WATER BALANCE CALCULATIONS

FOR

248 HIGH STREET, LLC

JUNE, 2016
Revised July 20, 2016

PREPARED BY: **DAVID E. ROSS ASSOCIATES, INC.**
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Project No. 31342

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978 772 6232 • Fax 978 772 6258

JOB #31342 248 HIGH ST. LLC
SHEET NO. 1 OF 5
CALCULATED BY RED DATE 7-20-16
CHECKED BY DATE
SCALE

WATER BALANCE CALCULATIONS

PRE-DEVELOPMENT

SUBCATCHMENT	AREA	CN	AREA × CN
1	1.22 AC.	73	89.06
2	0.30 AC.	76	22.80
	1.52 AC.		111.86

CN (AVG.) = 111.86 ÷ 1.52 = 73.6

POST-DEVELOPMENT SUBCATCHMENT	AREA	CN	AREA × CN
10	0.51 AC.	80	40.80
11	0.77 AC.	89	68.53
20	0.24 AC.	79	18.96
	1.52 AC.		128.29

CN (AVG.) = 128.29 ÷ 1.52 = 84.4

PRODUCT 204-1 (Single Sheets) 205-1 (Padded)

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SHEET NO. 2 OF 5
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PRE-DEVELOPMENT RECHARGE (SITE)

$C_N = 73.6$

INFILTRATION = 16.9 IN/YR (FIGURE A)

AREA = 66,436 S.F.

RECHARGE = 66,436 SF × 16.9 IN/YR (1/12) = 93,564 CF/YR

POST-DEVELOPMENT RECHARGE (SITE)

$C_N = 84.4$

INFILTRATION = 14.0 IN/YR (FIGURE A)

AREA = 66,436 S.F.

RECHARGE = 66,436 S.F. × 14.0 IN/YR (1/12) = 77,509 CF/YR

POST-DEVELOPMENT RECHARGE (DETENTION SYSTEM)

$C_N = 98.0$ PAVEMENT AREA = 9,768 SF

WEEKLY RUNOFF (TO ESTIMATE SMALLER, FREQUENT STORMS)
RUNOFF = 0.64 IN/WK (BASED ON ATTACHED PRECIP. DATA)

RECHARGE = 9,768 SF × 0.64"/WK (1/12) = 521 CF/WK

DETENTION 6" SUMP VOLUME = 3039 SF × 0.5' × .4 (VOIDS)
= 608 CF

∴ SUMP WILL CONTAIN & RECHARGE WEEKLY STORM EVENT

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POST-DEVELOPMENT RECHARGE (6 DRYWELLS)

$C_N = 98.0$ ROOF AREA 6 HOUSES = 9,288 SF

WEEKLY RUNOFF = 0.64"/WK

RECHARGE = 9288 S.F. × 0.64"/WK (1/12) = 495 CF/WK

DRYWELL VOLUME = (7' × 7' × 5') (.4 VOIDS) (6) = 588 CF

- TOTAL WEEKLY RECHARGE FROM DETENTION & DRYWELLS IS 521 CF + 495 CF = 1,016 CF/WK
- TOTAL YEARLY RECHARGE = 1,016 CF/WK × 52 = 52,832 CF/YR

TOTAL POST-DEVELOPMENT YEARLY RECHARGE

SITE = 77,509 CF

DETENTION = 521 CF/WK × 52 = 27,092 CF

DRYWELLS = 495 CF/WK × 52 = 25,740 CF

TOTAL RECHARGE = 130,341 CF

CONCLUSION

POST-DEVELOPMENT RECHARGE MEETS OR EXCEEDS PRE-DEVELOPMENT LEVELS FOR ANNUAL RECHARGE RATE

PRE = 93,564 CF

POST = 130,341 CF

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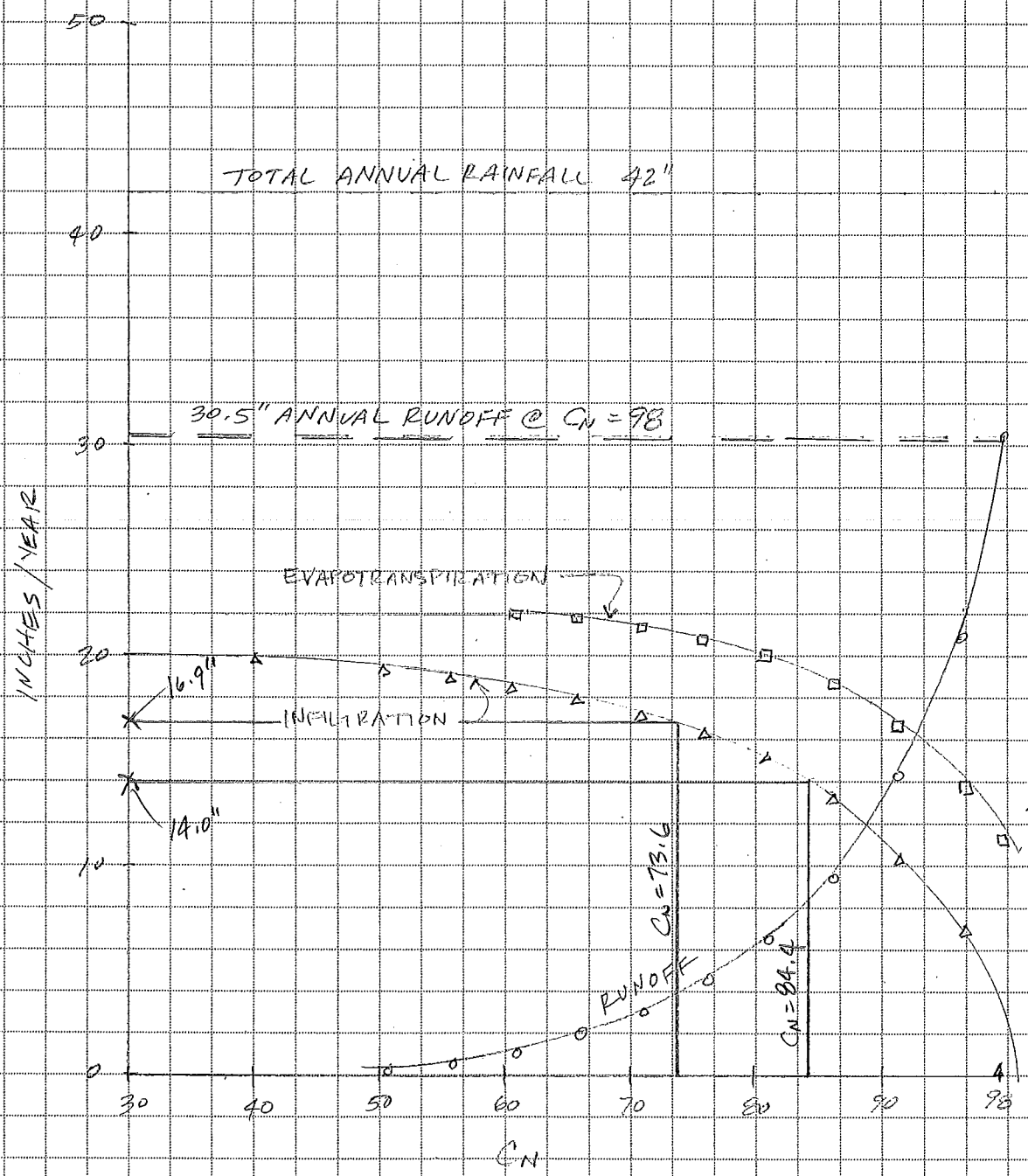

NOTE: GRAPH COMPILED FROM DATA PUBLISHED BY NOAA (1984-1988)

FIGURE A

#31342 248 HIGH ST. LLC

SHEET 5/5

Monthly Total Precipitation for Boston Area, MA (ThrendEx)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1966	5.29	3.48	1.98	1.24	2.66	3.40	3.21	1.25	3.42	2.62	4.43	3.03	36.01
1967	2.28	4.05	4.67	4.83	7.32	3.48	2.47	5.74	2.00	0.96	3.38	6.42	47.60
1968	3.85	1.15	7.86	1.72	3.26	5.65	0.55	1.63	1.79	1.85	6.74	6.23	42.28
1969	2.26	7.08	2.63	4.37	1.96	0.63	2.98	1.89	4.42	1.64	8.18	9.74	47.78
1970	0.89	4.65	4.32	2.79	3.01	4.62	1.27	4.12	2.60	2.63	4.09	6.92	41.91
1971	1.88	5.05	3.08	2.92	3.72	1.74	2.84	1.59	1.55	2.16	6.74	2.40	35.67
1972	2.05	5.29	5.37	3.34	5.26	6.76	2.19	0.83	5.94	2.98	7.02	6.08	53.11
1973	3.12	2.13	2.20	5.65	3.76	4.68	4.83	2.78	1.95	2.71	1.74	7.20	42.75
1974	3.22	3.24	4.01	3.86	2.87	2.29	1.54	3.41	7.03	3.12	1.73	3.92	40.24
1975	5.70	3.37	2.74	2.40	1.78	2.10	2.35	5.52	5.49	4.41	5.13	4.80	45.79
1976	5.29	2.45	2.42	2.00	1.98	0.58	4.30	7.99	1.56	4.16	0.64	3.35	36.72
1977	4.41	2.40	4.76	4.07	3.52	2.49	2.21	2.91	4.03	4.63	2.54	6.20	44.17
1978	8.12	2.87	2.46	1.79	4.50	1.53	1.48	4.62	1.30	3.13	2.21	3.63	37.64
1979	10.55	3.46	3.03	3.19	4.24	0.86	2.36	5.02	3.61	3.14	3.29	1.42	44.17
1980	0.74	0.88	5.37	4.36	2.30	3.05	2.20	1.55	0.82	4.14	3.01	0.97	29.39
1981	0.95	6.65	0.62	3.14	1.17	1.65	3.47	1.04	2.54	3.43	4.78	6.27	35.71
1982	4.69	2.66	2.17	3.42	2.58	13.20	4.22	2.22	1.57	3.19	3.42	1.27	44.61
1983	5.03	5.00	9.72	6.86	2.94	1.07	1.07	3.28	1.06	3.74	8.89	4.94	53.60
1984	2.31	7.81	6.82	4.43	8.77	3.06	4.43	1.60	1.22	5.18	1.68	2.93	50.24
1985	1.12	1.83	2.29	1.62	3.36	3.94	3.51	6.67	3.00	1.65	6.39	1.21	36.59
1986	3.42	2.83	3.42	1.59	1.31	7.74	3.96	3.32	1.08	3.27	6.01	6.38	44.33
1987	7.28	0.72	4.27	9.46	1.75	2.62	0.82	2.93	7.29	2.73	3.49	2.12	45.48
1988	2.50	3.93	3.52	1.47	2.86	1.29	7.62	1.11	1.29	1.60	6.57	1.02	34.78
1989	0.61	2.51	3.07	3.58	3.54	2.84	5.09	5.92	4.61	5.71	4.13	0.81	42.42
1990	3.78	3.60	1.71	5.94	6.53	0.69	4.08	6.57	1.67	7.36	1.39	3.18	46.50
1991	3.24	1.58	4.33	4.84	0.92	2.89	1.95	5.27	6.32	4.27	4.06	2.58	42.25
1992	3.11	2.28	3.59	2.34	1.40	4.61	2.66	4.25	3.46	1.62	6.14	8.26	43.72
1993	2.17	4.94	7.67	4.86	1.04	1.75	1.75	1.32	4.64	3.61	2.86	6.60	43.21
1994	5.22	2.95	7.49	2.25	5.35	0.86	1.80	7.03	4.58	0.41	4.31	5.37	47.62
1995	4.33	2.57	2.20	1.40	1.82	1.55	2.06	0.82	3.60	6.42	5.13	3.20	35.10
1996	7.44	3.17	2.36	4.38	2.73	1.03	5.23	1.54	6.09	10.66	2.18	5.71	52.52
1997	2.34	1.28	4.68	3.46	2.63	1.41	0.63	3.01	1.02	1.78	5.86	2.29	30.39
1998	4.76	5.54	4.15	3.58	6.84	11.58	2.47	3.37	3.03	5.38	1.38	1.59	53.67
1999	5.69	3.51	2.52	0.83	2.70	T	3.51	1.33	9.86	4.30	2.14	1.52	37.91
2000	2.62	2.55	3.59	5.02	2.88	6.61	5.20	2.22	2.87	2.86	4.51	4.67	45.60
2001	1.58	1.37	7.57	0.88	1.23	4.99	2.13	4.14	2.29	0.98	0.73	2.83	30.72
2002	3.14	1.81	3.52	2.61	4.48	4.77	1.42	2.13	3.39	3.47	5.03	5.30	41.07
2003	1.81	4.21	4.00	4.00	4.12	4.69	2.11	M	2.65	6.20	2.63	5.06	M
2004	1.01	1.45	3.38	9.57	3.07	1.95	3.87	4.38	7.44	1.88	2.91	3.66	44.57
2005	4.45	2.70	3.89	3.17	3.98	1.46	3.37	2.88	1.78	9.41	3.71	2.87	43.67
2006	4.60	2.64	0.56	1.83	12.48	10.09	3.58	3.20	1.72	4.50	5.80	1.89	52.89
2007	2.57	2.20	4.31	6.71	3.70	2.12	5.26	0.66	1.81	2.08	2.80	5.25	39.47
2008	2.69	7.94	4.66	2.98	2.73	3.46	6.00	4.47	6.45	1.41	4.57	7.10	54.46
2009	3.35	1.94	2.51	4.13	2.69	3.22	6.90	3.24	3.09	5.17	3.34	3.91	43.49
2010	2.91	3.34	14.87	1.78	2.90	3.18	2.66	5.75	1.80	3.90	2.96	3.61	49.66
2011	4.57	4.57	2.10	4.03	3.23	4.76	2.04	7.74	4.40	6.77	4.21	3.97	52.39
2012	2.67	1.00	1.21	3.09	3.43	4.71	3.88	3.08	4.10	2.62	1.01	5.93	36.73
2013	1.08	5.26	3.32	1.37	3.22	10.50	3.61	1.84	2.21	0.61	2.72	4.62	40.36
2014	3.24	4.13	4.48	3.24	2.86	2.62	4.57	1.75	0.70	5.83	5.27	6.56	45.25
2015	3.57	3.37	3.05	2.28	1.22	5.01	2.09	2.19	3.93	1.74	2.07	4.28	34.80
2016	3.27	4.17	3.16	2.91	2.83	1.33	M	M	M	M	M	M	M
* Mean	3.51	3.36	3.99	3.48	3.40	3.59	3.12	3.33	3.32	3.60	3.92	4.22	42.88
Max	10.55 1979	7.94 2008	14.87 2010	9.57 2004	12.48 2006	13.20 1982	7.62 1988	7.99 1976	9.86 1999	10.66 1996	8.89 1983	9.74 1969	54.46 2008
Min	0.61 1989	0.72 1987	0.56 2006	0.83 1999	0.92 1991	T 1999	0.55 1968	0.66 2007	0.70 2014	0.41 1994	0.64 1976	0.81 1989	29.39 1980

* AVG. MONTHLY MEAN = 42.88" ÷ 12 = 3.57"

AVG. MONTHLY RUNOFF = $3.57'' \left(\frac{30.5''}{42.88''}\right) = 2.54''/\text{MONTH}$

AVG. WEEKLY RUNOFF = 2.54"/MONTH ÷ 4 = 0.64"/WEEK