

Staff Report

POST-CONSTRUCTION STORMWATER MANAGEMENT ORDINANCE

June 26, 2018

BACKGROUND:

On April 17, 2018 the Ames City Council held a workshop to discuss various components of the existing Post-Construction Stormwater Management Ordinance. Following City staff’s presentation about the ordinance, the public was invited to provide their thoughts and comments about the existing ordinance and desired changes. Ultimately, this resulted in several motions by City Council for additional information and alternatives to be brought back at a future meeting.

MAINTENANCE OF PARKING LOTS:

Moved by Corrieri, seconded by Martin, to direct staff to prepare a report to remove the triggering of Chapter 5B when parking lots are maintained but does not increase the impervious surface, with allowances and options for incentivizing additional water quality improvements.

Currently, maintenance of parking lots is understood to include patching, milling and overlaying, etc. and it does not trigger any City review for stormwater. The reconstruction of a parking lot is not considered maintenance. Reconstruction is considered creation of a new impervious surface and, according to our existing Code, if it is greater than 10,000 square feet in size, it is subject to meeting stormwater treatment requirements of 5B. For context, the 10,000 square foot threshold is roughly equal to a standard 30 to 35 space parking lot.

Before contemplating a change in the 10,000 square foot threshold, the City Council should understand the impact on the City’s sewer system by parking lot runoff. As an example of how runoff is generated from parking lots, staff has calculated the stormwater runoff from two of the sites discussed during the City Council workshop in April. As can be seen in the following tables, these peak flows have been equated to a pipe diameter.

Fareway Parking Lot (1.5 acres) TR-55 Runoff Analysis			
	24-hour Storm Event (in)	Peak Flow (cfs)	Equivalent Concrete Pipe Diameter Flowing Full at 0.28% slope
1-year	2.67	5.04	16 inches
5-year	3.81	7.26	18 inches
10-year	4.46	8.51	20 inches
100-year	7.12	13.66	24 inches

The existing storm sewer pipe where the Fareway in downtown currently discharges is an 18-inch pipe. If left as it is today, the Fareway parking lot runoff would use nearly the full capacity of the adjacent storm sewer pipe in a 5-year event.

McFarland West Parking Lot (1.25 acres) TR-55 Runoff Analysis			
	24-hour Storm Event (in)	Peak Flow (cfs)	Equivalent Concrete Pipe Diameter Flowing Full at 1% slope
1-year	2.67	4.20	13 inches
5-year	3.81	6.05	15 inches
10-year	4.46	7.09	16 inches
100-year	7.12	11.38	18 inches

The existing pipe adjacent to the McFarland West site is 24-inch and drains approximately 40 acres of developed land. In a 5-year storm event, if left as it is today, the McFarland West parking lot runoff would use one-fourth of the capacity of the adjacent storm sewer pipe.

This illustrates the opportunity that is lost to make improvements for the existing storm sewer system if run-off is left uncontrolled following parking lot reconstruction.

OPTIONS:

Option 1. Chapter 5B could be modified to define parking lot reconstruction with no net increase in impervious area as maintenance, thus making it exempt from 5B requirements entirely. **Alternatively, if the parking lot is expanded while replacing the existing parking lot, such a project would be subject to the Chapter 5B requirements for the whole project.**

A reconstructed parking lot would still be subject to Zoning Ordinance standards of Chapter 29 (parking quantity, dimensions of the spaces/aisles, and landscaping).

Option 2. A second option for reconstruction would be to require only partial compliance with 5B to meet water quality only rather than both water quantity and quality requirements. This approach would lessen the size of the stormwater management features that would be required.

Option 3. Rather than exempting reconstruction from the 5B requirements, the City Council could focus on allowances to reduce required parking and landscaping. Currently, the Planning Director can waive up to 10% of the required parking for sites with 30 or more spaces for the purpose of adding landscaping, which could include stormwater features. Additionally, using landscaping as a stormwater treatment measure can serve to substitute for other landscaping requirements within parking lots. **Should the City Council believe this 10% incentive is not sufficient, direction can be given to make changes to the zoning standards to allow for a greater parking reduction (i.e. 20% reduction) or for any size of parking lot (not just 30 spaces or**

more) to take advantage of the reduction to help facilitate stormwater improvements with parking lot reconstruction.

Option 4. The City Council could **maintain the current standard** that parking lot reconstruction of greater than 10,000 SF must comply with 5B.

FINANCIAL SECURITY:

Moved by Corrieri, seconded by Nelson, that financial security would be required prior to occupancy if the requirements have not been met.

The current ordinance requires that financial security must be submitted prior to approval of stormwater management improvement plans.

OPTIONS:

Option 1. Amend Chapter 5B to require financial security in an amount for the total estimated construction cost to be on file with the City prior to a temporary Certificate of Occupancy being granted.

Option 2. Amend Chapter 5B to require financial security in an amount for the total estimated construction cost to be on file with the City prior to a final Certificate of Occupancy being granted.

Option 3. Maintain Chapter 5B as it currently exists, thereby requiring the financial security to be submitted prior to issuance of permits and commencement of construction

If City Council chooses to amend the current ordinance, staff would prefer Option 1 (security prior to temporary Certificate of Occupancy). This is because if Option 2 is followed, there is the potential that the work may not be completed since the building is fully occupied.

Under either of these Options, this financial security or bond would be released in full only upon submission of "as built plans" of all stormwater BMPs specified in the stormwater management plan and written certification, etc. as already specified in the ordinance (paragraph from current ordinance).

RUNOFF CURVE NUMBER:

Moved by Betcher, seconded by Nelson, to direct staff to report on whether runoff curve number 58 is the only number or most appropriate number for all of Ames.

The current ordinance requires the rate and volume of surface water runoff which flows from any specific development project site after completion to **not exceed the pre-development hydrologic regime of meadow in good condition.**

Runoff curve numbers (CN) indicate the runoff potential of an area. **The higher the CN, the higher the runoff that is allowed to leave the site.** Soil properties influence the relationship between runoff and rainfall since soils have differing rates of infiltration.

As described by the United States Department of Agriculture (USDA), soils are assigned to one of four hydrologic soil groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The historic landscape of Ames is said to have been open tall grass prairie. Historic soil surveys of the Ames area refer to glacial origin. Below are some highlights from the 1903 *Soil Survey of Story County*. **This indicates that over 82% of area soils were Marshall loam which is a Group B soil.**

Viewed broadly, the surface of Story County is a level plain. Its average elevation above sea level is about 1,000 feet. The greatest elevation is reached near Summit, at a point on the Gary Moraine, which is 1,075 feet above tide, and the lowest level is reached in the valley of the Skunk River, where that stream leaves the county at an elevation of 830 feet above sea level. Kamelike eminences occur quite frequently in the moraine belts and, rising in groups of gravelly knolls, form a salient feature of the landscape in some sections of the county.

The drainage features of the area may be described as extremely immature. It needs but a casual glance at the surface of the county to see that the present stream system is entirely inadequate to carry off the annual rainfall. The main drainage systems are the Skunk River, with its tributary, Squaw Creek, and Indian Creek, which flows into the Skunk River beyond the limits of the county. Skunk River, in the southern part of the county, occupies a broad, level valley and meanders widely upon its flood plain. Here it undoubtedly occupies a preglacial drainage valley, which has been filled in to a depth of 100 or more feet by glacial and fluvial material. Above Harmonies Mill, however, the valley shows more signs of youth and the river seems to be active in deepening its channel rather than broadening its flood plain. This part of its course is probably of postglacial formation.

SOILS.

Six soils were recognized and mapped in the area surveyed. Of these one type, the Marshall loam, covers over 82 per cent of the area, the remaining five types thus covering less than 20 per cent. The

SOIL SURVEY OF STORY COUNTY, IOWA. 837

names and the actual and relative areas of these soil types are given in the following table:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Marshall loam	303,808	82.4	Marshall clay loam	8,384	2.3
Miami black clay loam	21,952	6.0	Marshall fine sand	3,072	.8
Meadow	18,048	4.9	Total	368,640
Miami clay loam	13,376	3.6			

The Marshall loam is found in every part of the area, covering about four-fifths of Story County. In general it occupies level or gently rolling prairie. Differences of more than 25 or 30 feet in elevation are rare, although in the regions of the glacial moraines small kame-like eminences occur, which rise to a considerable altitude above the surrounding prairie.

The origin, physiography, and drainage features of this soil are very intimately related to each other. The material was originally derived by glacial action at the time of the great Ice Age. In its retreat the ice sheet left a mass of debris of somewhat uneven thickness, covering the entire surface of the country. This great mass of material upon settling assumed the slightly hummocky surface which is now seen to characterize the prairie regions. The consequence was that there were innumerable little saucer-shaped depressions which had no natural outlet for the draining off of surface waters.

Natural Resources Conservation Service (NRCS) (part of USDA) established several runoff curve numbers based on soil infiltration rates. **Included below are a few relevant curve numbers, including the 58 (Meadow in good condition, Group B soils) as currently required in the Post-Construction Stormwater Management Ordinance. As previously noted, this value was based on the historic landscape of the Ames/Story County area.** Also included below are curve numbers for other conditions (which would be higher than meadow, indicating that the soils are more

compacted and runoff is more prevalent). **Another runoff curve number could be selected, however it would not reflect the historic landscape of Story County/Ames area. Since the runoff curve number is based on soils, other communities who have stormwater management requirements may use different runoff curve number requirements based on their historic landscape and soils.**

<i>Cover description</i>	<i>Curve numbers for hydrologic soil</i>			
Cover type	A	B	C	D
<i>Agricultural land use</i>				
Meadow – continuous grass, protected from grazing and generally mowed for hay	30	58	71	78
Woods:				
Poor condition	45	66	77	83
Fair condition	36	60	73	79
Good condition	304	55	70	77
Straight Row crops				
Poor condition	72	81	88	91
Good condition	67	78	85	89

The runoff curve number designated to be used for existing conditions affects the total runoff (rate and volume) able to be released from the site (into the existing storm sewer system and/or creek/river). **For example, as designated in the current ordinance, using a 58 runoff curve number will require detaining more volume for a period of time with a release slower into the public system than a site using a 71 runoff curve number, therefore a higher runoff curve number is not recommended by staff.**

OPTIONS:

Option 1. Direct staff to bring an ordinance amendment that designates a different runoff curve number (associated with a certain cover type, condition, and hydrologic soils group not native to Ames).

Option 2. Direct staff to maintain the current meadow in good condition (58) runoff curve number.

STORMWATER MANAGEMENT THRESHOLD CRITERIA:

Moved by Nelson, seconded by Corrieri, to direct staff to come back with suggestions to change 5B to make impervious cover be the same as a land disturbance at one acre to be included in the previous staff report.

The current ordinance states that stormwater requirements apply to any new development, any redevelopment disturbing 1 acre or more of land, or to any development disturbing less than 1 acreage of land if the amount of impervious cover created exceeds 10,000 square feet.

City Council should note that prior to adoption of the new Post-Construction Stormwater Management Ordinance in April 2014, all site developments were not able to increase runoff rates. With the new ordinance, sites with less than 10,000 square feet impervious became exempt from having to meet new ordinance requirements. Therefore, prior to April 2014 adoption, sites creating 10,000 sf or less were exempt from stormwater management requirements.

The following tables illustrate the increased run-off that is created by a 1 acre site as compared to run-off from a 10,000 SF site.

10,000 SF of Impervious Area TR-55 Runoff Analysis			
	24-hour Storm Event (in)	Peak Flow (cfs)	Equivalent Concrete Pipe Diameter Flowing Full at 1% slope
1-year	2.67	0.77	8 inches
5-year	3.81	1.12	8 inches
10-year	4.46	1.31	8 inches
100-year	7.12	2.10	10 inches
1 Acre (43,560 SF) of Impervious Area TR-55 Runoff Analysis			
	24-hour Storm Event (in)	Peak Flow (cfs)	Equivalent Concrete Pipe Diameter Flowing Full at 1% slope
1-year	2.67	3.36	12 inches
5-year	3.81	4.84	15 inches
10-year	4.46	5.67	15 inches
100-year	7.12	9.10	18 inches

Thus, increasing the impervious area allowed without needing to meet 5B Post Construction Stormwater Management Ordinance requirements will increase runoff from these sites and will likely increase the flash flooding potential already experienced in the Ames community. This could result in the need to replace/increase storm sewer pipe capacities throughout the community which would be reflected in an increase in the CIP budget to improve deficiencies.

OPTIONS:

Option 1. Direct staff to bring an ordinance amendment that changes the impervious threshold for meeting Chapter 5B Post Construction Stormwater Management Ordinance requirements to **1 acre**.

Option 2. **Maintain Chapter 5B** Post-Construction Stormwater Management Ordinance **as it currently exists**, thus requiring projects with impervious area of 10,000 sf or more to meet all provisions of the current ordinance.

INSPECTIONS:

Moved by Corrieri, seconded by Betcher, to ask staff to provide recommendations for alternative inspections besides a licensed plumber.

A reasonable alternative to requiring on-site stormwater management systems to meet city Plumbing Code requirements as installed by a licensed plumber, can be to require that installation meets Statewide Urban Design and Specifications (SUDAS) and City of Ames Supplemental Specifications as already adopted and used for public infrastructure construction such as storm sewer.

If this alternative is confirmed by City Council, staff would coordinate with Building Inspections and Public Works staff to implement this change, including eliminating the requirement that a licensed plumber be responsible for completing these inspections.

OPTIONS:

Option 1. Direct that stormwater management system components be constructed in accordance with SUDAS and City of Ames Supplemental Specifications, negating the need for a licensed plumber to perform inspections. Staff believes this is a reasonable change.

Option 2. Maintain the current requirement of a licensed plumber for inspecting the stormwater management system.

CITY OF AMES FARMLAND CONSERVATION BEST PRACTICES:

Moved by Gartin, seconded by Betcher, to direct staff to provide Council a report on the use of cover crops, buffer strips, and other best practices in conservation for the City-owned farmland.

A City Manager Memo has been provided to City Council.

FLOOD MITIGATION – RIVER FLOODING PROJECT UPDATE:

Moved by Gartin, seconded by Corrieri, to direct staff to provide Council a report on the status of bank stabilization on South Duff and put on future agenda.

A Major Projects Update Staff Report will be provided to City Council by the beginning of July.

RECENT COMMUNITY FLOODING UPDATE:

The City of Ames continues to experience significant flooding in the community. Some floods are result of river/creek flooding (community runoff and rain in the watershed) and other more frequent flooding (runoff from impervious areas, flash flooding, localized

flooding in neighborhoods) are the results of significant (heavy) rain fall intensities such as more than 5 inches of rain falling over a short period of time on September 22, 2016 and again on June 14, 2018.

On average, the public storm sewer system in the community is designed to accommodate flows of a 5 to 10 year rainfall intensity. A 10-year rainfall intensity would be considered when 4.94 inches of rain falls over a 48-hour period or 3.61 inches of rain falls in a 6-hour period.

On June 14, 2018, the Ames Municipal Airport weather gauge indicated that 4.25 inches of rain fell in the area between 3:30 AM and 11:00 AM. This would equate close to a 25-year intensity. Numerous residents of the north part of Ames have indicated that their rain gauges reported more like 6.8 inches of rain during that same rain event, which would equate closer to a 100-year intensity.

During the June 14, 2018 rain event, several streets were temporary closed due to flooding. Eventually, the storm sewer systems were able to catch up when the water levels receded and streets were re-opened to traffic. Additionally, that morning, numerous residents experienced water in basements due to sump pumps not being able to discharge against full capacity storm sewer pipes. Some residents and businesses experienced surface water entering through windows or doors. Other residents experienced cars being flooded in parking lot within the floodway area.

The current requirements of Chapter 5B Post-Construction Stormwater Management Ordinance are intended to mitigate these types of effects that we are experiencing in Ames. Relaxing these requirements could exacerbate the negative impacts from heavy rainfall and flooding.

If City Council selects options that result in ordinance changes, staff will bring back a revised ordinance for three readings and adoption at a future City Council meeting.