DM ROMA
CONSULTING ENGINEERS

January 22, 2018

Amanda Lessard, Town Planner
Town of Windham
8 School Road
Windham, ME 04062

Re: Preliminary Major Subdivision Plan Application-Response to Review Comments
Majestic Woods Subdivision
Shoreland Development - Applicant

Dear Amanda:

On behalf of Shoreland Development, LLC we have prepared the enclosed plans and application materials to address Town staff's review comments on the proposed Majestic Woods Subdivision.

FINDINGS OF FACT

A. POLLUTION
- We have recently received the High Intensity Soils Map from Longview Partners, LLC which has been included in the design plan set. The hydrogeologic analysis for each septic field is currently underway and will be reviewed by the Maine DEP as part of the Site Location of Development Act Permit Review Process. The results of the hydrogeological analysis will be provided to the Town with our Final Plan application.

C. SOIL EROSIONS
- An updated Stormwater Management Report including both the stormwater treatment and quantity control calculations has been included with this submission, which has been updated to reflect the High Intensity Soil Survey mapping.
- Notes have been added to the Subdivision Plan referencing the requirement for each building to have a roofline drip edge installed, the stormwater buffers being permanently marked.

D. TRAFFIC
- The existing utility pole that is to be relocated does not currently have a street light attachment. Due to neighborhood concerns, it was not part of the proposal to install a street light at the new intersection. The only street light along Swett Road is located at the intersection with Chute Road.
- An intermediate hammerhead has been proposed at approximate roadway station 9+50.

E. SEWERAGE
- Included within this submission is the Class A High Intensity Soils Survey prepared by Longview Partners, LLC. Included within this report are the passing test pit logs for each lot. The test pit locations and potential septic field limits have been added to the Subdivision Plan.

G. AESTHETICS

- The mapped vernal pools on the property have been included on the Subdivision Plan for reference. During the vernal pool investigation, all of the pools indicated within the development were classified as “non-significant vernal pools” by the consultant, and forms have been sent to the Maine Department of Inland Fisheries and Wildlife for concurrance.
- A note has been added to the Subdivision Plan requiring the planting of street trees spaced at least every 50 feet.
- A note has been added to the Subdivision Plan restricting tree clearing beyond the tree line on the plan for five years after approval.
- Additional landscape screening has been proposed at the driveway entrance to help screen the view of vehicle headlights as they turn into the new roadway.

G. CONFORMITY WITH LOCAL PLANS AND ORDINANCES
- Net residential calculations for the overall parcel have been included on the revised Subdivision Plan.

Upon your review of this information, please let us know if you have any questions or require any additional information.

Sincerely,

DM ROMA CONSULTING ENGINEERS

Dustin M Roma

Dustin M. Roma, P.E.
President

LONGVIEW PARTNERS, LLC

ENVIRONMENTAL PERMITTING SPECIALISTS

Soil Narrative Report

prepared for

Majestic Woods Subdivision III

Swett Road

(DM Roma Consulting Engineers)

Windham, Maine

January 2018

Soil test pits observed January 9, 2018

Map prepared for a residential subdivision utilizing private water supplies and on-site subsurface wastewater disposal

Map scaled 1" = 60', base map provided by DM Roma Consulting Engineers

Mapping meets Maine Association of Professional Soil Scientists Class A High-Intensity mapping standards with minimum mapping units of 1/8 acre

ELMWOOD (S.W.P.)

SETTING

Parent Material: Sandy glaciofluvial deposits underlain by loamy or clayey marine or lacustrine sediments.

Landform: Glacial lake plains, terraces, and glacial outwash areas.

Position in Landscape: Intermediate to upper positions in landform.

Slope Gradient Ranges: **(B)** 3-8%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Somewhat poorly drained (S.W.P.) with a perched water table approximately 8 to 12 inches beneath the soil surface from November through May, or during periods of heavy precipitation.

Typical Profile Description:

Surface layer: Very dark grayish brown sandy loam or loamy sand, 0-9"
Subsurface layer: Olive brown loamy sand, 9-17"
Subsoil layer: Olive brown loamy sand, 17-27"
Substratum: Olive very fine sand, silt, or silty clay, 27-65"

Hydrologic Group: Group C

Surface Run Off: Moderately rapid to rapid

Permeability: Rapid in the solum and moderately slow or slow in substratum.

Depth to Bedrock: Deep, greater than 40".

Hazard to Flooding: None

INCLUSIONS
(Within Mapping Unit)

Similar: Lamoine, Nicholville (S.W.P.), Colonel, Eldridge, Skerry, moderately well drained taxajuncts

Dissimilar: Roundabout, Lyman, Naskeag

USE AND MANAGEMENT

Development with subsurface wastewater disposal: The limiting factor for building site development is wetness due to the presence of a water table within 1.5 feet of the soil surface. Proper foundation drainage or other site modification is recommended for houses with foundations. Portions of these map units may be suitable for subsurface wastewater disposal, in accordance with the State of Maine Subsurface Wastewater Disposal Rules, in non-shoreland zones where the seasonal high groundwater table is 12"-15" below the soil surface. The required separation distance is 18" between the bottom of disposal areas and seasonal high groundwater table.

Stormwater Detention: Elmwood (s.w.p.) soils are somewhat poorly drained with a perched groundwater table ranging from 8 to 12 inches below the existing soil surface. The upper horizons (0 to 12") typically exhibit soil permeabilities of 2.0 to 6.0 in/hr, while the subsoil (below 12") soil permeability is typically less than 0.2 in/hr.

NICHOLVILLE
(Aquic Haplorthods)

SETTING

Parent Material: Lacustrine material having a high content of silt and fine sand.

Landform: Commonly found on lake plains and upland till plains that have a mantle of water-deposited silt or very fine sand.

Position in Landscape: Intermediate and upper portions of landscape feature.

Slope Gradient Ranges: **(B)** 3-8% **(C)** 8-20% **(D)** 20+%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Moderately well drained, with a perched water table 1.5 to 2.0 feet below the soil surface from November through May.

Typical Profile Description:

Surface layer: Very dark grayish brown silt loam, 0-10"
Subsurface layer: Dark yellowish brown silt loam, 10-13"
Subsoil layer: Yellowish brown and grayish brown very fine sandy loam, 13-18"
Substratum: Grayish brown loamy very fine sand, 18-70"

Hydrologic Group: Group C

Surface Run Off: Medium

Permeability: Moderate throughout the profile.

Depth to Bedrock: Very deep, greater than 60".

Hazard to Flooding: None

INCLUSIONS
(Within Mapping Unit)

Similar: Skerry, Dixfield, Elmwood

Dissimilar: Nicholville (S.W.P.), Buxton, Tunbridge, Naskeag

USE AND MANAGEMENT

Development with subsurface wastewater disposal: The limiting factor for building site development is wetness due to the presence of a water table. Proper foundation drainage or site modification is recommended for construction. Nicholville soil meets the minimum criteria for subsurface wastewater disposal in accordance with State of Maine Rules for Subsurface Wastewater Disposal. This soil requires a 12-inch separation from the bottom of the disposal area and the seasonal high groundwater table. This soil requires 4.0 and 2.0 sq.ft/gpd for disposal beds and chambers, respectively.

Stormwater design: Nicholville is a moderately well drained soil, exhibiting a seasonal high groundwater table 1.5-2.0 feet beneath the soil surface in the spring and during periods of high precipitation. Nicholville soils exhibit permeabilities of 0.6-2.0 inches/hour, through the profile.

NICHOLVILLE (S.W.P.)

SETTING

Parent Material: Lacustrine material having a high content of silt and fine sand.

Landform: Commonly found on lake plains and upland till plains that have a mantle of water-deposited silt or very fine sand.

Position in Landscape: Intermediate portion of landscape feature.

Slope Gradient Ranges: **(A)** 0-3% **(B)** 3-8%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Nicholville (S.W.P.) is somewhat poorly drained, with a perched water table 0.5 to 1.5 feet below the soil surface from November through May and during periods of heavy precipitation.

Typical Profile Description:

Surface layer: Very dark grayish brown silt loam, 0-10"
Subsurface layer: Dark yellowish brown silt loam, 10-13"
Subsoil layer: Yellowish brown and grayish brown very fine sandy loam, 13-18"
Substratum: Grayish brown loamy very fine sand, 18-70"

Hydrologic Group: Group C

Surface Run Off: Medium

Permeability: Moderate throughout profiles.

Depth to Bedrock: Very deep, greater than 60".

Hazard to Flooding: None

INCLUSIONS
(Within Mapping Unit)

Similar: Nicholville, Naumburg (S.W.P.), Lamoine, Elmwood (SWP)

Dissimilar: Roundabout, Scantic, Naskeag

USE AND MANAGEMENT

Development with subsurface wastewater disposal: The limiting factor for building site development is wetness due to the presence of a high groundwater table. Proper foundation drainage or site modification is recommended. Nicholville (S.W.P.) may be suitable for subsurface wastewater disposal when the seasonal groundwater table is 12" or greater below the existing soil surface, outside shoreland zone areas.

Development with stormwater: Nicholville (SWP) is a somewhat poorly drained soil exhibiting a seasonal high groundwater table 1.0 to 1.5 feet beneath the soil surface in the spring and during periods of heavy precipitation. Nicholville (SWP) soils exhibit permeabilities of 0.6-2.0 inches/hr throughout the profile.

SCANTIC
(Typic Haplaquepts)

SETTING

Parent Material: Marine or lacustrine sediments.

Landform: Level or gently sloping marine or lake plains.

Position in Landscape: Lower to intermediate positions.

Slope Gradient Ranges: **(A)** 0-3% **(B)** 3-8%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Poorly drained, with a perched water table 0.5 to 1.0 feet beneath the soil surface.

Typical Profile Description:

Surface layer: Dark grayish brown silt loam, 0-9"
Subsurface layer: Olive gray silt loam, 9-11"
Subsoil layer: Olive gray, silty clay loam, 11-16"
Substratum: Olive gray clay, 16-65"

Hydrologic Group: Group D

Surface Run Off: Slow

Permeability: Moderate or moderately slow in upper profile, slow to very slow in dense substratum.

Depth to Bedrock: Very deep, greater than 60".

Hazard to Flooding: May flood occasionally on lowest fringes during spring and periods of excessive precipitation.

INCLUSIONS
(Within Mapping Unit)

Similar: Lamoine, Enosburg (Swanton)

Dissimilar: Naskeag, Biddeford, Whately

USE AND MANAGEMENT

Development with subsurface wastewater disposal: The limiting factor for building site development is wetness due to the presence of a shallow water table throughout most of the year. Proper foundation drainage or site modification is recommended for construction. Scantic soil does not meet the minimum requirements for subsurface wastewater disposal, as defined by State of Maine Rules for Subsurface Wastewater Disposal. Scantic soil may be classified as wetlands, based on the combined consideration of hydrology, hydric conditions, and vegetation.

Development for stormwater: Scantic soils are poorly drained with a high perched water table 0.5 to 1.0 feet beneath the soil surface and exhibit permeabilities of 0.2 to 2.0 inches/hr. in the upper 10 inches, and less than 0.2 inches/hr. below 10 inches.

SKERRY
(Aquic Haplorthods)

SETTING

Parent Material: Loamy glacial till underlain by sandy textured denser till.

Landform: Drumlins and glaciated uplands.

Position in Landscape: Usually occupies upper components of landform.

Slope Gradient Ranges: **(B)** 3-8% **(C)** 8-20%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Moderately well-drained, with a perched water table 1.5 to 3.5 feet below the soil surface from November through May.

Typical Profile Description:

Surface layer: Light gray fine sandy loam, 0-4"
Subsurface layer: Dark reddish brown fine sandy loam, 4-20"
Subsoil layer: Yellowish brown fine sandy loam, 20-25"
Substratum: Mixed brown and light olive brown fine sandy loam and sand, 25-65"

Hydrologic Group: Group C

Surface Run Off: Moderate

Permeability: Moderate in solum and slow or moderately slow in the compact substratum.

Depth to Bedrock: Deep, greater than 40".

Hazard to Flooding: None

INCLUSIONS
(Within Mapping Unit)

Similar: Dixfield, Nicholville

Dissimilar: Tunbridge, Lyman (less than 40" to bedrock), Colonel, Westbury

USE AND MANAGEMENT

Development with subsurface wastewater disposal: The limiting factor for building site development is wetness due to the presence of a water table 1.5 to 3.5 feet beneath the soil surface for some period during the year. Proper foundation drainage is recommended for construction. Skerry soil is suitable for subsurface wastewater disposal as defined by the State of Maine Rules for Subsurface Wastewater Disposal, and requires a 12-inch separation distance from the bottom of any disposal area to the seasonal high groundwater table. Skerry soil also requires 3.3 sq.ft/gpd for disposal system design.

Stormwater design: Skerry soils are moderately well drained. Soil permeabilities are expected to be 0.6 – 2.0 inches/hour in the upper portions of soil profile, and 0.06 – 0.6 inches/hour in the compact substratum, generally 25" – 65" beneath the soil surface.

TUNBRIDGE
(Typic Haplorthods)

SETTING

Parent Material: Loamy glacial till.

Landform: Glaciated uplands.

Position in Landscape: Upper positions on landform.

Slope Gradient Ranges: **(C)** 8-20%

COMPOSITION AND SOIL CHARACTERISTICS

Drainage Class: Somewhat excessively to well drained, with no evidence of a water table, or only inches from the bedrock surface during spring and during periods of heavy precipitation.

Typical Profile Description:

Surface layer: Black and reddish brown loam and fine sandy loam, 0-4"
Subsurface layer: Very dusky red loam, 4-6"
Subsoil layer: Dark red loam, 6-10"
Substratum layer: Dark brown to brown loam, 10-25". Bedrock at 25".

Hydrologic Group: Group C/D

Surface Run Off: Rapid

Permeability: Moderate or moderately rapid.

Depth to Bedrock: Moderately deep, 20-40".

Hazard to Flooding: None

INCLUSIONS
(Within Mapping Unit)

Similar: Dixfield, Skerry, Nicholville

Dissimilar: Lamoine, Lyman Variant, Naskeag

USE AND MANAGEMENT

Development with subsurface wastewater disposal: The limiting factor for building site development is shallow depth to bedrock. This map unit has limitations for construction of houses with foundations. Proper foundation drainage or other site modification is recommended for construction. Tunbridge soil is suitable for on-site wastewater disposal as defined by the State of Maine Subsurface Wastewater Disposal Rules. This soil requires a 24-inch separation distance between the bottom of the disposal area and bedrock, and 3.3 sq.ft/gpd and 1.7 sq.ft/gpd for bed and chamber areas, respectively.

Stormwater design: Tunbridge soils are shallow to bedrock, and offer limitations for subsurface stormwater design due to the 'ledge' blasting potential. The expected permeability of the upper 2.0' is 0.6 to 6.0 inches/hour, and 0.01 to 20.0 inches/hour in the lower horizons.

Town, City, Plantation: WINDHAM

Street, Road, Subdivision: MAJESTIC WOODS

Owner's Name: SHORELAND DEVELOPMENT, LLC

TP's HAND-DUG (VERIFY BY BH IF NECESSARY) (DM ROMA)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole: TP1 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	SANDY LOAM		DARK BROWN	
10	STONY LOAMY SAND	FRIABLE	DARK YELLOWISH BROWN	
20			LT. OL. BR.	FEW, FAINT
30		FIRM	OLIVE BROWN	
40				
50				

Soil Classification	Slope	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
Profile: 3 Condition: C	%	19"	☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR WASTEWATER DISPOSAL

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:
SKERRY	MWD	C

Observation Hole: TP2 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	SANDY LOAM		DARK BROWN	
10	LOAMY SAND	FRIABLE	DARK YELLOWISH BROWN	
20	LOAMY FINE SAND	SOMEWHAT FIRM	LT. YELL. BROWN	FEW, FAINT
30		FIRM	OLIVE	COMMON, DISTINCT
40				
50				

Soil Classification	Slope	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
Profile: 3 Condition: C	%	22"	☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
DIXFIELD/ SKERRY	MWD	C

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole: TP3 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	STONY		DARK BROWN	
10	SANDY LOAM	FRIABLE	DARK YELLOWISH BROWN	NONE EVIDENT
20				
30	REFUSAL			
40				
50				

Soil Classification	Slope	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
Profile: 2 Condition: A III	%	22"	☐ Ground Water ☐ Restrictive Layer ☒ Bedrock ☐ Pit Depth

FOR WASTEWATER DISPOSAL

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:
TUNBRIDGE	EWD	C

Observation Hole: TP4 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	SANDY LOAM		DARK BROWN	
10	STONY LOAMY SAND	FRIABLE	DARK YELLOWISH BROWN	
20			LIGHT YEL. BR.	FEW, FAINT
30	REFUSAL			
40				
50				

Soil Classification	Slope	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
Profile: 2 Condition: A III	%	28"	☐ Ground Water ☐ Restrictive Layer ☒ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
TUNBRIDGE	EWD/MWD	C

STATE OF MAINE
JAMES LOGAN
213
SOIL SCIENTIST

James Logan

Site Evaluator / Soil Scientist Signature

237/213 SE/OSS #

1/9/18 Date

JAMES LOGAN – LONGVIEW PARTNERS, LLC – 6 SECOND STREET – BUXTON, ME 04093 – longviewpartners213@gmail.com

Town, City, Plantation: WINDHAM | Street, Road Subdivision: MAJESTIC WOODS SHORELAND DEVELOPMENT, LLC (DM NOMA) | Owner's Name

TP'S HAND-DUG (VERIFY BY BH IF NECESSARY)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP5 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	STONY SANDY LOAM		DARK BROWN	
10	STONY LOAMY SAND	FRIABLE	DK. YEL. BROWN	
			LT. YEL. BROWN	
20			LT. OLIVE BROWN	FEW, FAINT
	LOAMY FINE SAND & SILT	FIRM	OLIVE	COMMON, DISTINCT
30				
40				
50				

FOR WASTEWATER DISPOSAL: Soil Classification: Profile 3/8, Condition C | Slope ___ % | Limiting Factor 15" | ☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING: Soil Series Name: NICHOLVILLE/SKERRY | Drainage Class: MUD | Hydrologic Group:

Observation Hole TP6 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	STONY SANDY LOAM		DARK BROWN	
10	STONY LOAMY SAND	FRIABLE	DARK YELLOWISH BROWN	
20	LOAMY FINE SAND & SILT	FIRM	LIGHT OLIVE BROWN	FEW, FAINT
30			OLIVE	COMMON, DISTINCT
40				
50				

Soil Classification: Profile 3/8, Condition C | Slope ___ % | Limiting Factor 18" | ☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name: NICHOLVILLE/SKERRY | Drainage Class: MUD | Hydrologic Group:

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP7 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	STONY SANDY LOAM	FRIABLE	DARK BROWN	
10			DARK YELLOWISH BROWN	
20	REFUSAL			
30				
40				
50				

FOR WASTEWATER DISPOSAL: Soil Classification: Profile 2, Condition A III | Slope ___ % | Limiting Factor 15" | ☐ Ground Water ☐ Restrictive Layer ☒ Bedrock ☐ Pit Depth

FOR SOILS MAPPING: Soil Series Name: GYMAN | Drainage Class: POOR | Hydrologic Group: D

Observation Hole TP8 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	BROWN	
10	VERY FINE SANDY LOAM & SILT	FIRM	LT. BR.	FEW FAINT
20			OLIVE	
30				
40				
50				

Soil Classification: Profile 8, Condition E | Slope ___ % | Limiting Factor 6± | ☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name: NICHOLVILLE (ERODED) | Drainage Class: MUD | Hydrologic Group: C/D

STATE OF MAINE — JAMES LOGAN # 213 — SOIL SCIENTIST

Site Evaluator / Soil Scientist Signature | 237/213 SE/OSS | 1/9/18 Date

JAMES LOGAN – LONGVIEW PARTNERS, LLC – 6 SECOND STREET – BUXTON, ME 04093 – longviewpartners213@gmail.com

Town, City, Plantation: WINDHAM

Street, Road Subdivision: MAJESTIC WOODS

Owner's Name: SHORELAND DEVELOPMENT, LLC

TP's HAND-DUG (VERIFY BY BH IF NECESSARY)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole: TP 9 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN / DARK YELLOWISH BROWN	
20	GRAVELLY SOMEWHAT SANDY LOAM & LOAMY SAND	FIRM TO FIRM	OLIVE BROWN	COMMON, FAINT
50				

Soil Classification: Profile 3, Condition C

Slope: ___ %

Limiting Factor: 18"

☒ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Drainage Class: MOD

Hydrologic Group: C

FOR WASTEWATER DISPOSAL

FOR SOILS MAPPING

Soil Series Name: SKERRY

Observation Hole: TP10 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	DARK BROWN / DARK YELLOWISH BROWN / Y. BR.	
20	LOAMY FINE SAND & SILT	SOMEWHAT FIRM / FIRM	LT. OL. BR. / OLIVE	FEW, FAINT / COMMON, DISTINCT
50				

Soil Classification: Profile 8, Condition C

Slope: ___ %

Limiting Factor: 17"

☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Drainage Class: MOD

Hydrologic Group: C

Soil Series Name: NICHOLVILLE

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole: TP11 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	DARK BROWN / DARK YELLOWISH BROWN	
20	LOAMY SOMEWHAT FINE SAND & SILT	FIRM TO FIRM	OLIVE BROWN	FEW FAINT / COMMON
50				

Soil Classification: Profile 8, Condition C

Slope: ___ %

Limiting Factor: 17

☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Drainage Class: MOD

Hydrologic Group: C

FOR WASTEWATER DISPOSAL

FOR SOILS MAPPING

Soil Series Name: NICHOLVILLE

STATE OF MAINE — JAMES LOGAN #213 — SOIL SCIENTIST

Observation Hole: TP12 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	DARK BROWN / DARK YELLOWISH BROWN	FEW, FAINT
20	LOAMY FINE SAND & SILT	SOMEWHAT FIRM TO FIRM	OLIVE BROWN	COMMON, FAINT
50				

Soil Classification: Profile 8, Condition C

Slope: ___ %

Limiting Factor: 16"

☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Drainage Class: MOD

Hydrologic Group: C

Soil Series Name: NICHOLVILLE

Site Evaluator / Soil Scientist Signature

237/213

SE/OSS #

1/9/18

Date

JAMES LOGAN – LONGVIEW PARTNERS, LLC – 6 SECOND STREET – BUXTON, ME 04093 – longviewpartners213@gmail.com

Town, City, Plantation: WINDHAM

Street, Road Subdivision: MAJESTIC WOODS

Owner's Name: SHORELAND DEVELOPMENT, LLC (DM RONA)

TP'S HAND-DUG (VERIFY BY BH IF NECESSARY)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP13 — Test Pit — Boring

" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	DARK BROWN	
10			DARK YELLOWISH BROWN	
20	LOAMY FINE SAND & SILT	SOMEWHAT FIRM TO FIRM	OLIVE BROWN	FEW FAINT COMMON DISTINCT
30				
40				
50				

Soil Classification: Profile 8, Condition C

Slope: ___ %

Limiting Factor: 24"

Restrictive Layer: X Ground Water; ☐ Bedrock; ☐ Pit Depth

Soil Series Name: NICHOLVILLE

Drainage Class: MWD

Hydrologic Group: C

Observation Hole TP14 — Test Pit — Boring

" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	DARK BROWN	
10			DARK YELLOWISH BROWN	
20	LOAMY FINE SAND & SILT	SOMEWHAT FIRM TO FIRM	LT. OLIVE BROWN	FEW FAINT
30			OLIVE BROWN	COMMON FAINT
40				
50				

Soil Classification: Profile 8, Condition C

Slope: ___ %

Limiting Factor: 27"

Restrictive Layer: X Ground Water; ☐ Bedrock; ☐ Pit Depth

Soil Series Name: NICHOLVILLE

Drainage Class: MWD

Hydrologic Group: C

FOR WASTEWATER DISPOSAL

FOR SOILS MAPPING

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP15 — Test Pit — Boring

" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	DARK BROWN	
10			DARK YELLOWISH BROWN	FEW FAINT
20	LOAMY FINE SAND & SILT	SOMEWHAT FIRM TO FIRM	OLIVE BROWN	COMMON FAINT
30				
40				
50				

Soil Classification: Profile 8, Condition C

Slope: ___ %

Limiting Factor: 16"

Restrictive Layer: X Ground Water; ☐ Bedrock; ☐ Pit Depth

Soil Series Name: NICHOLVILLE

Drainage Class: MWD

Hydrologic Group: C

Observation Hole TP16 — Test Pit — [ ] Boring

" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN	
10			DARK YELLOWISH BROWN	
20	GRAVELLY SANDY LOAM & LOAMY SAND	SOMEWHAT FIRM TO FIRM	OLIVE BROWN	FEW FAINT COMMON FAINT
30				
40				
50				

Soil Classification: Profile 3, Condition C

Slope: ___ %

Limiting Factor: 24"

Restrictive Layer: X Ground Water; ☐ Bedrock; ☐ Pit Depth

Soil Series Name: SKERRY

Drainage Class: MWD

Hydrologic Group: C

STATE OF MAINE — JAMES LOGAN # 213 — SOIL SCIENTIST

237/213 — SE/OSS

Site Evaluator / Soil Scientist Signature

1/9/18

Date

JAMES LOGAN – LONGVIEW PARTNERS, LLC – 6 SECOND STREET – BUXTON, ME 04093 – longviewpartners213@gmail.com

Town, City, Plantation: WINDHAM | Street, Road, Subdivision: MAJESTIC WOODS | Owner's Name: SHORELAND DEVELOPMENT, LLC (DM ReMA)

TP's HAND-DUG (VERIFY BY BH IF NECESSARY)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP17 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–10	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN; DARK YELLOWISH BROWN	
10–20			YELL. BR.	FEW, FAINT
20–35	GRAVELLY LOAMY SAND	FIRM	OLIVE BROWN	COMMON, FAINT
35–50				

FOR WASTEWATER DISPOSAL: Soil Classification: Profile 3, Condition C | Slope: ___ % | Limiting Factor: 16" | ☒ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth
FOR SOILS MAPPING: Soil Series Name: SKERRY | Drainage Class: MWD | Hydrologic Group: C

Observation Hole TP18 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–10	FINE SANDY LOAM		DARK BROWN	
10–20	LOAMY SAND	FRIABLE	DARK YELLOWISH BROWN	
20–30	LOAMY SAND	SOMEWHAT FIRM	OLIVE BROWN	FEW, FAINT
30–40	SAND	FIRM TO FIRM	OLIVE GRAY	COMMON, FAINT
40–50				

FOR WASTEWATER DISPOSAL: Soil Classification: Profile 7/8, Condition C | Slope: ___ % | Limiting Factor: 21" | ☒ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth
FOR SOILS MAPPING: Soil Series Name: NICHOLVILLE-LIKE" | Drainage Class: MWD | Hydrologic Group: C

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP19 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–10	FINE SANDY LOAM	FRIABLE	DARK BROWN; DARK YELL. BR.	
10–20			YEL. BR.; LT. OLBR.	FEW, FAINT
20–30	LOAMY FINE SAND & SILT	SOMEWHAT FIRM	OL. BR.	COMMON, FAINT
30–40		FIRM	OLIVE	COMMON
40–50				

FOR WASTEWATER DISPOSAL: Soil Classification: Profile 8, Condition C | Slope: ___ % | Limiting Factor: 16" | ☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth
FOR SOILS MAPPING: Soil Series Name: NICHOLVILLE | Drainage Class: MWD | Hydrologic Group: C

Observation Hole TP20 ■ Test Pit ☐ Boring
" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0–10	GRAVELLY SANDY LOAM	FRIABLE	DARK BROWN; DARK YELLOWISH BROWN	
10–20			YELLOWISH BROWN	FEW FAINT
20–30	GRAVELLY LOAMY SAND & SAND	SOMEWHAT FIRM; FIRM	LIGHT OLIVE BROWN	COMMON, FAINT
30–40				
40–50				

FOR WASTEWATER DISPOSAL: Soil Classification: Profile 3, Condition C | Slope: ___ % | Limiting Factor: 22" | ☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth
FOR SOILS MAPPING: Soil Series Name: SKERRY | Drainage Class: MWD | Hydrologic Group: C

STATE OF MAINE — JAMES LOGAN # 213 — SOIL SCIENTIST

Site Evaluator / Soil Scientist Signature: James Logan | 237/213 SE/OSS | 1/9/18 Date

JAMES LOGAN – LONGVIEW PARTNERS, LLC – 6 SECOND STREET – BUXTON, ME 04093 – longviewpartners213@gmail.com

Town, City, Plantation: WINDHAM

Street, Road, Subdivision: MAJESTIC WOODS

Owner's Name: SHORELAND DEVELOPMENT, LLC

TP'S HAND-DUG (VERIFY BY BH IF NECESSARY) (DM 12/14/17)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 21 — ☒ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	DARK BROWN	
10			DARK YELLOWISH BROWN	
20	LOAMY FINE SAND & SILT	FIRM	MIXED YELL. BR.	FEW, FAINT
30			OLIVE BROWN	COMMON, FAINT
40				
50				

Soil Classification: Profile B, Condition D — Slope: ___ % — Limiting Factor: 13" — ☒ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR WASTEWATER DISPOSAL

FOR SOILS MAPPING — Soil Series Name: NICHOLVILLE (SWP) — Drainage Class: SWP — Hydrologic Group: C

Observation Hole TP 22 — ☒ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	DARK BROWN	
10			DARK YELLOWISH BROWN	FEW, FAINT
20	SILTY CLAY LOAM	FIRM	OLIVE	COMMON, DISTINCT
30				
40				
50				

Soil Classification: Profile B, Condition C — Slope: ___ % — Limiting Factor: 15" — ☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name: ELMWOOD — Drainage Class: MWD — Hydrologic Group: C

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 23 — ☒ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	DARK BROWN	
10			DK. YELL. BROWN	FEW, DISTINCT
20	LOAMY SOMEWHAT FINE SAND	FIRM	OLIVE BROWN	COMMON DISTINCT
30	SILTY CLAY LOAM			MANY, PROMINENT
40				
50				

Soil Classification: (FOR STORMWATER) Profile ___, Condition ___ — Slope: ___ % — Limiting Factor: 9" — ☒ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR WASTEWATER DISPOSAL

FOR SOILS MAPPING — Soil Series Name: ELMWOOD — Drainage Class: SWP — Hydrologic Group: C

STATE OF MAINE — JAMES LOGAN #213 — SOIL SCIENTIST

Observation Hole TP 24 — ☒ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	DARK BROWN	
10			DARK YELL. BR.	
20	LOAMY FINE SAND & SILT LOAM	FIRM	MIXED DK. Y. BROWN	COMMON FAINT
30			OLIVE	COMMON, DISTINCT
40				
50				

Soil Classification: (FOR STORMWATER) Profile ___, Condition ___ — Slope: ___ % — Limiting Factor: 12" — ☒ Ground Water ☒ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name: ELMWOOD — Drainage Class: SWP — Hydrologic Group: C

Site Evaluator / Soil Scientist Signature — 237/213 SE/OSS — 1/9/18 Date

JAMES LOGAN – LONGVIEW PARTNERS, LLC – 6 SECOND STREET – BUXTON, ME 04093 – longviewpartners213@gmail.com

Town, City, Plantation: WINDHAM

Street, Road Subdivision: MAJESTIC WOODS

Owner's Name: SHORELAND DEVELOPMENT, LLC (DM ROMA)

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP25 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0	GRAVELLY FINE SANDY LOAM	FRIABLE	DARK BROWN	
10			DARK YELLOWISH BROWN	
20	GRAVELLY LOAMY SAND & SAND		MIXED OLIVE BROWN	FEW, FAINT
30				
40	REFUSAL			
50				

FOR WASTEWATER DISPOSAL

Soil Classification: Profile	Condition	Slope %	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
2	A III		24"	☒ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:
TUNBRIDGE	MWD.	C

Observation Hole TP26 ■ Test Pit ☐ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0	SANDY LOAM	FRIABLE	DARK BROWN	
10			DARK YELLOWISH BROWN	
20	GRAVELLY LOAMY SAND & SAND		OLIVE BROWN	COMMON, FAINT
30				
40	REFUSAL			
50				

Soil Classification: Profile	Condition	Slope %	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
2	A III		19"	☒ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
TUNBRIDGE	MWD	C

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TB27 ■ Test Pit ☒ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0	FINE SANDY LOAM	FRIABLE	DARK BROWN	
10			YELLOWISH BROWN	COMMON FAINT
20	LOAMY FINE SAND AND SILT	SOMEWHAT FIRM TO FIRM	OLIVE BROWN MIXED	MANY PROMINENT
30				
40				
50				

FOR WASTEWATER DISPOSAL

Soil Classification: Profile	Condition	Slope %	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
			9"	☒ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

FOR SOILS MAPPING

Soil Series Name:	Drainage Class:	Hydrologic Group:
NICHOLVILLE	SWP	

Observation Hole TB28 ■ Test Pit ☒ Boring

" Depth of Organic Horizon Above Mineral Soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0	SILT LOAM		DARK GRAYISH BROWN	
10			OLIVE	MANY PROMINENT
20	SILTY CLAY LOAM		MIXED OLIVE BROWN	
30				
40				
50				

Soil Classification: Profile	Condition	Slope %	Limiting Factor	Ground Water / Restrictive Layer / Bedrock / Pit Depth
			18"	☒ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Series Name:	Drainage Class:	Hydrologic Group:
SCANTIC		

STATE OF MAINE — JAMES LOGAN # 213 — SOIL SCIENTIST

Site Evaluator / Soil Scientist Signature

237/213 SE/OSS

1/9/18 Date

JAMES LOGAN – LONGVIEW PARTNERS, LLC – 6 SECOND STREET – BUXTON, ME 04093 – longviewpartners213@gmail.com

DM ROMA
CONSULTING ENGINEERS

STORMWATER MANAGEMENT REPORT

MAJESTIC WOODS SUBDIVISION
SWETT ROAD
WINDHAM, MAINE

A. Narrative

Shoreland Development, LLC is proposing to develop a 39-acre parcel along Swett Road in Windham. The project site is identified as Lot 63-13 on the Town of Windham Assessors Map 6 and was indicated as retained land as part of a previously constructed 12-lot subdivision. This parcel is located in the Farm Zoning District.

This subdivision amendment will consist of 22 single family residential lots including the construction of approximately 1,930 linear feet of paved roadway, utilities and stormwater infrastructure. In general, the site drains easterly to Coley Wright Brook, which runs southerly through the proposed open space. The brook eventually drains to the Presumpscot River.

B. Alterations to Land Cover

The 39-acre lot is primarily undeveloped woods and meadow with the exception of several structures and an old farm road. The proposed development will be permitted as a 22-lot commercial subdivision on a 39-acre lot which requires a Maine Department of Environmental Protection (MDEP) Site Location of Development Act permit requiring the proposed development to meet the Basic, General and Flooding Standards as indicated in the Chapter 500 Stormwater Management regulations. In addition to the State of Maine permitting, the project will also require review by the Town of Windham under their Land Use Ordinance which requires similar stormwater standards. The proposed roadway will generate approximately 54,725 square feet (1.26 acres) of new impervious area while the proposed lot development as indicated on the Post Development Watershed Map will generate an additional 59,920 square feet (1.37 acres) totaling approximately 114,645 square feet (2.63 acres) of new impervious area.

The site is moderately sloped, draining easterly or southeasterly towards Coley Wright Brook. The slopes that form the natural drainage channels and the Brook are much steeper (3:1 or greater). Soils on the property were determined utilizing a Class A High Intensity Soils Survey prepared for the project by Longview Partners, LLC and the Medium Intensity Soil Maps for Cumberland County, Maine published by the Natural Resources Conservation Service. The soils boundaries and hydrologic soils group (HSG) designations are indicated on the Watershed Maps. Enclosed within the plan set is the High Intensity Soils Map and the Medium Intensity Soils Map has been included as Attachment 1 of this report.

C. Methodology and Modeling Assumptions

The proposed stormwater management system has been designed utilizing Best Management Practices to maintain existing drainage patterns while providing stormwater quality improvement measures. The goal of the storm drainage system design is to remove potential stormwater pollutants from runoff generated by the development while providing attenuation of the peak rates of runoff leaving the site. The method utilized to predict the surface water runoff rates in this analysis is a computer program entitled HydroCAD, which is based on the same methods that were originally developed by the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, and utilized in the TR-20 modeling program. Peak rates of runoff are forecasted based upon land use, hydrologic soil conditions, vegetative cover, contributing watershed area, time of concentration, rainfall data, storage volumes of detention basins and the hydraulic capacity of structures. The computer model predicts the amount of runoff as a function of time, with the ability to include the attenuation effect due to dams, lakes, large wetlands, floodplains and constructed stormwater management basins. The input data for rainfalls with statistical recurrence frequencies of 2-, 10- and 25 years was obtained from Appendix H of the MDEP, Chapter 500 Stormwater Management, last revised in 2015. The National Weather Service developed four synthetic storm types to simulate rainfall patterns around the country. For analysis in Cumberland County, Maine, the type III rainfall pattern with a 24-hour duration is appropriate.

D. Basic Standards

The project is required by the Town and the MDEP to provide permanent and temporary Erosion Control Best Management Practices. These methods are outlined in detail in the plan set.

E. General Standard

The MDEP and Town of Windham requires the project to meet the General Standards outlined in the MDEP Chapter 500 to provide water quality treatment for no less than 95% of the new impervious surface and 80% of the total developed area associated with the project. This standard will be met by constructing four underdrained filter basins, a bioretention cell and a forested buffer. In addition, each of the proposed houses will be required to install roofline dripedges to provide treatment for the rooftop impervious surface. As a result of the proposed stormwater infrastructure, the project provides water quality treatment for 95% of the new impervious surfaces and 80% of the new developed areas. Calculations can be found on the Watershed Maps and enclosed as Attachment 2 in this report.

F. Flooding Standard

The MDEP Flooding Standard and the Town of Windham Land Use Ordinance require the project to detain, retain or result in the infiltration of stormwater from the 24-hour storms of the 2-year, 10-year and 25-year frequencies such that the peak flows of stormwater from the project site do not exceed the peak flows of stormwater prior to undertaking the project. To

maintain these rates, four underdrained filter basins and a bioretention cell have been proposed as part of the stormwater infrastructure.

The first study point (SP-1) is the location where stormwater drains southeasterly is collected in a wetland and crosses the southeasterly property line. This flow eventually comes back onto the project site. The second study point (SP-2) is to determine the flow from the site that drains to Colley Wright Brook. This study point also includes the flow from SP-1. Colley Wright Brook delineates the extents of the stormwater modeling. No development is proposed as part of this project on the easterly side of the brook. The last study point (SP-3) is the location where the relatively small area of the site drains northerly and crosses the property line. The following table summarizes the analysis:

Table 1 – Peak Rates of Stormwater Runoff

Study Point	2-Year (cfs)		10-Year (cfs)		25-Year (cfs)	
	Pre	Post	Pre	Post	Pre	Post
SP-1	8.12	7.49	18.50	16.42	27.78	24.20
SP-2	14.12	13.14	33.33	30.309	50.76	50.38
SP-3	1.10	1.10	2.40	2.39	3.53	3.53

The installation of the four proposed underdrained filter basins and the bioretention cell maintains or reduces the peak rates of runoff at all study points. The watershed maps showing pre-development and post-development drainage patterns are included in the plan set and the computations performed with the HydroCAD software program are included as Attachment 3 of this report.

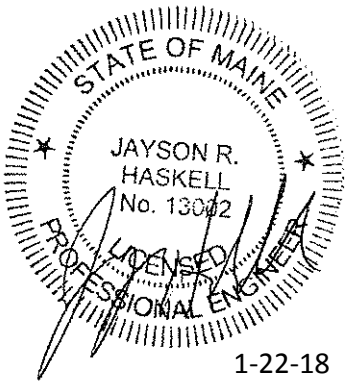
G. Maintenance of common facilities or property

The applicant will be responsible for the maintenance of the stormwater facilities until a homeowners' association is created. Enclosed within this submission is an Inspection, Maintenance and Housekeeping Plan for the project.

Prepared by:

DM ROMA CONSULTING ENGINEERS

Jayson R. Haskell, P.E.
Southern Maine Regional Manager

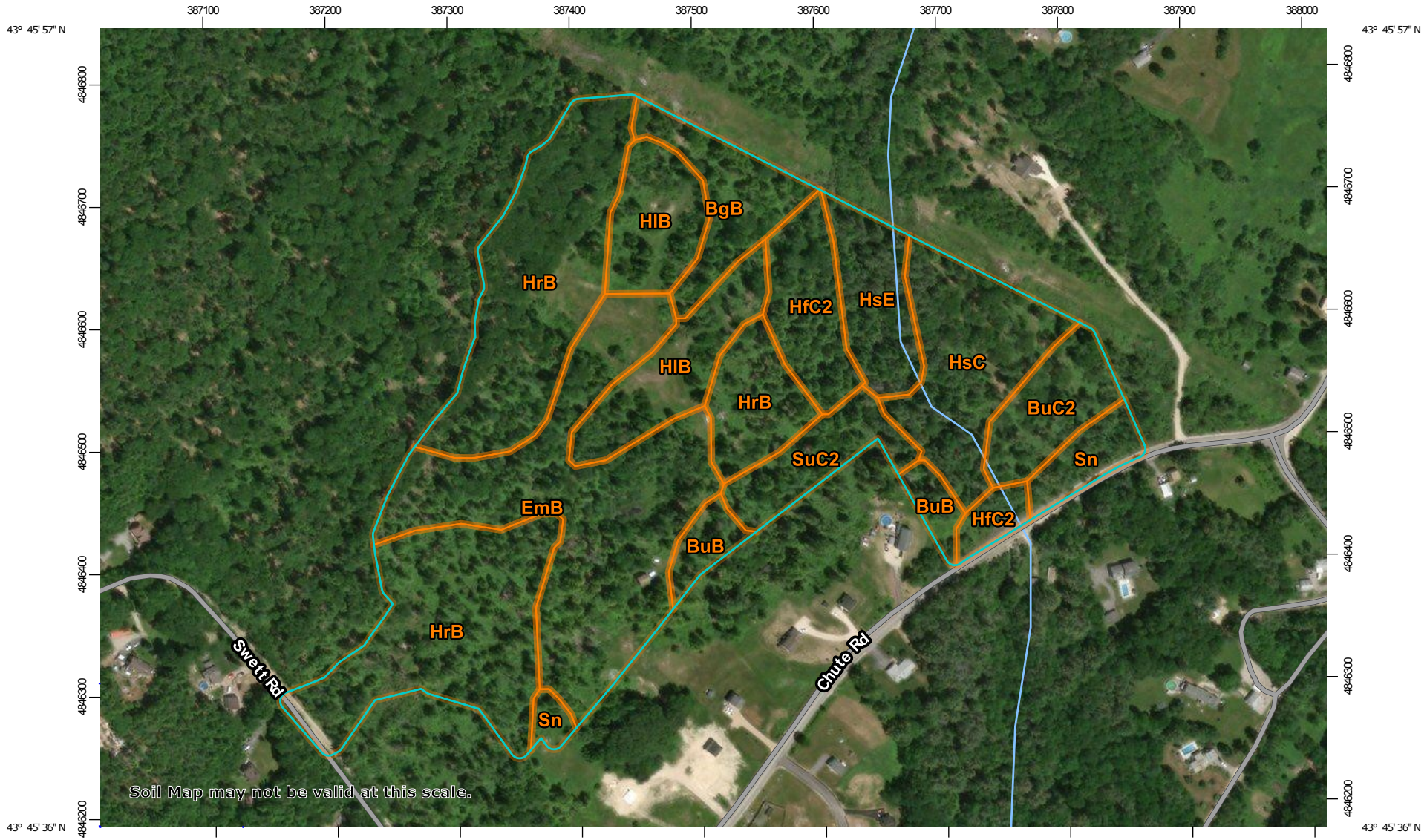


1-22-18

ATTACHMENT 1

MEDIUM INTENSITY SOILS MAP

Soil Map—Cumberland County and Part of Oxford County, Maine
(aoi)



Map Scale: 1:4,590 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 13, Sep 11, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 29, 2012—Jun 26, 2016

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BgB	Belgrade very fine sandy loam, 0 to 8 percent slopes	2.2	4.9%
BuB	Lamoine silt loam, 3 to 8 percent slopes	1.2	2.7%
BuC2	Buxton silt loam, 8 to 15 percent slopes	2.0	4.3%
EmB	Elmwood fine sandy loam, 0 to 8 percent slopes	9.2	20.3%
HfC2	Hartland very fine sandy loam, 8 to 15 percent slopes, eroded	2.7	6.1%
HlB	Hinckley loamy sand, 3 to 8 percent slopes	4.5	10.0%
HrB	Lyman-Tunbridge complex, 0 to 8 percent slopes, rocky	14.1	31.2%
HsC	Lyman-Abram complex, 8 to 15 percent slopes, very rocky	4.1	9.0%
HsE	Lyman-Abram complex, 15 to 35 percent slopes, very rocky	2.1	4.7%
Sn	Scantic silt loam, 0 to 3 percent slopes	1.3	2.9%
SuC2	Suffield silt loam, 8 to 15 percent slopes, eroded	1.8	3.9%
Totals for Area of Interest		**45.2**	**100.0%**

ATTACHMENT 2

STORMWATER TREATMENT CALCULATIONS

Stormwater Treatment Table

Majestic Woods Subdivision

	Total Watershed Area (SF)	New Driveway and Road Impervious Area (SF)	New Building Area (SF)*	New Landscaped Area (SF)	Existing/Offsite Impervious Area (SF)**	Existing/Offsite Landscaped Area (SF)**	Existing Undeveloped Area (SF)	Treatment Provided	New Impervious Area Treated In Treatment Device (SF)	New Landscaped Area Treated In Treatment Device (SF)	Treatment Device
WS-10	142,510	18,640	5,680	59,485	1,465	11,880	45,360	Yes	18,640	59,485	FB2
WS-11	41,255	13,370	0	15,400	230	3,215	9,040	Yes	13,370	15,400	FB1
WS-12	11,200	2,395	0	8,805	0	0	0	Yes	2,395	8,805	FB2
WS-13	36,830	2,595	4,260	29,975	0	0	0	Yes	2,595	29,975	BR1
WS-14	27,565	0	0	5,680	550	0	21,335	Yes	0	5,680	Buffer 1
WS-15	364,515	2,270	4,260	33,600	2,840	0	321,545	No	0	0	None
WS-20	145,485	11,235	5,680	56,450	0	0	72,120	Yes	11,235	56,450	FB3
WS-21	34,890	11,700	0	23,190	0	0	0	Yes	11,700	23,190	FB3
WS-22	79,075	8,345	2,840	30,520	0	0	37,370	Yes	8,345	30,520	FB4
WS-23	3,335	2,315	0	1,020	0	0	0	Yes	2,315	1,020	FB4
WS-24	17,290	4,750	0	12,540	0	0	0	Yes	4,750	12,540	FB4
WS-25	35,735	2,515	2,840	23,800	0	0	6,580	Yes	2,515	23,800	FB4
WS-26	425,160	3,275	5,680	54,560	1,380	0	360,265	No	0	0	None
WS-30	64,005	0	0	55	0	0	63,950	No	0	0	None
Total		**83,405**	**31,240**	**355,080**					**77,860**	**266,865**	

* All new buildings shall install a roofline drip edge to provide treatment for the rooftop impervious surface. The building's impervious area is included in the watershed and overall treatment calculations below, but not included in the BMP sizing calculations for each treatment device.

** The project is not taking credit for the Existing or Offsite impervious and landscaped areas, but are included in the BMP sizing calculations for each treatment device.

New Impervious Area =	114,645	sf
Impervious Area Requiring Treatment (95%) =	108,913	sf
Impervious Area Treatment Provided =	109,100	sf
	95%	New Impervious Area Treated
New Developed Area =	469,725	sf
Developed Area Requiring Treatment (80%) =	375,780	sf
Developed Area Treatment Provided =	375,965	sf
	80%	New Developed Area Treated

Filter Basin FB-1

Tributary Impervious Area=	13,600	sf	(WS-11 Impervious Area)
Tributary Landscaped Area=	18,615	sf	(WS-11 Landscaped Area)

Water Quality Volume (WQV) Calculation

WQV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

WQV (Required) = 1,754 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
214.5	1,235	0
216	2,125	2,520

Outlet Elevation = 216.00

Storage Volume Provided = 2,520 cf > Required

Filter Bottom Calculation

Filter Area (Required) = 5%xImpervious Area + 2%xLandscaped Area

Filter Area Required = 1,052 sf

Filter Area Provided = 1,235 sf > Required

Filter Basin FB-2

Tributary Impervious Area=	22,500	sf	(WS-10 & 12 Impervious Area)
Tributary Landscaped Area=	80,170	sf	(WS-10 & 12 Landscaped Area)

Water Quality Volume (WQV) Calculation

WQV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

WQV (Required) = 4,547 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
214.5	2,765	0
216	3,775	4,905

Outlet Elevation = 216.00

Storage Volume Provided= 4,905 cf > Required

Filter Bottom Calculation

Filter Area (Required) = 5%xImpervious Area + 2%xLandscaped Area

Filter Area Required = 2,728 sf

Filter Area Provided = 2,765 sf > Required

Filter Basin FB-3

Tributary Impervious Area=	22,935 sf	(WS-20 & 21 Impervious Area)
Tributary Landscaped Area=	79,640 sf	(WS-20 & 21 Landscaped Area)

Water Quality Volume (WQV) Calculation

WQV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

WQV (Required) = 4,566 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
204	2,840	0
206	4,260	7,100

Outlet Elevation= 205.50

Storage Volume Provided = 5,325 cf > Required

Filter Bottom Calculation

Filter Area (Required) = 5%xImpervious Area + 2%xLandscaped Area

Filter Area Required = 2,740 sf

Filter Area Provided = 2,840 sf > Required

Filter Basin FB-4

Tributary Impervious Area=	17,925 sf	(WS-22 thru 25 Impervious Area)
Tributary Landscaped Area=	67,880 sf	(WS-22 thru 25 Landscaped Area)

Water Quality Volume (WQV) Calculation

WQV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

WQV (Required) = 3,756 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
200	2,255	0
202	3,680	5,935

Outlet Elevation= 201.50

Storage Volume Provided = 4,451 cf > Required

Filter Bottom Calculation

Filter Area (Required) = 5%xImpervious Area + 2%xLandscaped Area

Filter Area Required = 2,254 sf

Filter Area Provided = 2,255 sf > Required

Bioretention Cell BR-1

Tributary Impervious Area=	2,595	sf	(WS-13 Impervious Area)
Tributary Landscaped Area=	29,975	sf	(WS-13 Landscaped Area)

Water Quality Volume (WQV) Calculation

WQV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

WQV (Required) = 1,215 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
214.5	1,300	0
215	1,580	720

Storage From Filter Media (1/3 Filter Volume)=	650	cf
Outlet Elevation =	215.00	
Storage Volume Above Media=	720	cf
Total Storage Volume Provided=	**1,370**	**cf > Required**

Filter Bottom Calculation

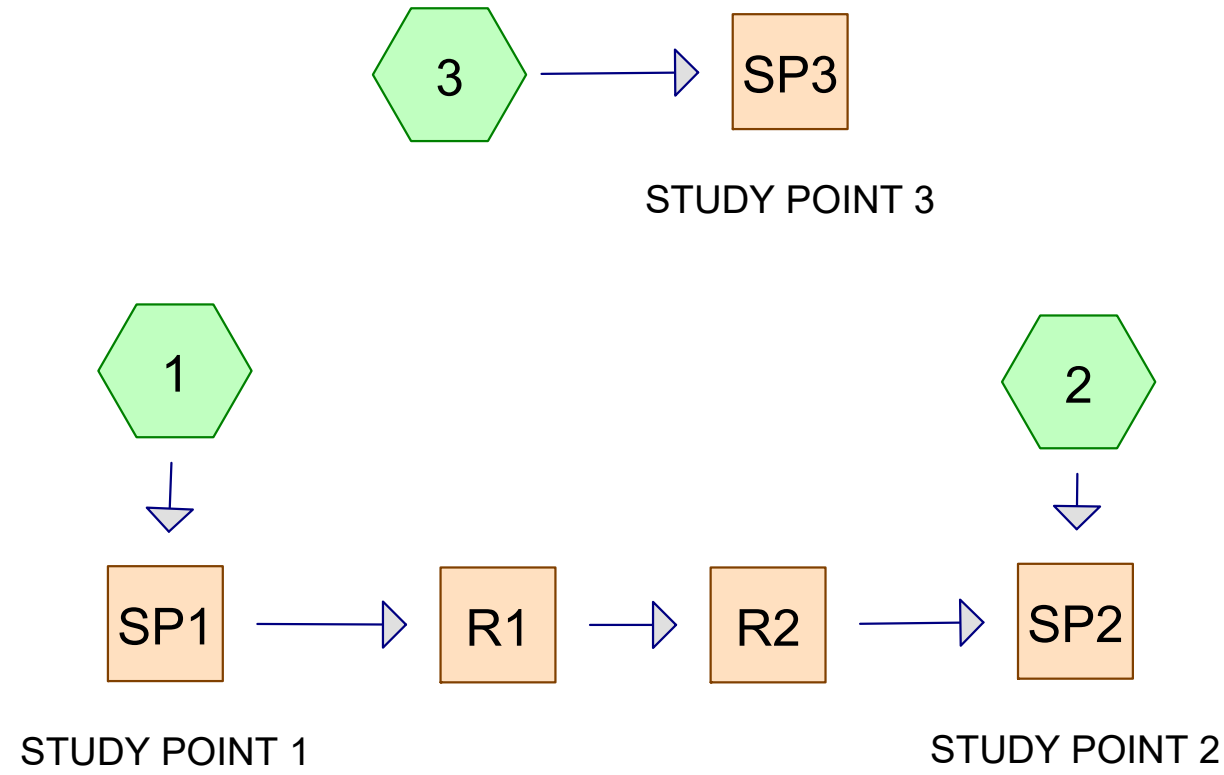
Filter Area (Required) = 7%xImpervious Area + 3%xLandscaped Area

Filter Area Required = 1,081 sf

Filter Area Provided = 1,300 sf > Required

ATTACHMENT 3

HYDROCAD OUTPUT



Subcat Reach Pond Link

Routing Diagram for 17002-PRE
Prepared by {enter your company name here}, Printed 1/19/2018

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Runoff Area=737,495 sf 0.13% Impervious Runoff Depth>2.68"
Flow Length=952' Tc=41.9 min CN=73 Runoff=27.78 cfs 3.781 af

Subcatchment 2: Runoff Area=627,360 sf 0.00% Impervious Runoff Depth>2.52"
Flow Length=906' Tc=26.2 min CN=71 Runoff=27.53 cfs 3.022 af

Subcatchment 3: Runoff Area=64,015 sf 0.00% Impervious Runoff Depth>2.88"
Flow Length=444' Tc=21.0 min CN=75 Runoff=3.53 cfs 0.353 af

Reach R1: Avg. Flow Depth=0.10' Max Vel=5.44 fps Inflow=27.78 cfs 3.781 af
n=0.030 L=105.0' S=0.2667 '/' Capacity=417.92 cfs Outflow=27.78 cfs 3.780 af

Reach R2: Avg. Flow Depth=0.42' Max Vel=4.91 fps Inflow=27.78 cfs 3.780 af
n=0.030 L=680.0' S=0.0353 '/' Capacity=941.14 cfs Outflow=27.72 cfs 3.768 af

Reach SP1: STUDY POINT 1 Inflow=27.78 cfs 3.781 af
Outflow=27.78 cfs 3.781 af

Reach SP2: STUDY POINT 2 Inflow=50.76 cfs 6.790 af
Outflow=50.76 cfs 6.790 af

Reach SP3: STUDY POINT 3 Inflow=3.53 cfs 0.353 af
Outflow=3.53 cfs 0.353 af

Summary for Subcatchment 1:

Runoff = 27.78 cfs @ 12.59 hrs, Volume= 3.781 af, Depth> 2.68"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	990	98	Existing Buildings
*	3,710	96	Gravel Road
*	15,445	80	Existing Grass D
	38,080	71	Meadow, non-grazed, HSG C
	24,375	78	Meadow, non-grazed, HSG D
	424,735	70	Woods, Good, HSG C
	230,160	77	Woods, Good, HSG D
	737,495	73	Weighted Average
	736,505		99.87% Pervious Area
	990		0.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.6	150	0.0250	0.09		**Sheet Flow, A TO B** Woods: Light underbrush n= 0.400 P2= 3.10"
5.2	415	0.0700	1.32		**Shallow Concentrated Flow, B TO C** Woodland Kv= 5.0 fps
6.2	185	0.0050	0.49		**Shallow Concentrated Flow, C TO D** Short Grass Pasture Kv= 7.0 fps
2.9	202	0.0550	1.17		**Shallow Concentrated Flow, D TO E** Woodland Kv= 5.0 fps
41.9	952	Total			

Summary for Subcatchment 2:

Runoff = 27.53 cfs @ 12.37 hrs, Volume= 3.022 af, Depth> 2.52"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	6,760	96	Gravel Road
	95,535	71	Meadow, non-grazed, HSG C
	3,200	78	Meadow, non-grazed, HSG D
	78,070	55	Woods, Good, HSG B
	262,420	70	Woods, Good, HSG C
	181,375	77	Woods, Good, HSG D
	627,360	71	Weighted Average
	627,360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	150	0.0650	0.13		**Sheet Flow, A TO B** Woods: Light underbrush n= 0.400 P2= 3.10"
2.6	230	0.0900	1.50		**Shallow Concentrated Flow, B TO C** Woodland Kv= 5.0 fps
1.3	118	0.0500	1.57		**Shallow Concentrated Flow, C TO D** Short Grass Pasture Kv= 7.0 fps
3.5	408	0.1500	1.94		**Shallow Concentrated Flow, D TO E** Woodland Kv= 5.0 fps
26.2	906	Total			

Summary for Subcatchment 3:

Runoff = 3.53 cfs @ 12.29 hrs, Volume= 0.353 af, Depth> 2.88"

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 25-Year Rainfall=5.80"

Area (sf)	CN	Description
20,505	70	Woods, Good, HSG C
43,510	77	Woods, Good, HSG D
64,015	75	Weighted Average
64,015		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	150	0.0650	0.13		**Sheet Flow, A TO B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.9	176	0.1000	1.58		**Shallow Concentrated Flow, B TO C** Woodland Kv= 5.0 fps
0.3	118	0.0100	5.80	208.88	**Trap/Vee/Rect Channel Flow, C TO D** Bot.W=8.00' D=2.00' Z= 5.0 '/' Top.W=28.00' n= 0.030
21.0	444	Total			

Summary for Reach R1:

Inflow Area = 16.931 ac, 0.13% Impervious, Inflow Depth > 2.68" for 25-Year event
Inflow = 27.78 cfs @ 12.59 hrs, Volume= 3.781 af
Outflow = 27.78 cfs @ 12.59 hrs, Volume= 3.780 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.44 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.15 fps, Avg. Travel Time= 0.8 min

Peak Storage= 536 cf @ 12.59 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 0.50' Flow Area= 27.5 sf, Capacity= 417.92 cfs

50.00' x 0.50' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 60.00'
Length= 105.0' Slope= 0.2667 '/'
Inlet Invert= 196.00', Outlet Invert= 168.00'

Summary for Reach R2:

Inflow Area = 16.931 ac, 0.13% Impervious, Inflow Depth > 2.68" for 25-Year event
Inflow = 27.78 cfs @ 12.59 hrs, Volume= 3.780 af
Outflow = 27.72 cfs @ 12.62 hrs, Volume= 3.768 af, Atten= 0%, Lag= 1.5 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.91 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 2.04 fps, Avg. Travel Time= 5.5 min

Peak Storage= 3,833 cf @ 12.62 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 3.00' Flow Area= 63.0 sf, Capacity= 941.14 cfs

12.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 30.00'
Length= 680.0' Slope= 0.0353 '/'
Inlet Invert= 168.00', Outlet Invert= 144.00'

Summary for Reach SP1: STUDY POINT 1

Inflow Area = 16.931 ac, 0.13% Impervious, Inflow Depth > 2.68" for 25-Year event
Inflow = 27.78 cfs @ 12.59 hrs, Volume= 3.781 af
Outflow = 27.78 cfs @ 12.59 hrs, Volume= 3.781 af, Atten= 0%, Lag= 0.0 min

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

Summary for Reach SP2: STUDY POINT 2

Inflow Area = 31.333 ac, 0.07% Impervious, Inflow Depth > 2.60" for 25-Year event
Inflow = 50.76 cfs @ 12.48 hrs, Volume= 6.790 af
Outflow = 50.76 cfs @ 12.48 hrs, Volume= 6.790 af, Atten= 0%, Lag= 0.0 min

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

Summary for Reach SP3: STUDY POINT 3

Inflow Area = 1.470 ac, 0.00% Impervious, Inflow Depth > 2.88" for 25-Year event
Inflow = 3.53 cfs @ 12.29 hrs, Volume= 0.353 af
Outflow = 3.53 cfs @ 12.29 hrs, Volume= 0.353 af, Atten= 0%, Lag= 0.0 min

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

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Runoff Area=737,495 sf 0.13% Impervious Runoff Depth>0.82"
Flow Length=952' Tc=41.9 min CN=73 Runoff=8.12 cfs 1.158 af

Subcatchment 2: Runoff Area=627,360 sf 0.00% Impervious Runoff Depth>0.73"
Flow Length=906' Tc=26.2 min CN=71 Runoff=7.45 cfs 0.879 af

Subcatchment 3: Runoff Area=64,015 sf 0.00% Impervious Runoff Depth>0.93"
Flow Length=444' Tc=21.0 min CN=75 Runoff=1.10 cfs 0.114 af

Reach R1: Avg. Flow Depth=0.05' Max Vel=3.36 fps Inflow=8.12 cfs 1.158 af
n=0.030 L=105.0' S=0.2667 '/' Capacity=417.92 cfs Outflow=8.12 cfs 1.157 af

Reach R2: Avg. Flow Depth=0.20' Max Vel=3.12 fps Inflow=8.12 cfs 1.157 af
n=0.030 L=680.0' S=0.0353 '/' Capacity=941.14 cfs Outflow=8.07 cfs 1.151 af

Reach SP1: STUDY POINT 1 Inflow=8.12 cfs 1.158 af
Outflow=8.12 cfs 1.158 af

Reach SP2: STUDY POINT 2 Inflow=14.12 cfs 2.030 af
Outflow=14.12 cfs 2.030 af

Reach SP3: STUDY POINT 3 Inflow=1.10 cfs 0.114 af
Outflow=1.10 cfs 0.114 af

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Runoff Area=737,495 sf 0.13% Impervious Runoff Depth>1.79"
Flow Length=952' Tc=41.9 min CN=73 Runoff=18.50 cfs 2.530 af

Subcatchment 2: Runoff Area=627,360 sf 0.00% Impervious Runoff Depth>1.66"
Flow Length=906' Tc=26.2 min CN=71 Runoff=17.95 cfs 1.991 af

Subcatchment 3: Runoff Area=64,015 sf 0.00% Impervious Runoff Depth>1.96"
Flow Length=444' Tc=21.0 min CN=75 Runoff=2.40 cfs 0.240 af

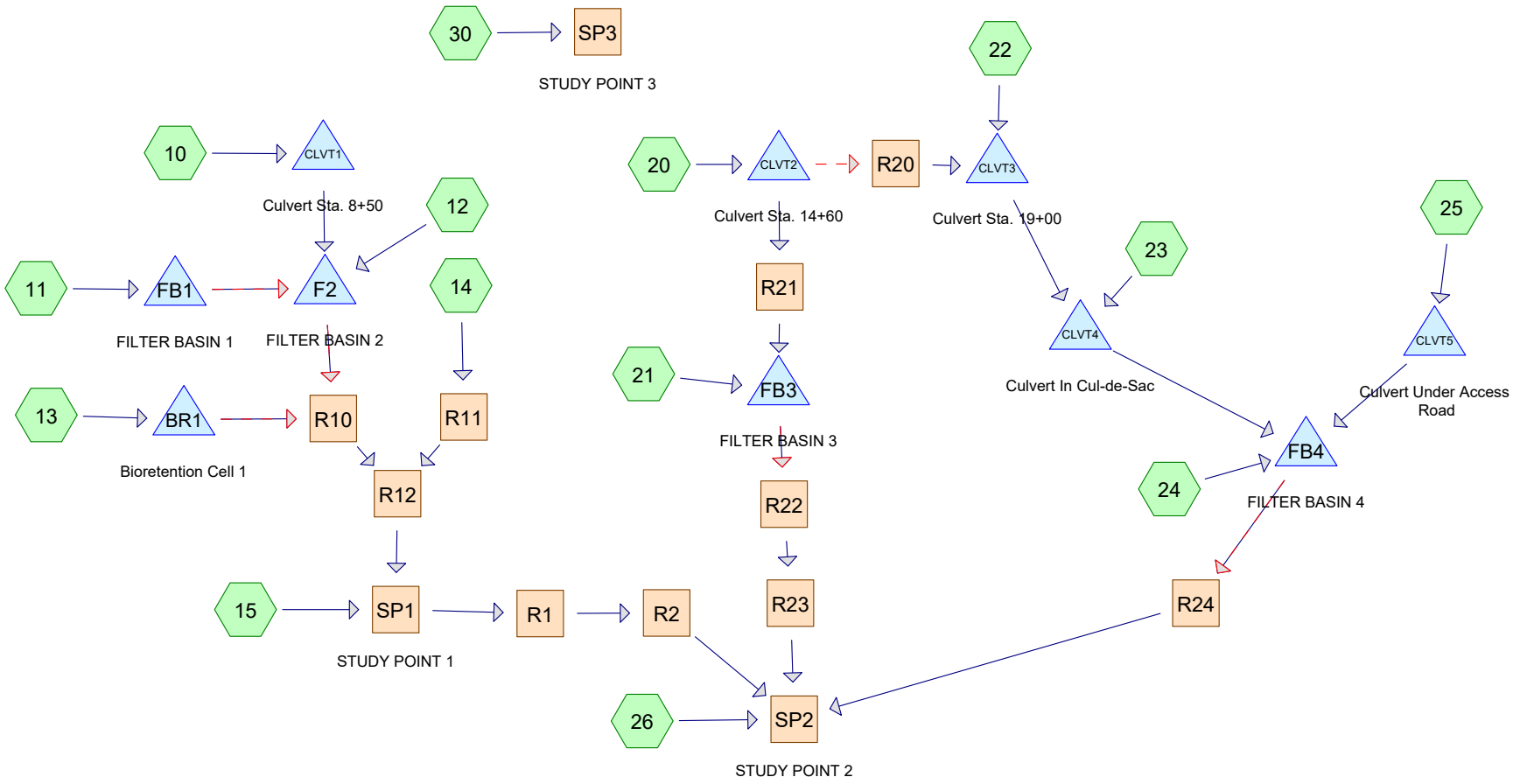
Reach R1: Avg. Flow Depth=0.08' Max Vel=4.64 fps Inflow=18.50 cfs 2.530 af
n=0.030 L=105.0' S=0.2667 '/' Capacity=417.92 cfs Outflow=18.50 cfs 2.529 af

Reach R2: Avg. Flow Depth=0.33' Max Vel=4.24 fps Inflow=18.50 cfs 2.529 af
n=0.030 L=680.0' S=0.0353 '/' Capacity=941.14 cfs Outflow=18.44 cfs 2.519 af

Reach SP1: STUDY POINT 1 Inflow=18.50 cfs 2.530 af
Outflow=18.50 cfs 2.530 af

Reach SP2: STUDY POINT 2 Inflow=33.33 cfs 4.510 af
Outflow=33.33 cfs 4.510 af

Reach SP3: STUDY POINT 3 Inflow=2.40 cfs 0.240 af
Outflow=2.40 cfs 0.240 af



Routing Diagram for 17002-POST

Prepared by {enter your company name here}, Printed 1/19/2018

HydroCAD® 10.00-20 s/n 09237 © 2017 HydroCAD Software Solutions LLC

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Runoff Area=142,510 sf 15.84% Impervious Runoff Depth>3.16"
Flow Length=441' Tc=29.3 min CN=78 Runoff=7.45 cfs 0.860 af

Subcatchment11: Runoff Area=41,255 sf 28.20% Impervious Runoff Depth>3.67"
Flow Length=551' Tc=6.0 min CN=83 Runoff=4.20 cfs 0.290 af

Subcatchment12: Runoff Area=11,200 sf 11.96% Impervious Runoff Depth>3.28"
Tc=6.0 min CN=79 Runoff=1.03 cfs 0.070 af

Subcatchment13: Runoff Area=36,830 sf 18.61% Impervious Runoff Depth>3.37"
Flow Length=315' Tc=9.0 min CN=80 Runoff=3.15 cfs 0.237 af

Subcatchment14: Runoff Area=27,565 sf 0.00% Impervious Runoff Depth>2.61"
Flow Length=233' Tc=19.6 min CN=72 Runoff=1.41 cfs 0.138 af

Subcatchment15: Runoff Area=364,515 sf 1.97% Impervious Runoff Depth>2.88"
Flow Length=571' Tc=21.3 min CN=75 Runoff=19.98 cfs 2.011 af

Subcatchment20: Runoff Area=145,485 sf 11.01% Impervious Runoff Depth>2.98"
Flow Length=604' Tc=21.3 min CN=76 Runoff=8.23 cfs 0.828 af

Subcatchment21: Runoff Area=34,890 sf 30.35% Impervious Runoff Depth>3.57"
Flow Length=438' Tc=6.0 min CN=82 Runoff=3.47 cfs 0.238 af

Subcatchment22: Runoff Area=79,075 sf 13.39% Impervious Runoff Depth>3.07"
Flow Length=431' Tc=21.8 min CN=77 Runoff=4.56 cfs 0.464 af

Subcatchment23: Runoff Area=3,335 sf 62.22% Impervious Runoff Depth>4.50"
Tc=6.0 min CN=91 Runoff=0.40 cfs 0.029 af

Subcatchment24: Runoff Area=17,290 sf 23.92% Impervious Runoff Depth>3.47"
Tc=6.0 min CN=81 Runoff=1.68 cfs 0.115 af

Subcatchment25: Runoff Area=35,735 sf 14.44% Impervious Runoff Depth>3.07"
Flow Length=603' Tc=21.2 min CN=77 Runoff=2.09 cfs 0.210 af

Subcatchment26: Runoff Area=425,160 sf 2.11% Impervious Runoff Depth>2.52"
Flow Length=597' Tc=20.8 min CN=71 Runoff=20.56 cfs 2.052 af

Subcatchment30: Runoff Area=64,005 sf 0.00% Impervious Runoff Depth>2.88"
Flow Length=444' Tc=21.0 min CN=75 Runoff=3.53 cfs 0.353 af

Reach R1: Avg. Flow Depth=0.09' Max Vel=5.16 fps Inflow=24.20 cfs 3.263 af
n=0.030 L=105.0' S=0.2667 '/' Capacity=417.92 cfs Outflow=24.22 cfs 3.261 af

Reach R10: Avg. Flow Depth=0.27' Max Vel=2.44 fps Inflow=7.46 cfs 1.122 af
n=0.035 L=362.0' S=0.0221 '/' Capacity=77.64 cfs Outflow=7.44 cfs 1.117 af

Reach R11: Avg. Flow Depth=0.10' Max Vel=1.36 fps Inflow=1.41 cfs 0.138 af
n=0.035 L=175.0' S=0.0229 '/' Capacity=258.63 cfs Outflow=1.41 cfs 0.137 af

Reach R12: Avg. Flow Depth=0.35' Max Vel=4.00 fps Inflow=8.35 cfs 1.254 af
n=0.035 L=172.0' S=0.0465 '/' Capacity=233.32 cfs Outflow=8.36 cfs 1.253 af

Reach R2: Avg. Flow Depth=0.39' Max Vel=4.67 fps Inflow=24.22 cfs 3.261 af
n=0.030 L=680.0' S=0.0353 '/' Capacity=941.14 cfs Outflow=24.15 cfs 3.249 af

Reach R20: Avg. Flow Depth=0.21' Max Vel=1.84 fps Inflow=1.05 cfs 0.018 af
n=0.025 L=260.0' S=0.0102 '/' Capacity=89.20 cfs Outflow=0.99 cfs 0.018 af

Reach R21: Avg. Flow Depth=0.62' Max Vel=3.28 fps Inflow=7.17 cfs 0.810 af
n=0.025 L=238.0' S=0.0100 '/' Capacity=88.35 cfs Outflow=7.16 cfs 0.809 af

Reach R22: Avg. Flow Depth=0.08' Max Vel=1.56 fps Inflow=6.07 cfs 0.807 af
n=0.080 L=216.0' S=0.2315 '/' Capacity=152.37 cfs Outflow=6.06 cfs 0.803 af

Reach R23: Avg. Flow Depth=0.24' Max Vel=1.10 fps Inflow=6.06 cfs 0.803 af
n=0.080 L=151.0' S=0.0265 '/' Capacity=74.74 cfs Outflow=6.04 cfs 0.799 af

Reach R24: Avg. Flow Depth=0.12' Max Vel=4.75 fps Inflow=6.62 cfs 0.684 af
n=0.035 L=210.0' S=0.2333 '/' Capacity=312.33 cfs Outflow=6.66 cfs 0.683 af

Reach SP1: STUDY POINT 1 Inflow=24.20 cfs 3.263 af
Outflow=24.20 cfs 3.263 af

Reach SP2: STUDY POINT 2 Inflow=50.38 cfs 6.783 af
Outflow=50.38 cfs 6.783 af

Reach SP3: STUDY POINT 3 Inflow=3.53 cfs 0.353 af
Outflow=3.53 cfs 0.353 af

Pond BR1: Bioretention Cell 1 Peak Elev=215.19' Storage=1,015 cf Inflow=3.15 cfs 0.237 af
Primary=0.09 cfs 0.077 af Secondary=3.02 cfs 0.147 af Outflow=3.12 cfs 0.225 af

Pond CLVT1: Culvert Sta. 8+50 Peak Elev=220.65' Storage=1,091 cf Inflow=7.45 cfs 0.860 af
18.0" Round Culvert n=0.013 L=50.0' S=0.0080 '/' Outflow=7.05 cfs 0.860 af

Pond CLVT2: Culvert Sta. 14+60 Peak Elev=213.04' Storage=181 cf Inflow=8.23 cfs 0.828 af
Primary=7.17 cfs 0.810 af Secondary=1.05 cfs 0.018 af Outflow=8.22 cfs 0.828 af

Pond CLVT3: Culvert Sta. 19+00 Peak Elev=210.64' Storage=245 cf Inflow=5.53 cfs 0.482 af
18.0" Round Culvert n=0.013 L=47.0' S=0.0096 '/' Outflow=5.41 cfs 0.482 af

Pond CLVT4: Culvert In Cul-de-Sac Peak Elev=209.92' Storage=164 cf Inflow=5.55 cfs 0.510 af
18.0" Round Culvert n=0.013 L=53.0' S=0.0283 '/' Outflow=5.53 cfs 0.510 af

Pond CLVT5: Culvert Under Access Road Peak Elev=203.50' Storage=568 cf Inflow=2.09 cfs 0.210 af
12.0" Round Culvert n=0.013 L=25.0' S=0.0040 '/' Outflow=1.79 cfs 0.210 af

Pond F2: FILTER BASIN 2 Peak Elev=218.00' Storage=14,116 cf Inflow=10.41 cfs 1.142 af
Primary=6.72 cfs 0.897 af Secondary=0.01 cfs 0.000 af Outflow=6.73 cfs 0.897 af

Pond FB1: FILTER BASIN 1 Peak Elev=217.61' Storage=6,841 cf Inflow=4.20 cfs 0.290 af
Primary=0.18 cfs 0.138 af Secondary=5.84 cfs 0.073 af Outflow=3.06 cfs 0.168 af

Pond FB3: FILTER BASIN 3 Peak Elev=207.80' Storage=16,257 cf Inflow=8.64 cfs 1.048 af
Primary=6.07 cfs 0.807 af Secondary=0.00 cfs 0.000 af Outflow=6.07 cfs 0.807 af

Pond FB4: FILTER BASIN 4 Peak Elev=203.20' Storage=10,946 cf Inflow=7.94 cfs 0.835 af
Primary=6.62 cfs 0.684 af Secondary=0.00 cfs 0.000 af Outflow=6.62 cfs 0.684 af

Summary for Subcatchment 10:

Runoff = 7.45 cfs @ 12.41 hrs, Volume= 0.860 af, Depth> 3.16"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	16,900	98	Road and Driveways
*	5,680	98	Houses
*	1,740	96	Gravel Shoulder
*	42,440	74	New Grass C
*	17,045	80	New Grass D
*	1,465	96	Existing Gravel Road
*	11,880	80	Existing Grass D
	44,135	70	Woods, Good, HSG C
	1,225	77	Woods, Good, HSG D
	142,510	78	Weighted Average
	119,930		84.16% Pervious Area
	22,580		15.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.6	150	0.0250	0.09		**Sheet Flow, A TO B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.6	126	0.0700	1.32		**Shallow Concentrated Flow, B TO C** Woodland Kv= 5.0 fps
0.1	165	0.1000	19.14	306.25	**Trap/Vee/Rect Channel Flow, C TO D** Bot.W=1.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=15.00' n= 0.025
29.3	441	Total			

Summary for Subcatchment 11:

Runoff = 4.20 cfs @ 12.09 hrs, Volume= 0.290 af, Depth> 3.67"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	11,635	98	Paved Road and Driveways
*	1,735	96	Gravel Shoulder
*	14,495	74	New Grass C
*	905	80	New Grass D
*	230	96	Existing Gravel Road
*	3,215	80	Existing Grass D
	9,040	77	Woods, Good, HSG D
	41,255	83	Weighted Average
	29,620		71.80% Pervious Area
	11,635		28.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	61	0.0350	0.19		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.10"
0.6	490	0.0460	13.54	189.50	**Trap/Vee/Rect Channel Flow, B TO C** Bot.W=2.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=12.00' n= 0.025
6.0	551	Total			

Summary for Subcatchment 12:

Runoff = 1.03 cfs @ 12.09 hrs, Volume= 0.070 af, Depth> 3.28"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	1,340	98	Paved Road
*	1,055	96	Gravel Shoulder
*	8,805	74	New Grass C
	11,200	79	Weighted Average
	9,860		88.04% Pervious Area
	1,340		11.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 MINUTE MIN. TC**

Summary for Subcatchment 13:

Runoff = 3.15 cfs @ 12.13 hrs, Volume= 0.237 af, Depth> 3.37"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	2,595	98	Paved Driveways
*	4,260	98	Buildings
*	20,675	74	New Grass C
*	9,300	80	New Grass D
	36,830	80	Weighted Average
	29,975		81.39% Pervious Area
	6,855		18.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	100	0.0800	0.29		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.10"
2.3	50	0.2000	0.37		**Sheet Flow, B TO C** Grass: Short n= 0.150 P2= 3.10"
0.6	65	0.0750	1.92		**Shallow Concentrated Flow, C TO D** Short Grass Pasture Kv= 7.0 fps
0.4	100	0.0100	4.04	32.31	**Trap/Vee/Rect Channel Flow, D TO E** Bot.W=2.00' D=1.00' Z= 10.0 & 2.0 '/' Top.W=14.00' n= 0.025
9.0	315	Total			

Summary for Subcatchment 14:

Runoff = 1.41 cfs @ 12.28 hrs, Volume= 0.138 af, Depth> 2.61"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	550	96	Existing Gravel Road
*	5,680	74	New Grass C
	5,170	71	Meadow, non-grazed, HSG C
	15,605	70	Woods, Good, HSG C
	560	77	Woods, Good, HSG D
	27,565	72	Weighted Average
	27,565		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	103	0.0850	0.30		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.10"
11.9	47	0.0200	0.07		**Sheet Flow, B TO C** Woods: Light underbrush n= 0.400 P2= 3.10"
2.0	83	0.0200	0.71		**Shallow Concentrated Flow, C TO D** Woodland Kv= 5.0 fps
19.6	233	Total			

Summary for Subcatchment 15:

Runoff = 19.98 cfs @ 12.30 hrs, Volume= 2.011 af, Depth> 2.88"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	1,930	98	New Driveways
*	340	96	New Gravel Shoulder/Turnaround
*	4,260	98	New Houses
*	33,600	74	New Grass C
*	990	98	Existing Buildings
*	1,850	96	Existing Gravel Road
	21,225	71	Meadow, non-grazed, HSG C
	24,375	78	Meadow, non-grazed, HSG D
	124,815	70	Woods, Good, HSG C
	151,130	77	Woods, Good, HSG D
	364,515	75	Weighted Average
	357,335		98.03% Pervious Area
	7,180		1.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	115	0.0400	0.23		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.10"
8.0	35	0.0300	0.07		**Sheet Flow, B TO C** Woods: Light underbrush n= 0.400 P2= 3.10"
2.1	111	0.0300	0.87		**Shallow Concentrated Flow, C TO D** Woodland Kv= 5.0 fps
2.5	105	0.0100	0.70		**Shallow Concentrated Flow, D TO E** Short Grass Pasture Kv= 7.0 fps
0.3	205	0.0465	10.60	233.29	**Trap/Vee/Rect Channel Flow, E TO F** Bot.W=5.00' D=2.00' Z= 3.0 '/' Top.W=17.00' n= 0.035
21.3	571	Total			

Summary for Subcatchment 20:

Runoff = 8.23 cfs @ 12.30 hrs, Volume= 0.828 af, Depth> 2.98"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	10,345	98	Paved Road and Driveways
*	5,680	98	New Houses
*	890	96	Gravel Shoulders
*	56,450	74	New Grass C
	41,475	70	Woods, Good, HSG C
	15,030	77	Woods, Good, HSG D
	15,615	71	Meadow, non-grazed, HSG C
	145,485	76	Weighted Average
	129,460		88.99% Pervious Area
	16,025		11.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	150	0.0750	0.14		**Sheet Flow, A TO B** Woods: Light underbrush n= 0.400 P2= 3.10"
2.0	170	0.0800	1.41		**Shallow Concentrated Flow, B TO C** Woodland Kv= 5.0 fps
1.1	120	0.0650	1.78		**Shallow Concentrated Flow, C TO D** Short Grass Pasture Kv= 7.0 fps
0.4	164	0.0110	6.62	92.67	**Trap/Vee/Rect Channel Flow, D TO E** Bot.W=2.00' D=2.00' Z= 2.0 & 3.0 '/' Top.W=12.00' n= 0.025
21.3	604	Total			

Summary for Subcatchment 21:

Runoff = 3.47 cfs @ 12.09 hrs, Volume= 0.238 af, Depth> 3.57"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	10,590	98	Paved Road and Driveways
*	1,110	96	Gravel Shoulder
*	22,030	74	New Grass C
*	1,160	80	New Grass D
	34,890	82	Weighted Average
	24,300		69.65% Pervious Area
	10,590		30.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	57	0.0700	0.25		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.10"
0.3	142	0.0200	8.93	124.95	**Trap/Vee/Rect Channel Flow, B TO C** Bot.W=2.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=12.00' n= 0.025
0.6	239	0.0100	6.31	88.35	**Trap/Vee/Rect Channel Flow, C TO D** Bot.W=2.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=12.00' n= 0.025
1.3					**Direct Entry, 6 MINUTE MIN. TC**
6.0	438	Total			

Summary for Subcatchment 22:

Runoff = 4.56 cfs @ 12.30 hrs, Volume= 0.464 af, Depth> 3.07"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	7,745	98	Paved Road and Driveways
*	2,840	98	New Houses
*	600	96	Gravel Shoulders
*	30,520	74	New Grass C
	6,190	71	Meadow, non-grazed, HSG C
	19,135	70	Woods, Good, HSG C
	12,045	77	Woods, Good, HSG D
	79,075	77	Weighted Average
	68,490		86.61% Pervious Area
	10,585		13.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	150	0.0650	0.13		**Sheet Flow, A TO B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.6	142	0.0900	1.50		**Shallow Concentrated Flow, B TO C** Woodland Kv= 5.0 fps
1.3	120	0.0500	1.57		**Shallow Concentrated Flow, C TO D** Short Grass Pasture Kv= 7.0 fps
0.1	19	0.0100	6.31	88.35	**Trap/Vee/Rect Channel Flow, D TO E** Bot.W=2.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=12.00' n= 0.025
21.8	431	Total			

Summary for Subcatchment 23:

Runoff = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af, Depth> 4.50"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	2,075	98	Paved Road
*	240	96	Gravel Shoulder
	1,020	74	>75% Grass cover, Good, HSG C
	3,335	91	Weighted Average
	1,260		37.78% Pervious Area
	2,075		62.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 MINUTE MIN. TC**

Summary for Subcatchment 24:

Runoff = 1.68 cfs @ 12.09 hrs, Volume= 0.115 af, Depth> 3.47"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	4,135	98	Paved Road and Driveways
*	615	96	Gravel Shoulders
*	12,540	74	New Grass C
	17,290	81	Weighted Average
	13,155		76.08% Pervious Area
	4,135		23.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 MINUTE MIN. TC**

Summary for Subcatchment 25:

Runoff = 2.09 cfs @ 12.29 hrs, Volume= 0.210 af, Depth> 3.07"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	2,320	98	Paved Road and Driveway
*	195	96	Gravel Shoulder
*	2,840	98	New Houses
*	23,800	74	New Grass C
	5,415	70	Woods, Good, HSG C
	1,165	77	Woods, Good, HSG D
	35,735	77	Weighted Average
	30,575		85.56% Pervious Area
	5,160		14.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.3	150	0.0800	0.14		**Sheet Flow, A TO B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.2	108	0.0900	1.50		**Shallow Concentrated Flow, B TO C** Woodland Kv= 5.0 fps
2.3	237	0.0600	1.71		**Shallow Concentrated Flow, C TO D** Short Grass Pasture Kv= 7.0 fps
0.4	108	0.0150	4.94	41.98	**Trap/Vee/Rect Channel Flow, D TO E** Bot.W=2.00' D=1.00' Z= 3.0 & 10.0 '/' Top.W=15.00' n= 0.025
21.2	603	Total			

Summary for Subcatchment 26:

Runoff = 20.56 cfs @ 12.30 hrs, Volume= 2.052 af, Depth> 2.52"

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 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	3,275	98	Paved Driveways
*	5,680	98	New Houses
*	1,380	96	Existing Gravel Road
*	48,800	74	New Grass C
*	5,760	80	New Grass D
	4,445	71	Meadow, non-grazed, HSG C
	78,070	55	Woods, Good, HSG B
	117,750	70	Woods, Good, HSG C
	160,000	77	Woods, Good, HSG D
	425,160	71	Weighted Average
	416,205		97.89% Pervious Area
	8,955		2.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	130	0.0550	0.12		**Sheet Flow, A TO B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.9	20	0.3500	0.17		**Sheet Flow, B TO C** Woods: Light underbrush n= 0.400 P2= 3.10"
0.3	54	0.3000	2.74		**Shallow Concentrated Flow, C TO D** Woodland Kv= 5.0 fps
0.1	198	0.1600	28.79	1,209.34	**Trap/Vee/Rect Channel Flow, D TO E** Bot.W=5.00' D=3.00' Z= 3.0 '/' Top.W=23.00' n= 0.030
0.5	195	0.0300	7.07	212.11	**Trap/Vee/Rect Channel Flow, E TO F** Bot.W=20.00' D=1.00' Z= 10.0 '/' Top.W=40.00' n= 0.030
20.8	597	Total			

Summary for Subcatchment 30:

Runoff = 3.53 cfs @ 12.29 hrs, Volume= 0.353 af, Depth> 2.88"

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 25-Year Rainfall=5.80"

Area (sf)	CN	Description
55	74	>75% Grass cover, Good, HSG C
20,430	70	Woods, Good, HSG C
43,520	77	Woods, Good, HSG D
64,005	75	Weighted Average
64,005		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	150	0.0650	0.13		**Sheet Flow, A TO B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.9	176	0.1000	1.58		**Shallow Concentrated Flow, B TO C** Woodland Kv= 5.0 fps
0.3	118	0.0100	5.80	208.88	**Trap/Vee/Rect Channel Flow, C TO D** Bot.W=8.00' D=2.00' Z= 5.0 '/' Top.W=28.00' n= 0.030
21.0	444	Total			

Summary for Reach R1:

Inflow Area = 14.322 ac, 7.95% Impervious, Inflow Depth > 2.73" for 25-Year event
Inflow = 24.20 cfs @ 12.29 hrs, Volume= 3.263 af
Outflow = 24.22 cfs @ 12.30 hrs, Volume= 3.261 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 5.16 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.84 fps, Avg. Travel Time= 1.0 min

Peak Storage= 493 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 0.50' Flow Area= 27.5 sf, Capacity= 417.92 cfs

50.00' x 0.50' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 60.00'
Length= 105.0' Slope= 0.2667 '/'
Inlet Invert= 196.00', Outlet Invert= 168.00'

‡

Summary for Reach R10:

Inflow Area = 5.321 ac, 18.30% Impervious, Inflow Depth > 2.53" for 25-Year event
Inflow = 7.46 cfs @ 12.56 hrs, Volume= 1.122 af
Outflow = 7.44 cfs @ 12.60 hrs, Volume= 1.117 af, Atten= 0%, Lag= 2.2 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 2.44 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.95 fps, Avg. Travel Time= 6.3 min

Peak Storage= 1,106 cf @ 12.60 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.00' Flow Area= 15.0 sf, Capacity= 77.64 cfs

10.00' x 1.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 20.00'
Length= 362.0' Slope= 0.0221 '/'
Inlet Invert= 212.00', Outlet Invert= 204.00'

‡

Summary for Reach R11:

Inflow Area = 0.633 ac, 0.00% Impervious, Inflow Depth > 2.61" for 25-Year event
Inflow = 1.41 cfs @ 12.28 hrs, Volume= 0.138 af
Outflow = 1.41 cfs @ 12.30 hrs, Volume= 0.137 af, Atten= 1%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 1.36 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 5.2 min

Peak Storage= 181 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 258.63 cfs

10.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 22.00'
Length= 175.0' Slope= 0.0229 '/'
Inlet Invert= 0.00', Outlet Invert= -4.00'

‡

Summary for Reach R12:

Inflow Area = 5.954 ac, 16.35% Impervious, Inflow Depth > 2.53" for 25-Year event
Inflow = 8.35 cfs @ 12.57 hrs, Volume= 1.254 af
Outflow = 8.36 cfs @ 12.57 hrs, Volume= 1.253 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 4.00 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.64 fps, Avg. Travel Time= 1.7 min

Peak Storage= 358 cf @ 12.57 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 2.00' Flow Area= 22.0 sf, Capacity= 233.32 cfs

5.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 172.0' Slope= 0.0465 '/'
Inlet Invert= 204.00', Outlet Invert= 196.00'

‡

Summary for Reach R2:

Inflow Area = 14.322 ac, 7.95% Impervious, Inflow Depth > 2.73" for 25-Year event
Inflow = 24.22 cfs @ 12.30 hrs, Volume= 3.261 af
Outflow = 24.15 cfs @ 12.32 hrs, Volume= 3.249 af, Atten= 0%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 4.67 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 1.78 fps, Avg. Travel Time= 6.4 min

Peak Storage= 3,510 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 3.00' Flow Area= 63.0 sf, Capacity= 941.14 cfs

12.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 30.00'
Length= 680.0' Slope= 0.0353 '/'
Inlet Invert= 168.00', Outlet Invert= 144.00'

‡

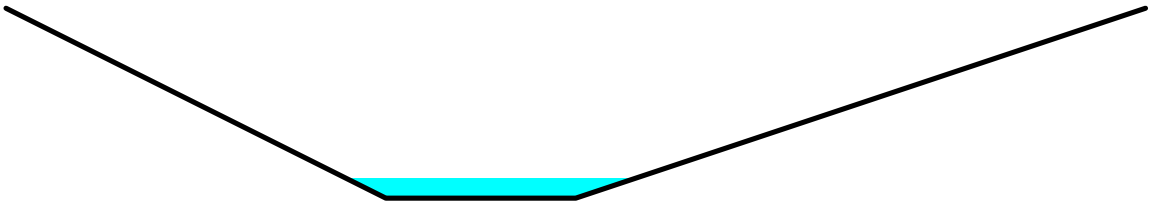
Summary for Reach R20:

Inflow = 1.05 cfs @ 12.31 hrs, Volume= 0.018 af
Outflow = 0.99 cfs @ 12.34 hrs, Volume= 0.018 af, Atten= 5%, Lag= 1.9 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 1.84 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 6.3 min

Peak Storage= 140 cf @ 12.34 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 89.20 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 3.0 '/' Top Width= 12.00'
Length= 260.0' Slope= 0.0102 '/'
Inlet Invert= 212.65', Outlet Invert= 210.00'



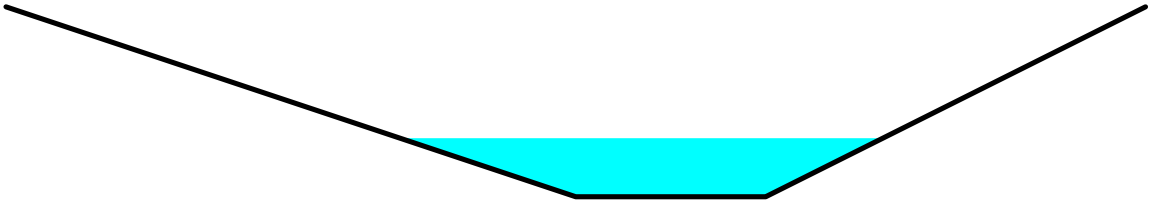
Summary for Reach R21:

Inflow Area = 3.340 ac, 11.01% Impervious, Inflow Depth > 2.91" for 25-Year event
Inflow = 7.17 cfs @ 12.31 hrs, Volume= 0.810 af
Outflow = 7.16 cfs @ 12.33 hrs, Volume= 0.809 af, Atten= 0%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 3.28 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.44 fps, Avg. Travel Time= 2.8 min

Peak Storage= 519 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 88.35 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 3.0 2.0 '/' Top Width= 12.00'
Length= 238.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -2.38'



Summary for Reach R22:

Inflow Area = 4.141 ac, 14.76% Impervious, Inflow Depth > 2.34" for 25-Year event
Inflow = 6.07 cfs @ 12.57 hrs, Volume= 0.807 af
Outflow = 6.06 cfs @ 12.60 hrs, Volume= 0.803 af, Atten= 0%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 1.56 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 6.2 min

Peak Storage= 837 cf @ 12.60 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 0.50' Flow Area= 30.0 sf, Capacity= 152.37 cfs

50.00' x 0.50' deep channel, n= 0.080 Heavy timber, flow below branches
Side Slope Z-value= 20.0 '/' Top Width= 70.00'
Length= 216.0' Slope= 0.2315 '/'
Inlet Invert= 200.00', Outlet Invert= 150.00'

‡

Summary for Reach R23:

Inflow Area = 4.141 ac, 14.76% Impervious, Inflow Depth > 2.33" for 25-Year event
Inflow = 6.06 cfs @ 12.60 hrs, Volume= 0.803 af
Outflow = 6.04 cfs @ 12.62 hrs, Volume= 0.799 af, Atten= 0%, Lag= 1.5 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 1.10 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 6.1 min

Peak Storage= 828 cf @ 12.62 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.00' Flow Area= 30.0 sf, Capacity= 74.74 cfs

20.00' x 1.00' deep channel, n= 0.080 Heavy timber, flow below branches
Side Slope Z-value= 10.0 '/' Top Width= 40.00'
Length= 151.0' Slope= 0.0265 '/'
Inlet Invert= 150.00', Outlet Invert= 146.00'

‡

Summary for Reach R24:

Inflow Area = 3.109 ac, 16.21% Impervious, Inflow Depth > 2.64" for 25-Year event
Inflow = 6.62 cfs @ 12.48 hrs, Volume= 0.684 af
Outflow = 6.66 cfs @ 12.47 hrs, Volume= 0.683 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 4.75 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.61 fps, Avg. Travel Time= 2.2 min

Peak Storage= 294 cf @ 12.47 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 1.00' Flow Area= 20.0 sf, Capacity= 312.33 cfs

10.00' x 1.00' deep channel, n= 0.035
Side Slope Z-value= 10.0 '/' Top Width= 30.00'
Length= 210.0' Slope= 0.2333 '/'
Inlet Invert= 195.00', Outlet Invert= 146.00'

‡

Summary for Reach SP1: STUDY POINT 1

Inflow Area = 14.322 ac, 7.95% Impervious, Inflow Depth > 2.73" for 25-Year event
Inflow = 24.20 cfs @ 12.29 hrs, Volume= 3.263 af
Outflow = 24.20 cfs @ 12.29 hrs, Volume= 3.263 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP2: STUDY POINT 2

Inflow Area = 31.333 ac, 7.85% Impervious, Inflow Depth > 2.60" for 25-Year event
Inflow = 50.38 cfs @ 12.45 hrs, Volume= 6.783 af
Outflow = 50.38 cfs @ 12.45 hrs, Volume= 6.783 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP3: STUDY POINT 3

Inflow Area = 1.469 ac, 0.00% Impervious, Inflow Depth > 2.88" for 25-Year event
Inflow = 3.53 cfs @ 12.29 hrs, Volume= 0.353 af
Outflow = 3.53 cfs @ 12.29 hrs, Volume= 0.353 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2

Summary for Pond BR1: Bioretention Cell 1

Inflow Area = 0.846 ac, 18.61% Impervious, Inflow Depth > 3.37" for 25-Year event
Inflow = 3.15 cfs @ 12.13 hrs, Volume= 0.237 af
Outflow = 3.12 cfs @ 12.15 hrs, Volume= 0.225 af, Atten= 1%, Lag= 1.4 min
Primary = 0.09 cfs @ 12.15 hrs, Volume= 0.077 af
Secondary = 3.02 cfs @ 12.15 hrs, Volume= 0.147 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 215.19' @ 12.15 hrs Surf.Area= 1,697 sf Storage= 1,015 cf

Plug-Flow detention time= 34.2 min calculated for 0.224 af (94% of inflow)
Center-of-Mass det. time= 15.1 min (799.3 - 784.2)

Volume	Invert	Avail.Storage	Storage Description
#1	214.50'	2,668 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
214.50	1,300	0	0
215.00	1,540	710	710
216.00	2,375	1,958	2,668

Device	Routing	Invert	Outlet Devices
#1	Primary	214.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	215.00'	**15.0' long x 9.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Primary OutFlow Max=0.09 cfs @ 12.15 hrs HW=215.19' TW=212.16' (Dynamic Tailwater)
└**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Secondary OutFlow Max=3.01 cfs @ 12.15 hrs HW=215.19' TW=212.16' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 3.01 cfs @ 1.07 fps)

Summary for Pond CLVT1: Culvert Sta. 8+50

Inflow Area = 3.272 ac, 15.84% Impervious, Inflow Depth > 3.16" for 25-Year event
Inflow = 7.45 cfs @ 12.41 hrs, Volume= 0.860 af
Outflow = 7.05 cfs @ 12.50 hrs, Volume= 0.860 af, Atten= 5%, Lag= 5.5 min
Primary = 7.05 cfs @ 12.50 hrs, Volume= 0.860 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 220.65' @ 12.50 hrs Surf.Area= 1,508 sf Storage= 1,091 cf

Plug-Flow detention time= 1.6 min calculated for 0.860 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (805.9 - 804.5)

Volume	Invert	Avail.Storage	Storage Description
#1	218.80'	4,330 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
218.80	10	0	0
220.00	640	390	390
222.00	3,300	3,940	4,330

Device	Routing	Invert	Outlet Devices
#1	Primary	218.80'	**18.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 218.80' / 218.40' S= 0.0080 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=7.05 cfs @ 12.50 hrs HW=220.65' TW=217.94' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 7.05 cfs @ 3.99 fps)

Summary for Pond CLVT2: Culvert Sta. 14+60

Inflow Area = 3.340 ac, 11.01% Impervious, Inflow Depth > 2.98" for 25-Year event
Inflow = 8.23 cfs @ 12.30 hrs, Volume= 0.828 af
Outflow = 8.22 cfs @ 12.31 hrs, Volume= 0.828 af, Atten= 0%, Lag= 0.7 min
Primary = 7.17 cfs @ 12.31 hrs, Volume= 0.810 af
Secondary = 1.05 cfs @ 12.31 hrs, Volume= 0.018 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 213.04' @ 12.31 hrs Surf.Area= 293 sf Storage= 181 cf

Plug-Flow detention time= 0.2 min calculated for 0.825 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (802.3 - 802.1)

Volume	Invert	Avail.Storage	Storage Description
#1	211.15'	581 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.15	10	0	0
212.00	26	15	15
214.00	540	566	581

Device	Routing	Invert	Outlet Devices
#1	Primary	211.15'	**18.0" Round Culvert** L= 48.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 211.15' / 210.90' S= 0.0052 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Secondary	212.65'	**2.0' long x 2.0' 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 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=7.15 cfs @ 12.31 hrs HW=213.03' TW=0.62' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 7.15 cfs @ 4.05 fps)

Secondary OutFlow Max=1.04 cfs @ 12.31 hrs HW=213.04' TW=212.85' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.04 cfs @ 1.34 fps)

Summary for Pond CLVT3: Culvert Sta. 19+00

Inflow Area = 1.815 ac, 13.39% Impervious, Inflow Depth > 3.19" for 25-Year event
Inflow = 5.53 cfs @ 12.32 hrs, Volume= 0.482 af
Outflow = 5.41 cfs @ 12.35 hrs, Volume= 0.482 af, Atten= 2%, Lag= 2.0 min
Primary = 5.41 cfs @ 12.35 hrs, Volume= 0.482 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 210.64' @ 12.35 hrs Surf.Area= 625 sf Storage= 245 cf

Plug-Flow detention time= 0.8 min calculated for 0.480 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (798.9 - 798.4)

Volume	Invert	Avail.Storage	Storage Description
#1	208.45'	1,955 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.45	10	0	0
210.00	35	35	35
212.00	1,885	1,920	1,955

Device	Routing	Invert	Outlet Devices
#1	Primary	209.25'	**18.0" Round Culvert** L= 47.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 209.25' / 208.80' S= 0.0096 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=5.39 cfs @ 12.35 hrs HW=210.63' TW=209.91' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 5.39 cfs @ 3.16 fps)

Summary for Pond CLVT4: Culvert In Cul-de-Sac

Inflow Area = 1.892 ac, 15.36% Impervious, Inflow Depth > 3.24" for 25-Year event
Inflow = 5.55 cfs @ 12.35 hrs, Volume= 0.510 af
Outflow = 5.53 cfs @ 12.36 hrs, Volume= 0.510 af, Atten= 0%, Lag= 0.8 min
Primary = 5.53 cfs @ 12.36 hrs, Volume= 0.510 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 209.92' @ 12.36 hrs Surf.Area= 222 sf Storage= 164 cf

Plug-Flow detention time= 0.5 min calculated for 0.510 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (796.7 - 796.4)

Volume	Invert	Avail.Storage	Storage Description
#1	208.50'	1,154 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.50	10	0	0
210.00	235	184	184
212.00	735	970	1,154

Device	Routing	Invert	Outlet Devices
#1	Primary	208.50'	**18.0" Round Culvert** L= 53.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 208.50' / 207.00' S= 0.0283 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=5.49 cfs @ 12.36 hrs HW=209.91' TW=203.11' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.49 cfs @ 3.19 fps)

Summary for Pond CLVT5: Culvert Under Access Road

Inflow Area = 0.820 ac, 14.44% Impervious, Inflow Depth > 3.07" for 25-Year event
Inflow = 2.09 cfs @ 12.29 hrs, Volume= 0.210 af
Outflow = 1.79 cfs @ 12.35 hrs, Volume= 0.210 af, Atten= 14%, Lag= 3.2 min
Primary = 1.79 cfs @ 12.35 hrs, Volume= 0.210 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 203.50' @ 12.46 hrs Surf.Area= 1,695 sf Storage= 568 cf

Plug-Flow detention time= 3.4 min calculated for 0.210 af (100% of inflow)
Center-of-Mass det. time= 3.0 min (803.1 - 800.1)

Volume	Invert	Avail.Storage	Storage Description
#1	202.50'	1,778 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
202.50	10	0	0
203.00	290	75	75
204.00	3,115	1,703	1,778

Device	Routing	Invert	Outlet Devices
#1	Primary	202.50'	**12.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 202.50' / 202.40' S= 0.0040 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.79 cfs @ 12.35 hrs HW=203.46' TW=203.08' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.79 cfs @ 2.95 fps)

Summary for Pond F2: FILTER BASIN 2

Inflow Area = 4.476 ac, 18.24% Impervious, Inflow Depth > 3.06" for 25-Year event
Inflow = 10.41 cfs @ 12.14 hrs, Volume= 1.142 af
Outflow = 6.73 cfs @ 12.64 hrs, Volume= 0.897 af, Atten= 35%, Lag= 30.2 min
Primary = 6.72 cfs @ 12.64 hrs, Volume= 0.897 af
Secondary = 0.01 cfs @ 12.65 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 218.00' @ 12.64 hrs Surf.Area= 5,419 sf Storage= 14,116 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 40.7 min (852.9 - 812.2)

Volume	Invert	Avail.Storage	Storage Description
#1	214.50'	20,030 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
214.50	2,765	0	0
216.00	3,775	4,905	4,905
218.00	5,415	9,190	14,095
219.00	6,455	5,935	20,030

Device	Routing	Invert	Outlet Devices
#1	Primary	212.20'	**12.0" Round Culvert** L= 48.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 212.20' / 210.00' S= 0.0458 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	214.50'	**2.410 in/hr Exfiltration over Surface area**
#3	Device 1	216.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	217.50'	**24" Dome Grate** Head (feet) 0.00 0.25 0.45 0.75 1.00 1.10 Disch. (cfs) 0.000 2.500 5.750 7.650 8.750 9.250
#5	Secondary	218.00'	**15.0' long x 20.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=6.71 cfs @ 12.64 hrs HW=218.00' TW=212.27' (Dynamic Tailwater)
- **1=Culvert** (Passes 6.71 cfs of 8.70 cfs potential flow)
  - **2=Exfiltration** (Exfiltration Controls 0.30 cfs)
  - **3=Orifice/Grate** (Orifice Controls 0.32 cfs @ 6.60 fps)
  - **4=24" Dome Grate** (Custom Controls 6.09 cfs)

Secondary OutFlow Max=0.01 cfs @ 12.65 hrs HW=218.00' TW=212.27' (Dynamic Tailwater)
- **5=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.17 fps)

Summary for Pond FB1: FILTER BASIN 1

Inflow Area = 0.947 ac, 28.20% Impervious, Inflow Depth > 3.67" for 25-Year event
Inflow = 4.20 cfs @ 12.09 hrs, Volume= 0.290 af
Outflow = 3.06 cfs @ 12.05 hrs, Volume= 0.168 af, Atten= 27%, Lag= 0.0 min
Primary = 0.18 cfs @ 13.45 hrs, Volume= 0.138 af
Secondary = 5.84 cfs @ 12.14 hrs, Volume= 0.073 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 217.61' @ 13.45 hrs Surf.Area= 3,227 sf Storage= 6,841 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 103.2 min (878.3 - 775.1)

Volume	Invert	Avail.Storage	Storage Description
#1	214.50'	11,983 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
214.50	1,235	0	0
216.00	2,125	2,520	2,520
218.00	3,490	5,615	8,135
219.00	4,205	3,848	11,983

Device	Routing	Invert	Outlet Devices
#1	Primary	214.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Secondary	216.00'	**35.0' long x 3.0' 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 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.18 cfs @ 13.45 hrs HW=217.61' TW=217.64' (Dynamic Tailwater)
└**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Secondary OutFlow Max=0.00 cfs @ 12.14 hrs HW=216.50' TW=216.63' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond FB3: FILTER BASIN 3

Inflow Area = 4.141 ac, 14.76% Impervious, Inflow Depth > 3.04" for 25-Year event
Inflow = 8.64 cfs @ 12.28 hrs, Volume= 1.048 af
Outflow = 6.07 cfs @ 12.57 hrs, Volume= 0.807 af, Atten= 30%, Lag= 17.4 min
Primary = 6.07 cfs @ 12.57 hrs, Volume= 0.807 af
Secondary = 0.00 cfs @ 12.55 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 207.80' @ 12.57 hrs Surf.Area= 5,904 sf Storage= 16,257 cf

Plug-Flow detention time= 116.8 min calculated for 0.804 af (77% of inflow)
Center-of-Mass det. time= 60.2 min (859.0 - 798.8)

Volume	Invert	Avail.Storage	Storage Description
#1	204.00'	24,065 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
204.00	2,840	0	0
206.00	4,260	7,100	7,100
208.00	6,085	10,345	17,445
209.00	7,155	6,620	24,065

Device	Routing	Invert	Outlet Devices
#1	Primary	201.70'	**12.0" Round Culvert** L= 75.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 201.70' / 201.00' S= 0.0093 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	204.00'	**2.410 in/hr Exfiltration over Surface area**
#3	Device 1	205.50'	**3.0" Vert. Orifice/Grate** C= 0.600

#4	Device 1	207.25'	**24" Dome Grate** Head (feet) 0.00 0.25 0.45 0.75 1.00 1.10 Disch. (cfs) 0.000 1.750 4.750 6.650 7.750 8.500
#5	Secondary	207.80'	**15.0' long x 38.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=6.05 cfs @ 12.57 hrs HW=207.80' TW=200.07' (Dynamic Tailwater)
- **1=Culvert** (Passes 6.05 cfs of 7.73 cfs potential flow)
  - **2=Exfiltration** (Exfiltration Controls 0.33 cfs)
  - **3=Orifice/Grate** (Orifice Controls 0.35 cfs @ 7.10 fps)
  - **4=24" Dome Grate** (Custom Controls 5.38 cfs)

Secondary OutFlow Max=0.00 cfs @ 12.55 hrs HW=207.80' TW=200.07' (Dynamic Tailwater)
- **5=Broad-Crested Rectangular Weir** (Weir Controls 0.00 cfs @ 0.01 fps)

Summary for Pond FB4: FILTER BASIN 4

Inflow Area =	3.109 ac,	16.21% Impervious,	Inflow Depth >	3.22" for 25-Year event
Inflow =	7.94 cfs @	12.35 hrs,	Volume=	0.835 af
Outflow =	6.62 cfs @	12.48 hrs,	Volume=	0.684 af, Atten= 17%, Lag= 7.4 min
Primary =	6.62 cfs @	12.48 hrs,	Volume=	0.684 af
Secondary =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 203.20' @ 12.48 hrs Surf.Area= 4,673 sf Storage= 10,946 cf

Plug-Flow detention time= 98.1 min calculated for 0.682 af (82% of inflow)
Center-of-Mass det. time= 50.5 min (846.5 - 796.0)

Volume	Invert	Avail.Storage	Storage Description
#1	200.00'	20,743 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
200.00	2,255	0	0
202.00	3,680	5,935	5,935
204.00	5,335	9,015	14,950
205.00	6,250	5,793	20,743

Device	Routing	Invert	Outlet Devices
#1	Primary	197.00'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 197.00' / 195.00' S= 0.0476 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	200.00'	**2.410 in/hr Exfiltration over Surface area**
#3	Device 1	201.50'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	202.70'	**24" Dome Grate** Head (feet) 0.00 0.25 0.45 0.75 1.00 1.10 Disch. (cfs) 0.000 2.500 5.750 7.650 8.750 9.250
#5	Secondary	203.20'	**15.0' long x 20.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=6.60 cfs @ 12.48 hrs HW=203.20' TW=195.12' (Dynamic Tailwater)
1=Culvert (Passes 6.60 cfs of 9.03 cfs potential flow)
2=Exfiltration (Exfiltration Controls 0.26 cfs)
3=Orifice/Grate (Orifice Controls 0.30 cfs @ 6.04 fps)
4=24" Dome Grate (Custom Controls 6.04 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=200.00' TW=195.00' (Dynamic Tailwater)
5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Runoff Area=142,510 sf 15.84% Impervious Runoff Depth>1.09"
Flow Length=441' Tc=29.3 min CN=78 Runoff=2.56 cfs 0.298 af

Subcatchment11: Runoff Area=41,255 sf 28.20% Impervious Runoff Depth>1.42"
Flow Length=551' Tc=6.0 min CN=83 Runoff=1.66 cfs 0.112 af

Subcatchment12: Runoff Area=11,200 sf 11.96% Impervious Runoff Depth>1.16"
Tc=6.0 min CN=79 Runoff=0.37 cfs 0.025 af

Subcatchment13: Runoff Area=36,830 sf 18.61% Impervious Runoff Depth>1.22"
Flow Length=315' Tc=9.0 min CN=80 Runoff=1.15 cfs 0.086 af

Subcatchment14: Runoff Area=27,565 sf 0.00% Impervious Runoff Depth>0.78"
Flow Length=233' Tc=19.6 min CN=72 Runoff=0.40 cfs 0.041 af

Subcatchment15: Runoff Area=364,515 sf 1.97% Impervious Runoff Depth>0.93"
Flow Length=571' Tc=21.3 min CN=75 Runoff=6.24 cfs 0.649 af

Subcatchment20: Runoff Area=145,485 sf 11.01% Impervious Runoff Depth>0.98"
Flow Length=604' Tc=21.3 min CN=76 Runoff=2.65 cfs 0.274 af

Subcatchment21: Runoff Area=34,890 sf 30.35% Impervious Runoff Depth>1.35"
Flow Length=438' Tc=6.0 min CN=82 Runoff=1.34 cfs 0.090 af

Subcatchment22: Runoff Area=79,075 sf 13.39% Impervious Runoff Depth>1.04"
Flow Length=431' Tc=21.8 min CN=77 Runoff=1.52 cfs 0.157 af

Subcatchment23: Runoff Area=3,335 sf 62.22% Impervious Runoff Depth>2.04"
Tc=6.0 min CN=91 Runoff=0.19 cfs 0.013 af

Subcatchment24: Runoff Area=17,290 sf 23.92% Impervious Runoff Depth>1.29"
Tc=6.0 min CN=81 Runoff=0.63 cfs 0.043 af

Subcatchment25: Runoff Area=35,735 sf 14.44% Impervious Runoff Depth>1.04"
Flow Length=603' Tc=21.2 min CN=77 Runoff=0.69 cfs 0.071 af

Subcatchment26: Runoff Area=425,160 sf 2.11% Impervious Runoff Depth>0.73"
Flow Length=597' Tc=20.8 min CN=71 Runoff=5.53 cfs 0.597 af

Subcatchment30: Runoff Area=64,005 sf 0.00% Impervious Runoff Depth>0.93"
Flow Length=444' Tc=21.0 min CN=75 Runoff=1.10 cfs 0.114 af

Reach R1: Avg. Flow Depth=0.05' Max Vel=3.25 fps Inflow=7.49 cfs 1.038 af
n=0.030 L=105.0' S=0.2667 '/' Capacity=417.92 cfs Outflow=7.50 cfs 1.037 af

Reach R10: Avg. Flow Depth=0.08' Max Vel=1.11 fps Inflow=1.05 cfs 0.353 af
n=0.035 L=362.0' S=0.0221 '/' Capacity=77.64 cfs Outflow=0.89 cfs 0.349 af

Reach R11: Avg. Flow Depth=0.05' Max Vel=0.83 fps Inflow=0.40 cfs 0.041 af
n=0.035 L=175.0' S=0.0229 '/' Capacity=258.63 cfs Outflow=0.39 cfs 0.041 af

Reach R12: Avg. Flow Depth=0.12' Max Vel=2.08 fps Inflow=1.28 cfs 0.390 af
n=0.035 L=172.0' S=0.0465 '/' Capacity=233.32 cfs Outflow=1.29 cfs 0.389 af

Reach R2: Avg. Flow Depth=0.19' Max Vel=3.01 fps Inflow=7.50 cfs 1.037 af
n=0.030 L=680.0' S=0.0353 '/' Capacity=941.14 cfs Outflow=7.33 cfs 1.029 af

Reach R20: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.025 L=260.0' S=0.0102 '/' Capacity=89.20 cfs Outflow=0.00 cfs 0.000 af

Reach R21: Avg. Flow Depth=0.37' Max Vel=2.47 fps Inflow=2.65 cfs 0.274 af
n=0.025 L=238.0' S=0.0100 '/' Capacity=88.35 cfs Outflow=2.64 cfs 0.273 af

Reach R22: Avg. Flow Depth=0.02' Max Vel=0.55 fps Inflow=0.42 cfs 0.244 af
n=0.080 L=216.0' S=0.2315 '/' Capacity=152.37 cfs Outflow=0.42 cfs 0.241 af

Reach R23: Avg. Flow Depth=0.05' Max Vel=0.41 fps Inflow=0.42 cfs 0.241 af
n=0.080 L=151.0' S=0.0265 '/' Capacity=74.74 cfs Outflow=0.42 cfs 0.239 af

Reach R24: Avg. Flow Depth=0.02' Max Vel=1.60 fps Inflow=0.36 cfs 0.193 af
n=0.035 L=210.0' S=0.2333 '/' Capacity=312.33 cfs Outflow=0.36 cfs 0.192 af

Reach SP1: STUDY POINT 1 Inflow=7.49 cfs 1.038 af
Outflow=7.49 cfs 1.038 af

Reach SP2: STUDY POINT 2 Inflow=13.14 cfs 2.057 af
Outflow=13.14 cfs 2.057 af

Reach SP3: STUDY POINT 3 Inflow=1.10 cfs 0.114 af
Outflow=1.10 cfs 0.114 af

Pond BR1: Bioretention Cell 1 Peak Elev=215.08' Storage=831 cf Inflow=1.15 cfs 0.086 af
Primary=0.09 cfs 0.061 af Secondary=0.79 cfs 0.025 af Outflow=0.88 cfs 0.086 af

Pond CLVT1: Culvert Sta. 8+50 Peak Elev=219.65' Storage=197 cf Inflow=2.56 cfs 0.298 af
18.0" Round Culvert n=0.013 L=50.0' S=0.0080 '/' Outflow=2.55 cfs 0.298 af

Pond CLVT2: Culvert Sta. 14+60 Peak Elev=212.08' Storage=18 cf Inflow=2.65 cfs 0.274 af
Primary=2.65 cfs 0.274 af Secondary=0.00 cfs 0.000 af Outflow=2.65 cfs 0.274 af

Pond CLVT3: Culvert Sta. 19+00 Peak Elev=209.88' Storage=31 cf Inflow=1.52 cfs 0.157 af
18.0" Round Culvert n=0.013 L=47.0' S=0.0096 '/' Outflow=1.52 cfs 0.157 af

Pond CLVT4: Culvert In Cul-de-Sac Peak Elev=209.15' Storage=38 cf Inflow=1.59 cfs 0.170 af
18.0" Round Culvert n=0.013 L=53.0' S=0.0283 '/' Outflow=1.59 cfs 0.170 af

Pond CLVT5: Culvert Under Access Road Peak Elev=203.04' Storage=87 cf Inflow=0.69 cfs 0.071 af
12.0" Round Culvert n=0.013 L=25.0' S=0.0040 '/' Outflow=0.68 cfs 0.071 af

Pond F2: FILTER BASIN 2 Peak Elev=216.75' Storage=7,960 cf Inflow=2.78 cfs 0.405 af
Primary=0.43 cfs 0.267 af Secondary=0.00 cfs 0.000 af Outflow=0.43 cfs 0.267 af

Pond FB1: FILTER BASIN 1 Peak Elev=215.94' Storage=2,401 cf Inflow=1.66 cfs 0.112 af
Primary=0.12 cfs 0.083 af Secondary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.083 af

Pond FB3: FILTER BASIN 3 Peak Elev=206.18' Storage=7,898 cf Inflow=3.22 cfs 0.363 af
Primary=0.42 cfs 0.244 af Secondary=0.00 cfs 0.000 af Outflow=0.42 cfs 0.244 af

Pond FB4: FILTER BASIN 4 Peak Elev=202.03' Storage=6,032 cf Inflow=2.55 cfs 0.283 af
Primary=0.36 cfs 0.193 af Secondary=0.00 cfs 0.000 af Outflow=0.36 cfs 0.193 af

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Runoff Area=142,510 sf 15.84% Impervious Runoff Depth>2.19"
Flow Length=441' Tc=29.3 min CN=78 Runoff=5.19 cfs 0.597 af

Subcatchment11: Runoff Area=41,255 sf 28.20% Impervious Runoff Depth>2.64"
Flow Length=551' Tc=6.0 min CN=83 Runoff=3.05 cfs 0.208 af

Subcatchment12: Runoff Area=11,200 sf 11.96% Impervious Runoff Depth>2.29"
Tc=6.0 min CN=79 Runoff=0.73 cfs 0.049 af

Subcatchment13: Runoff Area=36,830 sf 18.61% Impervious Runoff Depth>2.37"
Flow Length=315' Tc=9.0 min CN=80 Runoff=2.23 cfs 0.167 af

Subcatchment14: Runoff Area=27,565 sf 0.00% Impervious Runoff Depth>1.74"
Flow Length=233' Tc=19.6 min CN=72 Runoff=0.93 cfs 0.092 af

Subcatchment15: Runoff Area=364,515 sf 1.97% Impervious Runoff Depth>1.96"
Flow Length=571' Tc=21.3 min CN=75 Runoff=13.56 cfs 1.367 af

Subcatchment20: Runoff Area=145,485 sf 11.01% Impervious Runoff Depth>2.04"
Flow Length=604' Tc=21.3 min CN=76 Runoff=5.63 cfs 0.567 af

Subcatchment21: Runoff Area=34,890 sf 30.35% Impervious Runoff Depth>2.55"
Flow Length=438' Tc=6.0 min CN=82 Runoff=2.50 cfs 0.170 af

Subcatchment22: Runoff Area=79,075 sf 13.39% Impervious Runoff Depth>2.12"
Flow Length=431' Tc=21.8 min CN=77 Runoff=3.15 cfs 0.320 af

Subcatchment23: Runoff Area=3,335 sf 62.22% Impervious Runoff Depth>3.40"
Tc=6.0 min CN=91 Runoff=0.30 cfs 0.022 af

Subcatchment24: Runoff Area=17,290 sf 23.92% Impervious Runoff Depth>2.46"
Tc=6.0 min CN=81 Runoff=1.20 cfs 0.081 af

Subcatchment25: Runoff Area=35,735 sf 14.44% Impervious Runoff Depth>2.12"
Flow Length=603' Tc=21.2 min CN=77 Runoff=1.44 cfs 0.145 af

Subcatchment26: Runoff Area=425,160 sf 2.11% Impervious Runoff Depth>1.66"
Flow Length=597' Tc=20.8 min CN=71 Runoff=13.41 cfs 1.353 af

Subcatchment30: Runoff Area=64,005 sf 0.00% Impervious Runoff Depth>1.96"
Flow Length=444' Tc=21.0 min CN=75 Runoff=2.39 cfs 0.240 af

Reach R1: Avg. Flow Depth=0.07' Max Vel=4.43 fps Inflow=16.42 cfs 2.175 af
n=0.030 L=105.0' S=0.2667 '/' Capacity=417.92 cfs Outflow=16.42 cfs 2.174 af

Reach R10: Avg. Flow Depth=0.17' Max Vel=1.85 fps Inflow=3.48 cfs 0.724 af
n=0.035 L=362.0' S=0.0221 '/' Capacity=77.64 cfs Outflow=3.44 cfs 0.719 af

Reach R11: Avg. Flow Depth=0.08' Max Vel=1.16 fps Inflow=0.93 cfs 0.092 af
n=0.035 L=175.0' S=0.0229 '/' Capacity=258.63 cfs Outflow=0.92 cfs 0.091 af

Reach R12: Avg. Flow Depth=0.22' Max Vel=3.05 fps Inflow=3.73 cfs 0.810 af
n=0.035 L=172.0' S=0.0465 '/' Capacity=233.32 cfs Outflow=3.73 cfs 0.809 af

Reach R2: Avg. Flow Depth=0.31' Max Vel=4.05 fps Inflow=16.42 cfs 2.174 af
n=0.030 L=680.0' S=0.0353 '/' Capacity=941.14 cfs Outflow=16.24 cfs 2.162 af

Reach R20: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.025 L=260.0' S=0.0102 '/' Capacity=89.20 cfs Outflow=0.00 cfs 0.000 af

Reach R21: Avg. Flow Depth=0.54' Max Vel=3.06 fps Inflow=5.63 cfs 0.567 af
n=0.025 L=238.0' S=0.0100 '/' Capacity=88.35 cfs Outflow=5.60 cfs 0.566 af

Reach R22: Avg. Flow Depth=0.04' Max Vel=1.07 fps Inflow=2.31 cfs 0.525 af
n=0.080 L=216.0' S=0.2315 '/' Capacity=152.37 cfs Outflow=2.30 cfs 0.521 af

Reach R23: Avg. Flow Depth=0.14' Max Vel=0.77 fps Inflow=2.30 cfs 0.521 af
n=0.080 L=151.0' S=0.0265 '/' Capacity=74.74 cfs Outflow=2.28 cfs 0.517 af

Reach R24: Avg. Flow Depth=0.08' Max Vel=3.50 fps Inflow=2.84 cfs 0.437 af
n=0.035 L=210.0' S=0.2333 '/' Capacity=312.33 cfs Outflow=2.84 cfs 0.436 af

Reach SP1: STUDY POINT 1 Inflow=16.42 cfs 2.175 af
Outflow=16.42 cfs 2.175 af

Reach SP2: STUDY POINT 2 Inflow=30.30 cfs 4.468 af
Outflow=30.30 cfs 4.468 af

Reach SP3: STUDY POINT 3 Inflow=2.39 cfs 0.240 af
Outflow=2.39 cfs 0.240 af

Pond BR1: Bioretention Cell 1 Peak Elev=215.15' Storage=948 cf Inflow=2.23 cfs 0.167 af
Primary=0.09 cfs 0.071 af Secondary=2.11 cfs 0.088 af Outflow=2.20 cfs 0.159 af

Pond CLVT1: Culvert Sta. 8+50 Peak Elev=220.13' Storage=483 cf Inflow=5.19 cfs 0.597 af
18.0" Round Culvert n=0.013 L=50.0' S=0.0080 '/' Outflow=5.13 cfs 0.597 af

Pond CLVT2: Culvert Sta. 14+60 Peak Elev=212.65' Storage=87 cf Inflow=5.63 cfs 0.567 af
Primary=5.63 cfs 0.567 af Secondary=0.00 cfs 0.000 af Outflow=5.63 cfs 0.567 af

Pond CLVT3: Culvert Sta. 19+00 Peak Elev=210.21' Storage=63 cf Inflow=3.15 cfs 0.320 af
18.0" Round Culvert n=0.013 L=47.0' S=0.0096 '/' Outflow=3.15 cfs 0.320 af

Pond CLVT4: Culvert In Cul-de-Sac Peak Elev=209.48' Storage=82 cf Inflow=3.27 cfs 0.341 af
18.0" Round Culvert n=0.013 L=53.0' S=0.0283 '/' Outflow=3.27 cfs 0.341 af

Pond CLVT5: Culvert Under Access Road Peak Elev=203.29' Storage=281 cf Inflow=1.44 cfs 0.145 af
12.0" Round Culvert n=0.013 L=25.0' S=0.0040 '/' Outflow=1.33 cfs 0.145 af

Pond F2: FILTER BASIN 2 Peak Elev=217.75' Storage=12,786 cf Inflow=7.05 cfs 0.785 af
Primary=3.15 cfs 0.565 af Secondary=0.00 cfs 0.000 af Outflow=3.15 cfs 0.565 af

Pond FB1: FILTER BASIN 1 Peak Elev=216.84' Storage=4,540 cf Inflow=3.05 cfs 0.208 af
Primary=0.15 cfs 0.114 af Secondary=2.23 cfs 0.025 af Outflow=2.38 cfs 0.130 af

Pond FB3: FILTER BASIN 3 Peak Elev=207.49' Storage=14,458 cf Inflow=6.66 cfs 0.736 af
Primary=2.31 cfs 0.525 af Secondary=0.00 cfs 0.000 af Outflow=2.31 cfs 0.525 af

Pond FB4: FILTER BASIN 4 Peak Elev=202.93' Storage=9,723 cf Inflow=5.05 cfs 0.567 af
Primary=2.84 cfs 0.437 af Secondary=0.00 cfs 0.000 af Outflow=2.84 cfs 0.437 af

ATTACHMENT 4

INSPECTION, MAINTENANCE & HOUSEKEEPING PLAN

DM ROMA
CONSULTING ENGINEERS

INSPECTION, MAINTENANCE, AND HOUSEKEEPING PLAN

MAJESTIC WOODS SUBDIVISION
SWETT ROAD
WINDHAM, MAINE

Responsible Party

Owner: Shoreland Development, LLC
2320 Congress Street
Portland, Maine 04102

The owners are responsible for the maintenance of all stormwater management structures and related site components and the keeping of a maintenance log book with service records until such time that a homeowner's association is created. Records of all inspections and maintenance work performed must be kept on file with the owner and retained for a minimum of five years. The maintenance log will be made available to the Town and Maine Department of Environmental Protection (MDEP) upon request. At a minimum, the maintenance of stormwater management systems will be performed on the prescribed schedule.

The procedures outlined in this plan are provided as a general overview of the anticipated practices to be utilized on this site. In some instances, additional measures may be required due to unexpected conditions. *The Maine Erosion and Sedimentation Control BMP* and *Stormwater Management for Maine: Best Management Practices* Manuals published by the MDEP should be referenced for additional information.

During Construction

1. **Inspection and Corrective Action:** It is the contractor's responsibility to comply with the inspection and maintenance procedures outlined in this section. Inspection shall occur on all disturbed and impervious areas, erosion control measures, material storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. These areas shall be inspected at least once a week as well as 24 hours before and after a storm event and prior to completing permanent stabilization measures. A person with knowledge of erosion and stormwater control, including the standards and conditions in the permit, shall conduct the inspections.

2. **Maintenance:** Erosion controls shall be maintained in effective operating condition until areas are permanently stabilized. If best management practices (BMPs) need to be repaired, the repair work should be initiated upon discovery of the problem but no later than the end of the next workday. If BMPs need to be maintained or modified,

additional BMPs are necessary, or other corrective action is needed, implementation must be completed within seven calendar days and prior to any rainfall event.

3. **Documentation:** A report summarizing the inspections and any corrective action taken must be maintained on site. The log must include the name(s) and qualifications of the person making the inspections; the date(s) of the inspections; and the major observations about the operation and maintenance of erosion and sedimentation controls, materials storage areas, and vehicle access points to the parcel. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and location(s) where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken. The log must be made accessible to MDEP staff, and a copy must be provided upon request. The owner shall retain a copy of the log for a period of at least three years from the completion of permanent stabilization.

Houskeeping

1. **Spill prevention:** Controls must be used to prevent pollutants from construction and waste materials on site to enter stormwater, which includes storage practices to minimize exposure of the materials to stormwater. The site contractor or operator must develop, and implement as necessary, appropriate spill prevention, containment, and response planning measures.

2. **Groundwater protection:** During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials. Any project proposing infiltration of stormwater must provide adequate pre-treatment of stormwater prior to discharge of stormwater to the infiltration area, or provide for treatment within the infiltration area, in order to prevent the accumulation of fines, reduction in infiltration rate, and consequent flooding and destabilization.

3. **Fugitive sediment and dust:** Actions must be taken to ensure that activities do not result in noticeable erosion of soils or fugitive dust emissions during or after construction. Oil may not be used for dust control, but other water additives may be considered as needed. A stabilized construction entrance (SCE) should be included to minimize tracking of mud and sediment. If off-site tracking occurs, public roads should be swept immediately and no less than once a week and prior to significant storm events. Operations during dry months, that experience fugitive dust problems, should

wet down unpaved access roads once a week or more frequently as needed with a water additive to suppress fugitive sediment and dust.

4. **Debris and other materials:** Minimize the exposure of construction debris, building and landscaping materials, trash, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials to precipitation and stormwater runoff. These materials must be prevented from becoming a pollutant source.

5. **Excavation de-watering:** Excavation de-watering is the removal of water from trenches, foundations, coffer dams, ponds, and other areas within the construction area that retain water after excavation. In most cases the collected water is heavily silted and hinders correct and safe construction practices. The collected water removed from the ponded area, either through gravity or pumping, must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Avoid allowing the water to flow over disturbed areas of the site. Equivalent measures may be taken if approved by the Department.

6. **Authorized Non-stormwater discharges:** Identify and prevent contamination by non-stormwater discharges. Where allowed non-stormwater discharges exist, they must be identified and steps should be taken to ensure the implementation of appropriate pollution prevention measures for the non-stormwater component(s) of the discharge. Authorized non-stormwater discharges are:
   (a) Discharges from firefighting activity;
   (b) Fire hydrant flushings;
   (c) Vehicle washwater if detergents are not used and washing is limited to the exterior of vehicles (engine, undercarriage and transmission washing is prohibited);
   (d) Dust control runoff in accordance with permit conditions and Appendix (C)(3);
   (e) Routine external building washdown, not including surface paint removal, that does not involve detergents;
   (f) Pavement washwater (where spills/leaks of toxic or hazardous materials have not occurred, unless all spilled material had been removed) if detergents are not used;
   (g) Uncontaminated air conditioning or compressor condensate;
   (h) Uncontaminated groundwater or spring water;
   (i) Foundation or footer drain-water where flows are not contaminated;
   (j) Uncontaminated excavation dewatering (see requirements in Appendix C(5));
   (k) Potable water sources including waterline flushings; and
   (l) Landscape irrigation.

7. **Unauthorized non-stormwater discharges:** Approval from the MDEP does not authorize a discharge that is mixed with a source of non-stormwater, other than those discharges in compliance with Section 6 above. Specifically, the MDEP's approval does not authorize discharges of the following:

(a) Wastewater from the washout or cleanout of concrete, stucco, paint, form release oils, curing compounds or other construction materials;
(b) Fuels, oils or other pollutants used in vehicle and equipment operation and maintenance;
(c) Soaps, solvents, or detergents used in vehicle and equipment washing; and
(d) Toxic or hazardous substances from a spill or other release.

Post construction

1. **Inspection and Corrective Action:** All measures must be maintained by the owner in effective operating condition. A person with knowledge of erosion and stormwater control, including the standards and conditions of the permit, shall conduct the inspections. The following areas, facilities, and measures must be inspected, and identified deficiencies must be corrected. Areas, facilities, and measures other than those listed below may also require inspection on a specific site.

   A. **Vegetated Areas:** Inspect vegetated areas, particularly slopes and embankments, early in the growing season or after heavy rains to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

   B. **Ditches, Swales, and Open Channels:** Inspect ditches, swales, and other open channels in the spring, late fall, and after heavy rains to remove any obstructions to flow, remove accumulated sediments and debris, control vegetative growth that could obstruct flow, and repair any erosion of the ditch lining. Vegetated ditches must be mowed at least annually or otherwise maintained to control the growth of woody vegetation and maintain flow capacity. Any woody vegetation growing through riprap linings must also be removed. Repair any slumping side slopes as soon as practicable. If the ditch has a riprap lining, replace riprap on areas where any underlying filter fabric or underdrain gravel is showing through the stone or where stones have dislodged. The channel must receive adequate routine maintenance to maintain capacity and prevent or correct any erosion of the channel's bottom or side slopes.

   C. **Culverts:** Inspect culverts in the spring, late fall, and after heavy rains to remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit; and to repair any erosion damage at the culvert's inlet and outlet.

   D. **Buffers:** Wooded buffers must remain fully wooded and have no disturbance to the duff layer. Vegetation in non-wooded buffers may not be cut more than three times per year, and may not be cut shorter than six inches. Stormwater runoff should enter the buffer as sheet flow, and any observed channelization of flows or erosion

should be corrected immediately. Activities that may result in disturbance of the duff layer are prohibited in a buffer.

E. **Underdrained Filter Basin and Bioretention Cell:** Basin should be inspected semi-annually and following major storm events for the first year and every six months thereafter. The basin should drain within 48 hours following a one-inch storm and if a larger storm fills the system to overflow, it shall drain within 36 to 60 hours. If ponding exceeds 48 hours, the top of the filter bed must be rototilled to reestablish the soil's filtration capacity. If water ponds on the surface of the bed for more than 72 hours, the top several inches of the filter shall be replaced with fresh material. Inspect for debris and sediment build up in the forebay and basin and remove as needed. Mowing of the basin can only occur semi-annually to a height of no less than 6 inches utilizing a hand-held string trimmer or push-mower. Any bare areas or erosion rills shall be repaired with new filter media or sandy loam then seeded and mulched. The basin should also be inspected annually for destabilization of side slopes, embankment settling and other signs of structural failure.

F. **Roofline Dripedge:** The dripedges should be inspected semi-annually and following major storm events for the first year and every six months thereafter. The reservoir crushed stone should drain within 48 hours following a one-inch storm and if a larger storm fills the system to overflow, it shall drain within 36 to 60 hours. If ponding exceeds 48 hours, the stone reservoir course shall be removed and the filter bed be rototilled to reestablish the soil's filtration capacity. If water ponds in the reservoir course for more than 72 hours, the top several inches of the filter shall be replaced with fresh material. Inspect for debris and sediment build up at surface and remove as needed. The dripedges are part of the stormwater management plan and cannot be paved over or altered in anyway.

G. **Outlet Structure:** Inspect and, if required, clean out structures at least once a year, preferably in early spring. Clean out must include the removal and legal disposal of any accumulated sediments and debris at the bottom of the basin, at any inlet grates, at any inflow channels to the basin, and at any pipes between basins. If the basin outlet is designed to trap floatable materials, then remove the floating debris and any floating oils (using oil-absorptive pads).

H. **Regular Maintenance:** Clear accumulations of winter sand along roadway once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along pavement shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

I. **Documentation:** Keep a log (report) summarizing inspections, maintenance, and any corrective actions taken. The log must include the date on which each inspection or maintenance task was performed, a description of the inspection findings or

maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediments or debris, indicate where the sediment and debris was disposed after removal. The log must be made accessible to Town staff upon request. The permittee shall retain a copy of the log for a period of at least five years from the completion of permanent stabilization. Attached is a sample log.

Re-certification

Submit a certification of the following to the MDEP within three months of the expiration of each five-year interval from the date of issuance of the permit.

(a) **Identification and repair of erosion problems**. All areas of the project site have been inspected for areas of erosion, and appropriate steps have been taken to permanently stabilize these areas.

(b) **Inspection and repair of stormwater control system**. All aspects of the stormwater control system have been inspected for damage, wear, and malfunction, and appropriate steps have been taken to repair or replace the system, or portions of the system.

(c) **Maintenance**. The erosion and stormwater maintenance plan for the site is being implemented as written, or modifications to the plan have been submitted to and approved by the Department, and the maintenance log is being maintained.

Municipalities with separate storm sewer systems regulated under the Maine Pollutant Discharge Elimination System (MPDES) Program may report on all regulated systems under their control as part of their required annual reporting in lieu of separate certification of each system. Municipalities not regulated by the MPDES Program, but that are responsible for maintenance of permitted stormwater systems, may report on multiple stormwater systems in one report.

Duration of Maintenance

Perform maintenance as described.

MAINTENANCE LOG

MAJESTIC WOODS SUBDIVISION
WINDHAM, MAINE

The following stormwater management and erosion control items shall be inspected and maintained as prescribed in the Maintenance Plan with recommended frequencies as identified below. The owner is responsible for keeping this maintenance log on file for a minimum of five years and shall provide a copy to the Town and MDEP upon request. Inspections are to be performed by a qualified third party inspector and all corrective actions shall be performed by personnel familiar with stormwater management systems and erosion controls.

Maintenance Item	Maintenance Event	Date Performed	Responsible Personnel	Comments
Vegetated Areas	Inspect slopes and embankments early in Spring.			
Ditches, swales, and other open channels	Inspect after major rainfall event producing 1" of rain in two hours.			
	Inspect for erosion or slumping & repair			
	Mowed at least annually.			
Culverts	Inspect semiannually and after major rainfall.			
	Repair erosion at inlet or outlet of pipe.			
	Repair displaced riprap.			
	Clean accumulated sediment in culverts when >20% full.			
Buffers	Inspect for erosion and channelized flow semiannually.			
	Remove accumulated sediment semiannually.			
	Inspect vegetation cover and reestablish as needed.			

MAINTENANCE LOG

MAJESTIC WOODS SUBDIVISION
WINDHAM, MAINE

Maintenance Item	Maintenance Event	Date Performed	Responsible Personnel	Comments
Underdrained Filter Basin, Bioretention Cells, And Roofline Dripedges	Check after each rainfall event to ensure that pond drains within 24-48 hours.			
	Replace top several inches of filter if pond does not drain within 72 hours.			
	Mow grass no more than twice a year to no less than 6 inches in height.			
	Inspect semi-annually for erosion or sediment accumulation and repair as necessary.			
Outlet Structure	Inspect to ensure that structure is properly draining.			
	Remove accumulated sediment semiannually.			
	Inspect grates/inlets and remove debris as needed.			
Regular Maintenance	Clear accumulation of winter sand in paved areas annually.			