# Engineering Design Guidelines for Stormwater Management

**For:**
**City of Stillwater**

**Revised April 8, 2019**
**Approved by City Council June 20, 2019**

# Table of Contents

# Table of Contents



**APPENDICES**

## 1 DESIGN OVERVIEW

The City of Stillwater's Stormwater Pollution Prevention Plan (SWPPP) identifies the goals and policies that define the City's stormwater management program, which are implemented via the City's Stormwater Management Ordinance of the Zoning Code (Chapter 31), the City's Local Surface Water Management Plan, and these Engineering Design Guidelines. Stillwater's stormwater requirements were written to meet the City's goals to preserve, protect, and manage its water resources as well as to meet federal, state, and watershed stormwater regulations, and to meet the following objectives:

- Minimize increases in stormwater runoff rates from any development to reduce flooding, siltation, and erosion and to maintain the integrity of stream channels;
- Minimize increases in nonpoint source pollution caused by stormwater runoff from development which would otherwise degrade local water quality;
- Minimize the total annual volume of surface water runoff that flows from any specific site during and following development so as not to exceed the predevelopment hydrologic regime to the maximum extent practicable;
- Ensure that management controls are properly maintained and pose no threat to public safety; and
- Implement stormwater management controls to help meet current and future total maximum daily load (TMDL) goals, address the need to improve water quality, and meet objectives in the Local Surface Water Management Plan.

## 2 DEFINITIONS

The following definitions describe the meaning of the terms used in this Design Manual:

*Applicant* means a property owner or agent of a property owner who has filed an application for a Stormwater Management Permit.

*Applicability* means any land disturbing activity requiring a City of Stillwater Stormwater Management Plan as defined in City Zone Ordinance, Section 31-525 Stormwater Management Practices.

*Channel* means a natural or artificial watercourse with a definite bed and banks that conducts continuously or periodically flowing water.

*Impervious Area* means those surfaces that cannot effectively infiltrate rainfall (e.g., building rooftops, pavement, sidewalks, gravel, driveways, swimming pools, etc.).

*Land Disturbance Activity* means any activity that changes the volume or peak discharge rate of stormwater runoff from the land surface. This may include the grading, digging, cutting, scraping, or excavating of soil, placement of fill materials, paving, construction, substantial removal of vegetation, or any activity that bares soil or rock or involves the diversion or piping of any natural or fabricated watercourse.

*Maintenance Agreement* means document recorded against the property which provides for long-term maintenance of stormwater treatment practices.

*Nonpoint Source Pollution* means pollution from any source other than from any discernible, confined, and discrete conveyances, and shall include but not be limited to, pollutants from agricultural, silvicultural, mining, construction, subsurface disposal, and urban runoff sources.

*Off-Site Facility* means a stormwater management measure located outside the subject property boundary described in the permit application for land development activity.

*Redevelopment* means for projects with one acre or greater of impervious and reconstructing greater than 15% of the existing impervious surfaces the requirements of Minimal Impact Design Standards

(MIDS) will apply to both the reconstructed and new impervious surface. For projects reconstructing less than 15% of the existing impervious, only the new impervious will be subject to conformance with the MIDS requirements. (MPCA*, Tech Support Document for Post-Construction Stormwater Management)*.

*Responsible Party* means the entity which will be responsible for ownership and maintenance of Stormwater Treatment Practices.

*Stop Work Order* means an order which requires that all construction activity on a site be stopped.

*Stormwater Management* means the use of structural or non-structural practices that are design to reduce stormwater runoff pollutant loads, discharge volumes, and/or peak discharge rates.

*Stormwater Management Plan* means a set of drawings or other documents submitted by a person as a prerequisite to obtaining a stormwater management approval, which contains all the required information and specifications pertaining to stormwater management.

*Stormwater Reviews* means any site that the either increases impervious surface by more than one acre or redevelops one acre or more of impervious. The review will be completed to evaluate compliance with MIDS. For sites either creating or redeveloping less than one acre of impervious, the City will work with the applicant to determine if water quality practices can be incorporated into the site. Sites less than one acre will also not allow their drainage to negatively impact downstream properties (or water bodies).

*Stormwater Runoff* means flow on the surface of the ground resulting from precipitation.

*Stormwater Treatment Practices (STPs)* means measures, either structural or nonstructural, that are determined to be the most effective and practical means of preventing or reducing point source or nonpoint source pollution inputs to stormwater runoff and waterbodies.

*Water Quality Volume ($WQ_v$)* means that runoff storage volume needed to treat the specified phosphorus loading as determined in the Stillwater Engineering Design Guidelines.

*Watercourse* means a permanent or intermittent stream or other body of water, either natural or fabricated, which gathers or carries surface water.

*Watershed* means the total drainage area contributing runoff to a single point.

## 3 PROCEDURE FOR REVIEWING STORMWATER MANAGEMENT PLANS

Every applicant for a subdivision or a permit to allow land-disturbing activities will be required to submit an erosion control plan. In addition, all projects either creating or disturbing one acre or greater of new impervious will require the submittal of a Stormwater Management Plan.

The following activities are exempt from submitting a Stormwater Management Plan:

1. Any part of a subdivision if a plat for the subdivision has been approved by the City on or before August 3, 1993.
2. Any activity for which plans have been approved by the watershed management organization with jurisdiction over the project within six months prior to August 3, 1993.
3. A lot for which a building permit has been approved on or before August 3, 1993.
4. Installation of fence, sign, telephone and electric poles, and other kinds of posts or poles.
5. Emergency work to protect life, limb, or property.

The general review process, from the submittal of the concept and final plans to the issuance of the Stormwater Management Plan approval, is summarized in the following seven steps:

1. Determine what stormwater management provisions apply (stormwater management, erosion control, wetland management, floodplain management).
2. Determine what permits or approvals are required for the project site and what waivers and/or exemptions are applicable (COE, DNR, MPCA, Watershed, WCA, etc.).
3. Determine if the project falls with the Browns Creek Watershed District (BCWD), Carnelian-Marine-St. Croix Watershed District (CMSCWD), and/or the Middle St. Croix Watershed Management Organization (MSCWMO).
4. Select the appropriate practices appropriate for the site.
5. Determine if the practices designed to meet the minimum performance criteria.
6. Determine if the Plan meets other resource protection requirements as specified in the City of Stillwater Code.
7. Conform there are provisions for long-term maintenance adequate, including defined access and methods for maintenance.

### 3.1 Actions Requiring Review by the Browns Creek Watershed District (BCWD)

Stormwater Management

1. Residential subdivision or development of four or more lots.
2. Development or redevelopment creating impervious surface that, aggregated with existing impervious surface on the site, equals 10,000 square feet or more or creating impervious surface that, aggregated with existing impervious surface on the site, equals 5,000 square feet or more on a site within the surface water contributing area of a groundwater-dependent natural resource. For redevelopment:
   (a) If the proposed activity will disturb more than 50% of existing impervious surface, the stormwater management standards will apply to all impervious surface and disturbed areas on the project site.
   (b) If the proposed activity will disturb less than 50% of existing impervious surface, the stormwater management standards will apply only to reconstructed and net additional impervious surface and all disturbed areas on the project site.
3. Linear projects that create one or more acres of new and/or reconstructed impervious surfaces or that create 5,000 square feet or more of new and/or reconstructed impervious surface within the surface water contributing area of a groundwater-dependent natural resource.
4. The following are exempt from requiring a stormwater management permit from BCWD:
   (a) Single-family home sites
   (b) Land-disturbing activities that do not involve creation of new impervious surface or reconstruction of existing impervious surface.

Erosion Control

All persons undertaking any grading, filling, or other land disturbing activities which involve movement of more than 50 cubic yards of earth or removal of vegetative cover on five thousand (5,000) square feet or more of land shall submit an erosion control plan to the District, and secure a permit from the District approving the erosion control plan

Lake, Stream, and Wetland Buffers

The Lake, Stream and Wetland Buffer Requirements apply to the following land:

1. Land adjacent to Brown's Creek; a tributary of Brown's Creek designated as a public water pursuant to Minnesota Statues section 103G.005, subdivision 15; a lake, as

defined in these rules; a wetland one acre or larger; or a groundwater dependent natural resource; and
2. Land that has been either (i) subdivided or (ii) subject to a new primary use for which a necessary rezoning, conditional use permit, special-use permit or variance has been approved on or after April 9, 2007, (for wetlands and groundwater-dependent natural resources other than public waters) or January 1, 2000 (for other waters).

Shoreline & Stream Bank Alterations

No person shall disturb the natural shoreline or streambank partially or wholly below the ordinary high-water mark of a waterbody, without first securing a permit from the District and posting a surety.

Floodplain & Drainage Alterations

No person shall alter or fill land below the 100-year flood elevation of any waterbody, wetland, or stormwater management basin, or place fill in a landlocked basin without first obtaining a permit from the District. No person shall alter stormwater flows at a property boundary by changing land contours, diverting or obstructing surface or channel flow, or creating a basin outlet without first obtaining a permit from the District.

### 3.2 Actions Requiring Review by the Carnelian-Marine-St. Croix Watershed District (CMSCWD)

Stormwater Management

1. Residential subdivision of four or more lots;
2. Any project (including linear projects such as road, bikeway, sidewalk, etc.) creating impervious surface that exceeds either one acre or 5% of a site, whichever is less; or
3. Land disturbance of 5,000 square feet or more that includes creating impervious surface within 1,000 feet of and tributary to a groundwater-dependent natural resource or public water. The District's purposes and policy identifies areas subject to these criteria.
4. New or continued mining operations.
5. Projects requiring a variance from the applicable shoreland or St. Croix Riverway ordinance relating to structure setback from the property line adjacent to the resource or impervious surface percentage.
6. Redevelopment activity. If the proposed activity will disturb more than 50% of existing impervious surface and results in a net increase in impervious surface, the management standards will apply to all impervious surface on the project site. Otherwise, the criteria will apply only to new and reconstructed impervious surface. Notwithstanding, for road and other linear projects, only the net additional surface will be considered.

Erosion and Sediment Control

1. Land disturbance of one acre or more;
2. Land disturbance of 1/4 acre or more, if any part of the disturbed area is within 1,000 feet of and tributary to a groundwater-dependent natural resource or public water; or
3. Any land disturbance that requires a District permit under a rule other than the Erosion and Sediment Control Rule.

A person disturbing between 5,000 square feet and 1/4 acre, if any part of the disturbed area is within 1,000 feet of and tributary to a groundwater-dependent natural resource or public water, but not requiring a permit under the criteria of the Erosion and Sediment Control Rule, must submit a notice of intent on a form provided by the District and conform the activity to standard best practices published by the District.

Lake, Stream, and Wetland Buffers

The Lake, Stream and Wetland Buffer Requirements apply to the following land:

1. Land adjacent to a stream designated as a public water pursuant to Minnesota Statues section 103G.005, subdivision 15 as amended; a recreational development or natural environmental lake designated as a public water under Minnesota Statues section 103G.005, subdivision 15 as amended, a groundwater dependent natural resource, a wetland, or the St. Croix River; and
2. Land that has been either (i) subdivided or (ii) subject to a variance from the applicable shoreland or St. Croix Riverway ordinance relating to structure setback from the property line adjacent to the resource or impervious surface percentage; on or after March 1, 2010.

Shoreline & Streambank Alterations

No person shall disturb the natural shoreline or streambank partially or wholly below the ordinary high-water mark of a waterbody, without first securing a permit from the District and posting a surety.

Watercourse & Basin Crossings

No person shall use the beds of any waterbody within the District for agricultural activity or for the any other activity including, but not limited to the placement of roads, trails, and utilities without first securing a permit from the District.

Floodplain & Drainage Alterations

No person shall complete a subdivision of land or alter or fill land below the 100-year flood elevation of any waterbody, wetland, or stormwater management basin, or place fill below the 100-year flood elevation of a landlocked basin without first obtaining a permit from the District. No person shall alter stormwater flows at a property boundary by changing land contours, diverting or obstructing surface or channel flow, or creating a basin outlet without first obtaining a permit from the District.

Wetland Management

The District Wetland Management Plan regulates the following activities:

1. Excavation in all Management Category (1 through 4) wetlands.
2. Alteration of existing upland buffer associated with other activities regulated under this Rule.
3. Livestock access within all Management Category wetlands.
4. Water appropriation and/or dewatering of Management Categories 1, 2, and 3 wetlands.
5. Any other activity that alters the character or hydrology of a wetland.

A wetland management plan shall be submitted to the District in conformity with the requirements of the Wetland Management Rule before any of the above activities begins.

### 3.3 Actions Requiring Review by the Middle St. Croix Watershed Management Organization (MSCWMO)

1. Any project undertaking grading, filling, or other land alteration activities which involve movement of earth or removal of vegetation on greater than 10,000 square feet of land.

2. All projects that creates or fully reconstructs 6,000 square feet or more impervious surface.
3. All major subdivisions or minor subdivisions that are part of a common plan of development. Major subdivisions are defined as subdivisions with four or more lots.
4. Any project with wetland impacts and any project with grading within public waters, the wetland buffer as identified in the plan, or within 40 feet of the bluff line.
5. Any project in the St. Croix Riverway that requires a building permit and adds 500 square feet or greater of additional impervious surface.
6. Any project requiring a variance from local impervious surface zoning requirements.
7. Development projects that impact two or more of the member communities.

# 4 SUBMITTAL REQUIREMENTS

## 4.1 Requirements for City of Stillwater's Stormwater Management Plan Approval

Stormwater Management Plan (Required)

No stormwater management permit will be approved unless it includes a Stormwater Management Plan detailing how runoff and associated water quality impacts resulting from the development will be controlled or managed (note the exceptions in **Section 3**). This plan must indicate whether stormwater will be managed on-site or off-site and, if on-site, the general location and type of practices.

The Stormwater Management Plan must be signed by a licensed professional engineer in the State of Minnesota, who will verify that the design of all stormwater management practices meet the submittal requirements outlined in the Submittal Checklist found in **Appendix A**. No building permit, grading permit, or subdivision approval shall be issued until a satisfactory final Stormwater Management Plan or a waiver thereof has undergone a review and been approved by the City after determining that the plan or waiver is consistent with the requirements of this manual.

Projects within CMSCWD or BCWD must obtain watershed district permits as required. Projects within the jurisdiction of the MSCWMO must meet the requirements of the MSCWMO Watershed Management Plan. Projects within the MSCWMO meeting the full review requirements of the MSCWMO Plan will not be approved by the City until reviewed by the MSCWMO board.

Stormwater Management Conceptual Plan Requirements (Optional)

A stormwater management concept plan submittal is optional, but highly encouraged. A concept plan identifies basic site information, locations of proposed development features, and preliminary locations and sizing of STPs. The concept submittal has a greater chance of identifying major obstacles and can facilitate alternative stormwater management arrangements in a timely fashion and at the onset of project planning. If a concept plan is submitted for review, it should include sufficient information (e.g., maps, basic hydrologic, and water quality calculations) to evaluate the environmental characteristics of the project site. This information should show the potential impacts of all proposed development of the site, both present and future, on the water resources, and show the effectiveness and acceptability of the measures proposed for managing stormwater generated at the project site. The intent of this conceptual planning process is to determine the type of stormwater management of stormwater runoff form future development, and to identify major issues prior to completing final plans. The concept plan is less time consuming and more efficient to evaluate proposed development plans with this step of the review process.

The final plan provides more detailed design information for the proposed STPs and includes much more detail in terms of hydrologic conditions and site features.

For redevelopment, an applicant should include within a concept plan measures for controlling existing stormwater runoff discharges and water quality from the site in accordance with the standards of this Manual. After the review of the concept plan and modifications are made to that plan as deemed necessary by the City, a final Stormwater Management Plan may be submitted for approval.

Stormwater Management Plan Requirements (Required)

Record drawings are required for all projects that impact wetlands and/or the floodplain, require water quality ponding, have significant grade changes, and/or have other unusual circumstances. Record drawings must be certified by a professional land surveyor or civil engineer. (Record drawings should not include temporary erosion control measures.)

1. Plan Details
   - ☐ North arrow, street names, and lot and block numbers for property or subdivision
   - ☐ Location of benchmark based on the City/County benchmark system
   - ☐ Key with all line types, symbols, shading, and cross-hatching denoted
   - ☐ Illustration key showing symbols for all information pertaining to lot and building design, including grades, easements, lot and block, setbacks, etc.
   - ☐ Plan scale (shown graphically on a bar scale) of: 1 inch = 20 feet, 1 inch = 30 feet, 1 inch = 40 feet, or 1 inch = 50 feet. Plans in other scales will not be reviewed.
   - ☐ Total area of subject property, with subtotals of disturbed **and** undisturbed areas (tabulation permitted)
   - ☐ Subject property's boundary lines, lot lines, and right-of-way lines
   - ☐ All existing and proposed drainage and utility easements
   - ☐ All man-made features including existing and proposed buildings, structures, and paved areas
   - ☐ All existing storm sewer facilities within 150 feet of the subject parcel
   - ☐ All proposed storm sewer facilities (include grades and size of structures)
   - ☐ All existing and proposed natural features including, but not limited to, significant trees and tree lines, wetlands, ponds, lakes, streams, drainage channels, and floodplain
   - ☐ Show setbacks and buffers for wetlands, ponds, lakes, streams, and floodplains
   - ☐ All adjacent plats, parcels, rights-of-way, section lines, extended a minimum of 100 feet (50 feet for single family home construction) beyond the subject parcel in all directions
   - ☐ Crossing out of incorrect information (elevations, distances, etc.) will not be allowed on record plans. Incorrect information must be cleanly removed and replaced with the correct record plan information. Proposed elevations and lengths that are not changed should be check-marked to indicate them as being as-built.

2. Topography
   - ☐ Topography details in a minimum of two-foot contour intervals with existing contours as dashed lines and proposed contours as dark, solid lines, labeled at each edge of the plan and at other appropriate locations
   - ☐ Standard lot benching detail, where appropriate (maximum slopes 3:1)
   - ☐ Direction arrows indicating swales and lot drainage patterns (show percent grades along drainage swales on plan)

3. Elevation Information
   - ☐ Proposed top of curb elevations at lot corners and driveway or entrances
   - ☐ Finished spot elevations at all high and low points
   - ☐ Proposed elevations at garage and lowest floor for proposed buildings
   - ☐ Proposed finished ground elevations around home for final grading

4. Temporary Erosion Control Best Management Practices (BMPs)

Show location of all structural erosion control measures (with standard detail plates and maintenance information for each), including, but not limited to:

- ☐ Temporary rock entrance/exit for all vehicle access points (show on plan and provide detail)
- ☐ Perimeter silt fence. Silt fence and/or bale checks should also be placed along swales or slopes greater than 50 feet in length (flare ends of silt fence up slope)
- ☐ Storm sewer inlet filters (indicate type and show graphically on plan at each location)
- ☐ Temporary sediment basins
- ☐ Erosion control mats, fiber blankets, netting, temporary seed, or temporary mulch. All exposed soil areas must be stabilized as soon as possible to limit soil erosion but in no case later than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased and no later than seven days after construction activity in that portion of the site has temporarily or permanently ceased when discharge points on the project is within one mile of a special or impaired water and flows to that special or impaired water.
- ☐ Soil stockpile areas (indicate temporary stabilization measures)
- ☐ Street Sweeping Required
  Plans must include a note indicating that all adjacent streets will be swept daily, or as directed by the City, to remove all accumulated materials. Failure to perform any street sweeping within six hours of notice by the City will result in the work being performed by the City and all associated costs billed. The City also requires removal of accumulated materials on streets during winter.

5. Final Stabilization

New resident construction requires vegetated stabilization from the front curb line to the back of the structure for the entire width of the lot. Show seeding and/or turf establishment locations and specifications, including:

- ☐ Type of seeding (permanent, temporary, dormant)
- ☐ Seed type and application rate
- ☐ Fertilizer type and application rate
- ☐ Mulch type, application rate, and method of anchoring
- ☐ Specifications for installation and maintenance of erosion control mats, blankets, or netting
- ☐ Note requiring seeding/restoration to be completed within 48 hours of final grading
- ☐ Location of all areas to be vegetated

6. Tree Preservation

Show the following standards when a Tree Preservation Plan is required (see Tree and Forest Protection code for more requirements and information):

- ☐ Location, size, and species of all trees that are six caliper inches or greater for deciduous trees, or ten feet in height for coniferous trees.
- ☐ Trees to be preserved.
- ☐ Trees to be removed.
- ☐ Trees within 30 feet of grading limits.
- ☐ Method of tree protection.
- ☐ Tree replacement plan.
- ☐ The location and listing by size and species of existing significant trees, and delineation of the canopy cover of areas of significant trees greater than 10,000 square feet in size. The data on the significant trees should be listed in tabular form on the plan or included as an attachment.

**7. Miscellaneous**

- ☐ Traffic plan showing how the grading materials will be removed from or delivered to the site.

- ☐ One copy of soil borings together with boring location maps and other soils information pertinent to improvements.
- ☐ Schedule of building construction phasing.

## 5 LIST OF ACCEPTABLE PRACTICES

In the development of the STP appropriate for the development or redevelopment, infiltration (water quality volume) is foremost in importance to apply in the design. Filtration is warranted when site conditions do not allow for an effective infiltration facility. For flooding or rate control, detention systems are typically the preferred practice. Low Impact Design (LID) practices are encouraged when they can be functionally incorporated into the design. Alternative practices may be approved at the discretion of the City Engineer. For when infiltration is not feasible the STPs proposed shall meet the performance identified in the MIDS Flexible Treatment Options (FTO).

**Volume Control Systems:**

- Infiltration trench
- Infiltration basin
- Raingarden
- Underground storage
- Reuse
- Green Roofs
- Trees/Tree Planters

**Filtration Systems:**

- Surface sand filter
- Underground sand filter
- Perimeter sand filter
- Organic filter
- Bioretention system
- Raingarden with underdrain
- Pervious pavement with underdrain
- Underground storage with underdrain
- Tree trench

**Detention Systems:**

- Wet pond
- Stormwater re-use systems
- Multiple pond systems
- Extended detention basin
- Micro-pool extended detention basin
- Dry detention ponds
- Underground storage
- Other, as approved by the City of Stillwater

**Wetlands:**

- Shallow wetland
- Pond/wetland systems

**Open Channel Systems:**

- Dry swale
- Wet swale
- Grass swale
- Natural channel or stream

# 6 CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

## 6.1 Erosion Control

1. The City will enforce the Restrictive Soils requirements of the City's Zoning Ordinance for new development on soils with potential for erosion and sedimentation.
2. The Permittee must plan for and implement appropriate construction phasing vegetative buffer strips, horizontal slope grading, and other construction practices to minimize erosion. All areas not to be disturbed shall be marked (e.g. with flags, stakes, signs, silt fence etc.) on the project site before any work begins.
3. All exposed soil areas must be stabilized as soon as possible to limit soil erosion but in no case later than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased and no later than seven days after construction activity in that portion of the site has temporarily or permanently ceased when discharge points on the project is within one mile of a special or impaired water and flows to that special or impaired water.
4. Additional BMPs together with enhanced runoff controls are required for discharges to special waters and impaired waters. The BMPs identified for each special or impaired water are required for those areas of the project draining to a discharge point on the project that is within one mile of a special or impaired water and flows to that water. The additional BMPs are identified in Appendix A of the NPDES Construction General Permit.
5. The permittee must stabilize the normal wetted perimeter of any temporary or permanent drainage ditch or swale that drains water from any portion of the construction site, or diverts water around the site, within 200 lineal feet from the property edge or from the point of discharge into any surface water. Stabilization of the last 200 lineal feet must be completed within 24 hours after connecting to a surface water or property edge.
6. Pipe outlet must have temporary or permanent energy dissipation before connecting to surface water.
7. When possible, all slopes must be graded in such a fashion so that tracking marks made from heavy equipment are perpendicular to the slope.
8. All areas disturbed during construction must be restored as detailed in these requirements. The type of permanent restoration shall be clearly shown on the plans including but not limited to sod, seed, impervious cover and structures. A minimum of six inches of topsoil must be installed prior to permanent restoration. Areas in which the top soil has been placed and finish graded or areas that have been disturbed and other grading or site building construction operations are not actively underway must be temporary or permanently restored as set forth in the following requirements.
    a. Areas with slopes that area less than 3:1 must be seeded and mulched within 14 days of the area not being actively worked.
    b. Areas with slopes that area greater or equal to 3:1 must be seeded and erosion control blanket placed within 14 days of the area not being actively worked.
    c. All seeded area must be either mulched and disc anchored, hydro- mulched, or covered by erosion control blanket to reduced erosion and protects the seed. Temporary or permanent mulch must be disc anchored and applied at a uniform rate of two tons per acre and have 90% coverage.
    d. If the disturbed area will be re-disturbed within a six month period, temporary vegetative cover shall be required consisting of an approved seed mixture and application rate.

e. If the disturbed area will not be re-disturbed within a six month period, permanent vegetative cover shall be required consisting of an approved seed mixture and application rate.
f. All areas that will not have maintenance done such as mowing as part of the final design shall be permanently restored using an approved seed mixture and application rate.
g. Restoration of disturbed wetland areas shall be accomplished using an approved seed mixture and application rate.

9. All erosion control measures must be maintained for the duration of the project until final stabilization has been achieved. If construction operations or natural events damage or interfere with any erosion control measures, they shall be restored to serve their intended function.
10. Additional erosion control measures shall be added as necessary to effectively protect the natural resources of the City. The temporary and permanent erosion control plans shall be revised as needed based on current site conditions and to comply with all applicable requirements

## 6.2 Sediment Control Practices

1. Sediment control practices must be established on all down gradient perimeters before any upgradient land disturbing activities begin. These practices must remain in place until final stabilization has been achieved.
2. If down gradient treatment system is overloaded additional up gradient sediment control practices must be installed to eliminate overloading. The SWPPP must be amended to identify the additional practices.
3. All storm drain inlets must be protected by approved BMPs during construction until all potential sources for discharge have been stabilized. These devices must be maintained until final stabilization is achieved. Inlet protection may be removed if a specific safety concern (street flooding/freezing) has been identified.
4. Temporary stockpiles must have silt fence or other effective sediment controls on the down gradient side of the stockpile and shall not be placed at least 25 feet from any road, wetland, protected water, drainage channel, or stormwater inlets. Stockpile left for more than 14 days must be stabilized with mulch, vegetation, tarps or other approved means.
5. Vehicle tracking of sediment from project shall be minimized by approved BMPs. These shall be installed and maintained at the City approved entrances. Individual lots shall each be required to install and maintained entrances throughout the construction building until a paved driveway is install.
6. Sediment that has washed or tracked from site by motor vehicles or equipment shall be cleaned from paved surfaces throughout the duration of construction.
7. Silt fence or other approved sediment control devices must be installed in all areas as shown on the SWPPP.
8. Silt fence or other approved sediment control devices shall be required along the entire curb line, except for approved opening where construction entrance will be installed or drainage flows away from curb. This device must be maintained until final stabilization is achieved. Ditch checks shall be required in ditch bottoms. Spacing for the check must be as followed: [***Height in feet*** (of the sediment device used)] ***X 100 / Slope Gradient***
9. Dust control measures such as application of water must be performed periodically due to weather, construction activity, and/or as directed by the City.
10. Flows from diversion channels or pipes (temporary or permanent) must be routed to sedimentation basins or appropriate energy dissipaters to prevent the transport of sediment to outflow or lateral conveyors and to prevent erosion and sediment buildup when runoff flows into the conveyors.

11. A concrete washout shall be installed on projects that require the use of concrete. All liquid and solid waste generated by concrete washout operations must be contained in a leak-proof containment facility or impermeable liner. A sign must be installed adjacent to each washout facility to inform operators to utilize the proper facilities.
12. All sediment control measures shall be used and maintained for the duration of the project until final. If construction operations or natural events damage or interfere with any erosion control measures, they must be restored to serve their intended function.
13. Additional sediment control measures shall be added as necessary to effectively protect the natural resources of the City. The temporary and permanent erosion control plans shall be revised as needed based on current site conditions and to comply with all applicable requirements.
14. Restrict clearing and grading within 20 feet of an existing wetland boundary to provide for a protective buffer strip of natural vegetation.

### 6.3 Temporary Sediment Basins

A temporary sediment basin (or permanent) shall be provided when ten or more acres of disturbed soil drain to a common location prior to the runoff leaving the site or entering surface waters. The Permittee is also encouraged, but not required, to install temporary sediment basins in areas with steep slope or highly erodible soils even if the area is less than ten acres and it drains to one common area. The basins shall be designed and constructed according to the following requirements:

1. The basins must provide storage below the outlet pipe for a calculated volume of runoff from a 2-year, 24-hour storm from each acre drained to the basin, except that in no case shall the basin provide less than 1,800 cubic feet of storage below the outlet pipe from each acre drained to the basin.
2. Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage below the outlet pipe per acre drained to the basin shall be provided where attainable until final stabilization of the site.
3. Temporary basin outlets will be designed to prevent short-circuiting and the discharge of floating debris. The basin must be designed with the ability to allow complete basin drawdown (e.g., perforated riser pipe wrapped with filter fabric and covered with crushed gravel, pumps or other means) for maintenance activities and provide a stabilized emergency overflow to prevent failure of pond integrity. Energy dissipation must be provided for the basin outlet.
4. Temporary (or permanent) basins must be constructed and made operational concurrent with the start of soil disturbance that is up gradient of the area and contributes runoff to the pond.
5. Where the temporary sediment basin is not attainable due to site limitations, equivalent sediment controls such as smaller sediment basins and/or sediment traps, silt fences, vegetative buffer strips, or any appropriate combination of measures are required for all down slope boundaries of the construction area and for those side slope boundaries deemed appropriate as dictated by individual site conditions. In determining whether installing a sediment basin is attainable, the Permittee must consider public safety and may consider factors such as site soils, slope, and available area on site. This determination must be documented in the SWPPP.
6. The Permittee shall maintain the sedimentation basins and will remain functional until an acceptable vegetative cover is restored to the site, resulting in a pre-development level rate of erosion. The City will not issue building permits for lots containing sediment basins until they have been removed or relocated based on the projects restoration progress.
7. Basins designed to be used for permanent stormwater management shall be brought back to their original design contours prior to acceptance by the City.

### 6.4 Dewatering and Basin Draining

1. If water cannot be discharged into a sedimentation basin before entering a surface water it must be treated with the appropriate BMPs, so that the discharge does not adversely affect the receiving water or downstream landowners. The Permittee must make sure discharge points are appropriately protected from erosion and scour. The discharge must be dispersed over riprap, sand bags, plastic sheeting or other acceptable energy dissipation measures. Adequate sediment control measures are required for discharging water that contains suspended soils.
2. All water from dewatering or basin draining must discharge in a manner that does not cause nuisance conditions, erosion in receiving channels, on down slope properties, or inundation in wetlands causing significant adverse impact to wetlands.

### 6.5 Inspections and Maintenance

1. The Permittee shall be responsible for inspecting and maintenance of the BMPs
2. The Permittee must routinely inspect the construction project once every seven days during active construction and within 24-hours of a rainfall event of 0.5 inches or greater in 24-hours.
3. All inspections and maintenance conducted during construction must be recorded in writing and must be retained with the SWPPP. Records of each inspection and maintenance activity shall include:
    a. Date and time of inspection.
    b. Name of person(s) conducting the inspections.
    c. Findings of inspections, including recommendations for corrective actions.
    d. Corrective actions taken (including dates, times, and the party completing the maintenance activities).
    e. Date and amount of all rainfall events 0.5 inches or greater in 24-hours.
    f. Documentation of changes made to SWPPP.
4. Parts of the construction site that have achieved final stabilization, but work continues other parts of the site, inspections of the stabilized areas can be reduced to once a month. If work has been suspended due to frozen ground conditions, the required inspections and maintenance must take place as soon as runoff occurs or prior to resuming construction, which ever happens first.
5. All erosion and sediment BMPs shall be inspected to ensure integrity and effectiveness. All nonfunctional BMPs shall be repaired, replaced, or supplemented with a functional BMP. The Permittee shall investigate and comply with the following inspection and maintenance requirements.
6. All silt fences must be repaired, replaced, or supplemented when they become nonfunctional or the sediment reaches half of the height of the fence. These repairs shall be made within 24 hours of discovery, or as soon as field conditions allow access.
7. Temporary and permanent sedimentation basins must be drained and the sediment removed when the depth of sediment collected in the basin reaches half the storage volume. Drainage and removal must be completed within 72 hours of discovery, or as soon as field conditions allow access.
8. Surface waters, including drainage ditches and conveyance systems, must be inspected for evidence of sediment being deposited by erosion. The Permittee shall remove all deltas and sediment deposited in surface waters, including drainage ways, catch basins, and other drainage systems, and restabilize the areas where sediment removal results in exposed soil. The removal and stabilization shall take place within seven days of discovery unless precluded by legal, regulatory, or physical access constraints. The Permittee shall use all reasonable efforts to obtain access. If precluded, removal and stabilization shall take place within seven calendar days of obtaining access. The Permittee is responsible for contacting all local, regional, state, and federal authorities and receiving any applicable permits, prior to conducting any work.
9. Construction site vehicle exit locations shall be inspected for evidence of off-site sediment tracking onto paved surfaces. Tracked sediment shall be removed from all off-site paved surfaces, within 24 hours of discovery or, if applicable, within a shorter time.

10. The Permittee is responsible for the operation and maintenance of temporary and permanent water quality management BMPs, as well as all erosion prevention and sediment control BMPs, for the duration of the construction work at the site. The Permittee is responsible until another Permittee has assumed control over all areas of the site that have not been finally stabilized or the site has undergone final stabilization, and a Notice of Termination has been submitted to the MPCA.
11. If sediment escapes the construction site, off-site accumulations of sediment shall be removed in a manner and at a frequency sufficient to minimize off-site impacts (e.g., fugitive sediment in streets could be washed into storm sewers by the next rain and/or pose a safety hazard to users of public streets).
12. All infiltration areas shall be inspected to ensure that no sediment from ongoing construction activities is reaching the infiltration area and these areas are protected from compaction due to construction equipment driving across the infiltration area.

### 6.6 Pollution Management Measures/Construction Site Waste Control

1. The Permittee must implement the following pollution prevention management measures on the site.
    a. Solid Waste – Collected sediment, asphalt and concrete millings, floating debris, paper, plastic, fabric, construction and demolition debris, and other wastes must be disposed of properly and must comply with MPCA disposal requirements.
    b. Hazardous Materials such as oil, gasoline, paint, and any hazardous substances must be properly stored, including secondary containment, to prevent spills, leaks, or other discharge. Restricted access to storage areas shall be provided to prevent vandalism. Storage and disposal of hazardous waste shall follow MPCA regulations.
    c. External washing of trucks and other construction vehicles must be limited to a defined area of the site. Runoff shall be contained and waste properly disposed of. No engine degreasing is allowed on site.
    d. The City of Stillwater prohibits discharges of any material other than stormwater and discharges from dewatering or basin draining activities. Prohibited discharges include but are not limited to vehicle and equipment washing, maintenance spills, wash water, and discharges of oil and other hazardous substances.
    e. The Permittee must comply with all other pollution prevention/good housekeeping requirements of the MPCA NPDES Construction General Permit.

### 6.7 Final Stabilization

1. The Permittee must ensure final stabilization of the project. Final stabilization can be achieved in one of the following ways.
2. All soil disturbing activities at the site have been completed and all soils will be stabilized by a uniform perennial vegetative cover with a density of at least 70% over the entire pervious surface area, or other equivalent means necessary to prevent soil failure under erosive conditions and;
    a. All drainage ditches, constructed to drain water from the site after construction is complete, must be stabilized to preclude erosion; and
    b. All temporary synthetic and structural erosion prevention and sediment control BMPs (such as silt fence) must be removed as part of the site final stabilization; and
    c. The Permittee must clean out all sediment from conveyances and from temporary sedimentation basins that are to be used as permanent water quality management basins. Sediment must be stabilized to prevent it from washing back into the basin, conveyances or drainage ways discharging off-site or to surface waters. The cleanout of permanent basins must be sufficient to return the basin to design capacity.
3. For residential construction only, final stabilization has been achieved when:
    a. Temporary erosion protection and down gradient perimeter control for individual lots has been completed and the residence has been transferred to the homeowner.
    b. The Permittee must distribute the MPCA “homeowner factsheet” to the homeowner so the homeowner is informed for the need, and benefits, of final stabilization.

## 6.8 Training

1. The SWPPP must provide a chain of command showing who prepared the SWPPP, who is responsible for the management of the construction site and inspections.
2. The training shall consist of a course developed by a local, state or federal agency, professional organization, water management organization, or soil and water conservation district and must contain information that is related to erosion prevention, sediment control, or permanent stormwater management and must relate to the work that you are responsible for managing.

# 7 GUIDANCE ON STORMWATER TREATMENT PRACTICES (STPS)

Designers are expected to follow the Minimal Impact Design Standards (MIDS) flowchart detailed in the *Minnesota Stormwater Manual* (**Appendix C**). Deviations from recommended guidance in the *Minnesota Stormwater Manual* will require detailed written explanation. Approval of any deviation from the *Minnesota Stormwater Manual* guidance will be at the discretion of the City.

# 8 BASIC SIZING CRITERIA

Proposed Stormwater Management Plans must incorporate volume control, water quality control, and rate control as the basis for stormwater management in the proposed development plan. The City of Stillwater, as a permitted MS4, requires for new development projects to have a no net increase from pre-project conditions of total volume, TSS, and TP; in addition, for redevelopment projects within the City, it is required to have a net reduction from pre-project conditions of total volume, TSS, and TP.

## 8.1 Volume Control Requirements

Volume control measures are required on projects to meet the water quality criteria of the BCWD, CMSCWD, and MSCWMO Stormwater Management Plan and to meet the requirements of the City of Stillwater's MS4 Permit obligations.

Volume control shall be required for proposed new impervious areas greater than one-half acre or redevelopment of impervious greater than one-half acre. If an applicant can demonstrate that the volume control standard has been met, then the water quality sizing criteria shall be considered satisfied.

<u>For projects in the BCWD:</u>

1. The applicant must demonstrate that the proposed land altering activity will not increase stormwater flow volume from the site, as compared with the pre-settlement conditions, for a 24-hour precipitation event with a return frequency of two years, or five years within a landlocked basin or subwatershed draining to a landlocked basin.
2. If the proposed activity will disturb more than 50% of existing impervious surface, the criteria of subsection 2.4 of the Stormwater Management Rule will apply to all impervious surface on the project site. Otherwise, the criteria will apply only to net additional impervious surface. Notwithstanding, for road and other linear projects, only net additional surface will be considered.

<u>For projects in the CMSCWD:</u>

The applicant must demonstrate that the proposed land-altering activity:

1. Will not increase stormwater flow volume from the site, as compared with the stormwater flow volume calculated in accordance with sub-section 2.5.3 of CMSCWD's Rule 2.0 Stormwater Management, for a 24-hour precipitation event with a return frequency of two years, or ten years within a landlocked basin or a subwatershed draining to a landlocked basin.
2. Will provide water quality Best Management Practices (BMPs) sized to infiltrate and/or retain the runoff volume generated on the site by the 2-year, 24-hour event under the developed condition for all points where discharges leave a site. For that portion of the 2-year, 24-hour event runoff volume that is not required to be infiltrated as described above, water quality BMPs or additional infiltration will be incorporated. The order of preference for water quality BMPs is biofiltration, filtration, wetland treatment system, extended detention, and wet detention in accordance with NURP standards.

3. Will not increase the bounce in water level or duration of inundation, for a 24-hour precipitation event with a return frequency of 2-, 10-, and 100-years in the subwatershed in which the site is located, for any downstream lake or wetland beyond the limit specified in Appendix 2.2 of the District's Rules.

An applicant for a residential project, including subdivision of less than four lots, that creates one acre or less of impervious surface may demonstrate alternative compliance with the management standards via completion of the District's Small Residential Project Stormwater Worksheet, available from the District office or on the District's website.

For projects in the MSCWMO:

1. New, Nonlinear Developments: For new, nonlinear developments that create new impervious surfaces on sites without restrictions, stormwater runoff volumes will be controlled and the post-construction runoff volume shall be retained on site for 1.1 inches of runoff from impervious surfaces.
2. Reconstruction/Redevelopment Projects: Nonlinear redevelopment projects on site without restrictions that create or fully reconstruct impervious surfaces shall capture and retain on site 1.1 inches of runoff from the new and/or fully reconstructed impervious surfaces.
3. Linear Projects: Linear projects (roadways, sidewalks, and trails) that create or fully reconstruct impervious surface without restrictions and not part of another development shall capture and retain the larger of the following:
   (a) 0.55 inches of runoff from the new and/or fully reconstructed impervious surfaces
   (b) 1.1 inches of runoff from the net increase in impervious area

## 8.2 Volume Control Calculations

Depending on applicability, a proposed development shall capture and retain on site 1.1 inches of runoff from the total impervious surface in post-construction conditions. For redevelopment projects, the performance goal is to capture and retain on site 1.1 inches of runoff from the new and/or fully redeveloped impervious surfaces over one acre. For projects less than one acre, the City encourages applicants to incorporate volume control or the water quality provisions to the extent feasible. For linear projects, the performance goal is to capture and retain onsite the larger of the following:

- 0.55 inches of runoff from the new and fully reconstructed impervious surfaces
- 1.1 inches of runoff from the net increase in impervious surfaces

For projects where it is not feasible to meet the volume reductions requirements it will be required to meeting the water quality requirements of these engineering guidelines. Infiltration is infeasible when:

- Where industrial facilities are not authorized to infiltrate industrial stormwater under and NPDES/SDS Industrial Stormwater Permit issued by the MPCA.
- Where vehicle fueling and maintenance occur.
- With less than three feet of separation distance from the bottom of the infiltration system to the elevation of the seasonally saturated soils or the top of the bedrock.
- Where high levels of contaminant in soil or groundwater will be mobilized by the infiltrating stormwater.

The use of infiltration techniques shall be restricted and subject to additional City review where the infiltration BMP will be constructed in any of the following areas:

- Soils are predominately Hydrologic Soil Group D (clay) soils.
- Within 1,000 feet up-gradient, or 100 feet down-gradient of active karst features.
- Drinking Water Supply Management Areas are present, as defined by Minn. R. 4720.51000, subp.13, unless precluded by a local unit of government with an MS4 permit.
- 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.

## 8.3 Water Quality Control

For new development, the water quality control standard shall be considered satisfied if the volume control standard has been satisfied.

### *8.3.1 For projects in the CMSCWD:*

1. Flows to infiltration facilities must be pretreated for long-term removal of at least 50% of sediment loads. In the event an infiltration facility is constructed in the vicinity downstream of a potential Hot Spot, a skimmer shall be installed to facilitate clean-up.

### *8.3.2 For projects in the MSCWMO:*

1. Surface flows to volume control facilities must be pretreated for long-term removal of at least 50% of sediment loads. In the event an infiltration facility is constructed in the vicinity downstream of a potential Hot Spot, a skimmer shall be installed to facilitate clean-up.
2. Direct discharge of stormwater to water bodies without water quality treatment is prohibited.

If it is infeasible to meet the volume control standard due to contaminated soils, site constraints, etc., the proposed STP will need to maintain the TSS and TP loading and for redevelopment the goal is to reduce the TSS and TP loadings satisfy the water quality standards using the MIDS flexible treatment options as outlined below in addition to the MIDS Design Sequence Flowchart (**Appendix C**).

**MIDS Flexible Treatment Options**

Option 1:
- Applicant attempts to comply with the following conditions:
  - Achieve at least an 0.55-inch volume reduction goal; and
  - Remove 75% of the annual total phosphorus load; and
  - Options considered and presented shall examine the merits of relocating project elements to address varying soil conditions and other constraints across the site.

Option 2:
- Applicant attempts to comply with the following conditions:
  - Achieve volume reduction to the maximum extent practicable (as determined by the Local Authority); and
  - Remove 60% of the annual total phosphorus load; and
  - Options considered and presented shall examine the merits of relocating project elements to address varying soil conditions and other constraints across the site.

Option 3:

- Off-site mitigation (including banking or cash or treatment on another project, as determined by the local authority) equivalent to the volume reduction performance goal can be used in areas selected in the following order of preference:
  - Locations that yield benefits to the same receiving water that receives runoff from the original construction activity.
  - Locations within the same Department of Natural Resources (DNR) catchment area as the original construction activity.
  - Locations in the next adjacent DNR catchment area up-stream.
  - Locations anywhere within the local authority's jurisdiction.

## 8.4 Rate Control

1. At a minimum, detention basins should maintain existing flow rates for the 2-, 10-, and 100-year 24-hour rainfalls in accordance to the Atlas14 data as shown in the table below:

| Event | Rainfall/Snowmelt Depth (inches) |
|---|---|
| 2-year, 24-hour | 2.81 |
| 10-year, 24-hour | 4.17 |
| 100-year, 24-hour | 7.18 |
| 100-year, 10-day snowmelt | 9.82 |

2. Detention basins shall be designed with capacity for the critical 100-year event, which is defined as either the 100-year, 24-hour rainfall event or the 10-day snowmelt runoff event, whichever produces the highest water level.
3. The maximum duration for rainfall critical event analysis shall be 24-hours except in cases where basins are landlocked, where back to back 24-hour events and the 10-day snowmelt runoff event shall also be used. In all cases a hydrograph method of analysis should be used. For the 24-hour rainfall events, or back to back 24-hour rainfall events, an MSE 3 distribution should be used. For shorter duration critical events other distributions may be used with the approval of the City Engineer.
4. All drainage system analyses and designs shall be based on proposed full development land use patterns.
5. Development adjacent to a landlocked basin and the basin is not provided an outlet, freeboard should be determined based on one of three methods (whichever provides for the highest freeboard elevation):
   a. Two feet above the HWL determined by modeling back to back 100-year, 24-hour events; or
   b. Three feet above the highest known water level; or
   c. Five feet above the HWL determined by modeling a single 100-year, 24-hour event.
6. When modeling landlocked basins, the starting water surface elevation should be the basins Ordinary High Water elevation, which can be determined through hydrologic modeling or, in the case of a DNR regulated basin, from a DNR survey.
7. Adjacent to channels, creeks, and ravines two feet of freeboard with respect to the 100-year critical event elevation will also be required.
8. An MSE 3 24-hour rainfall distribution with average antecedent moisture conditions should be utilized for runoff calculations.
9. The recommended minimum outlet diameter is six inches due to plugging susceptibility and may supersede the rate control requirement for the 2-year event.
10. The City requires skimmers or other devices in the construction of new pond outlets and the addition of skimmers to existing systems whenever feasible and practical. The designs shall provide for skimmers that extend a minimum of four inches below the water surface and minimize the velocities of water passing under the skimmer to less than 0.5 feet per second for rainfall events having a 99% frequency.
11. City standard detail plates should be utilized for pond outlet structures.

12. Outlet structures should be designed in three phases with primary outlet structure and secondary overflow structure routed to the storm sewer and a defined emergency overflow as the tertiary outlet structure.

### *8.4.1 For projects in the BCWD*

1. The applicant must demonstrate that the proposed land-altering activity will not increase peak stormwater flow from the site, as compared with the pre-settlement condition, for a 24-hour precipitation event with a return frequency of 2, 10, or 100-years for all points where discharges leave a site.
2. If the proposed activity will disturb more than 50% of existing impervious surface, the criteria of subsection 2.4 of the Stormwater Management Rule will apply to all impervious surface on the project site. Otherwise, the criteria will apply only to net additional impervious surface. Notwithstanding, for road and other linear projects, only net additional surface will be considered.

### *8.4.2 For projects in the CMSCWD*

The applicant must demonstrate that the proposed land-altering activity will not increase peak stormwater flow rate from the site, as compared with the peak stormwater flow rate calculated in accordance with sub-section 2.5.3 of the Stormwater Management Rule, for a 24-hour precipitation event with a return frequency of 2, 10, and 100 years for all points where discharges leave a site.

### *8.4.3 For projects in the MSCWMO*

1. The peak rate of stormwater runoff from a newly developed or redeveloped shall not exceed the 2-, 10-, and 100-year 24-hour storms with respective 2.8, 4.2, and 7.3-inch rainfall depths with MSCWMO approved time distribution based on Atlas 14 for existing and proposed conditions. The runoff curve number for existing agriculture areas shall be less than or equal to the developed condition curve number. The newly developed or redeveloped peak rate shall not exceed the existing peak rate of runoff for all critical duration events, up to and including the 100-year return frequency storm event for all points where discharges leave a site during all phases of development.
2. In sub-areas of a landlocked watershed, development shall not increase the predevelopment volume or rate of discharge from the sub-area for the 10-year return period.
3. Applicants may be required to demonstrate that downgradient stormwater conveyance structures and features will be adequate to safely convey proposed increased peak flow or volume from the site.

## 8.5 Freeboard

Elevation separations of buildings with respect to ponds, lakes, streams, and stormwater features shall be designed as follows:

1. The basement floor elevation of any new building shall be placed at least two feet above the elevation of any known historic high groundwater elevations for the area and at least two feet above the 100-year high surface water elevation in the area.
2. The low building opening elevation of any new building shall be at least three feet above the projected 100-year high water elevation for the area. If this standard is considered a hardship, the standard may be lowered to placing the low building opening elevation at least two feet above the projected 100-year high water elevation if the following can be demonstrated:

a. That within the two-foot freeboard area above the 100-year high water elevation, stormwater storage is at least 50% of the stormwater storage capacity below the 100-year high water elevation; and
b. That a 25% obstruction of the basin outlet for a 100-year critical-duration rainfall event would not result in a high water elevation greater than one foot above the 100-year high water elevation; and
c. An adequate overflow route from the basin will assure that water levels, even for extreme rainfall events, will be greater than one foot below the low building opening elevation.

3. An emergency spillway from ponding areas shall be installed a minimum of one foot below the lowest floor elevation and shall be designed to have a capacity to overflow water at an elevation below the lowest building opening at a rate not less than three times the 100-year peak discharge rate from the basin or the 100-year inflow rate to the basin, whichever is higher.

## 8.6 Floodplain Management

The City prohibits filling activities within the 100-year floodplain the will cause an increase in the stage of the 100-year or regional flood or cause in increase in the flood damages in the reach affected unless compensatory storage is provided and/or channel improvement is provide that will not result in the flood stage. Filling within the floodway is prohibited unless the filling meets FEMA, DNR, and Watershed Commission and District requirements as well as City Zoning Code. Applications proposing to alter the floodplain shall submit the cut/fill diagrams along with calculations demonstrating that the filling or alteration of the floodplain is not resulting in a reduction in the flood stage/storage.

<u>For projects in the BCWD</u>

Floodplain filling must be accompanied by a replacement of flood volume between the ordinary water level and the 100-year flood elevation. The floodplain mitigation area must be calculated by a professional engineer registered in the State of Minnesota or by a qualified hydrologist.

A Floodplain and Drainage Alteration permit application must be submitted to prove that the alteration will not have an unreasonable impact on an upstream or downstream landowner and will not adversely affect flood risk, basin, or channel stability, groundwater hydrology, stream base flow, water quality, or aquatic of riparian habitat.

<u>For projects in the CMSCWD</u>

Floodplain filling must be accompanied by a replacement of floodplain storage volume between the ordinary water level and the 100-year flood elevation except for bioengineering and riprap projects permitted under Rule 5.0. The floodplain mitigation area shall be calculated by a professional engineer registered in the State of Minnesota or by a qualified hydrologist.

The District will issue a permit alter surface flows only on a finding that the alteration will not have an unreasonable impact on an upstream or downstream landowner and will not adversely affect flood risk, basin or channel stability, groundwater hydrology, stream baseflow, water quality, or aquatic or riparian habitat.

<u>For projects in the MSCWMO</u>

The MSCWMO has adopted the Washington County Floodplain Regulations. Upon receipt of an application for a permit or subdivision approval within the floodplain district, the Zoning Administrator shall require the applicant to furnish sufficient site development plans and a hydrologic/hydraulic analysis by a qualified engineer or hydrologist. These plans shall include:

1. The specifics on the nature of the development
2. Whether the proposed use in the floodway or outside the floodway
3. The Regulatory Flood Protection Elevation for the site.

### 8.7 Buffers

Buffers are required adjacent to wetlands for projects requiring a stormwater management permit as defined in City Zoning Code (Chapter 31).

The following standards shall guide the creation or restoration of buffers to achieve the goals and policies of the City of Stillwater, BCWD, CMSCWD, and MSCWMO. The Administrator may modify or waive standards depending on each project Site and goals for the wetland. The buffer zones are as follows:

| BCWD | |
|---|---|
| **Management Class** | **Buffer Width** |
| Stream\Tributaries: Streamside Zone | 25 feet |
| Stream\Tributaries: Middle Zone | 50 feet from upland edge of streamside zone |
| Stream: Outer zone | Upland edge of middle zone to structure setback line under applicable shoreland ordinance |
| Wetland: Preserve | 100 feet |
| Wetland: Manage 1 | 75 feet |
| Wetland: Manage 2 | 50 feet |
| Wetland: Manage 3 | 25 feet |
| Lake | 75 feet |

| CMSCWD | |
|---|---|
| **Management Class** | **Buffer Width** |
| St. Croix River: Streamside Zone | 25 feet from the Bluff Line or OHWL, whichever governs the Structure Setback set by the Lower Saint Croix National Scenic Riverway (LSCNSR) Management Rules |
| St. Croix River: Middle Zone | 50 feet from upland edge of streamside zone |
| St. Croix River: Outer Zone | Upland edge of middle zone to structure setback set by the LSCNSR Management Rules |
| Stream, Creeks and Tributaries: Streamside Zone | 25 feet |
| Stream, Creeks and Tributaries: Middle Zone | 50 feet from upland edge of streamside zone |
| Stream, Creeks and Tributaries: Outer zone | Upland edge of middle zone to structure setback line under applicable shoreland ordinance |
| Wetland: Manage 1 | 100 feet |
| Wetland: Manage 2 | 75 feet |
| Wetland: Manage 3 | 50 feet |
| Wetland: Manage 4 | 50 feet |
| Lake: Natural Environment | 75 feet |
| Lake: Recreational Development | 50 feet |

| MSCWMO | | |
|---|---|---|
| **A Preserve** | **B Maintain** | **C Manage** |
| ≥ 60 feet Require monument to mark edges. | ≥ 30 feet | No buffer. |

In addition, the City has established the following criteria for wetland buffers:

1. Wetland protective natural buffer zone means the area between a line delineating the wetland edge and a line parallel to and upland one-half the distance of the required setback (from Natural Environmental Lakes – 75 feet; Recreational – 37.5 feet; General Development Lakes, unclassified water bodies or wetlands – 25 feet). For Brown's Creek or tributaries of Brown's Creek, the buffer zone is 100 feet from the middle of the creek. If a wetland is associated with the tributary, the required buffer area is 100 feet from the centerline of the tributary or creek or 25 feet beyond the edge of the wetland, whichever is greater.
2. The buffer zone must be maintained in its existing condition, however invasive species as identified by the City must be removed under direction from the City.
3. Any buffer zone that is disturbed must be reestablished with natural planting approved by the City.
4. A silt fence must be installed and maintained protecting the buffer zone before construction begins and not removed until all land-disturbing activities are complete and disturbed areas reestablished.
5. All subdivision applications must have wetland delineated and buffer zones marked and required wetland building setbacks mapped.
6. All plats must show the wetland edge as approved by the City and the wetland protective natural buffer zone.
7. The owner or occupant of any property abutting any wetlands may not conduct or permit any of the following activities within the wetland buffer zone;
   a. Vegetation alteration, including moving or clear-cutting;
   b. Topographic alteration, including but not limited to grading, filing, excavation, and extractions;
   c. Construction, placement, or installation of any structure;
   d. Dumping or disposing of any material foreign to the natural state of the wetland.
8. Land-disturbing activity that is proposed outside of any established wetland buffer zone which may impact the buffer zone or wetland, requires approval by the City Engineer before the activity begins.
9. The buffer zone must be placed in a conservation or open space easement or dedicated for conservation purposes.
10. The wetland buffer zone must be identified by permanent markers, approved by the City; at each lot line, but in no case more than 300 feet apart. All markers must be correctly installed prior to final plat or subdivision approval.

### 8.8 Shoreland Management

The City Code has established setbacks for placement of structures and impervious and requirements for shoreland alterations. The City also encourages the following for work occurring within the shoreland zone:

1. Use of natural vegetation or bioengineering techniques for the stabilization of shorelines.
2. Use materials such as granite or fieldstone for shoreline stabilization project where hard armoring is necessary.
3. Use of techniques that will minimize runoff and improve water quality associated with new development and redevelopment. When possible use existing natural drainage ways, wetlands, and vegetated soil surfaces to convey, store, filter, and retain stormwater runoff

before discharge to public waters. When development density, topographic features, and soil and vegetation conditions are not sufficient to adequately handle stormwater runoff using natural features and vegetation, various types of constructed facilities such as diversions, settling basins, skimming devices, dikes, waterways, and ponds may be used. Preference shall be given to designs using surface drainage, vegetated filter strips, bioretention areas, rainwater gardens, enhanced swales, off-line retention areas, and natural depressions for infiltration rather than buried pipes and human-made materials and facilities (MnDNR *Alternative Shoreland Standards, 2005)*.

For projects in the BCWD: The Lake, Stream, and Wetland Buffer Rule requirements apply to, and not in place of the City's local shoreland ordinance.

For projects in the CMSCWD: The Lake, River, Stream, and Wetland Buffer Rule requirements apply to, and not in place of the City's local shoreland ordinance.

For projects in the MSCWMO: The MSCWMO defers to the Washington County regulations on shoreland management.

### 8.9 Long Term Inspection and Maintenance of Stormwater Facilities

1. No private stormwater facilities may be approved unless a maintenance plan is provided that defines how access will be provided, who will conduct the maintenance, the type of maintenance and the maintenance intervals. At a minimum, all private stormwater facilities shall be inspected annually and maintained in proper condition consistent with the performance goals for which they were originally designed and as executed in the stormwater facilities maintenance agreement (**Appendix B**).
2. Access to all stormwater facilities must be inspected annually and maintained as necessary. The applicant shall obtain all necessary easement or other property interests to allow access to the facilities for inspection or maintenance for both the responsible party and the City of Stillwater.
3. All settled materials including settled solids, shall be removed from ponds, sumps, grit chambers, and other devices and disposed of properly.
4. All BMPs must be maintained to the level required by the MPCA as noted in the Minnesota Stormwater Manual.

## 9 STORMWATER TREATMENT PRACTICE DESIGN STANDARDS

### 9.1 Storm Sewers

1. Manhole spacing shall not exceed 400 feet.
2. Where more than one pipe enters a structure, a catch basin/manhole shall be used.
3. Storm sewer pipe should match top of pipe on top of pipe unless grade constraints prevent this. In that case, hydraulic calculations will be necessary to verify that excessive surcharging will not occur.
4. Stormwater pipes shall be designed utilizing the Rational Method. Channel design shall be hydrograph method only. All methods are subject to the City Engineer's approval.
5. Lateral systems shall be designed for the 10-year rainfall using the Rational Method. State Aid roadway storm sewer shall be designed per the State Aid requirements.
6. The minimum full flow velocity within the storm sewer should be 3 feet per second (fps). The maximum velocity shall be 10 fps, except when entering a pond, where the maximum velocity shall be limited to 6fps.
7. Trunk storm sewer should be designed at a minimum to carry 100-year pond discharge in addition to the 10-year design flow for directly tributary areas. The following table shall be used for the calculation of peak rates using the Rational Method:

| Cover Type | 10-Year Runoff Coefficient |
|---|---|
| Single-family Residential | 0.4 |
| Multi-family Residential | 0.5 |
| Commercial | 0.7 |
| Industrial | 0.7 |
| Parks, Open Space | 0.2 |
| Ponds, Wetlands | 1.0 |

8. For storms greater than the 10-year event, and in the case of plugged inlets, transient street ponding will occur. For safety reasons, the maximum depth in streets should not exceed 1.5 feet at the deepest point.
9. To promote efficient hydraulics within manholes, manhole benching shall be provided to half the diameter of the largest pipe entering or leaving the manhole.
10. Vaned grate (3067V or 3067L) catch basin castings shall be used on all streets.
11. The maximum design flow at a catch basin for the 10-year storm event shall be 3 cubic feet per second (cfs), unless high capacity grates are provided. Catch basins at low points will be evaluated for higher flow with the approval of the City Engineer.
12. All structures located in the street are to be a minimum of three feet deep (rim to invert). Two-by-three catch basins are the minimum-sized catch basin required and they must be four feet deep.
13. Two-foot sump catch basins or manholes are required for all new or rehabilitated storm sewer just prior to discharge to a pond, wetland, lake, or stream.

## 9.2 Outlet and Inlet Pipes

1. Inlet pipes of stormwater ponds shall be extended to the pond normal water level whenever possible.
2. Outfalls with velocities greater than 4 fps into channels, where the angle of the outfall to the channel flow direction is greater than 30 degrees, requires energy dissipation or stilling basins.
3. Outfalls with velocities of less than 4 fps, that project flows downstream into a channel in direction 30 degrees or less from the channel flow direction, generally do not require energy dissipaters or stilling basins, but will require riprap protection.
4. In the case of discharge to channels, riprap shall be provided on all outlets to an adequate depth below the channel grade and to a height above the outfall or channel bottom. Riprap shall be placed over a suitably graded filter material and filter fabric to ensure that soil particles do not migrate though the riprap and reduce its stability. Riprap shall be placed to a thickness at least 2.5 times the mean rock diameter to ensure that it will not be undermined or rendered ineffective by displacement. If riprap is used as protection for overland drainage routes, grouting may be recommended.
5. Discharge velocity into a pond at the outlet elevation shall be 6 fps or less. Riprap protection is required at all inlet pipes into ponds from the normal water level to the pond bottom.
6. Where outlet velocities to ponds exceed 6 fps, the design should be based on the unique site conditions present. Submergence of the outlet or installation of a stilling basin approved by the City is required when excessive outlet velocities are experienced.
7. Submerged outlet pipes from ponds are not allowed.

## 9.3 Channels and Overland Drainage

1. Overland drainage routes where velocities exceed 4 fps should be reviewed by the City Engineer and approved only when suitable stabilization measures are proposed.
2. Open channels and swales are recommended where flows and small grade differences prohibit the economical construction of an underground conduit. Open channels and swales can provide infiltration and filtration benefits not provided by pipe.

3. The minimum grade in all unpaved areas shall be 2%.
4. Maximum length for drainage swales shall be 400 feet.
5. Channel side slopes should be a maximum of 4:1 (horizontal to vertical) with gentler slopes being desirable.
6. Riprap shall be provided at all points of juncture, particularly between two open channels and where storm sewer pipes discharge into a channel.
7. Open channels should be designed to handle the expected velocity from a 10-year design storm without erosion. Riprap may need to be provided.
8. Periodic cleaning of an open channel is required to ensure that the design capacity is maintained. Therefore, all channels shall be designed to allow easy access for equipment.

## 9.4 Ponds

1. Where on site water quality detention basins are required, copies of the calculations determining the design of the basins shall be required. The size and design considerations will be dependent on the receiving water body's water quality category, the imperviousness of the development and the degree to which on site infiltration of runoff is encouraged. Design of on-site detention basins, as described in the site's runoff water management plan, shall incorporate recommendations from the nationwide urban runoff program (NURP) and "Protecting Water Quality in Urban Areas", published by the MPCA, as adopted by the City, or the applicable publications, as adopted by the City. The following design considerations are required for on-site water quality detention basins based on the receiving water's water quality category. These designs include permanent detention for water quality treatment; extended detention designs may be substituted if they provide treatment equivalent to the requirements below:
    1) A permanent pool (dead storage) volume below the normal outlet shall be greater than or equal to the runoff from a 2.5-inch 24-hour storm over the entire contributing drainage area assuming full development.
    2) Maximum allowable pond slopes above the outlet elevation are 4:1.
    3) All constructed ponds and wetland mitigation areas shall have an aquatic or safety bench around their entire perimeter. The aquatic bench is defined as follows:
        a. Cross-slope no steeper than 10:1.
        b. Minimum width 10 feet.
        c. Located from pond outlet elevation to one-foot below pond outlet elevation.
    4) All constructed ponds shall be provided a maintenance access from an adjacent roadway. The maintenance access shall be provided in the form of an easement no narrower than 20 feet. The maintenance access shall have a longitudinal slope no steeper than 6:1 and minimal cross slope. Maintenance access routes, due to their extra width, also serve well as emergency overflow (EOF) routes.
    5) All constructed ponds and wetland mitigation areas shall have a maintenance access bench around sufficient perimeter to provide access to all inlets and outlets. The maintenance bench shall be located within a designated outlot or within a permanent easement. The maintenance bench shall extend from the outlet elevation to one foot above the outlet elevation and its cross slope shall be no steeper than 10:1. The maintenance bench shall connect to the maintenance access.
    6) Maximum pond wet volume depth is eight feet.
    7) Mean depth for wet ponds shall be a minimum of four feet. If the pond is smaller than three acre-feet in volume, mean depths of three to four feet may be used. Mean depth is defined as the area at outlet elevation divided by the wet volume.
    8) All ponds shall be graded to one foot below design bottom elevation. This “hold down” allows sediment storage until site restoration is complete.
    9) The top berm elevation of ponds shall be a minimum of one foot above the 100-year pond HWL.

10) Grading shall not block or raise emergency overflows from adjoining properties unless some provision has been made for the runoff that may be blocked behind such an embankment.
11) All ponds shall have a protected EOF that is a minimum of one foot below the lowest floor elevation.
12) The City requires skimmers or other devices in the construction of new pond outlets and the addition of skimmers to existing systems whenever feasible and practical. The designs shall provide for skimmers that extend a minimum of four inches below the water surface and minimize the velocities of water passing under the skimmer to less than 0.5 feet per second for rainfall events having a 99% frequency.

## 9.5 Infiltration/Filtration Practices

1. Sizing of filtration/infiltration practices, or STPs, shall be in conformance with the volume control requirements of this manual and the *Minnesota Stormwater Manual*.
2. When designing an infiltration practice for volume control and water quality management, on-site testing and detailed analysis are strongly encouraged to determine the infiltration rates of the proposed infiltration facility. Documented site-specific infiltration or hydraulic conductivity measurements (double-ring infiltrometer) completed by a licensed soil scientist or engineer is required. In the absence of a detailed analysis, the saturated infiltration rates listed in the Infiltration Rates for Infiltration STPs table found on the *Minnesota Stormwater Manual* shall be used. A piezometer shall be installed in order to ascertain the level of the local groundwater table and demonstrate at least three feet of separation between the bottom of the proposed facility and the groundwater. The soil boring is required to go to a depth of at least five feet below the proposed bottom of the STP. The soils shall be classified using the Unified Soil Classification system. The least permeable soil horizon will dictate the infiltration rate. Infiltration practices shall be designed to infiltrate the required runoff volume within 48 hours.
3. Pretreatment in the form of ponds, forebays, filter strips, or other approved methods shall be provided for all infiltration areas. Pretreatment upstream of volume management practices is a key element in the long-term viability of infiltration areas. The level of pretreatment varies largely depending on the STP and drainage area of the watershed, City staff, and *Minnesota Stormwater Manual* recommendations shall be utilized for determining the appropriate level of pretreatment on a case-by-case basis.
4. The infiltration practice shall not be used within fifty feet of a municipal, community or private well, unless specifically allowed by an approved wellhead protection plan.
5. The infiltration practice shall not be used for runoff from fueling and vehicle maintenance areas and industrial areas with exposed materials prosing contamination risk, unless the infiltration practice is designed to allow for spill containment.
6. The infiltration practice shall not be used in Hydrologic Soil Group (HSG) D soils without soil corrections.
7. Vegetation of infiltration/filtration practices shall be as shown in the City of Stillwater Standard Details. A plan for management for vegetation shall be included in the SWPPP.
8. If soils are unsuitable for infiltration, then filtration may be used with drain tile, provided in accordance with the City of Stillwater's Standard Details. However, filtration basins do not meet volume control requires and MIDS water quality requirements must be used.
9. Subgrade soils for infiltration/filtration practices shall be as presented in the City of Stillwater's Standard Details. Assume a 40% void ratio for clean washed rock and 20% for construction sand for the purposes of volume calculations.
10. Rock storage beds shall be constructed using crushed angular granite that has been thoroughly washed to remove all fine particles that could result in clogging of the system.
11. For infiltration benches adjacent to ponds, benches shall have slopes no steeper than 5:1 over the proposed infiltration zone. A slope of 10:1 is preferred. The *Minnesota Stormwater Manual* cites concerns with locating infiltration features immediately adjacent

to ponds. To address this, benches shall be located to maintain hydraulic separation from the saturated zone of the pond to minimize the loss of infiltration potential over time.

### 9.6 Emergency Overflow Paths

1. Emergency Overflows (EOFs) shall be sized with a minimum bottom width of five feet and 4:1 side slopes.
2. The maximum flow depth in EOFs shall be less than equal to one foot as calculated for a 100-year back-to-back storm event.

## 10 DESIGN EXAMPLES

The design process for each of the acceptable Stormwater Treatment Practices is detailed in the *Minnesota Stormwater Manual*.

## 11 STORMWATER TREATMENT PRACTICE DETAIL DRAWINGS

Please refer to the City of Stillwater's Engineering Details for the following:

- Bioretention
- Media Filter System
- Vegetative Filter System
- Infiltration Trench
- Infiltration Basin
- Stormwater Pond/Wetland

## 12 CONSTRUCTION SPECIFICATIONS

Construction specifications and details are found in the *Minnesota Stormwater Manual* for each of the acceptable STPs, unless otherwise restricted by this manual.

## 13 CHECKLISTS

Refer to **Appendix A**.

# APPENDIX A

# City of Stillwater Stormwater Plan Checklist

| | | | |
|---|---|---|---|
| Address: | | Permit No: | |
| PID: | | Date Approved: | |
| Date Received: | | Signature: | |
| Site Size (acres): | | Area of Disturbance(acres): | |
| Existing Impervious (acres): | | Proposed Impervious (acres): | |

**Submittals Received**

| Date | Document | Author |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

**General Site Plan**

- ☐ Scale of Survey. Minimum scale 1"=50'. Maximum size plan sheet 24"X36"
- ☐ Survey signed by a registered survey with elevations in NGVD-1983 datum for the following locations:
  - ☐ Each lot corner.
  - ☐ Grade elevation at the foundation and elevation of top of foundation of structures on adjacent lots.
  - ☐ Grade elevation at the foundation, elevation of top of foundation and garage floor of proposed new construction.
  - ☐ Lowest point of entry (i.e. door sill or top of window well) of proposed and existing construction.
  - ☐ Lowest floor of proposed and existing construction.
- ☐ Any proposed retaining wall must have a top and bottom elevation and bottom elevation would be finish grade. Also, no retaining wall is allowed to be built on private property.
- ☐ Retaining walls greater than 4.0 feet in height have been designed and certified by a licensed professional engineer.
- ☐ Easements are clear of any encroachments?
- ☐ New curb cuts proposed? If new curb cut is proposed, stamp all survey maps with the curb cut stamp. Also, write a note on the Residential Plan & Routing Approval form reminding the builder that a curb cut permit is required if the driveway is moved or a new driveway is added.
- ☐ Low floor a minimum of 4.25' (feet) above the sanitary sewer invert elevation.

Comments:

_____

_____

**Erosion Control Plan**

- ☐ SWPPP notes provided on the plan.
- ☐ Temporary stabilization measures provided.
- ☐ Erosion control blankets provided on all slopes greater than 3:1 and all basin slopes.
- ☐ Perimeter Control i.e., Silt Fence, Filter Log, etc.
- ☐ For Single Family Home construction, perimeter protection is provided up-gradient of rear yard drainage swale (see Figure 1).
- ☐ Wire backed silt fence is required at wetland margins. If grading is not taking place next to wetland area, place silt fence as far away from the wetland as possible
- ☐ Stormwater treatment basins must be graded first and silt fence must be installed immediately up-gradient of the stormwater basins as soon as the basins are graded.
- ☐ Rock checks must be installed on all high-flow channels
- ☐ Provide temporary ditches and/or swale to provide proper drainage during the construction process.
- ☐ A seed/mulch specification that meets City requirements and a wetland seed mix for stormwater basin and infiltration area.
- ☐ Installation of 36-inches of sod or silt fence behind the curbs after utilities are installed.
- ☐ Location of stockpiles.
- ☐ Phasing plan for sites that are ≥ 1 acre.
- ☐ CB Inlet Protection (Wimco Road Drain or approved equivalent)
- ☐ Rear lot catch basins must be protected with Infrasafe sediment control barrier Royal Environmental Services or an approved equal.
- ☐ Dewatering and discharge points for dewatering
- ☐ Sediment control (silt fence, etc.) must be indicated on all down-gradient perimeter.
- ☐ Waste control
- ☐ Concrete washout area
- ☐ Rock entrance according to City Specifications
- ☐ Street sweeping schedule at least once per week or more frequently
- ☐ Permanent restoration plan.
- ☐ SWPPP includes an erosion and sediment control inspection schedule and person responsible for maintenance.

Comments:

_____

_____

**Stormwater Management Plan**

- ☐ Delineation map
- ☐ Modeling calculations for existing and proposed conditions
  - ☐ 2, 10, 100, Snowmelt
  - ☐ Modeled direct connected impervious separate
- ☐ Off-site drainage included
- ☐ Wetlands shown on plans and wetland permitting completed
- ☐ Pretreatment
- ☐ Skimmer structures provided on the outlets of all ponds.
- ☐ Soil borings
  - ☐ Design Infiltration Rate Determination
  - ☐ Seasonal High Water Elevation

Comments:

_____

_____

**Water Quality**

☐ Volume control provided as per Watershed District/Organization requirements.

☐ Sequencing provided for alternatives where infiltration is infeasible.

Required Water Quality Volume:_____

Provided Water Quality Volume:_____

Comments:

_____

_____

**Rate Control**

☐ Peak Discharge Rates < Existing

Comments:

_____

_____

**Freeboard**

Building Opening:

☐ 2' above the critical 100-yr HWL of local basins, wetlands, & infiltration basins

☐ 2' above EOF of local basins, wetlands, & infiltration basins

☐ 2' above the 100-yr flow elevation of a swale or channel at the point where the swale channel is closest to the building

Low Floor Elevation:

☐ 2' above the critical 100-yr HWL of major basins

☐ 2' above EOF of major basins

☐ For landlocked basins: 2' above the HWL from back to back 100-yr rainfalls or 2' above the HWL from the 100-yr 10-day snowmelt, whichever is higher. Starting elevation of the basin/waterbody prior to runoff is one of the following:

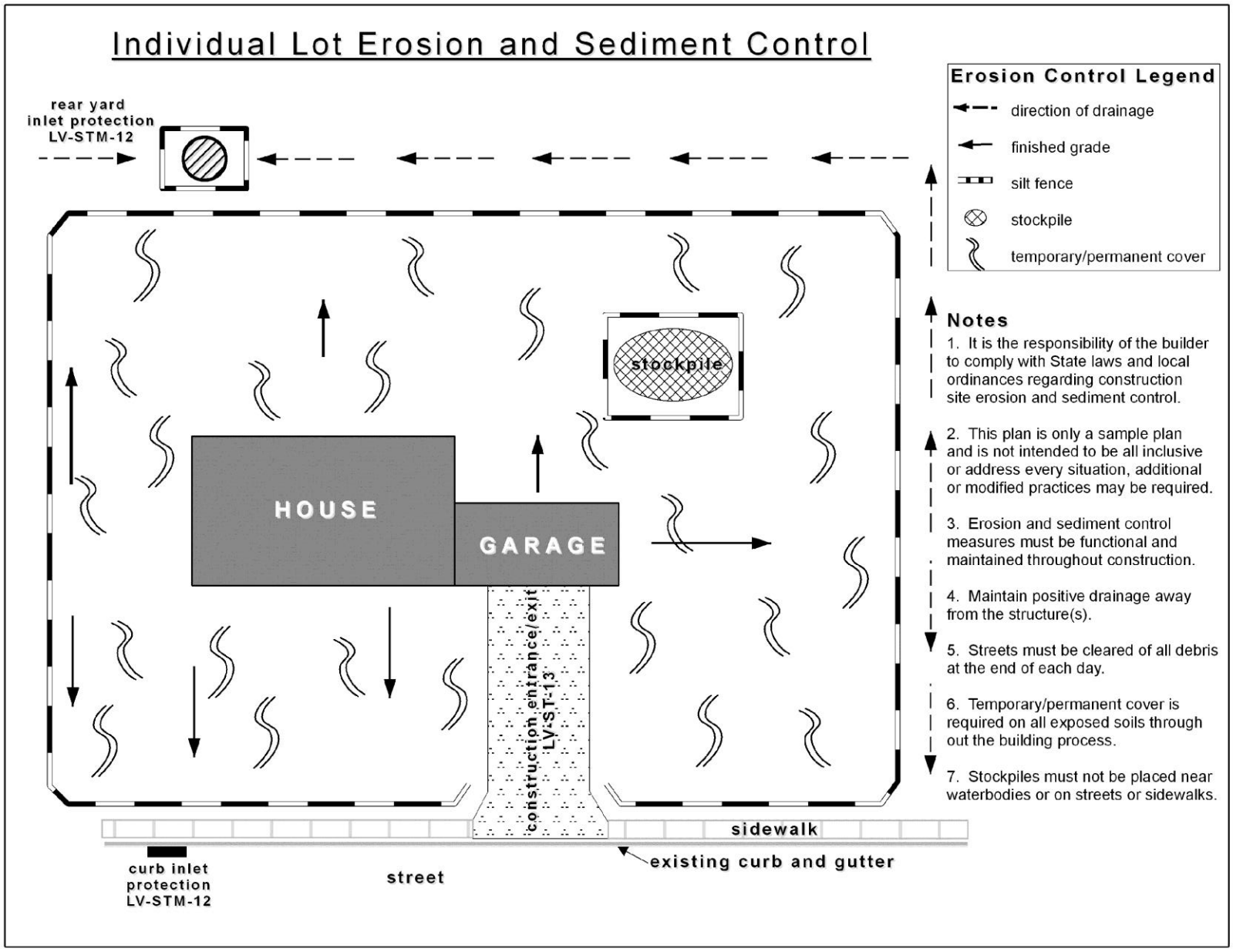
1) Existing Ordinary High Water level established by the Minnesota Department of Natural Resources
2) Annual water balance calculation approved by the City
3) Local observation well records, as approved by the City
4) Mottled soil

Comments:

_____

_____

**Figure 1. Individual Lot Erosion & Sediment Control**



# APPENDIX B

*(Reserved for Recording Data)*

# STORMWATER MANAGEMENT FACILITIES AGREEMENT

This Stormwater Management Facilities Agreement ("Agreement") is made, entered into and effective this ____ day of _____, 2020, by and between the City of Stillwater, a Minnesota municipal corporation ("City") and _____a Minnesota limited liability company ("Developer").

**WHEREAS**, Developer is the fee owner of certain real property situated in the City of Stillwater, County of Washington, State of Minnesota legally described on the attached Exhibit A, (the "Property"); and

**WHEREAS**, the Developer has obtained the approval of the City for the development of the Property for a Stormwater Management Facilities; and

**WHEREAS**, as used herein, the term "Stormwater Management Facilities" may refer to water quality and/or water quantity facilities (i.e. detention basins, retention basins, swales, pipes, oil/water separators, sand filtering devices, infiltration facilities, sump structures, etc.) which are located outside the public road right-of-way; and

**WHEREAS**, the City has required that the Developer make provision for the construction, maintenance and repair of the Stormwater Management Facilities located within the boundaries of the Property as shown on Exhibit B attached hereto, as the same is described and depicted in those certain construction plans drawn by _____ and

**WHEREAS**, the City and Developer desire to set forth their understanding with respect to the construction, repair and maintenance of the Stormwater Management Facilities and the responsibility relating to the costs of the repair and maintenance of the Stormwater Management Facilities.

**NOW THEREFORE**, in consideration of the foregoing facts and circumstances, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto hereby agree as follows:

1. Construction and Maintenance of Stormwater Management Facilities. The Developer agrees to construct the Stormwater Management Facilities according to the Plans and repair and maintain the Stormwater Management Facilities at its sole cost and expense. Maintenance of the Stormwater Management Facilities shall mean (i) monthly inspections of the Infiltration Basin and sump structures and, if necessary, removal of all litter, debris, sediment, and replacement of mulch, vegetation, and eroded areas to ensure establishment of healthy functioning plant life therein; and (ii) an annual inspection, and certification, by a qualified individual or company acceptable to the City that the Infiltration Basin and sump structures are functioning in accordance with the approved Plans and have maintained the proper operation of the stormwater treatment as a Infiltration Basin or sump structure according to the City Standards. If, as a result of an inspection by a qualified individual or company acceptable to the City or City staff, it is determined that the Infiltration Basin or sump structures (1) have not been maintained; or (2) are not functioning as originally designed and intended; or (3) are in need of repair, the Developer agrees to restore the Infiltration Basin or sump structure so that it functions as it was designed and intended. The Developer further agrees that they will not use the Infiltration Basin for snow storage and will inform its snow removal contractors of this provision of the Agreement.

Subject to Section 5 below, Developer shall be solely responsible for the repair and maintenance of the Infiltration Basin and sump structures and shall provide a copy of the required annual inspection report to the City Engineer. If the required annual inspection report is not submitted to the City by December 1st of each year, the Developer shall provide the City with the right to enter onto the property to conduct the annual inspection.

2. Developer's Default. In the event of default by the Developer as to any of the work to be performed by it hereunder, following at least thirty (30) days prior written notice and Developer's failure to cure such default within such time-frame, except in an emergency as determined by the City, the City may, at its option, perform the work and the Developer shall promptly, following receipt of an invoice and reasonable substantiation of such costs, reimburse the City for any reasonable out-of-pocket expense incurred by the City. This Agreement is a license for the City to act when so authorized under this Agreement, and it shall not be necessary for the City to seek a Court order for permission to enter the Property. When the City does any such work, the City may, in addition to its other remedies, assess the reasonable out-of-pocket cost in whole or in part.

3. Future City Policy. Notwithstanding anything contained in this Agreement to the contrary, in the event the City shall in the future establish a policy for repair and maintenance by the City of stormwater ponds owned by private parties located elsewhere in the City under which policy the costs of such repair and maintenance are to be paid either out of general City revenues or by collection of utility or service fees or charges, then any owner of any portion of the Property shall be entitled to petition the City for the inclusion of the Infiltration Basin under such repair and maintenance program. The recording of a certified copy of the Resolution of the City Council of the City which sets forth the consent and authorization described in the foregoing sentence shall serve to terminate this Agreement, without further action on the part of any party hereto.

4. Changes to Site Configuration or Stormwater Management Facilities. If site configurations or Stormwater Management Facilities change, causing decreased effectiveness of stormwater management facilities, new or improved Stormwater Management Facilities must be

implemented to ensure the conditions for post-construction stormwater management continue to be met.

5. Terms and Conditions. This Agreement shall run with the land and shall be binding upon Developer's successors and assigns with respect to the Property. The terms and conditions of this Agreement shall be binding upon, and shall insure to the benefit of the parties hereto and their respective successors and assigns.

6. Developer Warranty. Developer warrants and represents the following to the City, and acknowledges that this Agreement has been duly executed and delivered and constitutes the legal, valid and binding obligation of Developer enforceable in accordance with its terms. The party signing on behalf of the Developer has been duly authorized by the entity to sign the Agreement and bind the entity. Developer has been duly formed under the laws of the State of Minnesota and is in good standing under the laws of the jurisdiction in which the Property is located, is duly qualified to transact business in the jurisdiction in which the Property is located, and has the requisite power and authority to enter into and perform this Agreement and the documents and instruments required to be executed and delivered by Developer pursuant hereto. This Agreement and the documents and instruments required to be executed and delivered by Developer pursuant hereto have each been duly authorized by all necessary action on the part of Developer and such execution, delivery and performance does and will not conflict with or result in a violation of Developer's organizational agreement or any judgment or order. The execution, delivery and performance by Developer of this Agreement will not (a) violate any provision of any law, statute, rule or regulation or any order, writ, judgment, injunction, decree, determination or award of any court, governmental agency or arbitrator presently in effect having applicability to Developer, or (b) result in a breach of or constitute a default under any indenture, loan or credit agreement or any other agreement, lease or instrument to which Developer is a party or by which it or any of its properties may be bound.

7. Amendment and Waiver. The parties hereto may by mutual written agreement amend this Agreement in any respect. Any party hereto may extend the time for the performance of any of the obligations of another, waive any inaccuracies in representations by another contained in this Agreement or in any document delivered pursuant hereto which inaccuracies would otherwise constitute a breach of this Agreement, waive compliance by another with any of the covenants contained in this Agreement, waive performance of any obligations by the other or waive the fulfillment of any condition that is precedent to the performance by the party so waiving of any of its obligations under this Agreement. Any agreement on the part of any party for any such amendment, extension or waiver must be in writing. No waiver of any of the provisions of this Agreement shall be deemed, or shall constitute, a waiver of any other provisions, whether or not similar, nor shall any waiver constitute a continuing waiver.

8. Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of Minnesota.

9. Counterparts. This Agreement may be executed in any number of counterparts, each of which shall be deemed an original but all of which shall constitute one and the same instrument.

10. Consent. Developer consents to the recording of this Agreement.

11. Limitation of Liability. Notwithstanding any other provision of this Agreement, in no event shall either party or any of their affiliates, by reason of any of their respective acts or omissions be liable whether in contract, tort, misrepresentation, warranty, negligence, strict liability or otherwise for any special, indirect, incidental or consequential damages arising out of or in connection with this Agreement, or the performance, non-performance or breach thereof.

12. Notice. Notice shall mean notices given by one party to the other if in writing and if and when delivered or tendered: (i) in person; (ii) by depositing it in the United States mail in a sealed envelope, by certified mail, return receipt requested, with postage and postal charges prepaid, or (iii) by proper and timely delivery to an overnight courier service addressed by name and address to the party or person intended addressed as follows:

If to City:

City of Stillwater
Attn: City Administrator
216 4th Street North
Stillwater, MN 55082

If to Developer:

or to such other address as the party addressed shall have previously designated by notice given in accordance with this Section. Notices shall be deemed to have been duly given on the date of service if served personally on the party to whom notice is to be given, on the third day after mailing if mailed by United States postal service as provided above, or within twenty-four (24) hours if sent via overnight courier service provided, that a notice not given as above shall, if it is in writing, be deemed given if and when actually received by a party.

**[The remainder of this page was intentionally left blank.]**

**IN WITNESS WHEREOF**, the parties hereto have caused this document to be executed as of the day and year first above written.

**CITY:**
**CITY OF STILLWATER**

By: _____
XXXXXXXXXXX
Mayor

By: _____
XXXXXXXXXXXXXX
City Clerk

STATE OF MINNESOTA )
) ss.
COUNTY OF WASHINGTON )

On this _____ day of _____, 20 before me a Notary Public within and for said County, personally appeared Mayor and City Clerk Beth Wolf to me personally known, who being each by me duly sworn, each did say that they are respectively the Mayor and the City Clerk of the City of Stillwater, the Minnesota municipal corporation named in the foregoing instrument, and that it was signed on behalf of said municipal corporation by authority of its City Council and said Mayor and City Clerk acknowledged said instrument to be the free act and deed of said municipal corporation.

_____
Notary Public

By: _____
Name: _____
Its: _____

STATE OF MINNESOTA )
) ss.
COUNTY OF _____ )

On this _____ day of _____, 2020, before me a Notary Public within and for said County, personally appeared _____ to me personally known, who being by me duly sworn, did say that he is the _____ of _____, L. L. C., a Minnesota limited liability company named in the foregoing instrument, and that it was signed on behalf of said limited liability company and acknowledged said instrument to be the free act and deed of the limited liability company.

_____
Notary Public

**This instrument drafted by**
**And after recording, please return to:**
Korine L. Land (#262432)
Stillwater City Attorney
LeVander, Gillen & Miller, P.A.
633 South Concord Street, Suite 400
South St. Paul, Minnesota 55075

**EXHIBIT A**
**Legal Description**

**EXHIBIT B**
**Stormwater Maintenance Facilities Plans**

# APPENDIX C

**MIDS Project Flexible Treatment Options (FTO)**

The Flexible Treatment Options (FTO) alternatives presented here should be employed when the Performance Goal is not feasible and/or allowed. The designer should document the reasons why the Performance Goal and rejected FTO Alternatives are not feasible and/or allowed.

**FTO 1**

Applicant attempts to comply with the following conditions:

1.a. Achieve at least 0.55" volume reduction goal, and

1.b. *Remove 75%* of the annual TP load, and

1.c. Options considered and presented shall examine the merits of relocating project elements to address, varying soil conditions and other constraints across the site

**FTO #2**

Applicant attempts to comply with the following conditions:

2.a. Achieve volume reduction to the maximum extent practicable (as determined by the Local Authority), and

2.b. *Remove 60%* of the annual TP load, and

2.c. Options considered and presented shall examine the merits of relocating project elements to address, varying soil conditions and other constraints across the site.

**FTO #3**

Off-site mitigation (including banking or cash or treatment on another project, as determined by the local authority) equivalent to the volume reduction performance goal can be used in areas selected in the following order of preference:

1. Locations that yield benefits to the same receiving water that receives runoff from the original construction activity
2) Locations within the same Department of Natural Resource (DNR) catchment area as the original construction activity
3) Locations in the next adjacent DNR catchment area up-stream
4) Locations anywhere within the local authorities jurisdiction

**Notes:**

A. Volume reduction techniques considered shall include infiltration, rainwater harvesting & reuse, bioretention, permeable pavement, tree boxes, grass swales and/or additional techniques included in the MIDS calculator or the Minnesota Stormwater Manual.

B. Applicant shall document the flexible treatment options decision sequence, following the order of alternatives presented here.

C. For Alternative #2, the applicant is encouraged to use BMPs that reduce volume. Secondary preference is to employ filtration techniques, followed by rate control BMPs.

D. Fully reconstructed impervious surfaces: Areas where impervious surfaces have been removed down to the underlying soils. Activities such as structure renovation, mill and overlay projects and other pavement rehabilitation projects that do not alter the underlying soil material beneath the structure, pavement or activity are not considered full reconstruction. In addition, other maintenance activities such as catch basin and pipe repair/replacement, lighting, and pedestrian ramp improvements shall not be considered fully reconstructed impervious surfaces. Reusing an existing building foundation and re-roofing of an existing building are not considered fully reconstructed.

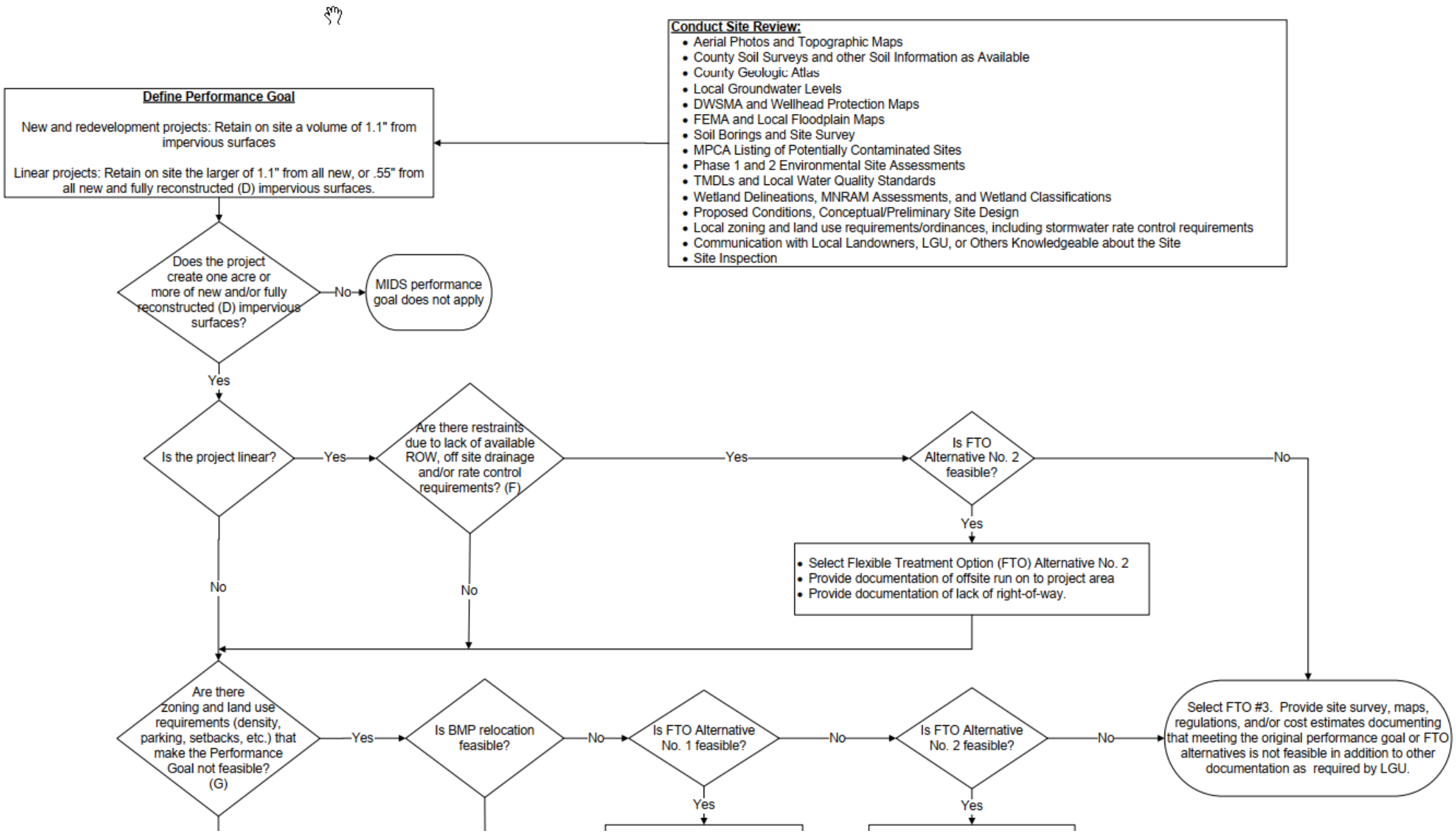
E. Soils that infiltrate too quickly may not provide sufficient pollutant removal before the infiltrated runoff enters groundwater.

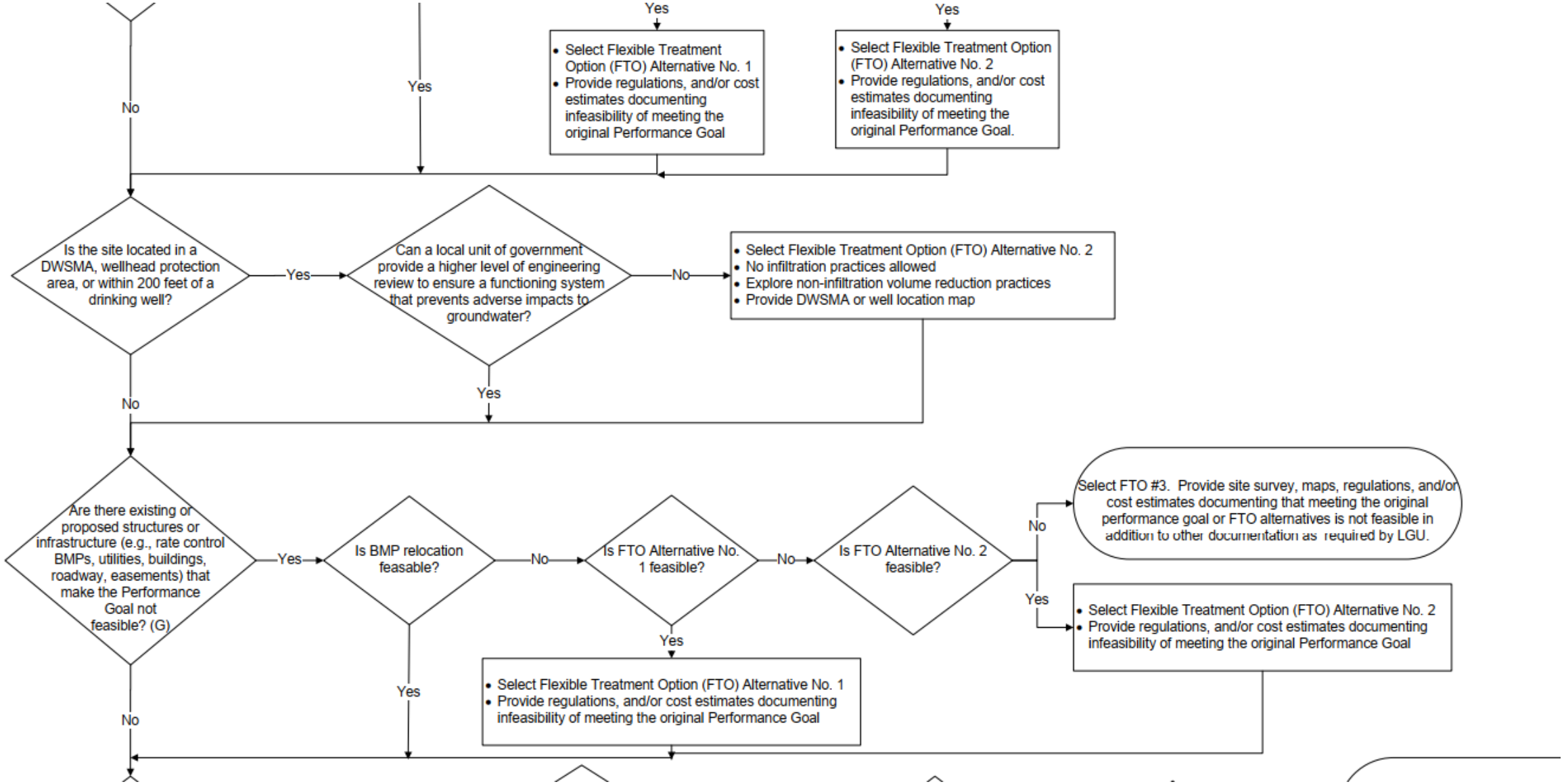
F. A reasonable attempt must be made to obtain right-of-way during the project planning process

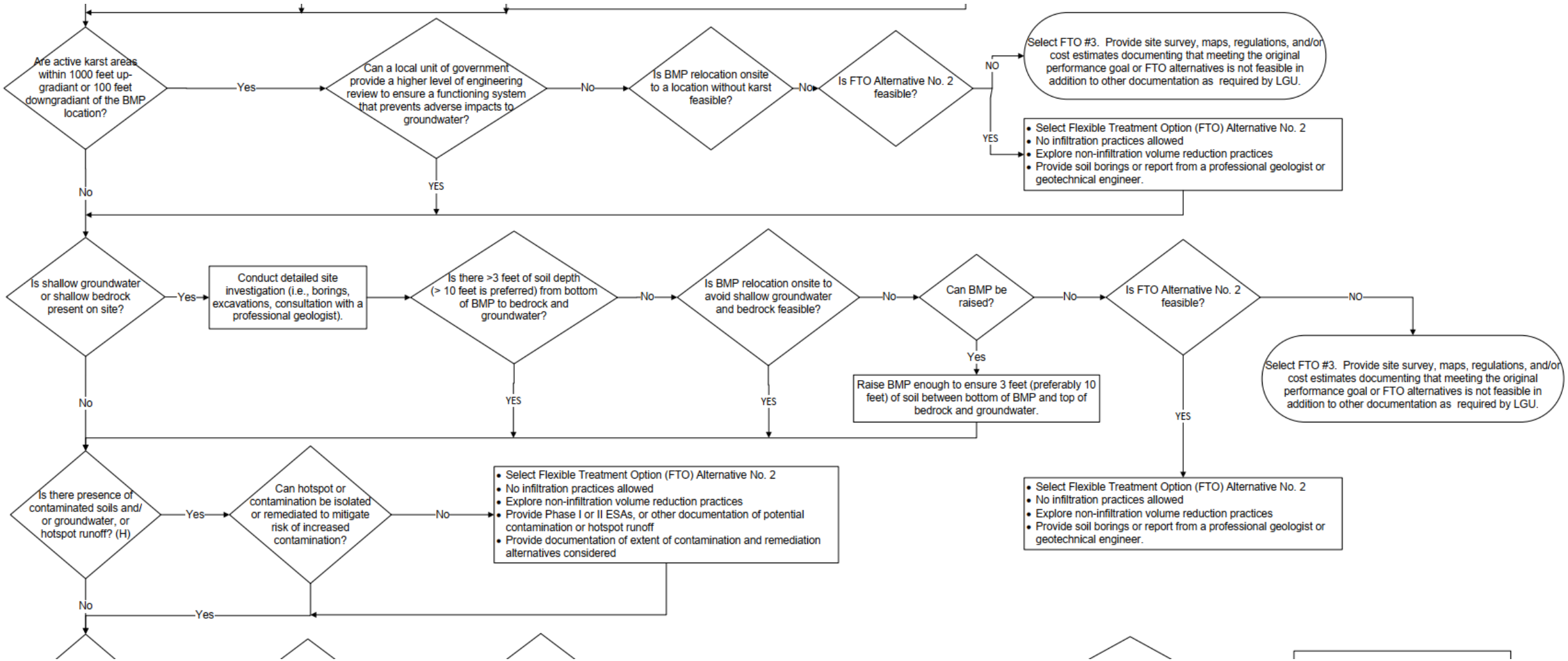
G. Other, this is not an exhaustive list

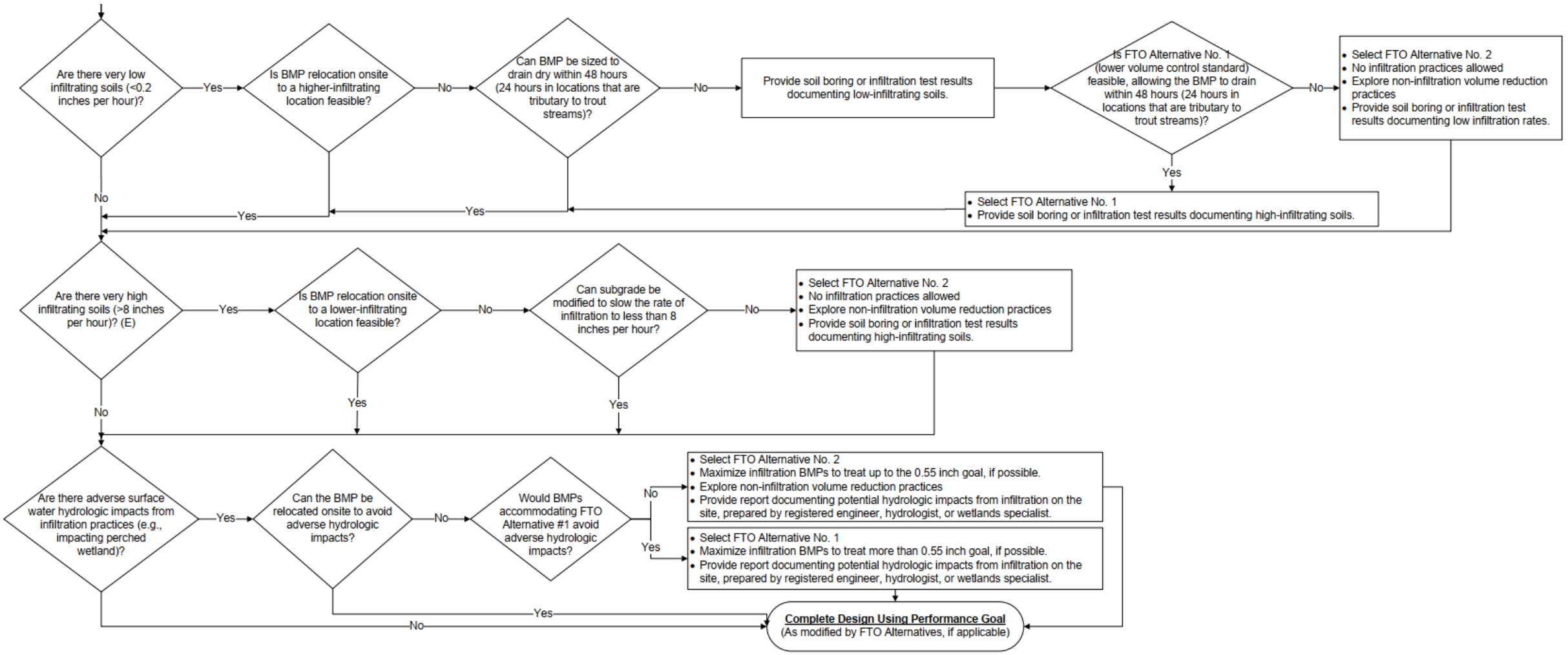
H. Hotspots includes any portion of a facility where infiltration is prohibited under an NPDES/SDS industrial stormwater permit issued by the MPCA

# MIDS DESIGN SEQUENCE FLOW CHART




No
Yes
Yes
• Select Flexible Treatment Option (FTO) Alternative No. 1
• Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal
Yes
• Select Flexible Treatment Option (FTO) Alternative No. 2
• Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal.
Is the site located in a DWSMA, wellhead protection area, or within 200 feet of a drinking well?
Yes
Can a local unit of government provide a higher level of engineering review to ensure a functioning system that prevents adverse impacts to groundwater?
No
• Select Flexible Treatment Option (FTO) Alternative No. 2
• No infiltration practices allowed
• Explore non-infiltration volume reduction practices
• Provide DWSMA or well location map
Yes
No
Are there existing or proposed structures or infrastructure (e.g., rate control BMPs, utilities, buildings, roadway, easements) that make the Performance Goal not feasible? (G)
Yes
Is BMP relocation feasable?
No
Is FTO Alternative No. 1 feasible?
No
Is FTO Alternative No. 2 feasible?
No
Select FTO #3. Provide site survey, maps, regulations, and/or cost estimates documenting that meeting the original performance goal or FTO alternatives is not feasible in addition to other documentation as required by LGU.
Yes
• Select Flexible Treatment Option (FTO) Alternative No. 2
• Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal
Yes
• Select Flexible Treatment Option (FTO) Alternative No. 1
• Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal
Yes
No


Are active karst areas within 1000 feet up-gradiant or 100 feet downgradiant of the BMP location?
Yes
Can a local unit of government provide a higher level of engineering review to ensure a functioning system that prevents adverse impacts to groundwater?
No
Is BMP relocation onsite to a location without karst feasible?
No
Is FTO Alternative No. 2 feasible?
NO
Select FTO #3. Provide site survey, maps, regulations, and/or cost estimates documenting that meeting the original performance goal or FTO alternatives is not feasible in addition to other documentation as required by LGU.
YES
• Select Flexible Treatment Option (FTO) Alternative No. 2
• No infiltration practices allowed
• Explore non-infiltration volume reduction practices
• Provide soil borings or report from a professional geologist or geotechnical engineer.
YES
No
Is shallow groundwater or shallow bedrock present on site?
Yes
Conduct detailed site investigation (i.e., borings, excavations, consultation with a professional geologist).
Is there >3 feet of soil depth (> 10 feet is preferred) from bottom of BMP to bedrock and groundwater?
No
Is BMP relocation onsite to avoid shallow groundwater and bedrock feasible?
No
Can BMP be raised?
No
Is FTO Alternative No. 2 feasible?
NO
Select FTO #3. Provide site survey, maps, regulations, and/or cost estimates documenting that meeting the original performance goal or FTO alternatives is not feasible in addition to other documentation as required by LGU.
Yes
Raise BMP enough to ensure 3 feet (preferably 10 feet) of soil between bottom of BMP and top of bedrock and groundwater.
YES
YES
YES
No
Is there presence of contaminated soils and/ or groundwater, or hotspot runoff? (H)
Yes
Can hotspot or contamination be isolated or remediated to mitigate risk of increased contamination?
No
• Select Flexible Treatment Option (FTO) Alternative No. 2
• No infiltration practices allowed
• Explore non-infiltration volume reduction practices
• Provide Phase I or II ESAs, or other documentation of potential contamination or hotspot runoff
• Provide documentation of extent of contamination and remediation alternatives considered
• Select Flexible Treatment Option (FTO) Alternative No. 2
• No infiltration practices allowed
• Explore non-infiltration volume reduction practices
• Provide soil borings or report from a professional geologist or geotechnical engineer.
No
Yes


Are there very low infiltrating soils (<0.2 inches per hour)?
Yes
Is BMP relocation onsite to a higher-infiltrating location feasible?
No
Can BMP be sized to drain dry within 48 hours (24 hours in locations that are tributary to trout streams)?
No
Provide soil boring or infiltration test results documenting low-infiltrating soils.
Is FTO Alternative No. 1 (lower volume control standard) feasible, allowing the BMP to drain within 48 hours (24 hours in locations that are tributary to trout streams)?
No
• Select FTO Alternative No. 2
• No infiltration practices allowed
• Explore non-infiltration volume reduction practices
• Provide soil boring or infiltration test results documenting low infiltration rates.
Yes
• Select FTO Alternative No. 1
• Provide soil boring or infiltration test results documenting high-infiltrating soils.
Yes
Yes
No
Are there very high infiltrating soils (>8 inches per hour)? (E)
Yes
Is BMP relocation onsite to a lower-infiltrating location feasible?
No
Can subgrade be modified to slow the rate of infiltration to less than 8 inches per hour?
No
• Select FTO Alternative No. 2
• No infiltration practices allowed
• Explore non-infiltration volume reduction practices
• Provide soil boring or infiltration test results documenting high-infiltrating soils.
Yes
Yes
No
Are there adverse surface water hydrologic impacts from infiltration practices (e.g., impacting perched wetland)?
Yes
Can the BMP be relocated onsite to avoid adverse hydrologic impacts?
No
Would BMPs accommodating FTO Alternative #1 avoid adverse hydrologic impacts?
No
• Select FTO Alternative No. 2
• Maximize infiltration BMPs to treat up to the 0.55 inch goal, if possible.
• Explore non-infiltration volume reduction practices
• Provide report documenting potential hydrologic impacts from infiltration on the site, prepared by registered engineer, hydrologist, or wetlands specialist.
Yes
• Select FTO Alternative No. 1
• Maximize infiltration BMPs to treat more than 0.55 inch goal, if possible.
• Provide report documenting potential hydrologic impacts from infiltration on the site, prepared by registered engineer, hydrologist, or wetlands specialist.
Yes
No
Complete Design Using Performance Goal
(As modified by FTO Alternatives, if applicable)

# APPENDIX D