2.0 Ordinances

2.1 Ordinance Summary

Although this Manual applies to all jurisdictions within Mecklenburg County, the requirements of the Post-Construction Ordinances vary by jurisdiction. For the purposes of this manual, the phrase "Post-Construction Ordinance" refers collectively to the ordinances within each jurisdiction named either "Post-Construction Controls Ordinance", "Post-Construction Storm Water Ordinance", "Post-Construction Storm Water Regulations" or "Water Quality (Post-Construction Ordinance)". Within Mecklenburg County, there are eight (8) different jurisdictions including the City of Charlotte, Mecklenburg County, and the Towns of Cornelius, Davidson, Huntersville, Matthews, Mint Hill, and Pineville. Copies of individual ordinances can be obtained from the respective jurisdiction, or alternatively can be found on the Charlotte-Mecklenburg Storm Water Services website.

2.2 Total Phosphorus Mitigation

Total phosphorus mitigation is presented in the Administration Manual.

2.3 Undisturbed Open Space and Natural Area Mitigation

Undisturbed Open Space and Natural Area mitigation is presented in the Administration Manual.

2.4 Density Threshold Determination

The Post-Construction Ordinance contains development standards for each watershed based upon the density of the built-upon areas. The ordinance classifies **low density** developments as developments that contain less than a certain percentage of built-upon area (ranges from 6% to 24%) and **high density** developments as those that exceed this percentage. The following guidelines are meant to help clarify this evaluation.

2.4.1 High Density Determination

For determining if the High Density option of the ordinance applies to a proposed project, an evaluation of the built-upon area (BUA) is required. The formula for the built-upon area percentage is:

$$\text{BUA (\%)} = \frac{\text{Proposed BUA (acres)}}{\text{[Drainage Area On site (acres)} - \text{Existing BUA to Remain (acres)]}} \times 100$$

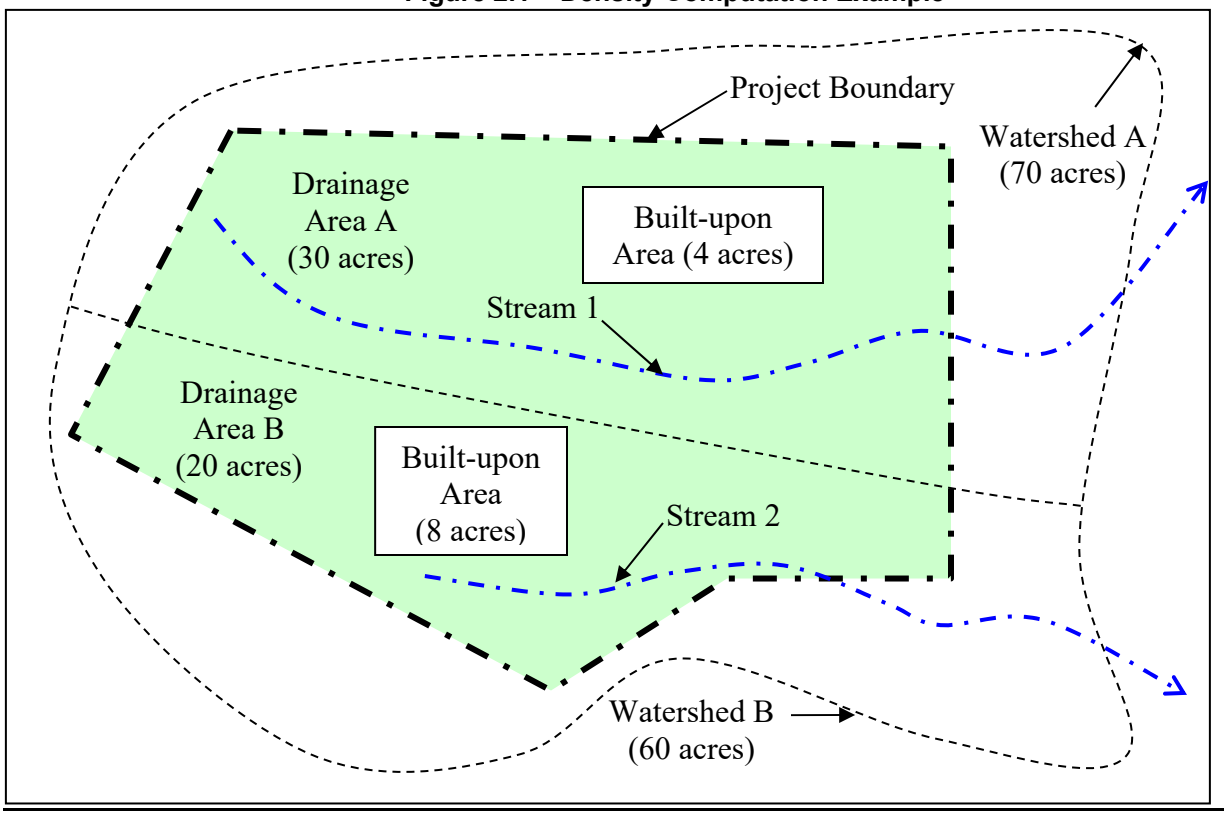
Please note that a single development project may include several drainage areas that will require separate analysis. A drainage area is defined as the project area that drains off the property at a common point (see Section 2.4.2 for details on evaluating these points). Off-site drainage should not be included in the evaluation.

Example

A proposed 50-acre project site has two distinct drainage areas described as follows (refer to Figure 2.1):

- Area A: 30 acres with 4 acres of built-upon area
- Area B: 20 acres with 8 acres of built-upon area

Figure 2.1 Density Computation Example



For this example, the high density threshold is 24%. Calculation of the BUA percentage would be as follows:

%Built-upon Area A = (4 acres) / (30 acres) x 100 = 13.3%

%Built-upon Area B = (8 acres) / (20 acres) x 100 = 40%

Therefore Area A is **Low Density** and Area B is **High Density**.

2.4.2 On-Site Drainage Area Determination

As an initial evaluation, drainage area determinations should be made based upon area (within the project boundary) that drains to a common point. One project submittal could contain multiple drainage areas that need to be evaluated individually. To determine the drainage area(s) of a particular project, locate the point at which a stream or distinct drainage feature (or draw) leaves the property. Any on-site area that drains to that point is considered a distinct drainage area for density calculations. Off-site drainage should not be included in this calculation.

As a second level evaluation, staff may allow distinct drainage areas to be combined into one drainage area for evaluation IF the distinct drainage areas converge together off-site near the project boundary. The determination of "near" the project boundary will need to be confirmed by staff review.

Example
A proposed 50-acre project site has two distinct drainage areas described as follows, but the drainage areas converge together just off-site (refer to Figure 2.2).

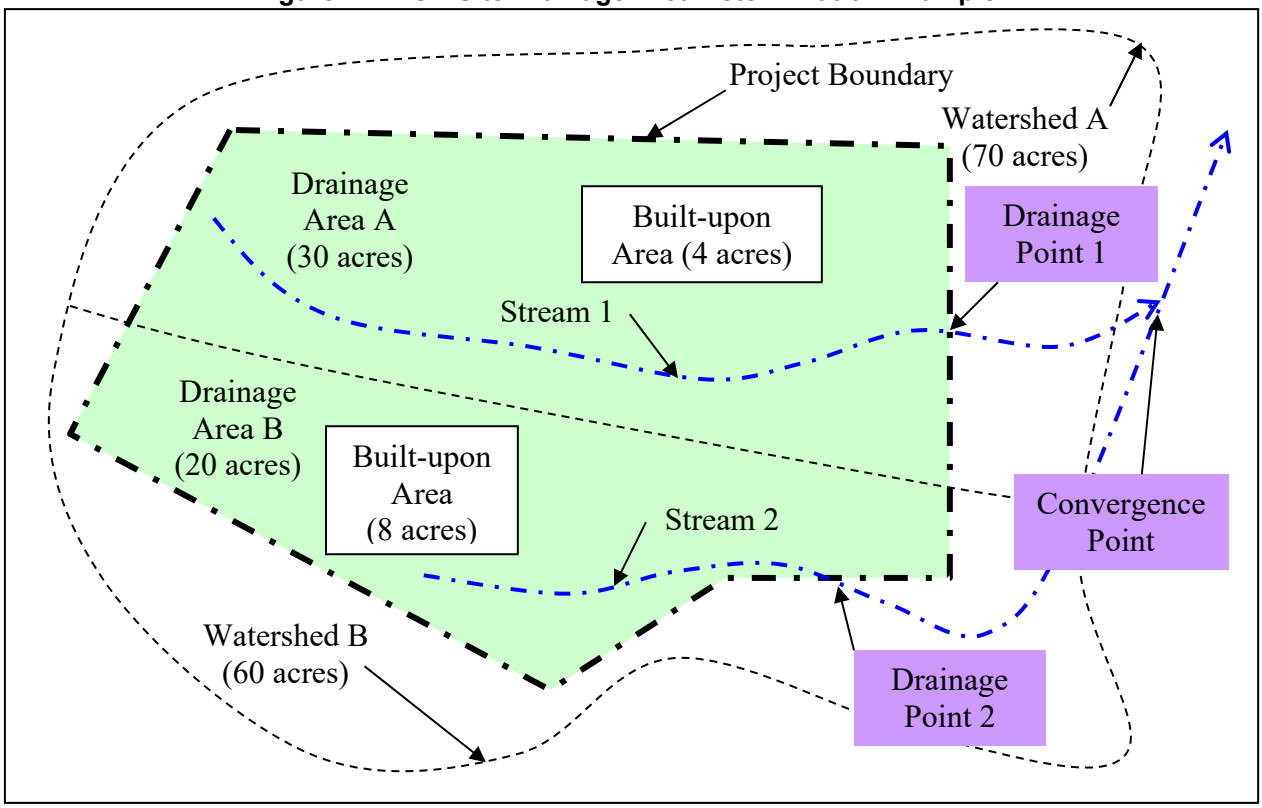
- Area A: 30 acres with 4 acres of built-upon area
- Area B: 20 acres with 8 acres of built-upon area

For the purposes of this example, staff review personnel agree that the drainage areas can be combined since the drainage areas converge together just off-site. The high density threshold is 24%. Calculation of the built-upon area percentage would be as follows:

%Built-upon Area A & B = (4 acres + 8 acres) / (50 acres) x 100 = 24%

Since the built-upon percentage equals 24% (the high density threshold), the entire project site would be considered **High Density.**

Figure 2.2 On-Site Drainage Area Determination Example



2.4.3 Built-Upon Area Cap Determination

Depending upon the jurisdiction, maximum built-upon area limits are required for some of the applications in the Post Construction Ordinance and in Watershed Overlay Ordinances. The built-upon area cap is evaluated based upon a project-wide approach. Drainage discharge points are not part of this calculation. Built-Upon Area caps will be determined by the following formula:

Proposed Built-upon Area (%) = Built-upon Area (acres) / Project Site Area (acres) x 100

Example
A proposed 50-acre site has 12 acres of built-upon area (refer to Figure 2.2). For the purposes of this example, the built-upon area cap is 24%. Calculation of built-upon area for the site would be:

%Built-upon Area = (12 acres) / (50 acres) x 100 = 24%

Even though the one of the drainage areas is above the built-upon area cap, when the site is considered as a whole, the built-upon area cap is not exceeded.

2.4.4 Built-Upon Area Calculations for Redevelopment Projects

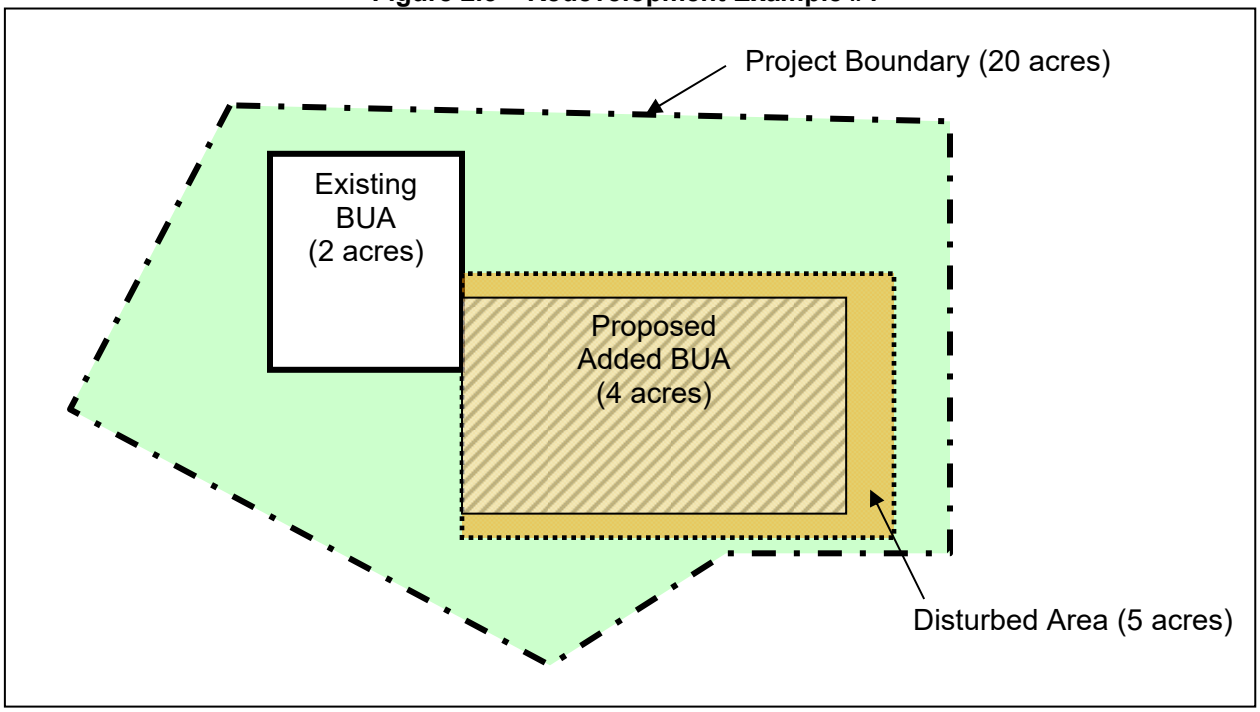
For rebuilding or building activities (including development, redevelopment, and expansions) that occur on a site containing existing built-upon area (BUA), the following examples detail the methodology to be used to calculate the percent built-upon area (% BUA) of a site for the purposes of determining if a project is considered **low density** or **high density**. Additionally, examples of multiple rebuilding projects on the same site are provided. For simplicity, all the various activities are termed as “redevelopment” in this section of the SCM Manual; however, the designer should not confuse redevelopment as used in this section with the regulatory definition of redevelopment provided in the various land development ordinances.

Please note that the examples below are used to determine the % BUA of a site for purposes of determining low density and high density projects and not necessarily for determining applicability of a particular ordinance. For example, some of the Post-Construction Storm Water ordinances within Mecklenburg County are applicable to projects that disturb greater than 0.5 acres of land, regardless of the BUA. Applicability of the various ordinances to each site should be established on a case-by-case basis with the approval of the Storm Water Administrator for that particular jurisdiction.

Example #1:

A proposed 20-acre site is located in a watershed that has a 24% BUA high density threshold. The site has 2 acres of existing BUA that existed prior to the effective ordinance date (refer to Figure 2.3). Redevelopment is proposed to increase the BUA by 4 acres. To complete the project, 5 acres of land will be disturbed.

Figure 2.3 Redevelopment Example #1



The high density threshold is 24% built-upon area (BUA). The % BUA is calculated using the proposed redeveloped BUA over the existing pervious area as follows:

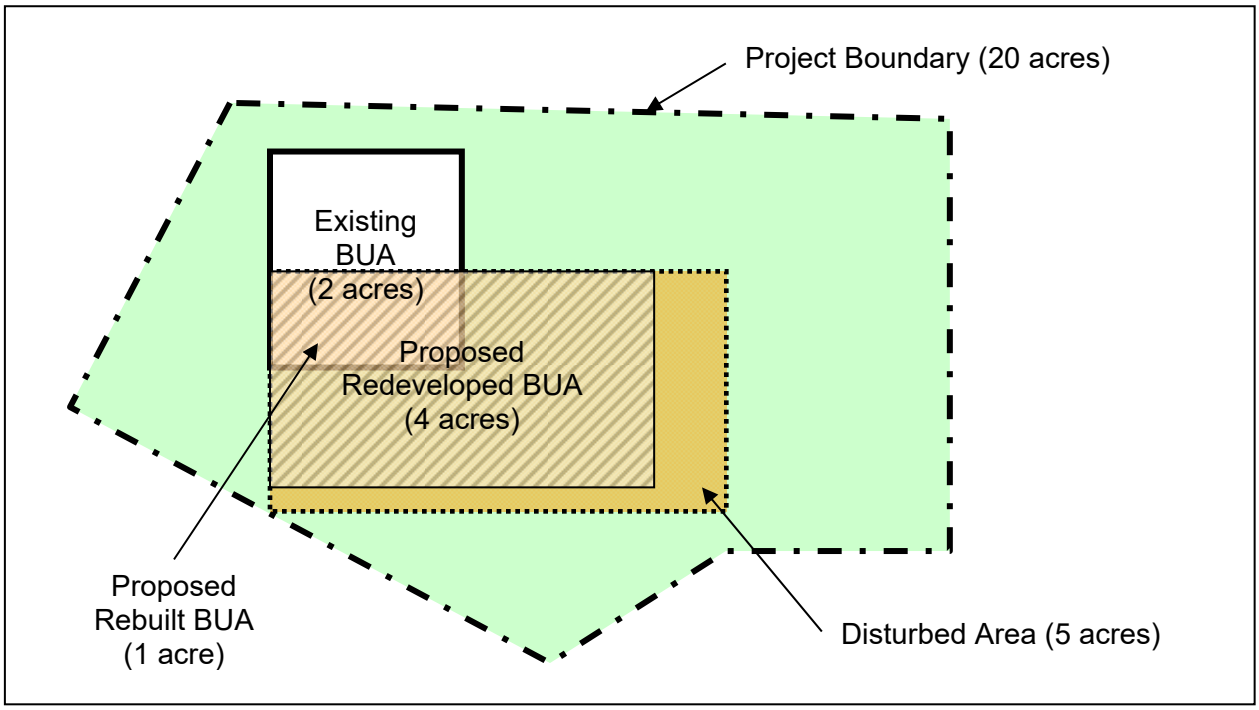
% BUA = [4 acres / (20 acres - 2 acres] x 100 = 22.2% BUA

Since the proposed 22.2% BUA does not exceed 24% BUA, the project is considered **low density.**

Example #2:

A proposed 20-acre site is located in a watershed that has a 24% BUA high density threshold. The site has 2 acres of existing BUA that existed prior to the effective ordinance date (refer to Figure 2.4). Redevelopment is proposed to create 4 acres of BUA, 1 acre of which includes the existing BUA. To complete the project, 5 acres of land will be disturbed.

Figure 2.4 Redevelopment Example #2



The % BUA is calculated using the proposed redeveloped BUA over the existing pervious area as follows:

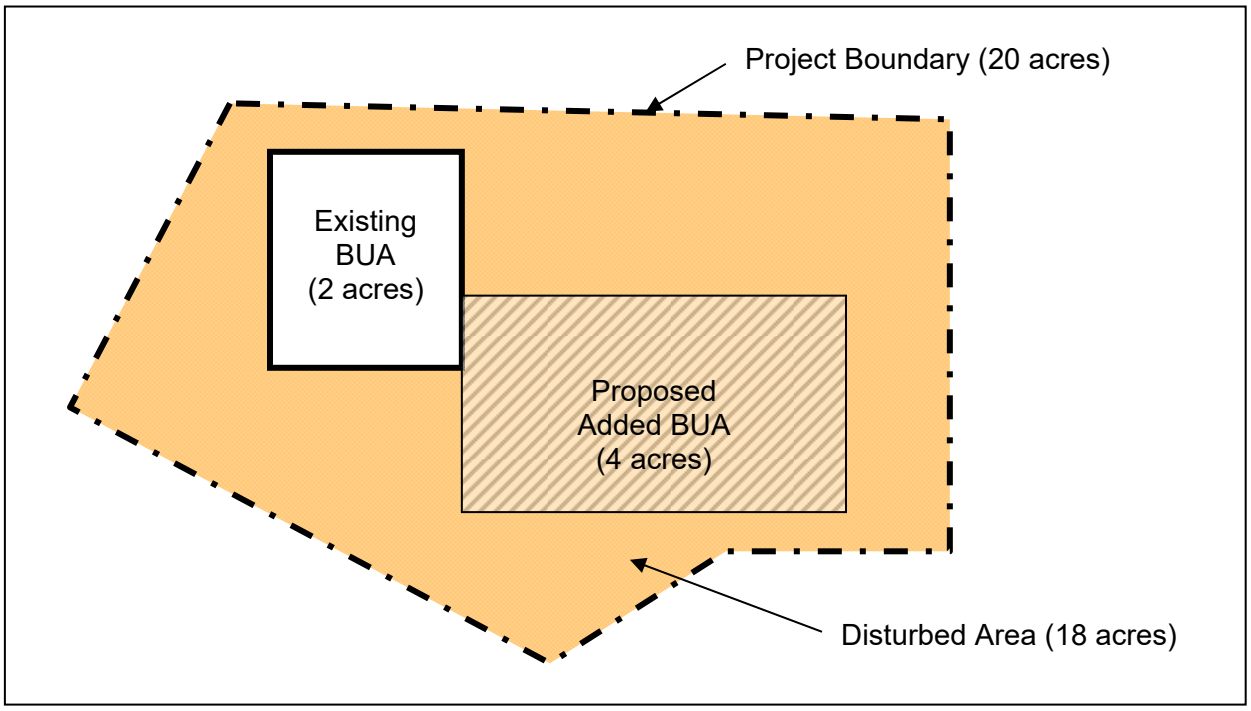
% BUA = [4 acres / (20 acres - 1 acres)] x 100 = 21.1% BUA

Since the proposed 21.1% BUA does not exceed 24% BUA, the project is considered **low density.**

Example #3:

A proposed 20-acre site is located in a watershed that has a 24% BUA high density threshold. The site has 2 acres of existing BUA that existed prior to the effective ordinance date (refer to Figure 2.5). Redevelopment is proposed to increase the BUA by 4 acres. To complete the project, 18 acres of land will be disturbed.

Figure 2.5 Redevelopment Example #3



The % BUA is calculated using the proposed redeveloped BUA over the existing pervious area as follows:

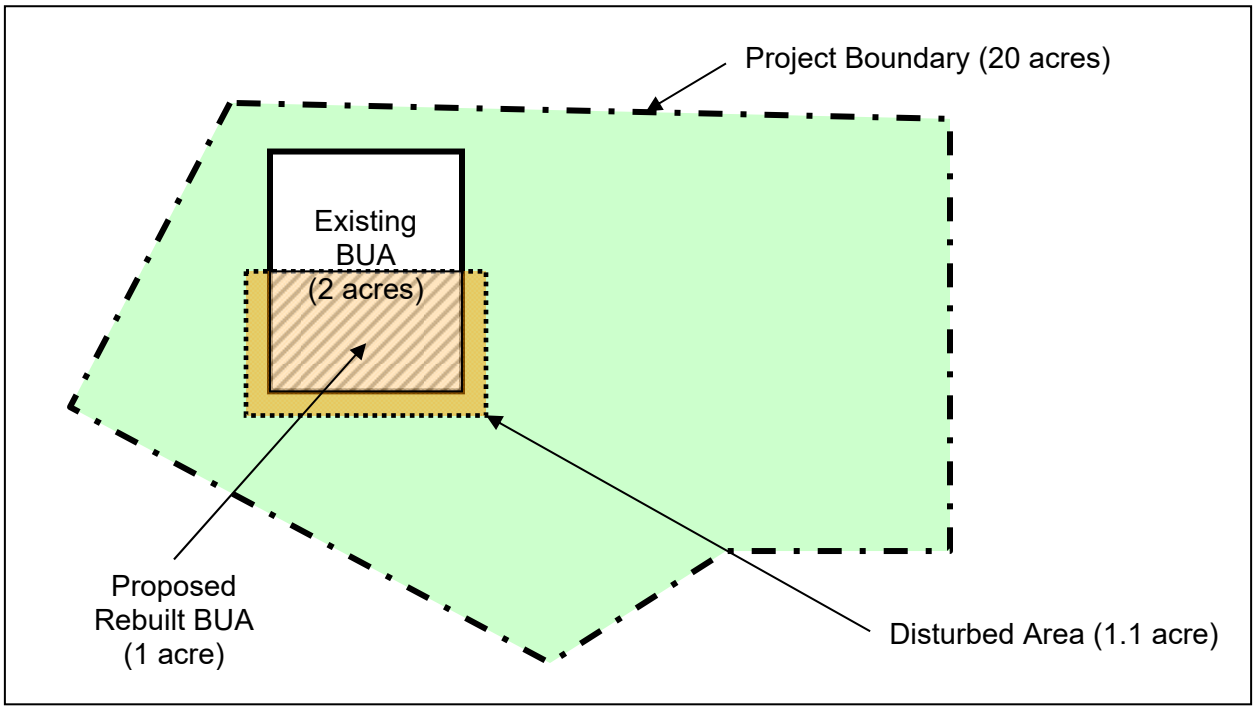
% BUA = [4 acres / (20 acres - 2 acres)] x 100 = 22.2% BUA

Since the proposed 22.2% BUA does not exceed 24%, the project is considered **low density.**

Example #4:

A proposed 20-acre site is located in a watershed that has a 24% BUA high density threshold. The site has 2 acres of existing BUA that existed prior to the effective ordinance date (refer to Figure 2.6). Redevelopment is proposed that would change one acre of the existing 2 acres of BUA with no net increase in BUA. To complete the project, 1.1 acres of land will be disturbed.

Figure 2.6 Redevelopment Example #4



The % BUA is calculated using the proposed redeveloped BUA over the existing pervious area as follows:

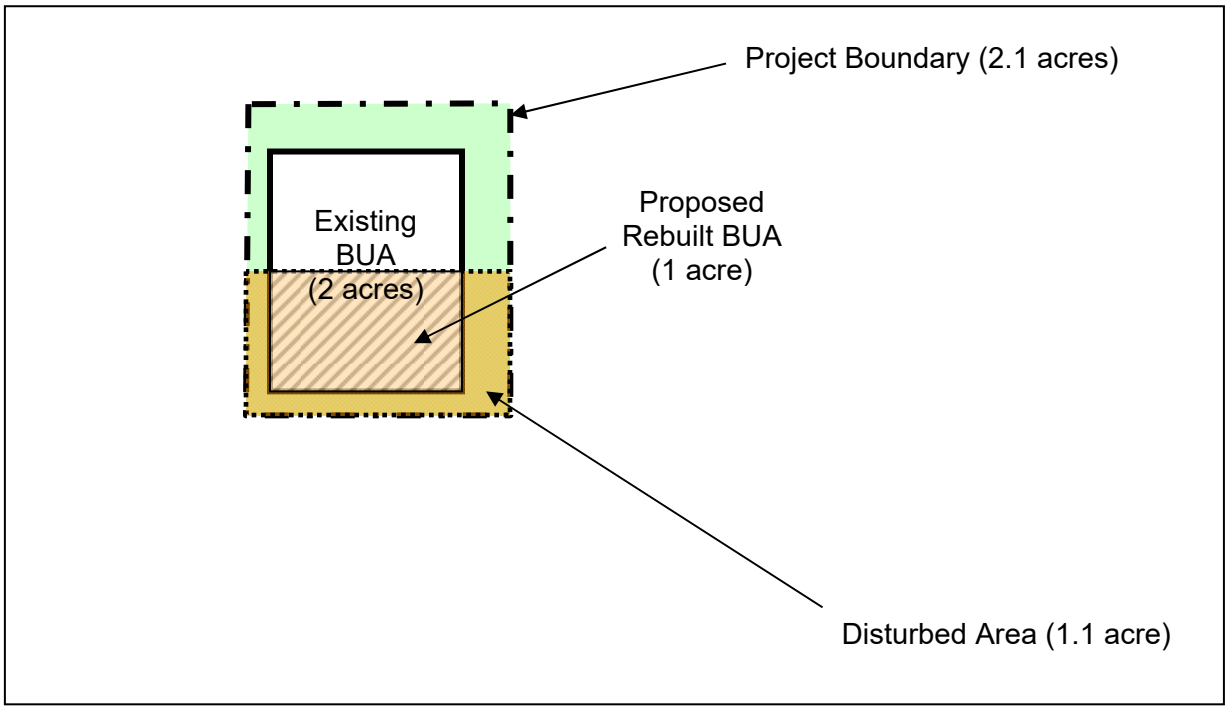
% BUA = [1 acre / (20 acres - 1 acres)] x 100 = 5.3% BUA

Since the proposed 5.3% BUA does not exceed 24% BUA, the project is considered **low density.**

Example #5:

A proposed 2.1-acre site is located in a watershed that has a 24% BUA high density threshold. The site has 2 acres of existing BUA that existed prior to the effective ordinance date (refer to Figure 2.7). Redevelopment is proposed that would change the existing 2 acres of BUA with no net increase in BUA. To complete the project, 1.1 acres of land will be disturbed.

Figure 2.7 Redevelopment Example #5



The % BUA is calculated using the proposed redeveloped BUA over the existing pervious area as follows:

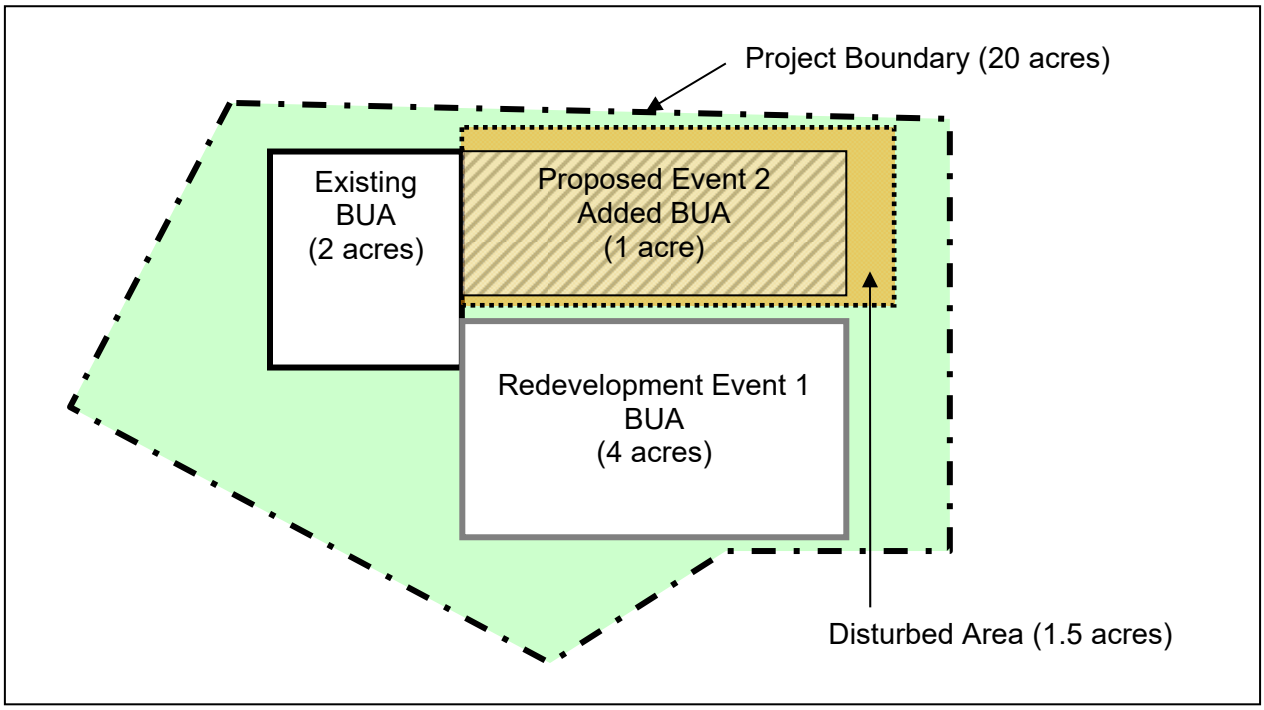
% BUA = [1 acre / (2.1 acres - 1 acres)] x 100 = 90.9% BUA

Since the proposed 90.9% BUA exceeds 24%, the project is considered **high density.**

Example #6:

A 20-acre site is located in a watershed that has a 24% BUA high density threshold. The site has 2 acres of existing BUA that existed prior to the effective ordinance date (refer to Figure 2.8). A redevelopment event (Event 1) occurred after the effective date of the ordinance which increased the BUA by 4 acres. The owner proposes a second redevelopment event (Event 2) that will increase the BUA by 1 acre. To complete the project, 1.5 acres of land will be disturbed.

Figure 2.8 Redevelopment Example #6



The % BUA is calculated using the total redeveloped BUA (redeveloped after the effective date of the ordinance) over the existing pervious area as follows:

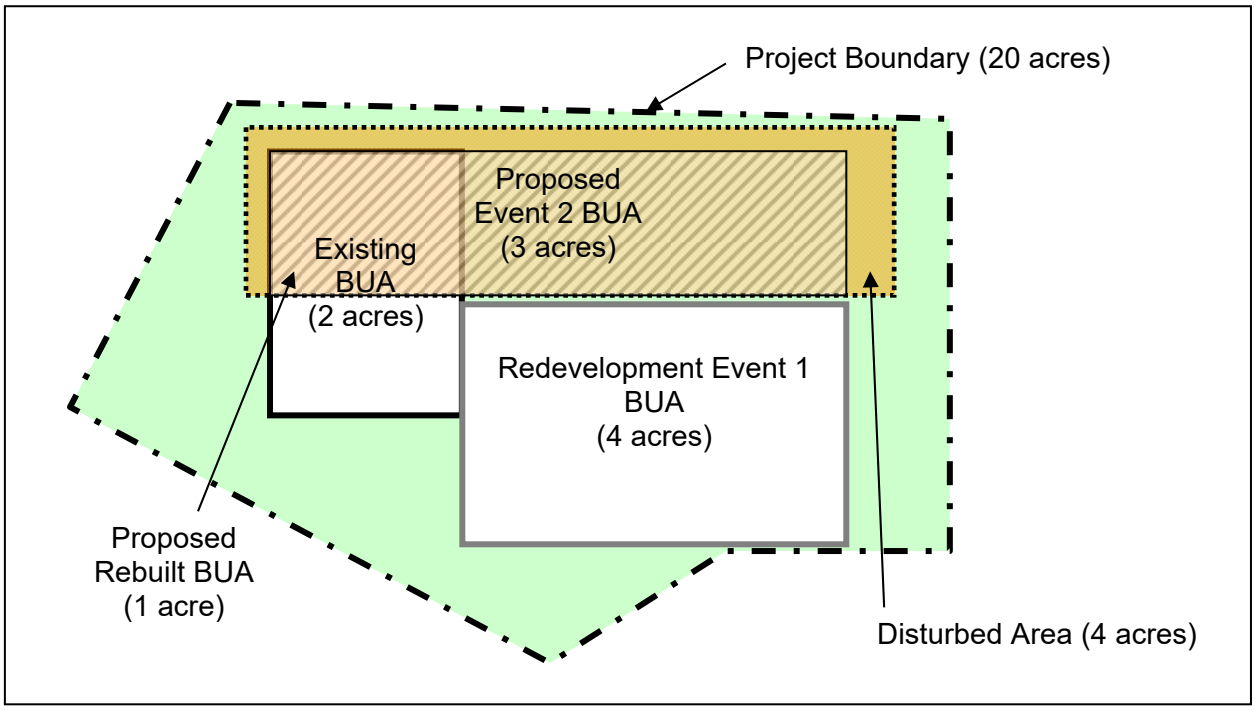
% BUA = [(4 acres + 1 acre) / (20 acres - 2 acres)] x 100 = 27.8% BUA

Since the proposed 27.8% BUA exceeds 24%, the project is considered **high density.**

Example #7:

A 20-acre site is located in a watershed that has a 24% BUA threshold. The site has 2 acres of existing BUA that existed prior to the effective ordinance date (refer to Figure 2.9). A redevelopment event (Event 1) occurred after the effective date of the ordinance and increased the BUA by 4 acres. The owner proposes a second redevelopment event (Event 2) that will involve 3 acres of BUA, but only add 2 acres of BUA. To complete the project, 4 acres of land will be disturbed.

Figure 2.9 Redevelopment Example #7



The % BUA is calculated using the total redeveloped BUA (redeveloped after the effective date of the ordinance) over the existing pervious area as follows:

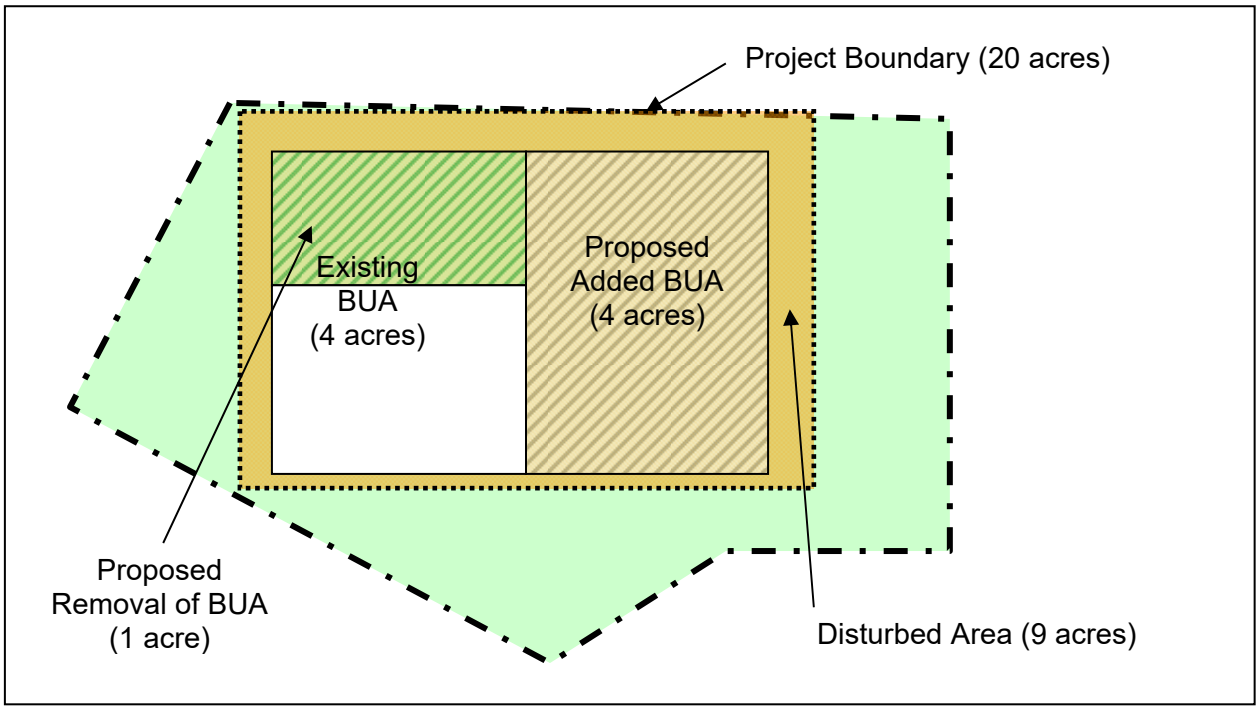
% BUA = [(4 acres + 3 acres) / (20 acres - 1 acres)] x 100 = 36.8% BUA

Since the proposed 36.8% BUA exceeds 24%, the project is considered **high density.**

Example #8:

A 20-acre site is located in a watershed that has a 24% BUA high density threshold. The site has 4 acres of existing BUA that existed prior to the effective ordinance date (refer to Figure 2-8). A redevelopment is proposed after the effective date of the ordinance which increased the BUA by 4 acres and removed 1 acre of existing BUA as part of the construction project. To complete the project, 9 acres of land will be disturbed.

Figure 2-10: Redevelopment Example #8



The % BUA is calculated using the proposed BUA over the existing pervious area as follows:

% BUA = [(4 acres) / (20 acres - 3 acres)] x 100 = 23.5% BUA

Since the proposed 23.5% BUA is less than 24%, the project is considered **low density.**

Note- If the 1 acre of existing is not removed, the density calculations would be:

% BUA = [(4 acres)/(20 acres – 4 acres)] x 100 = 25.0% BUA, which would be considered **high density**.

2.5 Pre-developed Conditions Assumptions

The assumptions associated with the site's pre-developed condition affect the type, size, intensity, etc. of the proposed site development and associated SCMs. These assumptions are used to set the design targets that must be met in order to comply with the post-construction ordinance requirements. Therefore, specific guidelines must be followed for all development designs. The most conservative pre-developed conditions must be assumed. Stormwater controls shall only be required on redeveloped BUA as allowed by state law (N.C.G.S § 143-214.7). Development and redevelopment projects shall not decrease existing on-site structural stormwater controls.

2.5.1 Land Use

The structural SCM design goal required by the post-construction ordinance is to alleviate any potential impacts of the development on the receiving drainage system regarding water quality, channel stability, and flooding. To meet that goal, the structural SCM shall be sized for Water Quality Control (WQ_v), Channel Protection Control (CP_v), and Flood Control assuming pre-developed land use conditions as 50 percent woods and 50 percent pasture, or existing land use, whichever produces less run-off. Pre-developed curve numbers shall be based on the assumption of good hydrologic condition.

The goal of the downstream analysis assessments is to determine the appropriate level of flood control that is necessary. The assessment is based on the watershed at the time of the proposed development immediately before and after the project. Therefore, for the downstream analysis, the pre-developed land use conditions shall be based on the actual land use at the time of construction plan submittal and approval.

Weighted curve numbers shall be computed using the methods illustrated in The hydrology chapter of the Charlotte-Mecklenburg Storm Water Design Manual.

2.5.2 Time of Concentrations

For structural SCM sizing for Water Quality Control (WQ_v), Channel Protection Control (CP_v), and Flood Control, the pre-developed time of concentrations shall be based on longest possible travel time for the significant flow paths based on pre-developed topography. Flow paths should be representative of overall basin characteristics for both pre-development and post-development conditions.

Longer time of concentration result in lower pre-developed targets and therefore are the most conservative. Flow lengths, slopes, roughness factors, etc. shall be assumed that are reasonable and result in conservative results. Typically, sheet flow lengths for pre-developed conditions should be between 200 and 300 feet. Sheet flow lengths for post-developed conditions should be less than 100 feet.

Time of concentrations shall be computed using the methods illustrated in the Hydrology chapter of the Charlotte-Mecklenburg Storm Water Design Manual.

2.5.3 Existing On-site SCMs

In some cases, there will be natural or man-made features on the site that provide water quality treatment, channel protection or flood control. If these SCMs are to be used to meet Post-Construction Ordinance requirements, it must be demonstrated that any retrofit meets all the design parameters of this manual.

2.5.4 Existing Contributing Watershed SCMs

In some cases, the project site receives runoff from an offsite watershed. The site designer can either bypass the upstream offsite runoff through the site or design the site drainage system and SCMs to include the offsite runoff. If the site drainage system and SCMs are designed to include offsite runoff from undeveloped areas, the SCMs must be designed with the assumption that all offsite land use has been developed to the maximum low density option. Existing upstream SCMs or other upstream storm drainage features cannot be assumed to function as designed, unless they have been designed and are maintained in accordance to the specifications presented in this Manual. Submittal of the recorded maintenance agreements and associated easements for the upstream SCMs may be required.

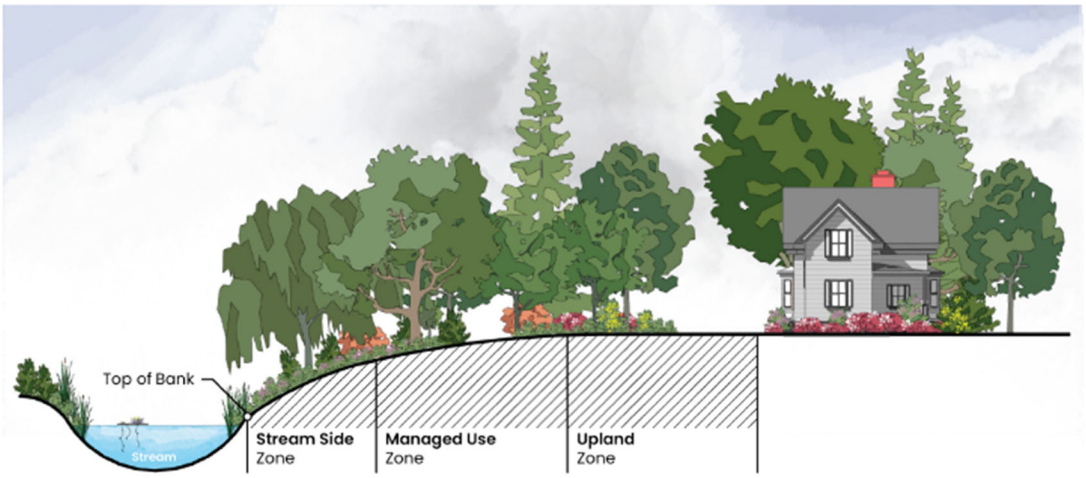
2.6 Definition of Terms

When used in the Charlotte-Mecklenburg SCM Design Manual, the following words and terms shall have the meanings set forth in this section, unless other provisions of the applicable ordinances or Manual specifically indicate otherwise.

Administrative Manual
A manual developed by the Storm Water Administrator and distributed to the public to provide information for the effective administration of this ordinance, including but not limited to application requirements, submission schedule, fee schedule, maintenance agreements, criteria for mitigation approval, criteria for recordation of documents, inspection report forms, requirements for submittal of bonds, a copy of this ordinance, and where to obtain the Design Manual.

Buffer
A natural or vegetated area through which storm water runoff flows in a diffuse manner so that the runoff does not become channelized and which provides for infiltration of the runoff and filtering of pollutants.

Buffer Zones
In the Central and Western Catawba Districts, streams draining greater than or equal to 50 acres but less than 300 acres have a two (2) zone buffer including a stream side and upland zone. Buffers for streams draining greater than or equal to 300 acres have three (3) zones as shown below. The amount of disturbance allowed in the buffer differs in each zone. In the Yadkin-Southeast Catawba (including Six Mile Creek) there are no zones, the entire buffer is undisturbed.



Buffer Widths
Viewed aerially, the stream buffer width is measured horizontally on a line perpendicular to the surface water, landward from the top of the bank on each side of the stream.

Built-Upon Area (BUA)
That portion of a development project that is covered by impervious or partially impervious surface including, but not limited to, buildings; pavement and gravel areas such as roads, parking lots, and paths; and recreation facilities such as tennis courts. “Built-upon area” does not include a wooden slatted deck or the water area of a swimming pool.

(Please note that for the purposes of this manual, created built-upon area refers to any new or removed-and-replaced built-upon area associated with land disturbance.)

Design Manual
The Charlotte-Mecklenburg SCM Design Manual shall be approved for use in the **Jurisdiction** and shall be at least as protective as the North Carolina Department of Environment and Natural Resources SCM design manual approved for use in Phase II jurisdictions for the proper implementation of the requirements of the federal Phase II storm water program. All references herein to the Design Manual are to the latest published edition or revision.

Disturbance
Any use of the land by any person or entity which results in a change in the natural cover or topography of the land.

Drainage Area
That area of land that drains to a common point on a project site.

Floodplain
The low, periodically-flooded lands adjacent to streams. For land use planning purposes, the regulatory floodplain is usually viewed as all lands that would be inundated by the Regulatory Flood.

Low Impact Development (LID)
The integration of site ecology and environmental goals and requirements into all phases of urban planning and design from the individual residential lot level to the entire watershed.

Mitigation
Actions taken either on-site or off-site as allowed by this ordinance to offset the impacts of a certain action.

Non-Point Source (NPS) Pollution
Forms of pollution caused by sediment, nutrients, organic and toxic substances originating from land use activities and carried to lakes and streams by surface runoff.

Storm Water Administrator
The position that has been designated by the **Jurisdiction** to administer and enforce the applicable ordinance.

Stormwater Control Measure (SCM)
Permanent structural devices that are designed, constructed, and maintained to remove pollutants from stormwater runoff and provide volume and peak runoff rate controls before the water reaches streams and drinking water supply reservoirs.

Top of Bank:
The landward edge of the stream channel during high water or bankfull conditions at the point where the water begins to overflow onto the floodplain.

Total Phosphorus (TP)
A nutrient that is essential to the growth of organisms but when it occurs in high enough concentrations it can negatively impact water quality conditions. Total phosphorus includes both dissolved and suspended forms of reactive phosphorus, acid hydrolyzable phosphorus and organic phosphorus as measured by Standard Method 4500-P.

Total Suspended Solids (TSS)
Total suspended matter in water which includes particles collected on a filter with a pore size of 2 microns as measured by Standard Method 2540-D, which is commonly expressed as a concentration in terms of milligrams per liter (mg/l) or parts per million (ppm).