ = 0.0213

To generate initial velocity, $H_v = V_o^2/2g$ = 0.02'

Entrance loss into 24" pipe = $H_e = 0.5 \times V_o^2/2g$ = 0.1'

Total Structure Loss = 0.02 + 0.01 = 0.03'

Structure 92 - Curb Inlet + Upstream Flow

Q_u = 5.75 cfs; V_u = 1.17 fps; $V_u^2/2g$ = 0.0213

Q_g = 2.09 cfs

Q_o = 7.84 cfs; V_o = 1.11 fps; $V_o^2/2g$ = 0.0191

$H_u - H_o = V_o^2/2g - Q_u/Q_o\ (V_u^2/2g)$

$H_u - H_o$ = 0.0191 - (0.7687 x 0.0213)

$H_u - H_o$ = 0.0191 - 0.0164 = 0.01'

Structure 91 - Curb Inlet + Lateral (45°) Flow

Q_u = 7.84 cfs; V_u = 1.11 fps; $V_u^2/2g$ = 0.0191

Q_g = 1.22 cfs

Q_o = 9.06 cfs; V_o = 1.28 fps; $V_o^2/2g$ = 0.0254

$H_u - H_o = V_o^2/2g - Q_u/Q_o\ (V_u^2/2g)$

$H_u - H_o$ = 0.0254 - (0.8653 x 0.0191) = 0.01'

Turn Loss (45°) = $H_L = K(V_L^2/2g)$ = .465 x 0.0191 = 0.01'

Total Structure Loss = 0.01' + 0.01' = 0.02'

(Continued on
Page 7A)

Structure 96 - Curb Inlet - Q_o only

Q_o = 2.59 cfs; D_o = 18"; V_o = 1.47 fps; $V_o^2/2g$ = 0.0336

To generate initial velocity, $H_v = V_o^2/2g$ = 0.04'

Entrance loss into 18" pipe = H_e = 0.5 x $V_o^2/2g$ = 0.02'

Total Structure Loss = 0.04 + 0.02 = 0.06'

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Structure 97 - Curb Inlet + Upstream Flow

Q_u = 2.59 cfs; V_u = 1.47 fps; $V_u^2/2g$ = 0.0336

Q_g = 5.10 cfs

Q_o = 7.69 cfs; V_o = 2.45 fps; $V_o^2/2g$ = 0.0932

$H_u - H_o = V_o^2/2g - Q_u/Q_o\ (V_u^2/2g)$

$H_u - H_o$ = 0.0932 - (0.3368 x 0.0336)

$H_u - H_o$ = 0.0932 - 0.0113 = 0.08'

AGE - DESIGN COMPUTATIONS

Storm Frequency - 2 YEAR
Mannings "n" = 0.013
Plan -
Profile -

Sheet 8 of 8
Computed By - DCM
Checked By -

	$\frac{V^2}{2g}$	Time in Minutes		Constr. Slope %	Req'd Hydr. Slope %	Struct. Head Loss	Hydraulic Grade Elevation		Structure Flowline Elevation		Upper Street Elev.	Remarks
		t	≤t				Upper	Lower	Upper	Lower		
7	.0336	0.45	15.45	.40	.06	0.06	1340.48	1340.40	1338.46	1338.30	1342.93	H.G.Elev.=2.45' below gutter F.L.
5	.0932	0.68	16.13	.25	.12	0.08	1340.32	1340.20	1338.20	1337.95	1342.93	Ditto = 2.61' below
7	.0213	0.85	16.51	.50	.0002	0.03	1341.05	1341.01	1337.70	1337.40	1343.24	H.G.Elev.=2.19' below gutter F.L.
1	.0191	3.38	19.89	.15	.0001	0.01	1341.00	1340.98	1337.20	1336.86	1342.92	Ditto = 1.92' below
8	.0254	2.34	22.23	.15	.0002	0.02	1340.96	1340.93	1336.76	1336.49	1343.95	Ditto = 2.99' below

STRUCTURE HEAD LOSS COMPUTATIONS - SYSTEM 90 (100 Yr. Frequency)

Structure 93 - Curb Inlet - Q_o only

Q_o = 16.45 cfs; D_o = 30"; V_o = 3.35 fps; $V_o^2/2g$ = .1743

To generate initial velocity, $H_v = V_o^2/2g$ = 0.17'

Entrance Loss into 30" pipe = $H_e = 0.5\ V_o^2/2g$ = 0.09'

Total Structure Loss = 0.17' + 0.09' = 0.26'

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Structure 92 - Curb Inlet + Upstream Flow

Q_u = 16.45 cfs; V_u - 3.35 fps; $V_u^2/2g$ = .1743

Q_g = 6.09 cfs; D_o = 36"

Q_o = 22.54 cfs; V_o = 3.19 fps; $V_o^2/2g$ = .1580

$H_u - H_o = V_o^2/2g - Q_u/Q_o\ (V_u^2/2g)$

$H_u - H_o$ = .1580 - (0.7298 x 0.1743)

$H_u - H_o$ = .1580 - .1272 = 0.03'

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Structure 91 - Curb Inlet + Lateral (45°) Flow

Q_u = 22.54 cfs; V_u = 3.19 fps; $V_u^2/2g$ = .1580

Q_g = 3.80 cfs

Q_o = 26.34 cfs; V_o = 3.73 fps; $V_o^2/2g$ = .2160

$H_u - H_o = V_o^2/2g - Q_u/Q_o\ (V_u^2/2g)$

$H_u - H_o$ = .2160 - (.8557 x .1580) = 0.08'

Turn Loss (45°) = $H_L = K(V_L^2/2g)$ = .465 x .1580 = 0.07'

Total Structure Loss = 0.08' + 0.07' = 0.15'

Structure 96 - Curb Inlet - Q_o only

Q_o = 7.42 cfs; D_o = 18"; V_o = 4.20 fps; $V_o^2/2g$ = .2739

To generate initial velocity, $H_v = V_o^2/2g$ = 0.27'

Entrance Loss into 18" pipe = $H_e = 0.5\ V_o^2/2g$ = 0.14'

Total Structure Loss = 0.27' + 0.14' = 0.41'

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Structure 97 - Curb Inlet + Upstream Flow

Q_u = 7.42 cfs; V_u = 4.20 fps; $V_u^2/2g$ = .2739

Q_g = 10.5 cfs

Q_o = 17.92 cfs; V_o = 5.70 fps; $V_o^2/2g$ = .5045

$H_u - H_o = V_o^2/2g - Q_u/Q_o\ (V_u^2/2g)$

$H_u - H_o = .5045 - (0.4141 \times .2739)$

$H_u - H_o = .5045 - 0.1134 = 0.39'$

AGE – DESIGN COMPUTATIONS

Storm Frequency – 100 Year
Mannings "n" = 0.013
Plan – Enclosed
Profile – Enclosed

Sheet of Revised
Computed By – DCM
Checked By –

	$\frac{V^2}{2g}$	Time in Minutes		Constr. Slope %	Req'd Hydr. Slope %	Struct. Head Loss	Hydraulic Grade Elevation		Structure Flowline Elevation		Upper Street Elev.	Remarks
		t	≤t				Upper	Lower	Upper	Lower		
)	.2739	0.16	15.16	.40	.50	0.41	1341.83	1341.22	1338.46	1338.30	1342.93	H.G.Elev.=1.10' below gutter F.L.
)	.5045	0.29	15.45	.25	.63	0.39	1340.83	1340.20	1338.20	1337.95	1342.93	Ditto = 2.10' below
	.1743	0.30	15.96	.50	.16	0.26	1343.88	1343.52	1337.70	1337.40	1343.24	H.G.Elev.=0.14' above top curb OK
	.1580	1.18	17.14	.15	.11	0.03	1343.49	1343.24	1337.20	1336.86	1342.92	H.G.Elev.=0.07' above top curb OK
	.2160	0.80	17.94	.15	.16	0.15	1343.09	1342.80	1336.76	1336.49	1343.50	H.G.Elev.=0.41' below gutter F.L.