ARCHITECTURE, ENGINEERING AND CONSTRUCTION
UNIVERSITY OF MICHIGAN

Storm Water Management Procedures For Use By Project Team

Prepared by AEC and EHS (updated 10/18/2024)

Project storm water goals are set at the Pre-Design Phase, during programming, to ensure that storm water management planning is incorporated early into the planning process for all projects. The Design Manager (DM) is responsible for developing the storm water management strategy for projects under his/her assign. A Storm Water Management Team ("Storm Water Team") consisting of U-M representatives from Environment, Health and Safety (EHS) and Architecture, Engineering and Construction (AEC) is available to assist Project Teams in determining what is required and in identifying strategies for storm water management before the project is too advanced. Meetings between the Project Team and Storm Water Team will be held at key decision points, as outlined below, for the purpose of reviewing and refining the overall storm water management options into a single approach for implementation. **At a minimum**, projects are required to meet the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Post-Construction Storm Water Management Requirements, regulated under the university's National Pollutant Discharge Elimination System (NPDES) permit, *on-site* when feasible. When this is not possible, alternative strategies need to be developed and agreed upon before moving into Schematic Design.

The process is described in detail below and an abridged version is available in the storm water management graphic.

The DM/Project Team is responsible for knowing and adhering to all environmental considerations as outlined in the EHS website-Environmental Considerations for Construction Projects and in the AEC Design Guidelines. Some, but not all, of the related guidelines, requirements and tools are highlighted below:

- EHS Storm Water Management Program Plan (as prepared for NPDES certificate)
- EHS Storm Water Management Post-Construction Requirements
- EHS Soil Erosion and Sedimentation Control Procedure
- EHS SESC Best Management Practices for U-M
- Southeast Michigan Council of Governments Low Impact Development Manual
- Michigan Nonpoint Source Best Management Practices Manual
- AEC soil boring and infiltration testing minimum requirements
- Examples of plan sheets and narrative template for plan sheet with new connection to City system

Procedure

Pre-Design (Program/Study Phase)

1. Kickoff meeting. The purpose of the meeting is to discuss U-M storm water management plans and requirements, review regulatory requirements, identify challenges and benefits of infiltration and green infrastructure, the initial minimum soil boring/test pit requirements (required to determine on-

site soil types, infiltration capabilities and limitations, and identify water table elevation limitations), best management practices (BMPs) proposed for use on the site, maintenance concerns, and the storm water outlet. This meeting may allow for a faster, more cost-effective site design by identifying the storm water management issues and determining regulatory environments early in the process.

2. Soils evaluation. If not already done, preferably as part of the initial Program/Planning Study Phase, initiate geotechnical soils investigation to determine the project site's suitability for storm water retention (infiltration). Soils evaluations are to be conducted by a qualified geo-technical firm with infiltration testing experience. At a minimum, the evaluation shall include soil borings and soil infiltration testing at potential design depths. Geotechnical investigation should also include water table investigation and some additional deep borings (as applicable) to determine infiltration layer thickness and to see if there are opportunities for deeper infiltration. If soils with favorable infiltration rates are found, the geotechnical firm shall make a determination as to whether they exist as isolated areas and are suitable for infiltration of storm water over time, or if the infiltrating soils are isolated areas with little benefit for storm water management.

3. The DM/Project Team will create and document the evolution of storm water management strategies (Basis of Design) throughout the course of the project and will review the most current design with the Storm Water Team **at each phase of the project.** The following information should be included, but not limited to, the following for this phase:
    a. Project name and number
    b. General site description/site plan
    c. A map, at the U.S.G.S. scale, showing the drainage boundary of the proposed development and its relationship with existing drainage patterns, including any drainage originating outside the development that flows onto or across the development. Such offsite drainage shall be quantified.
    d. Existing natural features (topography, land cover, water bodies, streams, wetland, etc.)
    e. On-site drainage infrastructure
    f. Off-site drainage patterns of adjacent properties
    g. Water table elevation (minimum 3' buffer from seasonably high water table is typically required for infiltration)
    h. Presence of known contaminated soils and/or groundwater (provide explanation)
    i. General soil characteristics information – soil survey, soil borings, preliminary infiltration test data performed at potential locations/depths proposed for infiltration
    j. Indicate proposed storm water management concepts and where the drainage will outlet, including if there will be the need for a new outlet to a surface receiving water, a new connection to City or County storm water systems, or if water from the site will enter the City storm system through a U-M storm line
    k. Potential locations for infiltration BMPs and any other BMPs
    l. Create a preliminary BMP list of potential options with cost/benefits identified. Recommend to the Storm Water Team viable options to pursue based on site specific information gathered.

4. Meeting minutes taken by the DM or DM's delegate (with action items/decision points).

1. Project Team to update the conceptual Basis of Design to include the following additional information:
    a. Limits of total earth disturbance required (including consideration of topographical requirements for excavation and off-site utility connections)
    b. The amount of runoff (CF) on the site for 2-yr/24-hr storm event, 10-yr/12-hr storm event, 25-yr/24-hr storm event and 100-yr/24-hr storm event
    c. A brief drainage narrative describing the proposed storm water management system
    d. Infiltration/retention options. If soil testing (based on boring logs and on-site infiltration) determines that infiltration is feasible, the Project Team shall evaluate and review with the Storm Water Team viable storm water management options and develop a conceptual plan that maximizes the use of the site by incorporating a combination of BMPs (or other site specific retention/green infrastructure practices approved by the Storm Water Team). Quantify/calculate the required volume of storm water infiltration/retention to meet post-construction permit requirements (minimum requirement). Quantify/calculate the volume of infiltration/retention so that there is no change in runoff for the change in impervious for the 100-year storm event as a targeted goal. When compiling a table of options for evaluation, the Project Team must factor in site specific infiltration rates (with applicable safety factor) and water table, rough cost, volume of water taken off-line, and area/depth needed to achieve the infiltration requirement.
    e. If on-site infiltration is not feasible at the project site, the Project Team will need to evaluate off-site infiltration options within the applicable watershed or other retention/green infrastructure practices to meet post-construction permit requirements. If off-site mitigation is to be utilized, the Project Team is to provide documentation of due diligence performed to determine on-site storm water mitigation is not a viable option. A 1.2x off-set mitigation penalty may be required, depending on how storm water is routed to the off-site infiltration BMP.
    f. Detention in-lieu option. If infiltration is not viable for the project, the Project Team will need to evaluate the use of detention and other green infrastructure practices to reduce possible increases in flow volume and rate. Alternate options must be included within the evaluation table and will require close coordination and approval from the Storm Water Team and will require MDEQ submittals for approval. Note, if detention in lieu is to be utilized, a 1.2x minimum off-set mitigation penalty will be required.
    g. Storm water volume calculations. When refining the BMP options for evaluation, the Project Team must factor in site specific infiltration rates (with applicable safety factor) and water table, rough cost, volume of water taken off-line, and area/depth needed to achieve the infiltration requirement.
        i. Based on conceptual site design, calculate a preliminary number for the required volume of storm water infiltration/retention for no change in run-off volume/rate for a 2-yr/24-hr storm event to meet post-construction permit requirements, (minimum requirement). Calculate a preliminary number for the volume of infiltration/retention for no change in runoff for a 100-yr/24-hr storm event as a targeted goal.
        ii. Calculate preliminary storm water volume and rate per option based on concept level BMP potential option plans. Provide evaluation of various options to accommodate from a 2yr/24-hr storm event through a 100-yr/24-hr storm event, as well as evaluating the maximum viable volume of storm water management and the optimal volume of storm water management based on site specific data. All projects shall evaluate the potential to manage the full 100-yr/24-hr storm event (both

volume and velocity). In addition, also evaluate the delta of the 100-yr/24-hr storm event (both volume and velocity) over existing conditions. Projects should work with the Storm Water Team to maximize or optimize for what is feasible and viable.

iii. Above and Beyond: Opportunities for maximizing storm water onsite infiltration. In some cases, a determination may be made that a given project site is an ideal location to go beyond NPDES permit requirements for the purposes of good engineering practices to manage storm water runoff flooding, system capacity constraints and/or erosive velocities. Note, if site conditions are favorable for infiltration, the Project Team shall include within the storm water evaluation additional BMP options/calculations for both the maximum and the optimal site infiltration volumes.

iv. If development is proposed in an area where flooding problems exist or are anticipated, include a plan for how these issues will be addressed. This is required for all exterior impact projects and not exclusive to those that must meet NPDES permit requirements.

v. In addition to NPDES permit requirements, the project must ensure that there will be no impacts to upstream, downstream, or adjacent properties from changes in floodwaters that could be caused by the proposed project. Projects must ensure that impacts to receiving waters will not cause erosion, and in some cases, projects may be required to include some stream channel restoration/BMP implementation to mitigate potential impacts. This may require that a no-rise analysis be performed for the proposed site design if in a shallow flood zone x, and would be required if within a 100-year floodplain or floodway.

h. Refine the Basis of Design with viable BMP option information and calculations including but not limited to the following:

i. Change in impervious (increase/decrease)

ii. Volume of storm water/runoff on the site and/or available to be redirected into a storm water BMP for 2-yr/24-hr event, 10-yr/12-hr event, 25-yr/24-hr event and 100-yr/24-hr event

iii. Volume of storm water required to be infiltrated/retained to meet NPDES permit for no change in run-off volume/rate for a 2-y/24-hr storm event

iv. Volume of storm water for no change in run-off volume/rate for a 100-yr/24-hr storm event

v. BMP options considered, with treatment type noted (infiltration, retention, detention)

vi. BMP dimensions/area/volume for treatment of 2-yr/24-hr through 100-yr/24-hr storm events. Verify that the proposed topography can accommodate the calculated volumes and identify/include in costs any utility relocations.

vii. Soil types and infiltration rates at location of proposed BMPs

viii. Opinion of probable construction costs to implement each BMP option

ix. Construction cost per volume. Example: cost of infiltrating above ground/volume of storm water infiltrated.

x. Maintenance requirements of BMP, including frequency and costs

xi. Aesthetics

xii. Project tradeoff summary (missed opportunities)

i. Conceptual layout for the BMPs and proposed drainage collection system.

i. Conceptual site plan including soil boring/infiltration locations and BMP locations with storm outlets

ii. Proposed topography for the detention or retention basin(s) in one foot intervals

2. The Project Team shall meet with the Storm Water Team to review the items above to determine the best course of action before moving into Schematic Design – including initiating the City of Ann Arbor Project Review Process or Washtenaw County Water Resource storm water plan submittal.

3. Meeting minutes taken by the DM or DM's delegate (with action items/decision points). A list of BMP's considered should be updated and refined for each design phase until selection of BMP's.

Schematic Design

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1. Project Team to initiate infiltration testing at each proposed infiltration location at design infiltration depths to verify infiltration rates are acceptable and that the design meets project and regulatory requirements. These tests are in addition to the early infiltration testing that was used to guide the design. Update calculations based on infiltration rates at actual infiltration locations. Multiple infiltration locations required multiple infiltration tests.

2. Project Team to update the Basis of Design to include the following additional information:
    a. Proposed topography for all areas, both off and onsite, to be disturbed by construction. The proposed topography will be provided in one-foot contour intervals. If off-site grading is required, provide evidence of appropriate easements.
    b. Storm Water Management Plan incorporating BMPs and Soil Erosion and Sedimentation Control Procedures
    c. SD layout for the proposed drainage collection system
    d. Calculations used for designing all components of storm water management systems
    e. Updated cost/benefit
    f. The overall storm water management system for the proposed development with structure rim and invert elevations, culvert and storm sewer lengths and sizes as well as all surface storm water conveyance top of bank and centerline elevations at 100' intervals

3. The Project Team shall meet with the Storm Water Team to review refinements to plans and calculations that will be submitted for AEC's plan review process. Follow U-M format for plans, and calcs with storm water narrative and, if applicable, for other regulatory reviews.

4. Meeting minutes are to be taken and distributed by the DM or DM's delegate (with action items/decision points). BMP's considered should be updated and refined for each design phase until the selection of BMP's.

Design Development, Construction Documentation and Post-Construction

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1. Project Team to update the Basis of Design and graphics to reflect updated information and storm water management options incorporated into the design.

2. Meet with the Storm Water Team as necessary and if there are changes to the storm water management plan.

3. Follow AEC plan review process, post-construction permit requirements, SESC requirements, and incorporate storm water best management practices as feasible and practical.

4. Once the overall Storm Water Management Plan is developed, projects with other agency regulated storm water components shall follow AECs' plan review process for those agencies. (Allow 4 to 8 months for City or County plan approval.) During further development or ongoing review of storm water plans, the Project Team shall continue to update the Storm Water Team on any review comments and/or modifications to the Plan.

5. Final design specifications are to include templates for construction inspection checklists and require contractor/design engineer signatures of compliance.

6. Meeting minutes are to be taken and distributed by the DM or DM's delegate. BMP's considered should be refined and documented for each design phase until selection and design of BMP's for implementation.