HYDROLOGY STUDY

FOR

EL PASO RESTAURANT

1.894 ACRES AT

200 WEST GLORIA SWITCH ROAD IN

CARENCRO, LOUISIANA

IN

LAFAYETTE PARISH, LOUISIANA

By,

Dammon Engineering, Inc.

554 Old Spanish Trail

Slidell, LA 70458

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EL PASO RESTAURANT
1.894 ACRES AT
200 WEST GLORIA SWITCH ROAD IN
CARENCRO, LOUISIANA
IN
LAFAYETTE PARISH, LOUISIANA

SITE DESCRIPTION

The project is located at 200 West Gloria Switch Road, Carencro Louisiana. The property is bounded by Evangeline Throughway (Hwy 49) on the East Side, Four Park Road on the West Side and West Gloria Switch Road on the South Side.

The overall lot size of lot 4 is 1.894 Acres. The site will be the new home of a 7000 sq. ft. Mexican restaurant named El Paso.

CURRENT DRAINAGE

The overall drainage ditch in this area is from the north along Hwy 49 to the south between our adjoining properties and under West Gloria Switch Road to the south.

The subject property currently drains from the east (existing concrete parking lot) onto the subject property into a swale and continues west into a 12" CCP and into the existing ditch at the rear of the property.

STUDY METHODOLOGY

The modified rational method was used to determine peak flows for the 10 year storm event for the drainage and retention.

The rainfall distribution was derived from the 1994 Louisiana Department of Transportation and Development hydraulic Manual.

PROPOSED DRAINAGE

The existing street in front of the property currently sheet flows to the west and will be captured in new catch basins in the new driveway entrances. The roof will drain into subsurface drainage and into the catch basins. The parking lot will drain into these catch basins and be retained until discharged in the existing rear drainage ditch. The outflow device is 12" PVC pipe-30 linear feet with a 9" orifice at a slope of 1.4%.

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Detention Requirements

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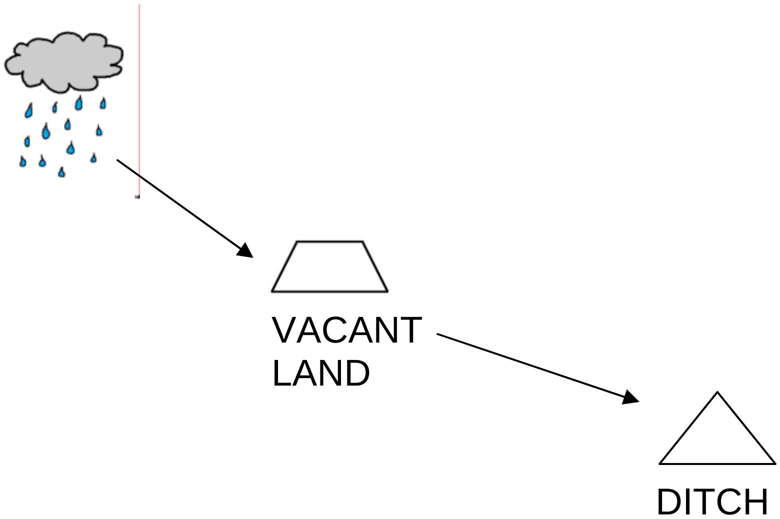
PREDEVELOPMENT



El Paso Restaurant
Lafayette Parish, Louisiana

PROJECT:	EL PASO MEXICAN GRILL
STORMWATER RUN-OFF CALCULATIONS	

Formulas used:

[1] RATIONAL METHOD: Q=Aci

where:

Q=	Peak discharge of watershed in cubic feet per second (cfs) due to maximum storm assumed.
A=	Area of watershed in acres.
c=	Coefficient of run-off [2].
i=	Intensity of rainfall in inches per hour based on concentration time. [3]

[4] TC= $$\frac{\left(L^{0.8}\left(\frac{1000}{c}-9\right)^{0.7}\right)}{(1140(s^{0.5}))}$$

where:

TC=	Time of concentration= time required for rain falling at most remote point to reach discharge point.
c=	Site run-off coefficient based on conditions shown.
s=	Percent slope of overland flow.

PRIOR DEVELOPMENT 10 Year Frequency					
Q_1 = Aci					
Watertight Surfaces		15606	sqft =	0.358	Acres
c(1) =	0.95				
Gravel Surface		8100	sqft =	0.186	Acres
c(2) =	0.25				
Green Space		58784	sqft =	1.349	Acres
c(3) =	0.20				
Summary		82490	sqft =	1.894	Acres
c =	0.35				

Duration (D) = Time of concentration (TC)

where	L =	316	run-off length ft	Elev diff =	1.2
	c =	0.35	run-off coef		
	S =	0.3797	percent slope		
therefore	TC = D =	14.24	minutes		
Expected rainfall intensity	i =	3.14	in/hr		

Q_1 =	2.062	cfs	15% reduction =	1.753	cfs

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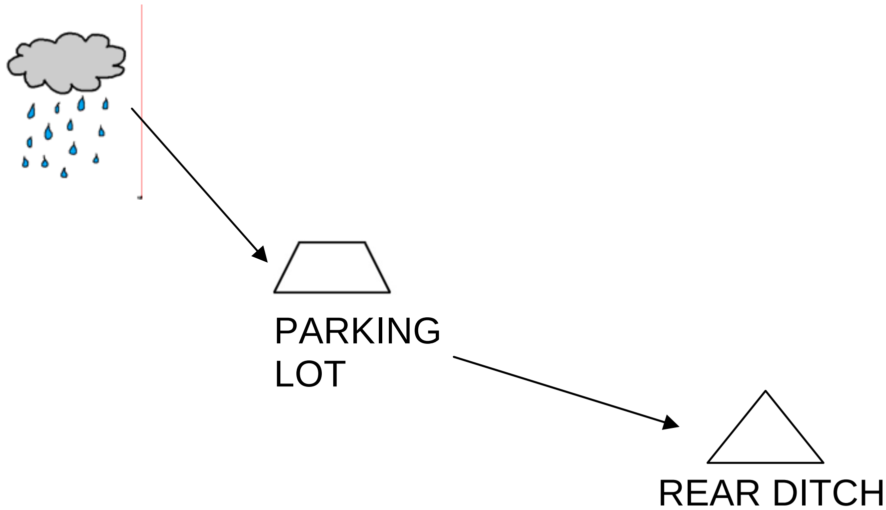
POST DEVELOPMENT



POST DEVELOPMENT
10 Year Frequency

Q_2 = Aci

Watertight Surfaces		59133	sqft =	1.358 Acres
c(1) =	0.95			
Gravel Surface		0	sqft =	0.000 Acres
c(2) =	0.25			
Green Space		23357	sqft =	0.536 Acres
c(3) =	0.20			
Summary		82490	sqft =	1.894 Acres
c =	0.74			

Duration (D) = Time of concentration (TC)

where	L =	215	run-off length ft	Elev diff =	1.1
	c =	0.74	run-off coef		
	S =	0.5116	percent slope		
therefore	TC = D =	7.15	minutes		
Expected rainfall intensity	i =	3.14	in/hr		

Q_2 = 4.386 cfs

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DETENTION REQUIREMENTS

Detention required=Q_2-(Q_1-15%)	2.63	cfs		
One Hour Detention	9480.0	cuft		
	Detention Dimensions	WIDTH	224	feet
		LENGTH	215	feet
		DEPTH	0.20	feet

DISCHARGE END AREA REQUIREMENTS

10 Year Frequency

[5] A= $$\frac{Q}{\left(c\sqrt{(2gh)}\right)}$$

where:	A=	Discharge Area required
	g=	Acceleration of gravity
	c=	Discharge coefficient
	h=	Hydraulic head
	Q=	Flow volume from run-off

Pipe Servicing Site Drainage

Q =	1.753	cfs	h =	0.42	feet
c =	0.62	coefficient	A =	0.544	sqft
g =	32.16	ft/sec/sec			

REQUIRED CONDUIT = 9.99 inch inside diameter

References:

1. Chen, W.F. The Civil Engineering Handbook. 1995. Eq.# 31.1, pg. 1036
2. Seelye, Elwyn E. Data Book for Civil Engineers. Vol.1 1960. Tbl. B, pg. 18-02
3. Seelye, Elwyn E. Data Book for Civil Engineers. Vol.1 1960. Fig.B, pg. 18-01
4. Chen, W.F. The Civil Engineering Handbook. 1995. Tbl. 31.2 Regan Equation (*n*=0.013)
5. Chen, W.F. The Civil Engineering Handbook. 1995. Eq.# 28.32, pg. 969

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100-YEAR EVENT

PROJECT:	EL PASO MEXICAN GRILL
STORMWATER RUN-OFF CALCULATIONS	
Formulas used:	
[1] RATIONAL METHOD: Q=Aci	
where: Q=	Peak discharge of watershed in cubic feet per second (cfs) due to maximum storm assumed.
A=	Area of watershed in acres.
c=	Coefficient of run-off [2].
i=	Intensity of rainfall in inches per hour based on concentration time. [3]
[4] TC=	$$\frac{\left(L^{0.8}\left(\frac{1000}{c}-9\right)^{0.7}\right)}{(1140(s^{0.5}))}$$
where: TC=	Time of concentration= time required for rain falling at most remote point to reach discharge point.
c=	Site run-off coefficient based on conditions shown.
s=	Percent slope of overland flow.

PRIOR DEVELOPMENT

100 Year Frequency

Q_1 = Aci

Watertight Surfaces		15606	sqft =	0.358	Acres
c(1) =	0.95				
Gravel Surface		8100	sqft =	0.186	Acres
c(2) =	0.25				
Green Space		58784	sqft =	1.349	Acres
c(3) =	0.20				
Summary		82490	sqft =	1.894	Acres
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Duration (D) = Time of concentration (TC)

where	L =	316	run-off length ft		Elev diff =	1.2
	c =	0.35	run-off coef			
	S =	0.3797	percent slope			
therefore	TC = D =	14.24	minutes			
Expected rainfall intensity	i =	4.41	in/hr			
	Q_1 =	2.896	cfs	15% reduction =	2.462	cfs

POST DEVELOPMENT 100 Year Frequency					
Q_2 = Aci					
Watertight Surfaces		59133	sqft =	1.358	Acres
c(1) =	0.95				
Gravel Surface		0	sqft =	0.000	Acres
c(2) =	0.25				
Green Space		23357	sqft =	0.536	Acres
c(3) =	0.20				
Summary		82490	sqft =	1.894	Acres
c =	0.74				

Duration (D) = Time of concentration (TC)

where	L =	215	run-off length ft	Elev diff =	1.1
	c =	0.74	run-off coef		
	S =	0.5116	percent slope		
therefore	TC = D =	7.15	minutes		
Expected rainfall intensity	i =	4.41	in/hr		
	Q_2 =	6.160	cfs		

DETENTION REQUIREMENTS				
Detention required=Q_2-(Q_1-15%)	3.70	cfs		
One Hour Detention	13314.3	cuft		
	Detention Dimensions	WIDTH	224	feet
		LENGTH	215	feet
		DEPTH	0.28	feet

DISCHARGE END AREA REQUIREMENTS

100 Year Frequency

[5] A= $$\frac{Q}{(c\sqrt{(2gh)})}$$

where:	A=	Discharge Area required
	g=	Acceleration of gravity
	c=	Discharge coefficient
	h=	Hydraulic head
	Q=	Flow volume from run-off

Pipe Servicing Site Drainage

Q =	2.462	cfs	h =	0.42	feet
c =	0.62	coefficient	A =	0.764	sqft
g =	32.16	ft/sec/sec			

REQUIRED CONDUIT = 11.83 inch inside diameter

References:
1. Chen, W.F. The Civil Engineering Handbook. 1995. Eq.# 31.1, pg. 1036
2. Seelye, Elwyn E. Data Book for Civil Engineers. Vol.1 1960. Tbl. B, pg. 18-02
3. Seelye, Elwyn E. Data Book for Civil Engineers. Vol.1 1960. Fig.B, pg. 18-01
4. Chen, W.F. The Civil Engineering Handbook. 1995. Tbl. 31.2 Regan Equation (n=0.013)
5. Chen, W.F. The Civil Engineering Handbook. 1995. Eq.# 28.32, pg. 969

INTENSITY CALCULATIONS

Table 1

Rainfall Intensity (I) Rainfall-Intensity-Duration-Frequency for Louisiana					
Duration (t) minutes	2 year	10 year	25 year	50 year	100 year
5	6.96	8.06	9.05	9.79	10.65
6	6.69	7.81	8.78	9.51	10.34
7	6.43	7.58	8.53	9.24	10.05
8	6.20	7.36	8.29	8.99	9.77
9	5.99	7.15	8.07	8.76	9.52
10	5.79	6.96	7.86	8.54	9.28
11	5.60	6.78	7.66	8.33	9.05
12	5.43	6.61	7.47	8.13	8.83
13	5.26	6.45	7.30	7.94	8.63
14	5.11	6.30	7.13	7.76	8.44
15	4.96	6.15	6.97	7.59	8.25
16	4.83	6.01	6.82	7.43	8.08
17	4.70	5.88	6.67	7.28	7.91
18	4.58	5.75	6.53	7.13	7.75
19	4.46	5.63	6.40	6.99	7.60
20	4.36	5.52	6.28	6.86	7.46
21	4.25	5.41	6.16	6.73	7.32
22	4.15	5.31	6.04	6.61	7.19
23	4.06	5.21	5.93	6.49	7.06
24	3.97	5.11	5.83	6.38	6.94
25	3.89	5.02	5.72	6.27	6.82
26	3.80	4.93	5.63	6.16	6.71
27	3.73	4.84	5.53	6.06	6.60
28	3.65	4.76	5.44	5.97	6.50
29	3.58	4.68	5.35	5.87	6.39
30	3.51	4.61	5.27	5.78	6.30
31	3.45	4.53	5.19	5.70	6.20
32	3.38	4.46	5.11	5.61	6.11
33	3.32	4.39	5.03	5.53	6.03
34	3.26	4.33	4.96	5.45	5.94
35	3.21	4.26	4.89	5.38	5.86
36	3.15	4.20	4.82	5.30	5.78
37	3.10	4.14	4.75	5.23	5.70
38	3.05	4.08	4.69	5.16	5.63
39	3.00	4.03	4.63	5.09	5.55
40	2.95	3.97	4.56	5.03	5.48
41	2.91	3.92	4.51	4.96	5.42
42	2.86	3.87	4.45	4.90	5.35
43	2.82	3.82	4.39	4.84	5.28

44	2.78	3.77	4.34	4.78	5.22
45	2.74	3.72	4.29	4.73	5.16
46	2.70	3.67	4.23	4.67	5.10
47	2.66	3.63	4.18	4.62	5.04
48	2.62	3.59	4.14	4.57	4.99
49	2.59	3.54	4.09	4.51	4.93
50	2.55	3.50	4.04	4.46	4.88
51	2.52	3.46	4.00	4.42	4.83
52	2.49	3.42	3.95	4.37	4.78
53	2.45	3.38	3.91	4.32	4.73
54	2.42	3.35	3.87	4.28	4.68
55	2.39	3.31	3.83	4.23	4.63
56	2.36	3.27	3.79	4.19	4.58
57	2.33	3.24	3.75	4.15	4.54
58	2.31	3.21	3.71	4.11	4.49
59	2.28	3.17	3.67	4.07	4.45
60	2.25	3.14	3.64	4.03	4.41

The runoff coefficient C The fraction of rainfall which may be expected to become runoff		
Business:		
downtown areas		0.70 to 0.95
neighborhood areas		0.50 to 0.70
Residential:		
single-family areas		0.30 to 0.50
multi units detached		0.40 to 0.60
multi units attached		0.60 to 0.75
residential suburban		0.25 to 0.40
Apartment dwelling areas		0.50 to 0.70
Industrial:		
light areas		0.50 to 0.80
heavy areas		0.60 to 0.90
parks, cemeteries		0.10 to 0.25
playgrounds		.020 to 0.40
unimproved areas		0.10 to 0.30

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