Anderson County Technical Specification

WQ-08: PERMANENT WATER QUALITY STREAM BUFFERS

1.0 Permanent Water Quality Stream Buffers

1.1 Description

A Permanent Water Quality Stream Buffer (Steam Buffer) is the area along a shoreline, wetland or stream meant to protect the waterbody. Development is restricted or prohibited in the stream buffer to prevent impacts to the waterbody. In addition, the stream buffer provides the following:

- Protection to the overall stream quality by providing shade for the stream,
- Natural habit for wildlife,
- Removal of pollutants (sediments, bacteria, and nutrients) from stormwater runoff through infiltration and filtering, and
- A setback from the stream to prevent damage to structures or improved property due to flooding or changes in the stream channel.

When a buffer must be disturbed, promptly stabilize it with a dense cover of strong rooted natural grasses, native plants, and native trees.

1.2 When and Where to Use

The most effective Stream Buffers for protecting water quality are those that consist of undisturbed natural vegetation including maintaining the original tree line along the stream , channel banks, or other waterbody to protect the waterbody. The buffer remains undisturbed to the maximum extent practicable. Immediately stabilize any stream buffer area that is temporarily disturbed with a dense cover of strong rooted natural grasses, native plants, and native trees.

1.3 Classification

Major streams, drainage ways and water bodies have Stream Buffer requirements based on the following three (3) classifications:

Class 1: Streams with a drainage area greater than or equal to 100 acres.
Class 2: Streams with a drainage area greater than or equal to 300 acres.
Class 3: Streams with a drainage area greater than or equal to 640 acres.

In addition, Stream Buffers are divided into different sections. The section widths vary depending on the stream classification. The sections include:

Stream Side Zone: Undisturbed area; adjacent to stream.
Managed Use Zone: Disturbance limited; adjacent to stream side zone.
Upland Zone: Some disturbance; farthest from stream.

Table 1 specifies the required buffer and section widths based on stream classification.

Table 1: Minimum Stream Buffer Section Widths

Stream Class	Stream Side Zone (ft)	Managed Use Zone (ft)	Upland Zone (ft)	Minimum Buffer Width on Each Side of Stream (ft)
1	30	None	15	45
2	30	20	15	65
3	30	45	25	100

All buffer measurements are from the top of the stream bank.

1.3.1 Stream Side Zone

The Stream Side Zone is directly adjacent to the stream and remains undisturbed. The vegetative target consists of mature forest. This zone is used to protect water quality and the ecosystem of the stream. In addition, the area is expected to hold flood waters during large storm events. Clearing, grading, or cutting of vegetation is prohibited in this zone, and natural vegetation is preferred. In the event stabilization measures are needed, use natural vegetation.

Allowable disturbances of the Stream Side Zone include:

- Flood control structures,
- Stabilized conveyance channels,
- Stream bank stabilization and restoration,
- Footpaths that do not require tree removal,
- Utility crossings, and
- Road crossings.

1.3.2 Managed Use Zone

The Managed Use Zone is between the Stream Side Zone and Upland Zone. The vegetative target for this zone is managed forest. This zone is used to store floodwaters and help remove pollutants through infiltration. Vegetation removal and tree cutting is limited. Grading activities and fill are prohibited. Maintain a minimum tree density of eight healthy trees at least six inches in diameter per 1,000 square feet. If the minimum tree density is not naturally present, reforestation is encouraged. Native grasses are appropriate in this zone.

Allowable disturbances of the Managed Use Zone include:

- Flood control structures,
- Stormwater best management practices (BMPs) provided that no other practicable alternative location exists on-site and minimal disturbance will take place,
- Engineered vegetated filter areas (that do not require the cutting of trees),
- Stabilized conveyance channels, and
- Walking trails and bike paths that result in no net tree removal of trees a minimum of 6 inches in diameter. When implementing walking trails or bike paths, utilize utility crossings or previously cleared areas when possible.

1.3.3 Upland Zone

The Upland Zone filters runoff and protects the stream. This zone is located farthest from the actual stream banks and grading and certain disturbances are allowed when performed in a manner that does not damage the roots of the trees located in the adjacent Managed Use Zone. Do not place fill material in the Upland Zone unless the replacement of deficient soil is required. Ensure the volume of fill material does exceed the volume of deficient soil removed. Commercial buildings and homes are not permitted in the upland zone. Forest cover is encouraged, but lawns, gardens, and other ground cover is permissible.

Allowable disturbances of the Upland Zone include:

- Stormwater best management practices (BMPs),
- Level spreaders,
- Engineered vegetated filter areas,
- Stabilized conveyance channels,
- Walking trails and bike paths,
- Personal gardens,
- Decks,
- Gazebos, and
- Storage buildings smaller than 150 square feet.

1.4 Design Requirements

Determine the required Stream Buffer width based on the watershed drainage areas.

Design the Upland Zone to have a level spreader to manage the water quality runoff volume. Ensure the water quality runoff from the level spreader discharges to a 35-foot minimum vegetated filter area width (or a width that achieves 80% TSS removal through the use of a pollutant loading model acceptable to County) before entering the Managed Use Zone.

For Stream Classes Type 2 and Type 3, the Managed Use Zone may be used as the vegetated filter area. when:

- The Managed Use Zone consists of an existing dense herbaceous buffer,
- The herbaceous buffer has an existing minimum ground cover of 70%,
- The area is validated by Anderson County during a field site visit, and
- In no cases, trees are cut in the Manages Use Zone to create the required vegetated filter area.

For water quality control, design the level spreader to capture the water quality volume from the site and bypass larger storm flows directly to the receiving water body through a stabilized flow bypass conveyance channel.

For outlet applications, design the level spreader to capture the peak flow for the 10-year, 24-hour storm up to 10 cfs, and bypass larger storm flows directly to the receiving water body through a stabilized flow bypass conveyance channel.

If stormwater quantity management is not addressed by other stormwater controls, then a stabilized stormwater conveyance channel is required for all buffers.

1.5 Maintenance

Stabilize all deposited sediment as soon as possible. Maintain the level spreader and vegetated filter areas as needed.

1.6 Buffer Impacts

Often times, impacts to buffers are unavoidable. In some cases, mitigation is needed to compensate for the impact and in other cases, mitigation is not required. Activities that require mitigation must be approved by Anderson County.

1.6.1 Buffer Impacts Not Requiring Mitigation

- Flood control structures.
- Road crossings.
- Utility crossings.
- Paths and trails in the Managed Use Zones that result in no net tree removal for trees a minimum of 6 inches in diameter.
- Stabilized conveyance channels.
- Stabilized drainage improvements or repairs.
- Domesticated animal trails lost by action beyond farmers control. Fencing is required to limit and direct animal movement.
- Activities with mitigation or approval by a State or Federal Agency for Sections 401 or 404 of the Federal Clean Water Act

1.6.2 Buffer Impacts Requiring Mitigation

- Filling of the Stream Side or Managed Use Zone.
- Vegetation removal in the Stream Side or Managed Use zones that do not meet the requirements in section 1.3.
- Paved paths in Stream Side Zone.
- Fences and walls requiring tree removal in the Stream Side or Managed Use Zones.

1.6.3 On-Site Mitigation Techniques

In the event that a stream side buffer is impacted, there are several on-site mitigation options that are acceptable upon request. Review and approval is required by Anderson County on a case by case basis.

1.6.3.1 Re-vegetation

For temporary Stream Buffer zone impacts or disturbance, re-vegetate the impacted area with native vegetation species to the pre-disturbed condition for specific vegetation size and species.

1.6.3.2 Installation of Structural BMPs.

Structural BMPs reduce the amount of pollutants that are released into the stream, and are used when impacts to the stream buffer reduce the effectiveness of the buffer. Install the BMPs outside of the Stream Side Zone when practicable. A long term maintenance plan for the BMP is required.

1.6.3.3 Stream Restoration.

Restoration, enhancement, or stabilization of the existing Stream Side Zone on-site may be used when impacts to the stream buffer reduce the effectiveness of the buffer. Restoration, enhancement, or stabilization improvements must be equal to the Stream Buffer footage in need of mitigation.

1.6.3.4 Controlled Impervious Cover.

Limit the impervious cover on the overall development to 24% or less when impacts to the Stream Buffer reduce the effectiveness of the buffer.

1.6.3.5 Open Space Development.

Preserve 50% of the total development area as undisturbed open space when impacts to the Stream Buffer reduce the effectiveness of the buffer.

1.7 Marking Permanent Water Quality Stream Buffer and Final Plat Requirements

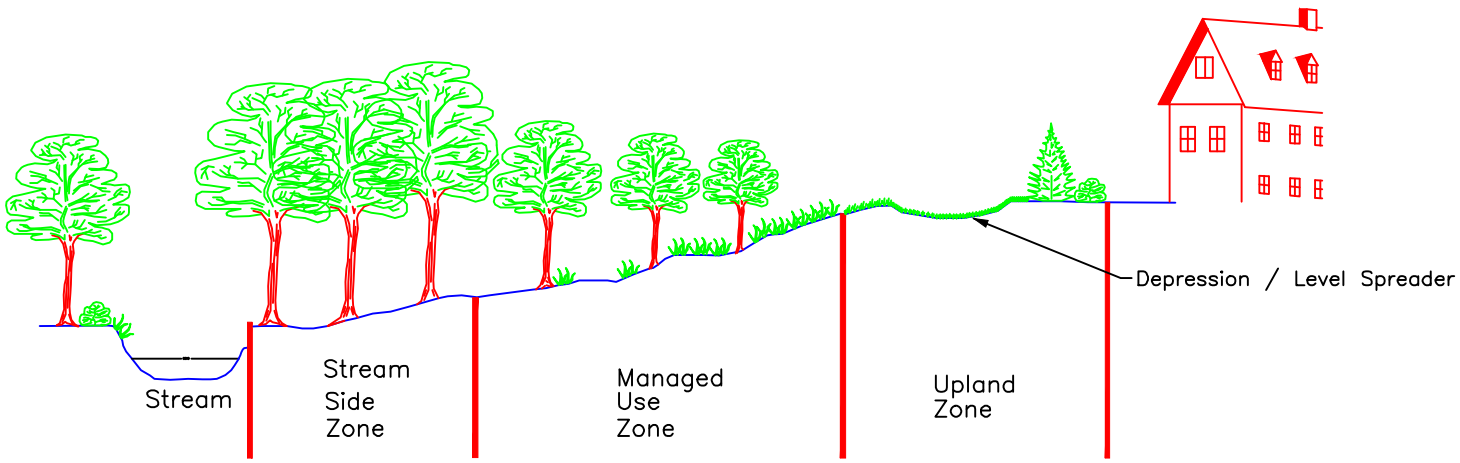
Clearly mark the different buffer zones during construction to protect the Stream Buffer and prevent unnecessary disturbance. Prior to the initiating of land disturbing activities, ensure construction layout surveys include staking and labeling of the Stream Buffer. Use a combination of staking, flagging, and/or other methods to ensure adequate visibility of the Stream Buffer during construction activities.

Ensure the final plat shows the exact boundary of all Permanent Water Quality Stream Buffers prepared by a registered surveyor.

Provide visible permanent Stream Buffer boundary markers approved by Anderson County prior to recording the final plat for the property. Ensure the boundary markers are installed in a visible area located on the landward edge of the Stream Buffer. Place boundary markers a minimum of one every 100 linear feet of Stream Buffer. Ensure permanent Stream Buffer boundary markers include the statement "*Water Quality Buffer – Do Not Disturb*". Where possible, attach the permanent boundary markers to trees larger than 6-inches in diameter. Where it is not possible to attach the marker to a tree, use treated wood, steel, or plastic signposts.

Ensure the final plat contain the following statement:

"This property contains a Permanent Water Quality Stream Buffer that must be maintained in perpetuity in accordance with the recorded Operations and Maintenance Agreement by the responsible property owner. No clearing, grading, construction or disturbance is permitted in the Permanent Water Quality Stream Buffer except as permitted by the Permanent Water Quality Stream Buffer Technical Specification and permitted by Anderson County."



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Three Zoned Water Quality Stream Buffer

NTS

ANDERSON COUNTY, SC

WQ STREAM BUFFER

STANDARD DRAWING NO. WQ-08

APPROVED BY: _____ January, 2013 DATE

WQ STREAM BUFFERS
MAINTENANCE AND RESPONSIBILITY AGREEMENT

The Permanent *Stormwater System Maintenance and Responsibility Agreement* requires adequate maintenance for stormwater management/Best Management Practices (BMP) facilities including WQ Stream Buffers. Document WQ Stream Buffer deficiencies during **annual** inspections. Complete any necessary repairs and/or preventive maintenance procedures in a timely manner to ensure proper functioning as a WQ Stream Buffer.

Important maintenance procedures:

- Immediately after the installation, water newly planted vegetation twice weekly as needed until the vegetation becomes established (typically six weeks).
- Ensure the grass cover is dense and healthy. Re-sod or re-seed if necessary to ensure a dense stand of grass.
- Maintain stable groundcover in the drainage area to reduce the sediment load.
- Two to three times per year, grass filter strips will be mowed and the clippings harvested to promote the growth of thick vegetation with optimum pollutant removal efficiency. Turf grass should not be cut shorter than 3 to 5 inches and may be allowed to grow as tall as 12 inches depending on the aesthetic requirements. Forested filter strips do not require this type of maintenance.
- Once a year, the soil will be aerated if necessary.
- Once a year, soil pH will be tested and lime will be added if necessary.
- Annually inspect the BMP to ensure proper function and effectiveness as a stormwater best management practice.

After vegetation is established, perform inspections once a quarter and after every storm event greater than 1.0 inch, and annually thereafter. Keep operation and maintenance records in a known location and make them available upon request.

Perform recommended maintenance activities as follows:

Required Maintenance	Frequency
Periodic pruning and weeding.	As needed
Remove trash and debris.	As needed
Inspect inflow points for clogging. Remove any sediment.	Every 6-months
Repair eroded areas. Re-seed or sod as necessary.	Every 6-months
Inspect trees and shrubs to evaluate their health.	Every 6-months
Remove and replace dead or severely diseased vegetation.	Every 6-months
Removal of evasive vegetation.	Every 6-months
Nutrient and pesticide management.	Annual, or as needed
Water vegetation, shrubs, and trees.	Every 6-months

Perform trouble shooting activities as follows:

Field Condition	Common Solutions
Trash/ Debris is present	Remove trash/ debris
Water is channelizing and causing erosion.	Re-grade if necessary to smooth it over and Provide additional erosion protection as needed such as erosion control blankets and turf reinforcement matting to prevent future erosion problems.
Too much sediment has accumulated.	Remove accumulated sediment to recover capacity. A sediment forebay may be required. Remove sediment that exceeds 2 inches on more than 10% of the vegetated treatment area, or anywhere that it is interfering with performance.
The flow control device is clogged or damaged	Unclog and properly dispose of any sediment off site. Make any necessary repairs or replace device if necessary.
Grass is too long or too short.	Maintain grass at a height of approximately three to six inches.
Plants are desiccated, 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. Provide additional irrigation and fertilizer as needed.
Nuisance vegetation is choking out desirable species	Remove vegetation by hand if possible. If pesticide is used, do not allow it to get into the receiving water (stream, pond, etc.).