Project: **Proposed Stormwater Improvements**
Thayer Nursery
Milton, MA 02186

Prepared for: **Thayer Nursery**
Hillside Street
Milton, MA 02186

Revised: **August 31, 2015**

DeCELLE BURKE & Associates, Inc.

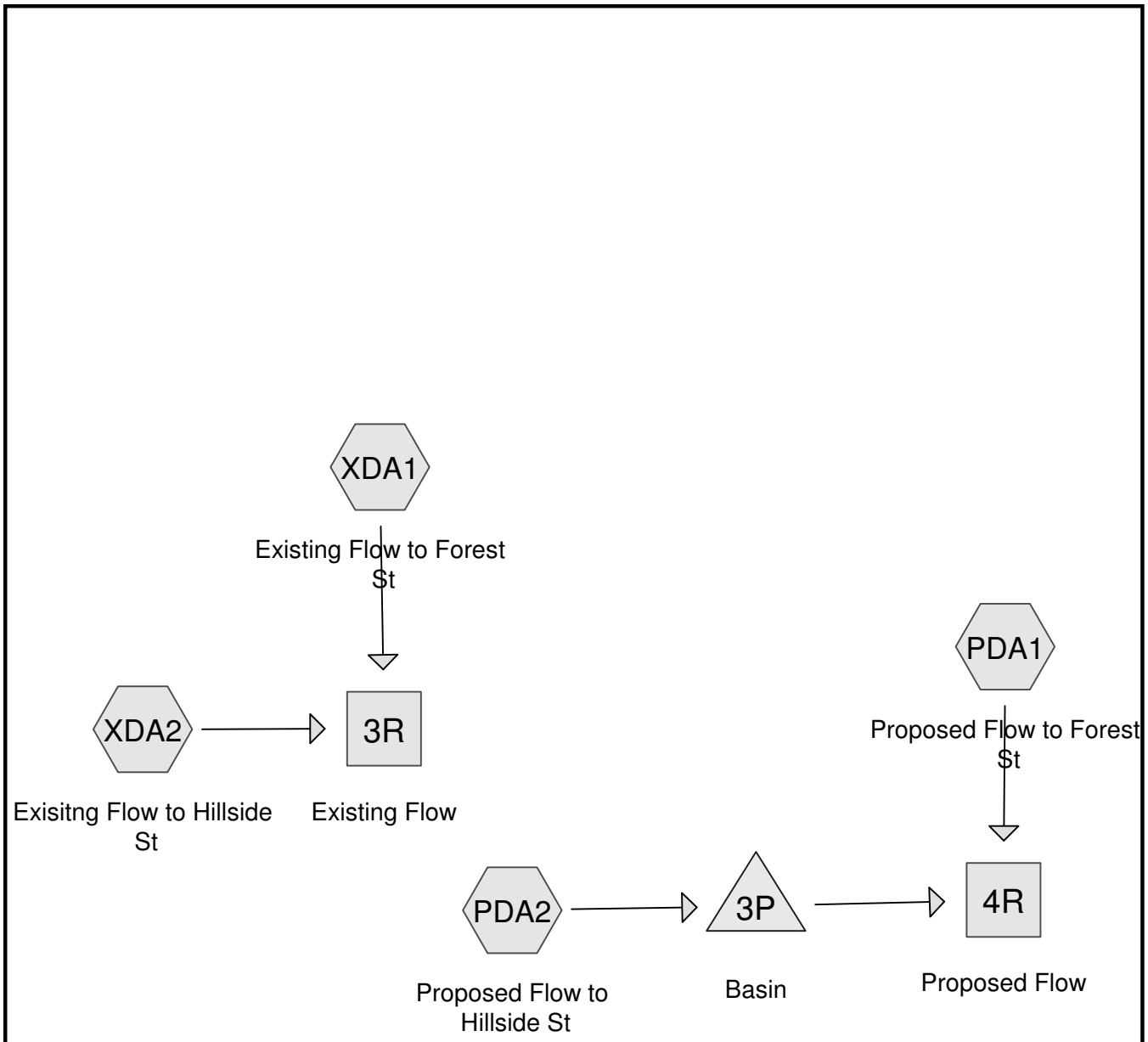
Stormwater Runoff Comparison for Pre- and Post-Improvements

2-Year Storm (3.2")			
Existing Conditions		Proposed Conditions	
Area Description	Flow (CFS)	Area Description	Flow (CFS)
Flow off-site	11.23	Flow off-site	6.33

10-Year Storm (4.7")			
Existing Conditions		Proposed Conditions	
Area Description	Flow (CFS)	Area Description	Flow (CFS)
Flow off-site	18.46	Flow off-site	9.45

25-Year Storm (5.6")			
Existing Conditions		Proposed Conditions	
Area Description	Flow (CFS)	Area Description	Flow (CFS)
Flow off-site	22.80	Flow off-site	11.12

100-Year Storm (7.0")			
Existing Conditions		Proposed Conditions	
Area Description	Flow (CFS)	Area Description	Flow (CFS)
Flow off-site	29.50	Flow off-site	13.53



Subcat Reach Pond Link

Routing Diagram for Thayer Nursery-JWB
Prepared by DeCelle-Burke & Associates, Printed 8/31/2015

Summary for Subcatchment PDA1: Proposed Flow to Forest St

Runoff = 2.83 cfs @ 12.12 hrs, Volume= 0.206 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.20"

Area (sf)	CN	Description
1,634	98	Roofs, HSG C
24,128	83	Small grain, straight row, Good, HSG C
15,948	74	>75% Grass cover, Good, HSG C
302	98	Paved parking, HSG C
20,936	96	Gravel surface, HSG C
62,948	86	Weighted Average
61,012		96.92% Pervious Area
1,936		3.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
2.4	200	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	250	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	500	Total			

Summary for Subcatchment PDA2: Proposed Flow to Hillside St

Runoff = 8.18 cfs @ 12.15 hrs, Volume= 0.640 af, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.20"

Area (sf)	CN	Description
19,007	98	Roofs, HSG C
6,400	98	Paved parking, HSG C
25,505	74	>75% Grass cover, Good, HSG C
39,394	81	Small grain, contoured, Good, HSG C
5,021	73	Woods, Fair, HSG C
76,011	96	Gravel surface, HSG C
171,338	89	Weighted Average
145,931		85.17% Pervious Area
25,407		14.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.6	110	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	270	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	85	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.3	225	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.3	740	Total			

Summary for Subcatchment XDA1: Existing Flow to Forest St

Runoff = 2.83 cfs @ 12.12 hrs, Volume= 0.206 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.20"

Area (sf)	CN	Description
1,634	98	Roofs, HSG C
24,128	83	Small grain, straight row, Good, HSG C
15,948	74	>75% Grass cover, Good, HSG C
302	98	Paved parking, HSG C
20,936	96	Gravel surface, HSG C
62,948	86	Weighted Average
61,012		96.92% Pervious Area
1,936		3.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
2.4	200	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	250	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	500	Total			

Summary for Subcatchment XDA2: Exisitng Flow to Hillside St

Runoff = 8.48 cfs @ 12.14 hrs, Volume= 0.667 af, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.20"

Area (sf)	CN	Description
19,007	98	Roofs, HSG C
9,809	98	Paved parking, HSG C
25,505	74	>75% Grass cover, Good, HSG C
35,985	83	Small grain, straight row, Good, HSG C
5,021	73	Woods, Fair, HSG C
76,011	96	Gravel surface, HSG C
171,338	90	Weighted Average
142,522		83.18% Pervious Area
28,816		16.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.6	110	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	270	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	85	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.3	225	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.3	740	Total			

Summary for Reach 3R: Existing Flow

Inflow Area = 5.378 ac, 13.13% Impervious, Inflow Depth > 1.95"
Inflow = 11.23 cfs @ 12.14 hrs, Volume= 0.874 af
Outflow = 11.23 cfs @ 12.14 hrs, Volume= 0.874 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 4R: Proposed Flow

Inflow Area = 5.378 ac, 11.67% Impervious, Inflow Depth > 1.87"
Inflow = 6.33 cfs @ 12.16 hrs, Volume= 0.837 af
Outflow = 6.33 cfs @ 12.16 hrs, Volume= 0.837 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 3P: Basin

Inflow Area = 3.933 ac, 14.83% Impervious, Inflow Depth > 1.95"
Inflow = 8.18 cfs @ 12.15 hrs, Volume= 0.640 af
Outflow = 4.28 cfs @ 12.36 hrs, Volume= 0.631 af, Atten= 48%, Lag= 12.9 min
Primary = 4.28 cfs @ 12.36 hrs, Volume= 0.631 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 179.78' @ 12.36 hrs Surf.Area= 4,341 sf Storage= 5,513 cf

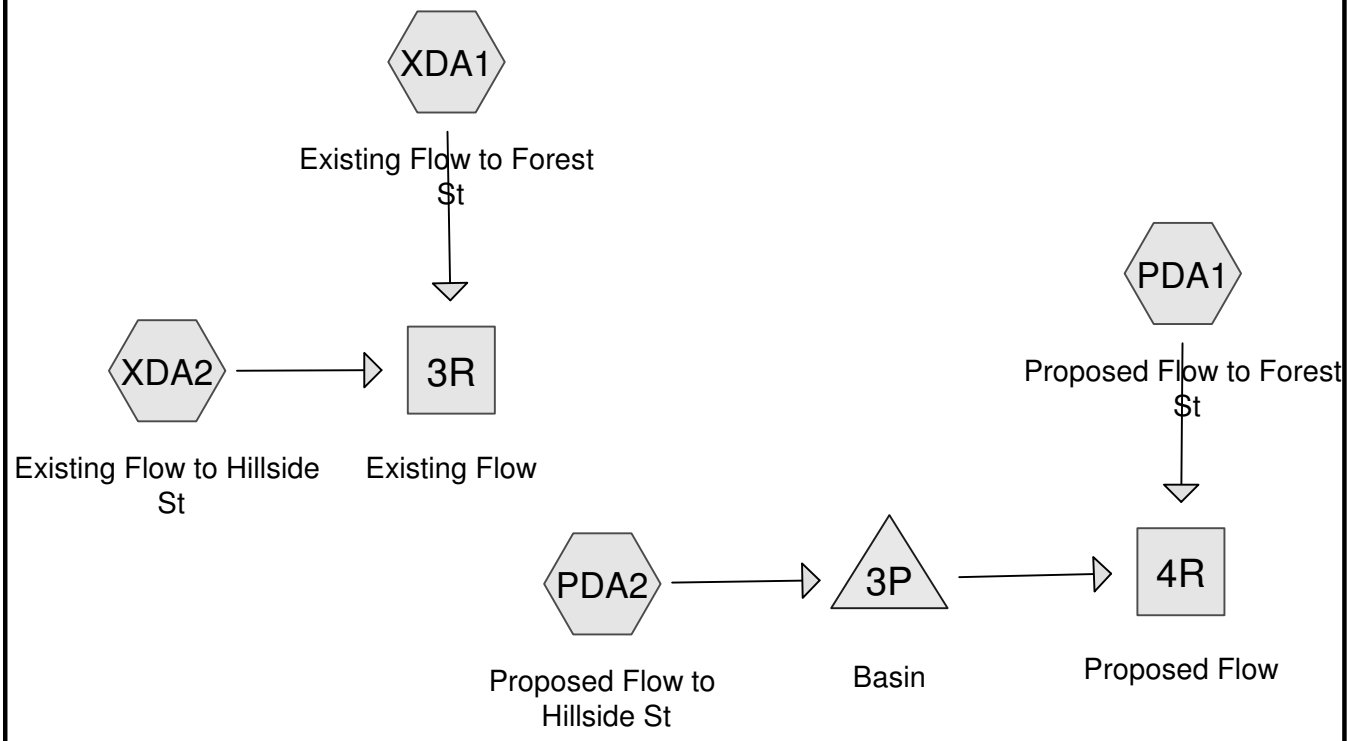
Plug-Flow detention time= 22.5 min calculated for 0.631 af (99% of inflow)
Center-of-Mass det. time= 17.0 min (798.6 - 781.6)

Volume	Invert	Avail.Storage	Storage Description
#1	178.00'	27,370 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
178.00	1,850	0	0
180.00	4,647	6,497	6,497
182.00	16,226	20,873	27,370

Device	Routing	Invert	Outlet Devices
#1	Primary	178.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	181.00'	**24.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	181.50'	**80.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=4.28 cfs @ 12.36 hrs HW=179.78' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 4.28 cfs @ 5.45 fps)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Subcat Reach Pond Link

Routing Diagram for Thayer Nursery-JWB
Prepared by DeCelle-Burke & Associates, Printed 8/31/2015

Summary for Subcatchment PDA1: Proposed Flow to Forest St

Runoff = 2.83 cfs @ 12.12 hrs, Volume= 0.206 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.20"

Area (sf)	CN	Description
1,634	98	Roofs, HSG C
24,128	83	Small grain, straight row, Good, HSG C
15,948	74	>75% Grass cover, Good, HSG C
302	98	Paved parking, HSG C
20,936	96	Gravel surface, HSG C
62,948	86	Weighted Average
61,012		96.92% Pervious Area
1,936		3.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
2.4	200	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	250	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	500	Total			

Summary for Subcatchment PDA2: Proposed Flow to Hillside St

Runoff = 8.18 cfs @ 12.15 hrs, Volume= 0.640 af, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.20"

Area (sf)	CN	Description
19,007	98	Roofs, HSG C
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5,021	73	Woods, Fair, HSG C
76,011	96	Gravel surface, HSG C
171,338	89	Weighted Average
145,931		85.17% Pervious Area
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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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0.6	110	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	270	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	85	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.3	225	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.3	740	Total			

Summary for Subcatchment XDA1: Existing Flow to Forest St

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1.6	250	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	500	Total			

Summary for Subcatchment XDA2: Existing Flow to Hillside St

Runoff = 8.48 cfs @ 12.14 hrs, Volume= 0.667 af, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=3.20"

Area (sf)	CN	Description
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Summary for Reach 4R: Proposed Flow

Inflow Area = 5.378 ac, 11.67% Impervious, Inflow Depth > 1.87"
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Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 3P: Basin

Inflow Area = 3.933 ac, 14.83% Impervious, Inflow Depth > 1.95"
Inflow = 8.18 cfs @ 12.15 hrs, Volume= 0.640 af
Outflow = 4.28 cfs @ 12.36 hrs, Volume= 0.631 af, Atten= 48%, Lag= 12.9 min
Primary = 4.28 cfs @ 12.36 hrs, Volume= 0.631 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 179.78' @ 12.36 hrs Surf.Area= 4,341 sf Storage= 5,513 cf

Plug-Flow detention time= 22.5 min calculated for 0.631 af (99% of inflow)
Center-of-Mass det. time= 17.0 min (798.6 - 781.6)

Volume	Invert	Avail.Storage	Storage Description
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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
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Primary OutFlow Max=4.28 cfs @ 12.36 hrs HW=179.78' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 4.28 cfs @ 5.45 fps)
- **2=Orifice/Grate** (Controls 0.00 cfs)
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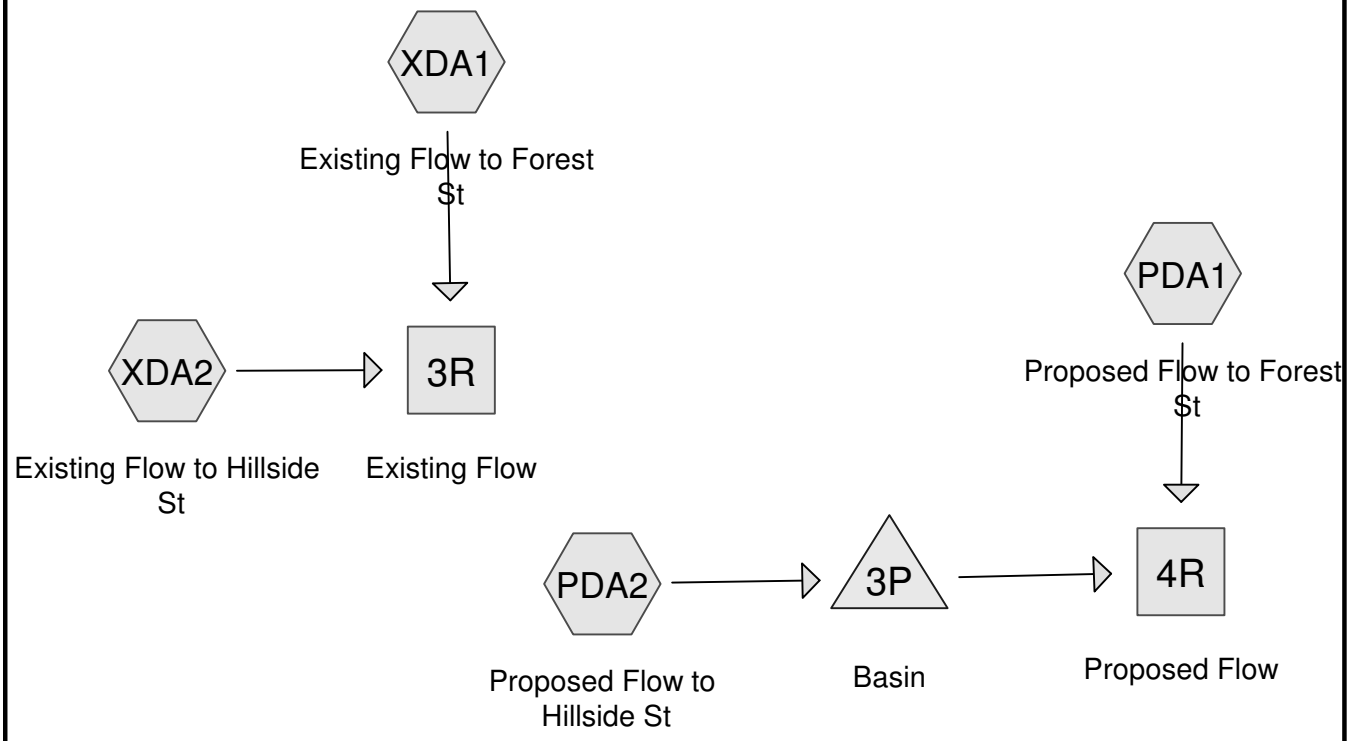

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Routing Diagram for Thayer Nursery-JWB
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Summary for Subcatchment PDA1: Proposed Flow to Forest St

Runoff = 6.11 cfs @ 12.12 hrs, Volume= 0.457 af, Depth> 3.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.60"

Area (sf)	CN	Description
1,634	98	Roofs, HSG C
24,128	83	Small grain, straight row, Good, HSG C
15,948	74	>75% Grass cover, Good, HSG C
302	98	Paved parking, HSG C
20,936	96	Gravel surface, HSG C
62,948	86	Weighted Average
61,012		96.92% Pervious Area
1,936		3.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
2.4	200	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	250	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	500	Total			

Summary for Subcatchment PDA2: Proposed Flow to Hillside St

Runoff = 16.59 cfs @ 12.14 hrs, Volume= 1.345 af, Depth> 4.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.60"

Area (sf)	CN	Description
19,007	98	Roofs, HSG C
6,400	98	Paved parking, HSG C
25,505	74	>75% Grass cover, Good, HSG C
39,394	81	Small grain, contoured, Good, HSG C
5,021	73	Woods, Fair, HSG C
76,011	96	Gravel surface, HSG C
171,338	89	Weighted Average
145,931		85.17% Pervious Area
25,407		14.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.6	110	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	270	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	85	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.3	225	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.3	740	Total			

Summary for Subcatchment XDA1: Existing Flow to Forest St

Runoff = 6.11 cfs @ 12.12 hrs, Volume= 0.457 af, Depth> 3.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.60"

Area (sf)	CN	Description
1,634	98	Roofs, HSG C
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15,948	74	>75% Grass cover, Good, HSG C
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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
2.4	200	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	250	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	500	Total			

Summary for Subcatchment XDA2: Existing Flow to Hillside St

Runoff = 16.89 cfs @ 12.14 hrs, Volume= 1.379 af, Depth> 4.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=5.60"

Area (sf)	CN	Description
19,007	98	Roofs, HSG C
9,809	98	Paved parking, HSG C
25,505	74	>75% Grass cover, Good, HSG C
35,985	83	Small grain, straight row, Good, HSG C
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0.6	110	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	270	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	85	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.3	225	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.3	740	Total			

Summary for Reach 3R: Existing Flow

Inflow Area = 5.378 ac, 13.13% Impervious, Inflow Depth > 4.10"
Inflow = 22.80 cfs @ 12.13 hrs, Volume= 1.837 af
Outflow = 22.80 cfs @ 12.13 hrs, Volume= 1.837 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 4R: Proposed Flow

Inflow Area = 5.378 ac, 11.67% Impervious, Inflow Depth > 3.99"
Inflow = 11.12 cfs @ 12.13 hrs, Volume= 1.790 af
Outflow = 11.12 cfs @ 12.13 hrs, Volume= 1.790 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 3P: Basin

Inflow Area = 3.933 ac, 14.83% Impervious, Inflow Depth > 4.10"
Inflow = 16.59 cfs @ 12.14 hrs, Volume= 1.345 af
Outflow = 6.05 cfs @ 12.47 hrs, Volume= 1.333 af, Atten= 64%, Lag= 19.5 min
Primary = 6.05 cfs @ 12.47 hrs, Volume= 1.333 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 181.04' @ 12.47 hrs Surf.Area= 10,694 sf Storage= 14,508 cf

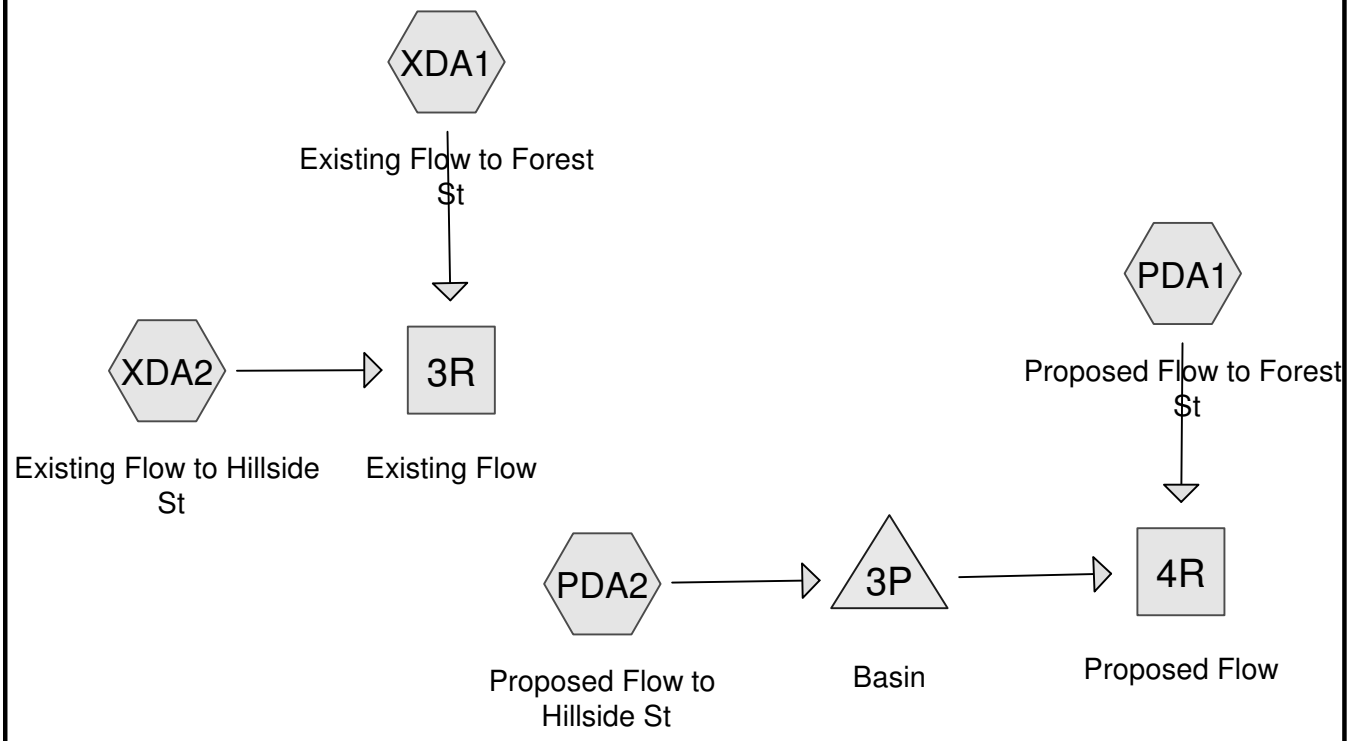
Plug-Flow detention time= 26.2 min calculated for 1.329 af (99% of inflow)
Center-of-Mass det. time= 22.3 min (786.4 - 764.1)

Volume	Invert	Avail.Storage	Storage Description
#1	178.00'	27,370 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
178.00	1,850	0	0
180.00	4,647	6,497	6,497
182.00	16,226	20,873	27,370

Device	Routing	Invert	Outlet Devices
#1	Primary	178.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	181.00'	**24.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	181.50'	**80.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=6.04 cfs @ 12.47 hrs HW=181.04' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 6.03 cfs @ 7.68 fps)
- **2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 0.70 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Subcat Reach Pond Link

Routing Diagram for Thayer Nursery-JWB
Prepared by DeCelle-Burke & Associates, Printed 8/31/2015

Summary for Subcatchment PDA1: Proposed Flow to Forest St

Runoff = 8.03 cfs @ 12.12 hrs, Volume= 0.610 af, Depth> 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=7.00"

Area (sf)	CN	Description
1,634	98	Roofs, HSG C
24,128	83	Small grain, straight row, Good, HSG C
15,948	74	>75% Grass cover, Good, HSG C
302	98	Paved parking, HSG C
20,936	96	Gravel surface, HSG C
62,948	86	Weighted Average
61,012		96.92% Pervious Area
1,936		3.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
2.4	200	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	250	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	500	Total			

Summary for Subcatchment PDA2: Proposed Flow to Hillside St

Runoff = 21.47 cfs @ 12.14 hrs, Volume= 1.767 af, Depth> 5.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=7.00"

Area (sf)	CN	Description
19,007	98	Roofs, HSG C
6,400	98	Paved parking, HSG C
25,505	74	>75% Grass cover, Good, HSG C
39,394	81	Small grain, contoured, Good, HSG C
5,021	73	Woods, Fair, HSG C
76,011	96	Gravel surface, HSG C
171,338	89	Weighted Average
145,931		85.17% Pervious Area
25,407		14.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.6	110	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	270	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	85	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.3	225	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.3	740	Total			

Summary for Subcatchment XDA1: Existing Flow to Forest St

Runoff = 8.03 cfs @ 12.12 hrs, Volume= 0.610 af, Depth> 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=7.00"

Area (sf)	CN	Description
1,634	98	Roofs, HSG C
24,128	83	Small grain, straight row, Good, HSG C
15,948	74	>75% Grass cover, Good, HSG C
302	98	Paved parking, HSG C
20,936	96	Gravel surface, HSG C
62,948	86	Weighted Average
61,012		96.92% Pervious Area
1,936		3.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
2.4	200	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	250	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	500	Total			

Summary for Subcatchment XDA2: Existing Flow to Hillside St

Runoff = 21.75 cfs @ 12.14 hrs, Volume= 1.802 af, Depth> 5.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=7.00"

Area (sf)	CN	Description
19,007	98	Roofs, HSG C
9,809	98	Paved parking, HSG C
25,505	74	>75% Grass cover, Good, HSG C
35,985	83	Small grain, straight row, Good, HSG C
5,021	73	Woods, Fair, HSG C
76,011	96	Gravel surface, HSG C
171,338	90	Weighted Average
142,522		83.18% Pervious Area
28,816		16.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.6	110	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	270	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	85	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.3	225	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.3	740	Total			

Summary for Reach 3R: Existing Flow

Inflow Area = 5.378 ac, 13.13% Impervious, Inflow Depth > 5.38"
Inflow = 29.50 cfs @ 12.13 hrs, Volume= 2.412 af
Outflow = 29.50 cfs @ 12.13 hrs, Volume= 2.412 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach 4R: Proposed Flow

Inflow Area = 5.378 ac, 11.67% Impervious, Inflow Depth > 5.27"
Inflow = 13.53 cfs @ 12.13 hrs, Volume= 2.363 af
Outflow = 13.53 cfs @ 12.13 hrs, Volume= 2.363 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 3P: Basin

Inflow Area = 3.933 ac, 14.83% Impervious, Inflow Depth > 5.39"
Inflow = 21.47 cfs @ 12.14 hrs, Volume= 1.767 af
Outflow = 8.00 cfs @ 12.46 hrs, Volume= 1.753 af, Atten= 63%, Lag= 19.0 min
Primary = 8.00 cfs @ 12.46 hrs, Volume= 1.753 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 181.49' @ 12.46 hrs Surf.Area= 13,302 sf Storage= 19,912 cf

Plug-Flow detention time= 28.3 min calculated for 1.747 af (99% of inflow)
Center-of-Mass det. time= 24.8 min (783.2 - 758.4)

Volume	Invert	Avail.Storage	Storage Description
#1	178.00'	27,370 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
178.00	1,850	0	0
180.00	4,647	6,497	6,497
182.00	16,226	20,873	27,370

Device	Routing	Invert	Outlet Devices
#1	Primary	178.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	181.00'	**24.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	181.50'	**80.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=7.99 cfs @ 12.46 hrs HW=181.49' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 6.54 cfs @ 8.33 fps)
- **2=Orifice/Grate** (Orifice Controls 1.44 cfs @ 2.39 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

DeCELLE
BURKE
& Associates, Inc.

Stormwater Operation & Site Maintenance Plan
for
Thayer Nursery
270 Hillside Street
Milton, Massachusetts

Prepared by:

DeCelle-Burke & Associates, Inc.
1266 Furnace Brook Parkway
Suite 401
Quincy, MA 02169

Prepared for:

Thayer Nursery
270 Hillside Street
Milton, MA 02186

August 31, 2015

Introduction

This Stormwater Operation & Maintenance Plan (OMP) for Thayer Nursery located at 270 Hillside Street in Milton, Massachusetts is outlined below to provide long term operation and maintenance procedures of the stormwater controls installed to manage the stormwater flow generated on the site and improve runoff quality. The landowners are required to implement the procedures and ensure the long term benefits of the stormwater controls approved and installed for this project. The OMP provides simple operational and maintenance procedures for the stormwater control structures as well as perform various tasks to remove pollutants from areas that would have potential to be picked up on site and moved via stormwater offsite.

The landowners shall be responsible to inspect, maintain and operate the stormwater management system as well as inspect the grounds for eroded areas and collected pollutants. Appointing a responsible person in charge to implement this OMP on behalf of the landowner is preferred but the landowners shall be responsible at all times for implementing this OMP. The purpose of the OMP is to maintain the long term benefits from the Stormwater Management features constructed that support stormwater detention and pollution prevention.

Responsible Party - Thayer Nursery
Josh Oldfield
270 Hillside Street
Milton, MA 02186
617-698-2005

The responsible party listed above is responsible for inspecting, maintaining and keeping copies of maintenance records for the following plan. Given that the responsible party is a professional landscaper with the proper tools and experience to oversee the maintenance of the stormwater system, it is expected that the yearly cost shall be minimal for materials and labor with no profit margin. The responsible party can therefore expect a yearly budget of $500 to $1,000 per year to maintain the site. The responsible party will be referenced as the Manager throughout the rest of this OMP.

Structural Operations

Detention Basin

A detention basin shall be constructed onsite to control stormwater runoff rates, allow some gradual infiltration and provide limited pollutant removal. The detention basin is designed to handle peak discharges for the 2, 10, 25 and 100 year storm events. Vegetation shall be applied as soon as grading operations have been completed. Temporary erosion control matting shall be used when slopes are expected to be exposed for more than a month.

Once constructed, the basin shall be inspected after each storm event to determine if any erosion, sedimentation or vegetative debris impacts the basin. If erosion is identified in the basin, the affected area will be stabilized and reseeded as required to maintain vegetative cover. Light equipment or hand tools such as rakes and shovels shall be used to remove accumulated deposits of silt and sand within the basin. Woody vegetation, such as saplings and brush shall be removed from the basin bottom and side slopes. The grass within the basin shall not be cut too often or too short to maintain the effectiveness of the basins ability to remove particulate from the stormwater. The grass should not be cut any lower than 4 inches.

Outlet Control Structure

The outlet control structure releases stormwater in a controlled fashion to minimize erosive forces that could cause rutting and possible sediment transport of-site. The outlet is a single 12" diameter orifice within a 24" vertical pipe. An overflow in the top of the pipe allows for large storm event to flow out of the system. A connection from this structure to the town system is proposed. The outlet control structures shall be inspected after each storm event. The Manager shall remove any and all sediment, debris, small sapling vegetative growth and any other material that may block the flow from the structure. All material removed and placed shall be done by hand using hand tools. The Manager shall provide a written inspection report of each time work occurs on the outlet structure. An example form is attached.

Rock Bag Check Dam

A rock bag check dam is proposed to remove sediment, debris and other deleterious material from entering the basin and the outlet control structure. The rock bag check dam consists of several small aligned porous bags of ¾" crushed stone that allows surface water to flow through while sediment and debris drops and/or is screened out of the flow. The rock bag check dam shall be inspected after each storm event. The Manager shall remove any and all sediment, debris and vegetation and any other material that may block the flow though the check dam the structure. All material removed and placed shall be done by hand using hand tools. The Manager shall provide a written inspection report of each time work occurs on the outlet structure. An example form is attached.

Record Keeping

Records of the inspections and maintenance for the Non-Structural and Structural Operations performed or organized by Manager for the property shall be up to date and available for review and inspection. An example record keeping sheet is attached.

Thayer Nursery 270 Hillside Street Milton, MA

Stormwater Operation & Site Maintenance Plan

INSPECTION SCHEDULE AND EVALUATION CHECKLIST

Best Management Practice	Inspection Frequency	Date Inspected	Contractor	Current Conditions and Minimum Maintenance / Repairs, if necessary	Completed Maintenance / Repair (i.e. date, contractor, tasks complete, etc...)
Detention Basin	After Storm Event				
Outlet Control Structures	After Storm Event				
Rock Bag Check Dam	After Storm Event				

Property Manager: _____ **Date** _____