



**DEVELOPMENT PLAN REVIEW - ENGINEERING
COMMERCIAL DEVELOPMENT / SUBDIVISION PERMIT REVIEW CHECKLIST**

DEVELOPMENT NAME: _____

ADDRESS/DISTRICT/LANDLOT/PARCEL: _____

ENGINEER: _____

DATE: _____

CITY TRACKING NO.: _____

Please contact City Engineer at 678-421-2027 with questions/ comments.

FYI: IT IS THE OWNER'S/DEVELOPER'S RESPONSIBILITY TO BE IN COMPLIANCE WITH APPLICABLE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND CLEAN WATER ACT REQUIREMENTS.

Abbreviations: DR - Development Regulations | FPMO - Floodplain Management Ordinance | RDNR - Rules of the Department of Natural Resources | ESCO - Erosion and Sediment Control Ordinance | SWDM – Gwinnett County Storm Water Design Manual
X – NEEDS TO BE ADDRESSED

STATUS OF REVIEW

- ... Walk through. Please address all comments and contact the City Engineer at 678-421-2027 to set up an appointment to review the addressed comments.
- ... Drop-off, include a copy of these comments and one set of plans. Bring to community Development Office 2nd Floor, City Hall. Other Comments to follow. If necessary, please consult this checklist and the Development Regulations of the City of Norcross, Georgia for minimum plan requirements.

GENERAL PLAN COMMENTS

- ... 1. All plan sheets to be sealed and signed across the seal by the registered party responsible for the contents of that sheet. Each seal signature shall include the date of signature. Signatures embedded in the seal, and computer generated signatures and dates, are not acceptable (Board Rule 180-12-.02, Sealing of Documents)
- ... 2. Add following note to plans:

Notify the following agencies 24 hours in advance before beginning each phase of construction:

- A. City of Norcross Inspector – Grading, Building, Erosion Control, ect. (770-448-7988)
- B. Gwinnett County Water Pollution Control – Sewer Lines
- C. Gwinnett County Water – Water Lines
- D. Gwinnett County Fire- Fire Codes (770-822-7500)
- E. Gwinnett County Environmental Health – Septic Tanks (770-963-5132)
- F. Georgia D.O.T. – State Highway Improvements (770-339-2308)

... 3. Include Community Development Plan Review Approval Signature Block:

All requirements of the City of Norcross Development Regulations relative to the preparation and submission of a development permit application having been fulfilled, and said application and all supporting plans and data having been reviewed and approved by all affected City Departments as required under their respective and applicable regulations, approval is hereby granted of this Site Plan and all other development plans associated with this project subject to all further provisions of said Development and other City Regulations.

Director
Department of Community Development

Date

THIS CERTIFICATE EXPIRES TWELVE MONTHS FROM THE DATE OF APPROVAL UNLESS A DEVELOPMENT PERMIT IS ISSUED.

- ... 4. Provide statement that all ad valorem taxes for the property have been paid. Provide proof of payment.
- ... 5. Provide an Erosion Control Bond in the amount of \$3,000 per _____ acres = \$ _____ (ESCO 109-490.j)
- ... 6. Show size of the project, or the phase under construction, in acres. (ESCO 5.3.2e)
- ... 7. Provide note on erosion control plan:

THE SOIL EROSION AND SEDIMENT CONTROL ORDINANCE REQUIRES THAT A 25 FOOT BUFFER ADJACENT TO ALL STATE WATERS BE MAINTAINED (ARTICLE 4 SECTION 4.3 PARAGRAPH 15). AN EXCEPTION IS GRANTED TO HOMEOWNERS WHO PERFORM MINOR LAND DISTURBING ACTIVITIES SUCH AS HOME LANDSCAPING, HOME GARDENS, REPAIRS AND MAINTENANCE WORK (ARTICLE 3, SECTION 3.1, PARAGRAPH 3).

- ... 8. Provide note(s) indicated below in a notes section Erosion and Sediment Control Plan
1. Description of existing land use including landlot and district number at the project site and description of proposed project _____.
 2. Name, address, and phone number of the property owner is _____.
 3. Name and phone number of the 24-hour contact person responsible for erosion, sedimentation and pollution controls is _____.
 4. Total project acres _____.
 5. Total disturbed acres _____.
 6. **THE ESCAPE OF SEDIMENT FROM THE SITE SHALL BE PREVENTED BY THE INSTALLATION OF EROSION AND SEDIMENT CONTROL MEASURES AND PRACTICES PRIOR TO, OR CONCURRENT WITH, LAND DISTURBING ACTIVITIES.**
 7. **EROSION AND SEDIMENTATION CONTROL MEASURES AND PRACTICES SHALL BE MAINTAINED AT ALL TIMES. IF FULL IMPLEMENTATION OF THE APPROVED PLAN DOES NOT PROVIDE FOR EFFECTIVE EROSION AND SEDIMENT CONTROL, ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED TO CONTROL OR TREAT THE SEDIMENT SOURCE.**
 8. **SEDIMENT STORAGE MAINTENANCE INDICATORS MUST BE INSTALLED IN SEDIMENT STORAGE STRUCTURES, INDICATING THE 1/3 FULL VOLUME.**
 9. **MAINTENANCE OF ALL SOIL EROSION AND SEDIMENTATION CONTROL MEASURES AND PRACTICES, WHETHER TEMPORARY OR PERMANENT, SHALL AT ALL TIMES BE THE RESPONSIBILITY OF THE PROPERTY OWNER.**
 10. A 50-foot undisturbed buffer and a 75-foot impervious setback is to be maintained adjacent to all streams.

11. Detention pond, detention outlet structures and temporary sediment pond features are to be constructed and fully operational prior to any other construction or grading.
12. **ANY DISTURBED AREA LEFT EXPOSED FOR A PERIOD GREATER THAN 14 DAYS SHALL BE STABILIZED WITH MULCH OR TEMPORARY SEEDING.**
13. All fill slopes shall have silt fence placed at the slope's toe.
14. Concentrated flow areas and all slopes steeper than 2.5:1 with a height of ten feet or greater shall be stabilized with the appropriate erosion control matting or blanket.
15. The professional who seals this plan certifies under penalty of law that this plan was prepared after a site visit to the locations described herein by the professional or the professional's authorized agent, under the professional's direct supervision.
16. Upon notification and authorization of the owner, the design professional who prepared the ES&PC Plan is responsible for inspecting the installation of the BMP's within 7 days after initial construction activities begins.
17. GaSWCC Level II Design Professional Certification number_____ and signature_____.
18. The receiving water(s) is_____.
19. Total wetland acres on site are_____.

- ... 9. Stream/channel as depicted on plan is a state water that will require a 50-foot undisturbed buffer. Show 50-foot undisturbed buffer from top of stream bank. (Sec 105-58.1)
- ... 10. Stream/channel as depicted on plan is a state water that will require a 75-foot impervious surface setback. Show 75-foot impervious surface setback from top of stream bank. (Sec 105-58.2)
- ... 11. Obtain a variance from EPD for proposed encroachment into the 25' buffer.
- ... 12. Show 100 year floodplain contour, elevation and floodway limits and indicate information source.
- ... 13. Indicate FIRM panel number and benchmark on plan. Tie topo to FIRM datum.
- ... 14. Provide floodplain lot chart indicating lot square footage and area inside and outside the 100 year floodplain.
- ... 15. Indicate on plan that floodplain limits shown are per floodplain variance, modification or appeal#

FLOOD STUDY

- ... 16. Flood Study shall contain the following: (FPMO 1.4.4a-e)
- A. Preliminary Plat, Grading Plan, or Site Plan clearly defining floodplain encroachments.
 - B. If changes to the regulatory flood elevation are proposed, submit profiles of the channel showing existing and proposed base flood elevations.
 - C. If encroaching in the floodplain, provide floodplain storage (end area) calculations based on maximum 100' cross sections (include cross sections in report) showing that flood storage capacity will not be reduced by the proposed grading.
 - D. Description of the extent to which any watercourse for floodplain will be altered or relocated as result by the proposed development.
 - E. Use step-backwater analysis to determine regulatory flood elevations. The department prefers either HEC-2 or HEC-RAS. If you wish to use another method, call Storm Water Management for approval.
 - F. If the floodplain is designated an 'A' zone on the FIRM, get CLOMR from FEMA prior to final plat approval.

- ... 17. 100 year regulatory floodplain elevation increases must be contained on site unless contained in a drainage easement obtained by the developer. Flood study shows increases offsite at cross section . (FPMO 1.4.3a (1))
- ... 18. Show minimum finished floor elevations on residential lots to be the higher of the regulatory floodplain elevation or 3 feet plus the base flood elevation. (FPMO 1.5.1b)
- ... 19. Provide additional documentation supporting your choice of Manning 'n' values for channel and overbank.
- ... 20. Any significant changes to the FEMA floodplain must be approved by FEMA prior to issuance of a certificate of occupancy or approval of the final plat. Submit Flood Study to FEMA for LOMR. (FPMO 1.4.3c)
- ... 21. Use both existing hydrology and built-out hydrology in flood study. Calculate built-out hydrology using CN or TIA, which considers built-out conditions of the current land use plan. Do not consider upstream detention in hydrology calculations unless it is large enough to impact the hydrograph. Check hydrology with USGS regression equations if using other hydrologic methods. (FPMO 1.1.3; definition of "Regulatory Flood")

SITE/GRADING PLAN

- ... 22. Number all pipes and structures on plan.
- ... 23. Number all open channels on plan.
- ... 24. Provide transition channels from inlet and outlet ends of all pipes to natural drainage swales, Specifically, at inlet/outlet of pipe(s) # .
- ... 25. Show directional flow arrows for street drainage and individual lot drainage if finished grading of lots is not shown.
- ... 26. Provide complete details of retaining walls, including all elevations. Retaining walls not conforming to the Gwinnett County Standard shall be designed by a Structural P.E. Provide note requiring concrete compressive testing and slump testing of concrete in accordance with ACI standard.
- ... 27. Gwinnett County retaining wall standard design not applicable to detention pond walls. Provide design by a Structural P.E.
- ... 28. Show typical paving section for parking areas and drives. To be 4" GAB, 2" E or F as a minimum.
- ... 29. Street design exceeds maximum cul-de-sac length (2000').
- ... 30. Street design exceeds maximum stub street length. Provide permanent cul-de-sac or alternate design.
- ... 31. Show cul-de-sac right-of-way and pavement radii, and cul-de-sac slope. Maximum 6% slope.
- ... 32. Show all roadway grades and vertical curves. Add note: **"12% to 15% street grades require and "As Graded" survey before installation of the curb."**
- ... 33. Provide topo at minimum 2' contour intervals.
- ... 34. Show proposed lot grading for subdivisions with zoning requiring lot sizes less than or equal to 12,000 square feet or a density of four units per acre or more.
- ... 35. Show direction of flow on all water courses .
- ... 36. Show fence enclosure around detention pond. Show details of fence enclosure and gate.

- ... 37. Show drainage easement on pipes and/or the SWM facility consistent with Table 7-A of the Development Regulations.

TABLE 7-A EASEMENTS FOR STORM DRAIN PIPES													
PIPE SIZE (FT)	MAXIMUM PIPE INVERT DEPTH (FT)							MINIMUM EASEMENT WIDTH (FT)					
NA	4	5	6	7	8	9	10	11	12	13	14	15	16
1.25	20	20	20	20	20	25	25	30	30	30	35	35	40
1.5	20	20	20	20	20	25	25	30	30	30	35	35	40
2.0	20	20	20	20	20	25	25	30	30	30	35	35	40
2.5	20	20	20	20	25	25	25	30	30	35	35	35	40
3.0	20	20	20	20	25	25	25	30	30	35	35	35	40
3.5	NA	20	20	20	25	25	30	30	30	35	35	40	40
4.0	NA	20	20	20	25	25	30	30	30	35	35	40	40
4.5	NA	NA	20	25	25	25	30	30	35	35	35	40	40
5.0	NA	NA	20	25	25	25	30	30	35	35	35	40	40
5.5	NA	NA	NA	25	25	30	30	30	35	35	40	40	40
6.0	NA	NA	NA	25	25	30	30	30	35	35	40	40	40

- ... 38. Indicate on plan the 100 year water elevation of the lake.

- ... 39. Provide note on plan:

NOTE: CITY OF NORCROSS ASSUMES NO RESPONSIBILITY FOR OVERFLOW OR EROSION OF NATURAL OR ARTIFICIAL DRAINS BEYOND THE EXTENT OF THE STREET RIGHT-OF-WAY, OR FOR THE EXTENSION OF CULVERTS BEYOND THE POINT SHOWN ON THE APPROVED AND RECORDED PLAN. THE CITY OF NORCROSS DOES NOT ASSUME THE RESPONSIBILITY FOR THE MAINTENANCE OF PIPES IN DRAINAGE EASEMENTS BEYOND THE CITY RIGHT-OF-WAY.

NOTE: STRUCTURES ARE NOT ALLOWED IN DRAINAGE EASEMENTS.

- ... 40. Show note: **MAXIMUM CUT OR FILL SLOPES IS 2H:1V**

- ... 41. Show finished floor elevation of building on plan. (FPMO 1.5.1c)

- ... 42. Residential Drainage Plan required on the following lots:

- ... 43. House Location Plan required on the following lots:

- ... 44. Storm sewer pipe must extend at least 50 feet past the front building setback line.

- ... 45. Provide note on plan: **DETENTION POND, DETENTION OUTLET STRUCTURES AND TEMPORARY SEDIMENT POND FEATURES ARE TO BE CONSTRUCTED AND FULLY OPERATIONAL PRIOR TO ANY OTHER CONSTRUCTION OR GRADING.**

- ... 46. Provide note on plan: **DEVELOPER TO CLEAN OUT ACCUMULATED SILT IN DETENTION POND AT END OF CONSTRUCTION WHEN DISTURBED AREAS HAVE BEEN STABILIZED.**

- ... 47. Add note on plan: **PROVIDE DETENTION POND POST-CONSTRUCTION (RECORD) DRAWINGS WITH THE SUBMITTAL OF THE FINAL PLAN OR ONE WEEK PRIOR TO REQUESTING A CERTIFICATE OF OCCUPANCY SO THAT THE POST-CONSTRUCTION CONDITIONS MAY BE VERIFIED AND APPROVED. CERTIFIED RECORD DRAWINGS SHALL INCLUDE TOPO OF POND AND OUTLET STRUCTURE DETAIL USING POST-CONSTRUCTION SURVEY DATA. USING RECORD DRAWINGS, PROVIDE A CERTIFIED HYDROLOGY REPORT**

VERIFYING POND VOLUMES AND PEAK OUTFLOWS FROM REGULATED STORM EVENTS.

- ... 48. Provide a 10-foot drainage easement around detention pond outside the 100-year ponding limit. Provide a cleared 20-foot access easement to detention pond for commercial projects, and a 30-foot access easement for residential projects. Pond walls, toe of slope can be no closer than 10 feet to adjoining property line.
- ... 49. Provide the following note with an arrow pointing to the access easement: **ACCESS EASEMENT TO BE CLEARED AND GRUBBED.**
- ... 50. Within the access easement, a 15-foot wide road shall be graded at a maximum 20% grade to provide access to the facility. Show grading on plans. The road shall be grassed or paved. The road shall extend to the bottom of the pond when the pond is greater than 10 feet deep or 50 feet wide.
- ... 51. When depth of normal pool or water quality ponding is over four feet, a 10 foot wide bench shall be provided and provide standard detail 622 for a dry facility or 623 for a wet facility (SSFISS 6.3.4.1)
- ... 52. Bottom of dry facility shall have positive drainage. Provide standard 622. (SSFISS 6.3.4.1)
- ... 53. Discuss the location of pond(s) # outlet with this office.
- ... 54. Show the detention pond 100-year ponding contour and elevation on plan.
- ... 55. Detention pond must be located on a parcel owned by a property owner's association. (DR 8.2.4h)
- ... 56. Discharge pipe must be no closer than six times its diameter to an adjoining property line. (DR 9.9.3a)
- ... 57. Show locations for temporary detention ponds if permanent ponds will not be constructed I this phase. Provide design data in storm water management report.
- ... 58. Minimum top width of detention pond, earthen dam to be 8'-0". (DR 9.8.2d(5))
- ... 59. Provide additional spot elevations in paved area to clarify drainage and ADA accessibility at the handicap parking spaces.
- ... 60. Show grading associated with widened section. All shoulders to extend to right-of-way. Extend storm sewer cross drains, as necessary.
- ... 61. Provide flume and riprap at end of widened section. Provide flume detail.

PIPE & OPEN CHANNEL PROFILE SHEET

- ... 62. All pipes within the right-of-way are to be reinforced concrete. Galvanized CMP and bituminous-coated CMP are not authorized.
- ... 63. All pipes within drainage easements are to be aluminized steel coated, aluminum alloy, reinforced concrete, or polyethylene pipe. Galvanized CMP and bituminous-coated CMP are not authorized.
- ... 64. If using HDPE pipe, add following note to plans: **HDPE pipe shall conform to the requirements of AASHTO M-294 and AASHTO MP7, Type S&D. Connections shall use a rubber gasket, which conforms to ASTM F-477. Installation shall be in accordance with ASTM Recommended Practice D-2321, AASHTO Section 30, or with Section 550 of the Georgia DOT Standard Specifications, Construction of Roads Bridges.**
- ... 65. If using Aluminum coated Type 2 steel pipe or aluminum alloy pipe, add following note to plans: **All aluminum coated Type 2 steel pipe or aluminum alloy pipe, which will carry a live stream, shall have paved inverts in accordance with AASHTO M-190, type C, except that the pipe need not be fully coated. Installation shall be in accordance with Section 550 of the Georgia DOT Standard Specifications,**

Construction of Roads and Bridges.

- ... 66. If using RCP pipe, add following note to plans: **All RCP pipe joints shall be bell & spigot type with a rubber gasket conforming to ASTM C-443. The pipe shall be manufactured in accordance with AASHTO M-170 and/or ASTM C-76. Class of pipe and wall thickness shall be in accordance with 1030-D, Georgia DOT specification, Table No. 1. Installation shall be in accordance with Section 550 of the Georgia DOT Standard Specifications, Construction of Roads and Bridges.**
- ... 67. All pipes carrying a live stream must have paved inverts
- ... 68. Provide pipe profiles. Show existing and proposed contours, pipe lengths, slopes, inverts, and 25 year hydraulic grade lines.
- ... 69. Provide channel profiles. Show existing and proposed contours, channel lengths, 25-year normal flow depth and slopes. Minimum freeboard to be 20% of the flow depth. (DR 8.4.1b)
- ... 70. 25 year hydraulic grade line must be at least 1 foot below the gutter line or top of grate. (DR 8.3.5a)
- ... 71. Specify gage and corrugation for all pipes. Refer to sheet 701 of the standard drawings. (DR 8.3.7(2))
- ... 72. Minimum pipe size shall be 15" diameter for public piped collection systems. Refer to pipe # _____. (DR 8.3.5d)
- ... 73. Minimum culvert size shall be 18" diameter. (DR 8.3.4c)
- ... 74. Channel velocities for the fully developed 25 year flow shall not exceed the non-erosive velocity as shown in 5.2.3 of the *Gwinnett County Storm Water Design Manual*. Refer to open channel # _____.
- ... 75. Velocity in pipe(s) # _____ exceeds 15 fps maximum.
- ... 76. Slope of ACMP or HDPE pipe(s) # _____ exceeds 14% maximum
- ... 77. Slope of RCP pipe(s) # _____ exceeds 10% maximum.
- ... 78. Show minimum ground cover of 1'-0" for pipes. **ADD THIS NOTE TO THE PROFILE SHEET.**
- ... 79. Specify Gwinnett County detail number 611, manhole casting – non-traffic areas, for all non-traffic bearing manholes. Include detail on plans. Detail can be downloaded at <http://www.co.gwinnett.ga.us/611.JPG> or a copy of the standard drawings can be obtained on CD-ROM or paper from Gwinnett County Planning and Development. Material suppliers include East Jordan Iron Works and US Foundry.
- ... 80. Use anchor collars on pipes exceeding 10% slope. Specifically pipe(s) # _____. (DR 9.9.2c)
- ... 81. Show 100 year ponding limits above pipe (culvert) # _____. (DR 8.3.4b)
- ... 82. Show 100-year hydraulic grade line in all culverts. Specifically pipe(s) # _____. Use USGS regression equations for culvert hydrology wherever possible. (DR 8.2.3j)
- ... 83. Provide transition channel profiles from inlet and outlet ends of all pipes to natural drainage swales. Specifically, at inlet / outlet of pipe(s) # _____. (DR 8.4.1b)
- ... 84. Provide an outside drop on structures _____
- ... 85. Provide a note on the profiles the minimum vertical separation between pipes is 1'.
- ... 86. Provide complete pipe chart indicating the following: (DR 10.6.7c2)
[] A. _____ Pipe numbers

-] B. _____ Pipe size
-] C. _____ Pipe length
-] D. _____ Pipe slope
-] E. _____ Contributing drainage area
-] F. _____ Design discharge (Q_{25} for piped drainage; Q_{100} for culverts)
-] G. _____ Design storm frequency (25 year for piped drainage; 100 year for culverts)
-] H. _____ Runoff coefficient (per future land use plan and assuming no detention)
-] I. _____ Pipe material/coating
-] J. _____ Velocity (V_{25} may not exceed non-erosive velocity at outlet headwall)

- ... 87. Provide complete channel chart indicating the following:
-] A. _____ Open channel numbers
 -] B. _____ Contributing drainage area
 -] C. _____ Runoff coefficient (per future land use plan and assuming no detention)
 -] D. _____ Conveyance size
 -] E. _____ Lining material (riprap, vegetative, etc. – see SWDM)
 -] F. _____ Channel length
 -] G. _____ Channel slope (for min and max values – see SWDM)
 -] H. _____ Velocity (V_{25} may not exceed non-erosive velocity)
 -] I. _____ Design storm frequency (25 year)
 -] J. _____ Design discharge (25 year)
 -] K. _____ Normal flow depth (25 year)

STORM WATER MANAGEMENT REPORT

- ... 88. Provide a storm water management report certified by a Professional Engineer for review and comment. (DR 8.2.1a)
- ... 89. Storm Water Management Report shall contain the following:
-] A. Narrative explaining the purpose of the report
 -] B. An executive summary of the report’s findings, including pre-developed and post developed flow comparisons. provided below:

Flow Summary

Basin	Return Frequency	Pre-developed flow @ property line	Post-developed flow @ property line	Detention necessary? (If yes, list routed flow)	Ponding elevation	10% point pre-developed flow	10% point post-developed flow
	2						
	5						
A	10						
	25						
	50						
	100						

Energy Dissipation Summary Reference Chapter 7 of GC SWDM

Pipe outlet headwall / Detention pond outlet	25 year post-developed flow velocity at outlet headwall	Non-erosive velocity from Storm Water Design Manual	Froude Number	Energy Dissipation Measures proposed
A				
B				
C				

Downstream receiving conveyance velocity summary

Study point/ hydraulic structure/ Basin	25 year pre- developed flow velocity	25 year post- developed flow velocity	Non-erosive velocity from Storm Water Design Manual	Current condition of the channel (appear stable or is it eroding)	Adverse impact expected from proposed project	Detention necessary?
A						
B						
C						

Times of Concentration Summary

Sub-area	Pre/Post Overland flow, minutes	Pre/Post Shallow Concentrated flow, minutes	Pre/Post Open channel flow, minutes	Pre-developed Tc, minutes	Post-developed Tc, minutes
A-1	25/15	35/20	10/10	70	45
A-2					

Curve Number Summary

Sub-area	Pre-developed Curve Number	Post-developed Curve Number
A-1		
A-2		

**Gutter Spread Calculations Summary
(for roadways, max to be 8')**

CB	Max spread, ft
1	
2	

- C. A map showing drainage areas used for pipe design. (DR 8.2.1b)
 - D. A map showing drainage areas for all hydrographs. Preferably county GIS. (DR 8.2.1b)
 - E. A map showing all on-site drainage areas, off-site drainage areas, and all pond bypass areas considered in detention calculations. (DR 8.2.1b)
 - F. Gutter spread calculations. Maximum to be 10', 16' combined, during 10-year storm event. (DR 8.3.5e)
 - G. Calculations verifying the adequacy of existing pipe to carry the proposed discharges. (DR 8.2.1c,1b)
 - H. Calculations showing discharge of concentrated flows into the streets do not exceed the flow rates in table 9-G of the Development Regulations. (DR 9.9.5a)
 - I. Calculations showing outlet pipe for detention ponds will accommodate 125% of Q_{100} routed, if no earthen embankment emergency spillway is proposed. (DR 9.8.4b)
 - J. Runoff coefficient calculations (for pipe and channel design only) showing offsite upstream areas as fully developed per the current land use plan. Follow the procedures set forth in the *Gwinnett County Storm Water Design Manual*. (DR 8.3.4a & DR 8.4.1h)
 - K. Time of concentration calculations for all hydrographs. Follow the procedures set forth in the *Gwinnett County Storm Water Design Manual*. (DR 8.2.3h)
 - L. Curve Number calculations for both pre-developed and post-developed conditions for all hydrographs. Follow the procedures set forth in the *Gwinnett County Storm Water Design Manual*. (DR 8.2.3h)
 - M. Check magnitude of peak flows with USGS regression equations when using other hydrologic methods. (DR 8.2.3g)
 - N. An analysis of downstream conditions. Pipe under drive way and any other down stream culverts.
 - O. Detention pond computer output for the 2, 5, 10, 25 and 100-year storms in basins where detention becomes necessary. (DR 8.2.3i)
 - P. Water Quality BMP calculations. BMP's should be designed using the calculation sheets in Chapter 8, Appendix A of the Storm Water Design Manual. (DR 8.9.1)
- ... 90. Provide storm water detention in Basin(s) _____ for the 2, 5, 10, and 25-year storms. Route the 100-year storm through the pond so that the earth embankment will not overflow. (DR 8.2.3b)
- ... 91. The Rational Method may not be used for detention pond design. (DR 8.2.3f & SWDM 2.1)

- ... 92. Analysis of downstream conditions shall include the following: (DR 8.2.1c)
- [] A. Describe in combination with a topographic map, all culverts, obstructions, existing and potential erosion problems, elevations of existing improvements, and existing drainage complaints, between the downstream property line and the 10% point.
 - [] B. Analyze downstream watercourses and receiving conveyance to ensure channel velocities do not exceed values recommended in the Storm Water Design Manual.
 - [] C. Analyze existing pipe systems and culverts for compliance with current development regulation design criteria. Culverts should pass Q_{100} .
 - [] D. Hydrograph comparisons for the 1, 2, 5, 10, 25, 50 and 100 year storms for both the downstream property line study point and the point where the drainage basin equals 10 times the project area.
 - [] E. FYI: Hydrograph analysis methodology should be as follows for each study point:
 1. Pre-developed on-site hydrograph
 2. Basin area at study point excluding on-site area hydrograph
 3. Combine 1 and 2
 4. Post-developed on-site hydrograph
 5. Combine 4 and 2
 6. Compare 5 and 3 to determine impacts.

... 93. Discuss the calculation of comment(s) # ##### with this office.

... 94. All hydrographs shall be based on a 24-hour storm. (DR 8.2.1c.2c)

... 95. Provide a cross-section of detention pond embankment including outlet pipe, emergency spillway, embankment slopes, minimum embankment top width, outlet control structures, headwalls, and riprap. Verify that minimum 1'-6" freeboard above maximum water surface elevation is provided for earthen dams. Provide 100 year w.s.e in the cross section of the pipe.

... 96. Maximum ponding for parking lot detention: 6" on 10-year storm, 9" on 100-year storm.

... 97. Provide Energy dissipater calculations/designs for outlet headwalls of pipes and detention ponds. The following energy dissipaters may only be used in the corresponding Froude number range:

<i>Energy dissipater</i>	<i>Froude Number range</i>
Riprap apron	Less than or equal to 2.5
Riprap outlet basins	Less than or equal to 2.5
Baffled outlets	1 to 9

... 98. Orifices less than 3" in diameter must be protected from clogging such as Detail 629. A trash rack (maximum mesh opening of $d/2$) with a surface area of at least 10 square feet shall protect all orifices less than 15" diameter. Provide detail.

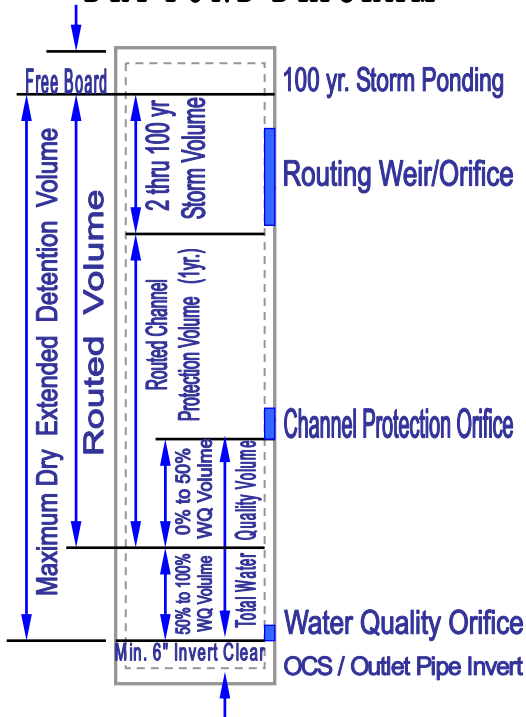
... 99. The following outlet control structure pipe sizes are required based on outlet orifice diameters:

<i>Orifice Diameter</i>	<i>Minimum Pipe Diameter</i>
< 3"	6"
3" to <5"	8"
5" to 11"	12"

... 100. For the site, use pre-developed CN less than or equal to 55 unless approved by this office. (D.R. 9.8.1.d)

- ... 101. Post-developed flows in every basin must be less than or equal to pre-developed flows, unless meeting the conditions of DR 8.2.2.
- ... 102. Please fill out the following table to facilitate review of the dry extended detention pond design (note – if this is a water quality only pond, only water quality volume, 100-year flow through volume and freeboard apply in the diagram below):

DRY POND DIAGRAM



	1	2	3	4	5	6
Pond	WQV required/ provided (c.f.)	50% WQV ponding elev. (2 nd line in above fig.)	Water Quality volume ponding elev. (3 rd line in above fig.)	1 year storm orifice invert elev. (3 rd line in above fig.)	Channel protection volume elev. (4 th line in above fig.)	2 thru 25-yr-detention orifice invert elev. (4 th line in above fig.)
Example	2500/2840	945.23	947.50	947.50	956.00	956.00
A						
B						

- ... 103. Note in the chart above, channel protection and detention pond stage-storage-discharge begins at the elevation shown in column 2.
- ... 104. Note in the chart above, the elevation in column 4 may not be less than the elevation in column 3.
- ... 105. Note in the chart above, the elevation in column 6 may not be less than the elevation in column 5.
- ... 106. Inlet and outlets should be at opposite ends of the pond to maximize flow length. Baffles or islands may be installed to increase the flow path length and to minimize short-circuiting.
- ... 107. Provide calculations showing emergency spillway is designed to pass the 100-year storm event and that freeboard for earthen dams is at least 1.5 feet above 100-year ponding elevation and 0.5 feet for non-earthen dams.

- ... 108. Provide a 15-foot wide maintenance access drive to the pond outlet structure. Show grading on plans.
- ... 109. Show calculations for Water Quality Volume (WQ_v). Use the following equations to calculate the Water Quality Volume (from page 2-30 of the GCSWDM):

$$\begin{aligned} WQ_R &= 1.2''*(R_v) \\ R_v &= 0.05 + (I)*.009 \\ WQ_v &= \frac{WQ_R}{12} *A \end{aligned}$$

Where: WQ_R = water quality runoff (watershed inches)
R_v = the weighted volumetric runoff coefficient

I = Percent Impervious as a whole number
A = on-site area (ft²)

- ... 110. Use the following equation to size the outlet orifice for a 24-hour drawdown time.

$$A = (WQ_v/t)/(0.6*(64.4*H/2)^{0.5}) \text{ where } t = 86,400 \text{ sec.}$$

A = area of the orifice, ft²
H = height above the centroid of the orifice (ft.)
WQ_v = water quality volume, ft³

- ... 111. Outlet orifices shall be protected from clogging. Recommend perforated double "Y" , surrounded by a 48" perforated 1/2 round (if outlet control structure is flat) or a 48" perforated 3/4 round (if outlet control structure is round). This 48" perforated pipe will then be surrounded by #4 stone or smaller. See standard details.
- ... 112. Forebay equaling 10% of the water quality volume must be provided for each inlet to the pond. Provide calculations within report and show grading details on plans.
- ... 113. Treat the runoff from the first one inch of rainfall on the project site as outlined in chapter 8 of the *Gwinnett County Storm Water Design Manual*. An area equivalent to the entire project site must be treated. (DR 8.9.1)
- ... 114. Off-site runoff that flows to the BMP must be treated along with on-site runoff. Off-site runoff may bypass the BMP. (DR 8.9.1)
- ... 115. Submit completed **DRAFT** BMP maintenance agreement (no bonds or signatures-confirm Owner has been briefed on requirements for CO). (DR 8.9.3a)

TSS SPREADSHEET

- ... 116. Use the Storm Water Quality Performance Review form to perform the TSS analysis for the project site. The form can be downloaded at www.gwinnettstormwater.com, under Documents and then Development Review Documents.
- ... 117. The modeled TSS load shall not exceed 850 lbs./acre/yr. (DR 8.9.1)
- ... 118. Provide a map delineating the different land use types for water quality analysis purposes. (i.e. Impervious Area, Disturbed Pervious Area, Undisturbed Upland Area, Undisturbed Stream Buffer Area)
- ... 119. Do not model off-site areas. The analysis should only consider areas included in the property being developed.

WETLANDS

- ... 120. FYI: Portions of this project may encroach on waters of the U.S. It is the responsibility of the applicant to speak with the United States Army Corps of Engineers about acquiring appropriate permits for this activity.

OTHER COMMENTS

- ... 121. #####
- ... 122. _____
- ... 123. _____
- ... 124. _____
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- ... 128. _____
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- ... 136. _____