

**Modified Rational Method for Stormwater Detention**  
54.8 Acre Site - Rockwall, Texas  
100 Year Storm Event

**Purpose:** Use the modified rational method to determine the volume of stormwater storage needed to compensate for increased runoff due to development.

**Method:** Use the Modified Rational Method to determine maximum rate of runoff,  $Q = c \cdot I \cdot A$

Where:  $c$  = Runoff Coefficient  
 $I$  = Rainfall Intensity (in/hr)  
 $A$  = Drainage Area (acres)

**Assumptions:** Rainfall Intensity determined from City of Rockwall To/Rainfall Intensity graph given Time of Concentration ( $T_c$ )

**For undeveloped conditions:** Use  $c = 0.35$ ,  $T_c = 24.45$  min.,  $I = 7.8$  in./hr.

**For developed conditions:** Use  $c = 0.80$ ,  $T_c = 10$  min.,  $I = 9.8$  in./hr.

**I. Determination of Allowable Release Rate - Undeveloped Site**

Total area of site draining to storage	40.48	acres
Total area of site allowed to bypass through the storage	13.32	acres
Total area of site bypassing the storage that is required to be detained	1.00	acres
Total time of concentration for undeveloped conditions	24.45	minutes
Runoff coefficient for undeveloped conditions	0.35	
Rainfall intensity for one-hundred year storm (undeveloped)	7.80	inches/hr
Total time of concentration for developed conditions	10	minutes
Runoff coefficient for developed conditions	0.80	
Rainfall intensity for one-hundred year storm (developed)	9.80	inches/hr
Release rate of undeveloped site draining to the storage	110.51	cfs
Release rate of undeveloped site allowed to bypass through the storage	36.36	cfs
Release rate of developed site bypassing the storage	7.84	cfs
Allowable release rate	139.03	cfs

**II. Required Storage Calculations, Return Period = 100 years**

Duration (hours)	Duration (min)	Rainfall Intensity (100-Year) (in/hr)	Inflow Rate (cfs)	Inflow Volume (cf)	Allowable Release Rate (cfs)	Outflow Volume (cf)	Inflow - Outflow Volume (cf)	Required Storage (ac-ft)
0.17	10	9.8	363.05	217,830	138.03	83,420	134,410	3.066
0.25	15	9.10	337.12	303,407	138.03	104,276	199,131	4.571
0.33	20	8.30	307.48	368,978	138.03	125,131	243,848	5.598
0.50	30	6.90	255.62	460,111	138.03	166,841	293,271	6.733
0.67	40	5.80	214.87	515,680	138.03	208,851	307,129	7.059
0.83	50	5.00	185.23	555,690	138.03	250,261	305,429	7.012
1.00	60	4.40	163.00	586,809	138.03	291,971	294,837	6.769
1.50	90	3.20	118.55	640,155	138.03	417,102	223,053	5.121
2.00	120	2.60	96.32	693,501	138.03	542,233	151,268	3.473

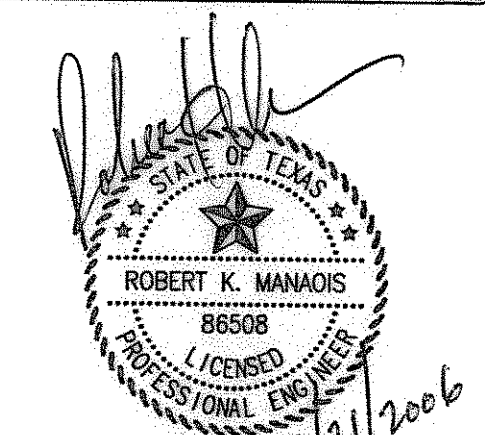
Total Capacity Required:  cubic feet  acre-feet

**III. Revised Storage Calculations, Return Period = 100 years**

Discharge Capacity:  cfs Existing Discharge Capacity of Weir based on HWS Elevation = 541.88

Duration (hours)	Duration (min)	Rainfall Intensity (100-Year) (in/hr)	Inflow Rate (cfs)	Inflow Volume (cf)	Allowable Release Rate (cfs)	Outflow Volume (cf)	Inflow - Outflow Volume (cf)	Required Storage (ac-ft)
0.17	10	9.8	363.05	217,830	138.03	83,280	134,550	3.069
0.25	15	9.10	337.12	303,407	138.03	104,100	199,307	4.575
0.33	20	8.30	307.48	368,978	138.03	124,920	244,058	5.603
0.50	30	6.90	255.62	460,111	138.03	166,560	293,551	6.739
0.67	40	5.80	214.87	515,680	138.03	208,200	307,480	7.059
0.83	50	5.00	185.23	555,690	138.03	249,840	305,850	7.021
1.00	60	4.40	163.00	586,809	138.03	291,480	295,329	6.780
1.50	90	3.20	118.55	640,155	138.03	416,400	223,755	5.137
2.00	120	2.60	96.32	693,501	138.03	541,320	152,181	3.494

**BENCHMARK:**  
BOX CUT IN NW CURB RETURN AT THE INTERSECTION OF WESTWOOD AND ROCKWALL PARKWAY. ELEVATION = 537.56



**RECORD DRAWING**  
RECORD INFORMATION PROVIDED BY  
C. F. JORDAN, L.P., DALLAS, TEXAS  
ELEVATION VERIFICATION PERFORMED BY  
dMAC SURVEYING & MAPPING, DENTON, TEXAS

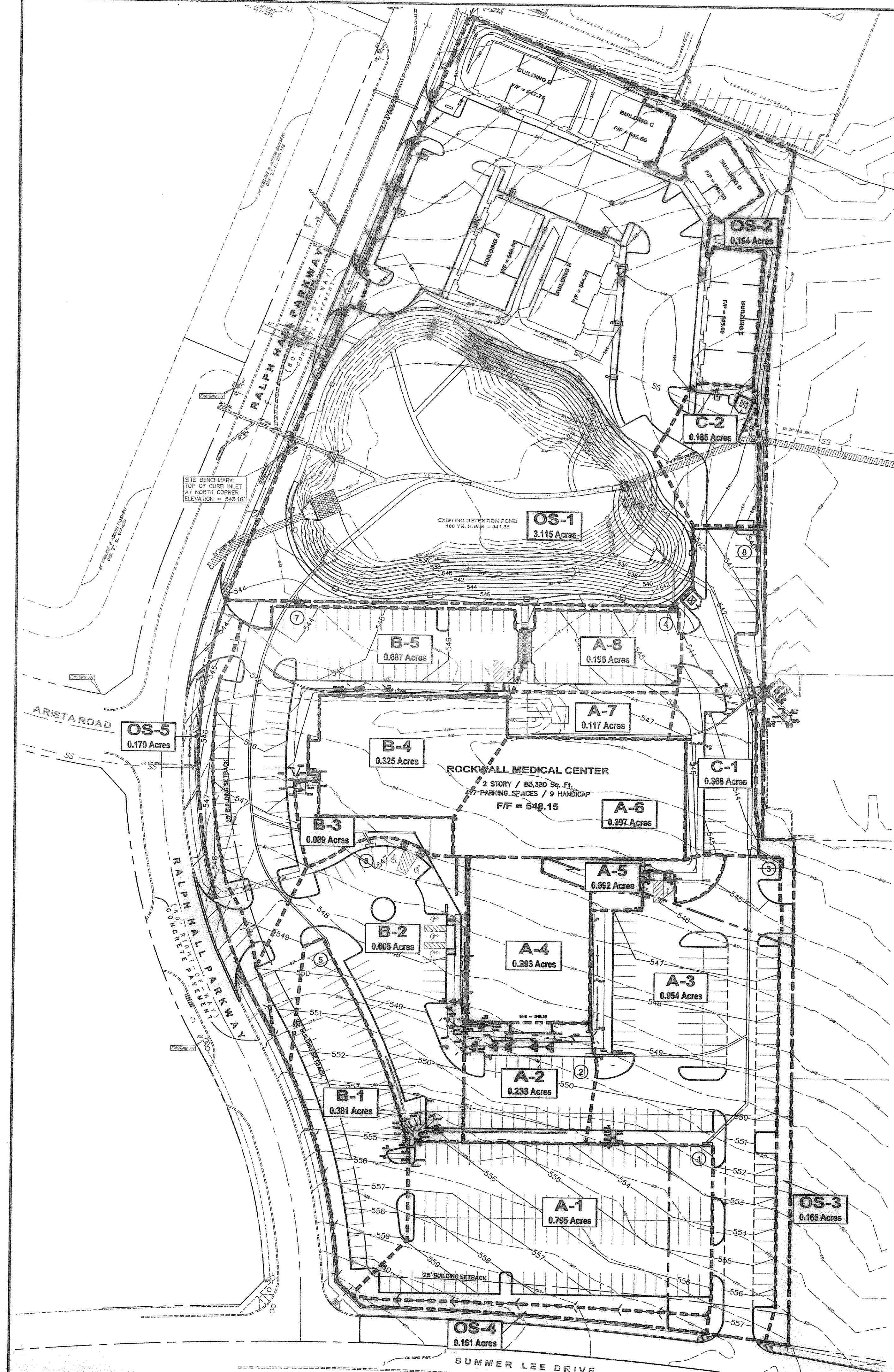
REV.	DATE	REMARKS	BY

**OVERALL DRAINAGE AREA MAP**  
ROCKWALL MEDICAL CENTER PHASE II  
CITY OF ROCKWALL, TEXAS

**RKM** RKM Consulting Engineers, Inc.  
14673 Midway Road, Suite 203  
Addison, Texas 75001  
phone (214) 432-8070  
fax (214) 432-8069

CHECKED	DESIGN	DRAWN	JOB	DATE	SCALE	SHEET
RKM	RKM	RKM	1007-002	06/21/05	1" = 50'	<b>10</b>

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**DRAINAGE AREA CALCULATIONS**

Subarea	Design Storm (yr)	$T_c$ (min)	$I_{100}$ (in/hr)	$C$	Area (acres)	CA	$Q_{100}$ (cfs)	Comments
A-1	100	10.0	9.8	0.90	0.795	0.72	7.01	DRAINS TO STORM LINE 'A'
A-2	100	10.0	9.8	0.90	0.233	0.21	2.06	DRAINS TO STORM LINE 'A'
A-3	100	10.0	9.8	0.90	0.954	0.86	8.41	DRAINS TO STORM LINE 'A'
A-4	100	10.0	9.8	0.90	0.293	0.26	2.58	DRAINS TO STORM LINE 'A'
A-5	100	10.0	9.8	0.90	0.092	0.08	0.81	DRAINS TO STORM LINE 'A'
A-6	100	10.0	9.8	0.90	0.369	0.33	3.25	DRAINS TO STORM LINE 'A'
A-7	100	10.0	9.8	0.90	0.117	0.11	1.03	DRAINS TO STORM LINE 'A'
A-8	100	10.0	9.8	0.90	0.196	0.18	1.73	DRAINS TO STORM LINE 'A'
<b>SUBTOTAL - A</b>					<b>3.049</b>	<b>2.74</b>	<b>26.89</b>	<b>STORM LINE 'A'</b>
B-1	100	10.0	9.8	0.90	0.381	0.34	3.36	DRAINS TO STORM LINE 'B'
B-2	100	10.0	9.8	0.90	0.605	0.54	5.34	DRAINS TO STORM LINE 'B'
B-3	100	10.0	9.8	0.90	0.089	0.08	0.78	DRAINS TO STORM LINE 'B'
B-4	100	10.0	9.8	0.90	0.325	0.29	2.87	DRAINS TO STORM LINE 'B'
B-5	100	10.0	9.8	0.90	0.687	0.62	6.06	DRAINS TO STORM LINE 'B'
<b>SUBTOTAL - B</b>					<b>2.087</b>	<b>1.88</b>	<b>18.41</b>	<b>STORM LINE 'B'</b>
C-1	100	10.0	9.8	0.90	0.368	0.33	3.24	DRAINS TO STORM LINE 'C' - BYPASSES POND
C-2	100	10.0	9.8	0.90	0.185	0.17	1.63	DRAINS TO STORM LINE 'C' - BYPASSES POND
<b>SUBTOTAL - C</b>					<b>0.553</b>	<b>0.50</b>	<b>4.87</b>	<b>STORM LINE 'C' - BYPASSES POND</b>
OS-1	100	10.0	9.8	0.90	3.115	2.80	27.47	ONSITE - DRAINS TO POND
OS-2	100	10.0	9.8	0.80	0.194	0.16	1.52	OFFSITE - ALLOWED TO BYPASS POND
OS-3	100	10.0	9.8	0.80	0.165	0.13	1.29	ONSITE - ALLOWED TO BYPASS POND
OS-4	100	10.0	9.8	0.80	0.161	0.13	1.26	ONSITE - ALLOWED TO BYPASS POND
OS-5	100	10.0	9.8	0.90	0.170	0.15	1.50	ONSITE - DRAINS TO POND
<b>SUBTOTAL</b>					<b>3.805</b>	<b>3.37</b>	<b>33.05</b>	