

# OFFICE BUILDING SITE DEVELOPMENT

1.082 ACRES OF LAND BEING LOT 6, BLOCK A OF TEMUNOVIC ADDITION, AN ADDITION TO THE CITY OF ROCKWALL, ROCKWALL COUNTY, TEXAS

**STORAGE CALCULATIONS (100 YR RAINFALL EVENT)**  
 CITY STANDARD RAINFALL INTENSITY-FIGURE 1  
 FOR 100 YEAR STORM FREQUENCY

ALLOWABLE RELEASE RATE EQUAL TO THE 100-YEAR PEAK RUNOFF RATE PRIOR TO SITE DEVELOPMENT  
 BYPASS RUNOFF = 0.97 CFS  
 ALLOWABLE RUNOFF FROM UNDERGROUND STORAGE = 3.41CFS - 0.97 CFS = 2.44 CFS  
 TOTAL DETAINED AREA= 0.97 ACRES (DRAINAGE AREA "B")  
 DISCHARGE FROM UNDERGROUND STORAGE: 2.42 CFS (REFER ORIFICE CALCULATIONS THIS SHEET)

**STORM DURATION DATA & DETENTION POND SYSTEM CALCULATIONS**

TIME (Min)	C x CI	I <sub>10</sub> (10-Year)	TOTAL AREA (Acres)	Q (CFS)	INFLOW (CF)	OUTFLOW (CF)	STORAGE (CF)
10	0.90	9.00	0.97	7.86	4,714	1,308	3,406
20	0.90	7.50	0.97	6.55	7,857	1,962	5,895
30	0.90	6.10	0.97	5.33	9,588	2,616	6,970
40	0.90	5.20	0.97	4.54	10,885	3,270	7,615
50	0.90	4.50	0.97	3.93	11,786	3,924	7,862
60	0.90	3.90	0.97	3.40	12,257	4,578	7,679
70	0.90	3.70	0.97	3.23	13,566	5,232	8,334
80	0.90	3.50	0.97	3.06	14,686	5,886	8,799
90	0.90	3.30	0.97	2.89	15,567	6,540	9,017
100	0.90	3.00	0.97	2.62	15,714	7,194	8,520
110	0.90	2.90	0.97	2.53	16,709	7,848	8,861

**REQUIRED STORAGE VOLUME SUMMARY:**  
 REQUIRED STORAGE VOLUME= INFLOW-OUTFLOW  
 INFLOW= STORM DURATION X RESPECTIVE PEAK DISCHARGE X 60 SEC./MIN  
 OUTFLOW= HALF OF THE RESPECTIVE INFLOW DURATION X CONTROL RELEASE DISCHARGE X 60 SEC./MIN  
 50 YEAR STORM EVENT @ 80 MIN.  
 INFLOW= 0.9 X 0.97 X 3.3 X 60 = 16,567 CF  
 OUTFLOW= 0.5 X 2.18 X 100 X 60 = 6,540 CF  
 REQUIRED DETENTION SYSTEM STORAGE CAPACITY = INFLOW-OUTFLOW= 16,567-6,540= 9,017 CF  
 PROVIDED VOLUME (691 L.F. 48" HDPE & 184 L.F. 36" RCP): 9,978 CF

**STORAGE CALCULATIONS (25 YR RAINFALL EVENT)**  
 CITY STANDARD RAINFALL INTENSITY-FIGURE 1  
 FOR 25 YEAR STORM FREQUENCY

DISCHARGE FROM UNDERGROUND STORAGE: 1.94 CFS (REFER ORIFICE CALCULATIONS THIS SHEET)  
 TOTAL DETAINED AREA= 0.97 ACRES (DRAINAGE AREAS "B")

**STORM DURATION DATA & DETENTION POND SYSTEM CALCULATIONS**

TIME (Min)	C x CI	I <sub>25</sub> (25-Year)	TOTAL AREA (Acres)	Q (CFS)	INFLOW (CF)	OUTFLOW (CF)	STORAGE (CF)
10	0.90	8.30	0.97	7.25	4,348	1,164	3,184
20	0.90	6.80	0.97	5.76	6,914	1,748	5,166
30	0.90	5.50	0.97	4.80	8,643	2,328	6,315
40	0.90	4.60	0.97	4.02	9,638	2,910	6,728
50	0.90	4.00	0.97	3.48	10,478	3,492	6,984
60	0.90	3.50	0.97	3.06	11,000	4,074	6,926
70	0.90	3.30	0.97	2.88	12,100	4,656	7,444
80	0.90	3.10	0.97	2.71	12,990	5,238	7,752
90	0.90	2.90	0.97	2.53	13,671	5,820	7,851
100	0.90	2.70	0.97	2.38	14,143	6,402	7,741
110	0.90	2.50	0.97	2.18	14,435	6,984	7,451

**REQUIRED STORAGE VOLUME SUMMARY:**  
 REQUIRED STORAGE VOLUME= INFLOW-OUTFLOW  
 INFLOW= STORM DURATION X RESPECTIVE PEAK DISCHARGE X 60 SEC./MIN  
 OUTFLOW= HALF OF THE RESPECTIVE INFLOW DURATION X CONTROL RELEASE DISCHARGE X 60 SEC./MIN  
 25 YEAR STORM EVENT @ 80 MIN.  
 INFLOW= 0.9 X 2.90 X 0.97 X 80 X 60 = 10,057 CF  
 OUTFLOW= 0.5 X 1.94 X 100 X 60 = 5,820 CF  
 REQUIRED DETENTION SYSTEM STORAGE CAPACITY = INFLOW-OUTFLOW= 10,057-5,820= 4,237 CF  
 PROVIDED VOLUME (691 L.F. 48" HDPE & 184 L.F. 36" RCP): 9,978 CF

**STORAGE CALCULATIONS (10 YR RAINFALL EVENT)**  
 CITY STANDARD RAINFALL INTENSITY-FIGURE 1  
 FOR 10 YEAR STORM FREQUENCY

DISCHARGE FROM UNDERGROUND STORAGE: 1.53 CFS (REFER ORIFICE CALCULATIONS THIS SHEET)  
 TOTAL DETAINED AREA= 0.97 ACRES (DRAINAGE AREAS "B")

**STORM DURATION DATA & DETENTION POND SYSTEM CALCULATIONS**

TIME (Min)	C x CI	I <sub>10</sub> (10-Year)	TOTAL AREA (Acres)	Q (CFS)	INFLOW (CF)	OUTFLOW (CF)	STORAGE (CF)
10	0.90	8.00	0.97	6.88	4,190	918	3,272
20	0.90	6.70	0.97	5.66	5,971	1,377	4,594
30	0.90	5.50	0.97	4.80	7,071	1,836	5,235
40	0.90	4.60	0.97	4.02	7,962	2,295	5,667
50	0.90	3.90	0.97	3.48	8,643	2,754	5,889
60	0.90	3.50	0.97	3.06	9,114	3,213	5,901
70	0.90	3.30	0.97	2.88	9,533	3,672	5,861
80	0.90	3.10	0.97	2.71	10,067	4,131	5,936
90	0.90	2.90	0.97	2.53	10,371	4,590	5,781
100	0.90	2.70	0.97	2.38	10,476	5,049	5,427
110	0.90	2.50	0.97	2.18	10,371	5,508	4,863

**REQUIRED STORAGE VOLUME SUMMARY:**  
 REQUIRED STORAGE VOLUME= INFLOW-OUTFLOW  
 INFLOW= STORM DURATION X RESPECTIVE PEAK DISCHARGE X 60 SEC./MIN  
 OUTFLOW= HALF OF THE RESPECTIVE INFLOW DURATION X CONTROL RELEASE DISCHARGE X 60 SEC./MIN  
 10 YEAR STORM EVENT @ 80 MIN.  
 INFLOW= 0.9 X 2.40 X 0.97 X 80 X 60 = 10,057 CF  
 OUTFLOW= 0.5 X 1.53 X 100 X 60 = 4,131 CF  
 REQUIRED DETENTION SYSTEM STORAGE CAPACITY = INFLOW-OUTFLOW= 10,057-4,131= 5,926 CF  
 PROVIDED VOLUME (691 L.F. 48" HDPE & 184 L.F. 36" RCP): 9,978 CF

**STORAGE CALCULATIONS (5 YR RAINFALL EVENT)**  
 CITY STANDARD RAINFALL INTENSITY-FIGURE 1  
 FOR 5 YEAR STORM FREQUENCY

DISCHARGE FROM UNDERGROUND STORAGE: 1.37 CFS (REFER ORIFICE CALCULATIONS THIS SHEET)  
 TOTAL DETAINED AREA= 0.97 ACRES (DRAINAGE AREAS "B")

**STORM DURATION DATA & DETENTION POND SYSTEM CALCULATIONS**

TIME (Min)	C x CI	I <sub>5</sub> (5-Year)	TOTAL AREA (Acres)	Q (CFS)	INFLOW (CF)	OUTFLOW (CF)	STORAGE (CF)
10	0.90	6.90	0.97	6.02	3,614	822	2,792
20	0.90	5.60	0.97	4.97	4,938	1,233	3,705
30	0.90	4.50	0.97	4.07	5,238	1,644	3,594
40	0.90	3.90	0.97	3.40	5,914	2,055	3,859
50	0.90	3.30	0.97	2.88	6,333	2,466	3,867
60	0.90	2.90	0.97	2.44	6,914	2,877	4,037
70	0.90	2.60	0.97	2.18	7,333	3,288	4,045
80	0.90	2.20	0.97	1.75	7,851	3,699	4,152
90	0.90	1.90	0.97	1.68	8,270	4,110	4,160
100	0.90	1.70	0.97	1.48	8,505	4,521	3,984
110	0.90	1.50	0.97	1.31	8,643	4,932	3,711

**REQUIRED STORAGE VOLUME SUMMARY:**  
 REQUIRED STORAGE VOLUME= INFLOW-OUTFLOW  
 INFLOW= STORM DURATION X RESPECTIVE PEAK DISCHARGE X 60 SEC./MIN  
 OUTFLOW= HALF OF THE RESPECTIVE INFLOW DURATION X CONTROL RELEASE DISCHARGE X 60 SEC./MIN  
 5 YEAR STORM EVENT @ 80 MIN.  
 INFLOW= 0.9 X 2.5 X 0.97 X 80 X 60 = 7,857 CF  
 OUTFLOW= 0.5 X 1.37 X 100 X 60 = 2,877 CF  
 REQUIRED DETENTION SYSTEM STORAGE CAPACITY = INFLOW-OUTFLOW= 7,857-2,877= 4,980 CF  
 PROVIDED VOLUME (691 L.F. 48" HDPE & 184 L.F. 36" RCP): 9,978 CF

**STORAGE CALCULATIONS (10 YR RAINFALL EVENT)**  
 CITY STANDARD RAINFALL INTENSITY-FIGURE 1  
 FOR 10 YEAR STORM FREQUENCY

DISCHARGE FROM UNDERGROUND STORAGE: 1.53 CFS (REFER ORIFICE CALCULATIONS THIS SHEET)  
 TOTAL DETAINED AREA= 0.97 ACRES (DRAINAGE AREAS "B")

**STORM DURATION DATA & DETENTION POND SYSTEM CALCULATIONS**

TIME (Min)	C x CI	I <sub>10</sub> (10-Year)	TOTAL AREA (Acres)	Q (CFS)	INFLOW (CF)	OUTFLOW (CF)	STORAGE (CF)
10	0.90	8.00	0.97	6.88	4,190	918	3,272
20	0.90	6.70	0.97	5.66	5,971	1,377	4,594
30	0.90	5.50	0.97	4.80	7,071	1,836	5,235
40	0.90	4.60	0.97	4.02	7,962	2,295	5,667
50	0.90	3.90	0.97	3.48	8,643	2,754	5,889
60	0.90	3.50	0.97	3.06	9,114	3,213	5,901
70	0.90	3.30	0.97	2.88	9,533	3,672	5,861
80	0.90	3.10	0.97	2.71	10,067	4,131	5,936
90	0.90	2.90	0.97	2.53	10,371	4,590	5,781
100	0.90	2.70	0.97	2.38	10,476	5,049	5,427
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 10 YEAR STORM EVENT @ 80 MIN.  
 INFLOW= 0.9 X 2.40 X 0.97 X 80 X 60 = 10,057 CF  
 OUTFLOW= 0.5 X 1.53 X 100 X 60 = 4,131 CF  
 REQUIRED DETENTION SYSTEM STORAGE CAPACITY = INFLOW-OUTFLOW= 10,057-4,131= 5,926 CF  
 PROVIDED VOLUME (691 L.F. 48" HDPE & 184 L.F. 36" RCP): 9,978 CF

**ORIFICE EQUATION**  
 $Q = CxAx(2gxH)^{1/2}$   
 WHERE  
 Q = RATE OF DISCHARGE (FT<sup>3</sup>/S)  
 A = ORIFICE AREA (FT<sup>2</sup>)  
 C = ORIFICE COEFFICIENT (USUALLY ABOUT 0.6)  
 g = GRAVITATIONAL CONSTANT (32.2 FT/S<sup>2</sup>)  
 H = DEPTH OF WATER ABOVE THE CENTROID OF THE ORIFICE (FT)

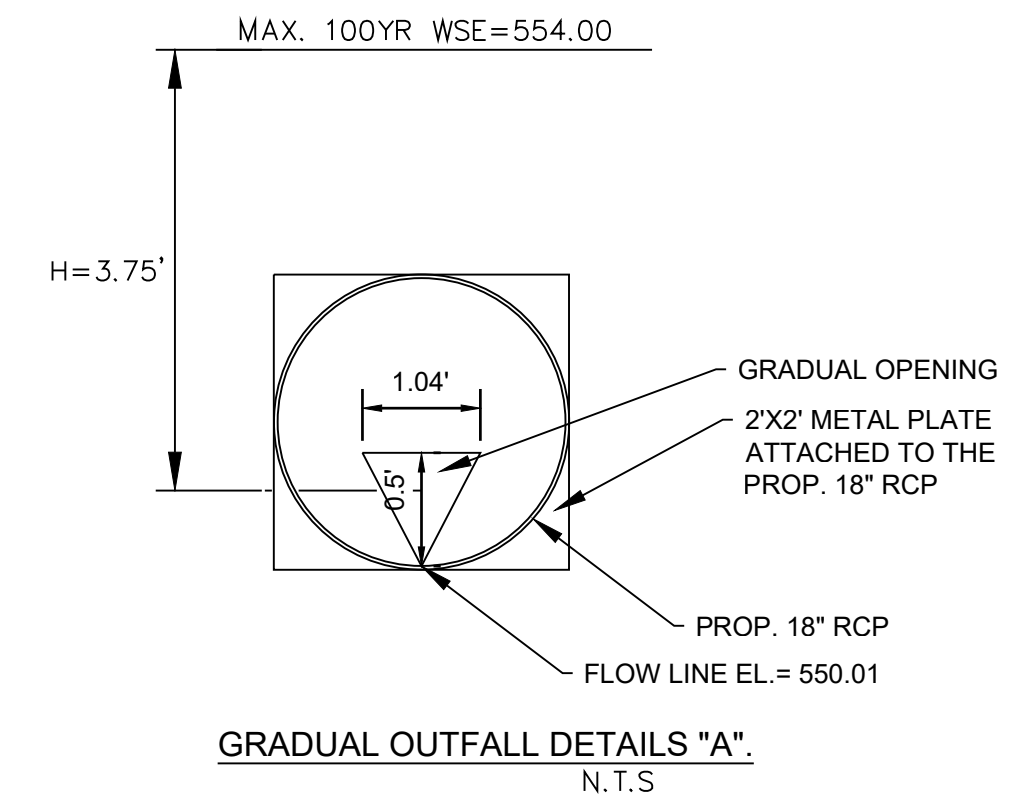
**100 YRS ORIFICE CALCULATIONS FOR SURFACE DETENTION POND**  
 USING ORIFICE EQUATION:  
 Q=2.42 CFS  
 H (AVG. DEPTH OF WATER)= 3.75 FT  
 $A = \frac{Q}{C \times (2gxH)^{1/2}}$   
 $= \frac{2.42}{0.6 \times (2 \times 32.2 \times 3.75)^{1/2}}$   
 $= 0.26 \text{ FT}^2$   
 AREA PROVIDED= 0.26 S.F.

**50 YRS ORIFICE CALCULATIONS FOR SURFACE DETENTION POND**  
 USING ORIFICE EQUATION:  
 H (AVG. DEPTH OF WATER)= 3.05 FT  
 $Q = CxAx(2gxH)^{1/2}$   
 $Q = 0.6 \times 0.26 \times (2 \times 32.2 \times 3.05)^{1/2}$   
 Q = 2.18 CFS

**25 YRS ORIFICE CALCULATIONS FOR SURFACE DETENTION POND**  
 USING ORIFICE EQUATION:  
 H (AVG. DEPTH OF WATER)= 2.40 FT  
 $Q = CxAx(2gxH)^{1/2}$   
 $Q = 0.6 \times 0.26 \times (2 \times 32.2 \times 2.4)^{1/2}$   
 Q = 1.94 CFS

**10 YRS ORIFICE CALCULATIONS FOR SURFACE DETENTION POND**  
 USING ORIFICE EQUATION:  
 H (AVG. DEPTH OF WATER)= 1.50 FT  
 $Q = CxAx(2gxH)^{1/2}$   
 $Q = 0.6 \times 0.26 \times (2 \times 32.2 \times 0.50)^{1/2}$   
 Q = 1.53 CFS

**5 YRS ORIFICE CALCULATIONS FOR SURFACE DETENTION POND**  
 USING ORIFICE EQUATION:  
 H (AVG. DEPTH OF WATER)= 1.2 FT  
 $Q = CxAx(2gxH)^{1/2}$   
 $Q = 0.6 \times 0.26 \times (2 \times 32.2 \times 0.47)^{1/2}$   
 Q = 1.37 CFS



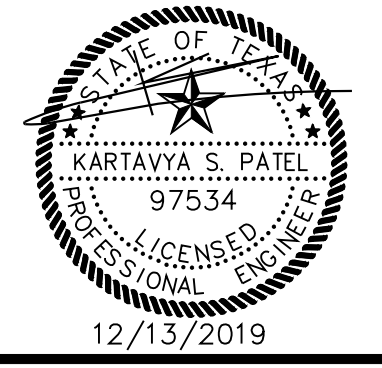
"ALL RESPONSIBILITY FOR ADEQUACY OF DESIGN REMAINS WITH THE DESIGN ENGINEER. THE CITY OF ROCKWALL, IN REVIEWING AND RELEASING PLANS FOR CONSTRUCTION, ASSUMES NO RESPONSIBILITY FOR ADEQUACY OR ACCURACY OF DESIGN."

**DETENTION STAGE VS STORAGE TABLE**

	ELEVATION (FT)	STORAGE (CF)
100YR	554.00	9,834
50YR	553.31	9,017
25YR	552.66	7,851
10YR	551.76	5,926
5YR	551.46	4,980

AS-BUILT DRAWINGS:  
 TO THE BEST OF OUR KNOWLEDGE TRIANGLE ENGINEERING LLC., HEREBY STATES THAT THIS PLAN IS AS-BUILT. THE INFORMATION PROVIDED IS BASED ON SURVEYING AT THE SITE AND INFORMATION PROVIDED BY THE CONTRACTOR.  
 KARTAVYA S. PATEL, P.E. NO. 97534

NO.	DATE	DESCRIPTION	BY
1	12/13/2019	AS-BUILT RECORD DRAWING	KP



**RECORD DRAWING**

CASE # SP2017-023  
 DETENTION CALCULATIONS  
 OFFICE BUILDING  
 1306 SUMMER LEE DRIVE  
 CITY OF ROCKWALL  
 ROCKWALL COUNTY, TEXAS

**TRIANGLE ENGINEERING LLC**  
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Planning | Civil Engineering | Construction Management

DESIGN/DRAWN	DATE	SCALE	PROJECT NO.	SHEET NO.
KP	DS	07/04/17	SEC. SCALE BAR	018-17

**6.2**

TX PE FIRM #11525