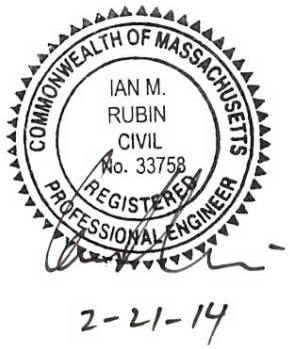
NARRATIVE & SUMMARY CHARTS
OF THE
STORMWATER MANAGEMENT

FOR

THE TEMPLE VS. CH. 40B PROJECT

BOSTON ROAD
GROTON, MA

February 21, 2014



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Narrative

Introduction

The site is located on the town line between Groton and Littleton on Boston Road. Most of the area is in Groton – about 26 acres – while the remaining 3 acres is in Littleton.

This parcel of land can be divided into four (4) catchment areas all draining to different design points. One is Vernal Pool on the NW side, another is house lots on Ernie's drive (SE side), a third is Boston Rd (SW side), and the wetlands on the north easterly corner of the property is the fourth design point.

This site has an approved project designed under Massachusetts Chapter 40B regulations resulting in a 44-unit residential condominium development. As an alternative, a new design is being presented for a Hindu Temple designed to accommodate a maximum of 500 attendees. In addition to the Temple, an auditorium is proposed to be attended by the same people.

See Sketches of the two different projects attached herewith.

Comparison

To compare the two projects, and the impact on the natural resources, first we can look at land coverage:

Total impervious surface is 11.1% to 10.5%. The impervious surface for the Ch. 40B project consists of buildings (4.6%), roads (5.8%) and sidewalks (0.7%). For the Temple it is buildings (3.2%), roads (5.3%), sidewalks (1.9%) and fishpond (0.1%).

The Ch. 40B project has a small area of impervious surface in the 100-foot buffer zone to the vernal pool, totaling 309 sq. ft. The Temple has no impervious surface within the same buffer.

The amount of development within the buffer for the Ch. 40B project is 4.1% whereas for the Temple it is only 1.5%. The closest development encroaches on the vernal pool is 38 feet for the Ch. 40B project, whereas it is 50 feet for the Temple.

Another comparison is stormwater runoff with development in both peaks and volumes. See tabulated results.

Overall, the pre-development results are very close for the two different projects – the major difference is runoff to the vernal pool. In the calculations for the Ch. 40B project, the catchment area included the vernal pool itself – a relatively large area of 9 acres – and hence the larger

numbers. (Since the area within the vernal pool is not undergoing any changes, this should not be included in the calculations.)

The results do show that in all cases peak flows are reduced with development. For the Ch. 40B project, volumes of runoff are increased with development in the case of the vernal pool. However, in the case of the Temple, all volumes are reduced with development.

When comparing the outflows from detention/retention basins, the ponds are more effective for smaller storms in the case of the Temple as opposed to the Ch. 40B project.

Conclusion

Overall, the impact on the natural resources is reduced with the Temple development when compared to the Ch. 40B project. There is less development within the buffer zones, there is a greater volume of runoff infiltrated on site, and especially with the porous paving, runoff is better balanced within catchment areas.

Comparative Data

A. Drainage Calculation Results at Design Points

Calculations from LandTech, June 4, 2004

2-yr Storm 3.1"				
	Pre-		Post-	
Design Pt.	Peak Flow	Volume	Peak Flow	Volume
	(c.f.s)	(a.f.)	(c.f.s)	(a.f.)
Vernal Pool	20.84	1.642	15.81	1.838
Ernie's Rd	2.22	0.185	1.46	0.122
Boston Rd	1.15	0.100	0.99	0.084
NE Wets	0.81	0.114	0.73	0.090

25-yr Storm 5.3"				
	Pre-		Post-	
Design Pt.	Peak Flow	Volume	Peak Flow	Volume
	(c.f.s)	(a.f.)	(c.f.s)	(a.f.)
Vernal Pool	61.08	4.498	49.14	5.111
Ernie's Rd	7.00	0.530	4.03	0.320
Boston Rd	4.11	0.307	3.45	0.255
NE Wets	4.86	0.438	4.00	0.333

10-yr Storm 4.5"				
	Pre-		Post-	
Design Pt.	Peak Flow	Volume	Peak Flow	Volume
	(c.f.s)	(a.f.)	(c.f.s)	(a.f.)
Vernal Pool	45.55	3.386	34.84	3.839
Ernie's Rd	5.14	0.394	3.05	0.244
Boston Rd	2.94	0.225	2.48	0.187
NE Wets	3.17	0.305	2.66	0.234

100-yr Storm 6.4"				
	Pre-		Post-	
Design Pt.	Peak Flow	Volume	Peak Flow	Volume
	(c.f.s)	(a.f.)	(c.f.s)	(a.f.)
Vernal Pool	83.37	6.115	71.35	6.952
Ernie's Rd	9.70	0.728	5.44	0.431
Boston Rd	5.83	0.430	4.88	0.355
NE Wets	7.43	0.643	6.05	0.486

Calculations from MRI, February 21, 2014

2-yr Storm 3.2"				
	Pre-		Post-	
Design Pt.	Peak Flow	Volume	Peak Flow	Volume
	(c.f.s)	(a.f.)	(c.f.s)	(a.f.)
Vernal Pool	7.63	0.799	4.69	0.480
Ernie's Rd	2.08	0.185	0.76	0.078
Boston Rd	1.35	0.143	1.20	0.140
NE Wets	0.80	0.110	0.71	0.107

25-yr Storm 5.4"				
	Pre-		Post-	
Design Pt.	Peak Flow	Volume	Peak Flow	Volume
	(c.f.s)	(a.f.)	(c.f.s)	(a.f.)
Vernal Pool	22.24	2.204	15.32	1.825
Ernie's Rd	6.27	0.522	2.40	0.219
Boston Rd	4.07	0.403	3.63	0.387
NE Wets	3.76	0.402	3.13	0.364

10-yr Storm 4.5"				
	Pre-		Post-	
Design Pt.	Peak Flow	Volume	Peak Flow	Volume
	(c.f.s)	(a.f.)	(c.f.s)	(a.f.)
Vernal Pool	15.90	1.589	10.64	1.193
Ernie's Rd	4.44	0.374	1.68	0.157
Boston Rd	2.89	0.288	2.40	0.219
NE Wets	2.40	0.268	2.03	0.247

100-yr Storm 6.6"				
	Pre-		Post-	
Design Pt.	Peak Flow	Volume	Peak Flow	Volume
	(c.f.s)	(a.f.)	(c.f.s)	(a.f.)
Vernal Pool	31.15	3.083	23.35	2.829
Ernie's Rd	8.84	0.734	3.41	0.308
Boston Rd	5.75	0.567	5.13	0.541
NE Wets	5.79	0.602	4.77	0.536

B. Detention/Retention Basin Results

From LandTech Calculations, June 4, 2004

Det. Basin 1 - Bottom Area = 2,210 sq. ft.						
	Inflow	Outflow	Exfiltration		Storage	Surf.Area
	(cfs)	(cfs)	(cfs)	(af)	(cu.ft.)	(sq.ft.)
2 yr	2.92	0.18	0.00	0.000	5,464	4,085
10 yr	5.18	0.62	0.00	0.000	8,800	4,797
25 yr	6.56	0.97	0.00	0.000	10,741	5,152
100 yr	8.49	1.32	0.00	0.000	13,755	5,702

Det. Basin 2 - Bottom Area = 1,150 sq. ft.						
	Inflow	Outflow	Exfiltration		Storage	Surf.Area
	(cfs)	(cfs)	(cfs)	(af)	(cu.ft.)	(sq.ft.)
2 yr	3.91	0.26	0.00	0.000	6,749	3,894
10 yr	6.91	1.70	0.00	0.000	9,978	4,551
25 yr	8.68	2.79	0.00	0.000	11,511	4,796
100 yr	11.12	3.92	0.00	0.000	13,962	5,187

Det./Ret. Basin 3 - Bottom Area = 2,870 sq. ft.						
	Inflow	Outflow	Exfiltration		Storage	Surf.Area
	(cfs)	(cfs)	(cfs)	(af)	(cu.ft.)	(sq.ft.)
2 yr	7.52	0.86	0.24	0.279	9,456	5,567
10 yr	13.43	4.11	0.24	0.306	15,450	6,871
25 yr	16.91	6.60	0.24	0.318	17,934	7,317
100 yr	21.75	9.61	0.24	0.333	21,987	8,061

Totals	Inflow	Outflow
2 yr	14.35	1.30
10 yr	25.52	6.43
25 yr	32.15	10.36
100 yr	41.36	14.85

From MRI, February 21, 2014

Det./Ret. Basin 1 - Bottom Area = 913 sq. ft.						
	Inflow	Outflow	Exfiltration		Storage	Surf.Area
	(cfs)	(cfs)	(cfs)	(af)	(cu.ft.)	(sq.ft.)
2 yr	0.66	0.06	0.05	0.050	1,144	1,570
10 yr	1.20	0.10	0.05	0.058	2,315	2,054
25 yr	1.59	0.72	0.05	0.060	2,677	2,183
100 yr	2.13	1.60	0.05	0.064	2,801	2,226

Det./Ret. Basin 2 - Bottom Area = 1,565 sq. ft.						
	Inflow	Outflow	Exfiltration		Storage	Surf.Area
	(cfs)	(cfs)	(cfs)	(af)	(cu.ft.)	(sq.ft.)
2 yr	5.97	0.00	0.10	0.122	14,017	5,679
10 yr	9.78	1.49	0.10	0.133	16,411	6,677
25 yr	12.47	3.17	0.10	0.139	18,801	7,543
100 yr	16.06	7.48	0.10	0.147	21,378	8,377

Det./Ret. Basin 3 - Bottom Area = 1,021 sq. ft.						
	Inflow	Outflow	Exfiltration		Storage	Surf.Area
	(cfs)	(cfs)	(cfs)	(af)	(cu.ft.)	(sq.ft.)
2 yr	3.99	0.12	0.06	0.073	7,721	3,692
10 yr	6.72	0.17	0.06	0.089	14,127	5,024
25 yr	8.66	0.46	0.06	0.084	17,937	5,694
100 yr	11.28	3.71	0.06	0.088	18,341	5,761

Infiltration Bed (Cultec Chambers) - Bottom Area = 54 ft. x 45 ft.						
	Inflow	Outflow	Exfiltration		Storage	Surf.Area
	(cfs)	(cfs)	(cfs)	(af)	(cu.ft.)	(sq.ft.)
2 yr	3.21	0.00	0.13	0.178	4,095	2,430
10 yr	4.42	0.00	0.13	0.192	6,752	2,430
25 yr	5.31	0.45	0.13	0.199	7,275	2,430
100 yr	6.51	1.84	0.13	0.209	7,667	2,430

Totals	Inflow	Outflow
2 yr	13.83	0.15
10 yr	22.12	1.76
25 yr	28.03	4.80
100 yr	35.98	14.63