

E-1. Low Density Projects



Design Objective

Low density projects are not required to be equipped with Stormwater Control Measures (SCMs) in exchange for limiting their built-upon area, maximizing dispersed flow and ensuring that stormwater conveyances are vegetated. These strategies protect the hydrology of the receiving stream, prevent erosion, and remove pollutants through infiltration.

The general requirements for low density projects are covered in in **Rule 15A NCAC 02H .1003(2)**, and the specific built-upon area limit for low density are set forth in the stormwater program to which they are subject. For example, a project subject to NPDES MS4 and Urbanizing Areas Rule 15A NCAC 02H .1017 would need to meet the requirements for dispersed flow, vegetated conveyances, curb outlet systems, AND contain no more than 24% built-upon area or 2 dwelling units/acre in order to be considered a low density project. The built-upon area limits vary by stormwater program.

Important Links

15A NCAC 2H .1002 – [Definitions](#)

N.C.G.S.143-214.7(b2) – [Built-Upon Area Definition](#)

15A NCAC 2H .1003(2) – [Design Requirements for Low Density Projects](#)

15A NCAC 2H .1040(4)(a) – [Permit Administration](#)

15A NCAC 2H .1003(1): CALCULATION OF PROJECT DENSITY. The following requirements shall apply to the calculation of project density:

- (a) Project density shall be calculated as the total built-upon area divided by the total project area;
- (b) A project with existing development may use the calculation method in Sub-Item (1)(a) or shall have the option of calculating project density as the difference of total built-upon area minus existing built-upon area divided by the difference of total project area minus existing built-upon area;
- (c) Total project area shall exclude the following:
 - (i) areas below the Normal High Water Line (NHWL); and
 - (ii) areas defined as "coastal wetlands" pursuant to 15A NCAC 07H .0205, herein incorporated by reference, including any subsequent amendments and editions, and may be accessed at no cost at <http://reports.oah.state.nc.us/ncac.asp> as measured landward from the Normal High Water (NHW) line; and
- (d) On a case-by-case basis as determined by the Division during application review, projects may be considered to have both high and low density areas based on one or more of the following criteria:
 - (i) natural drainage area boundaries;
 - (ii) variations in land use throughout the project; and
 - (iii) construction phasing.

“Project” means the proposed development activity for which an applicant is seeking a stormwater permit from the state or other entity in accordance with this Section. “Project” shall exclude any land adjacent to the area disturbed by the project that has been counted as pervious by any other development regulated under a federal, State, or local stormwater regulation. Owners and developers of large developments consisting of many linked projects may consider developing a master plan that illustrates how each project fits into the design of the large development. [15A NCAC 2H .1002(38)]

It is up to the applicant to determine what the project boundary shall be for a given application. However, when a project is part of a larger **“common plan of development”** will be permitted per the density of the larger common plan of development. It is also possible, on a case-by-case basis, for the state to permit a project that is partially high and partially low density. It is up to the applicant to propose how such a project will be designed and maintained.

“Common plan of development” means a site where multiple and distinct development activities may be taking place at different times on different schedules but governed by a single development plan regardless of ownership of the parcels. Information that may be used to determine a “common plan of development” include plats, blueprints, marketing plans, contracts, building permits, public notices of hearings, zoning requests, and infrastructure development plans. [15A NCAC 2H .1002(8)]

N.C.G.S.143-214.7(b2): For purposes of implementing stormwater programs, "**built-upon area**" means impervious surface and partially impervious surface to the extent that the partially impervious surface does not allow water to infiltrate through the surface and into the subsoil. "Built-upon area" does not include:

- a slatted deck;
- the water area of a swimming pool;
- a surface of number 57 stone, as designated by the American Society for Testing and Materials, laid at least four inches thick over a geotextile fabric;
- a trail as defined in G.S. 113A-85 that is either unpaved or paved as long as the pavement is porous with a hydraulic conductivity greater than 0.001 centimeters per second (1.41 inches per hour); or
- landscaping material, including, but not limited to, gravel, mulch, sand, and vegetation, placed on areas that receive pedestrian or bicycle traffic or on portions of driveways and parking areas that will not be compacted by the weight of a vehicle, such as the area between sections of pavement that support the weight of a vehicle.

The owner or developer of a property may opt out of any of the exemptions from "built-upon area" set out in this subsection.

NOTE: The above definition of "built-upon area" applies only to state stormwater programs.

Some additional guidance on using #57 stone in accordance with the statute is as follows:

- The #57 stone may not be mixed with other aggregate material;
- "**Geotextile fabric**" means a permeable geosynthetic comprised solely of non-biodegradable textiles. [15A NCAC 2H .1002(19)]
- The #57 stone and geotextile fabric may not be placed on top of an impervious material, such as crusher run or asphalt;
- The #57 stone area may not use an underdrain system that discharges without treatment; and
- The soil on which the 57 stone will be placed (subgrade) should not be mechanically compacted prior to installation; however, the statute does not prohibit this.

Figure 1: Number 57 Stone



Although #57 stone laid on geotextile fabric and trails that meet the minimum hydraulic conductivity standard are not considered built-upon area to determine whether a project is high density or low density, these areas shall be accounted for in the design of SCMs required in high density projects. Per 15A NCAC 02H .1050, SCMs shall be sized to account for runoff from all surfaces draining to the system unless the applicant can demonstrate that those areas will not produce stormwater runoff. The requirement to account for runoff from all surfaces for purposes of SCM sizing is consistent with rule 15A NCAC 2H .1003(3).

Any size stone or aggregate used on portions of projects that do not receive regular vehicular traffic may be counted as pervious regardless of the depth of the stone layer. This includes applications such as decorative landscaping, drainage areas, and weed control (such as at electrical substations).

Any surfaces that do not meet one of the five exemptions to built-upon area that are called out in N.C.G.S.143-214.7(b2) have the option of demonstrating to the permitting authority that they do allow an adequate level of stormwater infiltration to be considered pervious or partially pervious. the applicant shall provide technical justification based on engineering calculations and the results of research studies showing that the proposed surface provides equal or better infiltration rates as the surrounding pervious surfaces and that it shall function in perpetuity.

Also, permeable pavement that is designed to infiltrate per 15A NCAC 02H .1055 (MDC for Permeable Pavement) shall be considered 100% pervious.

15A NCAC 2H .1003(2)(a): DENSITY THRESHOLDS. Low density projects shall not exceed the low-density development thresholds set forth in the stormwater programs to which they are subject pursuant to Rules .1017, .1019, and .1021 of this Section. For projects subject to the requirements for Non-Coastal High Quality Waters and Outstanding Resource Waters, dwelling unit per acre may be used instead of density to establish low density status for single-family detached residential development as set forth in Rule .1021 in this Section.

Table 1: Thresholds for Low Density Projects

Stormwater Program	Maximum Percent BUA for Low Density
MS4 Stormwater	24%
Coastal County – SA	12%
Coastal County – Freshwater ORW	12%
Coastal County – Other	24%
Non-Coastal County – ORW and HQW	12%
Water Supply Watershed	Varies based on WS classification; see 15A NCAC 02H Rules.

If a low-density project is modified such that the low-density threshold is exceeded, then the entire project may become subject to high density stormwater management requirements.

15A NCAC 2H .1003(2)(b): DISPERSED FLOW. Projects shall be designed to maximize dispersed flow through vegetated areas and minimize channelization of flow.

“Dispersed flow” means uniform shallow flow that is conveyed to a vegetated filter strip as defined in Rule .1059 of this Section, another vegetated area, or stormwater control measure. The purpose of “dispersed flow” is to remove pollutants through infiltration and settling, as well as to reduce erosion prior to stormwater reaching surface waters. [15A NCAC 2H .1002(13)]

This Sub-item speaks to the objective of low density development; that is, to replicate the pre-development hydrology and water quality as much as possible by sending stormwater from the BUA on the site to vegetated areas where it will be infiltrated and evapo-transpired rather than being discharged to adjacent waters as surface runoff. It is also recommended that roof drains terminate at the landward edge of the vegetated setback.

15A NCAC 2H .1003(2)(c): VEGETATED CONVEYANCES. Stormwater that cannot be released as dispersed flow shall be transported by vegetated conveyances. A minimal amount of non-vegetated conveyances for erosion protection or piping for driveways or culverts under a road shall be allowed by the permitting authority when it cannot be avoided. Vegetated conveyances shall meet the following requirements:

- (i) Side slopes shall be no steeper than 3:1 (horizontal to vertical) unless it is demonstrated to the permitting authority that the soils and vegetation will remain stable in perpetuity based on engineering calculations and on-site soil investigation; and
- (ii) The conveyance shall be designed so that it does not erode during the peak flow from the 10-year storm as demonstrated by engineering calculations.

“Vegetated conveyance” means a permanent, designed waterway lined with vegetation that is used to convey stormwater runoff at a non-erosive velocity within or away from a developed area. [15A NCAC 2H .1002(52)]

Piping of stormwater is not allowed except the minimum necessary to direct runoff beneath a short run of pavement such as an access road or driveway. Filling in vegetated conveyances (ditches, swales, etc.) after the project is built is strictly prohibited. If a low-density development project is later modified such that stormwater is no longer transported by vegetated conveyances, the entire site may become subject to high density stormwater management requirements.

It is recommended that an operation and maintenance (O&M) plan be provided for vegetated conveyances. The O&M plan should include the following:

- inspection schedule;
- maintenance schedule that includes mowing and maintenance of side slopes in accordance with approved plans; and
- maintenance procedures that shall be taken to return the vegetated conveyance to design specifications if a failure occurs such as for sediment removal, revegetation of side slopes, repair of eroded areas.

O&M plans should be signed by the owner and notarized. It is also recommended that O&M plans be referenced on the project plat.

15A NCAC 2H .1003(2)(d): CURB OUTLET SYSTEMS. Low density projects may use curb and gutter with outlets to convey stormwater to grassed swales or vegetated areas.

Requirements for these curb outlet systems [are] shall be as follows:

- (i) The curb outlets shall be designed such that the swale or vegetated area can carry the peak flow from the 10-year storm at a non-erosive velocity;
- (ii) The longitudinal slope of the swale or vegetated area shall not exceed five percent, except where not practical due to physical constraints. In these cases, devices to slow the rate of runoff and encourage infiltration to reduce pollutant delivery shall be provided;
- (iii) The swale's cross-section shall be trapezoidal with a minimum bottom width of two feet;
- (iv) The side slopes of the swale or vegetated area shall be no steeper than 3:1 (horizontal to vertical);
- (v) The minimum length of the swale or vegetated area shall be 100 feet; and
- (vi) Low density projects may use treatment swales designed pursuant to Rule .1061 of this Section in lieu of the requirements specified in Sub-Item (i) through (v) of this Rule.

“Curb outlet system” means curb and gutter with breaks or other outlets used to convey stormwater runoff to vegetated conveyances or other vegetated areas. [15A NCAC 2H .1002(9)]

Figure 2: Curb break that allows stormwater to run into the vegetated area before it reaches the sewer



REQUIREMENT 15A NCAC 2H .1003(4): VEGETATED SETBACKS. Vegetated setbacks shall be required adjacent to waters as specified in the stormwater rules to which the project is subject pursuant to this Section, in addition to the following requirements applicable to all vegetated setbacks:

- (a) The width of a vegetated setback shall be measured horizontally from the normal pool elevation of impounded structures, from the top of bank of each side of streams or rivers, and from the mean high waterline of tidal waters, perpendicular to the shoreline;
- (b) Vegetated setbacks may be cleared or graded, but shall be replanted and maintained in grass or other vegetation;
- (c) Built-upon area that meets the requirements of G.S. 143-214.7(b2)(2) shall be allowed within the vegetated setback.
- (d) Built-upon area that does not meet the requirements of G.S. 143-214.7(b2)(2) shall be allowed within a vegetated setback when it is not practical to locate the built-upon area elsewhere, the built-upon area within the vegetated setback is minimized, and channelizing runoff from the built-upon area is avoided. Built-upon area within the vegetated setback shall be limited to:
 - (i) Publicly-funded linear projects such as roads, greenways, and sidewalks;
 - (ii) Water Dependent Structures; and
 - (iii) Minimal footprint uses such as poles, signs, utility appurtenances, and security lights.
- (e) Stormwater that has not been treated in an SCM shall not be discharged through a vegetated setback; instead it shall be released at the edge of the vegetated setback and allowed to flow through the setback as dispersed flow.
- (f) Artificial streambank and shoreline stabilization shall not be subject to the requirements of this Item.

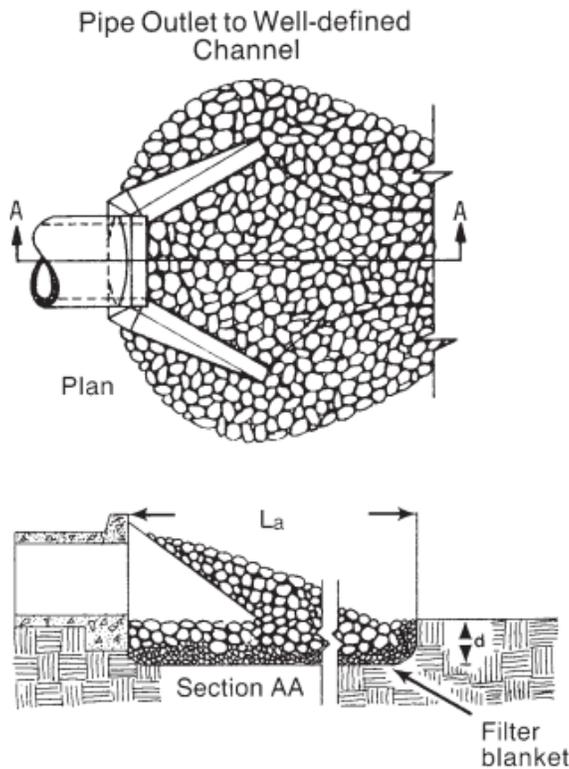
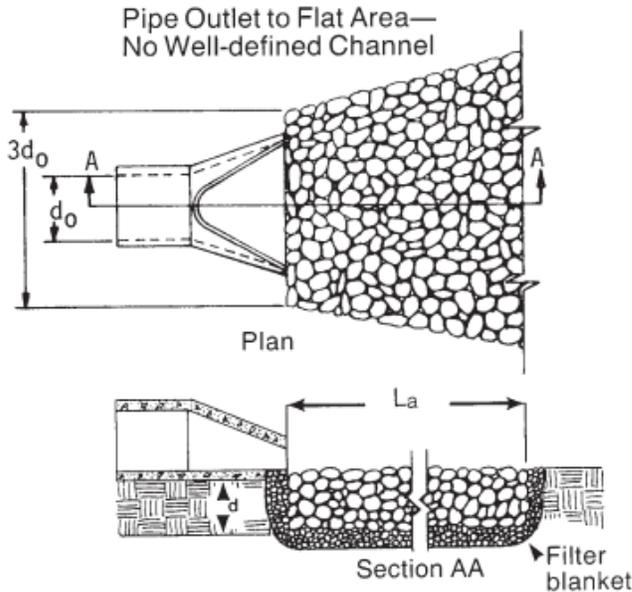
“Vegetated setback” means an area of natural or established vegetation adjacent to surface waters, through which stormwater runoff flows in a diffuse manner to protect surface waters from degradation due to development activities. [15A NCAC 2H .1002(51)]

“Public linear transportation project” means a project consisting of a road, bridge, sidewalk, greenway, or railway that is on a public thoroughfare plan or provides improved access for existing development and that is owned and maintained by a public entity. [15A NCAC 2H .1002(39)]

REQUIREMENT 15A NCAC 2H .1003(5): STORMWATER OUTLETS. Stormwater outlets shall be designed so that they do not cause erosion downslope of the discharge point during the peak flow from the 10-year storm event as shown by engineering calculations.

One resource for designing stormwater outlets that do not cause erosion is Chapter 6 of the [NC Erosion and Sediment Control Planning and Design Manual](#). Some of the relevant information is excerpted below.

Figure 3: Outlet Protection Guidance from the NC Sediment and Erosion Control Manual, 2006, page 6.41.3



Notes

1. L_a is the length of the riprap apron.
2. $d = 1.5$ times the maximum stone diameter but not less than 6".
3. In a well-defined channel extend the apron up the channel banks to an elevation of 6" above the maximum tailwater depth or to the top of the bank, whichever is less.
4. A filter blanket or filter fabric should be installed between the riprap and soil foundation.

Additional guidance on outlet protection from the NC Erosion and Sediment Control Planning and Design Manual is as follows:

1. Ensure that the subgrade for the filter and riprap follows the required lines and grades shown in the plan. Compact any fill required in the subgrade to the density of the surrounding undisturbed material. Low areas in the subgrade on undisturbed soil may also be filled by increasing the riprap thickness.
2. The riprap and gravel filter must conform to the specified grading limits shown on the plans.
3. Filter cloth, when used, must meet design requirements and be properly protected from punching or tearing during installation. Repair any damage by removing the riprap and placing another piece of filter cloth over the damaged area. All connecting joints should overlap so the top layer is above the downstream layer a minimum of 1 foot. If the damage is extensive, replace the entire filter cloth.
4. Riprap may be placed by equipment, but take care to avoid damaging the filter.
5. The minimum thickness of the riprap should be 1.5 times the maximum stone diameter.
6. Riprap may be field stone or rough quarry stone. It should be hard, angular, highly weather-resistant and well graded.
7. Construct the apron on zero grade with no overfill at the end. Make the top of the riprap at the downstream end level with the receiving area or slightly below it.
8. Ensure that the apron is properly aligned with the receiving stream and preferably straight throughout its length. If a curve is needed to fit site conditions, place it in the upper section of the apron.
9. Immediately after construction, stabilize all disturbed areas with vegetation

REQUIREMENT 15A NCAC 2H .1003(7): DEED RESTRICTIONS AND PROTECTIVE COVENANTS. The permittee shall record deed restrictions and protective covenants prior to the issuance of a certificate of occupancy to ensure that projects will be maintained in perpetuity consistent with the plans and specifications approved by the permitting authority. For projects owned by public entities, the permittee shall have the option to incorporate specific restrictions and conditions into a facility management plan or another instrument in lieu of deed restrictions and protective covenants.

Sample deed restriction forms can be found on the [Stormwater Post-Construction Forms web page](#).

REQUIREMENT 15A NCAC 2H .1003(8): COMPLIANCE WITH OTHER REGULATORY PROGRAMS. Project designs shall comply with all other applicable requirements pursuant to G.S. 143-214.1, 143-214.5, 143-214.7, and 143-215.3(a)(1).

The information in this chapter is not an exhaustive summary of the environmental requirements that might apply to a low density development project. Always check applicable local government ordinances as well as other federal and state environmental regulations that might apply such as 404 Permit/401 Water Quality Certification, Riparian Buffer Programs, NPDES Wastewater, Water Supply Watershed Protection Program, etc.

REQUIREMENT 15A NCAC 2H .1040(4)(a): PERMIT ISSUANCE. Stormwater management permits issued for low density projects shall not require permit renewal.

Even though low-density permits issued by DEQ do not require renewal, low density projects may still be subject to inspection to ensure that they continually comply with the approved plans and specifications.