



City of Waukesha
 Department of Public Works
 130 Delafield Street
 Waukesha, WI 53188
 Waukesha-wi.gov

Stormwater Management Plan

Attachment D
 (Rev 12/18)

See Page 6 for reference information

Project Name: Howell Oaks Addition No. 4 (Phase 5)

Engineer & Design Firm: Trio Engineering

STORM WATER MANAGEMENT PLAN WORKSHEET			
<p>The City of Waukesha requires a Stormwater Management Plan to be submitted with the proposed development plans for site plan review. A Stormwater Management Plan is a document describing the storm water management practices constructed and implemented within the proposed development to ensure compliance with the storm water management criteria, as set forth by the City of Waukesha. The purpose of a Stormwater Management Plan is to protect the safety and health of the public, property and aquatic environment from the threats due to storm water from land development activity. The worksheet will provide a basis to the information that shall be provided when preparing a Stormwater Management Plan for a proposed development. This Plan shall include a set of complete plans and calculations, stamped by a registered professional engineer. Stormwater Management Plans are required as listed in City Code Book Chapter 32.06(b)</p>			
Exemptions for Design and Plan Requirements			
YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Site is associated with agricultural or silvicultural activities
Design Requirements: Total Suspended Solids <i>See previously approved SWMP submitted with Howell Oaks Subd.</i>			
YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Site is a New Development – 80% Reduction must be met
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Site is an Infill Development – 80% Reduction must be met
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Site is a Redevelopment – 40% Reduction must be met
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Site has areas of New Development and Redevelopment
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Calculations for % Reduction are included in the plan (WinSLAMM input and output)
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Storm water Management Facilities to address TSS removal are designed according to Chapter 32 of the City Code Book and DNR Technical Standards – Check all that apply: <i>As required at the time of recording of the SWMP on 01/25/2016</i> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Wet Detention Basin <input type="checkbox"/> Bio Retention Basin <input checked="" type="checkbox"/> Swales <input type="checkbox"/> Proprietary Devices <input checked="" type="checkbox"/> Other (specify): <i>Infiltration Basin</i>
Design Requirements: Peak Discharge <i>See previously approved SWMP submitted with Howell Oaks Subd.</i>			
YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Storm water Management Facilities to address Peak Discharge are designed according to Chapter 32 of City Code Book and DNR Technical Standards – Check all that apply: <i>As required at the time of recording of the SWMP on 01/25/2016</i> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Wet Detention Basin <input type="checkbox"/> Bio Retention Basin <input checked="" type="checkbox"/> Swales <input checked="" type="checkbox"/> Other (specify): <i>Infiltration Basin</i>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Downstream Capacity for 2-year, 10-year and 100-year, 24-hour design storms are met
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Calculations of available capacity, proportional share, and proposed utilized capacity under all design storms are included in plan
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Calculations of Peak Discharge are included in the plan

Design Requirements: Infiltration			See previously approved SWMP submitted with Howell Oaks Subd.
YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Hydraulic Soil Type: <ul style="list-style-type: none"> <input type="checkbox"/> Soil Type A – Proceed <input type="checkbox"/> Soil Type B – Proceed <input type="checkbox"/> Exemption or Exclusion – Provide documentation
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Site and Soil Evaluation Report per DNR Technical Standard 1002
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Low Imperviousness. Ex: low density residential parks, cemeteries Post-Development Infiltration Performance Standards: <ul style="list-style-type: none"> <input type="checkbox"/> Up to 40% Connected Impervious Surface <input type="checkbox"/> 90% of Pre-Development Infiltration volume met <input type="checkbox"/> 1% of site – Maximum Effective Infiltration Area
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Medium Imperviousness. Ex: Medium and high density residential, multi-family, industrial, institutional, office park. Post-Development Infiltration Performance Standards: <ul style="list-style-type: none"> <input type="checkbox"/> 40%-80% Connected Impervious Surface <input type="checkbox"/> 75% of Pre-Development Infiltration volume met <input type="checkbox"/> 2% of site – Maximum Effective Infiltration Area
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	High Imperviousness. Ex: commercial strip malls, shopping centers, commercial downtowns Post-Development Infiltration Performance Standards: <ul style="list-style-type: none"> <input type="checkbox"/> Greater than 80% Connected Impervious Surface <input type="checkbox"/> 60% of Pre-Development Infiltration volume met <input type="checkbox"/> 2% of site – Maximum Effective Infiltration Area
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Site has parking lots and new road construction: <ul style="list-style-type: none"> <input type="checkbox"/> Pretreatment included <input type="checkbox"/> 10% Infiltration of the runoff from the tow-year, 24-hour design storm with Type II Distribution
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Calculations of Infiltration Volumes are included in the plan and model input and output (WinSLAMM)
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Exclusions for Infiltration: <ul style="list-style-type: none"> <input type="checkbox"/> Tier 1 Industrial Facility <input type="checkbox"/> Storage and Loading Areas of Tier 2 Industrial Facility <input type="checkbox"/> Fueling and Vehicle Maintenance Facility <input type="checkbox"/> Areas within 1,000 feet up gradient of Karst Features <input type="checkbox"/> Areas within 100 feet downgradient of Karst Features <input type="checkbox"/> Areas with < 3 feet of separation from bottom of Infiltration System to seasonal high groundwater or top of bedrock (does not prohibit roof runoff) <input type="checkbox"/> Areas with runoff from industrial, commercial and institutional parking lots and roads with < 5 feet separation from bottom of infiltration system to elevation of seasonal high groundwater or top of bedrock <input type="checkbox"/> Areas within 400 feet of community water system well <input type="checkbox"/> Areas within 100 feet of private well <input type="checkbox"/> Areas where contaminants of concern (defined by NR720.03(2) are present in the soil through which infiltration will occur) <input type="checkbox"/> Area where soil does not meet any of the following characteristics between bottom of infiltration system and seasonal high groundwater and top of bedrock: <ul style="list-style-type: none"> <input type="checkbox"/> At least 3-foot soil layer with 20% fines or greater <input type="checkbox"/> At least 5-foot soil layer with 10% fines or greater

YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>Exemptions for Infiltration:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Areas where infiltration rate < 0.6 inches/hour <input type="checkbox"/> Parking Areas and Access Roads less than 5,000 square feet for commercial and industrial <input type="checkbox"/> Redevelopment Post-Construction Sites <input type="checkbox"/> Infill Development < 5 acres <input type="checkbox"/> Infiltration during periods when soil on the site is frozen <input type="checkbox"/> Roads in commercial, industrial and institutional land uses <input type="checkbox"/> Arterial Roads in Residential land uses
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>Storm water Management Facilities to address Infiltration are designed according to Chapter 32 of the City Code Book and DNR Technical Standards – Check all that apply: As required at the time of recording of the SWMP on 01/25/2016</p> <ul style="list-style-type: none"> <input type="checkbox"/> Bioretention Basin (1004) <input type="checkbox"/> Infiltration Basin (1003) <input checked="" type="checkbox"/> Infiltration Trench (1007) <input type="checkbox"/> Permeable Pavement (1008) <input type="checkbox"/> Rain Garden (1000) <input type="checkbox"/> Other (specify): _____
Design Requirements: Protective Areas See previously approved SWMP submitted with Howell Oaks Subd.			
YES	NO	N/A	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Impervious areas are outside protective area. If not, provide a written explanation.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Land disturbing activities are within a protective area. If Yes, check all that apply:</p> <ul style="list-style-type: none"> <input type="checkbox"/> If no impervious area is within protective area, adequate sod or self-sustaining vegetative cover of 70% or greater shall be established. <input type="checkbox"/> Adequate sod or self-sustaining vegetative cover is sufficient for bank stability, maintenance of fish habitat and filtering of pollutants from upslope overland flow areas under sheet flow conditions. <input type="checkbox"/> Non-Vegetative materials are employed on the bank as necessary to prevent erosion (steep slopes, high velocity areas).
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Best Management Practices are located within the protective area – Check all that apply:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Filter Strips <input type="checkbox"/> Swales <input type="checkbox"/> Wet Detention Basins <input type="checkbox"/> Other (specify): _____
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>Non-Applicable Areas Apply:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Structures that cross or access surface water (boat landing, bridge, culvert) <input type="checkbox"/> Structures constructed in accordance with Section 59.692(1v) Wisconsin Statutes: <input type="checkbox"/> Post-Construction Runoff does not enter surface water except to the extent that vegetative groundcover necessary for bank stability
Design Requirements: Fuel and Maintenance Facilities			
YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Are Fuel and Maintenance Facilities on the Site?
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Are Best Management Practices designed to reduce petroleum within runoff (no visible sheen)?

Design Requirements: Swale Treatment for Transportation Facilities			
YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>Does the site use swales for runoff conveyance and pollutant removal for transportation facilities? If Yes, must have the following:</p> <p><i>Groundcover:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Vegetated <input type="checkbox"/> Non-Vegetated where appropriate to prevent erosion or provide runoff treatment (riprap, check dams) <p><i>Swale Velocity Control:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Swale is 200 feet or more in length with a velocity no greater than 1.5 feet per second for the two-year, 24-hour design storm or two-year storm with duration equal to time of concentration <input type="checkbox"/> Swale is 200 feet or more in length with velocity > 1.5 feet per second then velocity is reduced to maximum extent practicable. Written explanation stating why requirement of > 1.5 feet per second cannot be met
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<p>Exemptions Apply:</p> <p>Average Daily Vehicles > 2,500 and initial surface water of the state that runoff directly enters is any of the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> An outstanding resource of water (ORW) <input type="checkbox"/> An exceptional resource water (ERW) <input type="checkbox"/> Water is listed in Section 303(d) of the Federal Clean Water Act and is identified as impaired in whole or in part due to non-point source impacts <input type="checkbox"/> Water where targeted performance standards are developed under NR 151.004 of the Wisconsin Administrative Code to meet water quality standards
Plan Requirements <i>See previously approved SWMP</i>			
YES	NO	N/A	<i>submitted with Howell Oaks Subd.</i>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Provide permit application form, including contact information (name, address, telephone number) for the landowner, developer, land operator, certified project engineering, responsible party for installation of storm water management practices, responsible party for long-term maintenance of the storm water management practices.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Legal Description of proposed development.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Narrative describing the proposed development.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Brief summary of Design Criteria and methods used for development of Storm Water Management Practices.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Storm Water Management Maintenance Agreement shall be included with the Storm Water Management Plan (see Storm Water Management Maintenance Agreement template for additional information required).
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Certification by a Wisconsin registered professional engineer.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Financial Guarantee.

Description and Site Characteristics for Pre/Post Development conditions shall be delineated by one (1) or more site maps at a scale of not less than one (1") inch equals two hundred (200') feet. The map(s) shall include, at minimum, the following information:

See previously approved SWMP submitted with Howell Oaks Subd.

YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Site Location and Legal Description.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pre-developed and revised topography by contours related to USGS survey datum or other datum approved by City. The topographic contours of the site shall not exceed 2 feet. The topography shall extend at minimum 100 feet outside the site boundaries to show runoff patterns onto, through and from the site.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	One hundred (100) year Floodplain boundary, shore land, environmental corridors, and wetland boundaries shall be delineated if applicable
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	All lakes, streams, and other water bodies illustrated on map shall be named as defined on a USGS 7.5 minute topographic map.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Predominant Soil Types and Hydraulic Soil Group Classifications per NRCS
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Coordinates of all manhole and inlets with reference to two nearest reference point monuments which shall be Section or ¼ Section corners.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Location, capacity, and dimensions/details of on-site Pre-developed and Post-developed storm water management facilities such as, but not limited to, the following: manholes, pipes, curbs, gutters, curb inlets, filter strips, swales, detention basins, curb cuts, and drainage gates.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Location, extent, detailed drawings, typical cross sections and slope ratios of all pre-developed and post-developed storm water retention and detention areas and drainage ways – list inlet/outlet elevations, permanent water surface elevation, high water surface elevation, and emergency spillway elevation, if applicable.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Location and Elevations at top and bottom of pre-developed and post-developed buildings and structures.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Locations and names of pre-developed and post-developed streets and intersections and the location of parking lots, sidewalks, bike paths and impervious surfaces (excluding single family residences). Map(s) shall clearly differentiate pre-developed and post-developed surfaces.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Delineation and dimensions of all pre-developed and post-developed property boundaries, easements, right-of-way, building setbacks, maintenance easements, and other restrictions.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pre-developed and post-developed land use boundaries, including cover type and condition.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Post-developed land use cover totals for Impervious and Pervious areas as well as permanent water surface area of all storm water management facilities.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Delineation of pre-developed and post-developed watershed and sub-watershed boundaries used in determination of Peak flow discharges and discharge volumes from the site. (If the watershed extends beyond the site boundaries, a separate watershed map can be supplied).
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Location of the pre-developed and post-developed discharge points.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pre/Post developed directional Flow Paths used to calculate existing/proposed time of concentrations.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Location of the Emergency Overland Flow.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Location of any Regional Treatment Options (if applicable).
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Identify all pre-developed land cover features, such as, natural swales, natural depressions, native soil infiltrating capacity and natural groundwater recharge areas.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Location of any protective areas within the site.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Location of wells located within 1,200 feet of pre-developed and post-developed Storm Water Detention Basins, Infiltration Basins, or Infiltration Trenches.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Delineation of Wellhead protection areas defined under NR 811.16

Supportive Information and Calculation summaries shall be supplied for all storm water management requirements as dictated in the checklist under Design Requirements: See previously approved SWMP submitted with Howell Oaks Subd.			
YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pre-developed and post-developed watershed, sub-watersheds, and land use areas (acres, watershed shall be delineated by property lines).
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pre-developed and post-developed impervious areas (acres).
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pre-developed and post-developed Runoff Curve Numbers.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pre-developed and post-developed Time of Concentration.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pre-developed and post-developed peak flows for the 2-year, 10-year and 100-year, 24-hour storm events for each discharge point.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Total suspended solids removal computations to show compliance.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Design computations for the runoff volume of the pre-developed and post-developed conditions to show compliance with the infiltration requirements.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Design computations for all storm water drainage facilities such as, but not limited to, inflow/outflow rates, hydrographs, water surface elevations, outlet design computations, runoff discharge volume, velocities, and stage/storage data.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Design computations for the 10-year Rational Method flows for all proposed storm conveyance systems.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Computation of the available downstream capacity flowing full, overflow level of ditches and the top of the upstream end of the pipe for any culverts.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Computation of the downstream capacity using the 5-year rational storm.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Tail water analysis included in storm water design for 2-year, 10-year and 100-year storm events.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Design computations to illustrate compliance with pollutant loading criteria (Storm Water Quality Management practices) with pre- and post-storm water management facilities.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Narrative describing all assumptions that were deemed appropriate for design.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Explanation of provisions to preserve and use natural topography and land cover features.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Explanation of restrictions on Storm Water Management practices by wellhead protection plans (if applicable).
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Results of investigations of soil and groundwater required for installation of Storm Water Management practices.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Impact assessment results on Wetland Functional Values (if applicable).
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Storm Water Management practices installation schedule.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Cost estimate for the construction, operation and maintenance of each Storm Water Management practice.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Any additional information that the City, or designee, may need to evaluate the impacts of the storm water discharge quality and quantity on the existing area and existing utilities.

NOTE: The Stormwater Management Plan for Howell Oaks Addition No. 4 (Phase 5), all previous phases, and all remaining phases of the Howell Oaks development were previously designed and incorporated into the Stormwater Management Plan submitted and approved by the City of Waukesha for Howell Oaks Subdivision and subsequently recorded on 01/25/2016. Please refer to the recorded Stormwater Management Agreement recorded on 01/25/2016 and attached hereto for reference to the above questions.