Storm Water Commission
6801 Delmar Boulevard, University City, Missouri 63130,
Phone: (314) 505-8560, Fax: (314) 862-0694

MINUTES OF THE STORMWATER COMMISSION – AD-HOC SUB-COMMITTEE TO REVIEW UNIVERSITY CITY MUNICIPAL CODE REVISIONS PROPOSED BY THE UNIVERSITY HEIGHTS FLOOD TASK FORCE
March 26, 2024

Call to Order. The subcommittee listed above was called to order at 5:05 PM by Eric Karch.

1. **Attendance-Roll Call.** The following Commission members were present virtually via zoom: Susan Armstrong, Garry Aronberg, and Eric Karch. City representative Mirela Celaj attended as well. This was a non-quorum meeting, as allowed by our bylaws.

   Agenda. To discuss revisions to the proposed code language, and specifically the matrix of eight (8) proposed Green Infrastructure for Storwmater (GISW) techniques presented by the University Heights Association Flood Task Force (version dated 11/10/2023 Impervious Surfaces Draft Bill). This meeting is being held in response to an action item from the 11/14 Ad-Hoc Subcommittee meeting and is a continuation of topics discussed on 11/14/2022, 11/30/2023, 1/18/2024, 1/24/2024, 2/20/2024, 2/29/2024, and 3/19/2024.

2. **Old Business**

   2.1 Flatwork permit

   2.1.1 Mirela provided:
   - 2.1.1.1 DRAFT 1-page permit application
   - 2.1.1.2 DRAFT memo to commission explaining the need for flatwork permit
   - 2.1.1.3 Flatwork is any paving outside of the right-of-way and not attached to another permit. It would include any paving, pavers, or any other impervious material and if a permit is required, a fee would need to accompany the application. Flatwork is for any work that will not be encompassed in any other permit, is not an additional permit. If someone is simply replacing the exact footprint of a driveway or patio, i.e. not increasing the square footage, no flatwork permit would be required

   2.1.2 Suggestion to the City is to add on the back of the permit the definitions/examples of Impervious Surfaces (paved driveway, pool, etc); and Green Infrastructure for Stormwater Management (tree, rain garden, french drain, etc).

   2.1.3 Required for outside of City right of way. This is different than a GISW ordinance since rooftops would be impervious but not flatwork, for example. However, a GISW ordinance should apply to flatwork permit as well.

   2.1.4 Good location in ordinance is under https://ecode360.com/28293615#28293615

   University City, MO / Land Use / Zoning Code
   ← ARTICLE V Supplementary Regulations

   2.1.5 City website section on all city permits (as reference) https://app.mygov.us/pi/citizen/download_forms.php?limit=0&&citiesID=362

   2.1.6 On 3/19/2024, Agreed that the same threshold area should be used for both the Flatwork Permit and the GISW ordinance.

   2.1.7 On 3/26/2024 – Mirela offered to draft ordinance language for the flatwork permit.

2.2 Definition of Impervious Area

2.2.1 Suggest that the ordinance just use the term impervious. U City permits and guidelines is the best place to define impervious area.

2.2.2 One possible definition is in the Kirkwood Guidelines for Stormwater Management. Page 1 (Background and Purpose), 1st paragraph, second sentence "Impervious cover or areas are man-made areas that cannot absorb water from rain or snow. Driveways, rooftops, patios, sport courts, tennis courts, and pools, for example, are considered impervious; surfaces such as decks, lawn, or gardens, where the rainwater is allowed to soak into the ground, are not considered impervious. Impervious area increases the amount of rainwater runoff and can cause flooding."

2.2.3 Question to U Heights Flood Task Force. Should a wood deck be considered impervious? Kirkwood does not. It stands to reason that a wood deck with planks butted tightly together (<1/8 inch gap) could act similarly to concrete pavement and would be considered impervious

2.3 Avoiding potential conflict between MSD permit requirements and U City matrix

2.3.1 Ordinance should state that the matrix applies when a MSD permit is not required.

2.3.2 This helps address the fact that:

2.3.2.1 MSD occasionally does regulate new land disturbance and impervious area < 1 acre in size

2.3.2.2 Techniques being considered in the matrix are not all acceptable to MSD (e.g. dry wells)

2.4 How to make sure a GISW item remains in place in subsequent years? Options include:

2.4.1 Tie to occupancy permit

2.4.2 Easement area recorded on the legal plat document

2.4.3 Annual self-inspection, where property owner submits signed document that the matrix item is still in place and provides a photo as proof.

2.4.4 We recommend that City staff develop procedure for this, with preference for annual self-inspection since this has a lower cost burden on City staff. This procedure could also allow for the potential to adjust/change GISWs.

2.5 Storm/Volume on which matrix items will be based

2.5.1 Base this on 1.14 inches (1-yr 40 min storm or 2-year 30 min storm). This is consistent with MSD and Missouri Botanical Garden.

2.5.2 The goal clarified by the U Heights Flood Task Force at the 11/14/2023 meeting was:

2.5.2.1 Improve U City code which does not currently regulate new impervious area less than 1 acre. Improvement should be as close as you can get to zero increase in stormwater runoff.

2.5.3 Differential rainfall runoff – The offsets discussed to date (on 11/30/2023, 1/18/2024, and 1/25/2024) have been based on using a differential rainfall runoff increase. The understanding is that turfgrass itself creates a certain amount of rainfall runoff. A development to change turfgrass to impervious would generate more rainfall runoff. The matrix items would then be sized to handle these differential runoff increases. In doing so, the U Heights goal for no increase would be met.

2.6 **Matrix Item #1 – Plant native plants, such as grass and herbaceous vegetation**

2.6.1 Decided to base this on 1.14 inches (1-yr 40 min storm or 2-year 30 min storm).

2.1 **Matrix Item #2 – Amended soil ~~Direct new impervious surface runoff to permeable areas~~**

2.1.1 Decided to base this on Kirkwood's design guidance, which correlates well to Garry's calculations. This is a 1:1 ratio assuming a 12-inch deep amended soil.

2.2 **Matrix Item #3 – install tree cover**

(BELOW IS ACCUMULATED FROM PREVIOUS MEETINGS)

2.2.1 Decided to account for two different tree sizes: overstory (biggest trees) and understory (smaller trees). 1 mature overstory tree (e.g. oak) can be used to offset 500 SF of new impervious area. 1 mature understory tree (e.g. dogwood or eastern redbud) can be used to offset 100 SF of new impervious area. Require using only trees native to Missouri. Yield to City Forester to provide further guidance to City staff for administering the matrix.

2.2.2 Decided how to implement item #3:

2.2.2.1 Require U City Arborist approval of the developer's tree planting plan. This would help address the following possible complications. Planting trees too close together would compromise the tree's health. Planting trees too close to a house or utility (e.g. power line or sanitary lateral) should be avoided.

2.3 **Matrix Item 4 – Install permeable pavement**

2.3.1 Decided to defer to Kirkwood manual on permeable pavers (page 31)

2.3.2 100 SF of new impervious requires 40 SF of 6-inch deep permeable pavement, for example.

2.4 **Matrix Item 5 – Aerate lawns**

2.4.1 Deleted this due to maintenance difficulties.

2.5 **Matrix Item 5 – Green roof**

2.5.1 Discussed that offset should be same as item #1 since it is essentially creating a native planting area. This is appropriate for a sloped roof

2.5.2 Should there be a different offset for a flat roof ?

2.5.3 Evapotranspiration - this benefit is real, but should not be used as a design parameter since evapotranspiration benefit is on the year, but the ordinance is attempting to deal with a single storm event.

2.5.4 Discussed re-visit the offset to go from a runoff coefficient of 0.95 (impervious area) to a runoff coefficient of 0.1 (natives)

2.5.5 Mirela indicated that Brentwood does not include a green roof in their guideline.

2.5.6 Discussed that an engineered design will likely be required for a green roof due to structural considerations and the City's requirement for International Building Code (IBC) design.

2.5.7 Susan and Mirela shared:

2.5.7.1 Examples of local green rooms (New City School, Sheetmetal Workers Union, Children's Hospital, Missouri S&T, etc). All were flat roofs.

2.5.7.2 Local experts (greenroofs.com, Kelly Luckett owner of Green Roof Blocks).

2.5.7.3 Feels that the green roof would act like a detention basin, and that we should consider flat roofs not sloped roofs.

2.5.7.4 Missouri S&T shows that green roofs reduce runoff by 60%. That means 40% detention, which would act like native planting, which is a 1:1 compensation.

2.5.8 All agreed to a 5:1 offset assuming flat green roof.

2.6 Matrix Item 6 – Rain barrel / rain cisterns

2.6.1 State that these features must be emptied between rain events to be functional.

2.6.2 After some discussion of various offsets, the value of 1 SF : 0.6 gallons was accepted. This roughly equates to 100 SF of new impervious area requiring (1) 55-gallon rain barrel. This more than offsets the increase in runoff from grass to impervious which is actually only 38 gallons. This is also roughly in line with the MO Botanical Gardens, which shows that 100 SF requires 73 gallons of rain barrel.

2.7 Matrix Item 7 – Install Infiltration basins such as rain gardens and bioswales

2.7.1 Decided to defer to the MO Botanical Garden rule of thumb (5:1), which respects Garry's calculations based on differential runoff, with some accommodation of sloped ground and berm. This ratio of 5 impervious area : 1 rain garden ponding area is based on a 6 inch deep rain garden. Require applicant to demonstrate adequate ponding area for depths that vary from 6 inches.
https://www.missouribotanicalgarden.org/sustainability/sustainability/sustainability/sustainable-solutions-for-you/rainscaping-guide/design-and-build-a-rain-garden/determine-rain-garden-size-and-depth

2.8 **Matrix Item 8 – French Drain ~~Detention basin~~**

2.8.1 Discussed that for the size of development that is being targeted by the ordinance/matrix, a detention basin is effectively the same as a rain garden.

2.8.2 Decided to replace item 8 with French Drains

2.8.2.1 They are listed in Kirkwood's design guidance as the similar Dry Wells (page 15)

2.8.2.2 They are included in the USGBC LEED manual
https://www.usgbc.org/credits/homes/v2008/ssc4

2.8.2.3 City (Mirela) says that a French Drain was one of the most popular BMPs used in Crestwood to mitigate new impervious area

2.8.3 Design basis – decided to use the same volume as rain garden, but divide by 0.4 (accounts for void spaces between gravel), which yields an offset of 12:1.

2.8.4 Require that the surface is grass - consistent with Kirkwood, and U Heights will likely prefer it.

2.9 Ordinance location for GISW matrix is Chapter 405 Subdivision and Land Development Regulations

2.9.1 City (Mirela) suggests the best location is to add it to Code Chapter 405.510.

2.9.1.1 City (Mirela) provided "Section 405.510 Revised Ucity code 2-29-2024.docx"

2.9.1.2 Suggested item c (in red) is a good location to call for the new ordinance. The group discussed that the wording suggested by Mirela is different than what we've been discussed. Agreed that it needs to be reworded and needs work to call for threshold limit of impervious and new matrix.

2.9.1.3 On 3/19/2024, we revisited this. We agreed that a version of the matrix table should be included in the ordinance, but possibly without the references column. The reason is that the links in the reference column might not stand the test of time. The full matrix, with references should be included a version of the table that the City cold share to educate residents, and the references could more easily be periodically updated by DPW.

2.9.1.4 On 3/26/2024, we discussed a draft of the ordinance. All were in agreement with the language as written. This includes statements to address possible credit for pre-

existing matrix items and the suggestion to address maintenance.

2.9.2 Discussion about trigger threshold for new impervious. Previous discussions have been based on 100 SF. City (Mirela) suggested that this might be too low and maybe 200 SF would be more appropriate. Group decided to list 100 SF for initial draft.

2.9.2.1 On 3/20/2024, we revisited this discussion. Agreed that the same threshold area should be used for both the Flatwork Permit and the GISW ordinance. Discussed that the Brentwood trigger is 200 SF and the Kirkwood trigger is 1,000 SF. Agreed to state that the trigger in U City is 100 SF and allow further discussion outside the Stormwater Commission between the City Council, City DPW, City Legal, and the U Heights Flood Task Force. This trigger is tied to the workload of City staff.

2.9.3 The new GISW ordinance is in line with City Code Chapter 405.490 Utilities, including the following excerpts:

2.9.3.1 405.490.C.2 "Every development shall be designed to control storm water runoff. All storm sewers, storm sewer connections, detention/retention facilities, and other storm drainage improvements shall comply with MSD design standards and design standards established by the Director of Public Works and Parks. In instances where there are differences between MSD standardsand those established by the Director of Public Works and Parks, the most restrictive standard shall apply."

2.9.3.2 405.490.C.5 "In single-lot developments, drainage detention facilities, or other storm drainage facilities that will not be maintained by MSD shall be maintained by the property owner.

2.9.3.3 405.490.C.6 "...The rate of discharge of surface water shall be in accordance with the requiremts of MSD, except that the Director of Public Works and Parks may require a more restrictive discharge rate in areas where flash flooding, bank erosion, or other chronic storm water drainage problems exist."

2.10 Status of Matrix Review

2.10.1 See item 2.11 for remaining work.

2.11 Subjects raised, but not yet fully addressed

2.11.1 Need to develop ordinance language for Flatwork permit

2.12 References

The following are a list of references reviewed.

2.12.1 Cityof Kirkwood, MO – Stormwater Management Guidance; Green Infrastructure Techniques for Stormwater Management (January 2022) https://www.kirkwoodmo.org/home/showpublisheddocument/7847/637854587558070000

2.12.2 Local communities listed in the HR Green report to City (Feb 8, 2023): Town & Country/Olivette/etc

2.12.3 Dubuque, IA - Bee Branch Watershed Flood Mitigation Project

2.12.4 Tulsa, OK – From Harm's Way; Flood Mitigation in Tulsa, OK (1993)

2.12.5 Springfield MO on Fassnight Creek Stormwater Improvement Project

2.12.6 City of Brentwood "Brentwood Practices for Stormwater Control" https://www.brentwoodmo.org/DocumentCenter/View/28005/Stormwater-Control-Best-Management-Practices

2.12.7 EPA 430-S-18-001 Estimating the Environmental Effects of Green Roofs: A Case Study in Kansas City, Missouri (August, 2018).

https://www.epa.gov/sites/default/files/2018-09/documents/greenroofs_casestudy_kansascity.pdf

2.13 Grants

2.13.1 Susan asked if the City was aware of any grants that could help incentivize implementation of the GISW.

2.13.2 Mirela suggested that the City could refer property owners to the MSD small and large scale grants program. The first link is the general program. The second and third links are maps showing the geographic areas where the grants are available.

2.13.2.1 https://msdprojectclear.org/what-we-do/rainscaping/

2.13.2.2 https://stlmsd.maps.arcgis.com/apps/webappviewer/index.html?id=1dc144bdb9b2484b82cfe73cc8a3c8d1

2.13.2.3 https://stlmsd.maps.arcgis.com/apps/webappviewer/index.html?id=59ce6f7bc688469ea37423f969889fc7

3 **Next meeting** – Business was not completed. Net meeting date is TBD.

4 **Adjournment.** Adjourned at 6:00 PM.

Minutes Preparation. The minutes were prepared by Eric Karch.

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Section 405.510 Site Grading, Erosion Control, And Stormwater Consideration In Site Design.

[R.O. 2011 §16.16.100; Prior Code §29-51.8; Ord. No. 6143 §1(part), 1997]

A.4 Stormwater Consideration In Site Design.

[Ord. No. 7060, 11-13-2017[1]]

a. Applicability. The standards referenced and adopted in this Section shall apply to site design for any project which includes alteration of site drainage or floodplain areas, connection to storm sewer systems or open storm water channels, and all land disturbance projects encompassing more than one (1) acre.

b. MSD Approval Required. All private and public projects to which this Article is applicable must be reviewed and approved for storm water issues by the Metropolitan St. Louis Sewer District in accord with rules, regulations, standards, and procedures of that body prior to the issuance of any permits for land disturbance or construction.

c. Submittal Requirements. Applicants for any development, redevelopment, land disturbance, construction or other undertaking to which this Article is applicable shall be required to provide any and all information necessary to enable the Metropolitan St. Louis Sewer District ("MSD"), the City and City plan review personnel to assess and apply the principles promulgated by MSD known as "Site Design Guidance — Tools for Incorporating Post-Construction Stormwater Quality Protection Into Concept Plans and Land Disturbance Permitting," and "Landscape Guide for Best Management Practice Design," as revised from time to time.

[1] Editor's Note: Ord. No. 7060 also changed the title of this Section from "Site Grading and Erosion Control" to "Site Grading, Erosion Control, And Stormwater Consideration In Site Design."

PROPOSED CHANGES TO CITY CODE:

Item 405.51 A.4.c becomes Item 405.51 A.4.d

Item 405.51 A.4.c is added as listed below

~~d~~c. **Green Infrastructure ~~Offsets~~ to offset New Impervious ~~Area~~ Development**

Offsets in ~~this this~~ the table below shall be applied when proposed increases in impermeable development exceed 100 square feet (sf or SF) unless MSD evaluates the development for stormwater. MSD permit requirements take precedence. ~~Impermeable~~ Impervious development includes new buildings, new garages, new sheds, new gazebo, new patio, new walks, new driveway or other new pavement (asphalt or concrete or pavers ~~or brick~~ in which most of the individual ~~bricks~~ pavers are in contact with each other), or similar new structure or pavement. Green infrastructure such as shown in the following table are encouraged, but alternate green infrastructure may be proposed and approved for review by City permitting officials. Not every matrix item is necessarily appropriate for every site. The developer is invited to discuss which matrix items may be the most successful and easiest to maintain. Variances due to pre-existing matrix items that are in place prior to the new impervious development may be considered on a case-by-case basis by the Public Works Director.

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Offsets are not required for replacement of existing ~~impermeable~~ impervious site features when area of proposed and existing impervious ~~impermeable~~ features are equal.

#	Green Infrastructure	Offset Guidelines Ratio of New Impervious surface area: to green infrastructure improvement
1	Plant Native Plants such as grassy and herbaceous vegetation.	1 : 3.25 Example: 100 SF of new concrete patio must be offset by establishment of 325 SF of native garden plants replacing turf grass.
2	Amended Soil Good soil for growing vegetation Porous soil to soak up sheet flow. Suitable for narrow areas of pavements	1 :1 for amended soils installed 1 ft deep. The area of amended soils must generally be installed along the downhill side of the new impervious area and at a width equal to the longest flow path of the new impervious area it is treating. Example: A new 20 foot x 40 foot patio drains to the long side requires a 20 foot x 40 foot amended soil area.
3	Install tree cover	100 SF : One tree Tree planting plan approval by City Arborist. Example: 100 SF of new concrete patio can be offset by planting and maintaining one understory tree such as a flowering dogwood. One large tree (canopy trees such as oaks and maples) can offset 200 SF of new patio.
4	Install permeable pavement including sand base at least 3 inches thick	No offset required as this is not considered an impermeable development.
5	Build green roofs	~~1~~5:1 Example: 100 SF of new concrete patio can be offset by converting ~~10~~20 SF of a ~~standard~~ flat roof to a green roof

6	Install rain barrels to capture and slow runoff	100 SF : ~~20~~ 55 gallons of barrel ~~Example: 100 SF of new concrete patio that replaces turf grass, has a differential discharge of 2.6 CF or 19.1 gallons during a 1.14-inch 50-minute storm[1]. So a 55-gallon barrel will offset approximately 300 sq ft of new roof.~~
7	Install infiltration basins such as rain gardens and bioswales	5:1 Example: 100 SF of new concrete patio can be offset by installing a rain garden 20 SF with an average depth of 6-inches[1].
8	French drains (shallow small detention basins constructed as shallow rectangular trenches filled with gravel and covered with 6 to 12 inches of topsoil and turf grass)	12 :1 for 6-inch deep French Drain 6 : 1 for 12-inch deep French Drain

~~1 Differential runoff and detention are based on a triangular discharge hydrograph produced by a rainfall of 1.14 inches in 50 minutes (a 1-year 50 minute storm). Rain garden basin areas are based on an average depth of 6 inches and consider the volume in sloping side walls.~~