TOWMATE, LLC

SITE DRAINAGE REPORT

BY:

DAVIS ENGINEERING
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STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
No. 11089
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3-12-13

This site study is for a proposed commercial business to be located at 15704 East Hwy 12 in Rogers, Arkansas. The site is in Benton County and under the jurisdiction of the Benton County Planning & Environmental Department. The surveyed parcel is 3.913 acres and the parcel number is 18-03384-006.

The site is undeveloped with grass and few trees mainly along the property lines. It is bounded on the south by State Highway 12, on the west by Putman Lane, on the north by a creek and to the east by other commercial highway properties. The site is fairly flat with average slopes of approximately 2 percent.

Soil for the site is Elsah, gravelly alluvium/silty loam to depths of 60" and more. The soil is Hydrologic Soil Group B.

Offsite drainage from the west and north drains to the existing creek. The highway to the south is higher than the site so no runoff crosses the site from the south except from the approximate highway centerline.

Due to the location of this site in the overall watershed being in the lower reaches it is the opinion of the design engineer that stormwater detention is not in the best interest of sound stormwater management. The site is very close to Beaver Lake. It was decided that the focus be on ***stormwater quality***. Therefore, ***bioretention*** basins have been incorporated into the design to help filter and infiltrate the developed runoff.

TowMate Runoff Calcs

Hydrologic Soil Group B — Elsah soils

Tc overland — gravelly alluvium

$T_c = 450' / 2\,fps = 225\,sec = 3.8\,mins$ — <u>use 5 mins</u>

$i_{10} = 7.34$ — Area = 3.9 Acs

<u>Pre-Developed Runoff</u>

$C = 0.20$

$Q = CiA = (0.20)(7.34)(3.9) = \underline{5.74\ cfs}$

<u>Post-Developed Runoff</u>

$C_w = (0.20)(3.3\,Ac) + (0.90)(0.6\,Ac) = 1.20 / 3.913 = 0.$

$Q = CiA = (0.31)(7.34)(3.9) = \underline{8.90\ cfs}$

<u>BASIN to Bio-Retention</u>

0.77 Ac Total — 0.17 Ac Pervious — 0.60 Ac Impervious

$T_c = 5\,mins$ — $C_w = 0.75$

$Q_{pre} = (0.20)(7.34)(0.77) = 1.13\ cfs$

$Q_{post} = (0.75)(7.34)(0.77) = 4.24\ cfs$ — 3.11 cfs increas

LID BIORETENTION DEVICES

The focus here is on infiltration and runoff volume reduction.

Device Information (overwrite data in shaded cells, other cells will be auto

Controlling Area (Drainage Area)
Site Condition
device area
device storage depth (above ground)
infiltration porosity (volume fraction of soil pores)
soil depth
device's total volume (above ground + soils)

Runoff Information (overwrite data in shaded cells, other cells will be auto

Land Use	mixed
CN	90
S	1.11

(a) Rainfall (P) (in/day)	(b) Runoff (Q) (in/day)	(c) Rainfall Volume (cu.ft. / day)	(d) Runoff Volume (cu.ft. / day)	(e) RunoffTreated (cu.ft. / day)	(e)
0.05	0.000	139.72	0.00	0.00	
0.10	0.000	279.45	0.00	0.00	
0.15	0.000	419.17	0.00	0.00	
0.20	0.000	558.89	0.00	0.00	
0.30	0.005	838.34	14.22	14.22	
0.40	0.025	1117.78	68.52	68.52	
0.50	0.056	1397.23	155.25	155.25	
0.60	0.096	1676.68	267.86	267.86	
0.80	0.198	2235.57	552.35	552.35	
1.00	0.320	2794.46	894.96	894.96	
1.25	0.494	3493.07	1380.09	1380.09	
1.50	0.683	4191.69	1909.91	1909.91	
2.00	1.094	5588.92	3057.19	3057.19	
3.00	1.984	8383.38	5544.56	3252.00	
4.00	2.919	11177.83	8157.56	3252.00	
5.00	3.876	13972.29	10832.19	3252.00	
6.00	4.846	16766.75	13541.60	3252.00	

Percent of Total Runoff Infiltrated =

most of the rainfall becomes runoff.

matically calculated)

0.77	acres	=	33533.5 sq.ft.
commercial			
2168	sq.ft.	=	6.5% of the site
12	inches	=	1.00 ft.
0.2	***use 0 if you only want to count above-ground storage*		
18	inches	=	1.5 ft.
2818.4	**cubic ft./day**		

matically calculated)

(f) Cumulative Frequency	(g) Probability/ Frequency	(h) (e) x (g) (cu.ft. / day)	(i) (d) x (g) (cu.ft. / day)	(j) (c) x (g) (cu.ft. / day)
0.259	0.259	0.00	0.00	36.12
0.387	0.128	0.00	0.00	35.82
0.463	0.076	0.00	0.00	31.86
0.517	0.054	0.11	0.11	30.18
0.620	0.103	4.60	4.60	86.35
0.702	0.082	10.68	10.68	91.55
0.765	0.063	15.63	15.63	87.89
0.812	0.047	18.48	18.48	79.14
0.875	0.063	46.29	46.29	141.29
0.918	0.044	48.92	48.92	121.56
0.954	0.036	59.71	59.71	125.40
0.972	0.017	38.50	38.50	72.10
0.990	0.019	52.70	64.64	104.51
0.997	0.007	19.17	41.07	57.01
0.999	0.002	6.48	20.04	25.71
1.000	0.001	1.41	5.71	6.99
1.000	0.000	0.56	2.83	3.35
Total	1.000	**323.24**	**377.20**	**1136.81**
		Q Treated	**Q Total**	**P Total**

28.43%

LID FILTRATION DEVICES

The focus here is on filtration treatment of rainfall.
This is best used for highly impervious urban areas (CN>=98) where

Device Information (overwrite data in shaded cells, other cells will be auto

Controlling Area (Drainage Area)
Site Condition
device area
device storage depth (above ground)
infiltration porosity (volume fraction of soil pores)
soil depth
device's total volume (above ground + soils)

Runoff Information (overwrite data in shaded cells, other cells will be auto

Land Use	commercial
CN	92
S	0.87

(a) Rainfall (P) (in/day)	(b) Runoff (Q) (in/day)	(c) Rainfall Volume (cu.ft. / day)	(d) Runoff Volume (cu.ft. / day)	(e) RunoffTreated (cu.ft. / day)	(e)
0.05	0.000	139.72	0.00	0.00	
0.10	0.000	279.45	0.00	0.00	
0.15	0.000	419.17	0.00	0.00	
0.20	0.001	558.89	2.12	2.12	
0.30	0.016	838.34	44.62	44.62	
0.40	0.047	1117.78	130.37	130.37	
0.50	0.089	1397.23	248.52	248.52	
0.60	0.140	1676.68	391.57	391.57	
0.80	0.262	2235.57	732.38	732.38	
1.00	0.402	2794.46	1124.64	1124.64	
1.25	0.595	3493.07	1663.13	1663.13	
1.50	0.801	4191.69	2238.09	2238.09	
2.00	1.237	5588.92	3456.82	2818.40	
3.00	2.161	8383.38	6039.17	2818.40	
4.00	3.118	11177.83	8711.87	2818.40	
5.00	4.089	13972.29	11427.32	2818.40	
6.00	5.069	16766.75	14166.37	2818.40	

Percent of Total Rainfall Treated =

matically calculated)

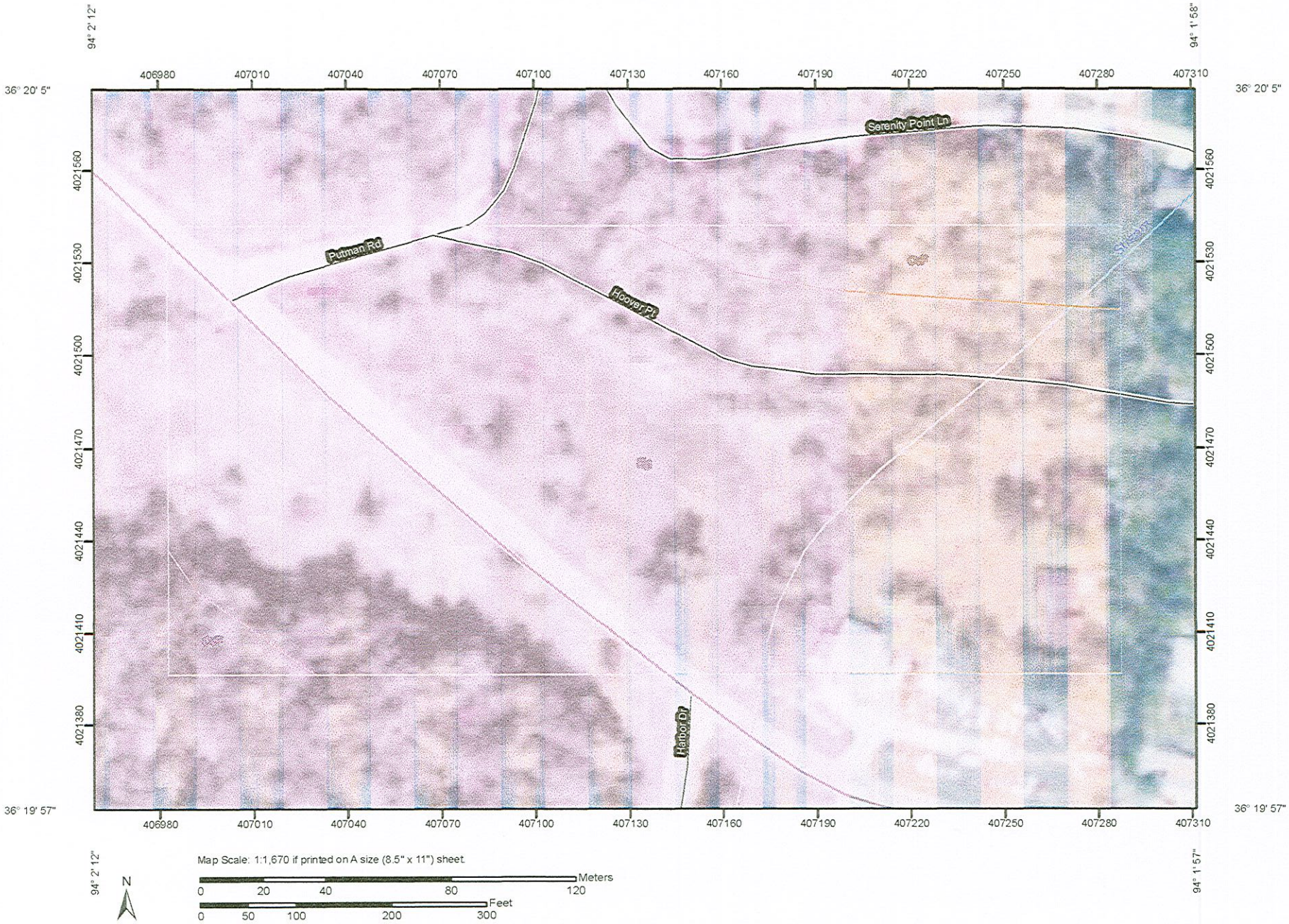
0.77	acres	=	33533.5 sq.ft.
commercial			
2168	sq.ft.	=	6.5% of the site
12	inches	=	1.00 ft.
0.2	***use 0 if you only want to count above-ground storage*		
30	inches	=	2.5 ft.
3252	**cubic ft./day**		

matically calculated)

(f) Cumulative Frequency	(g) Probability/ Frequency	(h) (e) x (g) (cu.ft. / day)	(i) (d) x (g) (cu.ft. / day)	(j) (c) x (g) (cu.ft. / day)
0.259	0.259	0.00	0.00	36.12
0.387	0.128	0.00	0.00	35.82
0.463	0.076	0.00	0.00	31.86
0.517	0.054	0.00	0.00	30.18
0.620	0.103	1.46	1.46	86.35
0.702	0.082	5.61	5.61	91.55
0.765	0.063	9.77	9.77	87.89
0.812	0.047	12.64	12.64	79.14
0.875	0.063	34.91	34.91	141.29
0.918	0.044	38.93	38.93	121.56
0.954	0.036	49.55	49.55	125.40
0.972	0.017	32.85	32.85	72.10
0.990	0.019	57.17	57.17	104.51
0.997	0.007	22.11	37.70	57.01
0.999	0.002	7.48	18.76	25.71
1.000	0.001	1.63	5.42	6.99
1.000	0.000	0.65	2.71	3.35
Total	1.000	**274.76**	**307.48**	**1136.81**
		Q Treated	**Q Total**	**P Total**

89.36%

Soil Map—Benton County, Arkansas
(TowMate, LLC)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

- Gully
- Short Steep Slope
- Other

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,670 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Benton County, Arkansas
Survey Area Data: Version 10, Sep 28, 2012

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Benton County, Arkansas (AR007)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CvF	Clarksville extremely gravelly silt loam, 12 to 50 percent slopes	1.0	8.8%
Eg	Elsah soils, occasionally and frequently flooded	10.0	91.2%
Totals for Area of Interest		**11.0**	**100.0%**