CITY OF WILMINGTON
NORTH CAROLINA

**Development Services**
Planning
305 Chestnut Street
PO Box 1810
Wilmington, NC 28402-1810

910 254-0900
910 341-3264 fax
wilmingtonnc.gov
Dial 711 TTY/Voice

October 11, 2016

Jeff Malpass
Malpass Engineering
1134 Shipyard Boulevard
Wilmington, NC 28412

RE: **Arbor Trace Apartments** (fka Echo Farms Apartments), located at 4010 Carolina Beach Road

Please make note of the conditions for the release as they appear on the attached release letter. These conditions must be followed and met in order for the construction to be approved. ***Prior to beginning any construction or grading on the site, you must have a pre-construction meeting between City staff and the project's representatives. Any violation of this condition will result in an immediate stop work order and other civil penalties. Please contact our zoning office at 254-0900 to schedule the preconstruction meeting.***

All construction on the site must be in accordance with the City of Wilmington standards and the approved construction plans stamped by the City. All trees and areas designated to be saved or protected must be properly barricaded and/or marked throughout construction. In addition please be aware that to obtain a final zoning inspection for this construction project, the appropriate departments within the City of Wilmington must perform and approve final inspections.

To arrange for inspections please contact the assigned Zoning Enforcement Officer, at 254-0900. Staff will coordinate the inspections and provide a punch-list to the Developer within 5 working days. Upon correction of the punch-list items, a final inspection will be performed. ***NOTE: Zoning will not issue final approval until all requirements of the City of Wilmington are fulfilled.***

Please also be advised that any party aggrieved by the issuance of this approval may file a notice of appeal to the City Clerk within 30 days of receipt of active or constructive notice of this decision. It shall be presumed that all persons with standing to appeal have constructive notice of the decision from the date a sign containing the words "Zoning Decision" or "Subdivision Decision" in letters at least six inches high and identifying the means to contact an official for information about the decision is prominently posted on the property that is the subject of the decision, provided the sign remains on the property for at least 10 days. Posting of signs is not the only form of constructive notice. Any such posting shall be the responsibility of the landowner or applicant. Verification of the posting shall be provided to the official who made the decision. Absent an ordinance provision to the contrary, posting of signs shall not be required.

The City thanks you for your investment in our community and we look forward to working with you towards the construction of a quality development project.

Sincerely,

Brian Chambers
Associate Planner

CITY OF WILMINGTON
NORTH CAROLINA

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28402-1810

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# TRANSMITTAL LETTER

TO: John Barham, Zoning Inspector
DATE: October 11, 2016
SUBJECT: **Arbor Trace Apartments** (fka Echo Farms Apartments) Project # 2015053
LOCATION: 4010 Carolina Beach Road

**REVISION 1**

The following items are being sent to you via this package.

| QUAN. | DWG./NO. | DESCRIPTION |
|---|---|---|
| 1 | Dated 9/9/16 | Arbor Trace Apartments Approved Plans |
| 1 | Dated 11/24/15 | City Tree Removal Permit TPP-16-78 |
| 1 | Dated 11/24/15 | NHC Erosion Control #GP 38-15 Revision 1 |
| 1 | Dated 11/18/15 | USACOE Wetland Determination |
| 1 | Dated 3/3/16 | City of Wilmington Stormwater Management Permit # SWP2016010 |

REMARKS: **Arbor Trace Apartments** (fka Echo Farms Apartments), located at **4010 Carolina Beach Road**, is hereby conditionally released construction. The following conditions must be satisfied as part of this release:

A. **A PRE-CONSTRUCTION MEETING MUST BE HELD BETWEEN THE SITE CONTRACTOR AND CITY STAFF PRIOR TO ANY SITE WORK, TREE REMOVAL, CLEARING, OR GRADING BEGINNING ON THE SITE. FAILURE TO COMPLY WILL RESULT IN IMMEDIATE CIVIL PENALTIES. CONTACT 910-254-0900.**

B. **ANY TREES, INCLUDING THE CRITICAL ROOT ZONE AREA, AND/OR AREA DESIGNATED TO BE SAVED MUST BE PROPERLY BARRICADED OR MARKED WITH FENCING AND PROTECTED THROUGHOUT CONSTRUCTION TO INSURE THAT NO CLEARING AND GRADING WILL OCCUR IN THOSE AREAS.**

C. **NO EQUIPMENT IS ALLOWED ON THE SITE AND NO CONSTRUCTION OF ANY BUILDING, STRUCTURE, WALL, UTILITIES, INFRASTRUCTURE, ETC., OF ANY KIND, INCLUDING FOOTINGS AND BUILDING SLABS, WILL BE PERMITTED UNTIL:**

1. **ALL TREE PROTECTION FENCING AND SILT FENCING HAS BEEN INSTALLED**
2. **BETH WETHERILL HAS FORMALLY ISSUED THE GRADING PERMIT AND AUTHORIZED THE ACTIVITY**
3. **THE CFPUA HAS AUTHORIZED THE WATER AND SEWER ACTIVITIES. THE CONTRACTOR MUST HAVE A PRECON WITH CFPUA 332-6560.**
4. **THE CITY ZONING INSPECTOR AUTHORIZES THE ACTIVITY.**

REVISION 1

D. ALL IMPROVEMENTS, AS RECOMMENDED BY THE SUBMITTED AND APPROVED TRAFFIC IMPACT ANALYSIS (TIA) SHALL BE INSTALLED AND INSPECTED PRIOR TO THE ISSUANCE OF THE FINAL ZONING APPROVAL.

E. A COPY OF THE RECORDED MAP SHOWING ANY REQUIRED EASEMENTS AND RIGHT-OF-WAY FOR THE PROJECT MUST BE SUBMITTED PRIOR TO ISSUANCE OF THE FINAL ZONING APPROVAL. THE RECORDED MAP SHALL INCLUDE A PRIVATE RIGHT-OF-WAY THAT SATIFIES THE REQUIREMENT THAT ALL PORTIONS OF EVERY RESIDENTIAL BUILDING BE LOCATED WITHIN 500 FEET OF A PRIVATE STREET.

F. THIS DEVELOPMENT SHALL COMPLY WITH ALL LOCAL, CITY TECHNICAL STANDARDS, REGIONAL, STATE AND FEDERAL DEVELOPMENT REGULATIONS.

G. ALL APPLICABLE TRC REQUIREMENTS SHALL BE COMPLETED PRIOR TO ISSUANCE OF THE FINAL ZONING APPROVAL.

H. IF THE CONDITIONS LISTED ABOVE ARE VIOLATED, A STOP WORK ORDER WILL BE ISSUED.

I. PER THE REQUIREMENTS OF THE STORMWATER PERMIT, THE FOLLOWING SHALL OCCUR PRIOR TO ISSUANCE OF A CERTIFICATE OF OCCUPANCY OR OPERATION OF THE PERMITTED FACILITY:
   - AS-BUILT DRAWINGS FOR ALL STORMWATER MANAGEMENT FACILITIES SHALL BE SUBMITTED TO THE CITY OF WILMINGTON ENGINEERING DIVISION.
   - AN ENGINEER'S CERTIFICATION SHALL ALSO BE SUBMITTED, ALONG WITH ALL SUPPORTING DOCUMENTATION THAT SPECIFIES, UNDER SEAL THAT THE AS-BUILT STORMWATER MEASURES, CONTROLS AND DEVICES ARE IN COMPLIANCE WITH THE APPROVED STORMWATER MANAGEMENT PLANS.
   - A FINAL INSPECTION BY CITY OF WILMINGTON ENGINEERING PERSONNEL.

J. THE APPLICANT SHALL SATISFY THE REQUIREMENT THAT SIDEWALK BE PROVIDED ON ECHO FARMS BOULEVARD EQUAL TO THE AMOUNT REQUIRED ALONG THE CAROLINA BEACH ROAD FRONTAGE, BASED ON AN APPROVED COST ESTIMATE, PRIOR TO ISSUANCE OF A CERTIFICATE OF OCCUPANCY FOR THE FACILITY.

K. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION (NCDOT) RIGHT-OF-WAY UNTIL ALL NCDOT PERMITS HAVE BEEN ISSUED AND RECEIVED BY THE CITY. ALL IMPROVEMENTS REQUIRED SHALL BE INSTALLED AND APPROVED BY NCDOT PRIOR TO ISSUANCE OF A CERTIFICATE OF OCCUPANCY.

L. PROPERTIES WITHIN THE SPECIAL FLOOD HAZARD AREA SHALL BE SUBJECT TO COMPLIANCE WITH ARTICLE 13 OF THE LAND DEVELOPMENT CODE. PLEASE CONTACT KATHRYN THURSTON, ZONING ADMINISTRATOR/FLOODPLAIN MANAGER (910.341.3249) FOR CLARIFICATION ON REQUIREMENTS FOR DEVELOPMENT IN THE FLOOD PLAIN.

M. THE DEVELOPER ASSUMES ALL RISKS AND PENALTIES WITH ANY DELAY OR STOP WORK ORDER ASSOCIATED WITH THE VIOLATION OF THIS RELEASE. THE DEVELOPER ACKNOWLEDGES THE CONDITIONS OF THIS RELEASE AND ASSUMES ALL RESPONSIBILITIES AND RISKS ASSOCIATED WITH IT. THE CITY

**REVISION 1**

**OF WILMINGTON WILL NOT BE HELD LIABLE FOR ANY COSTS ASSOCIATED WITH THE CONSTRUCTION RELEASE.**

**N. APPROVAL OF A MAJOR OR MINOR SITE PLAN SHALL EXPIRE AFTER EIGHTEEN (18) MONTHS FROM THE DATE OF SUCH APPROVAL IF THE APPLICANT HAS FAILED TO MAKE SUBSTANTIAL PROGRESS ON THE SITE. THE TECHNICAL REVIEW COMMITTEE MAY GRANT A SINGLE, SIX-MONTH EXTENSION OF THIS TIME LIMIT FOR MAJOR AND MINOR SITE PLANS, FOR GOOD CAUSE SHOWN, UPON RECEIVING A REQUEST FROM THE APPLICANT BEFORE THE EXPIRATION OF THE APPROVED PLAN. IN THE EVENT APPROVAL OF A SITE PLAN HAS EXPIRED, FOR WHATEVER REASONS, THE OWNER AND/OR APPLICANT WILL BE REQUIRED TO RESUBMIT FOR APPROVAL OF A SITE PLAN THAT MEETS CURRENT DEVELOPMENT STANDARDS UNLESS OTHERWISE NOTED IN THIS CHAPTER.**

Please notify New Hanover County Building Inspections of this release.

Signature: _____

Brian Chambers, Associate Planner

| | | |
|---|---|---|
| Copy: | Jeff Malpass | Malpass Engineering (e-mail only) |
| | Bret Russell | Construction Manager |
| | Rob Gordon | Engineering |
| | Jim Quinn | Stormwater Specialist |
| | Aaron Reese | Urban Forestry |
| | Chris Elrod | Wilmington Fire Department (e-mail only) |
| | Sammy Flowers | Wilmington Fire Department (e-mail only) |
| | Brian Blackmon | Surveyor (e-mail only) |
| | Jim Sahlie | GIS Addressing (e-mail only) |
| | Bill McDow | Traffic Engineering (e-mail only) |
| | Don Bennett | Traffic Engineering (e-mail only) |
| | Bernice Johnson | CFPUA (e-mail letter only) |
| | Beth Easley Wetherill | NHC Erosion Control (e-mail only) |
| | Michelle Hutchinson | GIS Engineer (e-mail only) |
| | Alina Jakubcanin | GIS Analyst (e-mail only) |
| | Genna Porter | Engineering (e-mail only) |
| | Amy Beaty | Community Services (e-mail only) |
| | Ryan O'Reilly | Community Services (e-mail only) |
| | Steve Harrell | Community Services (e-mail only) |
| File: | **Arbor Trace Apartments** (fka Echo Farms Apartments) | **Project File # 2015053** |

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Dial 711 TTY/Voice

**APPROVED:** X **DENIED:** ____ **PERMIT #:** TPP-16-78

## Application for Tree Removal Permit

**Name of Applicant:** Echo Farm Apartments **Phone:** 910-251-5030 **Date:** 1/15

**Name of Property Owner:** Echo Farm Apartments **Phone:** 910-251-5030

**Property Owner Address:** 10 S. Cardinal Dr., Wilmington, NC 28403

**Address of Proposed Tree Removal:** 4010 Carolina Beach Rd

**Description of tree(s) to be removed/reason for removal: (provide attachment if necessary)**

1. See Sheet 2 of plan
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____

Revised 10/11/16
48" Pine Removed
See LP

**Description of Replacement Tree(s):** 9 Common Persimmon trees, 166 Yaupon Holly trees, + 83 Longleaf Pine plugs

**Applicant Signature:** [signature] **Date:** 11-18-2015

**********FOR OFFICIAL USE ONLY**********

**Reviewed By:** [signature] **Date:** 11/24/15

**Remarks:** TREES REMOVED FOR ESSENTIAL SITE IMPROVEMENTS. SEE LANDSCAPE PLAN FOR APPROVED TREE MITIGATION

**ALL WORK MUST BE IN COMPLIANCE WITH THE CITY LAND DEVELOPMENT CODE, ARTICLE 8, LANDSCAPING AND TREE PRESERVATION.**

**NEW CONSTRUCTION:**____ **EXPANSION:**____ **OTHER:**____ **PAID:** $150.00 11/20/15

**Tree Preservation Permit Fees**

| | |
|---|---|
| Less than 1 acre | $25.00 |
| 1-5 acres | $50.00 |
| 5-10 acres | $100.00 |
| Greater than 10 acres | $150.00 |

RECEIVED
NOV 20 2015
PLANNING DIVISION

# NEW HANOVER COUNTY

**Engineering Department**
**230 Government Center Drive · Suite 160**
**Wilmington, North Carolina 28403**
**TELEPHONE (910)-798-7139**
**Fax (910) 798-7051**

**Beth E. Wetherill, C.P.E.S.C.**
*Soil Erosion Specialist*

November 24, 2015

Echo Farm Apartments, LLC
10 Cardinal Drive,
Wilmington, North Carolina 28403

**RE: Grading Permit # 38-15 Revision #1, Echo Farms Apartments**

Dear Mr. Mathew Maynard:

This office has reviewed the revised subject sedimentation and erosion control plan. We find the plan to be acceptable.

***Please read the permit conditions carefully and return the signed blue original to our office and keep the copy for your records.***

**A preconstruction meeting is required** prior to any land disturbing activity on site. Please contact us at (910) 798-7139 to set this up with us.

**The land disturbance fee of $3972 is due to be paid to New Hanover County, to my attention, prior to issuance of the Certificate of Occupancy.**

Please be advised that a copy of the approved soil erosion plan, a copy of the grading permit, a rain gauge and the Combined Inspection Reports must be available at all times at the site.

New Hanover County's Erosion and Sedimentation Control Program is performance oriented requiring protection of the natural resources and adjoining properties. If following the commencement of the project, it is determined that the plan is inadequate to meet the requirements of the New Hanover County's Erosion and Sedimentation Control Ordinance, this office may require revisions in the plan and its implementation to insure compliance with the ordinance.

This permit will not preclude any other permits or approvals necessary for beginning or completing this development. It is the owner's responsibility to have all the approvals or permits that are required prior to beginning construction. Approval of an erosion control plan is conditioned on the applicant's compliance with Federal and State Water Quality laws, regulations and rules.

Respectfully yours,

Beth Easley Wetherill

Beth Easley Wetherill
NHC Soil Erosion Specialist

cc: Jeff Malpass PE, Malpass Engineering
Brian Chambers, City of Wilmington Planning

Permit# GP 38-15

# Permit for a Land Disturbing Activity

New Hanover County
Department of Engineering
230 Government Center Drive - Suite 160
Wilmington, North Carolina 28403
(910) 798-7139

**As authorized by the New Hanover County Erosion and Sedimentation Control Ordinance**

This permit issued to **Echo Farms Apartments, LLC** authorizes the development of **9.93 acres** of land at **4010 Carolina Beach Road for Echo Farms Apartments** in New Hanover County. This permit issued on **November 24, 2015** is subject to compliance with the application and site drawings, all applicable regulations and special conditions and notes set forth below. **Any plan modifications must be approved by this office prior to field changes.**

It is understood by the applicant that a representative of New Hanover County's Engineering Department may inspect the site at any time following the issuance of this Permit. A copy of the approved Soil Erosion Control Plan, this permit, a rain gauge and copies of the Combined Self-Monitoring and Self Inspection Reports must be available at all times at the site.

Failure to execute the provisions of this permit and the approved Soil Erosion Plan, or any other provisions of the New Hanover County Soil Erosion and Sedimentation Control Ordinance, shall result in immediate legal action by the County to the limits prescribed by the Ordinance. If the measures outlined on the approved Soil Erosion Control Plan and this Permit prove insufficient, additional Erosion Control measures can and will be required which in turn will be considered provisions of this Permit. This Permit does not preclude any other permits or approvals necessary for beginning or completing this development. Approval of an erosion control plan is conditioned on the applicant's compliance with Federal and State laws, regulations and rules. It is the Permittee's responsibility to obtain all necessary permits and approvals.

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## SPECIAL CONDITIONS

**(THESE CONDITIONS MUST BE FOLLOWED IN ADDITION TO THE PLANS AND SPECIFICATIONS)**

*All the soil erosion control measures will be installed as the site is cleared and maintained throughout construction. These include 4 construction entrances, silt fences, inlet and outlet protection, 4 swales of which Swales 1 & 2 will be sloped 3:1 and all work and installation of excelsior mat must be completed on all disturbed area associated with these swales prior to any rain event, Swales 5 & 6 will be sloped 5;1, immediate construction and stabilization of Wet Pond #1, its slopes and the outlet structure with a 2.5 inch Faircloth Skimmer with a 1.8 inch orifice and installation of the Infiltration Basin after the upstream area has been stabilized per the construction sequence. NOTE: All work and disturbed area in the R/W's and on City of Wilmington property will be completed and will be lined with excelsior mat prior to any rain event and additional silt fence will be required on City of Wilmington property, above driveway pipes and on the south side of the site adjacent to Carolina Beach Road.

*Tree Removal Permits must be acquired from the City of Wilmington and/or New Hanover County prior to issuance of this permit and clearing the site.

*Silt fence stakes must be metal and will be placed **six feet apart without wire reinforcement** or **eight feet apart with wire reinforcement.** Silt fence is **not** allowed as inlet protection.

*This permit does not preclude any permits or approvals which may be necessary such as City of Wilmington or New Hanover County Stormwater, NCDENR Water Quality, C.A.M.A., and the US Army Corps. of Engineers, DEM Solid Waste or any other agencies.

*No sediment shall leave the site.
*If plan revisions are necessary you must submit a copy to this office for approval **prior** to any field changes.
*If soil is removed from the site, it must be taken to an approved or permitted site to be identified to this office **prior** to removal from the site.
*All City and/or County and State drainage and stormwater requirements will be adhered to.
*If these measures fail to adequately control erosion, more restrictive measures will be required.
*If any phase of grading ceases for more than 15 working days, the site will be temporarily stabilized.
*All slopes must be stabilized within 21 calendar days of any phase of activity.
The approval of an erosion control plan is conditioned on the applicant's compliance with Federal and State Water Quality laws, regulations and rules.
***Note the required rates for seed, lime, fertilizer and mulch in your seeding specifications.**
***Note the NPDES information from the State for sites disturbing 1 acre or more and the reporting requirements.** All **NEW** projects permitted after August 3, 2011 must include the following surface water withdrawal locations and stabilization requirement designations on the plan in order to qualify for coverage under the most recent NPDES Construction General Permit. All settling basins must have outlet structures that withdraw water from the surface, with the exception of basins or traps that have a drainage area of less than 1 acre. The NPDES permit requires ground cover within 14 calendar days on disturbed flat areas and ground cover within 7 calendar days on all areas within HQW Zones, perimeter dikes, swales, ditches, perimeter slopes and all slopes steeper than 3:1. Exceptions include slopes that are 10 feet or less in length and not steeper than 2:1 which must be stabilized within 14 calendar days and slopes greater than 50 feet which must be stabilized within 7 calendar days. This permit also includes other new requirements which are listed in the text of the NPDES Stormwater Discharge Permit for Construction Activities. Inspections of all erosion control measures and reports are required every 7 days and within 24 hours of every 1/2 inch rain event in a 24 hour period.

***Note the Land Resources Self Inspection Program Requirements. This program is separate from the NPDES reporting and requires inspection and documentation after each phase of construction. These phases include: Installation of perimeter erosion control measures, Clearing and Grubbing of existing ground cover, Completion of any phase of grading of slopes or fills, Installation of storm drainage facilities, Completion of construction or development, Establishment of permanent ground cover sufficient to restrain erosion and any Deviation from the approved plan.**

**Enclosed is a Combined Self-Monitoring and Self-Inspection Form that meets the requirements of both the NPDES Stormwater Permit for Construction Activities, NCG 010000 reporting and the Land Resources Self Inspection Program that satisfies the requirements of the Sedimentation Pollution Control Act.**
**This report is the responsibility of the property owner. It requires a rain gauge onsite and inspections and reporting every 7 calendar days and within 24 hours of every ½ inch rain per 24 hour period and at specific phases of construction. Additional copies of this Combined Construction Inspection Report can be found at http://portal.ncdenr.org/web/lr/erosion . Reports must be available onsite at all times. If you have questions please contact New Hanover County Engineering (910) 798-7139 or the Land Quality Section at the NCDENR Regional office at (910) 796-7215.**

***A pre-construction meeting is required prior to any activity on site. Please contact Beth E. Wetherill at (910) 798-7139 to set up this meeting.**

Permit # GP 38-15

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This Permit will expire one year from date of issue if no construction activity begins on site. This permit may not be amended or transferred to another party without approval of this office.

Beth Easley Wetherill

Beth E. Wetherill, C.P.E.S.C..
Soil Erosion Specialist/New Hanover County

Acknowledgment of receipt of Permit

Owner

By (please print)

Signature

# U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2015-01603** County: **New Hanover** U.S.G.S. Quad: **NC- Wilmington**

## NOTIFICATION OF JURISDICTIONAL DETERMINATION

**Property Owner:** **John McCarley**
**4010 Carolina Beach Road**
**Wilmington, North Carolina 28412**

**Agent:** **Alexandra Perillo**
**ECS**
**6714 Netherlands Drive**
**Wilmington, North Carolina 28405**

| | | | |
|---|---|---|---|
| Size (acres) | **10.93 Acres** | Nearest Town | **Wilmington** |
| Nearest Waterway | **Barnards Creek** | River Basin | **Cape Fear** |
| USGS HUC | **03030005** | Coordinates | Latitude: **34.16924 N** |
| | | | Longitude: **-77.923051 W** |

**Location description:** **The review area is comprised of two parcel (R06200-004-001-000 and R06500-004-001-002), located at 4010 Carolina Beach Road, near the City of Wilmington, New Hanover County, North Carolina.**

## Indicate Which of the Following Apply:

### A. Preliminary Determination

_ There appear to be waters, including wetlands, on the above described property, as depicted on the attached exhibit, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344). This preliminary jurisdictional determination may be used in the permit evaluation process, including determining compensatory mitigation. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). However, you may request an approved JD, which is an appealable action, by contacting the Corps district for further instruction

### B. Approved Determination

_ There are Navigable Waters of the United States within the above described project area subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

X There are waters of the U.S. including wetlands on the above described project area subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We strongly suggest you have the waters of the U.S. including wetlands on your project area delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

X The waters of the U.S. including wetlands on your project area have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters of the U.S. including wetlands have been delineated and surveyed and are accurately depicted on the plat identified below. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described property which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

X The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in Wilmington, NC, at (910) 796-7215 to determine their requirements.

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **Kyle Dahl at 910-251-4469 or Kyle.J.Dahl@usace.army.mil**.

**C. Basis For Determination: The site contains features that meet the wetland criteria identified in the 1987 Corps Delineation Manual and appropriate regional supplement that are considered jurisdictional. The site also contains a feature with an Ordinary High Water Mark that is considered jurisdictional as well. The enclosed map titled "Figure 5, Flagging Location Map; Echo Farms Apartments", accurately depicts the extent of on-site jurisdictional wetlands and other waters.**

## D. Remarks:

## E. Attention USDA Program Participants

This delineation/determination has been conducted to identify the limits of Corps' Clean Water Act jurisdiction for the particular site identified in this request. The delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA Program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

## F. Appeals Information (This information applies only to approved jurisdictional determinations as indicated in B. above)

This correspondence constitutes an approved jurisdictional determination for the above described site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

US Army Corps of Engineers
South Atlantic Division
Attn: Jason Steele, Review Officer
60 Forsyth Street SW, Room 10M15
Atlanta, Georgia 30303-8801

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **1/18/2016**

**It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this correspondence.**

Corps Regulatory Official: _____

Date: **November 18, 2015** Expiration Date: **November 18, 2020**

## NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

| Applicant: **John McCarley** | File Number: **SAW-2015-01603** | Date: **November 18, 2015** |
|---|---|---|
| Attached is: | | See Section below |
| ☐ INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission) | | A |
| ☐ PROFFERED PERMIT (Standard Permit or Letter of permission) | | B |
| ☐ PERMIT DENIAL | | C |
| ☒ **APPROVED JURISDICTIONAL DETERMINATION** | | **D** |
| ☐ PRELIMINARY JURISDICTIONAL DETERMINATION | | E |

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx or Corps regulations at 33 CFR Part 331.

**A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.**

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the district engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

| | |
|---|---|
| If you have questions regarding this decision and/or the appeal process you may contact:<br>**District Engineer, Wilmington Regulatory Division,**<br>**Attn: Kyle Dahl**<br>**(910) 251-4469**<br>**Kyle.J.Dahl@usace.army.mil** | If you only have questions regarding the appeal process you may also contact:<br>Mr. Jason Steele, Administrative Appeal Review Officer<br>CESAD-PDO<br>U.S. Army Corps of Engineers, South Atlantic Division<br>60 Forsyth Street, Room 10M15<br>Atlanta, Georgia 30303-8801<br>Phone: (404) 562-5137 |

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

| | | |
|---|---|---|
| _____<br>Signature of appellant or agent. | Date: | Telephone number: |

**For appeals on Initial Proffered Permits send this form to:**

**District Engineer, Wilmington Regulatory Division, Kyle Dahl, 69 Darlington Ave., Wilmington, NC 28403**

**For Permit denials, Proffered Permits and approved Jurisdictional Determinations send this form to:**

**Division Engineer, Commander, U.S. Army Engineer Division, South Atlantic, Attn: Mr. Jason Steele, Administrative Appeal Officer, CESAD-PDO, 60 Forsyth Street, Room 10M15, Atlanta, Georgia 30303-8801**
**Phone: (404) 562-5137**

THE WETLAND AREA LOCATIONS SHOWN ON THIS MAP ARE APPROXIMATE. THE SITE HAS BEEN DELINEATED BY ECS ON 06/22/2015 AND ON 07/17/2015. THE SITE HAS BEEN VERIFIED BY THE USACE ON 09/23/2015 AND BY THE NCDWR ON 19/18/2015. THE SITE HAS NOT BEEN SURVEYED. THIS MAP IS FOR PRELIMINARY PLANNING PURPOSES ONLY.

**LEGEND:**

- Approximate Site Boundary of Project Area
- Approximate Boundary of Parcels
- Approximate Location of Wetlands
- DP-1 Approximate Location of Data Points
- WA-1 Approximate Flagging Location

State Buffer Requirements: None
Watershed Classification = Class C; Sw,
Watershed = Cape Fear River Basin

Nearest Water Body = Barnards Creek
Local Buffer Requirements: None

**FLAG NUMBERS/COLOR SCHEME**
WETLAND/JURISDICTIONAL
TRIBUTARTY FLAGS =
Stream Flags = 0
Pond Flags = 0
Wetland Flags = 57
**Total Flags** = 57

Wetland Boundary


**SOURCE:**

GOOGLE EARTH

SCALE AS SHOWN

**FIGURE 5**
**FLAGGING LOCATION MAP**

ECHO FARMS APARTMENTS
4010 CAROLINA BEACH ROAD
WILMINGTON, NEW HANOVER COUNTY,
NORTH CAROLINA
ECS PROJECT NO. 22-22698-C

CITY OF WILMINGTON
NORTH CAROLINA

**Public Services**
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910 341-7807
910 341-5881 fax
wilmingtonnc.gov
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# COMPREHENSIVE STORMWATER MANAGEMENT PERMIT

## HIGH DENSITY DEVELOPMENT

## SECTION 1 – APPROVAL

Having reviewed the application and all supporting materials, the City of Wilmington has determined that the application is complete and the proposed development meets the requirements of the City of Wilmington's Comprehensive Stormwater Ordinance.

PERMIT HOLDER: **Echo Farms Apartments, LLC**
PROJECT: **Echo Farms Apartments**
ADDRESS: **4010 Carolina Beach Road**
PERMIT #: **2016010**
DATE: **3/3/2016**

Therefore, the above referenced site is hereby approved and subject to all conditions set forth in Section 2 of this approval and all applicable provisions of the City of Wilmington Comprehensive Stormwater Management Ordinance.

This permit shall be effective from the date of issuance until 3/3/2026 and shall be subject to the following specified conditions and limitations:

## Section 2 - CONDITIONS

1. This approval is valid only for the stormwater management system as proposed on the approved stormwater management plans dated 3/3/2016.

2. The project will be limited to the amount and type of built-upon area indicated in Section IV of the Stormwater Management Application Form submitted as part of the approved stormwater permit application package, and per the approved plans.

3. This permit shall become void unless the facilities are constructed in accordance with the approved stormwater management plans, specifications and supporting documentation, including information provided in the application and supplements.

4. The runoff from all built-upon area within any permitted drainage area must be directed into the permitted stormwater control system for that drainage area.

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5. The permittee shall submit a revised stormwater management application packet to the City of Wilmington and shall have received approval prior to construction, for any modification to the approved plans, including, but not limited to, those listed below:
   a. Any revision to any item shown on the approved plans, including the stormwater management measures, built-upon area, details, etc.
   b. Redesign or addition to the approved amount of built-upon area or to the drainage area.
   c. Further subdivision, acquisition, lease or sale of any part of the project area.
   d. Filling in, altering, or piping of any vegetative conveyance shown on the approved plan.
   e. Construction of any permitted future areas shown on the approved plans.

6. A copy of the approved plans and specifications shall be maintained on file by the Permittee.

7. During construction, erosion shall be kept to a minimum and any eroded areas of the system will be repaired immediately.

8. If the stormwater system was used as an Erosion Control device, it must be restored to design condition prior to operation as a stormwater treatment device, and prior to issuance of any certificate of occupancy for the project.

9. All areas must be maintained in a permanently stabilized condition. If vegetated, permanent seeding requirements must follow the guidelines established in the North Carolina Erosion and Sediment Control Planning and Design Manual unless an alternative is specified and approved by the City of Wilmington.

10. All stormwater treatment systems as well as access to nearest right-of-way must be located in recorded easements.

11. All applicable operation & maintenance agreements and easements pertaining to each stormwater treatment system shall be referenced on the final plat and recorded with the Register of Deeds upon final plat approval. If no plat is recorded for the site the operation and maintenance agreements and easements shall be recorded with the Register of Deeds so as to appear in the chain of title of all subsequent purchasers under generally accepted searching standards.

12. The stormwater management system shall be constructed in its entirety, vegetated and operational for its intended use prior to the construction of any built-upon surface unless prior approval is obtained. City Staff must be notified of any deviation prior to construction of the built-upon surface. Any deviation request shall include justification and must propose an alternative timeline or construction sequence. Notification shall not constitute approval. Any alternative timeline approved by City staff shall become an enforceable component of this permit.

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13. The permittee shall at all times provide the operation and maintenance necessary to assure the permitted stormwater system functions at optimum efficiency. The approved Operation and Maintenance Agreement must be followed in its entirety and maintenance must occur at the scheduled intervals including, but not limited to:
    a. Scheduled inspections (interval noted on the agreement).
    b. Sediment removal.
    c. Mowing and revegetation of slopes and the vegetated areas.
    d. Maintenance of landscape plants, including those within the landscape buffer and on the vegetated shelf.
    e. Immediate repair of eroded areas, especially slopes.
    f. Debris removal and unclogging of outlet structure, orifice device, flow spreader, catch basins and/or piping.
    g. Access to the outlet structure must be available at all times.

14. Records of inspection, maintenance and repair for the permitted stormwater system must be kept by the permittee for at least 5 years from the date of record and made available upon request to authorized personnel of the City of Wilmington. The records will indicate the date, activity, name of person performing the work and what actions were taken.

15. Upon completion of construction, before a Certificate of Occupancy shall be granted, and prior to operation or intended use of this permitted facility, the applicant shall submit to the City of Wilmington as-built plans for all stormwater management facilities. The plans shall show the final design specifications and the field location, type, depth, invert and planted vegetation of all measures, controls and devices, as-installed. A certification shall be submitted, along with all supporting documentation that specifies, under seal that the as-built stormwater measures, controls and devices are in compliance with the approved stormwater management plans. A final inspection by City of Wilmington personnel will be required prior to issuance of a certificate of occupancy or operation of the permitted facility.

16. This permit is not transferable except after application and approval by the City of Wilmington. In the event of a change of ownership, name change or change of address the permittee must submit a completed Name/Ownership Change form to the City of Wilmington at least 30 days prior to the change. It shall be signed by all applicable parties, and be accompanied by all required supporting documentation. Submittal of a complete application shall not be construed as an approved application. The application will be reviewed on its own merits by the City of Wilmington and may or may not be approved. The project must be in compliance with the terms of this permit in order for the transfer request to be considered. The permittee is responsible for compliance with all permit conditions until such time as the City of Wilmington approves the transfer request. Neither the sale of the project nor the conveyance of common area to a third party should be considered as an approved transfer of the permit.

17. Failure to abide by the conditions and limitations contained in this permit may subject the Permittee to enforcement action by the City of Wilmington, in accordance with Sections 18-52 and 18-53 and any other applicable section of the Land Development Code.

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18. The City of Wilmington may notify the permittee when the permitted site does not meet one or more of the minimum requirements of the permit. Within the time frame specified in the notice, the permittee shall submit a written time schedule to the City of Wilmington for modifying the site to meet minimum requirements. The permittee shall provide copies of revised plans and certification in writing to the City of Wilmington that the changes have been made.

19. The issuance of this permit does not preclude the Permittee from complying with any and all statutes, rules, regulations, or ordinances, which may be imposed by other government agencies (local, state, and federal) having jurisdiction.

20. In the event that the facilities fail to perform satisfactorily, including the creation of nuisance conditions, the Permittee shall take immediate corrective action, including those as may be required by the City of Wilmington, such as the construction of additional or replacement stormwater management systems.

21. The permittee grants City of Wilmington Staff permission to enter the property during normal business hours for the purpose of inspecting all components of the permitted stormwater management facility.

22. The permit issued shall continue in force and effect until revoked or terminated by the City of Wilmington. The permit may be modified, revoked and reissued or terminated for cause. The filing of a request for a permit modification, revocation and re-issuance or termination does not stay any permit condition.

23. The approved stormwater management plans and all documentation submitted as part of the approved stormwater management permit application package for this project are incorporated by reference and are enforceable parts of the permit.

24. The permittee shall submit a renewal request with all required forms and documentation at least 180 days prior to the expiration date of this permit.

25. If any one or more of the conditions of this permit is found to be unenforceable or otherwise invalidated, all remaining conditions shall remain in full effect.

Stormwater Management Permit issued this the 3rd day of March, 2016

*for* Sterling Cheatham, City Manager
City of Wilmington

unless otherwise noted *

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# STORMWATER MANAGEMENT PERMIT APPLICATION FORM
**(Form SWP 2.2)**

## I. GENERAL INFORMATION

1. Project Name (subdivision, facility, or establishment name - should be consistent with project name on plans, specifications, letters, operation and maintenance agreements, etc.):

   Echo Farm Apartments

2. Location of Project (street address):

   4010 Carolina Beach Road

   City: Wilmington County: New Hanover Zip: 28412

3. Directions to project (from nearest major intersection):

   Travel 1.8 miles east on US-421 (Carolina Beach Rd) from the intersection of US-117 (Shipyard Blvd) & US-421. Turn right onto Echo Farms Blvd & travel approx. 0.05 miles. Turn right to stay on Echo Farms Blvd & travel 0.13 miles to the site. Site is on the north side.

## II. PERMIT INFORMATION

1. Specify the type of project (check one): Low Density ✓ High Density
   Drains to an Offsite Stormwater System Drainage Plan Other
   If the project drains to an Offsite System, list the Stormwater Permit Number(s):

   City of Wilmington: _____ State – NCDENR/DWQ: _____

2. Is the project currently covered (whole or in part) by an existing City or State (NCDENR/DWQ) Stormwater Permit? Yes ✓ No
   If yes, list all applicable Stormwater Permit Numbers:

   City of Wilmington: _____ State – NCDENR/DWQ: _____

3. Additional Project Permit Requirements (check all applicable):
   CAMA Major ✓ Sedimentation/Erosion Control
   NPDES Industrial Stormwater 404/401 Permit: Proposed Impacts: _____
   If any of these permits have already been acquired please provide the Project Name, Project/Permit Number, issue date and the type of each permit:

   _____

## III. CONTACT INFORMATION

1. Print Applicant / Signing Official's name and title (specifically the developer, property owner, lessee, designated government official, individual, etc. who owns the project):

   Applicant / Organization: Echo Farm Apartments, LLC

   Signing Official & Title: Mark Maynard - Manager

   a. Contact information for Applicant / Signing Official:

   Street Address: 10 S. Cardinal Drive

   City: Wilmington State: NC Zip: 28403

   Phone: 910-251-5030 Fax: _____ Email: matt@tributeproperties.com

   Mailing Address (if different than physical address): _____

   City: _____ State: _____ Zip: _____

   b. Please check the appropriate box. The applicant listed above is:

   ✓ The property owner (Skip to item 3)
   Lessee* (Attach a copy of the lease agreement and complete items 2 and 2a below)
   Purchaser* (Attach a copy of the pending sales agreement and complete items 2 and 2a below)
   Developer* (Complete items 2 and 2a below.)

2. Print Property Owner's name and title below, if you are the lessee, purchaser, or developer. (This is the person who owns the property that the project is on.)

   Property Owner / Organization: _____

   Signing Official & Title: _____

   a. Contact information for Property Owner:

   Street Address: _____

   City: _____ State: _____ Zip: _____

   Phone: _____ Fax: _____ Email: _____

   Mailing Address (if different than physical address): _____

   City: _____ State: _____ Zip: _____

3. (Optional) Print the name and title of another contact such as the project's construction supervisor or another person who can answer questions about the project:

   Other Contact Person / Organization: _____

   Signing Official & Title: _____

a. Contact information for person listed in item 3 above:

Street Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____ Email: _____

Mailing Address (if different than physical address): _____

City: _____ State: _____ Zip: _____

## IV. PROJECT INFORMATION

1. In the space provided below, briefly summarize how the stormwater runoff will be treated.

   Stormwater will be treated in three permeable pavement systems, an infiltration basin, & a wet pond.

2. Total Property Area: 475,805 square feet
3. Total Coastal Wetlands Area: 0 square feet
4. Total Surface Water Area: 0 square feet
5. Total Property Area (2) – Total Coastal Wetlands Area (3) – Total Surface Water Area (4) = Total Project Area: 475,805 square feet.
6. Existing Impervious Surface within Property Area: 20,504 square feet
7. Existing Impervious Surface to be Removed/Demolished: 20,504 square feet
8. Existing Impervious Surface to Remain: 0 square feet
9. Total Onsite (within property boundary) Newly Constructed Impervious Surface (*in square feet*):

| | |
|---|---|
| Buildings/Lots (including overhang) | 59,250 |
| Impervious Pavement | 70,518 |
| Pervious Pavement (adj. total, with 75 % credit applied) | 10,836 |
| Impervious Sidewalks | 13,909 |
| Pervious Sidewalks (adj. total, with % credit applied) | 0 |
| Other (describe) (pool apron, trash compactor) | 5,722 |
| Future Development | 0 |
| **Total Onsite Newly Constructed Impervious Surface** | 160,235 |

10. Total Onsite Impervious Surface
    (Existing Impervious Surface to remain + Onsite Newly Constructed Impervious Surface) = 160,235 square feet
11. Project percent of impervious area: (Total Onsite Impervious Surface / Total Project Area) x100 = 33.68 %

12. Total Offsite Newly Constructed Impervious Area (improvements made outside of property boundary, *in square feet*):

| | |
|---|---|
| Impervious Pavement | 1,476 |
| Pervious Pavement (adj. total, with % credit applied) | 0 |
| Impervious Sidewalks | 1,962 |
| Pervious Sidewalks (adj. total, with % credit applied) | 0 |
| Other (describe) | 0 |
| **Total Offsite Newly Constructed Impervious Surface** | 3,438 |

13. Total Newly Constructed Impervious Surface
(Total Onsite + Offsite Newly Constructed Impervious Surface) = 163,673 square feet

14. Complete the following information for each Stormwater BMP drainage area. If there are more than three drainage areas in the project, attach an additional sheet with the information for each area provided in the same format as below. Low Density projects may omit this section and skip to Section V.

| Basin Information | Wet Pond #1 BMP # 1 | Infiltration Basin #1 BMP # 2 | Perm. Pvmt. Sys. #1 BMP # 3 |
|---|---|---|---|
| Receiving Stream Name | Barnards Creek | Barnards Creek | Barnards Creek |
| Receiving Stream Index Number | 18-80 | 18-80 | 18-80 |
| Stream Classification | C; Sw | C;Sw | C;Sw |
| Total Drainage Area (sf) | 239,070 | 61,910 | 36,178 |
| On-Site Drainage Area (sf) | 239,070 | 61,910 | 36,178 |
| Off-Site Drainage Area (sf) | 0 | 0 | 0 |
| **Total Impervious Area (sf)** | 108,674 | 19,963 | 22,521 |
| Buildings/Lots (sf) | 30,773 | 3,500 | 13,998 |
| Impervious Pavement (sf) | 64,690 | 15,172 | 1,129 |
| Pervious Pavement (sf), 75% credit (sf) | 0 | 0 | 4,553 |
| Impervious Sidewalks (sf) | 8,373 | 1,133 | 2,345 |
| Pervious Sidewalks (sf) | 0 | 0 | 0 |
| Other (sf) | 4,838 | 158 | 496 |
| Future Development (sf) | 0 | 0 | 0 |
| Existing Impervious to remain (sf) | 0 | 0 | 0 |
| Offsite (sf) | 0 | 0 | 0 |
| Percent Impervious Area (%) | 45.46 | 32.25 | 62.25 |

15. How was the off-site impervious area listed above determined? Provide documentation:

N/A

CITY OF WILMINGTON ENGINEERING





**BMP Drainage area information (continued)**

| Basin Information | (Perm. Pvmt. Sys. #2) BMP # 4 | (Perm. Pvmt. Sys. #3) BMP # 5 | (Type of BMP) BMP # |
|---|---|---|---|
| Receiving Stream Name | Barnards Creek | Barnards Creek | |
| Receiving Stream Index Number | 18-80 | 18-80 | |
| Stream Classification | C;Sw | C;Sw | |
| Total Drainage Area (sf) | 29882 | 17713 | 0 |
| On-Site Drainage Area (sf) | 29882 | 17713 | |
| Off-Site Drainage Area (sf) | 0 | 0 | |
| **Total Impervious Area (sf)** | 17737 | 11012 | 0 |
| Buildings/Lots (sf) | 10499 | 3980 | |
| Impervious Pavement (sf) | 1027 | 3672 | |
| Pervious Pavement, 75 % credit (sf) | 4049 | 2234 | |
| Impervious Sidewalks (sf) | 1873 | 1027 | |
| Pervious Sidewalks, % credit (sf) | 0 | 0 | |
| Other (sf) | 289 | 99 | |
| Future Development (sf) | 0 | 0 | |
| Existing Impervious to remain (sf) | 0 | 0 | |
| Offsite (sf) | 0 | 0 | |
| Percent Impervious Area (%) | 59.36 | 62.17 | |
| Basin Information | (Type of BMP) BMP # | (Type of BMP) BMP # | (Type of BMP) BMP # |
| Receiving Stream Name | | | |
| Receiving Stream Index Number | | | |
| Stream Classification | | | |
| Total Drainage Area (sf) | 0 | 0 | 0 |
| On-Site Drainage Area (sf) | | | |
| Off-Site Drainage Area (sf) | | | |
| **Total Impervious Area (sf)** | 0 | 0 | 0 |
| Buildings/Lots (sf) | | | |
| Impervious Pavement (sf) | | | |
| Pervious Pavement, % credit (sf) | | | |
| Impervious Sidewalks (sf) | | | |
| Pervious Sidewalks, % credit (sf) | | | |
| Other (sf) | | | |
| Future Development (sf) | | | |
| Existing Impervious to remain (sf) | | | |
| Offsite (sf) | | | |
| Percent Impervious Area (%) | | | |

## V. SUBMITTAL REQUIREMENTS

1. Supplemental and Operation & Maintenance Forms - One applicable City of Wilmington Stormwater BMP supplement form and checklist must be submitted for **each** BMP specified for this project. One applicable proposed operation and maintenance (O&M) form must be submitted for **each type** of stormwater BMP. Once approved, the operation and maintenance forms must be referenced on the final plat and recorded with the register of deeds office.

2. Deed Restrictions and Restrictive Covenants - For all subdivisions, outparcels, and future development, the appropriate property restrictions and protective covenants are required to be recorded prior to the sale of any lot. Due to variability in lot sizes or the proposed BUA allocations, a table listing each lot number, lot size, and the allowable built-upon area must be provided as an attachment to the completed and notarized deed restriction form. The appropriate deed restrictions and protective covenants forms can be downloaded at the link listed in section V (3). Download the latest versions for each submittal.

   In instances where the applicant is different than the property owner, it is the responsibility of the property owner to sign the deed restrictions and protective covenants form while the applicant is responsible for ensuring that the deed restrictions are recorded.

   **By the notarized signature(s) below, the permit holder(s) certify that the recorded property restrictions and protective covenants for this project, if required, shall include all the items required in the permit and listed on the forms available on the website, that the covenants will be binding on all parties and persons claiming under them, that they will run with the land, that the required covenants cannot be changed or deleted without concurrence from the City of Wilmington, and that they will be recorded prior to the sale of any lot.**

3. Only complete application packages will be accepted and reviewed by the City. A complete package includes all of the items listed on the City Engineering Plan Review Checklist, including the fee. Copies of the Engineering Plan Review Checklist, all Forms, Deed Restrictions as well as detailed instructions on how to complete this application form may be downloaded from:

   http://www.wilmingtonnc.gov/PublicServices/Engineering/PlanReview/StormwaterPermits.aspx

   The complete application package should be submitted to the following address:

   City of Wilmington – Engineering
   Plan Review Section
   212 Operations Center Dr
   Wilmington, NC 28412

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## VI. CONSULTANT INFORMATION AND AUTHORIZATION

1. Applicant: Complete this section if you wish to designate authority to another individual and/or firm (such as a consulting engineer and /or firm) so that they may provide information on your behalf for this project (such as addressing requests for additional information).

   Consulting Engineer: Jeff Malpass & Justin C. Bishop

   Consulting Firm: Malpass Engineering & Surveying, P.C.

   a. Contact information for consultant listed above:

   Mailing Address: 1134 Shipyard Blvd

   City: Wilmington State: NC Zip: 28412

   Phone: 910-392-5243 Fax: 910-392-5203 Email: jeffmalpass@bizec.rr.com

## VII. PROPERTY OWNER AUTHORIZATION (If Section III(2) has been filled out, complete this section)

I, (*print or type name of person listed in Contact Information, item 2*)_____, certify that I own the property identified in this permit application, and thus give permission to (*print or type name of person listed in Contact Information, item 1*)_____ with (*print or type name of organization listed in Contact Information, item 1*) _____ to develop the project as currently proposed. A copy of the lease agreement or pending property sales contract has been provided with the submittal, which indicates the party responsible for the operation and maintenance of the stormwater system.

As the legal property owner I acknowledge, understand, and agree by my signature below, that if my designated agent (*entity listed in Contact Information, item 1*) dissolves their company and/or cancels or defaults on their lease agreement, or pending sale, responsibility for compliance with the City of Wilmington Stormwater Permit reverts back to me, the property owner. As the property owner, it is my responsibility to notify the City of Wilmington immediately and submit a completed Name/Ownership Change Form within 30 days; otherwise I will be operating a stormwater treatment facility without a valid permit. I understand that the operation of a stormwater treatment facility without a valid permit is a violation of the City of Wilmington Municipal Code of Ordinances and may result in appropriate enforcement including the assessment of civil penalties.

SEAL

Signature: _____

_____Date:_____

I, _____, a Notary Public for the State of _____, County of _____, do hereby certify that _____ personally appeared before me this day of _____, _____,

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and acknowledge the due execution of the application for a stormwater permit. Witness my hand and official seal,

_____

My commission expires: _____

## VIII. APPLICANT'S CERTIFICATION

I, *(print or type name of person listed in Contact Information, item 1)*, Mark Maynard certify that the information included on this permit application form is, to the best of my knowledge, correct and that the project will be constructed in conformance with the approved plans, that the required deed restrictions and protective covenants will be recorded, and that the proposed project complies with the requirements of the applicable stormwater rules under.

SEAL

Signature: _____

Date: Sept. 11, 2015

I, Charity C. Lane, a Notary Public for the State of NC, County of New Hanover do hereby certify that Mark Maynard personally appeared before me this day of Sept. 11, 2015 and acknowledge the due execution of the application for a stormwater permit. Witness my hand and official seal,

Charity C. Lane

My commission expires: June 29, 2019

CHARITY C LANE
NOTARY PUBLIC
PENDER CO., NORTH CAROLINA

Permit No._____ (to be provided by DWQ)

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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 | Echo Farm Apartments |
| Contact person | Matt Maynard |
| Phone number | 910-251-5030 |
| Date | 2/9/2016 |
| Drainage area number | 1 |

## II. DESIGN INFORMATION

**Site Characteristics**

| | | | |
|---|---|---|---|
| Drainage area | 239,070 | $ft^2$ | |
| Impervious area, post-development | 108,674 | $ft^2$ | |
| % impervious | 45.46 | % | |
| Design rainfall depth | 1.5 | in | |

**Storage Volume: Non-SA Waters**

| | | | |
|---|---|---|---|
| Minimum volume required | 13,721 | $ft^3$ | 2,633 ft3 required in Infiltration Basin #1, therefore only 11,082 ft3 is required in Wet Pond #1 |
| Volume provided | 13,911 | $ft^3$ | OK<br>Does not include 3,367 cf of volume provided in Infiltration Basin #1.<br>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 | 3.9 | in | |
| Rational C, pre-development | 0.17 | (unitless) | |
| Rational C, post-development | | (unitless) | |
| Rainfall intensity: 1-yr, 24-hr storm | 2.96 | in/hr | OK |
| Pre-development 1-yr, 24-hr peak flow | 2.76 | $ft^3$/sec | |
| Post-development 1-yr, 24-hr peak flow | | $ft^3$/sec | |
| Pre/Post 1-yr, 24-hr peak flow control | | $ft^3$/sec | |

**Elevations**

| | | |
|---|---|---|
| Temporary pool elevation | 11.20 | fmsl |
| Permanent pool elevation | 10.00 | fmsl |
| SHWT elevation (approx. at the perm. pool elevation) | 11.64 | fmsl |
| Top of 10ft vegetated shelf elevation | 10.50 | fmsl |
| Bottom of 10ft vegetated shelf elevation | 9.50 | fmsl |
| Sediment cleanout, top elevation (bottom of pond) | 3.50 | fmsl |
| Sediment cleanout, bottom elevation | 2.50 | fmsl |
| 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 |

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 036232 AUSTIN C. BISHOP 2-9-16

Permit No._____
*(to be provided by DWQ)*

## II. DESIGN INFORMATION

| | | | |
|---|---|---|---|
| **Surface Areas** | | | |
| Area, temporary pool | 13,301 | $ft^2$ | |
| Area REQUIRED, permanent pool | 6,997 | $ft^2$ | |
| SA/DA ratio | 2.93 | (unitless) | ← Based on impervious area that drains to Infiltration Basin #1 first being treated as grass |
| Area PROVIDED, permanent pool, $A_{perm\_pool}$ | 8,713 | $ft^2$ | OK |
| Area, bottom of 10ft vegetated shelf, $A_{bot\_shelf}$ | 6,755 | $ft^2$ | |
| Area, sediment cleanout, top elevation (bottom of pond), $A_{bot\_pond}$ | 1,883 | $ft^2$ | |
| **Volumes** | | | |
| Volume, temporary pool | 13,911 | $ft^3$ | OK |
| Volume, permanent pool, $V_{perm\_pool}$ | 28,147 | $ft^3$ | |
| Volume, forebay (sum of forebays if more than one forebay) | 5,955 | $ft^3$ | |
| Forebay % of permanent pool volume | 21.2% | % | OK |
| **SA/DA Table Data** | | | |
| Design TSS removal | 90 | % | |
| Coastal SA/DA Table Used? | Y | (Y or N) | |
| Mountain/Piedmont SA/DA Table Used? | N | (Y or N) | |
| SA/DA ratio | 2.93 | (unitless) | ← |
| Average depth (used in SA/DA table): | | | |
| Calculation option 1 used? (See Figure 10-2b) | N | (Y or N) | |
| Volume, permanent pool, $V_{perm\_pool}$ | 28,147 | $ft^3$ | |
| Area provided, permanent pool, $A_{perm\_pool}$ | 8,713 | $ft^2$ | |
| Average depth calculated | | ft | Need 3 ft min. |
| Average depth used in SA/DA, $d_{av}$, (Round to nearest 0.5ft) | | ft | |
| Calculation option 2 used? (See Figure 10-2b) | Y | (Y or N) | |
| Area provided, permanent pool, $A_{perm\_pool}$ | 8,713 | $ft^2$ | |
| Area, bottom of 10ft vegetated shelf, $A_{bot\_shelf}$ | 6,755 | $ft^2$ | |
| Area, sediment cleanout, top elevation (bottom of pond), $A_{bot\_pond}$ | 1,883 | $ft^2$ | |
| "Depth" (distance b/w bottom of 10ft shelf and top of sediment) | 6.00 | ft | |
| Average depth calculated | 4.27 | ft | OK |
| Average depth used in SA/DA, $d_{av}$, (Round to nearest 0.5ft) | 4.5 | ft | OK |
| **Drawdown Calculations** | | | |
| Drawdown through orifice? | Y | (Y or N) | |
| Diameter of orifice (if circular) | 1.50 | in | |
| Area of orifice (if-non-circular) | | $in^2$ | |
| Coefficient of discharge ($C_D$) | 0.60 | (unitless) | |
| Driving head ($H_o$) | 0.38 | 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 | 2.76 | $ft^3$/sec | |
| Post-development 1-yr, 24-hr peak flow | | $ft^3$/sec | |
| Storage volume discharge rate (through discharge orifice or weir) | 0.04 | $ft^3$/sec | |
| Storage volume drawdown time | 3.56 | 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 | 4.3 | :1 | OK |
| Trash rack for overflow & orifice? | Y | (Y or N) | OK |
| Freeboard provided | 3.8 | 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: | Pump | | |

Permit Number:_____
*(to be provided by City of Wilmington)*
BMP Drainage Basin #: 1

# 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 1.5 inches.** 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 side slopes 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 City of Wilmington)*
BMP Drainage Basin #:___1_____

| 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 |
| | The plant community and coverage is significantly (>25%) different from approved landscape plan. | Restore plant vegetation to approved condition. If landscape plan needs to be adjusted to specify vegetation more appropriate for site conditions, contact City Stormwater or Engineering Staff. |
| | Cattails or other invasive plants cover >25% of the veg't shelf. A monculture of plants must be avoided) | Remove all invasives by physical removal or by wiping them with pesticide (do not spray) – consult a professional. |
| | 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. |
| **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. |

Permit Number:_____
*(to be provided by City of Wilmington)*
BMP Drainage Basin #: 1

| BMP element: | Potential problem: | How I will remediate the problem: |
|---|---|---|
| **The main treatment area (continued)** | Algal growth covers over 25% of the area. | Consult a professional to remove and control the algal growth. |
| | Cattails or other invasive plants cover >25% of the veg't shelf. A monculture of plants must be avoided) | Remove all invasives by physical removal or by wiping them with pesticide (do not spray) – consult a professional. |
| **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. |

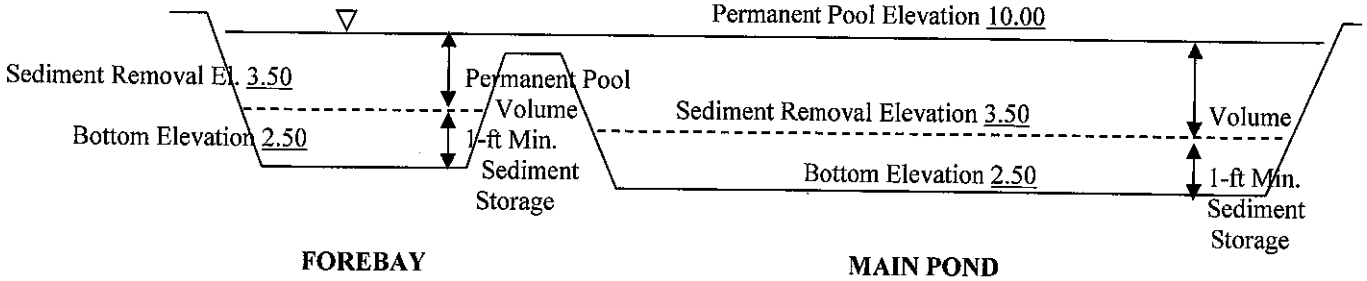
The measuring device used to determine the sediment elevation shall be such that it will give an accurate depth reading and not readily penetrate into accumulated sediments.

When the permanent pool depth reads _6.50_ feet in the main pond, the sediment shall be removed.

When the permanent pool depth reads _6.50_ feet in the forebay, the sediment shall be removed.

## BASIN DIAGRAM

*(fill in the blanks)*



Permit Number: _____
*(to be provided by City of Wilmington)*

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 the City of Wilmington of any problems with the system or prior to any changes to the system or responsible party.

*Project name*: Echo Farm Apartments

*BMP drainage basin number*: 1

Print name: Mark Maynard

Title: Member / manager

Address: 10 S. Cardinal Drive, Wilmington, NC 28403

Phone: 910-251-5030

Signature: _____

Date: Dec. 14, 2015

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, Mary Douthit, a Notary Public for the State of North Carolina, County of New Hanover, do hereby certify that Mark Maynard personally appeared before me this 14TH day of December, 2015, and acknowledge the due execution of the forgoing wet detention basin maintenance requirements. Witness my hand and official seal, Mary Douthit

MARY DOUTHIT NOTARY PUBLIC NEW HANOVER COUNTY, NC

SEAL

My commission expires 7-1-2020

Permit No._____
*(to be provided by DWQ)*

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM

# INFILTRATION 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 | Echo Farm Apartments |
| Contact Person | Matt Maynard |
| Phone Number | 910-251-5030 |
| Date | 10/26/2015 |
| Drainage Area Number | 2 |

## II. DESIGN INFORMATION

**Site Characteristics**

| | | | |
|---|---|---|---|
| Drainage area | 61,910.00 | $ft^2$ | |
| Impervious area | 19,963.00 | $ft^2$ | |
| Percent impervious | 0.32 | % | |
| Design rainfall depth | 1.50 | in | |

**Peak Flow Calculations**

| | | | |
|---|---|---|---|
| 1-yr, 24-hr rainfall depth | | in | |
| 1-yr, 24-hr intensity | | in/hr | |
| Pre-development 1-yr, 24-hr discharge | | $ft^3$/sec | |
| Post-development 1-yr, 24-hr discharge | | $ft^3$/sec | |
| Pre/Post 1-yr, 24-hr peak flow control | | $ft^3$/sec | |

**Storage Volume: Non-SA Waters**

| | | | |
|---|---|---|---|
| Minimum design volume required | 2,633.00 | $ft^3$ | |
| Design volume provided | 3,367.00 | $ft^3$ | OK for non-SA waters |

**Storage Volume: SA Waters**

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

**Soils Report Summary**

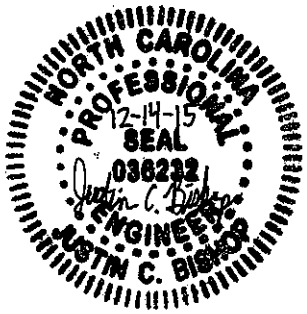
| | | | |
|---|---|---|---|
| Soil type | Kureb & Leon ✓ | | |
| Infiltration rate | 24.03 | in/hr | |
| SHWT elevation | 12.60 | fmsl | |

**Basin Design Parameters**

| | | | |
|---|---|---|---|
| Drawdown time | 0.04 | days ✓ | OK |
| Basin side slopes | 3.00 | :1 | OK |
| Basin bottom elevation | 15.00 | fmsl | OK |
| Storage elevation | 16.00 | fmsl | |
| Storage Surface Area | 3,817.00 | $ft^2$ | |
| Top elevation | 17.50 | fmsl | |

**Basin Bottom Dimensions**

| | | |
|---|---|---|
| Basin length | 88.06 | ft |
| Basin width | 67.66 | ft |
| Bottom Surface Area | 2,925.00 | $ft^2$ |



Permit No._____
*(to be provided by DWQ)*

**Additional Information**

| | | | |
|---|---|---|---|
| Maximum runoff to each inlet to the basin? | 0.73 | ac-in | OK |
| Length of vegetative filter for overflow | N/A | ft | OK |
| Distance to structure | >15 | ft | OK |
| Distance from surface waters | >30 | ft | OK |
| Distance from water supply well(s) | >100 | ft | OK |
| Separation from impervious soil layer | >2 | ft | OK |
| Naturally occuring soil above shwt | 4.00 | ft | OK |
| Bottom covered with 4-in of clean sand? | Y | (Y or N) | OK |
| Proposed drainage easement provided? | Y | (Y or N) | OK |
| Capures all runoff at ultimate build-out? | Y | (Y or N) | OK |
| Bypass provided for larger storms? | Y | (Y or N) | OK |
| Pretreatment device provided | Catch Basin | | |

Permit Number: _____
*(to be provided by City of Wilmington)*
BMP Drainage Basin #: 2

# Infiltration Basin Operation and Maintenance Agreement

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.

mportant maintenance procedures:

- The drainage area will be carefully managed to reduce the sediment load to the infiltration basin.
- Immediately after the infiltration basin is established, the vegetation will be watered twice weekly if needed until the plants become established (commonly six weeks).
- No portion of the infiltration basin will be fertilized after the initial fertilization that is required to establish the vegetation.
- The vegetation in and around the basin will be maintained at a height of approximately six inches.

After the infiltration basin is established, it will be inspected **once a quarter and within 24 hours after every storm event greater than 1.5 inches**. Records of operation and maintenance will be kept in a known set location and will 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 infiltration 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. |
| **The inlet device: pipe or swale** | The pipe is clogged (if applicable). | Unclog the pipe. Dispose of the sediment off-site. |
| | The pipe is cracked or otherwise damaged (if applicable). | Replace the pipe. |
| | Erosion is occurring in the swale (if applicable). | 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. |

| BMP element: | Potential problem: | How I will remediate the problem: |
|---|---|---|
| **The forebay** | Sediment has accumulated and reduced the depth to 75% of the original design 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. |
| | Erosion has occurred or riprap is displaced. | 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 pesticides are used, wipe them on the plants rather than spraying. |
| **The main treatment area** | A visible layer of sediment has accumulated. | 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. Replace any media that was removed in the process. Revegetate disturbed areas immediately. |
| | Water is standing more than 5 days after a storm event. | Replace the top few inches of filter media and see if this corrects the standing water problem. If so, revegetate immediately. If not, consult an appropriate professional for a more extensive repair. |
| | Weeds and noxious plants are growing in the main treatment area. | Remove the plants by hand or by wiping them with pesticide (do not spray). |
| **The embankment** | Shrubs or trees have started to grow on the embankment. | Remove shrubs or trees immediately. |
| | An annual inspection by an appropriate professional shows that the embankment needs repair. | 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 NC Division of Water Quality 401 Oversight Unit at 919-733-1786. |

Permit Number: _____
*(to be provided by City of Wilmington)*

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 the City of Wilmington of any problems with the system or prior to any changes to the system or responsible party.

*Project name:* Echo Farm Apartments

*BMP drainage basin number:* 2 (Infiltration Basin #1)

Print name: Mark Maynard

Title: Member / Manager

Address: 10 S. Cardinal Drive, Wilmington, NC 28403

Phone: 910-251-5030

Signature: _____

Date: Dec. 14, 2015

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, Mary Douthit, a Notary Public for the State of North Carolina, County of New Hanover, do hereby certify that Mark Maynard personally appeared before me this 14TH day of December, 2015, and acknowledge the due execution of the forgoing infiltration basin maintenance requirements. Witness my hand and official seal,

Mary Douthit

MARY DOUTHIT NOTARY PUBLIC NEW HANOVER COUNTY, NC

SEAL

My commission expires 7-1-2020

Permit No._____
*(to be provided by DWQ)*

NCDENR

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM

# PERMEABLE PAVEMENT SUPPLEMENT

*This form must be completely 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 | Echo Farm Apartments |
| Contact Person | Matt Maynard |
| Phone Number | 910-251-5030 |
| Date | 10/26/2015 |
| Drainage Area | 3 |

## II. DESIGN INFORMATION

### Soils Report Summary

| | | | |
|---|---|---|---|
| Hydrologic soil group (HSG) of subgrade | A | | |
| Infiltration rate | 20.32 | in/hr | |

### Pavement Design Summary

BUA Credit for Permeable Pavement Footprint: **75% BUA Credit**

| | | | |
|---|---|---|---|
| Permeable Pavement (PP) design type | Infiltration - HSG A/B | | |
| SA of PP being proposed ($A_p$) | 18,210 | $ft^2$ | |
| Resulting BUA counted as impervious for main application form | 4,553 | $ft^2$ | |
| Adjacent BUA directed to PP ($A_c$) | 17,968 | $ft^2$ | OK |
| Ratio of $A_c$ to $A_p$ | 0.99 | (unitless) | |
| Flow from pervious surfaces is directed away from PP? | Yes | | OK |
| Design rainfall depth | 1.5" | in | |
| Permeable pavement surface course type | PC | | |
| Layer 1 - Washed aggregate size *(ex. No. 57)* | No. 57 stone | | |
| Layer 1 - Aggregate porosity (n) | 0.40 | (unitless) | OK |
| Layer 2 - Washed aggregate size *(ex. No. 57)* | | | |
| Layer 2 - Aggregate porosity (n) | | (unitless) | |
| Minimum total aggregate depth for design rainfall ($D_{wq}$) | 7.5 | in | |
| Drawdown/infiltration time for $D_{wq}$ | 0.0 | days | OK |
| How is 10-yr, 24-hr storm handled? | infiltrated | | |
| Aggregate depth to infiltrate 10-yr, 24-hr storm ($D_{10}$) | -210.5 | in | |
| Drawdown/infiltration time of 10-yr, 24-hr storm | 0.14 | days | |
| Actual provided total aggregate depth | 8.5 | in | OK |
| Top of aggregate base layer elevation | 23.51, 24.35, 25.88 | fmsl | |
| Storage elevation of design rainfall depth | 23.43, 24.27, 25.80 | fmsl | |
| Overflow elevation | 24.01, 24.85, 26.38 | fmsl | |
| Bottom elevation at subgrade | 22.80, 23.64, 25.17 | fmsl | |
| SHWT elevation | 21.48, 22.21, 24.17 | fmsl | |
| Underdrain diameter | | in | |

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 036232 JUSTIN C. BISHOP 12-14-15

#REF!

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*(to be provided by DWQ)*

**Detention Systems** *(skip for infiltration systems)*

| | | |
|---|---|---|
| Diameter of orifice | | in |
| Coefficient of discharge ($C_D$) | | (unitless) |
| Driving head ($H_o$) | | ft |
| Storage volume discharge rate (through discharge orifice) | | $ft^3$/sec |
| Storage volume drawdown time | | days |
| Pre-development 1-yr, 24-hr peak flow | | $ft^3$/sec |
| Post-development 1-yr, 24-hr peak flow | | $ft^3$/sec |

**Additional Information**

| | | | |
|---|---|---|---|
| Slope of soil subgrade at bottom of permeable pavement | 0.00 | % | OK |
| Slope of the permeable pavement surface | 6.00 | % | OK |
| Construction sequence minimizes compaction to soils? | Yes | | OK |
| Subsoil preparation specified (must select one) | scarified | | |
| Meets industry standards for structural requirements? | | | OK |
| Washed stone is specified for the aggregate? | Yes | | OK |
| Required signage specified on plans? | Yes | | OK |
| Number of observation wells provided | 4 | | OK |
| Distance to structure | 15.00 | ft | |
| Distance to surface waters | >30 | ft | OK |
| Distance to water supply well(s) | >100 | ft | OK |

## Permeable Pavement

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. | Version 1.0 |
|---|---|---|
| JCB | 9, 10 | 1. Plans (1" = 50' or larger) of the entire site showing:<br>- Design at ultimate build-out,<br>- Location of permeable pavement,<br>- Roof and other surface flow directed away from permeable pavement, |
| JCB | 13 | 2. Section view of the permeable pavement (1" = 20' or larger) showing:<br>- Layers, and<br>- SHWT |
| JCB | See soils report | 3. 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. |
| JCB | 13 | 4. A construction sequence that shows how the permeable pavement will be protected from sediment until the entire drainage area is stabilized. |
| JCB | See calcs | 5. The supporting calculations. |
| JCB | See O+M Agreement | 6. A copy of the signed and notarized operation and maintenance (O&M) agreement. |
| N/A | | 7. A copy of the deed restrictions (if required). |
| JCB | 13 | 8. Installation must be at a slope of 0.5% or less. |

**Example #1**

Project is a lot with a maximum allowed BUA of 5,000 sq. ft. that drains to class SC waters.
Project proposes a 1,000 sq. ft. permeable concrete driveway with a 6" gravel base.
Managed grass factor = 0.6
1000 x 0.6 = 600 square feet is counted as managed grass.
1000 - 600 = 400 square feet is counted as built-upon area.
5000 - 400 = 4,600 square feet available for house and other BUA.

**Example #2**

Project is a high density commercial site with a 5,000 square foot parking lot.
Project is within 1/2 mile of and draining to SA waters. An infiltration system is proposed.
The parking lot will handle <100 cars per day and is a flexible pavement with a 4" gravel base.
Managed grass factor is one half of 0.4. = 0.2
5000 x 0.2 = 1000 square feet is counted as managed grass.
5000 - 1000 = 4,000 square is counted as impervious.
The total BUA used to calculate the minimum volume draining to the infiltration system can be reduced by 1,000 square feet.

Permit No._____
*(to be provided by DWQ)*

NCDENR

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM

# PERMEABLE PAVEMENT SUPPLEMENT

*This form must be completely 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 | Echo Farm Apartments |
| Contact Person | Matt Maynard |
| Phone Number | 910-251-5030 |
| Date | 10/26/2015 |
| Drainage Area | 4 |

## II. DESIGN INFORMATION

### Soils Report Summary

| | | |
|---|---|---|
| Hydrologic soil group (HSG) of subgrade | A | |
| Infiltration rate | 18.50 | in/hr |

### Pavement Design Summary

BUA Credit for Permeable Pavement Footprint: **75% BUA Credit**

| | | | |
|---|---|---|---|
| Permeable Pavement (PP) design type | Infiltration - HSG A/B | | |
| SA of PP being proposed ($A_p$) | 16,194 | $ft^2$ | |
| Resulting BUA counted as impervious for main application form | 4,049 | $ft^2$ | |
| Adjacent BUA directed to PP ($A_c$) | 13,688 | $ft^2$ | OK |
| Ratio of $A_c$ to $A_p$ | 0.85 | (unitless) | ✓ |
| Flow from pervious surfaces is directed away from PP? | Yes | | OK |
| Design rainfall depth | 1.5" | in | |
| Permeable pavement surface course type | PC | | |
| Layer 1 - Washed aggregate size *(ex. No. 57)* | No. 57 stone | | |
| Layer 1 - Aggregate porosity (n) | | (unitless) | |
| Layer 2 - Washed aggregate size *(ex. No. 57)* | | | |
| Layer 2 - Aggregate porosity (n) | | (unitless) | |
| Minimum total aggregate depth for design rainfall ($D_{wq}$) | 6.9 | in | |
| Drawdown/infiltration time for $D_{wq}$ | 0.03 | days | OK |
| How is 10-yr, 24-hr storm handled? | infiltrated | | |
| Aggregate depth to infiltrate 10-yr, 24-hr storm ($D_{10}$) | -191.0 | in | |
| Drawdown/infiltration time of 10-yr, 24-hr storm | 0.14 | days | |
| Actual provided total aggregate depth | 7.8 | in | OK |
| Top of aggregate base layer elevation | 26.50, 27.03 | fmsl | |
| Storage elevation of design rainfall depth | 26.43, 26.96 | fmsl | |
| Overflow elevation | 27.0, 27.53 | fmsl | |
| Bottom elevation at subgrade | 25.85, 26.38 | fmsl | |
| SHWT elevation | 24.40 ✓ | fmsl | |
| Underdrain diameter | | in | |

NORTH CAROLINA PROFESSIONAL SEAL 036232 ENGINEER JUSTIN C. BISHOP 12-14-15

#REF!

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Permit No._____
*(to be provided by DWQ)*

**Detention Systems** *(skip for infiltration systems)*

| | | |
|---|---|---|
| Diameter of orifice | _____ | in |
| Coefficient of discharge ($C_D$) | _____ | (unitless) |
| Driving head ($H_o$) | _____ | ft |
| Storage volume discharge rate (through discharge orifice) | _____ | $ft^3$/sec |
| Storage volume drawdown time | _____ | days |
| Pre-development 1-yr, 24-hr peak flow | _____ | $ft^3$/sec |
| Post-development 1-yr, 24-hr peak flow | _____ | $ft^3$/sec |

**Additional Information**

| | | | |
|---|---|---|---|
| Slope of soil subgrade at bottom of permeable pavement | 0.00 | % | OK |
| Slope of the permeable pavement surface | 4.09 | % | OK |
| Construction sequence minimizes compaction to soils? | Yes | | OK |
| Subsoil preparation specified (must select one) | scarified | | |
| Meets industry standards for structural requirements? | | | OK |
| Washed stone is specified for the aggregate? | Yes | | OK |
| Required signage specified on plans? | Yes | | OK |
| Number of observation wells provided | 3 | | OK |
| Distance to structure | 7.66 | ft | |
| Distance to surface waters | >30 | ft | OK |
| Distance to water supply well(s) | >100 | ft | OK |

## Permeable Pavement

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. | Version 1.0 |
|---|---|---|
| JCB | 9, 10 | 1. Plans (1" = 50' or larger) of the entire site showing:<br>- Design at ultimate build-out,<br>- Location of permeable pavement,<br>- Roof and other surface flow directed away from permeable pavement, |
| JCB | 13 | 2. Section view of the permeable pavement (1" = 20' or larger) showing:<br>- Layers, and<br>- SHWT |
| JCB | see soils report | 3. 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. |
| JCB | 13 | 4. A construction sequence that shows how the permeable pavement will be protected from sediment until the entire drainage area is stabilized. |
| JCB | see calcs | 5. The supporting calculations. |
| JCB | see O + M Agreement | 6. A copy of the signed and notarized operation and maintenance (O&M) agreement. |
| N/A | | 7. A copy of the deed restrictions (if required). |
| JCB | 13 | 8. Installation must be at a slope of 0.5% or less. |

**Example #1**

Project is a lot with a maximum allowed BUA of 5,000 sq. ft. that drains to class SC waters.
Project proposes a 1,000 sq. ft. permeable concrete driveway with a 6" gravel base.
Managed grass factor = 0.6
1000 x 0.6 = 600 square feet is counted as managed grass.
1000 - 600 = 400 square feet is counted as built-upon area.
5000 - 400 = 4,600 square feet available for house and other BUA.

**Example #2**

Project is a high density commercial site with a 5,000 square foot parking lot.
Project is within 1/2 mile of and draining to SA waters. An infiltration system is proposed.
The parking lot will handle <100 cars per day and is a flexible pavement with a 4" gravel base.
Managed grass factor is one half of 0.4. = 0.2
5000 x 0.2 = 1000 square feet is counted as managed grass.
5000 - 1000 = 4,000 square is counted as impervious.
The total BUA used to calculate the minimum volume draining to the infiltration system can be reduced by 1,000 square feet.

Permit No._____
*(to be provided by DWQ)*

NCDENR

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM

# PERMEABLE PAVEMENT SUPPLEMENT

*This form must be completely 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 | Echo Farm Apartments |
| Contact Person | Matt Maynard |
| Phone Number | 910-251-5030 |
| Date | 10/26/2015 |
| Drainage Area | 5 |

## II. DESIGN INFORMATION

### Soils Report Summary

| | | | |
|---|---|---|---|
| Hydrologic soil group (HSG) of subgrade | A | | |
| Infiltration rate | 12.94 | in/hr | |

### Pavement Design Summary

BUA Credit for Permeable Pavement Footprint: **75% BUA Credit**

| | | | |
|---|---|---|---|
| Permeable Pavement (PP) design type | Infiltration - HSG A/B | | |
| SA of PP being proposed ($A_p$) | 8,935 | $ft^2$ | |
| Resulting BUA counted as impervious for main application form | 2,234 | $ft^2$ | |
| Adjacent BUA directed to PP ($A_c$) | 8,778 | $ft^2$ | OK |
| Ratio of $A_c$ to $A_p$ | 0.98 | (unitless) | |
| Flow from pervious surfaces is directed away from PP? | Yes | | OK |
| Design rainfall depth | 1.5" | in | |
| Permeable pavement surface course type | PC | | |
| Layer 1 - Washed aggregate size *(ex. No. 57)* | No. 57 stone | | |
| Layer 1 - Aggregate porosity (n) | | (unitless) | |
| Layer 2 - Washed aggregate size *(ex. No. 57)* | | | |
| Layer 2 - Aggregate porosity (n) | | (unitless) | |
| Minimum total aggregate depth for design rainfall ($D_{wq}$) | 7.4 | in | |
| Drawdown/infiltration time for $D_{wq}$ | 0.1 | days | OK |
| How is 10-yr, 24-hr storm handled? | bypassed | | Underdrain Required |
| Aggregate depth to infiltrate 10-yr, 24-hr storm ($D_{10}$) | | in | |
| Drawdown/infiltration time of 10-yr, 24-hr storm | | days | |
| Actual provided total aggregate depth | 8.5 | in | OK |
| Top of aggregate base layer elevation | 26.68 | fmsl | |
| Storage elevation of design rainfall depth | 26.59 | fmsl | |
| Overflow elevation | 27.18 | fmsl | |
| Bottom elevation at subgrade | 25.97 | fmsl | #REF! |
| SHWT elevation | 23.97 | fmsl | |
| Underdrain diameter | | in | |

NORTH CAROLINA PROFESSIONAL SEAL 036232 ENGINEER JUSTIN C. BISHOP 12-14-15

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Permit No._____
*(to be provided by DWQ)*

**Detention Systems** *(skip for infiltration systems)*

| | | | |
|---|---|---|---|
| Diameter of orifice | | in | |
| Coefficient of discharge ($C_D$) | | (unitless) | |
| Driving head ($H_o$) | | ft | |
| Storage volume discharge rate (through discharge orifice) | | $ft^3$/sec | |
| Storage volume drawdown time | | days | |
| Pre-development 1-yr, 24-hr peak flow | | $ft^3$/sec | |
| Post-development 1-yr, 24-hr peak flow | | $ft^3$/sec | |

**Additional Information**

| | | | |
|---|---|---|---|
| Slope of soil subgrade at bottom of permeable pavement | 0.00 | % | OK |
| Slope of the permeable pavement surface | 1.04 | % | OK |
| Construction sequence minimizes compaction to soils? | Yes | | OK |
| Subsoil preparation specified (must select one) | scarified | | |
| Meets industry standards for structural requirements? | | | OK |
| Washed stone is specified for the aggregate? | Yes | | OK |
| Required signage specified on plans? | Yes | | OK |
| Number of observation wells provided | 1 | | OK |
| Distance to structure | 7.66 | ft | |
| Distance to surface waters | >30 | ft | OK |
| Distance to water supply well(s) | >100 | ft | OK |

## Permeable Pavement

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.**

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| JCB | see calcs | 5. The supporting calculations. |
| JCB | see O+M Agreement | 6. A copy of the signed and notarized operation and maintenance (O&M) agreement. |
| N/A | | 7. A copy of the deed restrictions (if required). |
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**Example #1**

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The parking lot will handle <100 cars per day and is a flexible pavement with a 4" gravel base.
Managed grass factor is one half of 0.4. = 0.2
5000 x 0.2 = 1000 square feet is counted as managed grass.
5000 - 1000 = 4,000 square is counted as impervious.
The total BUA used to calculate the minimum volume draining to the infiltration system can be reduced by 1,000 square feet.

Permit Number:_____
*(to be provided by City of Wilmington)*
Drainage Area / Lot Number: 3, 4, + 5

# Permeable Pavement 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.

Important operation and maintenance procedures:

- Stable groundcover will be maintained in the drainage area to reduce the sediment load to the permeable pavement.
- The area around the perimeter of the permeable pavement will be stabilized and mowed, with clippings removed.
- Any weeds that grow in the permeable pavement will be sprayed with pesticide immediately. Weeds will not be pulled, since this could damage the fill media.
- Once a year, the permeable pavement surface will be vacuum swept.
- At no time shall wet sweeping (moistening followed by sweeping) be allowed as a means of maintenance.
- There shall be no repair or treatment of Permeable Pavement surfaces with other types of pavement surfaces. All repairs to Permeable Pavement surfaces must be accomplished utilizing permeable pavement which meets the original pavement specifications.
- Concentrated runoff from roof drains, piping, swales or other point sources, directly onto the permeable pavement surface shall not be allowed. These areas must be diverted away from the permeable pavement.

**Initial Inspection**: Permeable Pavements shall be inspected monthly for the first three months for the following:

| BMP element: | Potential problem: | How to remediate the problem: |
|---|---|---|
| **The perimeter of the permeable pavement** | Areas of bare soil and/or erosive gullies have formed. | In the event that rutting or failure of the groundcover occurs, the eroded area shall be repaired immediately and permanent groundcover re-established. Appropriate temporary Erosion Control measures (such as silt fence) shall be installed in the affected area during the establishment of permanent groundcover, and any impacted area of permeable pavement is to be cleaned via vacuum sweeping. |
| **The surface of the permeable pavement** | Rutting / uneven settlement | This indicates inadequate compaction of the pavement base / sub-base. If rutting or uneven settlement on the order of ½ inch or greater occurs, permeable pavement shall be removed and base / sub-base re-compacted, smoothed, and permeable pavement shall then be re-installed. Base and sub-base compaction shall be monitored by a licensed geotechnical engineer to ensure that infiltration capacity of base and sub-base are not compromised by compaction and smoothing processes. |
| | The pavement does not dewater between storms, or water is running off. | Vacuum sweep the pavement. If the pavement still does not dewater, consult a professional. |

Permit Number:_____
*(to be provided by City of Wilmington)*
Drainage Area / Lot Number: 3, 4, & 5

The permeable pavement will be inspected **once a quarter and within 24 hours after every storm event greater than 1.5 inches.** Records of operation and maintenance will be kept in a known set location and will 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 to remediate the problem: |
|---|---|---|
| **The perimeter of the permeable pavement** | 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 3 to 6 inches (remove clippings). |
| **The surface of the permeable pavement** | Trash/debris is present. | Remove the trash/debris. |
| | Weeds are growing on the surface of the permeable pavement. | Do not pull the weeds (may pull out media as well). Spray them with pesticide. |
| | Sediment is present on the surface. | Vacuum sweep the pavement. |
| | The structure is deteriorating or damaged. | Consult an appropriate professional. Damaged areas of the pavement shall be removed and repaired. |
| | The pavement does not dewater between storms. | Vacuum sweep the pavement. If the pavement still does not dewater, consult a professional. Permanently clogged pavement shall be removed and repaired. |

Permit Number: _____
*(to be provided by City of Wilmington)*

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 City of Wilmington of any problems with the system or prior to any changes to the system or responsible party.

*Project name*: Echo Farm Apartments

*BMP drainage area or lot number*: 3, 4, & 5 (Permeable Pavement Systems #1, #2, #3)

Print name: Mark Maynard

Title: Member / Manager

Address: 10 S. Cardinal Drive, Wilmington, NC 28403

Phone: 910-251-5030

Signature: _____

Date: Dec. 14, 2015

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, Mary Douthit, a Notary Public for the State of North Carolina, County of New Hanover, do hereby certify that Mark Maynard personally appeared before me this 14TH day of December, 2015, and acknowledge the due execution of the forgoing permeable pavement maintenance requirements. Witness my hand and official seal, Mary Douthit

SEAL
MARY DOUTHIT
NOTARY
PUBLIC
NEW HANOVER COUNTY, NC

My commission expires 7-1-2020

CITY OF WILMINGTON
NORTH CAROLINA

**Public Services**
Engineering
212 Operations Center Drive
Wilmington, NC 28412
910 341-7807
910 341-5881 fax
wilmingtonnc.gov
Dial 711 TTY/Voice

October 4, 2016

Mr. Mark Maynard
Echo Farms Apartments, LLC
10 S. Cardinal Drive
Wilmington, NC 28403

**Subject:** **Stormwater Management Permit No. 2016010R1**
**Echo Farms Apartments**
**High Density Development**

Dear Mr. Maynard:

The City of Wilmington Engineering Division has received a request for a revision to the Stormwater Management Permit for Echo Farms Apartments. Having reviewed the application and all supporting materials, the City of Wilmington has determined that the proposed revision meets the requirements of the City of Wilmington's Comprehensive Stormwater Ordinance.

The revisions include:

Adjustment of the parking and sidewalk in front of Building #2, the clubhouse, the sidewalk around the clubhouse, the mail kiosk and Wet Pond #1 resulting in additional impervious surface draining to Infiltration Basin #1 and Wet Pond #1.

Please be aware all terms and conditions of the permit issued on 3/3/2016 remain in full force and effect. Any additional changes to the approved plans must be approved by this office prior to construction. The issuance of the plan revision does not preclude the permittee from complying with all other applicable statutes, rules, regulations or ordinances which may have jurisdiction over the proposed activity, and obtaining a permit or approval prior to construction.

The revised stamped, approved stormwater management drawings will be released for construction by the Wilmington Planning Division under separate cover. Please replace any old plan sheets from the approved set with the new, revised sheet. An electronic copy of the approved drawing set, permit, application and supplementary documents will be maintained by the Wilmington Engineering Division. If you have any questions, or need additional information, please contact Richard Christensen at (910) 341-7813 or richard.christensen@wilmingtonnc.gov

Sincerely,

*for* Sterling Cheatham, City Manager
City of Wilmington

cc: Justin C. Bishop, PE, Malpass Engineering & Surveying, P.C.
Brian Chambers, Associate Planner, City of Wilmington

RECEIVED

AUG 24 2016

ENGINEERING

*unless noted otherwise

CITY OF WILMINGTON
NORTH CAROLINA

Public Services
Engineering
212 Operations Center Dr
Wilmington, NC 28412
910 341-7807
910 341-5881 fax
wilmingtonnc.gov
Dial 711 TTY/Voice

# STORMWATER MANAGEMENT PERMIT APPLICATION FORM
**(Form SWP 2.2)**

## I. GENERAL INFORMATION

1. Project Name (subdivision, facility, or establishment name - should be consistent with project name on plans, specifications, letters, operation and maintenance agreements, etc.):

   Echo Farm Apartments

2. Location of Project (street address):

   4010 Carolina Beach Road

   City: Wilmington County: New Hanover Zip: 28412

3. Directions to project (from nearest major intersection):

   Travel 1.8 miles east on US-421 (Carolina Beach Rd) from the intersection of US-117 (Shipyard Blvd) & US-421. Turn right onto Echo Farms Blvd & travel approx. 0.05 miles. Turn right to stay on Echo Farms Blvd & travel 0.13 miles to the site. Site is on the north side.

## II. PERMIT INFORMATION

1. Specify the type of project (check one): Low Density ✓ High Density
   Drains to an Offsite Stormwater System Drainage Plan Other
   If the project drains to an Offsite System, list the Stormwater Permit Number(s):

   City of Wilmington: _____ State – NCDENR/DWQ: _____

2. Is the project currently covered (whole or in part) by an existing City or State (NCDENR/DWQ) Stormwater Permit? ✓ Yes No
   If yes, list all applicable Stormwater Permit Numbers:

   City of Wilmington: 2016010 State – NCDENR/DWQ: _____

3. Additional Project Permit Requirements (check all applicable):
   CAMA Major ✓ Sedimentation/Erosion Control
   NPDES Industrial Stormwater 404/401 Permit: Proposed Impacts: _____
   If any of these permits have already been acquired please provide the Project Name, Project/Permit Number, issue date and the type of each permit:

   _____

CITY OF WILMINGTON ENGINEERING

## III. CONTACT INFORMATION

1. Print Applicant / Signing Official's name and title (specifically the developer, property owner, lessee, designated government official, individual, etc. who owns the project):

   Applicant / Organization: Echo Farm Apartments, LLC

   Signing Official & Title: Mark Maynard, Manager

   a. Contact information for Applicant / Signing Official:

   Street Address: 10 S. Cardinal Drive

   City: Wilmington State: NC Zip: 28403

   Phone: 910-251-5030 Fax: _____ Email: matt@tributeproperties.com

   Mailing Address (if different than physical address): _____

   City: _____ State: _____ Zip: _____

   b. Please check the appropriate box. The applicant listed above is:

   ✓ The property owner (Skip to item 3)
   Lessee* (Attach a copy of the lease agreement and complete items 2 and 2a below)
   Purchaser* (Attach a copy of the pending sales agreement and complete items 2 and 2a below)
   Developer* (Complete items 2 and 2a below.)

2. Print Property Owner's name and title below, if you are the lessee, purchaser, or developer. (This is the person who owns the property that the project is on.)

   Property Owner / Organization: _____

   Signing Official & Title: _____

   a. Contact information for Property Owner:

   Street Address: _____

   City: _____ State: _____ Zip: _____

   Phone: _____ Fax: _____ Email: _____

   Mailing Address (if different than physical address): _____

   City: _____ State: _____ Zip: _____

3. (Optional) Print the name and title of another contact such as the project's construction supervisor or another person who can answer questions about the project:

   Other Contact Person / Organization: _____

   Signing Official & Title: _____

a. Contact information for person listed in item 3 above:

Street Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____ Email: _____

Mailing Address (if different than physical address): _____

City: _____ State: _____ Zip: _____

## IV. PROJECT INFORMATION

1. In the space provided below, briefly summarize how the stormwater runoff will be treated.

Stormwater will be treated in three permeable pavement systems, an infiltration basin, & a wet pond.

2. Total Property Area: 475,805 square feet
3. Total Coastal Wetlands Area: 0 square feet
4. Total Surface Water Area: 0 square feet
5. Total Property Area (2) – Total Coastal Wetlands Area (3) – Total Surface Water Area (4) = Total Project Area: 475,805 square feet.
6. Existing Impervious Surface within Property Area: 20,504 square feet
7. Existing Impervious Surface to be Removed/Demolished: 20,504 square feet
8. Existing Impervious Surface to Remain: 0 square feet
9. Total Onsite (within property boundary) Newly Constructed Impervious Surface (*in square feet*):

| | |
|---|---|
| Buildings/Lots (including overhang) | 59,296 |
| Impervious Pavement | 71,700 |
| Pervious Pavement (adj. total, with 75 % credit applied) | 10,836 |
| Impervious Sidewalks | 13,628 |
| Pervious Sidewalks (adj. total, with % credit applied) | 0 |
| Other (describe) (pool apron, trash compactor, mail kiosk) | 6,027 |
| Future Development | 1,350 |
| **Total Onsite Newly Constructed Impervious Surface** | 162,837 |

10. Total Onsite Impervious Surface
(Existing Impervious Surface to remain + Onsite Newly Constructed Impervious Surface) = 162,837 square feet

11. Project percent of impervious area: (Total Onsite Impervious Surface / Total Project Area) x100 = 34.23 %

12. Total Offsite Newly Constructed Impervious Area (improvements made outside of property boundary, *in square feet*):

| | |
|---|---|
| Impervious Pavement | 1,476 |
| Pervious Pavement (adj. total, with % credit applied) | 0 |
| Impervious Sidewalks | 1,962 |
| Pervious Sidewalks (adj. total, with % credit applied) | 0 |
| Other (describe) | 0 |
| **Total Offsite Newly Constructed Impervious Surface** | 3,438 |

13. Total Newly Constructed Impervious Surface
(Total Onsite + Offsite Newly Constructed Impervious Surface) = 166,275 square feet

14. Complete the following information for each Stormwater BMP drainage area. If there are more than three drainage areas in the project, attach an additional sheet with the information for each area provided in the same format as below. Low Density projects may omit this section and skip to Section V.

| Basin Information | Wet Pond #1 BMP # 1 | Infiltration Basin #1 BMP # 2 | Perm. Pvmt. Sys. #1 BMP # 3 |
|---|---|---|---|
| Receiving Stream Name | Barnards Creek | Barnards Creek | Barnards Creek |
| Receiving Stream Index Number | 18-80 | 18-80 | 18-80 |
| Stream Classification | C; Sw | C;Sw | C;Sw |
| Total Drainage Area (sf) | 239,060 | 61,901 | 36,178 |
| On-Site Drainage Area (sf) | 239,060 | 61,901 | 36,178 |
| Off-Site Drainage Area (sf) | 0 | 0 | 0 |
| **Total Impervious Area (sf)** | 111,276 | 21,200 | 22,521 |
| Buildings/Lots (sf) | 30,819 | 3,500 | 13,998 |
| Impervious Pavement (sf) | 65,872 | 16,354 | 1,129 |
| Pervious Pavement (sf), 75% credit (sf) | 0 | 0 | 4,553 |
| Impervious Sidewalks (sf) | 8,092 | 1,188 | 2,345 |
| Pervious Sidewalks (sf) | 0 | 0 | 0 |
| Other (sf) | 5,143 | 158 | 496 |
| Future Development (sf) | 1,350 | 0 | 0 |
| Existing Impervious to remain (sf) | 0 | 0 | 0 |
| Offsite (sf) | 0 | 0 | 0 |
| Percent Impervious Area (%) | 46.55 | 34.25 | 62.25 |

15. How was the off-site impervious area listed above determined? Provide documentation:

N/A

## BMP Drainage area information (continued)

| Basin Information | (Perm. Pvmt. Sys. #2) BMP # 4 | (Perm. Pvmt. Sys. #3) BMP # 5 | (Type of BMP) BMP # |
|---|---|---|---|
| Receiving Stream Name | Barnards Creek | Barnards Creek | |
| Receiving Stream Index Number | 18-80 | 18-80 | |
| Stream Classification | C;Sw | C;Sw | |
| Total Drainage Area (sf) | 29882 | 17713 | 0 |
| On-Site Drainage Area (sf) | 29882 | 17713 | |
| Off-Site Drainage Area (sf) | 0 | 0 | |
| **Total Impervious Area (sf)** | 17737 | 11012 | 0 |
| Buildings/Lots (sf) | 10499 | 3980 | |
| Impervious Pavement (sf) | 1027 | 3672 | |
| Pervious Pavement, 75 % credit (sf) | 4049 | 2234 | |
| Impervious Sidewalks (sf) | 1873 | 1027 | |
| Pervious Sidewalks, % credit (sf) | 0 | 0 | |
| Other (sf) | 289 | 99 | |
| Future Development (sf) | 0 | 0 | |
| Existing Impervious to remain (sf) | 0 | 0 | |
| Offsite (sf) | 0 | 0 | |
| Percent Impervious Area (%) | 59.36 | 62.17 | |
| Basin Information | (Type of BMP) BMP # | (Type of BMP) BMP # | (Type of BMP) BMP # |
| Receiving Stream Name | | | |
| Receiving Stream Index Number | | | |
| Stream Classification | | | |
| Total Drainage Area (sf) | 0 | 0 | 0 |
| On-Site Drainage Area (sf) | | | |
| Off-Site Drainage Area (sf) | | | |
| **Total Impervious Area (sf)** | 0 | 0 | 0 |
| Buildings/Lots (sf) | | | |
| Impervious Pavement (sf) | | | |
| Pervious Pavement, % credit (sf) | | | |
| Impervious Sidewalks (sf) | | | |
| Pervious Sidewalks, % credit (sf) | | | |
| Other (sf) | | | |
| Future Development (sf) | | | |
| Existing Impervious to remain (sf) | | | |
| Offsite (sf) | | | |
| Percent Impervious Area (%) | | | |

## V. SUBMITTAL REQUIREMENTS

1. Supplemental and Operation & Maintenance Forms - One applicable City of Wilmington Stormwater BMP supplement form and checklist must be submitted for **each** BMP specified for this project. One applicable proposed operation and maintenance (O&M) form must be submitted for **each type** of stormwater BMP. Once approved, the operation and maintenance forms must be referenced on the final plat and recorded with the register of deeds office.

2. Deed Restrictions and Restrictive Covenants - For all subdivisions, outparcels, and future development, the appropriate property restrictions and protective covenants are required to be recorded prior to the sale of any lot. Due to variability in lot sizes or the proposed BUA allocations, a table listing each lot number, lot size, and the allowable built-upon area must be provided as an attachment to the completed and notarized deed restriction form. The appropriate deed restrictions and protective covenants forms can be downloaded at the link listed in section V (3). Download the latest versions for each submittal.

   In instances where the applicant is different than the property owner, it is the responsibility of the property owner to sign the deed restrictions and protective covenants form while the applicant is responsible for ensuring that the deed restrictions are recorded.

   **By the notarized signature(s) below, the permit holder(s) certify that the recorded property restrictions and protective covenants for this project, if required, shall include all the items required in the permit and listed on the forms available on the website, that the covenants will be binding on all parties and persons claiming under them, that they will run with the land, that the required covenants cannot be changed or deleted without concurrence from the City of Wilmington, and that they will be recorded prior to the sale of any lot.**

3. Only complete application packages will be accepted and reviewed by the City. A complete package includes all of the items listed on the City Engineering Plan Review Checklist, including the fee. Copies of the Engineering Plan Review Checklist, all Forms, Deed Restrictions as well as detailed instructions on how to complete this application form may be downloaded from:

   http://www.wilmingtonnc.gov/PublicServices/Engineering/PlanReview/StormwaterPermits.aspx

   The complete application package should be submitted to the following address:

   City of Wilmington – Engineering
   Plan Review Section
   212 Operations Center Dr
   Wilmington, NC 28412

CITY OF WILMINGTON ENGINEERING

## VI. CONSULTANT INFORMATION AND AUTHORIZATION

1. Applicant: Complete this section if you wish to designate authority to another individual and/or firm (such as a consulting engineer and /or firm) so that they may provide information on your behalf for this project (such as addressing requests for additional information).

   Consulting Engineer: Jeff Malpass & Justin C. Bishop

   Consulting Firm: Malpass Engineering & Surveying, P.C.

   a. Contact information for consultant listed above:

   Mailing Address: 1134 Shipyard Blvd

   City: Wilmington State: NC Zip: 28412

   Phone: 910-392-5243 Fax: 910-392-5203 Email: jeffmalpass@bizec.rr.com

## VII. PROPERTY OWNER AUTHORIZATION (If Section III(2) has been filled out, complete this section)

I, (*print or type name of person listed in Contact Information, item 2*)_____, certify that I own the property identified in this permit application, and thus give permission to (*print or type name of person listed in Contact Information, item 1*)_____ with (*print or type name of organization listed in Contact Information, item 1*) _____ to develop the project as currently proposed. A copy of the lease agreement or pending property sales contract has been provided with the submittal, which indicates the party responsible for the operation and maintenance of the stormwater system.

As the legal property owner I acknowledge, understand, and agree by my signature below, that if my designated agent (*entity listed in Contact Information, item 1*) dissolves their company and/or cancels or defaults on their lease agreement, or pending sale, responsibility for compliance with the City of Wilmington Stormwater Permit reverts back to me, the property owner. As the property owner, it is my responsibility to notify the City of Wilmington immediately and submit a completed Name/Ownership Change Form within 30 days; otherwise I will be operating a stormwater treatment facility without a valid permit. I understand that the operation of a stormwater treatment facility without a valid permit is a violation of the City of Wilmington Municipal Code of Ordinances and may result in appropriate enforcement including the assessment of civil penalties.

SEAL

Signature: _____

_____Date:_____

I, _____, a Notary Public for the State of _____, County of _____, do hereby certify that _____ personally appeared before me this day of _____, _____,

and acknowledge the due execution of the application for a stormwater permit. Witness my hand and official seal,

_____

My commission expires: _____

## VIII. APPLICANT'S CERTIFICATION

I, *(print or type name of person listed in Contact Information, item 1)*, Mark Maynard certify that the information included on this permit application form is, to the best of my knowledge, correct and that the project will be constructed in conformance with the approved plans, that the required deed restrictions and protective covenants will be recorded, and that the proposed project complies with the requirements of the applicable stormwater rules under.

SEAL

Kelly M. Lattuca
Notary Public
New Hanover County
North Carolina
My Commission Expires 9/28/2020

Signature: _____

Date: 8/23/16

I, Kelly M. Lattuca, a Notary Public for the State of North Carolina, County of New Hanover, do hereby certify that Mark Maynard personally appeared before me this day of August 23, 2016, and acknowledge the due execution of the application for a stormwater permit. Witness my hand and official seal,

Kelly M Lattuca

My commission expires: 9/28/20

Permit No._____
*(to be provided by DWQ)*

RECEIVED
SEP 19 2016
ENGINEERING

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 | Echo Farm Apartments |
| Contact person | Matt Maynard |
| Phone number | 910-251-5030 |
| Date | 9/9/2016 |
| Drainage area number | 1 |

## II. DESIGN INFORMATION

**Site Characteristics**

| | | |
|---|---|---|
| Drainage area | 239,060 | $ft^2$ |
| Impervious area, post-development | 111,276 | $ft^2$ |
| % impervious | 46.55 | % |
| Design rainfall depth | 1.5 | in |

**Storage Volume: Non-SA Waters**

| | | | |
|---|---|---|---|
| Minimum volume required | 14,014 | $ft^3$ | OK |
| Volume provided | 13,868 | $ft^3$ | |

2,772 $ft^3$ required in Infiltration Basin #1, therefore only 11,242 $ft^3$ is required in Wet Pond #1

Does not include 3,367 cf of volume provided in Infiltration Basin #1.

**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 | 3.9 | in | |
| Rational C, pre-development | 0.17 | (unitless) | |
| Rational C, post-development | | (unitless) | |
| Rainfall intensity: 1-yr, 24-hr storm | 2.96 | in/hr | OK |
| Pre-development 1-yr, 24-hr peak flow | 2.76 | $ft^3$/sec | |
| Post-development 1-yr, 24-hr peak flow | | $ft^3$/sec | |
| Pre/Post 1-yr, 24-hr peak flow control | | $ft^3$/sec | |

**Elevations**

| | | |
|---|---|---|
| Temporary pool elevation | 11.20 | fmsl |
| Permanent pool elevation | 10.00 | fmsl |
| SHWT elevation (approx. at the perm. pool elevation) | 11.64 | fmsl |
| Top of 10ft vegetated shelf elevation | 10.50 | fmsl |
| Bottom of 10ft vegetated shelf elevation | 9.50 | fmsl |
| Sediment cleanout, top elevation (bottom of pond) | 3.50 | fmsl |
| Sediment cleanout, bottom elevation | 2.50 | fmsl |
| 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 |

NORTH CAROLINA PROFESSIONAL SEAL 030232 ENGINEER JUSTIN C. BISHOP 9-9-16

Permit No._____
*(to be provided by DWQ)*

## II. DESIGN INFORMATION

| | | | |
|---|---|---|---|
| **Surface Areas** | | | |
| Area, temporary pool | 13,260 | $ft^2$ | |
| Area REQUIRED, permanent pool | 7,078 | $ft^2$ | |
| SA/DA ratio | 2.96 | (unitless) | |
| Area PROVIDED, permanent pool, $A_{perm\_pool}$ | 8,686 | $ft^2$ | OK |
| Area, bottom of 10ft vegetated shelf, $A_{bot\_shelf}$ | 6,728 | $ft^2$ | |
| Area, sediment cleanout, top elevation (bottom of pond), $A_{bot\_pond}$ | 1,883 | $ft^2$ | |
| **Volumes** | | | |
| Volume, temporary pool | 13,868 | $ft^3$ | OK |
| Volume, permanent pool, $V_{perm\_pool}$ | 28,041 | $ft^3$ | |
| Volume, forebay (sum of forebays if more than one forebay) | 5,849 | $ft^3$ | |
| Forebay % of permanent pool volume | 20.9% | % | OK |
| **SA/DA Table Data** | | | |
| Design TSS removal | 90 | % | |
| Coastal SA/DA Table Used? | Y | (Y or N) | |
| Mountain/Piedmont SA/DA Table Used? | N | (Y or N) | |
| SA/DA ratio | 2.96 | (unitless) | |
| Average depth (used in SA/DA table): | | | |
| Calculation option 1 used? (See Figure 10-2b) | N | (Y or N) | |
| Volume, permanent pool, $V_{perm\_pool}$ | 28,041 | $ft^3$ | |
| Area provided, permanent pool, $A_{perm\_pool}$ | 8,686 | $ft^2$ | |
| Average depth calculated | | ft | Need 3 ft min. |
| Average depth used in SA/DA, $d_{av}$, (Round to nearest 0.5ft) | | ft | |
| Calculation option 2 used? (See Figure 10-2b) | Y | (Y or N) | |
| Area provided, permanent pool, $A_{perm\_pool}$ | 8,686 | $ft^2$ | |
| Area, bottom of 10ft vegetated shelf, $A_{bot\_shelf}$ | 6,728 | $ft^2$ | |
| Area, sediment cleanout, top elevation (bottom of pond), $A_{bot\_pond}$ | 1,883 | $ft^2$ | |
| "Depth" (distance b/w bottom of 10ft shelf and top of sediment) | 6.00 | ft | |
| Average depth calculated | 4.28 | ft | OK |
| Average depth used in SA/DA, $d_{av}$, (Round to nearest 0.5ft) | 4.5 | ft | OK |
| **Drawdown Calculations** | | | |
| Drawdown through orifice? | Y | (Y or N) | |
| Diameter of orifice (if circular) | 1.50 | in | |
| Area of orifice (if-non-circular) | | $in^2$ | |
| Coefficient of discharge ($C_D$) | 0.60 | (unitless) | |
| Driving head ($H_o$) | 0.38 | 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 | 2.76 | $ft^3/sec$ | |
| Post-development 1-yr, 24-hr peak flow | | $ft^3/sec$ | |
| Storage volume discharge rate (through discharge orifice or weir) | 0.04 | $ft^3/sec$ | |
| Storage volume drawdown time | 3.62 | 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 | 4.5 | :1 | OK |
| Trash rack for overflow & orifice? | Y | (Y or N) | OK |
| Freeboard provided | 3.8 | 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: | Pump | | |

Based on impervious area that drains to Infiltration Basin #1 first being treated as grass

Permit Number:_____
*(to be provided by City of Wilmington)*
BMP Drainage Basin #:_____

# 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 1.5 inches.** 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 side slopes 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 City of Wilmington)*
BMP Drainage Basin #:_____

| 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 |
| | The plant community and coverage is significantly (>25%) different from approved landscape plan. | Restore plant vegetation to approved condition. If landscape plan needs to be adjusted to specify vegetation more appropriate for site conditions, contact City Stormwater or Engineering Staff. |
| | Cattails or other invasive plants cover >25% of the veg't shelf. A monculture of plants must be avoided) | Remove all invasives by physical removal or by wiping them with pesticide (do not spray) – consult a professional. |
| | 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. |
| 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. |

Permit Number: _____
*(to be provided by City of Wilmington)*
BMP Drainage Basin #: 1

| BMP element: | Potential problem: | How I will remediate the problem: |
|---|---|---|
| **The main treatment area (continued)** | Algal growth covers over 25% of the area. | Consult a professional to remove and control the algal growth. |
| | Cattails or other invasive plants cover >25% of the veg't shelf. A monculture of plants must be avoided) | Remove all invasives by physical removal or by wiping them with pesticide (do not spray) - consult a professional. |
| **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. |

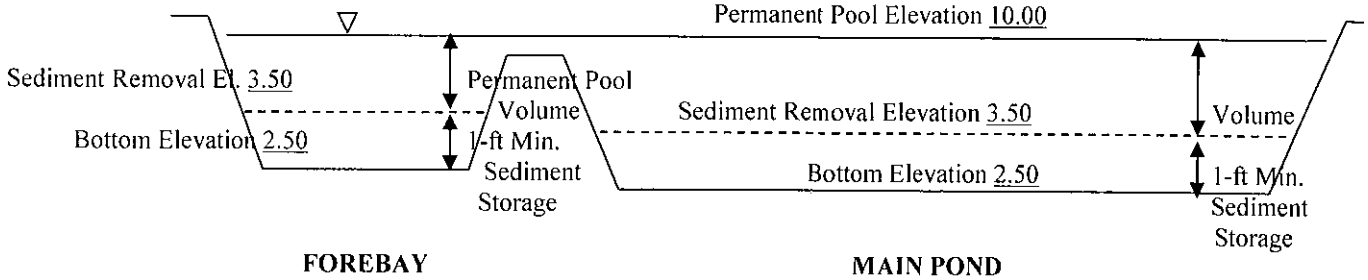
The measuring device used to determine the sediment elevation shall be such that it will give an accurate depth reading and not readily penetrate into accumulated sediments.

When the permanent pool depth reads _6.50_ feet in the main pond, the sediment shall be removed.

When the permanent pool depth reads _6.50_ feet in the forebay, the sediment shall be removed.

## BASIN DIAGRAM

*(fill in the blanks)*



Permit Number: _____
*(to be provided by City of Wilmington)*

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 the City of Wilmington of any problems with the system or prior to any changes to the system or responsible party.

*Project name*: Echo Farm Apartments

*BMP drainage basin number*: 1

Print name: Mark Maynard

Title: Member / Manager

Address: 10 S. Cardinal Drive, Wilmington, NC 28403

Phone: 910-251-5030

Signature: _____

Date: Dec. 14, 2015

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, Mary Douthit, a Notary Public for the State of North Carolina, County of New Hanover, do hereby certify that Mark Maynard personally appeared before me this 14TH day of December, 2015, and acknowledge the due execution of the forgoing wet detention basin maintenance requirements. Witness my hand and official seal, Mary Douthit

MARY DOUTHIT NOTARY PUBLIC NEW HANOVER COUNTY, NC

SEAL

My commission expires 7-1-2020

Permit No._____
*(to be provided by DWQ)*

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM

# INFILTRATION 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 | Echo Farm Apartments |
| Contact Person | Matt Maynard |
| Phone Number | 910-251-5030 |
| Date | 8/22/2016 |
| Drainage Area Number | 2 |

## II. DESIGN INFORMATION

**Site Characteristics**

| | | | |
|---|---|---|---|
| Drainage area | 61,901.00 | $ft^2$ | |
| Impervious area | 21,200.00 | $ft^2$ | |
| Percent impervious | 0.34 | % | |
| Design rainfall depth | 1.50 | in | |

**Peak Flow Calculations**

| | | | |
|---|---|---|---|
| 1-yr, 24-hr rainfall depth | | in | |
| 1-yr, 24-hr intensity | | in/hr | |
| Pre-development 1-yr, 24-hr discharge | | $ft^3$/sec | |
| Post-development 1-yr, 24-hr discharge | | $ft^3$/sec | |
| Pre/Post 1-yr, 24-hr peak flow control | | $ft^3$/sec | |

**Storage Volume: Non-SA Waters**

| | | | |
|---|---|---|---|
| Minimum design volume required | 2,772.00 | $ft^3$ | |
| Design volume provided | 3,367.00 | $ft^3$ | OK for non-SA waters |

**Storage Volume: SA Waters**

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

**Soils Report Summary**

| | | |
|---|---|---|
| Soil type | Kureb & Leon | |
| Infiltration rate | 24.03 | in/hr |
| SHWT elevation | 12.60 | fmsl |

**Basin Design Parameters**

| | | | |
|---|---|---|---|
| Drawdown time | 0.04 | days | OK |
| Basin side slopes | 3.00 | :1 | OK |
| Basin bottom elevation | 15.00 | fmsl | OK |
| Storage elevation | 16.00 | fmsl | |
| Storage Surface Area | 3,817.00 | $ft^2$ | |
| Top elevation | 17.50 | fmsl | |

**Basin Bottom Dimensions**

| | | |
|---|---|---|
| Basin length | 88.06 | ft |
| Basin width | 67.66 | ft |
| Bottom Surface Area | 2,925.00 | $ft^2$ |

Permit No._____
*(to be provided by DWQ)*

**Additional Information**

| | | | |
|---|---|---|---|
| Maximum runoff to each inlet to the basin? | 0.76 | ac-in | OK |
| Length of vegetative filter for overflow | N/A | ft | OK |
| Distance to structure | >15 | ft | OK |
| Distance from surface waters | >30 | ft | OK |
| Distance from water supply well(s) | >100 | ft | OK |
| Separation from impervious soil layer | >2 | ft | OK |
| Naturally occuring soil above shwt | 4.00 | ft | OK |
| Bottom covered with 4-in of clean sand? | Y | (Y or N) | OK |
| Proposed drainage easement provided? | Y | (Y or N) | OK |
| Capures all runoff at ultimate build-out? | Y | (Y or N) | OK |
| Bypass provided for larger storms? | Y | (Y or N) | OK |
| Pretreatment device provided | Catch Basin | | |

Permit Number:_____
*(to be provided by City of Wilmington)*
BMP Drainage Basin #: 2

# Infiltration 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.

Important maintenance procedures:

- The drainage area will be carefully managed to reduce the sediment load to the infiltration basin.
- Immediately after the infiltration basin is established, the vegetation will be watered twice weekly if needed until the plants become established (commonly six weeks).
- No portion of the infiltration basin will be fertilized after the initial fertilization that is required to establish the vegetation.
- The vegetation in and around the basin will be maintained at a height of approximately six inches.

After the infiltration basin is established, it will be inspected **once a quarter and within 24 hours after every storm event greater than 1.5 inches**. Records of operation and maintenance will be kept in a known set location and will 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 infiltration 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. |
| **The inlet device: pipe or swale** | The pipe is clogged (if applicable). | Unclog the pipe. Dispose of the sediment off-site. |
| | The pipe is cracked or otherwise damaged (if applicable). | Replace the pipe. |
| | Erosion is occurring in the swale (if applicable). | 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. |

| BMP element: | Potential problem: | How I will remediate the problem: |
|---|---|---|
| The forebay | Sediment has accumulated and reduced the depth to 75% of the original design 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. |
| | Erosion has occurred or riprap is displaced. | 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 pesticides are used, wipe them on the plants rather than spraying. |
| The main treatment area | A visible layer of sediment has accumulated. | 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. Replace any media that was removed in the process. Revegetate disturbed areas immediately. |
| | Water is standing more than 5 days after a storm event. | Replace the top few inches of filter media and see if this corrects the standing water problem. If so, revegetate immediately. If not, consult an appropriate professional for a more extensive repair. |
| | Weeds and noxious plants are growing in the main treatment area. | Remove the plants by hand or by wiping them with pesticide (do not spray). |
| The embankment | Shrubs or trees have started to grow on the embankment. | Remove shrubs or trees immediately. |
| | An annual inspection by an appropriate professional shows that the embankment needs repair. | 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 NC Division of Water Quality 401 Oversight Unit at 919-733-1786. |

Permit Number: _____
*(to be provided by City of Wilmington)*

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 the City of Wilmington of any problems with the system or prior to any changes to the system or responsible party.

*Project name:* Echo Farm Apartments

*BMP drainage basin number:* 2 (Infiltration Basin #1)

Print name: Mark Maynard

Title: Member / Manager

Address: 10 S. Cardinal Drive, Wilmington, NC 28403

Phone: 910-251-5030

Signature: [signature]

Date: Dec. 14, 2015

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, Mary Douthit, a Notary Public for the State of North Carolina, County of New Hanover, do hereby certify that Mark Maynard personally appeared before me this 14TH day of December, 2015, and acknowledge the due execution of the forgoing infiltration basin maintenance requirements. Witness my hand and official seal,

Mary Douthit

MARY DOUTHIT NOTARY PUBLIC NEW HANOVER COUNTY, NC

SEAL

My commission expires 7-1-2020

Permit No._____
*(to be provided by DWQ)*

NCDENR

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM

# PERMEABLE PAVEMENT SUPPLEMENT

*This form must be completely 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 | Echo Farm Apartments |
| Contact Person | Matt Maynard |
| Phone Number | 910-251-5030 |
| Date | 10/26/2015 |
| Drainage Area | 3 |

## II. DESIGN INFORMATION

### Soils Report Summary

| | | |
|---|---|---|
| Hydrologic soil group (HSG) of subgrade | A | |
| Infiltration rate | 20.32 | in/hr |

### Pavement Design Summary

| | | | |
|---|---|---|---|
| Permeable Pavement (PP) design type | Infiltration - HSG A/B | | |
| SA of PP being proposed ($A_p$) | 18,210 | $ft^2$ | |
| Resulting BUA counted as impervious for main application form | 4,553 | $ft^2$ | |
| Adjacent BUA directed to PP ($A_c$) | 17,968 | $ft^2$ | OK |
| Ratio of $A_c$ to $A_p$ | 0.99 | (unitless) | |
| Flow from pervious surfaces is directed away from PP? | Yes | | OK |
| Design rainfall depth | 1.5" | in | |
| Permeable pavement surface course type | PC | | |
| Layer 1 - Washed aggregate size *(ex. No. 57)* | No. 57 stone | | |
| Layer 1 - Aggregate porosity (n) | 0.40 | (unitless) | OK |
| Layer 2 - Washed aggregate size *(ex. No. 57)* | | | |
| Layer 2 - Aggregate porosity (n) | | (unitless) | |
| Minimum total aggregate depth for design rainfall ($D_{wq}$) | 7.5 | in | |
| Drawdown/infiltration time for $D_{wq}$ | 0.0 | days | OK |
| How is 10-yr, 24-hr storm handled? | infiltrated | | |
| Aggregate depth to infiltrate 10-yr, 24-hr storm ($D_{10}$) | -210.5 | in | |
| Drawdown/infiltration time of 10-yr, 24-hr storm | 0.14 | days | |
| Actual provided total aggregate depth | 8.5 | in | OK |
| Top of aggregate base layer elevation | 23.51, 24.35, 25.88 | fmsl | |
| Storage elevation of design rainfall depth | 23.43, 24.27, 25.80 | fmsl | |
| Overflow elevation | 24.01, 24.85, 26.38 | fmsl | |
| Bottom elevation at subgrade | 22.80, 23.64, 25.17 | fmsl | |
| SHWT elevation | 21.48, 22.21, 24.17 | fmsl | |
| Underdrain diameter | | in | |

BUA Credit for Permeable Pavement Footprint:
**75% BUA Credit**

NORTH CAROLINA PROFESSIONAL SEAL 036232 ENGINEER AUSTIN C. BISHOP
12-14-15

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Permit No._____
*(to be provided by DWQ)*

**Detention Systems** *(skip for infiltration systems)*

| | | |
|---|---|---|
| Diameter of orifice | _____ | in |
| Coefficient of discharge ($C_D$) | _____ | (unitless) |
| Driving head ($H_o$) | _____ | ft |
| Storage volume discharge rate (through discharge orifice) | _____ | $ft^3$/sec |
| Storage volume drawdown time | _____ | days |
| Pre-development 1-yr, 24-hr peak flow | _____ | $ft^3$/sec |
| Post-development 1-yr, 24-hr peak flow | _____ | $ft^3$/sec |

**Additional Information**

| | | | |
|---|---|---|---|
| Slope of soil subgrade at bottom of permeable pavement | 0.00 | % | OK |
| Slope of the permeable pavement surface | 6.00 | % | OK |
| Construction sequence minimizes compaction to soils? | Yes | | OK |
| Subsoil preparation specified (must select one) | scarified | | |
| Meets industry standards for structural requirements? | | | OK |
| Washed stone is specified for the aggregate? | Yes | | OK |
| Required signage specified on plans? | Yes | | OK |
| Number of observation wells provided | 4 | | OK |
| Distance to structure | 15.00 | ft | |
| Distance to surface waters | >30 | ft | OK |
| Distance to water supply well(s) | >100 | ft | OK |

## Permeable Pavement

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. | Version 1.0 |
|---|---|---|
| JCB | 9, 10 | 1. Plans (1" = 50' or larger) of the entire site showing:<br>- Design at ultimate build-out,<br>- Location of permeable pavement,<br>- Roof and other surface flow directed away from permeable pavement, |
| JCB | 13 | 2. Section view of the permeable pavement (1" = 20' or larger) showing:<br>- Layers, and<br>- SHWT |
| JCB | see soils report | 3. 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. |
| JCB | 13 | 4. A construction sequence that shows how the permeable pavement will be protected from sediment until the entire drainage area is stabilized. |
| JCB | see calcs | 5. The supporting calculations. |
| JCB | see O+M Agreement | 6. A copy of the signed and notarized operation and maintenance (O&M) agreement. |
| N/A | | 7. A copy of the deed restrictions (if required). |
| JCB | 13 | 8. Installation must be at a slope of 0.5% or less. |

**Example #1**

Project is a lot with a maximum allowed BUA of 5,000 sq. ft. that drains to class SC waters.
Project proposes a 1,000 sq. ft. permeable concrete driveway with a 6" gravel base.
Managed grass factor = 0.6
1000 x 0.6 = 600 square feet is counted as managed grass.
1000 - 600 = 400 square feet is counted as built-upon area.
5000 - 400 = 4,600 square feet available for house and other BUA.

**Example #2**

Project is a high density commercial site with a 5,000 square foot parking lot.
Project is within 1/2 mile of and draining to SA waters. An infiltration system is proposed.
The parking lot will handle <100 cars per day and is a flexible pavement with a 4" gravel base.
Managed grass factor is one half of 0.4. = 0.2
5000 x 0.2 = 1000 square feet is counted as managed grass.
5000 - 1000 = 4,000 square is counted as impervious.
The total BUA used to calculate the minimum volume draining to the infiltration system can be reduced by 1,000 square feet.

Permit No._____
*(to be provided by DWQ)*

NCDENR

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM

# PERMEABLE PAVEMENT SUPPLEMENT

*This form must be completely 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 | Echo Farm Apartments |
| Contact Person | Matt Maynard |
| Phone Number | 910-251-5030 |
| Date | 10/26/2015 |
| Drainage Area | 4 |

## II. DESIGN INFORMATION

### Soils Report Summary

| | | |
|---|---|---|
| Hydrologic soil group (HSG) of subgrade | A | |
| Infiltration rate | 18.50 | in/hr |

### Pavement Design Summary

BUA Credit for Permeable Pavement Footprint:
**75% BUA Credit**

| | | | |
|---|---|---|---|
| Permeable Pavement (PP) design type | Infiltration - HSG A/B | | |
| SA of PP being proposed ($A_p$) | 16,194 | $ft^2$ | |
| Resulting BUA counted as impervious for main application form | 4,049 | $ft^2$ | |
| Adjacent BUA directed to PP ($A_c$) | 13,688 | $ft^2$ | OK |
| Ratio of $A_c$ to $A_p$ | 0.85 | (unitless) | ✓ |
| Flow from pervious surfaces is directed away from PP? | Yes | | OK |
| Design rainfall depth | 1.5" | in | |
| Permeable pavement surface course type | PC | | |
| Layer 1 - Washed aggregate size *(ex. No. 57)* | No. 57 stone | | |
| Layer 1 - Aggregate porosity (n) | | (unitless) | |
| Layer 2 - Washed aggregate size *(ex. No. 57)* | | | |
| Layer 2 - Aggregate porosity (n) | | (unitless) | |
| Minimum total aggregate depth for design rainfall ($D_{wq}$) | 6.9 | in | |
| Drawdown/infiltration time for $D_{wq}$ | 0.03 | days | OK |
| How is 10-yr, 24-hr storm handled? | infiltrated | | |
| Aggregate depth to infiltrate 10-yr, 24-hr storm ($D_{10}$) | -191.0 | in | |
| Drawdown/infiltration time of 10-yr, 24-hr storm | 0.14 | days | |
| Actual provided total aggregate depth | 7.8 | in | OK |
| Top of aggregate base layer elevation | 26.50, 27.03 | fmsl | |
| Storage elevation of design rainfall depth | 26.43, 26.96 | fmsl | |
| Overflow elevation | 27.0, 27.53 | fmsl | |
| Bottom elevation at subgrade | 25.85, 26.38 | fmsl | |
| SHWT elevation | 24.40 | fmsl | |
| Underdrain diameter | | in | |

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 036232 JUSTIN C. BISHOP 12-14-15

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Permit No._____
*(to be provided by DWQ)*

**Detention Systems** *(skip for infiltration systems)*

| | | | |
|---|---|---|---|
| Diameter of orifice | | in | |
| Coefficient of discharge ($C_D$) | | (unitless) | |
| Driving head ($H_o$) | | ft | |
| Storage volume discharge rate (through discharge orifice) | | $ft^3$/sec | |
| Storage volume drawdown time | | days | |
| Pre-development 1-yr, 24-hr peak flow | | $ft^3$/sec | |
| Post-development 1-yr, 24-hr peak flow | | $ft^3$/sec | |

**Additional Information**

| | | | |
|---|---|---|---|
| Slope of soil subgrade at bottom of permeable pavement | 0.00 | % | OK |
| Slope of the permeable pavement surface | 4.09 | % | OK |
| Construction sequence minimizes compaction to soils? | Yes | | OK |
| Subsoil preparation specified (must select one) | scarified | | |
| Meets industry standards for structural requirements? | | | OK |
| Washed stone is specified for the aggregate? | Yes | | OK |
| Required signage specified on plans? | Yes | | OK |
| Number of observation wells provided | 3 | | OK |
| Distance to structure | 7.66 | ft | |
| Distance to surface waters | >30 | ft | OK |
| Distance to water supply well(s) | >100 | ft | OK |

## Permeable Pavement

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. | Version 1.0 |
|---|---|---|
| JCB | 9, 10 | 1. Plans (1" = 50' or larger) of the entire site showing:<br>- Design at ultimate build-out,<br>- Location of permeable pavement,<br>- Roof and other surface flow directed away from permeable pavement, |
| JCB | 13 | 2. Section view of the permeable pavement (1" = 20' or larger) showing:<br>- Layers, and<br>- SHWT |
| JCB | see soils report | 3. 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. |
| JCB | 13 | 4. A construction sequence that shows how the permeable pavement will be protected from sediment until the entire drainage area is stabilized. |
| JCB | see calcs | 5. The supporting calculations. |
| JCB | see O + M Agreement | 6. A copy of the signed and notarized operation and maintenance (O&M) agreement. |
| N/A | | 7. A copy of the deed restrictions (if required). |
| JCB | 13 | 8. Installation must be at a slope of 0.5% or less. |

**Example #1**

Project is a lot with a maximum allowed BUA of 5,000 sq. ft. that drains to class SC waters.
Project proposes a 1,000 sq. ft. permeable concrete driveway with a 6" gravel base.
Managed grass factor = 0.6
1000 x 0.6 = 600 square feet is counted as managed grass.
1000 - 600 = 400 square feet is counted as built-upon area.
5000 - 400 = 4,600 square feet available for house and other BUA.

**Example #2**

Project is a high density commercial site with a 5,000 square foot parking lot.
Project is within 1/2 mile of and draining to SA waters. An infiltration system is proposed.
The parking lot will handle <100 cars per day and is a flexible pavement with a 4" gravel base.
Managed grass factor is one half of 0.4. = 0.2
5000 x 0.2 = 1000 square feet is counted as managed grass.
5000 - 1000 = 4,000 square is counted as impervious.
The total BUA used to calculate the minimum volume draining to the infiltration system can be reduced by 1,000 square feet.

Permit No._____
*(to be provided by DWQ)*

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM

# PERMEABLE PAVEMENT SUPPLEMENT

*This form must be completely 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 | Echo Farm Apartments |
| Contact Person | Matt Maynard |
| Phone Number | 910-251-5030 |
| Date | 10/26/2015 |
| Drainage Area | 5 |

## II. DESIGN INFORMATION

### Soils Report Summary

| | | |
|---|---|---|
| Hydrologic soil group (HSG) of subgrade | A | |
| Infiltration rate | 12.94 | in/hr |

### Pavement Design Summary

BUA Credit for Permeable Pavement Footprint:
**75% BUA Credit**

| | | | |
|---|---|---|---|
| Permeable Pavement (PP) design type | Infiltration - HSG A/B | | |
| SA of PP being proposed ($A_p$) | 8,935 | $ft^2$ | |
| Resulting BUA counted as impervious for main application form | 2,234 | $ft^2$ | |
| Adjacent BUA directed to PP ($A_c$) | 8,778 | $ft^2$ | OK |
| Ratio of $A_c$ to $A_p$ | 0.98 | (unitless) | |
| Flow from pervious surfaces is directed away from PP? | Yes | | OK |
| Design rainfall depth | 1.5" | in | |
| Permeable pavement surface course type | PC | | |
| Layer 1 - Washed aggregate size *(ex. No. 57)* | No. 57 stone | | |
| Layer 1 - Aggregate porosity (n) | | (unitless) | |
| Layer 2 - Washed aggregate size *(ex. No. 57)* | | | |
| Layer 2 - Aggregate porosity (n) | | (unitless) | |
| Minimum total aggregate depth for design rainfall ($D_{wq}$) | 7.4 | in | |
| Drawdown/infiltration time for $D_{wq}$ | 0.1 | days | OK |
| How is 10-yr, 24-hr storm handled? | bypassed | | Underdrain Required |
| Aggregate depth to infiltrate 10-yr, 24-hr storm ($D_{10}$) | | in | |
| Drawdown/infiltration time of 10-yr, 24-hr storm | | days | |
| Actual provided total aggregate depth | 8.5 | in | OK |
| Top of aggregate base layer elevation | 26.68 | fmsl | |
| Storage elevation of design rainfall depth | 26.59 | fmsl | |
| Overflow elevation | 27.18 | fmsl | |
| Bottom elevation at subgrade | 25.97 | fmsl | |
| SHWT elevation | 23.97 | fmsl | |
| Underdrain diameter | | in | |

NORTH CAROLINA PROFESSIONAL SEAL 036232 ENGINEER JUSTIN C. BISHOP 12-14-15

#REF!

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Permit No._____
*(to be provided by DWQ)*

**Detention Systems** *(skip for infiltration systems)*

| | | | |
|---|---|---|---|
| Diameter of orifice | | in | |
| Coefficient of discharge ($C_D$) | | (unitless) | |
| Driving head ($H_o$) | | ft | |
| Storage volume discharge rate (through discharge orifice) | | $ft^3$/sec | |
| Storage volume drawdown time | | days | |
| Pre-development 1-yr, 24-hr peak flow | | $ft^3$/sec | |
| Post-development 1-yr, 24-hr peak flow | | $ft^3$/sec | |

**Additional Information**

| | | | |
|---|---|---|---|
| Slope of soil subgrade at bottom of permeable pavement | 0.00 | % | OK |
| Slope of the permeable pavement surface | 1.04 | % | OK |
| Construction sequence minimizes compaction to soils? | Yes | | OK |
| Subsoil preparation specified (must select one) | scarified | | |
| Meets industry standards for structural requirements? | | | OK |
| Washed stone is specified for the aggregate? | Yes | | OK |
| Required signage specified on plans? | Yes | | OK |
| Number of observation wells provided | 1 | | OK |
| Distance to structure | 7.66 | ft | |
| Distance to surface waters | >30 | ft | OK |
| Distance to water supply well(s) | >100 | ft | OK |

## Permeable Pavement

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. | Version 1.0 |
|---|---|---|
| JCB | 9, 10 | 1. Plans (1" = 50' or larger) of the entire site showing:<br>- Design at ultimate build-out,<br>- Location of permeable pavement,<br>- Roof and other surface flow directed away from permeable pavement, |
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| JCB | see calcs | 5. The supporting calculations. |
| JCB | see O+M Agreement | 6. A copy of the signed and notarized operation and maintenance (O&M) agreement. |
| N/A | | 7. A copy of the deed restrictions (if required). |
| JCB | 13 | 8. Installation must be at a slope of 0.5% or less. |

**Example #1**

Project is a lot with a maximum allowed BUA of 5,000 sq. ft. that drains to class SC waters.
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Managed grass factor = 0.6
1000 x 0.6 = 600 square feet is counted as managed grass.
1000 - 600 = 400 square feet is counted as built-upon area.
5000 - 400 = 4,600 square feet available for house and other BUA.

**Example #2**

Project is a high density commercial site with a 5,000 square foot parking lot.
Project is within 1/2 mile of and draining to SA waters. An infiltration system is proposed.
The parking lot will handle <100 cars per day and is a flexible pavement with a 4" gravel base.
Managed grass factor is one half of 0.4. = 0.2
5000 x 0.2 = 1000 square feet is counted as managed grass.
5000 - 1000 = 4,000 square is counted as impervious.
The total BUA used to calculate the minimum volume draining to the infiltration system can be reduced by 1,000 square feet.

Permit Number:_____
*(to be provided by City of Wilmington)*
Drainage Area / Lot Number: 3, 4, + 5

# Permeable Pavement 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.

Important operation and maintenance procedures:

- Stable groundcover will be maintained in the drainage area to reduce the sediment load to the permeable pavement.
- The area around the perimeter of the permeable pavement will be stabilized and mowed, with clippings removed.
- Any weeds that grow in the permeable pavement will be sprayed with pesticide immediately. Weeds will not be pulled, since this could damage the fill media.
- Once a year, the permeable pavement surface will be vacuum swept.
- At no time shall wet sweeping (moistening followed by sweeping) be allowed as a means of maintenance.
- There shall be no repair or treatment of Permeable Pavement surfaces with other types of pavement surfaces. All repairs to Permeable Pavement surfaces must be accomplished utilizing permeable pavement which meets the original pavement specifications.
- Concentrated runoff from roof drains, piping, swales or other point sources, directly onto the permeable pavement surface shall not be allowed. These areas must be diverted away from the permeable pavement.

**Initial Inspection**: Permeable Pavements shall be inspected monthly for the first three months for the following:

| BMP element: | Potential problem: | How to remediate the problem: |
|---|---|---|
| **The perimeter of the permeable pavement** | Areas of bare soil and/or erosive gullies have formed. | In the event that rutting or failure of the groundcover occurs, the eroded area shall be repaired immediately and permanent groundcover re-established. Appropriate temporary Erosion Control measures (such as silt fence) shall be installed in the affected area during the establishment of permanent groundcover, and any impacted area of permeable pavement is to be cleaned via vacuum sweeping. |
| **The surface of the permeable pavement** | Rutting / uneven settlement | This indicates inadequate compaction of the pavement base / sub-base. If rutting or uneven settlement on the order of ½ inch or greater occurs, permeable pavement shall be removed and base / sub-base re-compacted, smoothed, and permeable pavement shall then be re-installed. Base and sub-base compaction shall be monitored by a licensed geotechnical engineer to ensure that infiltration capacity of base and sub-base are not compromised by compaction and smoothing processes. |
| | The pavement does not dewater between storms, or water is running off. | Vacuum sweep the pavement. If the pavement still does not dewater, consult a professional. |

Permit Number:_____
*(to be provided by City of Wilmington)*
Drainage Area / Lot Number: 3, 4, & 5

The permeable pavement will be inspected **once a quarter and within 24 hours after every storm event greater than 1.5 inches**. Records of operation and maintenance will be kept in a known set location and will 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 to remediate the problem: |
|---|---|---|
| **The perimeter of the permeable pavement** | 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 3 to 6 inches (remove clippings). |
| **The surface of the permeable pavement** | Trash/debris is present. | Remove the trash/debris. |
| | Weeds are growing on the surface of the permeable pavement. | Do not pull the weeds (may pull out media as well). Spray them with pesticide. |
| | Sediment is present on the surface. | Vacuum sweep the pavement. |
| | The structure is deteriorating or damaged. | Consult an appropriate professional. Damaged areas of the pavement shall be removed and repaired. |
| | The pavement does not dewater between storms. | Vacuum sweep the pavement. If the pavement still does not dewater, consult a professional. Permanently clogged pavement shall be removed and repaired. |

Permit Number:_____
*(to be provided by City of Wilmington)*

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 City of Wilmington of any problems with the system or prior to any changes to the system or responsible party.

*Project name*: Echo Farm Apartments

*BMP drainage area or lot number*: 3, 4, & 5 (Permeable Pavement Systems #1, #2, #3)

Print name: Mark Maynard

Title: Member / Manager

Address: 10 S. Cardinal Drive, Wilmington, NC 28403

Phone: 910-251-5030

Signature: _____

Date: Dec. 14, 2015

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, Mary Douthit, a Notary Public for the State of North Carolina, County of New Hanover, do hereby certify that Mark Maynard personally appeared before me this 14TH day of December, 2015, and acknowledge the due execution of the forgoing permeable pavement maintenance requirements. Witness my hand and official seal, Mary Douthit

SEAL
MARY DOUTHIT
NOTARY
PUBLIC
NEW HANOVER COUNTY, NC

My commission expires 7-1-2020