McKIM & CREED

LETTER OF TRANSMITTAL

DATE: June 30, 2014	
PROJECT NO: 2735-0109	TASK NO: EXP
RE: Briar Chapel – Phase 11	
TRANSMITTAL NO: 1	PAGE 1 OF 1

TO: NCDENR – Division of Energy, Mineral and Land Resources, North Carolina Stormwater Permitting Program
1612 Mail Service Center
Raleigh, NC 27604
ATTENTION: Mr. Boyd Devane

WE ARE SENDING: ☐ Originals ☒ Prints ☐ Shop Drawings ☐ Samples
☐ Specifications ☒ Calculations ☐ Other -

Quantity	Dwg No.	Rev.	Description	Status
2			Stormwater Design Plans	G
2			Narrative & Supporting Calculations	G
2			BMP #17 O&M Agreement and Design Supplements (1 Original, 1 copy)	G

Issue Status Code: A. Preliminary B. Fabrication Only C. For Information D. Bid
E. Construction F. For Review & Comments G. For Approval H. See Remarks

REMARKS:

Boyd,

Please find the enclosed documents for your review. Please let us know if you have any questions or comments. Thank you.

1730 Varsity Drive, Suite 500 Raleigh, NC 27606 919/233-8091 Fax 919/233-8031

Cc:

McKIM & CREED, INC.

Signed Gareth Avant

Gareth Avant, PE

Permit No._____
(to be provided by DWQ)

Red triangles at the upper right hand corner indicate design comments

Please complete the yellow shaded items.

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM

WET DETENTION BASIN SUPPLEMENT

This form must be filled out, printed and submitted.

The Required Items Checklist (Part III) must be printed, filled out and submitted along with all of the required information.

I. PROJECT INFORMATION

Project name	Briar Chapel Development - Great Ridge Parkway Extension
Contact person	Gareth Avant, PE
Phone number	919.233.8091
Date	30-Jun-2014
Drainage area number	1 - Wet Pond #17

II. DESIGN INFORMATION

Site Characteristics

Drainage area	1,446,191	ft^2	
Impervious area, post-development	965,075	ft^2	
% impervious	66.73	%	
Design rainfall depth	1.0	in	

Storage Volume: Non-SA Waters

Minimum volume required	78,407	ft^3	OK
Volume provided	87,191	ft^3	OK, volume provided is equal to or in excess of volume required.

Storage Volume: SA Waters

1.5" runoff volume		ft^3	
Pre-development 1-yr, 24-hr runoff		ft^3	
Post-development 1-yr, 24-hr runoff		ft^3	
Minimum volume required		ft^3	
Volume provided		ft^3	

Peak Flow Calculations

Is the pre/post control of the 1yr 24hr storm peak flow required?	Y	(Y or N)	
1-yr, 24-hr rainfall depth	3.0	in	
Rational C, pre-development	0.40	(unitless)	
Rational C, post-development	0.80	(unitless)	
Rainfall intensity: 1-yr, 24-hr storm	0.13	in/hr	OK
Pre-development 1-yr, 24-hr peak flow	12.87	ft^3/sec	
Post-development 1-yr, 24-hr peak flow	47.65	ft^3/sec	
Pre/Post 1-yr, 24-hr peak flow control	34.78	ft^3/sec	

Elevations

Temporary pool elevation	433.00	fmsl	
Permanent pool elevation	431.50	fmsl	
SHWT elevation (approx. at the perm. pool elevation)		fmsl	
Top of 10ft vegetated shelf elevation	432.00	fmsl	
Bottom of 10ft vegetated shelf elevation	431.00	fmsl	Data not needed for calculation option #1, but OK if provided.
Sediment cleanout, top elevation (bottom of pond)	427.00	fmsl	
Sediment cleanout, bottom elevation	426.00	fmsl	Data not needed for calculation option #1, but OK if provided.
Sediment storage provided	1.00	ft	
Is there additional volume stored above the state-required temp. pool?	N	(Y or N)	
Elevation of the top of the additional volume		fmsl	

II. DESIGN INFORMATION

Surface Areas			
Area, temporary pool	87,191	ft^2	
Area REQUIRED, permanent pool	50,617	ft^2	
SA/DA ratio	3.50	(unitless)	
Area PROVIDED, permanent pool, A_{perm_pool}	52,455	ft^2	OK
Area, bottom of 10ft vegetated shelf, A_{bot_shelf}	45,419	ft^2	
Area, sediment cleanout, top elevation (bottom of pond), A_{bot_pond}	25,198	ft^2	
Volumes			
Volume, temporary pool	87,191	ft^3	OK
Volume, permanent pool, V_{perm_pool}	199,394	ft^3	
Volume, forebay (sum of forebays if more than one forebay)	43,503	ft^3	
Forebay % of permanent pool volume	21.8%	%	OK
SA/DA Table Data			
Design TSS removal	90	%	
Coastal SA/DA Table Used?	N	(Y or N)	
Mountain/Piedmont SA/DA Table Used?	Y	(Y or N)	
SA/DA ratio	3.50	(unitless)	
Average depth (used in SA/DA table):			
Calculation option 1 used? (See Figure 10-2b)	Y	(Y or N)	
Volume, permanent pool, V_{perm_pool}	199,394	ft^3	
Area provided, permanent pool, A_{perm_pool}	52,455	ft^2	
Average depth calculated	3.73	ft	OK
Average depth used in SA/DA, d_{av}, (Round to nearest 0.5ft)	3.5	ft	OK
Calculation option 2 used? (See Figure 10-2b)	N	(Y or N)	
Area provided, permanent pool, A_{perm_pool}	52,455	ft^2	
Area, bottom of 10ft vegetated shelf, A_{bot_shelf}	45,419	ft^2	
Area, sediment cleanout, top elevation (bottom of pond), A_{bot_pond}	25,198	ft^2	
"Depth" (distance b/w bottom of 10ft shelf and top of sediment)	4.00	ft	
Average depth calculated		ft	
Average depth used in SA/DA, d_{av}, (Round to nearest 0.5ft)		ft	
Drawdown Calculations			
Drawdown through orifice?	Y	(Y or N)	
Diameter of orifice (if circular)	5.00	in	
Area of orifice (if-non-circular)		in^2	
Coefficient of discharge (C_D)	0.60	(unitless)	
Driving head (H_o)	0.50	ft	
Drawdown through weir?	N	(Y or N)	
Weir type		(unitless)	
Coefficient of discharge (C_w)		(unitless)	
Length of weir (L)		ft	
Driving head (H)		ft	
Pre-development 1-yr, 24-hr peak flow	22.07	ft^3/sec	
Post-development 1-yr, 24-hr peak flow	18.28	ft^3/sec	
Storage volume discharge rate (through discharge orifice or weir)	0.34	ft^3/sec	
Storage volume drawdown time	2.00	days	OK, draws down in 2-5 days.
Additional Information			
Vegetated side slopes	3	:1	OK
Vegetated shelf slope	10	:1	OK
Vegetated shelf width	10.0	ft	OK
Length of flowpath to width ratio	3	:1	OK
Length to width ratio	3.9	:1	OK
Trash rack for overflow & orifice?	Y	(Y or N)	OK
Freeboard provided	1.0	ft	OK
Vegetated filter provided?	N	(Y or N)	OK
Recorded drainage easement provided?	Y	(Y or N)	OK
Capures all runoff at ultimate build-out?	Y	(Y or N)	OK
Drain mechanism for maintenance or emergencies is:	8" DIP with gate valve		

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project. Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. If a requirement has not been met, attach justification.

Initials	Page/ Plan Sheet No.	
GCA	C3.2-C3.3	1. Plans (1" - 50' or larger) of the entire site showing: - Design at ultimate build-out, - Off-site drainage (if applicable), - Delineated drainage basins (include Rational C coefficient per basin), - Basin dimensions, - Pretreatment system, - High flow bypass system, - Maintenance access, - Proposed drainage easement and public right of way (ROW), - Overflow device, and - Boundaries of drainage easement.
GCA	D4.1-D4.3	2. Partial plan (1" = 30' or larger) and details for the wet detention basin showing: - Outlet structure with trash rack or similar, - Maintenance access, - Permanent pool dimensions, - Forebay and main pond with hardened emergency spillway, - Basin cross-section, - Vegetation specification for planting shelf, and - Filter strip.
GCA	D4.1-D4.3	3. Section view of the wet detention basin (1" = 20' or larger) showing: - Side slopes, 3:1 or lower, - Pretreatment and treatment areas, and - Inlet and outlet structures.
GCA	N/A	4. If the basin is used for sediment and erosion control during construction, clean out of the basin is specified on the plans prior to use as a wet detention basin.
GCA	Calc Booklet	5. A table of elevations, areas, incremental volumes & accumulated volumes for overall pond and for forebay, to verify volume provided.
GCA	C3.2-C3.3	6. A construction sequence that shows how the wet detention basin will be protected from sediment until the entire drainage area is stabilized.
GCA	Calc Booklet	7. The supporting calculations.
GCA	Included	8. A copy of the signed and notarized operation and maintenance (O&M) agreement.
GCA	Included	9. A copy of the deed restrictions (if required).
_____	N/A	10. A soils report that is based upon an actual field investigation, soil borings, and infiltration tests. County soil maps are not an acceptable source of soils information.

Permit Number:_____
(to be provided by DWQ)
Drainage Area Number:_____

Wet Detention Basin Operation and Maintenance Agreement

I will keep a maintenance record on this BMP. This maintenance record will be kept in a log in a known set location. Any deficient BMP elements noted in the inspection will be corrected, repaired or replaced immediately. These deficiencies can affect the integrity of structures, safety of the public, and the removal efficiency of the BMP.

The wet detention basin system is defined as the wet detention basin, pretreatment including forebays and the vegetated filter if one is provided.

This system (*check one*):
☐ **does** ☒ **does not** **incorporate a vegetated filter at the outlet.**

This system (*check one*):
☐ **does** ☒ **does not** **incorporate pretreatment other than a forebay.**

Important maintenance procedures:

- Immediately after the wet detention basin is established, the plants on the vegetated shelf and perimeter of the basin should be watered twice weekly if needed, until the plants become established (commonly six weeks).
- No portion of the wet detention pond should be fertilized after the first initial fertilization that is required to establish the plants on the vegetated shelf.
- Stable groundcover should be maintained in the drainage area to reduce the sediment load to the wet detention basin.
- If the basin must be drained for an emergency or to perform maintenance, the flushing of sediment through the emergency drain should be minimized to the maximum extent practical.
- Once a year, a dam safety expert should inspect the embankment.

After the wet detention pond is established, it should be inspected **once a month and within 24 hours after every storm event greater than 1.0 inches (or 1.5 inches if in a Coastal County)**. Records of operation and maintenance should be kept in a known set location and must be available upon request.

Inspection activities shall be performed as follows. Any problems that are found shall be repaired immediately.

BMP element:	Potential problem:	How I will remediate the problem:
The entire BMP	Trash/debris is present.	Remove the trash/debris.
The perimeter of the wet detention basin	Areas of bare soil and/or erosive gullies have formed.	Regrade the soil if necessary to remove the gully, and then plant a ground cover and water until it is established. Provide lime and a one-time fertilizer application.
	Vegetation is too short or too long.	Maintain vegetation at a height of approximately six inches.

Permit Number:_____
(to be provided by DWQ)
Drainage Area Number:_____

BMP element:	Potential problem:	How I will remediate the problem:
The inlet device: pipe or swale	The pipe is clogged.	Unclog the pipe. Dispose of the sediment off-site.
	The pipe is cracked or otherwise damaged.	Replace the pipe.
	Erosion is occurring in the swale.	Regrade the swale if necessary to smooth it over and provide erosion control devices such as reinforced turf matting or riprap to avoid future problems with erosion.
The forebay	Sediment has accumulated to a depth greater than the original design depth for sediment storage.	Search for the source of the sediment and remedy the problem if possible. Remove the sediment and dispose of it in a location where it will not cause impacts to streams or the BMP.
	Erosion has occurred.	Provide additional erosion protection such as reinforced turf matting or riprap if needed to prevent future erosion problems.
	Weeds are present.	Remove the weeds, preferably by hand. If pesticide is used, wipe it on the plants rather than spraying.
The vegetated shelf	Best professional practices show that pruning is needed to maintain optimal plant health.	Prune according to best professional practices
	Plants are dead, diseased or dying.	Determine the source of the problem: soils, hydrology, disease, etc. Remedy the problem and replace plants. Provide a one-time fertilizer application to establish the ground cover if a soil test indicates it is necessary.
	Weeds are present.	Remove the weeds, preferably by hand. If pesticide is used, wipe it on the plants rather than spraying.
The main treatment area	Sediment has accumulated to a depth greater than the original design sediment storage depth.	Search for the source of the sediment and remedy the problem if possible. Remove the sediment and dispose of it in a location where it will not cause impacts to streams or the BMP.
	Algal growth covers over 50% of the area.	Consult a professional to remove and control the algal growth.
	Cattails, phragmites or other invasive plants cover 50% of the basin surface.	Remove the plants by wiping them with pesticide (do not spray).

Permit Number:_____
(to be provided by DWQ)
Drainage Area Number:_____

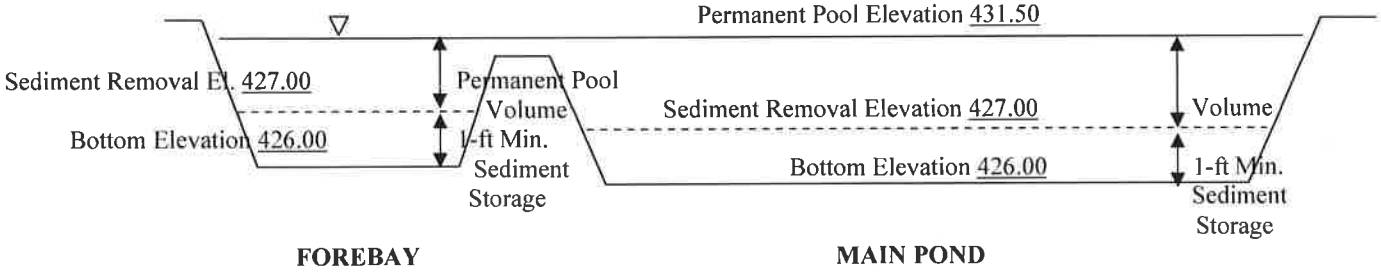
BMP element:	Potential problem:	How I will remediate the problem:
The embankment	Shrubs have started to grow on the embankment.	Remove shrubs immediately.
	Evidence of muskrat or beaver activity is present.	Use traps to remove muskrats and consult a professional to remove beavers.
	A tree has started to grow on the embankment.	Consult a dam safety specialist to remove the tree.
	An annual inspection by an appropriate professional shows that the embankment needs repair. (if applicable)	Make all needed repairs.
The outlet device	Clogging has occurred.	Clean out the outlet device. Dispose of the sediment off-site.
	The outlet device is damaged	Repair or replace the outlet device.
The receiving water	Erosion or other signs of damage have occurred at the outlet.	Contact the local NC Division of Water Quality Regional Office, or the 401 Oversight Unit at 919-733-1786.

The measuring device used to determine the sediment elevation shall be such that it will give an accurate depth reading and not readily penetrate into accumulated sediments.

When the permanent pool depth reads _4.50_ feet in the main pond, the sediment shall be removed.

When the permanent pool depth reads _4.50_ feet in the forebay, the sediment shall be removed.

BASIN DIAGRAM
(fill in the blanks)



Permit Number: _____
(to be provided by DWQ)

I acknowledge and agree by my signature below that I am responsible for the performance of the maintenance procedures listed above. I agree to notify DWQ of any problems with the system or prior to any changes to the system or responsible party.

Project name: Briar Chapel - Phase 11

BMP drainage area number: 1 - Wet Detention Pond #17

Print name: Laurie Ford

Title: Vice President, Operations

Address: 16 Windy Knoll Circle, Chapel Hill, NC 27516

Phone: (919) 951-0700

Signature: _____

Date: 7-3-14

Note: The legally responsible party should not be a homeowners association unless more than 50% of the lots have been sold and a resident of the subdivision has been named the president.

I, G. Leon Bowman, a Notary Public for the State of NC, County of Chatham, do hereby certify that Laurie Ford personally appeared before me this 3rd day of July, 2014, and acknowledge the due execution of the forgoing wet detention basin maintenance requirements. Witness my hand and official seal,

G. LEON BOWMAN NOTARY PUBLIC CHATHAM COUNTY, N.C.

SEAL

My commission expires 9/10/14

401 NARRATIVE & SUPPORTING CALCULATIONS

Briar Chapel Development
Phase 11

Chatham County, North Carolina
June 30, 2014

Prepared for:

BRIAR CHAPEL™
by
Newland COMMUNITIES

NNP Briar Chapel, LLC
16 Windy Knoll Circle
Chapel Hill, North Carolina 27516

Prepared By:

McKIM&CREED
1730 Varsity Drive, Suite 500
Raleigh, North Carolina 27606
Phone: (919) 233.8091
Fax: (919) 233.8031

M&C Project No. 02735-0109

PROJECT DESCRIPITON

The purpose of the project is to construct water, sewer and roadway infrastructure to support 200 residential lots within the Briar Chapel development. This will be the fourth of five phases of construction in this proximity.

Based on the conditions of the approved 401 Water Quality Certification, NCDENR-DWQ will require runoff from the roads to be captured and treated for 85% TSS removal before being discharged into existing stream buffers. To meet this requirement, the runoff from the general area of all Phase 11 construction will be directed to Wet Detention Pond #17. Calculations for these new facilities are included in this package.

Upon completion of the project's construction, the proposed public roads will be turned over to and maintained by NCDOT.

SITE DESCRIPTION

The project area is approximately 34 acres of disturbed area located within the BC South development area, east to Granite Mill Boulevard and west of the previous phases 7 and 8 construction activities.

SOILS

According to the Chatham County Generalized Soil Survey, the soils located on the site are classified as Helena sandy loam, 2% to 6% slopes (HeB), Wedowee sandy loam, 2% to 6% slopes (WeB).

The following soil descriptions are associated with the soils found on the site:

> He(X) – Helena sandy loam are often found in piedmont uplands, along ridges, drainageways, and at the heads of drainageways. Permeability is slow and the soils are only moderately well drained. Soils have a high shrink/swell potential. The seasonal high water is perched and at a depth of 1.5-2.5 feet from January through April.
>
> We(B) – Wedowee sandy loam soils are often found in piedmont uplands, along ridges and side slopes. Permeability is moderate and the soils are well drained. Soils have a low shrink/swell potential. The seasonal high water is generally more than 6.0 feet below the surface.

WET DETENTION DESIGN

The wet detention pond on this site has been designed to remove 90% of the total suspended solids entering from the surrounding impervious drainage areas before discharging into the adjacent stream buffer. The calculations provided with this package include all projected future drainage areas that might be captured by the pond. Treated runoff will be dissipated by a riprap outlet protection device before entering any stream buffers.

Design parameters were taken from the BMP manual and from DWQ's design supplement forms.

MAINTENANCE CONSIDERATIONS

The property owner shall be responsible for periodic inspection and maintenance of all temporary erosion control measures devices. Any measure that fails to function as intended shall be repaired immediately.

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

CHAPEL HILL 2 W, NORTH CAROLINA (31-1677) 35.9086 N 79.0794 W 462 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 2, Version 3
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2004

Extracted: Wed Jan 20 2010

Confidence Limits | Seasonality | Location Maps | Other Info. | GIS data | Maps | Docs | Return to State Map

Precipitation Intensity Estimates (in/hr)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	4.93	3.94	3.28	2.25	1.40	0.84	0.60	0.36	0.21	0.12	0.07	0.04	0.03	0.02	0.01	0.01	0.01	0.01
2	5.81	4.64	3.89	2.69	1.69	1.01	0.72	0.43	0.25	0.15	0.09	0.05	0.03	0.03	0.02	0.01	0.01	0.01
5	6.70	5.36	4.52	3.21	2.06	1.25	0.89	0.53	0.32	0.19	0.11	0.06	0.04	0.03	0.02	0.02	0.01	0.01
10	7.38	5.90	4.98	3.61	2.35	1.43	1.03	0.62	0.37	0.22	0.12	0.07	0.04	0.03	0.02	0.02	0.01	0.01
25	8.11	6.46	5.46	4.04	2.69	1.66	1.20	0.73	0.44	0.25	0.15	0.08	0.05	0.04	0.03	0.02	0.02	0.01
50	8.62	6.86	5.79	4.36	2.95	1.85	1.34	0.82	0.50	0.29	0.16	0.09	0.06	0.04	0.03	0.02	0.02	0.02
100	9.07	7.21	6.07	4.65	3.20	2.02	1.48	0.91	0.56	0.32	0.18	0.10	0.06	0.05	0.03	0.02	0.02	0.02
200	9.44	7.49	6.30	4.90	3.44	2.20	1.63	1.01	0.62	0.35	0.20	0.11	0.07	0.05	0.03	0.03	0.02	0.02
500	9.85	7.79	6.54	5.21	3.73	2.43	1.82	1.14	0.71	0.40	0.22	0.12	0.08	0.06	0.04	0.03	0.02	0.02
1000	10.19	8.02	6.71	5.43	3.96	2.62	1.98	1.24	0.78	0.43	0.24	0.13	0.08	0.06	0.04	0.03	0.02	0.02

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting forces estimates near zero to appear as zero.

* Upper bound of the 90% confidence interval Precipitation Intensity Estimates (in/hr)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	5.39	4.31	3.59	2.46	1.53	0.92	0.65	0.39	0.23	0.13	0.08	0.04	0.03	0.02	0.01	0.01	0.01	0.01
2	6.36	5.08	4.26	2.94	1.85	1.11	0.79	0.47	0.28	0.16	0.09	0.05	0.03	0.03	0.02	0.01	0.01	0.01
5	7.31	5.86	4.94	3.51	2.25	1.37	0.97	0.58	0.34	0.20	0.12	0.06	0.04	0.03	0.02	0.02	0.01	0.01
10	8.06	6.44	5.43	3.94	2.56	1.57	1.12	0.68	0.40	0.23	0.13	0.07	0.05	0.04	0.02	0.02	0.02	0.01
25	8.83	7.04	5.95	4.41	2.93	1.82	1.31	0.79	0.48	0.27	0.16	0.09	0.05	0.04	0.03	0.02	0.02	0.01
50	9.38	7.48	6.31	4.75	3.22	2.02	1.47	0.89	0.54	0.31	0.17	0.10	0.06	0.05	0.03	0.02	0.02	0.02
100	9.89	7.85	6.62	5.07	3.49	2.22	1.62	0.99	0.60	0.34	0.19	0.11	0.07	0.05	0.03	0.02	0.02	0.02
200	10.32	8.18	6.88	5.35	3.75	2.41	1.78	1.09	0.67	0.38	0.21	0.12	0.07	0.06	0.04	0.03	0.02	0.02
500	10.78	8.52	7.15	5.69	4.08	2.66	1.99	1.23	0.76	0.43	0.24	0.13	0.08	0.06	0.04	0.03	0.02	0.02
1000	11.14	8.77	7.34	5.94	4.34	2.87	2.16	1.36	0.85	0.46	0.26	0.14	0.09	0.07	0.04	0.03	0.02	0.02

* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

* Lower bound of the 90% confidence interval Precipitation Intensity Estimates (in/hr)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

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from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 2, Version 3
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NOAA, National Weather Service, Silver Spring, Maryland, 2004

Extracted: Tue Jan 19 2010

Confidence Limits | Seasonality | Location Maps | Other Info. | GIS data | Maps | Docs | Return to State Map

Precipitation Frequency Estimates (inches)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.41	0.66	0.82	1.12	1.40	1.68	1.79	2.15	2.54	2.96	3.46	3.87	4.44	5.05	6.76	8.39	10.69	12.84
2	0.48	0.77	0.97	1.34	1.69	2.02	2.16	2.59	3.06	3.58	4.17	4.64	5.30	6.00	7.97	9.88	12.52	14.97
5	0.56	0.89	1.13	1.60	2.06	2.49	2.66	3.20	3.80	4.47	5.17	5.71	6.44	7.21	9.41	11.47	14.32	16.89
10	0.61	0.98	1.25	1.80	2.35	2.87	3.08	3.71	4.44	5.17	5.95	6.54	7.34	8.15	10.56	12.72	15.72	18.37
25	0.68	1.08	1.36	2.02	2.69	3.33	3.61	4.37	5.28	6.11	6.99	7.68	8.57	9.42	12.11	14.36	17.55	20.28
50	0.72	1.14	1.45	2.18	2.95	3.70	4.04	4.92	5.99	6.86	7.81	8.57	9.54	10.43	13.34	15.62	18.95	21.72
100	0.76	1.20	1.52	2.33	3.20	4.05	4.46	5.47	6.71	7.62	8.64	9.49	10.53	11.44	14.57	16.87	20.31	23.11
200	0.79	1.25	1.57	2.45	3.44	4.40	4.89	6.03	7.47	8.41	9.49	10.44	11.56	12.47	15.83	18.12	21.67	24.46
500	0.82	1.30	1.64	2.60	3.73	4.86	5.46	6.80	8.53	9.50	10.66	11.73	12.96	13.87	17.55	19.80	23.46	26.21
1000	0.85	1.34	1.68	2.72	3.96	5.23	5.93	7.44	9.43	10.35	11.58	12.76	14.06	14.97	18.89	21.09	24.83	27.53

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting forces estimates near zero to appear as zero.

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)

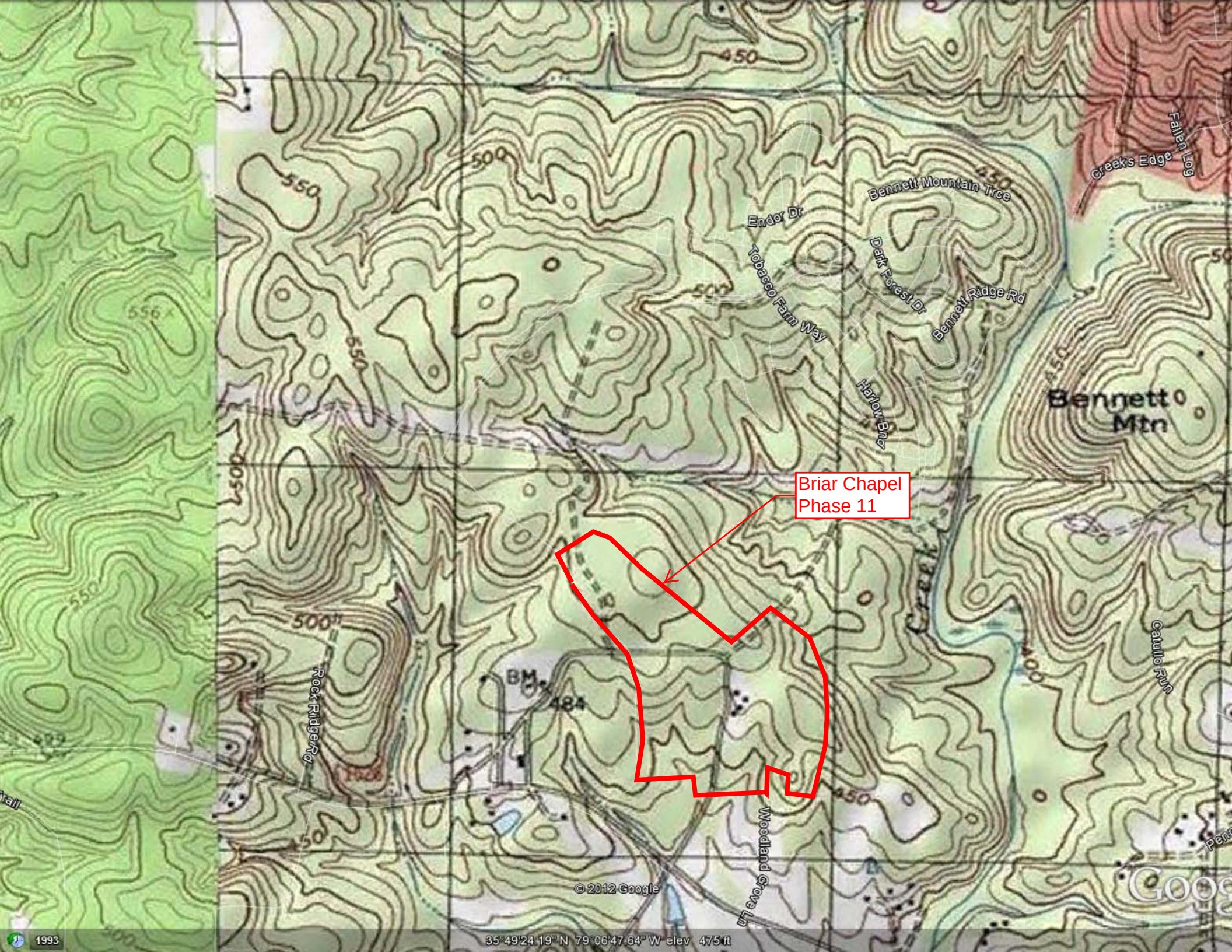
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.45	0.72	0.90	1.23	1.53	1.84	1.96	2.35	2.77	3.16	3.70	4.14	4.73	5.37	7.14	8.87	11.24	13.44
2	0.53	0.85	1.06	1.47	1.85	2.22	2.37	2.83	3.34	3.82	4.46	4.96	5.64	6.38	8.43	10.42	13.15	15.68
5	0.61	0.98	1.23	1.75	2.25	2.73	2.92	3.50	4.15	4.77	5.53	6.09	6.86	7.66	9.95	12.10	15.04	17.69
10	0.67	1.07	1.36	1.97	2.56	3.14	3.37	4.05	4.83	5.51	6.36	6.99	7.82	8.66	11.17	13.41	16.51	19.25
25	0.74	1.17	1.49	2.20	2.93	3.64	3.94	4.76	5.73	6.54	7.47	8.22	9.14	10.02	12.82	15.15	18.44	21.26
50	0.78	1.25	1.58	2.38	3.22	4.04	4.41	5.35	6.47	7.34	8.35	9.19	10.19	11.11	14.14	16.50	19.92	22.80
100	0.82	1.31	1.66	2.53	3.49	4.43	4.87	5.94	7.25	8.17	9.27	10.19	11.26	12.21	15.48	17.85	21.39	24.28
200	0.86	1.36	1.72	2.68	3.75	4.82	5.34	6.56	8.06	9.03	10.19	11.22	12.38	13.33	16.86	19.21	22.85	25.73
500	0.90	1.42	1.79	2.84	4.08	5.32	5.96	7.39	9.20	10.21	11.47	12.65	13.91	14.86	18.72	21.04	24.81	27.63
1000	0.93	1.46	1.83	2.97	4.34	5.74	6.50	8.11	10.19	11.15	12.49	13.79	15.14	16.07	20.20	22.46	26.31	29.07

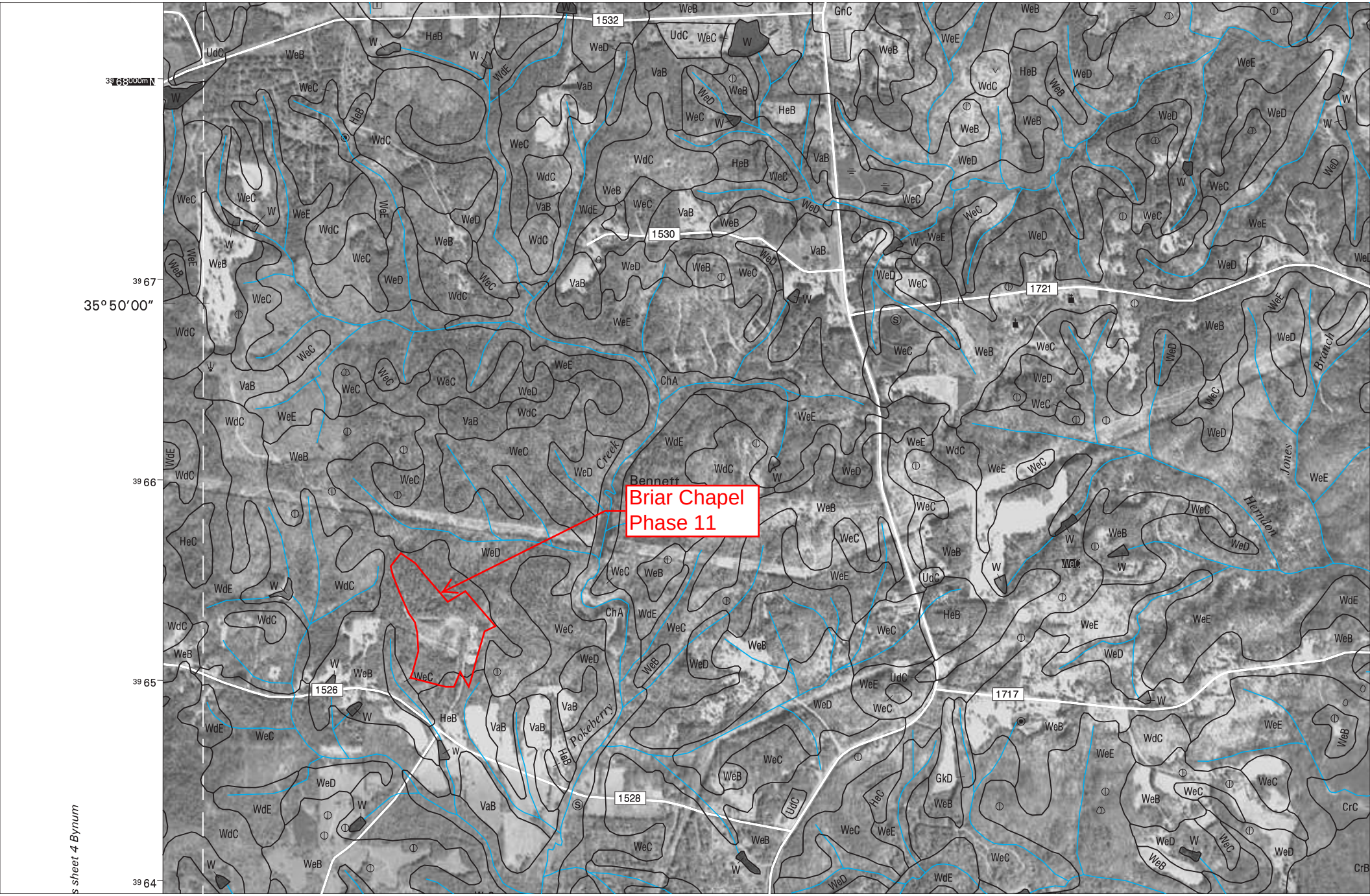
* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

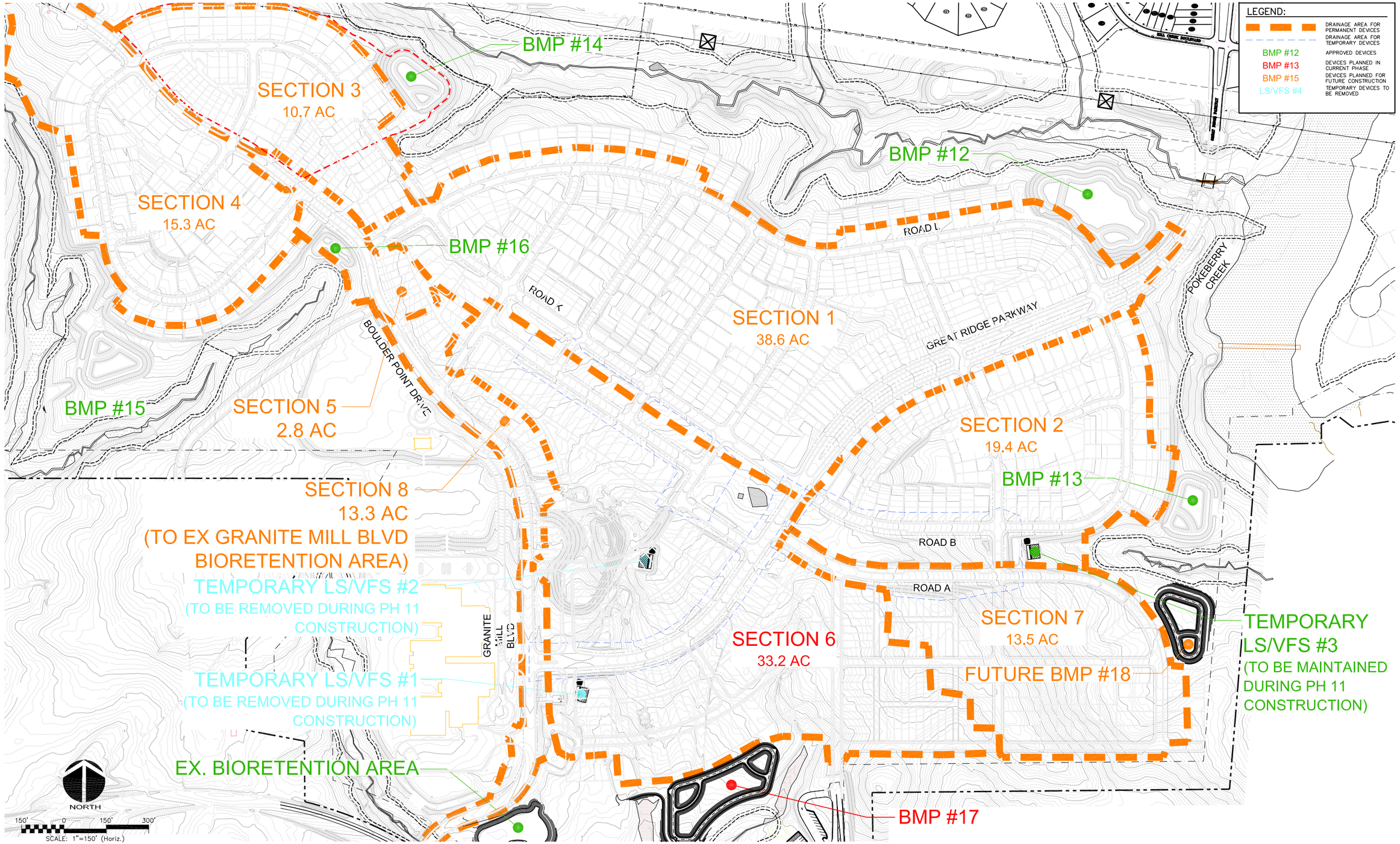
* Lower bound of the 90% confidence interval Precipitation Frequency Estimates (inches)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day

MAPS


Briar Chapel
Phase 11
Bennett Mtn
Endor Dr
Tobacco Farm Way
Dark Forest Dr
Bennett Ridge Rd
Bennett Mountain Trce
Creeks Edge
Fallen Log
Harlow Brae
Rock Ridge Rd
Woodland Grove Ln
Catullo Run
BM
484
© 2012 Google
1993
35°49'24.19" N 79°06'47.64" W elev 475 ft


Briar Chapel
Phase 11
1532
1530
1721
1526
1528
1717
Bennett
Creek
Pokeberry
Jones
Branch
Herndon
39 68 000m N
39 67
35° 50′ 00″
39 66
39 65
39 64
s sheet 4 Bynum



REV.NO.	DESCRIPTIONS	DATE
	REVISIONS	
4	SUBMITTAL TO DWQ 401 UNIT FOR PHASE 11 PROJECT	2014.06.30
3	SUBMITTAL TO DWQ 401 UNIT FOR PHASE 8 PROJECT	2013.05.21
2	SUBMITTAL TO DWQ 401 UNIT FOR PHASE 7 PROJECT	2013.01.24
1	SUBMITTAL TO DWQ 401 UNIT FOR GREAT RIDGE PARKWAY EXTENSION PROJECT	2012.12.19

SEAL

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Raleigh, North Carolina 27606
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F-1222

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BRIAR CHAPEL™
by Newland COMMUNITIES

BRIAR CHAPEL
GREAT RIDGE PARKWAY EXTENSION
CHATHAM COUNTY, NORTH CAROLINA

BC SOUTH DRAINAGE AREA MAP

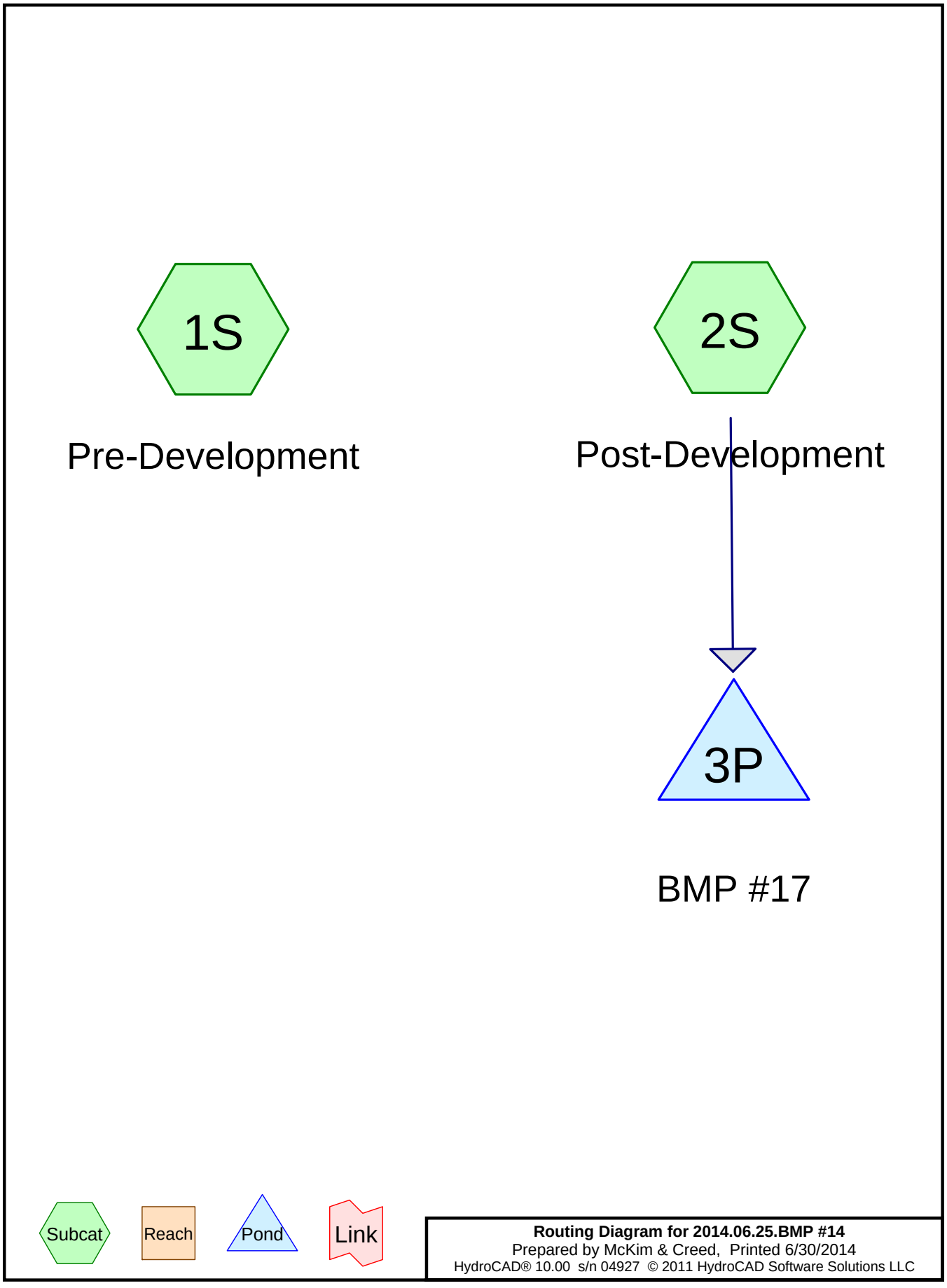
DATE:	DECEMBER 19, 2012
MCE PROJ. #	02735-0080
DRAWN	GCA
DESIGNED	GCA
CHECKED	CHS
PROJ. MGR.	CHS

SCALE
HORIZONTAL: 1" = 150'
VERTICAL: N/A

M&C FILE NUMBER: DA MAP
DRAWING NUMBER: MAP 1

STATUS: FOR PERMIT ONLY
REVISION: 4

Wet Detention Pond
#17 Design



Routing Diagram for 2014.06.25.BMP #14
Prepared by McKim & Creed, Printed 6/30/2014

Summary for Subcatchment 1S: Pre-Development

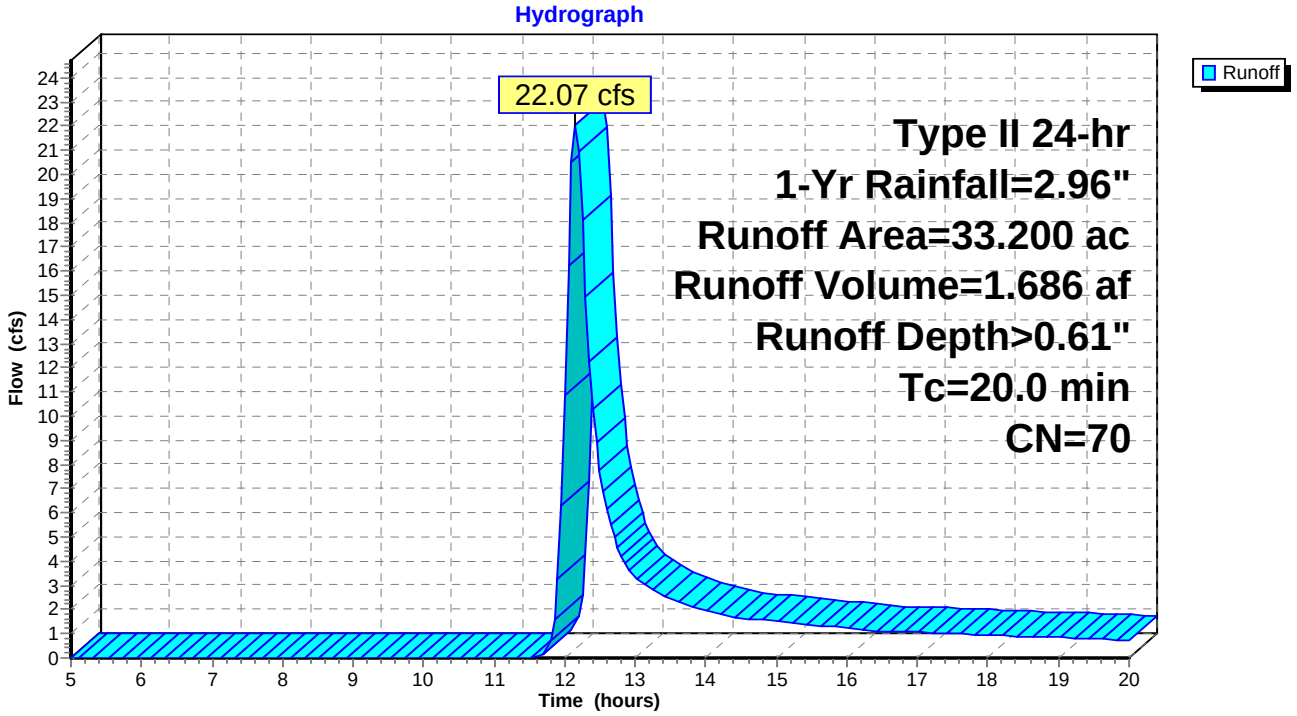
Runoff = 22.07 cfs @ 12.15 hrs, Volume= 1.686 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Yr Rainfall=2.96"

Area (ac)	CN	Description
33.200	70	Woods, Good, HSG C
33.200		100.00% Pervious Area

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

Subcatchment 1S: Pre-Development



Summary for Pond 3P: BMP #17

Inflow Area = 33.200 ac, 66.75% Impervious, Inflow Depth > 1.81" for 1-Yr event
Inflow = 96.19 cfs @ 12.01 hrs, Volume= 5.016 af
Outflow = 18.28 cfs @ 12.29 hrs, Volume= 2.933 af, Atten= 81%, Lag= 16.5 min
Primary = 18.28 cfs @ 12.29 hrs, Volume= 2.933 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 433.54' @ 12.29 hrs Surf.Area= 63,107 sf Storage= 120,610 cf

Plug-Flow detention time= 158.2 min calculated for 2.933 af (58% of inflow)
Center-of-Mass det. time= 84.9 min (857.6 - 772.7)

Volume	Invert	Avail.Storage	Storage Description
#1	431.50'	359,973 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

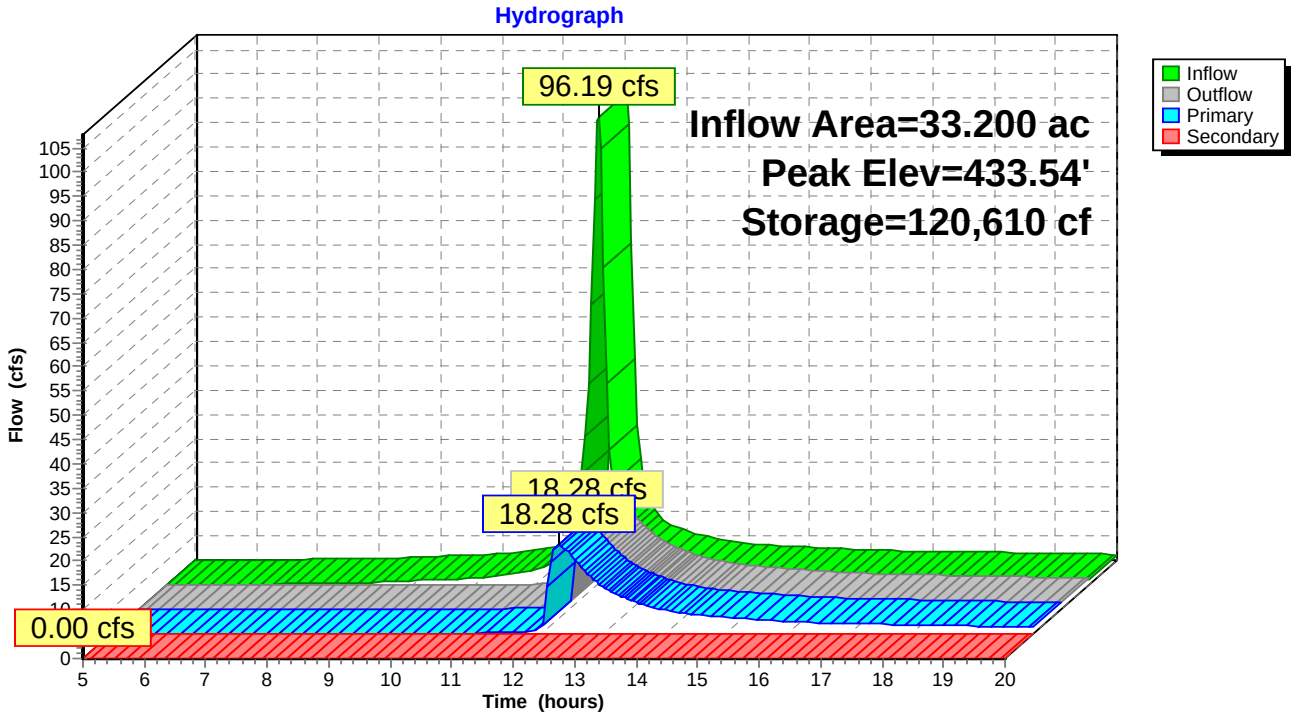
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.50	52,455	0	0
432.00	57,920	27,594	27,594
433.00	61,274	59,597	87,191
434.00	64,686	62,980	150,171
435.00	68,153	66,420	216,590
436.00	71,677	69,915	286,505
437.00	75,258	73,468	359,973

Device	Routing	Invert	Outlet Devices
#1	Primary	429.25'	**36.0" Round Culvert** L= 43.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 429.25' / 429.00' S= 0.0058 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf
#2	Device 1	431.50'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	433.00'	**54.0" x 54.0" Horiz. Orifice/Grate X 0.75** C= 0.600 Limited to weir flow at low heads
#4	Secondary	435.00'	**40.0' long x 22.0' 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=18.24 cfs @ 12.29 hrs HW=433.54' (Free Discharge)
└**1=Culvert** (Passes 18.24 cfs of 52.23 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.89 cfs @ 6.51 fps)
└**3=Orifice/Grate** (Weir Controls 17.35 cfs @ 1.80 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=431.50' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: BMP #17



Summary for Subcatchment 1S: Pre-Development

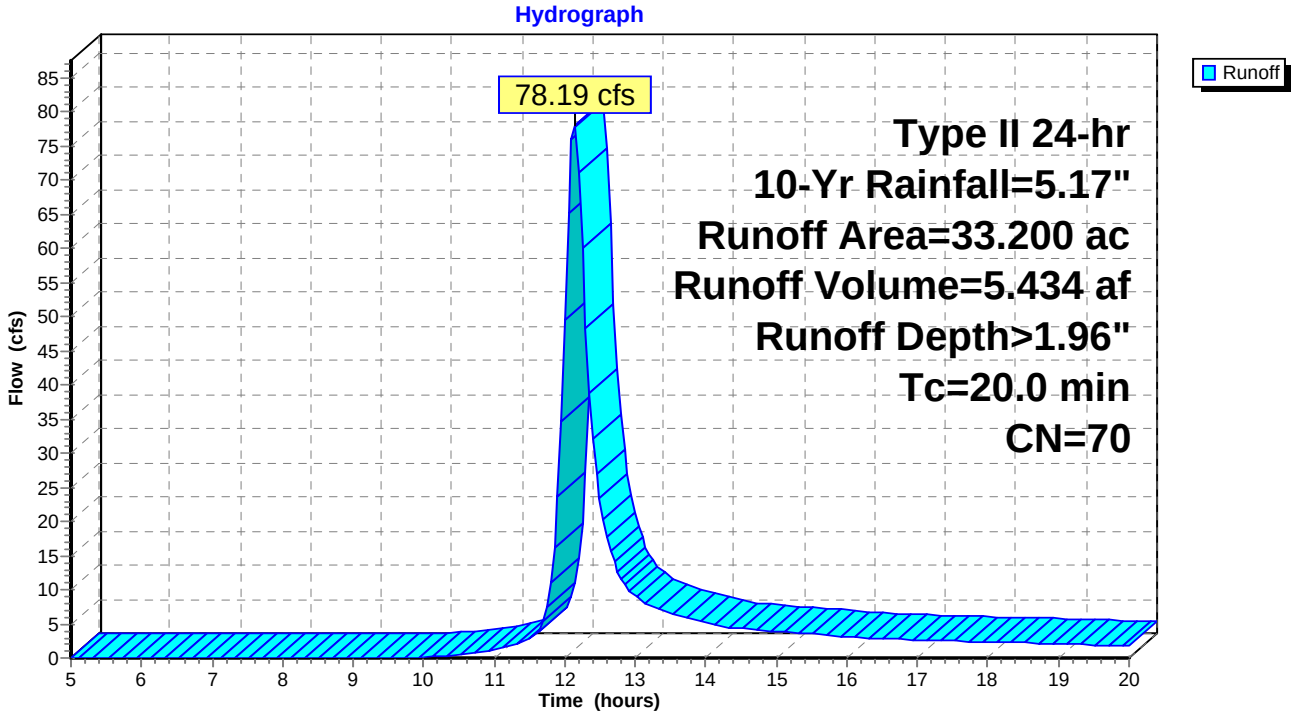
Runoff = 78.19 cfs @ 12.14 hrs, Volume= 5.434 af, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Yr Rainfall=5.17"

Area (ac)	CN	Description
33.200	70	Woods, Good, HSG C
33.200		100.00% Pervious Area

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

Subcatchment 1S: Pre-Development



Summary for Pond 3P: BMP #17

[82] Warning: Early inflow requires earlier time span

Inflow Area = 33.200 ac, 66.75% Impervious, Inflow Depth > 3.79" for 10-Yr event
Inflow = 192.38 cfs @ 12.01 hrs, Volume= 10.474 af
Outflow = 69.64 cfs @ 12.17 hrs, Volume= 8.311 af, Atten= 64%, Lag= 9.8 min
Primary = 69.64 cfs @ 12.17 hrs, Volume= 8.311 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 434.94' @ 12.17 hrs Surf.Area= 67,931 sf Storage= 212,235 cf

Plug-Flow detention time= 111.5 min calculated for 8.310 af (79% of inflow)
Center-of-Mass det. time= 56.5 min (812.7 - 756.1)

Volume	Invert	Avail.Storage	Storage Description
#1	431.50'	359,973 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

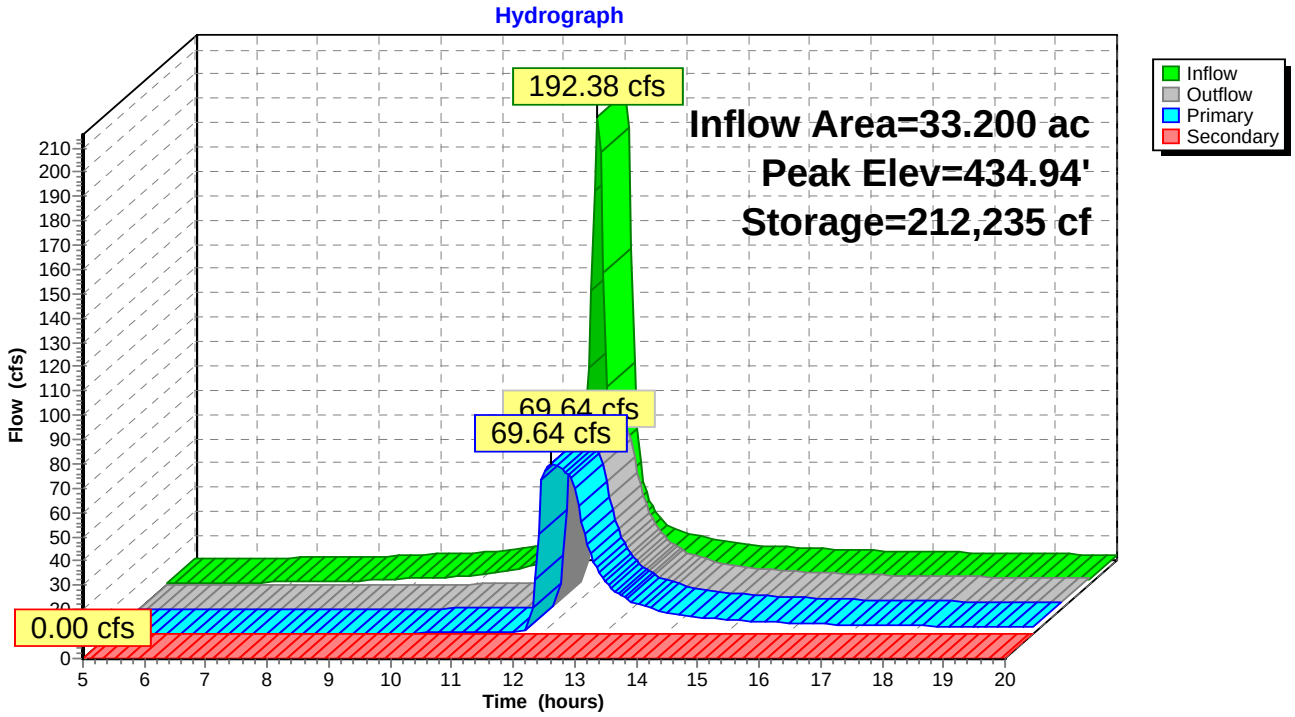
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.50	52,455	0	0
432.00	57,920	27,594	27,594
433.00	61,274	59,597	87,191
434.00	64,686	62,980	150,171
435.00	68,153	66,420	216,590
436.00	71,677	69,915	286,505
437.00	75,258	73,468	359,973

Device	Routing	Invert	Outlet Devices
#1	Primary	429.25'	**36.0" Round Culvert** L= 43.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 429.25' / 429.00' S= 0.0058 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf
#2	Device 1	431.50'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	433.00'	**54.0" x 54.0" Horiz. Orifice/Grate X 0.75** C= 0.600 Limited to weir flow at low heads
#4	Secondary	435.00'	**40.0' long x 22.0' 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=69.53 cfs @ 12.17 hrs HW=434.92' (Free Discharge)
└**1=Culvert** (Inlet Controls 69.53 cfs @ 9.84 fps)
  ├**2=Orifice/Grate** (Passes < 1.18 cfs potential flow)
  └**3=Orifice/Grate** (Passes < 101.43 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=431.50' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: BMP #17



Summary for Pond 3P: BMP #17

[82] Warning: Early inflow requires earlier time span

Inflow Area = 33.200 ac, 66.75% Impervious, Inflow Depth > 6.02" for 100-Yr event
Inflow = 297.75 cfs @ 12.01 hrs, Volume= 16.651 af
Outflow = 177.46 cfs @ 12.12 hrs, Volume= 14.419 af, Atten= 40%, Lag= 6.6 min
Primary = 77.73 cfs @ 12.12 hrs, Volume= 12.470 af
Secondary = 99.73 cfs @ 12.12 hrs, Volume= 1.949 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 435.97' @ 12.12 hrs Surf.Area= 71,556 sf Storage= 284,050 cf

Plug-Flow detention time= 93.0 min calculated for 14.416 af (87% of inflow)
Center-of-Mass det. time= 50.3 min (797.9 - 747.6)

Volume	Invert	Avail.Storage	Storage Description
#1	431.50'	359,973 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

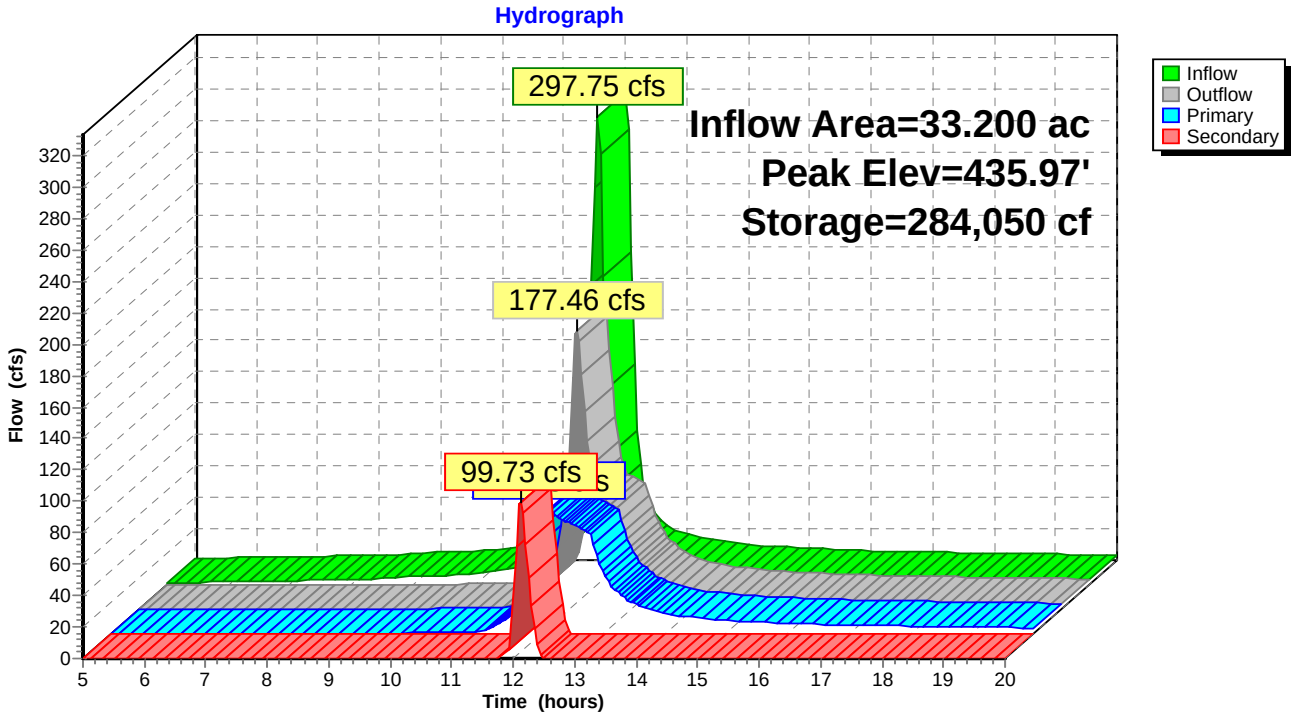
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.50	52,455	0	0
432.00	57,920	27,594	27,594
433.00	61,274	59,597	87,191
434.00	64,686	62,980	150,171
435.00	68,153	66,420	216,590
436.00	71,677	69,915	286,505
437.00	75,258	73,468	359,973

Device	Routing	Invert	Outlet Devices
#1	Primary	429.25'	**36.0" Round Culvert** L= 43.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 429.25' / 429.00' S= 0.0058 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf
#2	Device 1	431.50'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	433.00'	**54.0" x 54.0" Horiz. Orifice/Grate X 0.75** C= 0.600 Limited to weir flow at low heads
#4	Secondary	435.00'	**40.0' long x 22.0' 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=77.54 cfs @ 12.12 hrs HW=435.94' (Free Discharge)
└**1=Culvert** (Inlet Controls 77.54 cfs @ 10.97 fps)
  ├**2=Orifice/Grate** (Passes < 1.35 cfs potential flow)
  └**3=Orifice/Grate** (Passes < 125.40 cfs potential flow)

Secondary OutFlow Max=96.10 cfs @ 12.12 hrs HW=435.94' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Weir Controls 96.10 cfs @ 2.55 fps)

Pond 3P: BMP #17



WATER QUALITY POND #17 CALCULATIONS

Project Name

Briar Chapel - Phase 11

Project Number

02735-0109

Date

June 25, 2014

3rd revision

2nd revision

1st revision

Water Quality Pond Drainage Area Data

Project: Briar Chapel - Phase 11
Project No.: 02735-0109

Date: June 25, 2014

Total site area: 1,446,191 square feet = 33.20 acres

	Drainage area to pond			Other Drainage Area	
Impervious areas	Existing [sf]	Proposed [sf]	Change [sf]	Existing [sf]	Proposed [sf]
On-site buildings (BUA)	0	403,975	403,975	0	0
On-site streets	0	191,047	191,047	0	0
On-site alleys	0	78,439	78,439	0	0
On-site sidewalks	0	45,227	45,227	0	0
On-site future (open space)	0	30,000	30,000	0	0
Off-site future development	0	178,953	178,953	0	0
5% Contingency	0	37,434	37,434	0	0
Total Impervious	0	965,075	965,075	0	0

	Drainage area to pond			Other Drainage Area	
Non-impervious areas	Existing [sf]	Proposed [sf]	Change [sf]	Existing [sf]	Proposed [sf]
On-site grass/landscape	0	469,691	469,691	0	0
On-site woods	1,446,171	11,425	-1,434,746	0	0
Other undeveloped	0	0	0	0	0
Total off-site non-impervious	0	0	0	0	0
Total non-impervious	1,446,171	481,116	-965,055	0	0

Total Drainage Area	1,446,191	1,446,191	0	3,167,850	3,167,850
Percent Impervious	0.0	66.7	66.7	0.0	0.0

Notes:

Water Quality Pond Surface Area Calculations

Project: Briar Chapel - Phase 11
Project No.: 02735-0109

Date: June 25, 2014

Total on-site drainage area to pond	1,446,191	square feet
Total impervious area in drainage area	965,075	square feet

Average water depth of basin at normal pool: 3.5 feet

Location of site: Chatham County
Site region: Piedmont

% Impervious cover: 66.7 percent

If the site is in a coastal area, will a vegetative filter be used? n/a

Surface Area/Drainage Area Ratios:

For a site in the Piedmont (85%)	2.5	percent
For a site in the Piedmont (90%)	3.5	percent
For a site in a Coastal County w/ Vegetative Filter	5.0	percent
For a site in a Coastal County w/out Vegetative Filter	6.8	percent

Required surface area of pond:

For a site in the Piedmont (85%)	36,180.0	square feet
For a site in the Piedmont (90%)	50,430.0	square feet
For a site in a Coastal County w/ Vegetative Filter	71,910.0	square feet
For a site in a Coastal County w/out Vegetative Filter	97,710.0	square feet

Notes:

Water Quality Pond Stormwater Runoff Volume Calculations

Project	Briar Chapel - Phase 11	
Project No.	02735-0109	
Date	June 25, 2014	
Drainage area	1,446,191	square feet
Impervious area	965,075	square feet
Rainfall depth	1.00	inches
Percent Impervious	66.7	percent

R(v)=0.05+0.009*(Percent impervious)

Runoff coefficient - R(v)	0.65	in/in

Runoff volume=(Design rainfall)*(R(v))*(Drainage area)

Runoff volume	78,406.5	cubic feet

Notes:

Water Quality Pond Volume Calculations
Stage-Storage Data for Pond - Temporary Pool

Project: Briar Chapel - Phase 11
Project No.: 02735-0109

Date: June 25, 2014

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
431.5	0	52,455.0	1.204	52,455.0	1.2	0.0	0.0	0.0	0.0
432	0.5	57,920.0	1.330	57,920.0	0.1	27,593.8	0.6	27,593.8	0.6
433	1.5	61,274.0	1.407	61,274.0	0.1	59,597.0	1.4	87,190.8	2.0
434	2.5	64,686.0	1.485	64,686.0	0.1	62,980.0	1.4	150,170.8	2.8
435	3.5	68,153.0	1.565	68,153.0	0.1	66,419.5	1.5	216,590.3	3.0
436	4.5	71,677.0	1.645	71,677.0	0.1	69,915.0	1.6	286,505.3	3.1
437	5.5	75,258.0	1.728	75,258.0	0.1	73,467.5	1.7	359,972.8	3.3

Water Quality Pond Volume Calculations
Stage-Storage Data for Pond - Permanent Pool

Project: Briar Chapel - Phase 11
Project No.: 02735-0109

Date: June 25, 2014

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
426	0	25,198.0	0.578	25,198.0	0.6	0.0	0.0	0.0	0.0
427	1	28,910.0	0.664	3,712.0	0.1	27,054.0	0.6	27,054.0	0.6
428	2	32,814.0	0.753	3,904.0	0.1	30,862.0	0.7	57,916.0	1.3
429	3	36,846.0	0.846	4,032.0	0.1	34,830.0	0.8	92,746.0	1.5
430	4	41,047.0	0.942	4,201.0	0.1	38,946.5	0.9	131,692.5	1.7
431	5	45,419.0	1.043	4,372.0	0.1	43,233.0	1.0	174,925.5	1.9
431.5	5.5	52,455.0	1.204	7,036.0	0.2	24,468.5	0.6	199,394.0	1.6

Water Quality Pond Volume Calculations
Stage-Storage Data for Pond - Forebays

Project: Briar Chapel - Phase 11
Project No.: 02735-0109

Date: June 25, 2014

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
426	0	4,067.0	0.093	4,067.0	0.1	0.0	0.0	0.0	0.0
427	1	5,281.0	0.121	1,214.0	0.0	4,674.0	0.1	4,674.0	0.1
428	2	6,630.0	0.152	1,349.0	0.0	5,955.5	0.1	10,629.5	0.2
429	3	8,051.0	0.185	1,421.0	0.0	7,340.5	0.2	17,970.0	0.3
430	4	9,585.0	0.220	1,534.0	0.0	8,818.0	0.2	26,788.0	0.4
431	5	11,232.0	0.258	1,647.0	0.0	10,408.5	0.2	37,196.5	0.4
431.5	5.5	13,994.0	0.321	2,762.0	0.1	6,306.5	0.1	43,503.0	0.4

Water Quality Basin Dewatering Time Calculations

Project Briar Chapel - Phase 11
Project No. 02735-0109

Date June 25, 2014

Water quality treatment volume	78,407	cubic feet
Total treatment volume	87,190	cubic feet
Maximum head of water above dewatering hole	1.40	feet
Driving head	0.46	feet
Orifice coefficient	0.60	
Diameter of each hole	5.00	inches
Number of holes	1	
Cross sectional area of each hole =	0.136	square feet
Cross sectional area of each hole =	19.6	square inches
Cross sectional area of dewatering hole(s) =	0.136	square feet
Cross sectional area of dewatering hole(s) =	19.6	square inches
Dewatering time for water quality volume =	2.0	days
Dewatering time for total volume =	2.3	days

Notes:
Dewatering time formula: t (days) = V / (Cd*A*Sqrt (2*32.2*H)*86,400)

t = drawdown time
V = treatment volume
Cd = orifice coefficient
A = cross sectional area of orifice
H = driving head (1/3 max. head)

Water Quality Pond Summary Information

Project Briar Chapel - Phase 11
Project No. 02735-0109

Date June 25, 2014

Drainage area to pond 1,446,191 square feet = 33.20 acres
Impervious area in drainage area 965,075 square feet = 22.16 acres

Bottom of pond elevation 426.00 feet
Normal pool elevation 431.50 feet
Pond volume at normal pool 199,394 cubic feet

Required volume for design rainfall 78,406 cubic feet
Required surface area for pond 50,430 square feet

Volume provided for storage of design rainfall = 81,079 cubic feet at elevation 432.9

Surface area provided at normal pool 52,455 square feet

ANTI-FLOATATION DESIGN	DATE: 6/25/2014	DESIGNED BY: GCA
PROJECT NAME: Briar Chapel Phase 11 PROJECT LOCATION: Chatham County, NC	PROJECT NO: 02735-0109	CHECKED BY: GML

Pond Name=	BMP #17				
Riser Outer Width =	5.5	ft	Riser Resisting Force =	6,375	lb
Riser Outer Length =	5.5	ft	Base Resisting Force =	10,547	lb
Riser Inner Width =	4.5	ft	Total Resisting Force =	16,922	lb
Riser Inner Length =	4.5	ft			
Riser Height =	4.25	ft	Riser Buoyant Force =	8,022	lb
			Base Buoyant Force =	4,388	lb
Concrete Base Length =	7.5	ft	Total Buoyant Force =	12,410	lb
Concrete Base Width =	7.5	ft			
Concrete Base Depth =	15	in	Factor of Safety	1.36	**Design Acceptable**

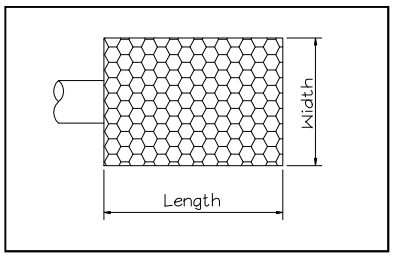
OUTLET PROTECTION DESIGN	DATE: 06/25/2014	DESIGNED BY: GCA
PROJECT NAME: Briar Chapel - Phase 11 PROJECT LOCATION: Chatham County, NC	PROJECT NO: 02735-0109	CHECKED BY GML

Storm Outlet Structure

Structure=	BMP #17 Out		Q_{10}/Q_{full} =	1.37	
Size=	36	in	V/Vfull =	1.37	
Q_{10} =	69.24	cfs	V =	9.8	fps
Qfull =	50.71	cfs			
Vfull =	7.17	fps			

From Fig. 8.06.b.1: Zone = 3

From Fig. 8.06.b.2:



D_{50}	=	10	in
D_{MAX}	=	15	in
Riprap Class	=	1	
Apron Thickness	=	24	in
Apron Length	=	24.0	ft
Apron Width = 3 x Dia	=	9.0	ft