APPENDIX F – PERMANENT STORMWATER DESIGN CHECKLIST

Last Updated: October, 2022

PERMANENT STORMWATER DESIGN CHECKLIST

- For New Subdivisions and Commercial Building Sites
- Each site will be reviewed for site specific items

CITY OF ST.CLOUD MINNESOTA

Site Address/Project Name:_____

Prepared By:_____ **Date:**_____

Reviewed By:_____ **Date:**_____

- Proposed drainage plan and calculations shall be prepared in accordance with the current City Standards for volume, rate, and water quality control as outlined in the City's Land Development Code, Article 19.12 DRAINAGE IMPROVEMENTS found at: http://ci.stcloud.mn.us/index.aspx?nid=1011
- Checklist items are reviewed during the building permit review, land disturbance permit and/or subdivision review process.
- This checklist is not an all-inclusive list of design requirements. The owner and the licensed professional responsible for design shall be responsible to meet all applicable local, state and federal requirements.

1.0 GENERAL

1.1 Proposed drainage plan and hydraulic calculations are dated and signed by a licensed professional.

1.2 Owner, engineer and architect name, address, phone and email listed.

1.3 Plan is to scale with a legend. North arrow shown.

1.4 Size of the project shown:
   a) Existing impervious and pervious surface areas of the site.
   b) Ultimate (fully developed) impervious and pervious surface of the site.
   c) Development schedule: show phasing and calendar year each phase is planned for construction.

1.5 Plan is drawn in 2-foot maximum contours. Existing and proposed contours shown differently. All contours are labeled and legible. Where applicable, extend existing contour lines a minimum beyond the site boundary to accurately depict the drainage patterns. Elevation tied to NGVD 88 (City benchmark).

1.6 Describe and identify the location of existing vegetation.

1.7 Areas not to be disturbed clearly defined.

1.8 On-site soil characteristics: Boundaries of different soil types are described. Groundwater elevations are shown.

1.9 Existing drainage: Show pre-developed drainage areas, land use and the direction of flow for each area and travel path used to determine the Time of Concentration.

1.10 Final drainage: Show post-developed drainage areas, land use and the direction of flow for each area and travel path used to determine the Time of Concentration.

1.11 Identify off-site catchment areas draining to the site. Provide 2-foot contours. Show land use and direction of flow for each area and travel path used to determine the Time of Concentration.

1.12 Existing public and private utilities shown.

1.13 All receiving surface waters, including wetlands and ponds, within one mile from the project boundaries that will receive stormwater from the construction site. Identify if the surface water is a special or impaired water.

1.14 Property limits shown. Streets labeled. Lot and block information shown if platted. Street address shown if un-platted.

1.15 A long-term inspection and maintenance plan for all permanent stormwater treatment practices is required to be submitted with the SWPPP.

1.16 All calculations for the permanent stormwater treatment system(s) and the water quality volume that will be treated through volume reduction practices shall be submitted.

2.0 EASEMENTS

2.1 Existing and proposed drainage easements shown and labeled on the plan.

2.2 **Private** structural stormwater BMPs (e.g. ponds, infiltration/filtration systems) shall meet permanent public easement and maintenance agreement requirements per Land Development Code Section 19.12.E. Easement access shall be designed for:

a) The easement is required to be a minimum of 10 feet in width and shall extend from the structural stormwater BMP to the boundary of the parcel and terminate at said boundary at a location providing **reasonable access** (e.g. abut to existing approaches) from the adjoining public right-of-way onto the easement.

b) The easement shall be a minimum of 10 feet in width from the edge of the structural stormwater BMP and include all pre-treatment BMPs (e.g. sumps). In the case of surface ponding BMP's, the easement shall be a minimum of 10 feet in width from the Normal High-Water Level.

2.3 The easement access shall be a minimum of 15 feet in width from the Normal High-Water Level for **City owned (public) ponds and infiltration systems**.

2.4 See Stormwater Easement & Maintenance Agreement Checklist.

3.0 BUILDING LOTS & DRAINAGE SWALES

3.1 All existing and proposed lot corner elevations shown to the nearest tenth of a foot.

3.2 Control/spot elevations for drainage ways provided.

3.3 100-year flow contained in easement.

3.4 Minimum slope of side lot drainage swales is 2%, direction arrow shown.

3.5 Minimum back lot drainage swale slope is 1%, direction arrow shown.

3.6 Building pads, type of house to be built, garage floor elevation, lowest floor elevation and lowest opening elevation are shown.

3.7 Driveway slope from garage to the gutter is shown.

3.8 Lowest opening elevation: min. 2 feet above 100-year HWL, and min. 1 foot above emergency overflow elevation.

4.0 STORMDRAIN SYSTEM, INLETS, AND OVERFLOWS

4.1 Stormdrain system design: Rainfall frequency shall be determined by City Engineer.

4.2 Pipe size, length, grade and material shown.

4.3 Top of castings and all inverts of catch basins and manholes shown. Label storm drain structures.

4.4 All apron elevations (inlets and outlets) shown.

4.5 450-foot max. manhole spacing (**City owned systems only**).

4.6 Apron inlets to stormdrain system include trash guards.

4.7 Discharge direction of flow generally 45 degrees or less to the flow direction of receiving ditch or stream.
4.8 Discharges to rear property lines shall be piped to at least the rear property line.
4.9 Overflow design to be considered for events greater than stormdrain system design event.
4.10 Private stormdrain pipes and structures servicing a building site (e.g. commercial lot) not designed for water quality treatment shall meet requirements of the plumbing code.

5.0 PRETREATMENT

5.1 A pretreatment device such as a vegetated filter strip, small sedimentation basin, or water quality inlet (e.g. grit chamber, sump, hydrodynamic separator) is required to remove solids, floating materials, and oil and grease from the runoff, to the maximum extent practicable before stormwater discharges into an infiltration or filtration system. Pretreatment devices shall be sized and designed based on Minnesota Stormwater Manual guidance and to prevent clogging of the system.
5.2 It is recommended that pretreatment practices be designed for easy maintenance and capture a minimum of 25 percent of the sediment from runoff.
5.3 Pre-treatment sumps shall have a minimum 3-foot sump depth and be a manhole structure if possible.
5.4 Pre-treatment sumps are required on the last storm manhole prior to discharging to a pond **(City owned ponds only)**.
5.5 Standard details of proprietary pre-treatment devices shall be provided.
5.6 City owned pre-treatment devices shall be sized by the City's Stormwater Compliance Specialist.

6.0 <u>WET SEDIMENTATION BASIN (PONDS)</u>

6.1 Pond drainage/service area shown (in the report).
6.2 Grading plan with pond cross section. All apron elevations (inlet and outlet) shown.
6.3 Hydraulic calculations for ponding provided. 100-year high water level and normal water level shown.
6.4 Where possible, provide a forebay at the inlet; locate inlet and outlet at opposite ends of pond; and provide length to width ratio 3:1.
6.5 Permanent pool volume minimum of 1,800 cubic feet of storage below the outlet pipe per acre drained to the basin.
6.6 Pond design shall provide live storage for a water quality volume (calculated as an instantaneous volume) based on the new and/or redevelopment volume requirement not treated by another on-site system.
6.7 Outlet sized to discharge water quality volume at no more than 5.66 cfs/acre of pond surface area
6.8 Outlet designed to prevent discharge of floating debris and short circuiting.
6.9 Energy dissipation on outlet piping.
6.10 Emergency overflow spillway is located to protect adjacent property and large fill sections.
6.11 Stabilized emergency overflow spillway provided to accommodate storms greater than the 100-year event. High point elevation and direction of overflow marked on plans. Top of berm is 1 foot above emergency overflow spillway.
6.12 Ponds shall not be in a wetland unless mitigated for.
6.13 Minimum horizontal distance between a water supply well and the ordinary high-water level of a pond is 35 feet.

6.14 Pre-treatment sumps are required on the last storm manhole prior to discharging to the pond. **(City owned ponds only)**

6.15 Pond liners shall be considered, following Minnesota Stormwater Manual design specifications, in circumstances where a permanent pool is needed but difficult to maintain due to site conditions, or where seepage from the pond into the groundwater would otherwise occur but must be avoided. This includes:

a) Areas with Hydrologic Group A soils, gravel, or fractured bedrock
b) Potential stormwater hotspots (PSHs) or contaminated soils or groundwater

6.16 As part of the drawing set submittal, provide in table form the following information:

a) Elevation of normal water level (NWL).
b) Elevation of 100-year high water level (HWL), with respective discharge rate.

6.17 The permanent volume must reach a minimum depth of at least 3 feet with no depth greater than 10 feet, and be configured to minimize scour or resuspension of solids.

6.18 A 10:1 bench is provided for first 1 foot of depth below normal water elevation.

6.19 Buffer zones, pond slopes, pond depth as per City of St. Cloud Engineering Department Standard Plate "Vegetated Buffer Area for Wet Ponds".

6.20 Vegetation and slope stabilization methods are subject to City's approval.

6.21 Minimum 10-foot width at top of berm.

6.22 Regional wet sedimentation basins.

a) When the entire water quality volume cannot be retained onsite, regional wet sedimentation basins can be used or created, provided they are constructed basins, not a natural wetland or water body.
b) The regional basin conforms to all requirements for a wet sedimentation basin as described in Part 3.d.iii. (Wet Sedimentation Basin)
c) Must be large enough to account for the entire area that drains to the basin.
d) Waterways between the project and the regional basin must not be significantly degraded.
e) Written authorization for construction/use of the regional basin from the City or private entity that owns and maintains the regional basin.

7.0 INFILTRATION/FILTRATION

7.1 Refer to the Minnesota Stormwater Manual for specific design criteria and guidance. City owned systems shall be designed in partnership with City staff.

7.2 Infiltration systems must not be excavated to final grade, or within three (3) feet of final grade, and filter media cannot be installed until the contributing drainage area has been constructed and fully stabilized unless rigorous erosion prevention and sediment controls (e.g. diversion berms) are provided to keep sediment and runoff completely away from the infiltration/filtration area. Notes, temporary BMPs, and details provided on plans.

7.3 Area to be infiltrated or filtrated shall be shown in the stormwater report.

7.4 Calculations and/or computer model results that demonstrate the design adequacy of the infiltration or filtration system must be included as part of the SWPPP.

7.5 The water quality volume shall discharge through the soil surface or filter media in 48 hours or less. Additional flows that cannot be infiltrated or filtered in 48 hours should be routed to bypass the system through a stabilized discharge point. A way to visually verify that the system is functioning as designed must be provided.

7.6 **At least one soil boring** is required in the location of each infiltration treatment system to verify soil types, ensure a minimum of 3 feet of separation from the seasonally saturated soils (or from bedrock) and the bottom of the proposed infiltration system, and to help determine and confirm infiltration rates.

7.7 **In addition to the soil boring required above, At least one double-ring infiltrometer test is required** to be completed in all infiltration treatment systems per the chart and below. Field measured infiltration rates must be divided by a safety factor of 2. On-site testing must be consistent with the recommendations in the Minnesota Stormwater Manual

a) **For new development** projects of raw land, the infiltration rate test is required prior to plan submittal.

b) **For redevelopment** projects with existing infrastructure over the proposed infiltration area, the infiltration rate test must be completed prior to installation of the infiltration system. Results must be approved by the City's Engineering Department prior to installation.

7.8 The number of soil borings and double-ring infiltration tests required per each infiltration system is shown in the chart.

Surface area (ft2) of infiltration BMP	Soil Borings	Double-Ring Infiltrometer Tests
<1,000	1	1
1,000 - 5,000	2	2
5,000 - 10,000	3	3
>10,000	4	4

7.9 Provide scaled drawing with typical detail and cross section and associated pre-treatment BMPs. Show runoff area directed to the BMP. Show design details such as planting/engineered soils, landscape/final stabilization plan, soil & subgrade preparation details.

7.10 Infiltration is prohibited when the infiltration systems will be constructed in:

a) Areas that receive stormwater runoff from these types of entities regulated under NPDES for industrial stormwater: automobile salvage yards; scrap recycling and waste recycling facilities; hazardous waste treatment, storage, or disposal facilities; or air transportation facilities that conduct deicing activities.

b) Areas that receive discharge from vehicle fueling and maintenance areas, regardless of the amount of new and fully reconstructed impervious area.

c) Areas with less than three (3) feet of separation distance from the bottom of the infiltration system to the elevation of the seasonally saturated soils or the top of bedrock.

d) Areas where soil infiltration rates are more than 8.3 inches per hour unless soils are amended to slow the infiltration rate below 8.3 inches per hour per MN Stormwater Manual Guidance.

e) Areas of predominately Hydrologic Soil Group D (clay) soils.

f) Areas within 1,000 feet up-gradient, or 100 feet down-gradient of active karst features

g) Areas within a Drinking Water Supply Management Area (DWSMA) as defined in Minn. R. 4720.5100, subp. 13 and per NPDES CSW Permit requirements.

h) Areas where infiltrating stormwater may mobilize high levels of contaminants in soil or groundwater. It is required to complete the MPCA's contamination screening checklist or conduct your own assessment to determine the suitability for infiltration. Permittees must retain the checklist or assessment with the site plan.

7.11 **Filtration systems** shall be designed to remove at least 80% TSS.

7.12 **Filtration systems** shall meet City standard plate/detail requirements for filtration basin and draintile connection and cleanout.

7.13 **Filtration systems** must be constructed with an impermeable liner with less than three (3) feet of separation between seasonally saturated soils or bedrock, and in areas where infiltrating water may mobilize contaminants in soil or groundwater.

7.14 **Underground treatment systems** shall also meet the following minimum requirements:

a) Minimize manifold pipe lengths and maximize manifold pipe sizes.
b) 6" minimum inspection port
   i. Centered on each maintenance row;
   ii. On least 1 non-maintenance row, If a multiple row system.
c) At least one maintenance access per each 100-foot maintenance section.
d) Pipe transitions shall be designed without a vertical lip.
e) Proprietary device standard details shall be provided.

7.15 As part of the drawing set submittal, provide in table form the following information from the below example. Include in the table additional site and BMP specific summary information to determine volume reduction, water quality or rate control compliance. If the MIDS calculator was used to determine water quality treatment, provide the summary table and raw MIDS file.

EXAMPLE BMP SUMMARY TABLE *Provide additional information as appropriate to site conditions and BMPs used*	
EXISTING IMPERVIOUS AREA = 25,000 SF	IMPERVIOUS DRAINAGE AREA TO BMPS
EXISTING PERVIOUS AREA = 27,000 SF	RAIN GARDEN = 12,000 SF
	STORMTECH = 23,000 SF
PROPOSED IMPERVOIUS AREA = 50,000 SF	
PROPOSED PERVIOUS AREA = 2,000 SF	PERVIOUS DRAINAGE TO BMPS = 1,500 SF
NEW IMPERVIOUS AREA = 25,000 SF	**SITE INFILTRATION RATE** = 3.1 IN/HR (TESTED, SEE TEST RESULTS)
REDEVELOPED IMPERVIOUS AREA = 10,000 SF	SAFETY FACTOR = 2 (MN STORMWATER MANUAL RECCOMENDED SAFETY FACTOR)
FINAL PERVIOUS AREA = 2,000 SF	DESIGN INFILTRATIOIN RATE = 3.1/2 = 1.55 IN/HR
REQUIRED VOLUME REDUCTION:	**TIME OF INFILTRATION**
25,000 SF X 1" = 2,084 CF	RAIN GARDEN: 24" (SOIL MIX DEPTH + SURFACE) / 1.55 IN/HR = 15.5 HRS (OK)
10,000 SF X 1/4" = 209 CF	STORMTECH CHAMBER + ROCK DEPTH = 36" / 1.55 IN/HR = 23.2 HRS (OK)
2,084 + 209 = 2,293 TOTAL CF REQUIRED	
PROVIDED INFILTRATION VOLUME (2 BMPS):	**DEPTH TO GROUNDWATER & SOILS:**
RAIN GARDEN = 350 CF (SHOW CALCULATION)	SOIL BORINGS SHOW GREATER THAN 10 FEET FROM BOTTOM OF EACH BMP TO GW
STORMTECH SC 740 = 2,000 CF (SEE CALCS IN REPORT OR SHOW)	SEE SOIL BORING X IN REPORT (SHOW WATER TABLE & BMP BOTTOM ELEVATIONS)

8.0 TROUT STREAM

For projects that are required to provide water quality volume treatment and discharge to a trout stream the system must be designed so the discharge from the project minimizes any increase in the temperature of the trout streams resulting from the one (1) or two (2) year 24-hour precipitation events. This includes all tributaries of

the designated trout streams located within the same Public Land Survey System (PLSS) Section. The design must incorporate one or more of the following measures, in order of preference:

a) Provide stormwater infiltration or other volume reduction practices to reduce runoff. Infiltration systems must discharge all stormwater routed to the system within 24 hours;
b) Provide stormwater filtration. Filtration systems must discharge all stormwater routed to the system within 24 hours;
c) Minimize the discharge from connected impervious surfaces by discharging to vegetated areas, or grass swales, and through the use of other non-structural controls;
d) If ponding is used, the design must include an appropriate combination of measures such as shading, vegetated swale discharges or constructed wetland treatment cells that limit temperature increases. The pond must be designed as a dry pond and should draw down in 24 hours or less; and
e) Other methods that minimize any increase in the temperature of the trout stream.

9.0 REFERENCES

9.1 City Standard Construction Specifications and Plates

9.2 Minnesota Stormwater Manual

9.3 City of St. Cloud's Land Development Code

a) Article 19.12, Drainage Improvements

b) Appendix G, Alternative Stormwater Treatment Options

c) Appendix H, Stormwater Easement & Maintenance Agreement Documents

9.4 Permanent Stormwater Treatment Practice Inspection and Maintenance Plan Examples

9.5 Stormwater Easement & Maintenance Agreement Documentation Requirements and Checklist