

DRAINAGE REPORT

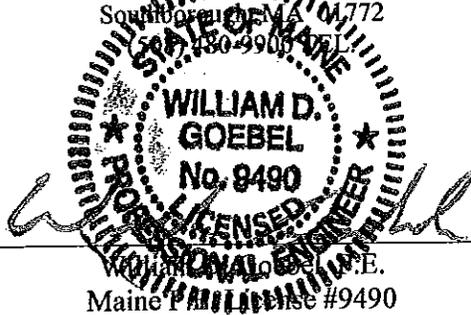
Proposed



**Map R61, Lot 009-G
663 Stillwater Avenue
Bangor, Maine
Penobscot County**

Prepared by:

BOHLER ENGINEERING
352 Trappan Road
Southport, ME 04772
507-830-4900



W.D. Goebel, P.E.
Maine Professional Engineer #9490



BOHLER
ENGINEERING

Date: May 26, 2015
Revised: October 20, 2015
Revised: November 20, 2015

NOV 24 2015

Bohler Project #W141184

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I. EXECUTIVE SUMMARY

The proposed project involves construction of a 4,975± square foot Chick-fil-A restaurant within a subdivided lot the Bangor Mall. The site is currently a lawn area between Stillwater Avenue and Bangor Mall Boulevard.

Stormwater flows generated as a result of the project will be treated and attenuated through the use of a closed drainage system and a grassed underdrained soil filter with a sediment forebay.

The pre and post development conditions were analyzed at one design point (mall drainage system) where the site currently drains. A comparison of the pre and post development 2, 10, and 25 year storms, as required by the Maine DEP Stormwater Management Manual and as indicated in Table 1 below.

Table 1 – Comparison of Peak Runoff Rates (in CFS)

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
#1 (Mall Drainage System)	1.34	1.22	-.12	3.54	2.66	-0.88	4.69	3.17	-1.52

As shown the peak rates have been reduced for the post development 2, 10, and 25 year storms.

The calculations provided for the project demonstrate that project adequately addresses the stormwater runoff generated as part of the project. The calculations have been prepared in accordance with all Maine DEP standards.

II. EXISTING SITE CONDITIONS

The outlot lies on the east side of Stillwater Avenue at the west entrance of the Bangor Mall and drains to the Mall drainage system which is part of the Penjajawoc Stream watershed. The existing site area of development E1 is comprised of 94,766 sf of landscaped area. There are currently no water quality BMPs present at the site. The existing soils have been found to sandy silt per geotechnical borings on-site. This soil would be consistent with a "C" soil which provides an infiltration rate of 0.27 in/hr per the Rauls Infiltration chart.

III. PROPOSED SITE CONDITIONS

The project involves the construction of a 4,975± square foot Chick-fil-A restaurant and associated parking areas, utilities, and stormwater facilities. Stormwater runoff generated by the paved surfaces will be collected by hooded, deep sump catch basins, which will discharge to a sediment forebay. Approximately 96% of the proposed impervious surfaces, inclusive of the proposed roof, will be treated by the sediment forebay. Over 80% of the developed area will also be treated by the sediment forebay.

Drainage Subareas

The site was subdivided into two separate drainage areas for the proposed conditions as described below. Drainage areas are shown in the drainage area maps in Appendix E. The time of concentration for all proposed areas is calculated as 6 minutes (0.1 hr).

Area P1 consists of 45,472 sf of paved area and 30,112 sf of landscaped area totaling 75,484 sf. This area will drain in various directions, where the runoff will be picked up by catch basins that will discharge the runoff to sediment forebay.

Area P2 is the remainder of the site not draining to either of the sediment forebay. This area consists of 2,000 sf of paved area and 17,282 sf of landscaped area totaling 19,282 sf. This area will drain in various directions, where the runoff will be picked up by existing catch basins that will discharge the runoff to the mall drainage system.

Storm Sewer System

Deep sump hooded catch basins are proposed to collect and route runoff from the paved parking. Pipes have been designed for the 25-year storm (pipe sizing information is included in Appendix D).

The closed drainage system will discharge to a sediment forebay and grassed underdrained soil filter. The soil filter will be used to maintain existing stormwater run-off rates in addition to providing

pollutant removal of suspended sediment, phosphorous, nitrogen, etc., prior to discharging to the existing Bangor Mall Drainage System.

Per Section 7.1 of the BMP manual, the impoundment depth over the soil filter does not exceed 18" for the Water Quality Volume and drains within 12 hours for all storm event as shown in Appendix C.

IV. COMPLIANCE WITH MAINE STORMWATER MANAGEMENT MANUAL OBJECTIVES

The following section describes the project's conformance with the Maine DEP's current Stormwater Management objectives. Chapter 1 of Volume III of the Stormwater Management Manual states that when the BMPs outlined in the manual are properly designed, they will accomplish the four objectives listed below. As outlined throughout this report, the proposed filtration BMP has been designed in accordance with section 7.3 of Volume 3 of the Stormwater Management Manual and therefore meets the objectives.

Effective Pollutant Removal

Several BMPs are proposed to reduce Total Suspended Solids (TSS) and other pollutants (including hydrocarbons) from the site. The following pollutant removal devices are proposed:

- Regular parking lot sweeping (fall and spring)
- Catch basins with deep sumps and trap hoods for separation of floatables and hydrocarbons
- Sediment forebay
- Grassed Underdrain soil filter

An Operation and Maintenance plan for the above is included in Appendix F.

Cooling

The stormwater will be routed to a grassed underdrained soil filter which will filter the water and infiltrate it back into the groundwater before it's released to any waterbody. In large storms that exceed the 25 year storm the stormwater will overflow into the mall's drainage system and will

be underground for an extended period of time where it will cool to the temperature of the surrounding soil.

Channel Protection

The channel protection volume is the same as the water quality volume calculated in Appendix C, which is equal to 1" of rainfall over impervious areas plus 0.4" over pervious areas. The equivalent 24-hour rainfall depth that generates the water quality volume over the combined pervious and impervious areas is 1.22 inches. Calculations are included in Appendix C showing that water quality volume / channel protection volume is discharged over a period of 24 hours with a maximum flow rate of 6.03 cfs.

Flood Control

The grassed underdrained soil filter with forebay has been designed in conformance with the Maine DEP's requirements of providing post-development flow rates less than pre-development flow rates for the 2, 10, and 25 year storms. Summary table of the pre and post-development flows can be found in the Executive Summary and Summary of this report. The overflow spillway for the basin are capable of independently conveying the 25 year storm.

Phosphorous

The site is within the Penjajawoc stream watershed and as such, the proposed stormwater management system for the site incorporates a grassed underdrain soil filter for removal of suspended sediment, phosphorous and nitrogen designed per the BMP Technical Design Manual.

V. METHOD

Methodology utilized to design the stormwater management system associated with this project includes compliance with the requirements described in the Maine Department of Environmental Protection Stormwater Management Manual. The proposed stormwater management design will provide a decrease in peak stormwater runoff rates from the proposed facility for the 2, 10, and 25 storm events utilizing the SCS TR-55 Urban Hydrology for Small Watersheds method, as calculated using HydroCAD software.

Times of concentration (T_c) utilized in the preparation of this report were generated utilizing the SCS TR-55 Urban Hydrology for Small Watersheds method. Runoff coefficients for the pre- and post-development conditions were calculated using widely accepted and often utilized runoff coefficients / curve numbers and have been documented within the Appendices of this report.

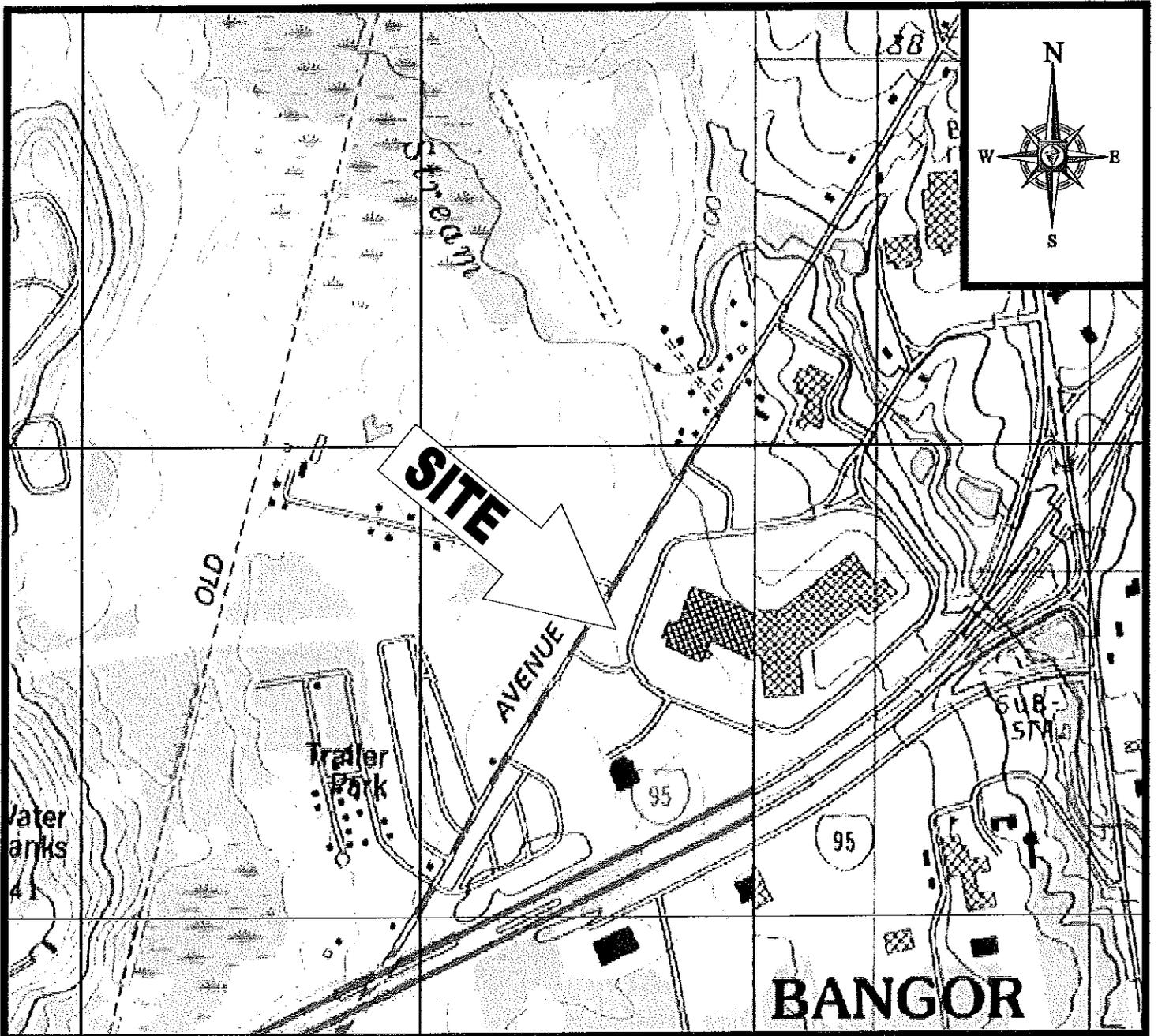
VI. SUMMARY

Post-development peak flows discharging from proposed paved areas to the malls storm sewer system will be less than pre-development peak flows.

The stormwater drainage design complies with the requirements of the Maine DEP's Stormwater Management Manual. BMPs include regular street sweeping, catch basins with deep sumps and trap hoods, and a Grassed Underdrained Soil Filter with sediment forebay. The project is not expected to have an adverse impact on receiving waters, adjacent properties, or downstream properties or structures.

APPENDIX A

USGS MAP



LOCATION MAP

SCALE: 1"=1000'
PLAN REFERENCE: BANGOR MAINE USGS QUADRANGLE

APPENDIX B

FEMA MAP

National Flood Insurance Program at 1-800-638-6620.



MAP SCALE 1" = 500'



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0012 C

FIRM FLOOD INSURANCE RATE MAP
CITY OF BANGOR, MAINE
PENOBSCOT COUNTY

PANEL 12 OF 21

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY NUMBER 20102
PANEL SUFFIX 0012 C

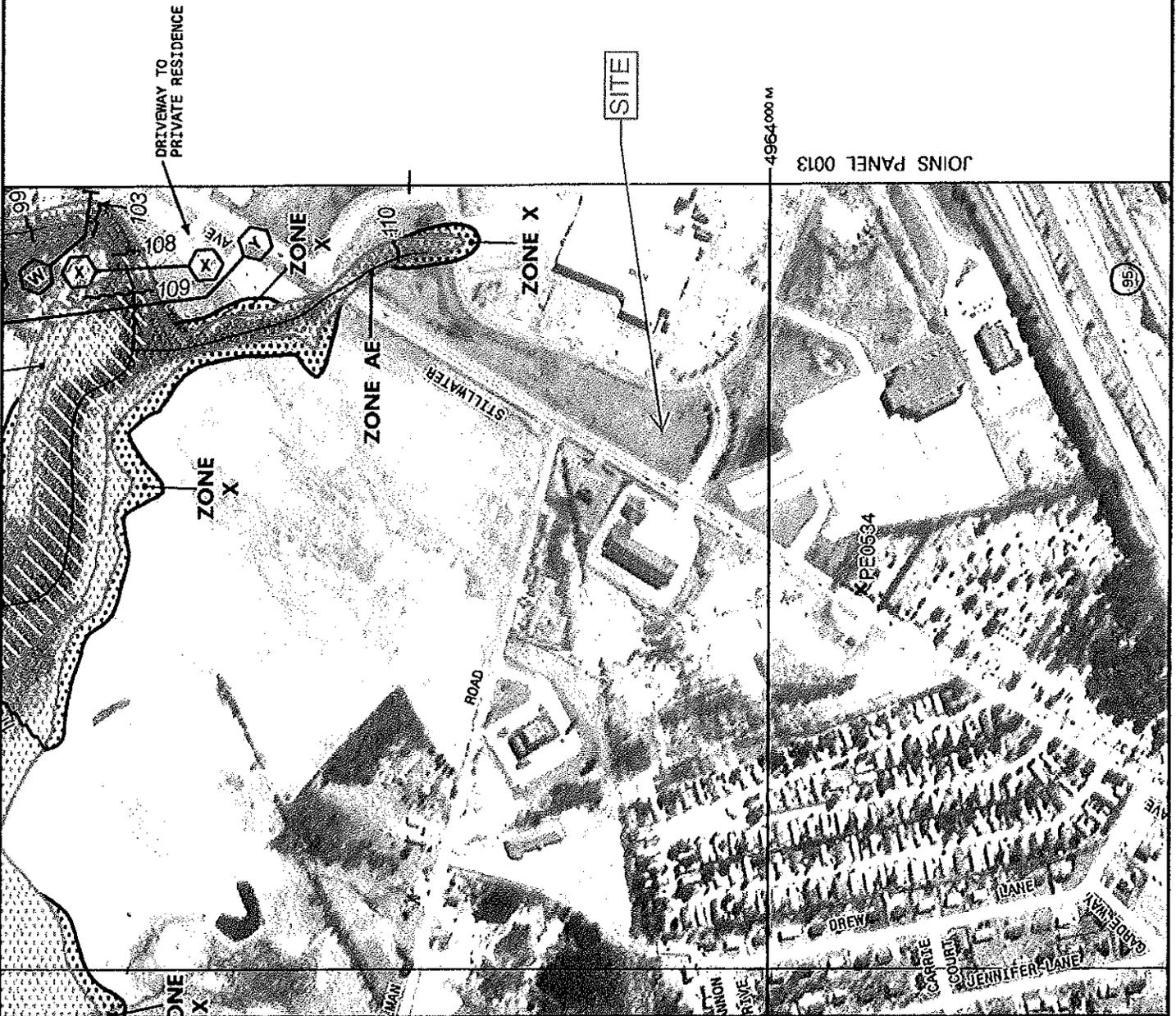
Notice to User: This Map Number should be used when placing this Community Number above should be used on insurance applications for the subject community.



MAP NUMBER 2301020012 C
MAP REVISED MARCH 4, 2002

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov.



APPENDIX C
DRAINAGE CALCULATIONS

Rip-rap Sizing Calculations

Performed by: KBS

Rip-rap Apron Sizing

Outfall Structure	25 year peak discharge (cfs)*	Pipe Diam. (in)	D ₀ ** (ft.)	L _a (ft.)	W ₁ (ft.)	W ₂ (ft.)	TW*** (ft.)
FES 1	6.07	15	1.25	11	3.75	8.15	0.2

Length Equation

Flow < 5 cfs see chart 11-12.1

Width Equation

Apron width (W₁) at pipe outlet- $W=3D_0$

Apron width (W₂) at end of apron- $W=3D_0 + .4L_a$ (TW>0.5D₀)

Outlet Velocity	
0-8 fps- modified	12"
8-10 fps-intermediate	18"
10-14 fps-standard	36"

NOTES

* 25-Year Storm Peak Discharge value taken from Drainage sizing

** Pipe Diameter, D₀=max. width of upstream pipe

*** Tailwater (TW)= depth above invert of pipe in feet, minimum tailwater is 0.2 feet

SOURCE: CTDOT DRAINAGE MANUAL

OUTLET PROTECTION - OUTLET VELOCITY ≤ 14 feet/sec

DISCHARGE (cfs)	OUTLET PIPE DIAMETER OR SPAN (in)									
	12	15	18	24	30	36	42	48	54	60
0-5	10	10		USE						
6	12	11								
7		13	12							
8		14	13	12		MINIMUM				
9			14	13						
10			15	13						
11			16	14				LENGTH		
12				14						
14				16	14					
16				17	15	14			OUTLINED	
18				18	16	15				
20					17	15	14			
22		USE			18	16	15			
24						17	15	14		
26						17	16	15		
28						18	16	15		
30						19	17	16		
35						20	18	17	16	
40				PREFORMED			20	18	17	16
45							21	19	18	16
50							22	20	18	17
55								21	19	18
60								22	20	19
65								24	21	20
70						SCOUR		25	22	20
75							24	26	23	21
80									24	22
90									26	24
100									28	25
110										27
125							HOLD			29
130										30

Table 11-12.1 - Length - L_1 (feet)

Type A Riprap Apron

- Notes: 1. Bold face outlined boxes indicate minimum L_1 to be used for a given pipe diameter or span.
 2. Rounding and interpolating are acceptable.

Water Quality Volume Calculator

IMPERVIOUS COVERAGE (AC)	1.04	ACRES
WQV FACTOR 0.1 INCH	0.1	INCHES
WQV=1" IMPERVIOUS ACRE	377.62	CF REQUIRED

Summary	
Total Volume Provided	1074 cf (FROM HYDROCAD ELEV.=119.70)
WQV Total Volume Required	377.62 cf

119.50	837	900
119.55	854	942
119.60	871	985
119.65	888	1,029
119.70	905	1,074
119.75	922	1,119
119.80	939	1,166

IMPERVIOUS COVERAGE (AC)	1.04	ACRES
WQV FACTOR 1 INCH	1	INCHES
WQV=1" IMPERVIOUS ACRE	3775.2	CF REQUIRED
PERVIOUS COVERAGE (AC)	0.69	ACRES
WQV FACTOR 0.4 INCH	0.4	INCHES
WQV=1" IMPERVIOUS ACRE	1001.88	CF REQUIRED
TOTAL WQV	4777.08	CF REQUIRED

Summary	
Total Volume Provided	4896 cf (FROM HYDROCAD ELEV.=119.70 + Soil filter)
WQV Total Volume Required	4777.08 cf

Forebay	soil filter		
119.50	837	900	3823 cf
119.55	854	942	
119.60	871	985	
119.65	888	1,029	
119.70	905	1,074	
119.75	922	1,119	
119.80	939	1,166	

PERCENT OF PAVED IMPERVIOUS AREA TREATED:

Total Impervious Area:	47,473 SF	
Treated Impervious Area:	45,472 SF	
Percent Treated:	96%	95% Required per Chapter 500

PERCENT OF DEVELOPED AREA (PAVED AND LANDSCAPED) TREATED:

Total Developed Area:	94,766 SF	
Treated Developed Area:	75,484 SF	
Percent Treated:	80%	80% Required per Chapter 500

Drawdown Analysis

RV	7346 cubic feet
K	8.27 see table
Bottom Area	1529 square feet

$$Time_{drawdown} = \frac{Rv}{(K \times Bottom Area)} = 6.999384262 \text{ Hours}$$

RV=Storage Volume
 K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate (see Table 2.3.3)
 Bottom Area= Bottom area of the Recharge Structure

Note: K value is taken from Rauls value for sand and gravel which the proposed pond will be built upon.

Peak Water Quality Depth 18" max. 1" provided

IMPOUNDMENT FOR WATER QUALITY VOLUME

Pond BS: basin - W141184_kbs 11-17-15

Summary	Hydrograph	Discharge	Storage	Events	Sizing
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Inflow Area = 1.733 ac, 60.24% Impervious, Inflow Depth = 0.07" for wqv event
 Inflow = 0.03 cfs @ 15.94 hrs, Volume= 0.010 af
 Outflow = 0.01 cfs @ 22.89 hrs, Volume= 0.010 af, Atten= 61%, Lag= 416.6 min
 Primary = 0.01 cfs @ 22.89 hrs, Volume= 0.010 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 117.59' @ 22.89 hrs Surf.Area= 1,578 sf Storage= 144 cf

Plug-Flow detention time= 176.8 min calculated for 0.010 af (100% of inflow)
 Center-of-Mass det. time= 177.3 min (1,332.0 - 1,154.7)

** Depth of Storm
 water impoundment
 for water quality
 Volume = .09' / 1"
 (117.59 - 117.5)*

Volume	Invert	Avail. Storage	Storage Description
#1	117.50'	7,346 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.50	1,529	0	0
118.00	1,794	831	831
119.00	2,365	2,080	2,910
120.00	2,993	2,679	5,589
120.50	4,032	1,756	7,346

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	12.0" Round Culvert L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.00' / 114.50' S= 0.0050 /' Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf
#2	Device 1	117.50'	0.270 in/hr Exfiltration over Surface area
#3	Primary	119.90'	15.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#4	Primary	118.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 4	117.50'	4.0" Vert. Orifice/Grate X 5.00 C= 0.600

Primary OutFlow Max=0.01 cfs @ 22.89 hrs HW=117.59' (Free Discharge)

- ↑ 1=Culvert (Passes 0.01 cfs of 4.06 cfs potential flow)
- ↑ 2=Exfiltration (Exfiltration Controls 0.01 cfs)
- ↑ 3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- ↑ 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- ↑ 5=Orifice/Grate (Controls 0.00 cfs)

Location: Bangor, Me Treatment Train to Organic Filter

BMP ¹	C TSS Removal Rate ²	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Organic Filter w/ Pretreatment	0.90	1.00	0.90	0.10
-	0.00	0.10	0.00	0.10
-	0.00	0.10	0.00	0.10
-	0.00	0.10	0.00	0.10
-	0.00	0.10	0.00	0.10
Total TSS Removal =			90%	

Project: Chic Fil A
 Prepared By: Kevin Sanders
 Date: 11/19/16

*Equals remaining load from previous BMP (E)
 which enters the BMP

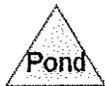
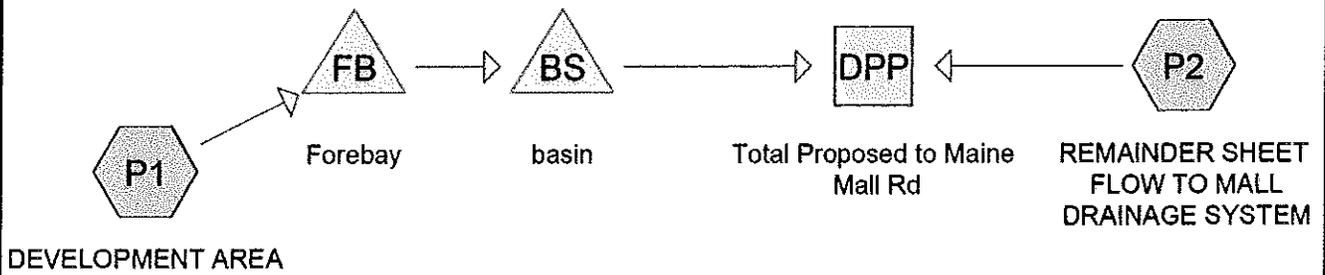
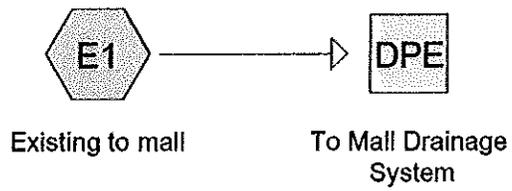
**TSS Removal
 Calculation Worksheet**

APPENDIX D
PIPE SIZING CALCULATIONS

DRAINAGE COMPUTATIONS

LOCATION		IMPERVIOUS AREA			OTHER			SUM	Q			Q			V	
FROM	TO	A	C	CA	A	C	CA	CA	Tc	I	I x CA	D	S	n	full	full
		(Ac)			(Ac)				(Min)	in/hr	(cfs)	(in)	(ft/ft)		(cfs)	(fps)
RD	DMH A	0.11	0.9	0.10	0.00	0.3	0.00	0.10	6	6.2	0.61	8	0.010	0.011	1.43	4.09
CB #1	DMH A	0.04	0.9	0.04	0.06	0.3	0.02	0.05	6	6.2	0.33	12	0.005	0.011	2.98	3.79
DMH A	DMH B	0.15	0.9	0.14	0.06	0.3	0.02	0.15	6	6.2	0.95	12	0.005	0.011	2.98	3.79
CB#2	DMH B	0.04	0.9	0.04	0.06	0.3	0.02	0.05	6	6.2	0.33	12	0.020	0.011	5.95	7.58
DMH B	DMH C	0.19	0.9	0.17	0.12	0.3	0.04	0.21	6	6.2	1.28	12	0.005	0.011	2.98	3.79
CB#3	DMH C	0.35	0.9	0.32	0.02	0.3	0.01	0.32	6	6.2	1.99	12	0.007	0.011	3.52	4.49
CB#4	DMH C	0.13	0.9	0.12	0.17	0.3	0.05	0.17	6	6.2	1.04	12	0.022	0.011	6.25	7.95
DMH C	DMH F	0.67	0.9	0.60	0.31	0.3	0.09	0.70	6	6.2	4.32	12	0.037	0.011	8.10	10.31

CB #5	DMH D	0.03	0.9	0.03	0.00	0.3	0.00	0.03	6	6.2	0.17	12	0.020	0.011	5.95	7.58
CB #6	DMH D	0.02	0.9	0.02	0.01	0.3	0.00	0.02	6	6.2	0.13	12	0.010	0.011	4.21	5.36
DMH D	DMH E	0.05	0.9	0.05	0.01	0.3	0.00	0.05	6	6.2	0.30	12	0.005	0.011	2.98	3.79
CB#7	DMH E	0.05	0.9	0.05	0.01	0.3	0.00	0.05	6	6.2	0.30	12	0.005	0.011	2.98	3.79
CB#8	DMH E	0.02	0.9	0.02	0.01	0.3	0.00	0.02	6	6.2	0.13	12	0.005	0.011	2.98	3.79
DMH E	DMH F	0.12	0.9	0.11	0.03	0.3	0.01	0.12	6	6.2	0.73	12	0.008	0.011	3.77	4.80
CB#10	CB#9	0.14	0.9	0.13	0.00	0.3	0.00	0.13	6	6.2	0.78	12	0.010	0.011	4.21	5.36
CB#9	DMH F	0.28	0.9	0.25	0.03	0.3	0.01	0.26	6	6.2	1.62	12	0.010	0.011	4.21	5.36
DMH F	FES1	1.07	0.9	0.96	0.03	0.3	0.01	0.97	6	6.2	6.03	15	0.006	0.011	5.91	4.82



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: Existing to mall Runoff Area=94,766 sf 0.00% Impervious Runoff Depth=0.61"
Tc=6.0 min CN=74 Runoff=1.34 cfs 0.110 af

Subcatchment P1: DEVELOPMENT AREA Runoff Area=75,484 sf 60.24% Impervious Runoff Depth=1.38"
Tc=6.0 min CN=88 Runoff=2.75 cfs 0.199 af

Subcatchment P2: REMAINDER SHEET Runoff Area=19,282 sf 10.37% Impervious Runoff Depth=0.69"
Tc=6.0 min CN=76 Runoff=0.32 cfs 0.026 af

Reach DPE: To Mall Drainage System Inflow=1.34 cfs 0.110 af
Outflow=1.34 cfs 0.110 af

Reach DPP: Total Proposed to Maine Mall Rd Inflow=1.22 cfs 0.169 af
Outflow=1.22 cfs 0.169 af

Pond BS: basin Peak Elev=118.75' Storage=2,339 cf Inflow=2.68 cfs 0.173 af
Outflow=1.07 cfs 0.144 af

Pond FB: Forebay Peak Elev=119.97' Storage=1,329 cf Inflow=2.75 cfs 0.199 af
Outflow=2.68 cfs 0.173 af

Total Runoff Area = 4.351 ac Runoff Volume = 0.335 af Average Runoff Depth = 0.92"
74.95% Pervious = 3.261 ac 25.05% Impervious = 1.090 ac

Summary for Subcatchment E1: Existing to mall

Runoff = 1.34 cfs @ 12.11 hrs, Volume= 0.110 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=2.50"

Area (sf)	CN	Description
94,766	74	>75% Grass cover, Good, HSG C
94,766		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P1: DEVELOPMENT AREA

Runoff = 2.75 cfs @ 12.09 hrs, Volume= 0.199 af, Depth= 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=2.50"

Area (sf)	CN	Description
45,472	98	Paved parking, HSG C
30,012	74	>75% Grass cover, Good, HSG C
75,484	88	Weighted Average
30,012		39.76% Pervious Area
45,472		60.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P2: REMAINDER SHEET FLOW TO MALL DRAINAGE SYSTEM

Runoff = 0.32 cfs @ 12.10 hrs, Volume= 0.026 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=2.50"

Area (sf)	CN	Description
17,282	74	>75% Grass cover, Good, HSG C
2,000	98	Paved parking, HSG C
19,282	76	Weighted Average
17,282		89.63% Pervious Area
2,000		10.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Reach DPE: To Mall Drainage System

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.176 ac, 0.00% Impervious, Inflow Depth = 0.61" for 2 yr event
 Inflow = 1.34 cfs @ 12.11 hrs, Volume= 0.110 af
 Outflow = 1.34 cfs @ 12.11 hrs, Volume= 0.110 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach DPP: Total Proposed to Maine Mall Rd

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.176 ac, 50.09% Impervious, Inflow Depth > 0.93" for 2 yr event
 Inflow = 1.22 cfs @ 12.34 hrs, Volume= 0.169 af
 Outflow = 1.22 cfs @ 12.34 hrs, Volume= 0.169 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond BS: basin

Inflow Area = 1.733 ac, 60.24% Impervious, Inflow Depth = 1.20" for 2 yr event
 Inflow = 2.68 cfs @ 12.10 hrs, Volume= 0.173 af
 Outflow = 1.07 cfs @ 12.37 hrs, Volume= 0.144 af, Atten= 60%, Lag= 16.3 min
 Primary = 1.07 cfs @ 12.37 hrs, Volume= 0.144 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 118.75' @ 12.37 hrs Surf.Area= 2,223 sf Storage= 2,339 cf

Plug-Flow detention time= 197.8 min calculated for 0.144 af (83% of inflow)
 Center-of-Mass det. time= 126.7 min (979.2 - 852.5)

Volume #1	Invert	Avail.Storage	Storage Description
	117.50'	7,346 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.50	1,529	0	0
118.00	1,794	831	831
119.00	2,365	2,080	2,910
120.00	2,993	2,679	5,589
120.50	4,032	1,756	7,346

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	12.0" Round Culvert L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.00' / 114.50' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf
#2	Device 1	117.50'	0.270 in/hr Exfiltration over Surface area
#3	Primary	119.90'	15.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#4	Primary	118.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 4	117.50'	4.0" Vert. Orifice/Grate X 5.00 C= 0.600

Primary OutFlow Max=1.06 cfs @ 12.37 hrs HW=118.75' (Free Discharge)

- 1=Culvert (Passes 0.01 cfs of 5.06 cfs potential flow)
- 2=Exfiltration (Exfiltration Controls 0.01 cfs)
- 3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- 4=Broad-Crested Rectangular Weir (Passes 1.05 cfs of 1.68 cfs potential flow)
- 5=Orifice/Grate (Orifice Controls 1.05 cfs @ 2.40 fps)

Summary for Pond FB: Forebay

Inflow Area = 1.733 ac, 60.24% Impervious, Inflow Depth = 1.38" for 2 yr event
 Inflow = 2.75 cfs @ 12.09 hrs, Volume= 0.199 af
 Outflow = 2.68 cfs @ 12.10 hrs, Volume= 0.173 af, Atten= 3%, Lag= 0.6 min
 Primary = 2.68 cfs @ 12.10 hrs, Volume= 0.173 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 119.97' @ 12.10 hrs Surf.Area= 996 sf Storage= 1,329 cf
 Flood Elev= 120.50' Surf.Area= 1,514 sf Storage= 1,991 cf

Plug-Flow detention time= 86.2 min calculated for 0.173 af (87% of inflow)
 Center-of-Mass det. time= 26.9 min (852.5 - 825.6)

Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	1,991 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.00	382	0	0
119.00	666	524	524
120.00	1,007	837	1,361
120.50	1,514	630	1,991

Device	Routing	Invert	Outlet Devices
#1	Primary	119.80'	15.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

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Type III 24-hr 2 yr Rainfall=2.50"

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Primary OutFlow Max=2.65 cfs @ 12.10 hrs HW=119.97' (Free Discharge)

←1=Broad-Crested Rectangular Weir (Weir Controls 2.65 cfs @ 1.05 fps)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: Existing to mall Runoff Area=94,766 sf 0.00% Impervious Runoff Depth=1.45"
Tc=6.0 min CN=74 Runoff=3.54 cfs 0.263 af

Subcatchment P1: DEVELOPMENT AREA Runoff Area=75,484 sf 60.24% Impervious Runoff Depth=2.54"
Tc=6.0 min CN=88 Runoff=5.01 cfs 0.367 af

Subcatchment P2: REMAINDER SHEET Runoff Area=19,282 sf 10.37% Impervious Runoff Depth=1.59"
Tc=6.0 min CN=76 Runoff=0.80 cfs 0.059 af

Reach DPE: To Mall Drainage System Inflow=3.54 cfs 0.263 af
Outflow=3.54 cfs 0.263 af

Reach DPP: Total Proposed to Maine Mall Rd Inflow=2.66 cfs 0.370 af
Outflow=2.66 cfs 0.370 af

Pond BS: basin Peak Elev=119.57' Storage=4,355 cf Inflow=4.90 cfs 0.341 af
Outflow=2.19 cfs 0.311 af

Pond FB: Forebay Peak Elev=120.05' Storage=1,414 cf Inflow=5.01 cfs 0.367 af
Outflow=4.90 cfs 0.341 af

Total Runoff Area = 4.351 ac Runoff Volume = 0.689 af Average Runoff Depth = 1.90"
74.95% Pervious = 3.261 ac 25.05% Impervious = 1.090 ac

Summary for Subcatchment E1: Existing to mall

Runoff = 3.54 cfs @ 12.10 hrs, Volume= 0.263 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=3.80"

Area (sf)	CN	Description
94,766	74	>75% Grass cover, Good, HSG C
94,766		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P1: DEVELOPMENT AREA

Runoff = 5.01 cfs @ 12.09 hrs, Volume= 0.367 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=3.80"

Area (sf)	CN	Description
45,472	98	Paved parking, HSG C
30,012	74	>75% Grass cover, Good, HSG C
75,484	88	Weighted Average
30,012		39.76% Pervious Area
45,472		60.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P2: REMAINDER SHEET FLOW TO MALL DRAINAGE SYSTEM

Runoff = 0.80 cfs @ 12.10 hrs, Volume= 0.059 af, Depth= 1.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=3.80"

Area (sf)	CN	Description
17,282	74	>75% Grass cover, Good, HSG C
2,000	98	Paved parking, HSG C
19,282	76	Weighted Average
17,282		89.63% Pervious Area
2,000		10.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Reach DPE: To Mall Drainage System

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.176 ac, 0.00% Impervious, Inflow Depth = 1.45" for 10 yr event
 Inflow = 3.54 cfs @ 12.10 hrs, Volume= 0.263 af
 Outflow = 3.54 cfs @ 12.10 hrs, Volume= 0.263 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach DPP: Total Proposed to Maine Mall Rd

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.176 ac, 50.09% Impervious, Inflow Depth > 2.04" for 10 yr event
 Inflow = 2.66 cfs @ 12.16 hrs, Volume= 0.370 af
 Outflow = 2.66 cfs @ 12.16 hrs, Volume= 0.370 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond BS: basin

Inflow Area = 1.733 ac, 60.24% Impervious, Inflow Depth = 2.36" for 10 yr event
 Inflow = 4.90 cfs @ 12.10 hrs, Volume= 0.341 af
 Outflow = 2.19 cfs @ 12.31 hrs, Volume= 0.311 af, Atten= 55%, Lag= 12.7 min
 Primary = 2.19 cfs @ 12.31 hrs, Volume= 0.311 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 119.57' @ 12.31 hrs Surf.Area= 2,722 sf Storage= 4,355 cf

Plug-Flow detention time= 109.8 min calculated for 0.311 af (91% of inflow)
 Center-of-Mass det. time= 68.1 min (896.1 - 827.9)

Volume #1	Invert	Avail.Storage	Storage Description	
	117.50'	7,346 cf	Custom Stage Data (Prismatic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
117.50	1,529	0	0	
118.00	1,794	831	831	
119.00	2,365	2,080	2,910	
120.00	2,993	2,679	5,589	
120.50	4,032	1,756	7,346	

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	12.0" Round Culvert L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.00' / 114.50' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf
#2	Device 1	117.50'	0.270 in/hr Exfiltration over Surface area
#3	Primary	119.90'	15.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#4	Primary	118.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 4	117.50'	4.0" Vert. Orifice/Grate X 5.00 C= 0.600

Primary OutFlow Max=2.19 cfs @ 12.31 hrs HW=119.57' (Free Discharge)

- 1=Culvert (Passes 0.02 cfs of 5.66 cfs potential flow)
- 2=Exfiltration (Exfiltration Controls 0.02 cfs)
- 3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- 4=Broad-Crested Rectangular Weir (Passes 2.17 cfs of 16.59 cfs potential flow)
- 5=Orifice/Grate (Orifice Controls 2.17 cfs @ 4.97 fps)

Summary for Pond FB: Forebay

Inflow Area = 1.733 ac, 60.24% Impervious, Inflow Depth = 2.54" for 10 yr event
 Inflow = 5.01 cfs @ 12.09 hrs, Volume= 0.367 af
 Outflow = 4.90 cfs @ 12.10 hrs, Volume= 0.341 af, Atten= 2%, Lag= 0.5 min
 Primary = 4.90 cfs @ 12.10 hrs, Volume= 0.341 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 120.05' @ 12.10 hrs Surf.Area= 1,060 sf Storage= 1,414 cf
 Flood Elev= 120.50' Surf.Area= 1,514 sf Storage= 1,991 cf

Plug-Flow detention time= 57.6 min calculated for 0.341 af (93% of inflow)
 Center-of-Mass det. time= 19.7 min (827.9 - 808.2)

Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	1,991 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.00	382	0	0
119.00	666	524	524
120.00	1,007	837	1,361
120.50	1,514	630	1,991

Device	Routing	Invert	Outlet Devices
#1	Primary	119.80'	15.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

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Type III 24-hr 10 yr Rainfall=3.80"

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Primary OutFlow Max=4.88 cfs @ 12.10 hrs HW=120.05' (Free Discharge)

↳1=Broad-Crested Rectangular Weir (Weir Controls 4.88 cfs @ 1.30 fps)

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: Existing to mall Runoff Area=94,766 sf 0.00% Impervious Runoff Depth=1.90"
Tc=6.0 min CN=74 Runoff=4.69 cfs 0.344 af

Subcatchment P1: DEVELOPMENT AREA Runoff Area=75,484 sf 60.24% Impervious Runoff Depth=3.10"
Tc=6.0 min CN=88 Runoff=6.07 cfs 0.448 af

Subcatchment P2: REMAINDER SHEET Runoff Area=19,282 sf 10.37% Impervious Runoff Depth=2.05"
Tc=6.0 min CN=76 Runoff=1.04 cfs 0.076 af

Reach DPE: To Mall Drainage System Inflow=4.69 cfs 0.344 af
Outflow=4.69 cfs 0.344 af

Reach DPP: Total Proposed to Maine Mall Rd Inflow=3.17 cfs 0.468 af
Outflow=3.17 cfs 0.468 af

Pond BS: basin Peak Elev=119.91' Storage=5,320 cf Inflow=5.93 cfs 0.421 af
Outflow=2.57 cfs 0.392 af

Pond FB: Forebay Peak Elev=120.09' Storage=1,450 cf Inflow=6.07 cfs 0.448 af
Outflow=5.93 cfs 0.421 af

Total Runoff Area = 4.351 ac Runoff Volume = 0.867 af Average Runoff Depth = 2.39"
74.95% Pervious = 3.261 ac 25.05% Impervious = 1.090 ac

Summary for Subcatchment E1: Existing to mall

Runoff = 4.69 cfs @ 12.10 hrs, Volume= 0.344 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=4.40"

Area (sf)	CN	Description
94,766	74	>75% Grass cover, Good, HSG C
94,766		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P1: DEVELOPMENT AREA

Runoff = 6.07 cfs @ 12.09 hrs, Volume= 0.448 af, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=4.40"

Area (sf)	CN	Description
45,472	98	Paved parking, HSG C
30,012	74	>75% Grass cover, Good, HSG C
75,484	88	Weighted Average
30,012		39.76% Pervious Area
45,472		60.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment P2: REMAINDER SHEET FLOW TO MALL DRAINAGE SYSTEM

Runoff = 1.04 cfs @ 12.10 hrs, Volume= 0.076 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=4.40"

Area (sf)	CN	Description
17,282	74	>75% Grass cover, Good, HSG C
2,000	98	Paved parking, HSG C
19,282	76	Weighted Average
17,282		89.63% Pervious Area
2,000		10.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Reach DPE: To Mall Drainage System

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.176 ac, 0.00% Impervious, Inflow Depth = 1.90" for 25 yr event
 Inflow = 4.69 cfs @ 12.10 hrs, Volume= 0.344 af
 Outflow = 4.69 cfs @ 12.10 hrs, Volume= 0.344 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Reach DPP: Total Proposed to Maine Mall Rd

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.176 ac, 50.09% Impervious, Inflow Depth > 2.58" for 25 yr event
 Inflow = 3.17 cfs @ 12.14 hrs, Volume= 0.468 af
 Outflow = 3.17 cfs @ 12.14 hrs, Volume= 0.468 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Pond BS: basin

[79] Warning: Submerged Pond FB Primary device # 1 by 0.11'

Inflow Area = 1.733 ac, 60.24% Impervious, Inflow Depth = 2.92" for 25 yr event
 Inflow = 5.93 cfs @ 12.10 hrs, Volume= 0.421 af
 Outflow = 2.57 cfs @ 12.31 hrs, Volume= 0.392 af, Atten= 57%, Lag= 12.7 min
 Primary = 2.57 cfs @ 12.31 hrs, Volume= 0.392 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 119.91' @ 12.32 hrs Surf.Area= 2,936 sf Storage= 5,320 cf

Plug-Flow detention time= 94.9 min calculated for 0.391 af (93% of inflow)
 Center-of-Mass det. time= 59.9 min (880.6 - 820.6)

Volume #1	Invert	Avail.Storage	Storage Description
	117.50'	7,346 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.50	1,529	0	0
118.00	1,794	831	831
119.00	2,365	2,080	2,910
120.00	2,993	2,679	5,589
120.50	4,032	1,756	7,346

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	12.0" Round Culvert L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.00' / 114.50' S= 0.0050 '/ Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 0.79 sf
#2	Device 1	117.50'	0.270 in/hr Exfiltration over Surface area
#3	Primary	119.90'	15.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59
#4	Primary	118.50'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#5	Device 4	117.50'	4.0" Vert. Orifice/Grate X 5.00 C= 0.600

Primary OutFlow Max=2.53 cfs @ 12.31 hrs HW=119.91' (Free Discharge)

- 1=Culvert (Passes 0.02 cfs of 5.89 cfs potential flow)
- 2=Exfiltration (Exfiltration Controls 0.02 cfs)
- 3=Broad-Crested Rectangular Weir (Weir Controls 0.02 cfs @ 0.24 fps)
- 4=Broad-Crested Rectangular Weir (Passes 2.49 cfs of 26.71 cfs potential flow)
- 5=Orifice/Grate (Orifice Controls 2.49 cfs @ 5.71 fps)

Summary for Pond FB: Forebay

Inflow Area = 1.733 ac, 60.24% Impervious, Inflow Depth = 3.10" for 25 yr event
 Inflow = 6.07 cfs @ 12.09 hrs, Volume= 0.448 af
 Outflow = 5.93 cfs @ 12.10 hrs, Volume= 0.421 af, Atten= 2%, Lag= 0.5 min
 Primary = 5.93 cfs @ 12.10 hrs, Volume= 0.421 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 120.09' @ 12.10 hrs Surf.Area= 1,094 sf Storage= 1,450 cf
 Flood Elev= 120.50' Surf.Area= 1,514 sf Storage= 1,991 cf

Plug-Flow detention time= 50.2 min calculated for 0.421 af (94% of inflow)
 Center-of-Mass det. time= 18.0 min (820.6 - 802.6)

Volume	Invert	Avail.Storage	Storage Description
#1	118.00'	1,991 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.00	382	0	0
119.00	666	524	524
120.00	1,007	837	1,361
120.50	1,514	630	1,991

Device	Routing	Invert	Outlet Devices
#1	Primary	119.80'	15.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

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Type III 24-hr 25 yr Rainfall=4.40"

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Primary OutFlow Max=5.90 cfs @ 12.10 hrs HW=120.08' (Free Discharge)

←1=Broad-Crested Rectangular Weir (Weir Controls 5.90 cfs @ 1.38 fps)

APPENDIX F
OPERATION AND MAINTENANCE PLAN

**STORMWATER SYSTEM OPERATION AND MAINTENANCE
PLAN FOR
CHICK-FIL-A RESTAURANT
663 STILLWATER AVENUE
BANGOR, MAINE**

Developer: Chick-fil-A Restaurants

Contact Person: Chick-fil-A
Stillwater Avenue, Bangor, ME
Store Manager

Chick-fil-A will assume responsibility for stormwater maintenance upon substantial completion of the project, or when the contractor files the MPDES Notice of Termination for Construction Activity, whichever occurs first.

COMPONENT: *Parking lot (approx. 1 acre)*

RESPONSIBILITY: *Contractor during construction, Chick Fil A after construction*

ACTION: *Sweeping*

FREQUENCY: *Semi-Annually*

DESCRIPTION: *Roadway shall be swept at least semi-annually, once in March-May, and once in October-November. Sweeping must be done with a dry vacuum sweeper or regenerative air sweeper. During construction, the contractor will monitor the roadway and remove sediments as necessary, considering both annual necessity and the need for more frequent cleaning during construction. Sweeping shall be performed to remove sediments prior to introduction into the stormwater collection system. Washing and water jetting shall be discouraged.*

COMPONENT: *Deep sump catch basins*

RESPONSIBILITY: *Contractor during construction, Chick Fil A after construction*

ACTION: *Sediment removal / sump cleaning*

FREQUENCY: *Semi-annually*

DESCRIPTION: *Basins are to be inspected on a semi-annual basis, once in March-April, and once in October-November. Grates are to be cleaned of trash and debris at least semi-annually, or more often as needed to maintain flows to the inlet. The sumps are to be cleaned at least once annually in March or April. All sediment removed from catch basin sumps will be disposed of in a manner consistent with current DEP Policy relative to stormwater related sediments. If the system drains too fast, an orifice may be need to be added on the underdrain outlet or if already present, may need to be modified. The top several inches of the filter shall be replaced with fresh material when the water ponds for more than 72 hours. The removed sediments shall be disposed in an approved manner.*

COMPONENT: *Grass Underdrained Soil Filter*

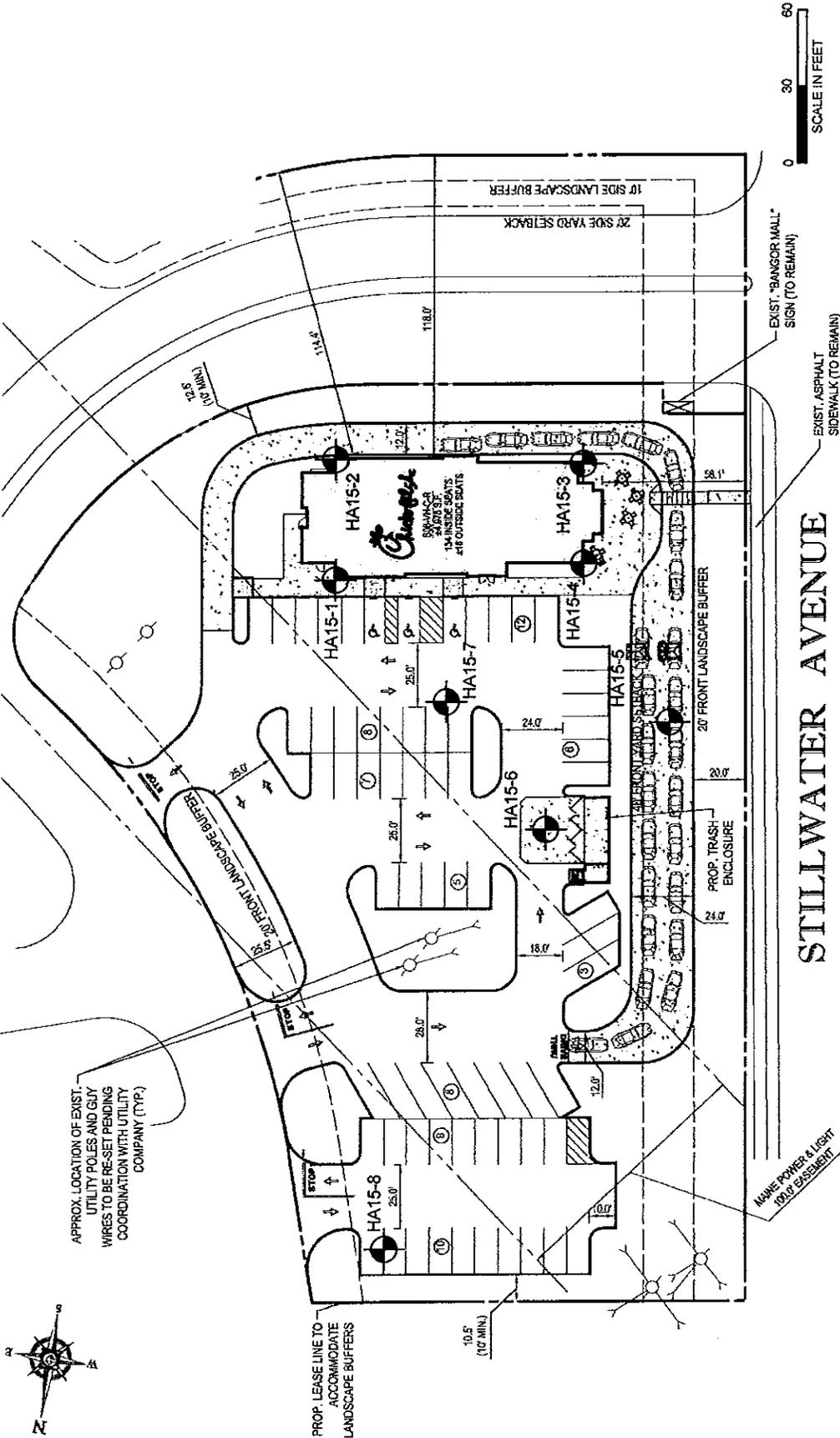
RESPONSIBILITY: *Contractor during construction, Chick Fil A after construction*

ACTION: *Debris and Sediment removal / inspection*

FREQUENCY: *Semi-annually and following major storm events*

DESCRIPTION: *The Soil Filter should be inspected after every major storm in the first year to be sure its functioning properly. Thereafter, the filter should be inspected at least once every six months to ensure that it is draining within 48 hours following a 1" storm or greater. And that following a storms that fill the system to overflow, it drains in less than 36-60 hrs.*

APPENDIX G
GEO TECHNICAL INFORMATION



APPROX. LOCATION OF EXIST. UTILITY POLES AND GUY WIRES TO BE RE-SET PENDING COORDINATION WITH UTILITY COMPANY (TYP.)

PROP. LEASE LINE TO ACCOMMODATE LANDSCAPE BUFFERS

10.5' (10' MIN.)

PROP. TRASH ENCLOSURE

MAIN POWER & LIGHT 100' RADIUS

STILLWATER AVENUE

LEGEND

HA15-1

NOTE:

1. BASE MAP IS ELECTRONIC CAD IMAGE ENTITLED "CONCEPT SKETCH 'A'" DATED 3 DECEMBER 2014 FROM BOHLER ENGINEERING OF SOUTHBOROUGH, MASSACHUSETTS.

HALEY ALDRICH
 PROPOSED CHICK-FIL-A #03935/BANGOR ME
 BANGOR MALL
 BANGOR, MAINE

**SUBSURFACE EXPLORATION
 LOCATION PLAN**

SCALE: AS SHOWN
 FEBRUARY 2015

HALEY ALDRICH	TEST BORING REPORT	Boring No. HA15-1
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Project Proposed Chick-fil-A Store #03635, Bangor, Maine Client Chick-fil-A, Inc. Contractor New England Boring Contractors	File No. 41663-002 Sheet No. 1 of 1 Start 21 January 2015 Finish 21 January 2015 Driller T. Schaeffer H&A Rep. R. Estes
---	--

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	SSA	S	--	Rig Make & Model: Mobile B-53
Inside Diameter (in.)	--	1.375	--	Bit Type: Cutting Head
Hammer Weight (lb)	--	140	-	Drill Mud: None
Hammer Fall (in.)	--	30	-	Casing: SSA to 16.0 ft
				Hoist/Hammer: Winch Safety Hammer
				PID Make & Model: MiniRAE 2000 10.6 eV

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel			Sand			Field Test						
							% Coarse	% Fine		% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength		
0	6	S1	0.0	0.6	OL/OH	Frozen brown SILT with organics (OL/OH) -TOPSOIL-													
5	5	18	2.0		ML	Stiff olive-brown SILT (ML), mps < 1 mm, moist, mottled -GLACIOMARINE DEPOSIT-							5	95	S	L	L	L	
6	6					PID = 0 ppm													
7	7																		
8	4	S2	2.0	3.8	ML	Stiff olive-brown SILT (ML), mps < 1 mm, moist, mottled -GLACIOMARINE DEPOSIT-													
13	5	19	4.0		ML	Stiff olive-brown SILT (ML), with occasional fine sand partings, mps < 1 mm, moist, mottled													
	8						PID = 0 ppm												
	13																		
5	11	S3	4.0	5	ML	Hard olive-brown sandy SILT with gravel (ML), occasional cobbles, mps 1.0 in., moist to wet (cobbles from 3.8 to 4.5 ft)	5	10	5	5	10	65							
	50/2*	8	4.7		ML	Hard olive-brown sandy SILT with gravel (ML), occasional cobbles, mps 1.0 in., moist to wet (cobbles from 3.8 to 4.5 ft)													
						-GLACIAL TILL-													
10	12	S4	9.0	10	ML	Hard olive-brown sandy SILT with gravel (ML), mps 0.75 in., moist	5	10	5	5	10	65							
	20	18	11.0		ML	Hard olive-brown sandy SILT with gravel (ML), mps 0.75 in., moist													
	24						PID = 0 ppm												
	28																		
15	14	S5	14.0	15	ML	Hard olive-brown sandy SILT with gravel (ML), mps 1.0 in., moist	5	10	5	5	10	65							
	16	15	16.0		ML	Hard olive-brown sandy SILT with gravel (ML), mps 1.0 in., moist													
	19						PID = 0 ppm												
	19																		
				16.0		BOTTOM OF EXPLORATION 16.0 FT - NO REFUSAL													

Water Level Data						Sample ID		Well Diagram			Summary				
Date	Time	Elapsed Time (hr.)	Depth (ft) to:			O - Open End Rod	T - Thin Wall Tube	Filter Sand	Cuttings	Grout	Concrete	Bentonite Seal	Overburden (ft)	Rock Cored (ft)	Samples
			Bottom of Casing	Bottom of Hole	Water										
1/21/15	10:20	--	--	16.0	15.0								16.0	--	SS

Field Tests: Dilatancy: R - Rapid S - Slow N - None
 Toughness: L - Low M - Medium H - High
 Plasticity: N - Nonplastic L - Low M - Medium H - High
 Dry Strength: N - None L - Low M - Medium H - High V - Very High

Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.
Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Feb 5, 15
 HA-TEST BORING-07-1 NO EST EL HA-1808.GLB HA-TB-CORE-WELL-07-1.GDT G:\PROJECTS\14683 - CFA BANGOR\02\FIELD\1686-000_TB_HA15-1_HA15-5.GPJ

**HALEY
ALDRICH**

TEST BORING REPORT

Boring No. HA15-2

Project Proposed Chick-fil-A Store #03635, Bangor, Maine
 Client Chick-fil-A, Inc.
 Contractor New England Boring Contractors

File No. 41663-002
 Sheet No. 1 of 1
 Start 21 January 2015
 Finish 21 January 2015
 Driller T. Schaeffer
 H&A Rep. R. Estes

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	SSA	S	--	Rig Make & Model: Mobile B-53
Inside Diameter (in.)	--	1.375	--	Bit Type: Cutting Head
Hammer Weight (lb)	--	140	--	Drill Mud: None
Hammer Fall (in.)	--	30	--	Casing: SSA to 16.0 ft
				Hoist/Hammer: Winch Safety Hammer
				PID Make & Model: MiniRAE 2000 10.6 eV

Elevation 140.0 (est.)
 Datum See Report
 Location See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test						
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength		
0					OL/OH	Frozen brown SILT with organics (OL/OH) -TOPSOIL-					5	95						
5	5	S1	0.0	0.6	OH													
9	9	S2	2.0		ML	Stiff olive-brown SILT (ML), mps < 1 mm, moist, mottled -GLACIOMARINE DEPOSIT-					5	95	S	L	L	L		
10	10				ML	Stiff olive-brown SILT (ML), with occasional fine sand layers and partings, mps 1 mm, moist PID = 0 ppm					5	15	80	S	L	L	L	
4	4	S2	2.0	3.5	ML													
6	6	S2	4.0		ML													
9	9	S2	4.0		ML													
11	11	S2	4.0		ML													
10	10	S3	4.0		ML	Hard olive-brown sandy SILT with gravel (ML), mps 1.25 in., moist to wet PID = 0 ppm	10	10	5	5	10	60						
15	15	S3	6.0		ML													
5	5					-GLACIAL TILL-												
18	18	S4	9.0		ML	Hard olive-brown sandy SILT with gravel (ML), mps 0.75 in., moist PID = 0 ppm	5	10	5	5	10	65						
21	21	S4	11.0		ML													
22	22	S4	11.0		ML													
34	34	S4	11.0		ML													
8	8	S5	14.0		ML	Very stiff olive-brown sandy SILT with gravel (ML), mps 1.375 in., moist PID = 0 ppm	10	10	5	5	10	60						
12	12	S5	16.0		ML													
14	14	S5	16.0		ML													
16.0				16.0		BOTTOM OF EXPLORATION 16.0 FT - NO REFUSAL												

Water Level Data						Sample ID		Well Diagram				Summary							
Date	Time	Elapsed Time (hr.)	Depth (ft) to:			O - Open End Rod	T - Thin Wall Tube	U - Undisturbed Sample	S - Split Spoon Sample	Riser Pipe	Screen	Filter Sand	Cuttings	Grout	Concrete	Bentonite Seal	Overburden (ft)	Rock Cored (ft)	Samples
1/21/15	11:10	--	Bottom of Casing	Bottom of Hole	Water												16.0	--	5S
Boring No. HA15-2																			

Field Tests: Dilatancy: R - Rapid S - Slow N - None
 Toughness: L - Low M - Medium H - High
 Plasticity: N - Nonplastic L - Low M - Medium H - High
 Dry Strength: N - None L - Low M - Medium H - High V - Very High

*Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.
 Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HA-TEST BORING-07-1 NO EST EL HA-TB-CORE+WELL-07-1.GDT C:\PROJECTS\1688 - CFA BANGOR\02\FIELD\1688-000_TB_HA15-1_HA15-8.GPJ Feb 5, 15

**HALEY
ALDRICH**

TEST BORING REPORT

Boring No. HA15-4

Project Proposed Chick-fil-A Store #03635, Bangor, Maine
 Client Chick-fil-A, Inc.
 Contractor New England Boring Contractors

File No. 41663-002
 Sheet No. 1 of 1
 Start 21 January 2015
 Finish 21 January 2015
 Driller T. Schaeffer
 H&A Rep. R. Estes

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	SSA	S	--	Rig Make & Model: Mobile B-53
Inside Diameter (in.)	--	1.375	--	Bit Type: Cutting Head
Hammer Weight (lb)	--	140	-	Drill Mud: None
Hammer Fall (in.)	--	30	-	Casing: SSA to 16.0 ft
				Hoist/Hammer: Winch Safety Hammer
				PID Make & Model: MiniRAE 2000

Elevation 139.0 (est.)
 Datum See Report
 Location See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test						
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength		
0	5	S1	0.0	0.5	OL/OH	Frozen brown SILT with organics (OL/OH)					5	95						
4	16		2.0		OH	-TOPSOIL-						5	95	S	L	L	L	
5				2.0	ML	Medium stiff olive-brown SILT (ML), mps < 1 mm, moist, mottled -REWORKED GLACIOMARINE DEPOSIT-												
5	S2	2.0	4.0		ML	Stiff olive-brown SILT (ML), mps < 1 mm, moist to wet, slightly mottled -GLACIOMARINE DEPOSIT-						5	95	S	L	L	L	
7				4.0	ML	Hard olive-brown sandy SILT with gravel (ML), mps 1.375 in., moist to wet PID = 0 ppm	10	10	5	5	10	60						
12	S3	4.0	6.0		ML													
22				16.0		-GLACIAL TILL-												
28					ML	Hard olive-brown sandy SILT with gravel (ML), mps 1.375 in., moist to wet PID = 0 ppm	10	10	5	5	10	60						
32																		
12	S4	9.0	11.0		ML	Hard olive-brown sandy SILT with gravel (ML), mps 1.25 in., moist PID = 0 ppm	10	10	5	5	10	60						
22																		
28																		
24	S5	14.0	16.0		ML	Hard olive-brown sandy SILT with gravel (ML), mps 1.25 in., moist PID = 0 ppm	10	10	5	5	10	60						
28																		
BOTTOM OF EXPLORATION 16.0 FT - NO REFUSAL																		

Water Level Data						Sample ID		Well Diagram			Summary			
Date	Time	Elapsed Time (hr.)	Depth (ft) to:			O - Open End Rod	T - Thin Wall Tube	Filter Sand	Cuttings	Grout	Concrete	Bentonite Seal	Overburden (ft)	Rock Cored (ft)
			Bottom of Casing	Bottom of Hole	Water									
1/21/15	12:40	--	--	16.0	Dry							16.0	--	
												Boring No. HA15-4		

Field Tests: Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
 Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High V - Very High
 *Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.
 Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HA-TEST BORING-07-1 NO EST EL HA-4898.GLB HA-78-CORE-WELL-07-1.CDT C:\PROJECTS\1683 - CFA BANGOR\02\FIELD\1683-000_TB_HA15-L_HA15-8.GPJ Feb 5, 15

Project Proposed Chick-fit-A Store #03635, Bangor, Maine
 Client Chick-fit-A, Inc.
 Contractor New England Boring Contractors

File No. 41663-002
 Sheet No. 1 of 1
 Start 21 January 2015
 Finish 21 January 2015
 Driller T. Schaeffer
 H&A Rep. R. Estes

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	SSA	S	--	Rig Make & Model: Mobile B-53
Inside Diameter (in.)	--	1.375	--	Bit Type: Cutting Head
Hammer Weight (lb)	--	140	-	Drill Mud: None
Hammer Fall (in.)	--	30	-	Casing: SSA to 6.0 ft
				Hoist/Hammer: Winch Safety Hammer
				PID Make & Model: MiniRAE 2000

Elevation 138.0 (est.)
 Datum See Report
 Location See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test							
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength			
0	4	S1	0.0	0.7	OL/OH	Frozen brown SILT with organics (OL/OH) -TOPSOIL-					5	95							
	4	15	2.0		ML	Stiff olive-brown SILT (ML), mps < 1 mm, moist, mottled PID = 0 ppm					5	95	S	L	L	L			
	6	S2	2.0		ML	Stiff olive-brown SILT (ML), mps < 1 mm, moist, mottled -REWORKED GLACIOMARINE DEPOSIT- PID = 0 ppm					5	95	S	L	L	L			
	6	22	4.0	4.0	ML	Very stiff olive-brown sandy SILT with gravel (ML), mps 1.25 in., moist to wet -GLACIAL TILL- PID = 0 ppm	10	10	5	5	10	60							
	6	7	4.0																
	8	S3	4.0																
	11	20	6.0	6.0		BOTTOM OF EXPLORATION 6.0 FT - NO REFUSAL													
	13																		
	17																		

Water Level Data						Sample ID		Well Diagram				Summary						
Date	Time	Elapsed Time (hr.)	Depth (ft) to:			O - Open End Rod T - Thin Wall Tube U - Undisturbed Sample S - Split Spoon Sample		Overburden (ft)		Rock Cored (ft)		Samples		Boring No.				
			Bottom of Casing	Bottom of Hole	Water													
1/21/15	13:25	--	--	6.0	Dry													
Field Tests:						Dilatancy: R - Rapid S - Slow N - None Toughness: L - Low M - Medium H - High				Plasticity: N - Nonplastic L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High V - Very High								
*Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.																		
Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.																		

HA15-TEST BORING-07-1 NO EST EL HA15BIB.GLB HA-TB-CORE+WELL-07-1.GDT G:\PROJECTS\41885 - CFA BANGOR\02\FIELD\41885-000_TB_HA15-1_HA15-8.GPJ Feb 5, 15

**HALEY
ALDRICH**

TEST BORING REPORT

Boring No. HA15-7

Project Proposed Chick-fil-A Store #03635, Bangor, Maine
 Client Chick-fil-A, Inc.
 Contractor New England Boring Contractors

File No. 41663-002
 Sheet No. 1 of 1
 Start 21 January 2015
 Finish 21 January 2015
 Driller T. Schaeffer
 H&A Rep. R. Estes

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	SSA	S	--	Rig Make & Model: Mobile B-53
Inside Diameter (in.)	--	1.375	--	Bit Type: Cutting Head
Hammer Weight (lb)	--	140	-	Drill Mud: None
Hammer Fall (in.)	--	30	-	Casing: SSA to 6.0 ft
				Hoist/Hammer: Winch Safety Hammer
				PID Make & Model: MiniRAE 2000

Elevation 139.0 (est.)
 Datum See Report
 Location See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test						
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength		
0	5	S1	0.0		OL/OH	Frozen brown SILT with organics (OL/OH)					5	95						
	4	15	2.0	0.7	ML	-TOPSOIL- Stiff olive-brown SILT (ML), mps <1 mm, moist, mottled					5	95	S	L	L	L		
	5	S2	2.0		ML	Stiff olive-brown SILT (ML), mps <1 mm, moist, mottled					5	95	S	L	L	L		
	5	21	4.0		ML	Stiff olive-brown SILT (ML), mps <1 mm, moist, mottled					5	95	S	L	L	L		
	5			3.5		-REWORKED GLACIOMARINE DEPOSIT- Stiff olive-brown SILT (ML), mps <1 mm, moist, mottled					5	95	S	L	L	L		
	5	S3	4.0		ML	Very stiff olive-brown SILT (ML), mps <1 mm, moist, slightly blocky and fissured					5	95	S	L	L	L		
5	6	19	6.0		ML	Very stiff olive-brown sandy SILT with gravel (ML), mps 1.0 in., moist to wet					10	10	5	5	10	60		
	12					-GLACIOMARINE DEPOSIT- Very stiff olive-brown sandy SILT with gravel (ML), mps 1.0 in., moist to wet					10	10	5	5	10	60		
	13					-GLACIAL TILL- BOTTOM OF EXPLORATION 6.0 FT - NO REFUSAL												

HA-TEST BORING-07-1 NO EST EL HA-LIB08, GLB HA-TB-CORE-WELL-07-1.GDT G:\PROJECTS\1688 - CFA BANGOR\02\FIELD\1688-000_TB_HA15-L_HA15-8.GPJ Feb 5, 15

Water Level Data				Sample ID		Well Diagram		Summary	
Date	Time	Elapsed Time (hr.)	Depth (ft) to:			O - Open End Rod	Screen	Overburden (ft)	
			Bottom of Casing	Bottom of Hole	Water	T - Thin Wall Tube <td>Filter Sand <td>Rock Cored (ft) <td></td> </td></td>	Filter Sand <td>Rock Cored (ft) <td></td> </td>	Rock Cored (ft) <td></td>	
1/21/15	13:55	--	--	6.0	Dry	U - Undisturbed Sample	Cuttings	Samples	3S
						S - Split Spoon Sample	Grout		
							Concrete	Boring No.	HA15-7
							Bentonite Seal		

Field Tests: Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
 Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High V - Very High

*Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.
 Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

