Stormwater Plan - Requirements

Hydrology Report

- The Cherokee County Engineering Department utilizes the policy, criteria and information, including technical specifications and standards, in the latest edition of the Georgia Stormwater Management Manual and any relevant local addenda, for the proper implementation of the requirements of the Stormwater Management Ordinance. The manual may be updated and expanded periodically, based on improvements in science, engineering, monitoring and local maintenance experience.

- The plans are insufficient for review without a hydrology report. Section 6.02.B(1)a of the Cherokee County Development Ordinance states that a post developed stormwater management plan and hydrology report is required for new development that involves the creation of 5,000 square feet or more of impervious cover, or that involves other land development activities of 1.0 acre or more. Additional comments may apply once a hydrology report has been submitted and reviewed.

- The hydrology report must be signed and sealed by a professional engineer licensed in the State of Georgia. (Section 6.04(C) of the Cherokee County Development Ordinance).

- If detention exemption is being cited for this development, a hydrology report is still required referencing the exact criteria per Section 5.F.2.b of the Cherokee County Development Ordinance for which the project complies. Provide sufficient data accordingly.

- If the existing downstream conditions are overburdened by the pre-developed flows in the stream, then detention shall be required unless the applicant elects to eliminate the downstream overburdened conditions at his or her expense when the development occurs.

- The SCS method is required for this project.

- To utilize level spreaders for sheet flow the following must be provided:

    a. Provide plan location with associated permanent drainage easements;
    b. The spreaders must be constructed of non-erodible material; provide full construction details;
    c. Spreaders must be included in permanent stormwater maintenance agreement;
    d. Spreaders must be sized for a length that ensures the flow depth and velocity is effectively dissipated; include all supporting calculations for the 100 year storm.

- The proposed use is a hotspot use per Section 4.2.2 of the Georgia Stormwater Management Manual. Secondary water quality devices are required such as catch basin inserts or other proprietary devices.

- A detail of the outlet structures must appear in the hydrology report and on the plans.

- Provide a separate pre-developed, post-developed, and downstream analysis basin map. Clearly delineate the basin limit(s), show the basin area(s) in acres, CN, project boundaries, study point(s), any perennial or intermittent streams and the soil types on the basin maps.

- A downstream analysis in accordance with the Georgia Stormwater Management Manual and Section 6.04(C)6 of the Cherokee County Development Ordinance is required. The stormwater management plan must ensure that the requirements and criteria in this ordinance are being complied with and that appropriate measures are being taken to minimize adverse post-development stormwater runoff impacts from the development.

- Upsizing of undersized pipes or stormwater channels will be required where applicable based on downstream analysis.

- Describe the method of run-off control in the hydrology report narrative.

- The hydrology report must demonstrate that the peak post-developed flow does not exceed the pre-developed peak flow for the 2, 5, 10, 25 and 100 year storms.

- If the detention pond discharges in right-of-way, piping, over detaining, or other upgrades are necessary to convey the 100-year storm.

- Demonstrate that the 100 year flow(s) are conveyed to the detention pond(s).

- Provide detailed calculations of the pre-developed and post-developed CN's in accordance with Table 3.1.5-1 of the Georgia Stormwater Management Manual.

- Time of concentration calculations must be provided utilizing the TR-55. A minimum of 5 minutes shall be used but back up data must be included.

- The Unified Sizing Criteria, as shown in the *Georgia Stormwater Management Manual* (GSWMM), must be calculated and the required volumes provided.

- A dam breach study is required for this project.

Water Quality Calculations

- All water quality calculations shall be per the revised GSWMM including Runoff reduction. The site review spreadsheet can be found at: http://atlantaregional.org/wp-content/uploads/2017/03/site-development-review-tool-2-1.xlsm

- The Site Review spreadsheet must be completed for this project. The spreadsheet must be included in the hydrology report and on the construction plans.

- Site wide TSS removal shall be 80%, and to the extent feasible, runoff reduction must be met/reviewed. Runoff reduction calculations must be provided with all applicable upstream BMPS, or a rationale from the GWSMM on why runoff reduction cannot be achieved.

- Provide a separate water quality basin map clearly showing all BMPs/treatment for each basin that corresponds with the site review spreadsheet.

- The water quality basin map shall be included on the plans and in the hydrology report.

- Any areas shown as "NC" in the Site Review spreadsheet must be within undisturbed buffers or protected by a conservation easement.

- The use of proprietary water quality devices is allowed, however, third party testing data and appropriate sizing calculations are required to be included in the hydrology study. The engineer shall still complete a site review spreadsheet and use a 80% TSS removal for the drainage area at the device.

- Proprietary water quality devices are not allowed in the right-of-way of County roads. Please revise plans to show the location of water quality units on private property.

- All water quality BMP's should include all specifications and details outlined in the GSWMM.

- Soils tests are required for infiltration BMP's where applicable.

Channel Protection

- Provide channel protection calculations as outlined in the blue book Section 3.3.5, or specify the exemption for post-development discharges less than 2.0 cfs as per Section 2.2.4.2

- If applicable, confirm the following: The applicant is requesting that the channel protection criteria be waived by the local jurisdiction since this sites discharges directly into a larger stream/floodplain and the reduction in the smaller flows will not have an impact on streambank or channel integrity as per Section 2.2.4.2 of the Georgia Stormwater Management Manual. Additionally, if applicable, this report should demonstrate a detention facility is not required per Section 5.02.F.2.C of the Cherokee County Development Regulations.

- Encroachments into special flood hazard area require a flood study showing a no-rise (less than 0.01 foot) with compensatory mitigation as per Section 4.4 of the Cherokee County Floodplain Ordinance. Special consideration should be given to developments with the flooding source as the property lines.

Pond Detail (Pond detail must also be in hydrology report and match plans)

- Per Section 4.05.A.1 (l) of the Cherokee County Development Ordinance, any road crossing a dam shall be a private street. The appropriate state approved professional shall provide a report certifying that the existing or proposed dam is structurally capable of supporting the road. Ingress and egress easements, not right-of-way, shall be granted. A second point of access to the subdivision across a public or private street must be provided. The section of road across the dam, and the dam itself, shall be maintained by the property owners or a mandatory homeowners association.

- Ponds/or stormwater management facilities shall not be located in any stream or zoning buffer.

- Provide a trash rack or anti-clogging device on all weirs and orifices; include the detail in the hydrology report and on the plans.

- Ponds are recommended to be located on common area in a residential subdivision.

- Provide an anti-seep collar on the principle spillway pipe.

- The outlet structure detail must conform to the calculations in the hydrology report.

- Rip-rap aprons are required at all discharge headwalls. The apron must be designed in accordance with Section 4.5 of the Georgia Stormwater Management Manual.

- The steepest slope allowed for detention pond embankments is 2:1; label all pond slopes.

- A 5 foot high fence, with a 10 foot wide gate, is required for along the perimeter of all detention ponds with slopes steeper than 3:1 and 100-year ponding depths over 4 feet.

- Provide a 12 foot wide access easement from a public street to the stormwater management facility.

- The access route to the stormwater management facility must provide be 12 feet clear in width, maximum 15% slope and be appropriately stabilized to accommodate heavy equipment per Section 3.2.1.5(G) of the Georgia Stormwater Management Manual. Provide 6" GAB and filter fabric on pond access routes with 12-15% slope.

- Provide a 10' easement around the perimeter of the stormwater management facility or lake. The easement should be measured from the 100-year high water elevation. Easements exceeding this criteria are acceptable.

- Provide a secondary emergency overflow on the dam, 1.0 foot below the top of dam with the appropriate stabilization (include calculations if grass will be used); this will not count against total volume storage. A trapezoidal section at 3H:1V is preferred.

- Provide a permanent silt gauge with a detail on the plans in the forebay and next to the outlet control structure. Painted red lines at 1 foot intervals may be used on the outlet control structure.

- Provide a minimum of 1 foot of freeboard on all detention ponds and water quality ponds.

- The detention pond outlet pipe shall be laid at a maximum of 2.0% grade.

- Provide a section though all stormwater management facilities showing the pond embankment slopes, top of embankment elevation, water quality volume and elevation, channel protection volume and elevation, overbank flood protection volume and elevation and the extreme flood protection volume and elevation. This detail must match in the hydrology report and plans.

- Pond retaining wall structural design is required prior to issuance of a Land Disturbance Permit.

- Per Section 5.02.F.3.d.1 of the Cherokee County Development Regulations, pond retaining walls shall be masonry.

- Provide a forebay sized per the GSWMM. The forebay should be rip-rap or gabion type. If an earthen forebay is used, a standpipe will be required.

- Drains with a gate valve must be provided for micropools; provide all details.

- Show all plantings for micropools with the aquatic bench.

- Micropools must be at least 3 feet deep.

- Provide exterior and interior access steps on all outlet control structures and walls.

- Stormwater facilities with a dam height 25 feet or higher are subject to Safe Dams Act. Dam breach analysis and submittal to EPD for review and approval is required.

- No plantings are allowed on the stormwater facility dam or in the pond access easement.

Plan Sheets

- Review all Phase 1 Erosion Control Plan pond discharges at site perimeter.
- Show a 10 foot wide clear width maintenance and access easement at the top and bottom of all retaining walls and pond walls. This may be combined with a drainage easement. The geogrid must be entirely contained within the easement; even if this causes the easement to exceed the access width.
- The top of walls shall include a swale to divert surface runoff around the wall. Sizing, lining and sufficient energy dissipation shall be incorporated into the plans.
- Show the safety railing or fencing at all walls on the plans, if applicable.
- Provide a 20 scale grading and drainage plan for the entrance.
- Affected road frontage should be upgraded to Cherokee County Standard Road Section 202. Include all applicable calculations and details.
- Label offsite drainage area acreage and include a flow arrow on the grading plan.
- Check for lots with 3:1 or greater slopes between the lots. Drainage easements, conveyances and calculations may be required on the upstream lots to prevent water from causing erosion on the slopes or effecting the downstream property owners.
- Is the proposed development downstream of a Category I or Category II dam, or is a lake incorporated into the development? If so, a dam breach analysis is required.
- Development upstream of any existing lake requires pre and post developed sediment studies.
- Show topographic information for the existing and proposed grades at 2 foot contour intervals on the grading and drainage plan.
- The existing topographic information must be based on NAVD 88.
- Review and address possible bypass areas at entrance and along perimeter of project.
- Drainage easements are required where concentrated drainage discharge crosses property lines.
- Driveway culverts shall be sized for subdivisions where applicable, and placed on the plat also.
- Dumpster drains must be tied to the sewer system or septic system.
- A hooded grate must be used in intersection radius.
- Show the location, size and material types for all drainage structures on the grading plans. Include the applicable GDOT detail number.
- Provide a downstream cross-section for the proposed channel(s), and also where there is a proposed change in width/depth. Show the 25 year HGL in the ditch and provide a minimum 20% freeboard. Include all applicable calculations (drainage area, Manning's "n" value, etc).

- Show the grading for the proposed swale(s) on the grading and drainage plan. The grading must conform to the profile(s) and section(s).

- The maximum velocity for unlined ditches is 5 FPS.

- Per the *Manual for Erosion and Sediment Control in Georgia – Sixth Edition,* Category 1 channels (0-5 ft/sec*) - vegetated lining may be used to stabilize channels with a velocity of 0 – 5 ft/s, **temporary erosion control blankets or sod** shall be used on all channels and concentrated flow areas to aid in the establishment of the vegetated lining. Refer to specifications Ds3 - Disturbed Area Stabilization (with permanent vegetation), Ds4 – Disturbed Area Stabilization (with sodding). Specify what will be used on the plans.

- Show all rip-rap aprons to scale on the grading and drainage plans.

- All headwalls discharging at or over 5 FPS must have energy dissipaters. GDOT 1125, precast or retrofitted are options. Precast or retrofitted headwalls must meet GDOT minimum standards. Provide the appropriate detail and label headwalls clearly in plan view.

- Provide all applicable GDOT details (1030D1,2,3 ,1030P, 1033, 1125, 100, 1122, 1011, etc).

- Review the 90 degree rule. If less than 90 degrees, the invert of the upstream pipe must match the top of the downstream pipe.

- Grate inlets are not recommended for unpaved areas. Provide a pedestal top inlet, GDOT 9031S, or a receiving headwall.

- Provide gutter spread calculations. Per the GDOT Drainage Manual catch basins shall be spaced so that the spread in the street for the 10-year design flow shall not exceed 8 feet.

- Clearly delineate all drainage easements.

- Show all stream buffers and undisturbed buffers on the grading and drainage plan.

- Storm drain pipes 30 inches in diameter and smaller on the downstream side of a roadway must extend into the rear building setback, but not more than 120 linear feet from the right-of-way. Zoning R-40 through AG districts are exempt from this requirement.

- The inlet and outlet ends of all storm drains for streets with speed limits of 35 MPH or greater, within or connected to County right-of-way, shall have concrete or metal flared end sections with safety grates (GDOT 1122), or County approved grate and frame, or raised pedestal top drop inlets meeting the requirements of the Georgia DOT (GDOT 9031 S)

- Grate inlets are not acceptable for unpaved areas; provide a pedestal inlet with a detail or a GDOT 9031S. Label in plan and profile view.

- Cul-de-sacs on downhill street centerline grades shall have six (6) inch vertical curb and gutter along the circumference, beginning at the 25 foot transition radius and ending at the second 25 foot transition radius. A catch basin throat design or standard Georgia DOT detail shall be submitted for downhill street centerline grade cul-de-sacs.

- All drainage pipes in a County right-of-way shall be a minimum of eighteen (18) inches in diameter.

- Show 100 year HW and associated minimum FFE 1.0 feet above on all applicable inlets. Provide a sump grading detail if applicable.

- No storm drain pipe parallel to any existing or proposed County roads shall be placed beneath a proposed deceleration lane without the approval of the County Engineer.

- Drainage easements shall be 20 feet wide for open channels. Easements for pipes shall be four times the pipe depth from finished grade to the invert of the pipe, with the exception of reinforced concrete pipe. Easements for reinforced concrete pipe may be 10 feet wide if the pipe is less than 5 feet from finished grade to invert. Reinforced concrete pipe over 5 feet deep shall have a 20 foot wide easement. All easements shall be centered on the pipe, swale, channel or ditch.

- For lots less than 10,000 square feet 12" HDPE or 12" CMP may be used to serve a single lot. A 10 foot wide drainage easement is required. A metal dome inlet or standard GDOT pedestal inlet must be provided. Junction boxes are required at County right-of-way if this is utilized. Profiles and a pipe chart must be provided for this conveyance.

- Reinforced concrete pipe is required under roads and parallel to right-of-way; HDPE or CMP is only allowed in the right-of-way on a perpendicular (or near) crossing outside the roadbed. RCP shall be used for pipes within the structural zone of influence of the curb, subgrade, sidewalk, GAB, etc.

Profile Sheets

- Reinforced concrete pipe is required on live streams and within County right of way.

- Per Section 5.02.C.8 of the Cherokee County Development Regulations, concrete headwalls are required for all pipes on live streams.

- Per Section 5.02.C.10 of the Cherokee County Development Regulations, storm drain pipes in fill sections over 10 feet from finished grade to crown shall be RCP, including outside of the right-of-way.

- All HDPE pipe shall include bedding details per the manufacturer on the plans. Include the following notes on the profile sheets for HDPE pipe:

    a. High-density polyethylene pipe (HDPE) shall meet AASHTO M-294 Type "S" with an annular exterior and smooth interior. Pipe shall consist of a bell and spigot joint incorporating an F477 gasket to insure a leak-tight performance HDPE pipe shall be back filled by concurrently applying 8" lifts on each side of the pipe using two (2) tamps (one for each side). Backfill soil shall conform to Class II, B2 of the Georgia Department of Transportation Standard Specifications for Construction of Roads and Bridges, current edition. Any manufacturer's specifications for HDPE pipe exceeding this requirements shall apply where applicable.
    b. HDPE pipe must conform to current GDOT standards (Standard Thermoplastic Pipe 1030P). ASTM F2648 pipe is not an acceptable substitution.

- Between the bottom of the road base, or sub-base if used, and the exterior crown of any culvert, the minimum clearance shall be one (1) foot, or greater.

- Storm drainage pipe crossing live streams must be sized for the 100 year event with no surcharge.

- Storm drainage in live streams must be embedded 20%. Pipe size shall be adjusted to compensate for this.

- Proposed storm drainage in live streams requires a US Army Corps of Engineers PCN. If a bottomless culvert is to be used, design plans must be provided showing no impact to the stream along with all applicable bearing capacity, structural calculations, etc.

- Temporary diversions for storm drainage installations in streams shall be included in the erosion control plans.

- Maximum length between storm drainage structures is 300 feet.

- Provide profiles for all proposed storm drain pipes. On the pipe profiles show the existing grade, proposed grade, pipe lengths, pipe diameters, invert elevations, rim or grate elevation, 100 year and 25 year HGL and the structure labels.

- Provide a pipe chart for all proposed storm drains. At a minimum, provide the upstream structure label, pipe diameter, pipe material, Manning's n value, pipe slope, basin area discharging to the upstream inlet, inlet flow in CFS, accumulated flow in CFS, up and downstream inverts, up and downstream 25 year HGL and the downstream velocity.

- All proposed drainage systems must convey the 25 year design storm without surcharge; the 100 year must stay within the system (except for live streams, the 100 year with no surcharge is required).

- Structural anchor blocks must be provided for all storm drains to be installed at or over 15% slope.

- Match crowns of storm drainage pipes at junction boxes. The upstream crown must be higher than the downstream crown within a junction box.

Flood Plain

- If the floodplain is Zone AE show the 100 year BFE's. (if applicable)

- Check for Cherokee County Future Conditions Floodplain. If applicable, delineate the cross sections, elevations, and limits accordingly.

- A detailed study to determine base flood elevations is required. The study must be performed by a professional engineer licensed in the State of Georgia using methods and a computer model approved by FEMA and accepted by the Cherokee County Engineering Department.

- A Conditional Letter of Map Revision (CLOMR) or Conditional Letter of Map Amendment (CLOMA), whichever is applicable, is required. The CLOMR submittal shall be subject to approval by the Cherokee County Engineering Department using the Community Consent forms before forwarding the submittal package to FEMA for final approval.

- Set the minimum finished floor elevation for lots ___ a minimum of 3.0 feet above the 100 year FEMA BFE, or 1.0 feet above the Cherokee County Future Conditions BFE, whichever is higher. Provide a note requiring an elevation certificate for these lots prior to issuance of a Certificate of Occupancy (CO). Note that if a FEMA zone A is involved, this department may require a LOMA be applied for prior to a CO being issued in order to reduce the requirement for flood insurance.