

DRAFT
KENT CONSERVATION DISTRICT
SEDIMENT AND STORMWATER MANAGEMENT
DETAILED PLAN CHECKLIST

For use of project designer

Project Name: _____
Prepared By: _____ Date: _____

For use of Kent Conservation District

REVIEWED BY: _____ DATE: _____

1.0 DESIGNER CERTIFICATION

I, the undersigned certify that I am a Professional Engineer, Land Surveyor or Landscape Architect, registered in the State of Delaware and that each element of this checklist was considered and addressed. I also understand that this checklist and plan approval by the Kent Conservation District does not relieve me of my professional responsibility to comply with all applicable regulations, codes, standards, guidelines and policies.

Signature and Seal

2.0 SUBMISSION REQUIREMENTS

- 2.1 _____ Completed signed Application for Sediment and Stormwater Management Detailed Plan Approval.
- 2.2 _____ One set of construction plans sealed by a Registered Professional. Upon notification, four (4) sets of signed and sealed plans (5 copies if located within a municipality) must be submitted for final approval. Two (2) will remain at the district office and two (2) will be returned to the owner, unless otherwise requested, with one (1) available on the construction site at all times.
- 2.3 _____ A design report with narrative and supporting calculations, and any waivers or variances requested.
- 2.4 _____ Final record plan if a letter of “No Objection to Recordation” is being requested.
- 2.5 _____ Review fee payable to the Kent Conservation District has been provided (See fee schedule for amount).
- 2.6 _____ This signed and sealed KCD Sediment and Stormwater Management Plan Review checklist that verifies that all items have been considered and are addressed on the plans or in the storm water report.

3.0 REQUIRED SEDIMENT AND STORMWATER NOTES (Notes must appear on the Sediment and Stormwater Management Plan.)

- 3.1 _____ The Kent Conservation District must be notified in writing five (5) days prior to commencing with construction. Failure to do so constitutes a violation of the approved Sediment and Stormwater Management Plan.
- 3.2 _____ A pre-construction meeting must take place before any earth disturbing activity begins. The meeting must be attended by the owner’s representative, contractor, CCR (if required for the site), and Kent Conservation District inspector.
- 3.3 _____ Approval of a Sediment and Storm Water Plan does not grant or imply a right to discharge storm water runoff. The owner/developer is responsible for acquiring any and all agreements, easements, etc., necessary to comply with State drainage and other applicable laws.
- 3.4 _____ Approval of a Sediment and Storm Water Plan shall not relieve the contractor from his or her responsibilities for compliance with the Sediment and Stormwater Regulations.
- 3.5 _____ If the approved plan needs to be modified due to errors or emissions or field conditions, additional sediment and Stormwater control measures may be required as deemed necessary by the Kent Conservation District.
- 3.6 _____ The conditional approval for this site is valid for three (3) years from the approval date stamped on the plan by Kent Conservation District.

- 3.7 _____ The Kent Conservation District reserves the right to enter private property for purposes of periodic site inspection.
- 3.8 _____ Following soil disturbance or management, permanent or temporary stabilization shall be completed within 14 calendar days as to the surface of all perimeter sediment controls, topsoil stockpiles, and all other disturbed or graded areas on the project site.
- 3.9 _____ Periodic maintenance of all sediment control measures is required to insure effective sediment control. Inspection of all sediment and erosion control measures shall be made at least weekly and after each rainfall event. Repairs shall be made within 24 hours of the rain event or when otherwise identified
- 3.10 _____ All erosion and sediment control practices shall comply with the Delaware Erosion and Sediment Control Handbook, latest edition.
- 3.11 _____ The sequence of construction on the approved sediment and stormwater management plan must be strictly adhered. Any divergence from the approved construction sequence requires a written request to modify and the written approval of the Kent Conservation District.
- 3.12 _____ A copy of the approved Sediment & Stormwater Management Plan must be maintained on-site at all times during construction.
- 3.13 _____ All site dewatering shall be done through an approved filtration device. The sediment filter must be placed so as not to cause erosion of the downstream area. KCD Inspector must approve dewatering filter placement and use prior to commencement of dewatering activities.
- 3.14 _____ Soil stockpile areas must be delineated. Locate stockpiles on areas with little or no slope. Stockpiles must be surrounded with silt fence or a stabilized earthen berm. Stockpile areas must be seeded with temporary seeding mixture and mulched.
- 3.15 _____ It shall be the responsibility of _____ *specify the responsible party* _____ to maintain and repair all erosion and sediment control and stormwater management practices during utility installation
- 3.16 _____ It shall be the responsibility of developer to provide long term maintenance of the stormwater management facilities until that responsibility is assumed by a homeowner's association or Maintenance Corporation.
- 3.17 _____ KCD reserves the right to withhold permits and letters of no objection related to obtaining certificates of occupancy from the local jurisdiction for non compliance with the plans and specifications for stormwater management and erosion and sediment control.
- 3.18 _____ An as built survey must be prepared and submitted to KCD for approval within 60 days of stormwater management facility completion.
- 3.19 _____ Prior to start of home construction on each residential lot within a subdivision or building on a commercial property KCD must issue a Standard Permit for grading work on that lot.

4.0 GENERAL REQUIREMENTS

- 4.1 _____ Provide on the Sediment and Stormwater Management Plan the name address, phone number of the owner of the property, the land developer, the engineer or consultant and the applicant
- 4.2 _____ Provide the names of adjacent property owners on the Sediment and Stormwater Management Plan
- 4.3 _____ Provide a legend on the Sediment and Stormwater Management Plan.
- 4.4 _____ Provide a "limit of disturbance" line including all area to be disturbed, including any off-site improvements. The disturbed area in acres must be included on the Sediment and Stormwater Management Plan in bold type near the Owners Certification.
- 4.5 _____ In the lower right hand corner of the Sediment and Stormwater Management Plan provide a 3"X5" space under the Owners Certification for KCD Plan Approval.
- 4.6 _____ Provide a vicinity map with a scale of 1" = 1 mile
- 4.7 _____ Provide a north arrow on the plan
- 4.8 _____ Maximum plan scale of 1" = 100'.
- 4.9 _____ Plans must be submitted on 24"x36" sheets
- 4.10 _____ When two or more sheets are used to illustrate the plan view, an index sheet is required, illustrating the entire project on one 24"x36" sheet.
- 4.11 _____ Provide legible existing and proposed contours based on mean sea level datum (NAVD 88) provided at one-foot intervals. For small projects, provide existing and proposed spot elevations on a 50-foot grid system with high and low points.
- 4.12 _____ State and Federal wetlands must be accurately delineated. If none are present add a note to the plan to this effect.
- 4.13 _____ Delineate the National Flood Insurance Program 100 Year Flood Zone. If none are present add a note to the plan

to this effect.

- 4.14 _____ All streams, ditches, and waterbodies must be delineated.
- 4.15 _____ Provide soils mapping on plan with a general description of each soil.
- 4.16 _____ Establish a permanent project bench mark in the field set by a registered land surveyor for construction vertical control. Show the location of the benchmark on the title sheet for the construction plans.
- 4.17 _____ Include signed Owner's Certification (Signed in ink on the Sediment and Stormwater Management Plan submitted for final approval and a printed name Company affiliation, address and phone number provided). The Certification shall read: "I, the undersigned, certify that all land clearing, construction and development shall be done pursuant to the approved plan and I the undersigned certify that responsible personnel certified by DNREC will be in charge of on-site clearing and land disturbing activities".
- 4.18 _____ Soil stockpile areas must be shown. Locate stockpiles on areas with little or no slope. Stockpiles must be surrounded with silt fence or a stabilized earthen berm. Stockpile areas must be seeded with temporary seeding mixture and mulched.

5.0 EROSION AND SEDIMENT CONTROL

- 5.1 Provide site specific details and specifications for all erosion and sediment control management practices used.
 - A _____ Stabilized construction entrance
 - B _____ Silt fence. Reinforced or super silt fence shall be utilized in areas of steep slopes and/or adjacent to sensitive areas such as wetlands, streams and drainage ways
 - C _____ Storm drain inlet protection shall be silt sacks as manufactured by ACF Industries or a KCD approved equal or alternative method
 - E _____ Rock check dam
 - F _____ Rock outlet protection
 - G _____ Sediment traps/sediment basins
 - H _____ Perimeter dike/swale
 - I _____ Erosion control matting.
 - J _____ Dewatering device. For wet ponds a floating skimmer is the preferred device
 - K _____ Anti-seep collar
 - L _____ Specify details of any unusual practices used.
 - M _____ Sump Pit to remove excess water from excavation
- 5.2 _____ Projects must be phased so that no more than 20 acres is disturbed at any one time. Disturbance of the second 20-acre phase may not proceed until temporary or permanent stabilization of the first 20-acre phase is complete.
- 5.3 _____ Temporary Stone check dams are required in all swales, ditches and channels. Provide details, cross sections and specifications, including check dam station locations.
- 5.4 _____ All stone, with the exception of check dams, must be underlined by a filter fabric. Filter fabric specifications must be specified for each application.
- 5.5 _____ Outlet protection is required at all points of discharge from pipes, channels, and spillways. Provide details, cross- sections and specifications, including d50 stone size, stone depth, and height of outlet protection in outlet channel and outlet dimensions and type of filter fabric under the stone.
- 5.6 _____ Provide inlet and outlet invert elevations for all drainage structures and facilities.
- 5.7 _____ Provide profiles for all stormdrain pipes and open channels or ditches. Provide a typical section of open channels or ditches
- 5.8 _____ A biodegradable stabilization matting is required on disturbed slopes steeper than 3:1 and in areas of concentrated flow. Specify the required biodegradable matting for each intended use.
- 5.9 _____ For residential subdivisions, provide a typical detail for each lot showing a stabilized construction entrance and silt fence at the low side and behind the curb and a generalized sequence of construction for each lot (as shown on the standard plan)
- 5.10 _____ Provide corner and lowest floor elevations for all buildings.
- 5.11 _____ Specify what stabilization measures will be used if dust control becomes a problem.
- 5.12 _____ Sediment traps and basins shall be utilized and sized to accommodate 3600 cubic feet of storage per acre of contributing drainage area until project stabilization is complete. These structures must be located at the base of the drainage area. The following information is required: top of slope, bottom, and outlet elevations, dimensions, proposed and required volumes, type of trap or basin, and contributing drainage area. Include details, cross

sections and specifications including stabilization of sediment traps/ basin; a minimum 2:1 length to width ratio is required.

- 5.13 _____ Diversions must be used to direct runoff into traps. When sediment-laden stormwater is directed to traps or basins by closed pipe systems, temporary diversions must be used to direct stormwater to traps and basins until closed pipe systems are operational. Provide details, cross-sections and specifications (including stabilization) for diversions, ditches, ponds, swales, infiltration structures, etc.
- 5.14 _____ Provide a detailed, site specific sequence of construction, at a minimum, includes the following activities:
- A _____ Installation of perimeter controls and perimeter control inspection by CCR or KCD prior to continuing.
 - B _____ Installation of Stormwater Management basin and/or sediment trap(s). Provide a stormwater management basin sequence of construction that includes installation of outlet structure prior to excavation of basin. Basin is to be permanently stabilized.
 - C _____ Submission of as-built plan of the SWM Facilities to KCD for approval. Building or home construction is not to begin until KCD has approved the as built plan.
 - D _____ Installation of Utilities, both on and off site.
 - E _____ Development of the site.
 - F _____ Conversion of sediment basin to permanent stormwater management basin and/or removal of all temporary erosion control measures (such as inlet protection and silt fence) after approval from KCD.
 - G _____ Prior to the start of home construction in residential subdivisions or building construction on commercial property KCD must approve lot grading.
- 5.17 _____ Provide details of temporary and permanent stabilization measures.
- A _____ seed mix(s) and rates,
 - B _____ Fertilizer and lime requirements
 - C _____ Mulch type, rate and anchoring method
 - D _____ Specify 4-inch minimum of topsoil for all areas to receive permanent stabilization
- 5.18 _____ Provide specific notes and details on dewatering procedures where excavation for trenches and ponds below the water table is anticipated
- 5.19 _____ Provide a typical section for each SWM Pond. Show the existing ground elevation, elevation of the pond bottom, level benches, 2, 10 and 100 year water surface elevations, the elevation of the Seasonal high water table. Show the typical side slope of the pond. Provide a 12 foot wide maintenance access way around the perimeter of the SWM Basin.

6.0 STORMWATER MANAGEMENT DESIGN

- 6.1 _____ As an attachment to the storm water management report provide separate drainage area maps for both the pre and post-development conditions. (max scale is 1"=100'). Where 2 or more sheets are involved an overall plan (normally 1"=200') with key map and match lines must be provided.
- A _____ Delineate on-site sub-watershed areas and off-site contributory areas. Total contributing drainage area must be shown regardless of being located on or off-site. Contours are to be shown for a minimum distance of 100 feet beyond the property line. The computations of pre and post peak discharge rates at the analysis points shall include off site contributing areas
 - B _____ Show soils including NRCS HSG classification
 - C _____ Existing and proposed land use and cover conditions
 - D _____ Provide directional flow arrows and slopes for all existing and proposed channels, pipes, etc. Show existing and proposed pipe sizes
 - E _____ Show time of concentration flow path, included segment ID, slope and lengths.
Sheet flow length
Pervious: 100' max: Impervious: 150' max
Sheet Flow Roughness Coefficients
Woods: 0.40; Row Crops: 0.17; Lawns/open space/pasture/meadow:0.24; Impervious surface: 0.011
For the Composite Curve Number analyses use the following:
Maximum predevelopment Ag: Row Crop w/crop residue
Predevelopment hydraulic condition assumed good
 - F _____ Show analysis point(s) at the property line of each discharge point from the site.
 - G _____ Show adjacent property lines and property Owners

- H _____ Provide a legend showing symbols for information shown on the plan
I _____ Show wetland and flood plain boundaries
K _____ Show all topographical features

- 6.2 _____ All hydrologic computations shall be accomplished using the most recent version of USDA NRCS (former SCS) TR-20 or TR-55 methodology or DNREC approved proprietary software. All hydrologic computations must incorporate the Delmarva Unit Hydrograph with a peak hour factor of 284. The storm duration for computational purposes shall be the 24-hour rainfall event. The pre-development peak discharge rate shall be computed assuming that all land uses in the site to be developed are in good hydrologic condition. The design storms for Kent County, Delaware are 2 year = 3.3", 10 year = 5.2", and 100 year = 8.9".
- 6.3 _____ QUANTITY: Post-development peak rates of discharge for the 2 and 10 year frequency storm events shall not exceed the pre-development peak rates of discharge for the 2 and 10 year frequency storm events.
- 6.4 _____ Stormwater facilities must be designed to safely pass the 100-year storm.
- 6.5 _____ QUALITY: Water quality practices shall be designed to manage the rate and volume of flow from the 2.0" NRCS Type II rainfall event up to a maximum of 1.0" of runoff.
- 6.7 _____ The Storm Water Management Report is to include a Table of Contents with page numbers. The Storm Water Management Report as a minimum will include:
- Narrative Report
 - Scope of Project
 - Existing land use and cover conditions.
 - Proposed stormwater management strategy for quality and quantity
 - Request for waivers, variances with appropriate section of Regulations cited
 - Executive Summary
 - Stormwater Quality Design Summary (Provide page number references to supporting documentation)
 - Stormwater Quantity Design Summary (Provide page number references to supporting documentation). Summary is to include a comparison of pre and post peak discharge rates at the analysis points
 - Appendix Pre Development Computations with Table of Contents and page numbers. Provide a schematic of the analysis. Use a consistent identification system for subareas, Links and ponds between the schematic, computations and the plans
 - Appendix Post Development with Table of Contents and page numbers for:
 - Stormwater Quality Computations. Provide a schematic of the analysis. Use a consistent identification system for subareas, Links and ponds between the schematic, computations and the plans
 - Stormwater Quantity Computations
 - Appendix Soils Report at each SWM Facility with Table of Contents and page numbers. The report as a minimum will include:
 - Purpose and Scope of Study
 - Existing Site Conditions
 - Field Exploration and Study. Borings are to extend to at least 3 feet below the bottom of the SWM Facility
 - Subsurface Conditions. Use the USDA textural triangle and textural classification Soil Classification. Soil boring logs in the area of the stormwater management area shall show soil classification and depth to ground water table for all stormwater management facilities. The soil boring profile is to show the elevations of changes in soil texture, the soil texture and the seasonal high water table.
 - Narrative of findings including soils type and elevation of seasonal high water table
 - Recommendations for design and construction of the SWM Facility relative to slope stability, infiltration, and seasonal high water table
 - Supporting documentation including a plan showing boring locations, field logs and testing. The boring log is to include date of boring, boring location with plan, name of members of boring crew, the elevation of the existing ground at the boring or test pit location and the elevation of each change in soil horizon

7.0 STORMWATER MANAGEMENT FACILITY CONSTRUCTION

- 7.1 _____ Maintenance set aside areas for disposal of sediments removed from stormwater management facilities must be provided. Set aside areas shall accommodate at least 2 percent of the stormwater management facility volume to the elevation of the 2 year storm volume elevation, maximum depth of set aside volume shall be 1 foot, and the slope of the set aside area shall not exceed 5 percent. The maintenance set aside areas must be delineated on the appropriate plan to be recorded
- 7.2 _____ Outlet structures must be accessible from the backslope of the pond. The low flow orifice must be at least 3" in diameter and must have at least 2'-0" above the bottom of the conveyance channel to the control structure. Trash racks or guards are to be provided to prevent the facility from becoming clogged.
- 7.3 _____ Provide a flared end section on both ends of culverts and the outlet end of storm drains. Provide a detail for pipe bedding or refer to DelDOT standard
- 7.4 _____ Preferred options for water quality shall be those practices to as Green Technology BMP's.
- 7.5 _____ INFILTRATION - Infiltration practices shall be used only when the following criteria can be met or exceeded:
- A _____ Systems shall be designed to accept, at least, the first inch of runoff from all streets, roadways and parking lots. (Including all contributing drainage areas.)
 - B _____ Areas draining to these practices must be stabilized and vegetative filters established prior to runoff entering the system.
 - C _____ A suspended solids filter accompanies the practice, when vegetation is used there shall be at least a 20 foot length of vegetative filter.
 - D _____ The bottom of the infiltration practice is at least 3 feet above the seasonal high water table.
 - E _____ The system shall be designed to drain completely in 48 hours.
 - F _____ Infiltration practices are limited to soils having an infiltration rate of at least 1.02 inches per hour as determined by a double ring or single ring infiltrometer. On site soil borings and textural classifications must be done to verify site conditions and seasonal high water table. This information must be submitted with the plan. The design infiltration rate shall have a factor of safety of 2 based on the measured rate
 - G _____ Infiltration practices greater than 3 feet deep shall be located at least 20 feet from basement walls.
 - H _____ Infiltration practices designed to handle runoff from impervious parking areas shall be a minimum of 150 feet from any public or private water supply well.
 - I _____ The slope of the bottom of the infiltration practice shall have a minimum slope of 0.5 percent and not exceed 5 percent.
 - J _____ Infiltration practices shall not be installed in fill material.

7.7 _____ STORMWATER MANAGEMENT PONDS:

All ponds constructed for stormwater management shall be designed and constructed in accordance with USDA NRCS (SCS) Small Pond Code 378, as approved for use in Delaware.

- A _____ Provide a trash rack for orifices and weirs.
- B _____ Provide the note "All seals must be watertight." If dissimilar materials are to be joined (i.e. HDPE pipe to concrete), a means of providing a watertight seal must be specified.
- C _____ Concrete outlet structures must be pre-cast. The opening for pipes can be no greater than the outside diameter of connecting pipe plus 4". Space between the pipe and the walls of outlet structure are to be water tight.
- D _____ The placement of embankment material shall be in 8" lifts. Fill material shall have the optimum moisture content to achieve 90% of the maximum density of the soils as determined by AASHTO T99 Method C Modified. When material is too wet it must be allowed to dry or replaced with acceptable materials. Require field testing by qualified testing company and results supplied to KCD for review.
- E _____ Scale detail of the outlet structure showing dimensions and locations for all control orifices, weirs, etc. plus reinforcing schedule for cast-in-place or non-standard DelDOT structures. Material for structure backfill shall meet the requirements of DelDOT Type C Borrow.
- F _____ Emergency spillways shall be trapezoidal and located in undisturbed earth.

- G _____ All ponds shall have a forebay or other design feature to act as a sediment trap, sized at least 2 percent of the stormwater management facility volume to the elevation of the 2 year storm volume elevation.
- H _____ Max slopes in SWM Basins are 3:1. Benches are to be provided around the perimeter of the pond. The preferred configuration is a 10' wide bench one foot above and below the normal pool. The double bench may be omitted on a case by case basis provided the slope above the bench is 4:1. In KCD the double bench is required if the depth of the normal pool exceeds 3 feet and the difference in elevation between the normal pool and top of the basin exceeds 6 feet.
- I _____ Emergency spillways shall be trapezoidal and located in undisturbed earth.
- J _____ Provide an anti-vortex device for risers.
- K _____ Provide three- (3) square feet of cross sectional area if the principal spillway is to be used to pass the 100 year storm.
- L _____ All anti-seep collars and their connections to the conduit shall be watertight and made of material compatible with the conduit. Provide a detail for the anti-seep collar.
- M _____ One (1) foot of freeboard must be provided between the crest elevation of the 100 year storm and the top of bank for embankment ponds.
- N _____ Ponds constructed by both the excavation and the embankment methods are classified as embankment ponds if the depth of water impounded against the embankment at spillway elevation is three (3) feet or more.
- O _____ The volume of the permanent pool should be equivalent to ½ inch of runoff over the contributing area. The depth of the permanent pool should be 3 feet over 50 to 75% of the area of the water surface.
- P _____ The locations where the soil borings were taken are to be shown on the Stormwater Management Plan. The profile of the soil boring logs is to be shown on the typical section of the SWM Basin. The elevation of the seasonal high water table is shown on the pond cross section
- Q _____ Provide a 12 foot access way around the perimeter of all SWM Basins. The Maximum side slope shall not exceed 6:1.

7.8 **BIO-SWALES AND FILTER STRIPS**

- A _____ Provide a typical section of the bioswale showing 4 inches of topsoil and the vegetative seed mixture
- B _____ Provide a profile with centerline stationing of the bioswale showing bottom slope and relation to existing ground
- C _____ Design of the bioswale is to be based on the procedures set forth in the latest edition of the DNREC Green Technology: The Delaware Urban Runoff Management Approach

7.9 **BIO-RETENTION**

- A _____ Design of the bio retention area is to be based on the procedures set forth in the latest edition of the DNREC Green Technology: The Delaware Urban Runoff Management Approach.

8.0 RECORD PLAN

- 8.1 _____ Include the following statements on the plan to be recorded by the county or local municipally.
 - A _____ If the approved plan needs to be modified, additional sediment and stormwater control measures may be required as deemed necessary by the Kent Conservation District.
 - B _____ The Kent Conservation District reserves the right to enter private property for purposes of periodic site inspection.
- 8.2 _____ Provide a clear statement of defined long term maintenance responsibility. If a homeowner's association or maintenance corporation is to assume long-term maintenance responsibility, specify who is responsible until that organization assumes responsibility.
- 8.3 _____ Maintenance set aside areas for disposal of sediments removed from stormwater management facilities must be shown.
- 8.4 _____ Show all drainage easements. Provide 20 foot Drainage easements where stormdrains or drainageways cross more than one property or lot.
- 8.5 _____ Show the location of all SWM Facilities.

Stability analysis at points of discharge

Pond cross-section with design storm elevations and
Ease of maintenance must be incorporated into the design, access to the structure must be considered.

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