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PETRO LUBE

8/28/14

900 American Rd

STORM WATER DETENTION

EXISTING RUNOFF (DRAINING INTO EXIST. DET. POND)

$$\text{GROSS AREA} = (770' \times 390') = 300,300 \text{ SF} = 6.90 \text{ ACRES}$$

$$\text{BUILDING AREA} = 10,000 \text{ SF} = .23 \text{ ACRES}$$

$$\begin{aligned} \text{PAYEMENT AREA} &= (485' \times 200') + (53' \times \frac{18428'}{2}) + \\ & \quad (30' \times 80') + (120' \times 20') + \frac{(80' \times 87')}{2} + \\ & \quad \frac{(43' \times 20')}{2} + 21,250 \text{ SF} + 14,640 \text{ SF} \\ & \quad + (10' \times 100' \times 2) + (60' \times 20') = 146,019 \text{ SF} \\ & = 3.35 \text{ ACRES} \end{aligned}$$

$$\text{POND AREA} = (280' \times 120') = 33,600 \text{ SF} = .77 \text{ ACRES}$$

$$\text{GRASS AREA} = 6.90 \text{ A} - .23 \text{ A} - 3.35 \text{ A} - .77 \text{ A} = 2.55 \text{ A.}$$

DESIGN FOR 2 YEAR STORM (24 HR. STORM)

$$i = 2.60 \text{ IN/HR (20 MIN.) TABLE OH-1 TR-55 OHIO}$$

$$C_{\text{ROOF}} = .90 \quad C_{\text{PAYEMENT}} = .90 \quad C_{\text{POND}} = 1.0 \quad C_{\text{GRASS}} = .20$$

$$C_{\text{AVG.}} = \frac{(\text{BUILDING } .23 \text{ A} \times .90) + (\text{PAYEMENT } 3.35 \text{ A} \times .90) + (\text{POND } .77 \text{ A} \times 1.0) + (2.55 \text{ A} \times .20)}{6.90 \text{ A.}}$$

$$C_{\text{AVG.}} = .65$$

$$\text{PRE-DEVELOPMENT "C" = .30}$$

$$\text{POST-DEVELOPMENT "C" = .65}$$

$$Q_{2A} = .30 \times 2.60 \text{ IN/HR.} \times 6.90 \text{ A} = 5.38 \text{ CFS.}$$

$$Q_{2B} = .65 \times 2.60 \text{ IN/HR.} \times 6.90 \text{ A.} = 11.66 \text{ CFS.}$$

$$\frac{(Q_{2B} - Q_{2A})}{Q_{2A}} = \frac{11.66 - 5.38}{5.38} = 117\%$$

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CRITICAL STORM (FROM TABLE PAGE 20 OF
NAPOLEON ENGINEERING DEPT. RULES & REGULATIONS
USE 25 YEAR STORM FREQUENCY (24 HR. STORM

$$\begin{aligned}\text{ALLOWABLE RUNOFF} &= .3 \times 2.6 \text{ IN/HR.} \times 6.9 \text{ A} \\ &= 5.38 \text{ CFS.}\end{aligned}$$

EXIST 8" PVC METER LINE WITH 3.5 FT
HEAD (SEE ENCLOSED CALC'S)

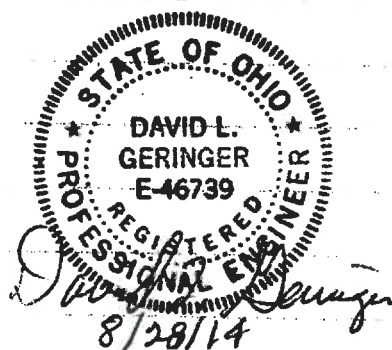
REQUIRED CAPACITY = 31,264 CF

ADD 20% SAFETY FACTOR TO CAPACITY

$$V = 1.20 \times 31,264 \text{ CF} = 37,517 \text{ CF.}$$

FROM PLAN ACTUAL VOLUME = $(275' \times 110') \times 3.5' \text{ DP.}$
= 105,875 CF.

ACTUAL VOLUME OF DETENTION POND IS
105,875 CF. WHICH IS GREATER THAN THE
REQD. VOLUME OF 37,517 CF.



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PETRO LUBE
(NORTH DETENTION AREA)
Detention Design Meter Line Check

8/28/14

Data:

- 1. Length of Meter Line (L) 672 ft.
- 2. Slope of Meter Line (%) 0.1 %
- 3. Size of Meter Line (in.) 8 in.
- 4. Manning's N: PVC = 0.010 0.01
CMP = 0.024
Others = 0.013
- 5. Entrance Coeff. (Ke) 0.5
- 6. Assumed Max. Head (H) 3.5 ft.
- 7. Hydr. Radius (R) 0.167 ft.
- 8. Radius 0.3330 ft.
- 9. Area 0.348 sq. ft.
- 10. Perimeter 2.09 ft.

Assumed Head (H)	$H \times 2g$	$1 + K_e + (29n^2L/R^{4/3})$	V^2	V	Area of Pipe (A)	Flow (Q.)
0.5	32.2	22.78	1.41	1.19	0.348	0.41
1.0	64.4	22.78	2.83	1.68	0.348	0.59
1.5	96.6	22.78	4.24	2.06	0.348	0.72
2.0	128.8	22.78	5.66	2.38	0.348	0.83
2.5	161	22.78	7.07	2.66	0.348	0.93
3.0	193.2	22.78	8.48	2.91	0.348	1.01
3.5	225.4	22.78	9.90	3.15	0.348	1.10
4.0	257.6	22.78	11.31	3.36	0.348	1.17
4.5	289.8	22.78	12.72	3.57	0.348	1.24
5.0	322	22.78	14.14	3.76	0.348	1.31
5.5	354.2	22.78	15.55	3.94	0.348	1.37
6.0	386.4	22.78	16.97	4.12	0.348	1.43
6.5	418.6	22.78	18.38	4.29	0.348	1.49
7.0	450.8	22.78	19.79	4.45	0.348	1.55
7.5	483	22.78	21.21	4.61	0.348	1.60
8.0	515.2	22.78	22.62	4.76	0.348	1.66
8.5	547.4	22.78	24.03	4.90	0.348	0.00
9.0	579.6	22.78	25.45	5.04	0.348	0.00

MAX. FLOW OUT @ 3.5' HEAD

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PETRO LUBE (NORTH DETENTION AREA)

8/28/14

Determination of Design Detention Volume

Data:

- 1. Gross Area (Sq. Ft.) 300300 sq. ft.
- 2. Pavement Area (Sq. Ft.) 146019 sq. ft.
- 3. Building Area (Sq. Ft.) 10000 sq. ft.
- 4. Other Impervious Areas (Sq. Ft.) 33600 sq. ft.
- 5. Total Impervious Area (Sq. Ft.) 156019 sq. ft. (Runoff Coefficient - 0.9) 126375 sq. ft.
- 6. Total Other Impervious Area (Sq. Ft.) 33600 sq. ft. (Runoff Coefficient - 1.0) 33600 sq. ft.
- 7. Net Pervious Area (Sq. Ft.) 110681 sq. ft. (Runoff Coefficient - 0.15) 16602 sq. ft.
- 8. Weighted Runoff coefficient 0.65
- 9. Weighted Runoff coefficient x Area 4.49
- 10. Quantity of Runoff (Qallow.) 5.377 c.f.s.
- 11. Maximum Flow (Qmax.) 1.1 c.f.s.
(Determined by Assumed Max. Head)

Time of Concentration (tc)	Rainfall Intensity (in/hr.)	Weighted Runoff coefficient per Acre	Runoff Quantity (Qin)	Runoff Quantity (Qout)	Qin - Qout	(Qin-Qout) x tc x 60 (cu. ft.)
20.0	4.40	4.49	19.76	1.10	18.66	22387
30.0	3.40	4.49	15.27	1.10	14.17	25499
40.0	2.90	4.49	13.02	1.10	11.92	28610
50.0	2.40	4.49	10.78	1.10	9.68	29028
60.0	2.00	4.49	8.98	1.10	7.88	28368
70.0	1.90	4.49	8.53	1.10	7.43	31210
80.0	1.60	4.49	7.18	1.10	6.08	29203
90.0	1.50	4.49	6.74	1.10	5.64	30429
100.0	1.40	4.49	6.29	1.10	5.19	31116
110.0	1.30	4.49	5.84	1.10	4.74	31264
120.0	1.20	4.49	5.39	1.10	4.29	30874
130.0	1.15	4.49	5.16	1.10	4.06	0
140.0	1.10	4.49	4.94	1.10	3.84	0
150.0	1.05	4.49	4.71	1.10	3.61	0
160.0	1.03	4.49	4.62	1.10	3.52	0
170.0	1.00	4.49	4.49	1.10	3.39	0
180.0	0.98	4.49	4.40	1.10	3.30	0

MAX. VOLUME @ 110 MIN.