100 YR STORM

100 YEAR 60" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	60.00
AREA OF PIPE (SF)	19.63
LENGTH OF PIPE (FT)	2360.00
PIPE AREA ITERATIONS (GIVEN d< RADIUS)	
INPUT d (ft)	2.40
h = d	2.40
ø = 2arccos((r-h)/r)	3.06
K = (r^2(Ø-sin(Ø)))/2	9.32
A = ∏r^2 - K	9.32
PROVIDED VOLUME (60 in. PIPE)	21989.56

100 YEAR 48" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	48.00
AREA OF PIPE (SF)	12.57
LENGTH OF PIPE (FT)	538.17
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	2.40
h = 2r-d	1.60
ø = 2arccos((r-h)/r)	2.74
K = (r^2(Ø-sin(Ø)))/2	4.69
A = ∏r^2 - K	7.87
PROVIDED VOLUME (48 in. PIPE)	4236.72

100YR WSEL

545.97+2.40 = 548.37

100 YEAR 36" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	36.00
AREA OF PIPE (SF)	7.07
LENGTH OF PIPE (FT)	551.75
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	2.40
h = 2r-d	0.60
ø = 2arccos((r-h)/r)	1.85
K = (r^2(Ø-sin(Ø)))/2	1.01
A = ∏r^2 - K	6.06
PROVIDED VOLUME (36 in. PIPE)	3344.80

100 YEAR 30" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	30.00
AREA OF PIPE 30 in. (SF)	4.91
LENGTH OF PIPE (FT)	401.00
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	2.40
h = 2r-d	0.10
ø = 2arccos((r-h)/r)	0.81
K = (r^2(Ø-sin(Ø)))/2	0.07
A = ∏r^2 - K	4.84
PROVIDED VOLUME (30 in. PIPE)	1941.99

100 YEAR 24" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	24.00
AREA OF PIPE 24 in. (SF)	3.14
LENGTH OF PIPE (FT)	288.00
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	2.00
h = 2r-d	0.00
ø = 2arccos((r-h)/r)	0.00
K = (r^2(Ø-sin(Ø)))/2	0.00
A = ∏r^2 - K	3.14
PROVIDED VOLUME (24 in. PIPE)	904.78

100 YEAR DETENTION VOLUME REQUIRED (CF)	*32,322.87*
TOTAL DETENTION VOLUME PROVIDED (CF)	***32417.85***

WEIR CALCULATION		FL= 1.97
Equation: Q = Cd*B*H^1.5		
Q =	1.27 ft³/sec	
Cd =	3.32	
H =	0.43 ft	
B =	16.25 in	

WEIR CALCULATION		FL= 1.68
Equation: Q = Cd*B*H^1.5		
Q =	0.69 ft³/sec	
Cd =	3.32	
H =	0.29 ft	
B =	16.00 in	

WEIR CALCULATION		FL= 1.1
Equation: Q = Cd*B*H^1.5		
Q =	2.80 ft³/sec	
Cd =	3.32	
H =	0.58 ft	
B =	22.90 in	

RECTANGULAR

ORIFICE CALCULATION		
Equation: Q = Cd*A*((2*g*H)^0.5)		FL= 0
Q =	3.53 ft³/sec	
Cd =	0.62	
g =	32.20 ft/sec²	
H =	2.24 ft	
A = BH	0.47 ft²	
B =	17.30 in	
H=	3.95 in	

100YR Qallowable = 8.29 cfs

Q total = 3.53+2.80+0.69+1.27 = 8.29 cfs

25 YR STORM

25 YEAR 60" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	60.00
AREA OF PIPE (SF)	19.63
LENGTH OF PIPE (FT)	2360.00
PIPE AREA ITERATIONS (GIVEN d< RADIUS)	
INPUT d (ft)	1.97
h = d	1.97
ø = 2arccos((r-h)/r)	2.71
K = (r^2(Ø-sin(Ø)))/2	7.19
A = K	7.19
PROVIDED VOLUME (48 in. PIPE)	16962.41

25 YEAR 48" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	48.00
AREA OF PIPE (SF)	12.57
LENGTH OF PIPE (FT)	538.17
PIPE AREA ITERATIONS (GIVEN d< RADIUS)	
INPUT d (ft)	1.97
h = d	1.97
ø = 2arccos((r-h)/r)	3.11
K = (r^2(Ø-sin(Ø)))/2	6.16
A = K	6.16
PROVIDED VOLUME (48 in. PIPE)	3316.84

25YR WSEL

545.97+1.97 = 547.94

25 YEAR 36" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	36.00
AREA OF PIPE (SF)	7.07
LENGTH OF PIPE (FT)	551.75
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	1.97
h = 2r-d	1.03
ø = 2arccos((r-h)/r)	2.50
K = (r^2(Ø-sin(Ø)))/2	2.15
A = ∏r^2 - K	4.92
PROVIDED VOLUME (36 in. PIPE)	2715.09

25 YEAR 30" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	30.00
AREA OF PIPE 30 in. (SF)	4.91
LENGTH OF PIPE (FT)	401.00
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	1.97
h = 2r-d	0.53
ø = 2arccos((r-h)/r)	1.91
K = (r^2(Ø-sin(Ø)))/2	0.76
A = ∏r^2 - K	4.15
PROVIDED VOLUME (30 in. PIPE)	1663.82

25 YEAR 24" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	24.00
AREA OF PIPE 24 in. (SF)	3.14
LENGTH OF PIPE (FT)	288.00
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	1.97
h = 2r-d	0.03
ø = 2arccos((r-h)/r)	0.49
K = (r^2(Ø-sin(Ø)))/2	0.01
A = ∏r^2 - K	3.13
PROVIDED VOLUME (30 in. PIPE)	901.97

25 YEAR DETENTION VOLUME REQUIRED (CF)	*25,489.77*
TOTAL DETENTION VOLUME PROVIDED (CF)	***25560.14***

WEIR CALCULATION		FL= 1.68
Equation: Q = Cd*B*H^1.5		
Q =	0.69 ft³/sec	
Cd =	3.32	
H =	0.29 ft	
B =	16.00 in	

WEIR CALCULATION		FL= 1.1
Equation: Q = Cd*B*H^1.5		
Q =	2.80 ft³/sec	
Cd =	3.32	
H =	0.58 ft	
B =	22.90 in	

RECTANGULAR

ORIFICE CALCULATION		
Equation: Q = Cd*A*((2*g*H)^0.5)		FL= 0
Q =	3.17 ft³/sec	
Cd =	0.62	
g =	32.20 ft/sec²	
H =	1.81 ft	
A = BH	0.47 ft²	
B =	17.30 in	
H=	3.95 in	

25YR Qallowable = 6.68 cfs

Qtotal = 3.17+2.80+0.69 = 6.66 cfs

10 YR STORM

10 YEAR 60" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	60.00
AREA OF PIPE (SF)	19.63
LENGTH OF PIPE (FT)	2360.00
PIPE AREA ITERATIONS (GIVEN d<RADIUS)	
INPUT d (ft)	1.68
h = d	1.68
ø = 2arccos((r-h)/r)	2.47
K = (r^2(Ø-sin(Ø)))/2	5.79
A = K	5.79
PROVIDED VOLUME (48 in. PIPE)	13669.66

10 YEAR 48" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	48.00
AREA OF PIPE (SF)	12.57
LENGTH OF PIPE (FT)	538.17
PIPE AREA ITERATIONS (GIVEN d< RADIUS)	
INPUT d (ft)	1.68
h = d	1.68
ø = 2arccos((r-h)/r)	2.82
K = (r^2(Ø-sin(Ø)))/2	5.01
A = K	5.01
PROVIDED VOLUME (48 in. PIPE)	2695.51

10YR WSEL

545.97+1.68 = 547.65

10 YEAR 36" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	36.00
AREA OF PIPE (SF)	7.07
LENGTH OF PIPE (FT)	551.75
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	1.68
h = 2r-d	1.32
ø = 2arccos((r-h)/r)	2.90
K = (r^2(Ø-sin(Ø)))/2	3.00
A = ∏r^2 - K	4.07
PROVIDED VOLUME (36 in. PIPE)	2247.27

10 YEAR 30" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	30.00
AREA OF PIPE 30 in. (SF)	4.91
LENGTH OF PIPE (FT)	401.00
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	1.68
h = 2r-d	0.82
ø = 2arccos((r-h)/r)	2.44
K = (r^2(Ø-sin(Ø)))/2	1.40
A = ∏r^2 - K	3.51
PROVIDED VOLUME (30 in. PIPE)	1406.62

10 YEAR 24" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	24.00
AREA OF PIPE 24 in. (SF)	3.14
LENGTH OF PIPE (FT)	288.00
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	1.68
h = 2r-d	0.32
ø = 2arccos((r-h)/r)	1.65
K = (r^2(Ø-sin(Ø)))/2	0.32
A = ∏r^2 - K	2.82
PROVIDED VOLUME (30 in. PIPE)	811.34

10 YEAR DETENTION VOLUME REQUIRED (CF)	*20,745.48*
TOTAL DETENTION VOLUME PROVIDED (CF)	***20830.40***

WEIR CALCULATION		FL= 1.1
Equation: Q = Cd*B*H^1.5		
Q =	2.80 ft³/sec	
Cd =	3.32	
H =	0.58 ft	
B =	22.90 in	

RECTANGULAR

ORIFICE CALCULATION		
Equation: Q = Cd*A*((2*g*H)^0.5)		FL= 0
Q =	2.91 ft³/sec	
Cd =	0.62	
g =	32.20 ft/sec²	
H =	1.52 ft	
A = BH	0.47 ft²	
B =	17.30 in	
H=	3.95 in	

10YR Qallowable = 5.84 cfs

Qtotal = 2.91+2.80 = 5.71 cfs

5 YR STORM

5 YEAR 60" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	60.00
AREA OF PIPE (SF)	19.63
LENGTH OF PIPE (FT)	2360.00
PIPE AREA ITERATIONS (GIVEN d< RADIUS)	
INPUT d (ft)	1.56
h = d	1.56
ø = 2arccos((r-h)/r)	2.37
K = (r^2(Ø-sin(Ø)))/2	5.23
A = K	5.23
PROVIDED VOLUME (48 in. PIPE)	12344.45

5 YEAR 48" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	48.00
AREA OF PIPE (SF)	12.57
LENGTH OF PIPE (FT)	538.17
PIPE AREA ITERATIONS (GIVEN d< RADIUS)	
INPUT d (ft)	1.56
h = d	1.56
ø = 2arccos((r-h)/r)	2.70
K = (r^2(Ø-sin(Ø)))/2	4.54
A = K	4.54
PROVIDED VOLUME (48 in. PIPE)	2441.94

5YR WSEL

545.97+1.56 = 547.53

5 YEAR 36" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	36.00
AREA OF PIPE (SF)	7.07
LENGTH OF PIPE (FT)	551.75
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	1.56
h = 2r-d	1.44
ø = 2arccos((r-h)/r)	3.06
K = (r^2(Ø-sin(Ø)))/2	3.35
A = ∏r^2 - K	3.71
PROVIDED VOLUME (36 in. PIPE)	2049.33

5 YEAR 30" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	30.00
AREA OF PIPE 30 in. (SF)	4.91
LENGTH OF PIPE (FT)	401.00
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	1.56
h = 2r-d	0.94
ø = 2arccos((r-h)/r)	2.64
K = (r^2(Ø-sin(Ø)))/2	1.69
A = ∏r^2 - K	3.22
PROVIDED VOLUME (30 in. PIPE)	1291.76

5 YEAR 24" PIPE STORAGE CALCULATION	
PIPE DIAMETER (in.)	24.00
AREA OF PIPE 24 in. (SF)	3.14
LENGTH OF PIPE (FT)	288.00
PIPE AREA ITERATIONS (GIVEN d> RADIUS)	
INPUT d (ft)	1.56
h = 2r-d	0.44
ø = 2arccos((r-h)/r)	1.95
K = (r^2(Ø-sin(Ø)))/2	0.51
A = ∏r^2 - K	2.63
PROVIDED VOLUME (30 in. PIPE)	757.19

5 YEAR DETENTION VOLUME REQUIRED (CF)	*18,874.77*
TOTAL DETENTION VOLUME PROVIDED (CF)	***18884.67***

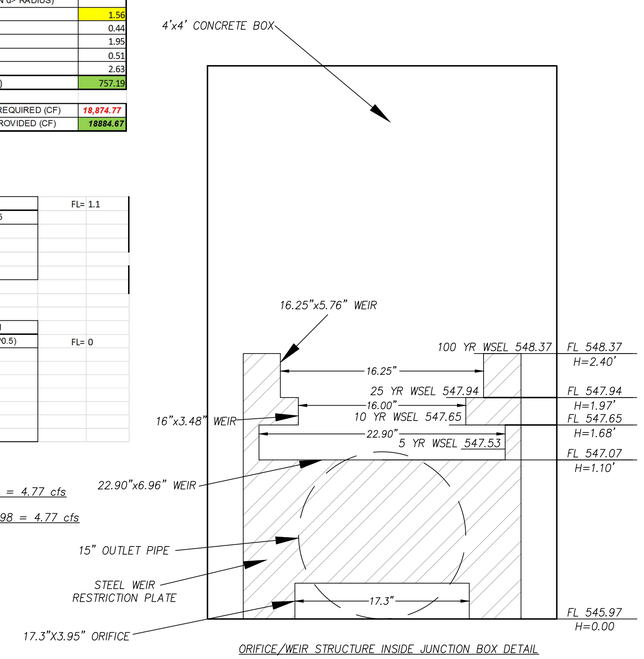
WEIR CALCULATION		FL= 1.1
Equation: Q = Cd*B*H^1.5		
Q =	1.98 ft³/sec	
Cd =	3.32	
H =	0.46 ft	
B =	22.90 in	

RECTANGULAR

ORIFICE CALCULATION		
Equation: Q = Cd*A*((2*g*H)^0.5)		FL= 0
Q =	2.79 ft³/sec	
Cd =	0.62	
g =	32.20 ft/sec²	
H =	1.40 ft	
A = BH	0.47 ft²	
B =	17.30 in	
H=	3.95 in	

5YR Qallowable = 4.77 cfs

Qtotal = 2.79+1.98 = 4.77 cfs



ORIFICE/WEIR STRUCTURE INSIDE JUNCTION BOX DETAIL

N.T.S

RECORD DRAWING

Revision	Date	Description

Owner:
Rockwall Rental Properties
PO Box 818 • Terrell, Texas 75060

RANDALL NOE
SUBARU
I-30 ROCKWALL, TX

~ Civil Engineer ~
F.C. CUNY CORPORATION
#2 Horizon Court • Ste. 500 • Heath, Texas 75032
Phone: 469-402-7700
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Texas Registered Engineering Firm F-7449

12/5/2019

STATE OF TEXAS
CAMERON A. SLOWN
106317
LICENSED
PROFESSIONAL ENGINEER

Drawn By:	Checked By:
F.C. CUNY	F.C. CUNY
Date: 09/18	Project No.: –

Sheet Title:
Detention Pond Calculations

Scale:	Sheet No.:
1"=40'	10C of 11