The City of
OKLAHOMA CITY

March 26, 2021

DRAINAGE CRITERIA MANUAL

RESPONSE TO QUESTIONS

Drainage Criteria Manual

Public Comment No. 1: Introduction Sec 1.1 Page 5

1. Since made a part of the Drainage Ordinance, the DCM should require City Council approval for amendments. The development community should have input and consideration on changes.
2. Paragraph 3 - This needs to be modified to notify City of OKC engineers of record somehow. Not just a posting on City website. Also, this doesn't provide any feedback/approval process. Should go to PC and CC so consultants have a way to provide feedback and changes are not just made no matter consultants and developers feedback.

Response: This provision allows revisions to be made in a more stream-lined manner. Any revisions will be made as a result of new or updated design data, materials, or methodology. It is anticipated that a substantial portion of this information would come from the design/development community. Paragraph 3 states that updates will be posted to the City's website for 60 days, allowing for comments to be received, prior to changes becoming effective. An email with notification of the revisions and updates will be sent out to developers, engineers, and contractors with contact information on file with the Public Works Department.

Public Comment No. 3: Sec 2 Page Various

The tables are not in chronological order, table is on page 10 (section 2.3.1) and table 2 is on page 7.

Response: The table numbers will be revised.

Public Comment No. 4: Runoff Calculations Methods Sec 2.3 Page 7

The use of fully urbanized flows to determine stormwater runoff and associated storm systems including detention ponds does not appear to consider the impact of the current FEMA flood studies. How are the FEMA floodplains coordinated with these new stormwater requirements?

Response: The currently mapped FEMA floodplains will be used as the floodplain boundaries for insurance purposes and the Floodplain Activity Permit. . In areas included as part of the current FEMA maps, the USGS Urbanized Qs and WSEs will be used for establishing min FFEs and boundaries for common areas or private drainage easements. In other areas adjacent to creeks or streams not included within FEMA floodplains, an urbanized study will be required.

Public Comment No. 5 and 9: Runoff Calculations Methods Rational Method Sec 2.3.1 Page 8

1. Runoff for duplex should be the same as Single-family (0.70)
2. C factor for Duplex and Quad-Plex - Why does duplex runoff coefficient differ from R-1 when lot size and coverage requirements are the same?

Response: Based on the regulations in the Municipal Code, the lot coverage for R-1 and R-2 zoning districts is 50%. Therefore, the "c" factor for the duplex use (R-2 zoning) will be changed to 0.70.

Public Comment No. 6 and 10: Runoff Calculations Methods Rational Method Sec 2.3.1 Page 8

1. Table 2-3 not specify a value for grass/ undeveloped area. What runoff coefficient (c-value) should be used to determine pre-development flow for undeveloped areas?
2. The Rational method C value needs a c value for existing conditions.

Response: The "c" factor for grass of 0.50 will be used for undeveloped conditions. This "c" factor will be added to the table.

Public Comment No. 7: Runoff Calculations Methods Rational Method Sec 2.3.1 Page 10

Is there a reason for not using the following Channel Flow Equation, provided in Oklahoma DOT Roadway Design Manual, Chapter 7, Section 7.6.6.2.

Ts = KL0.77/S0.385

The velocity based travel time equation, proposed in DCM requires an assumption that the swale, ditch or channel is flowing full to calculate the hydraulic radius and then calculate velocity to arrive at Ts value. It is possible that with the calculated Q per velocity based Ts function, the conveyance system may not flow full; hence, it nullifies the initial assumption of using hydraulic radius; which was based on swale, ditch or channel flowing full.

Response: The difference between the formula listed in the DCM and the formula from the ODOT Design Manual is minimal. The formula in the DCM should be used.

Public Comment No. 8: Runoff Calculations Methods Rational Method Sec 2.3.1 Page 10

Changes were made to 10-year and 100-year intensity parameters. It seems like this might be a typo? The increases to the 100-year intensity parameters are resulting in an approximate increase of 5% in runoff rates; when, area and runoff coefficient variables are kept constant.

Response: City staff has verified that the values in the DCM Table are correct.

Public Comment No. 11: Runoff Calculations Methods USGS Regression Equations Sec 2.3.3 Page 11

It is suggested to use USGS Equation to convert non-urbanized flow to urbanized flow using the three parameters equation per USGS Scientific Report of 2019-5143; which is currently used by ODOT, too. The NSS routine requires six parameters. Out of six parameters, three parameters; such as 'Percent Storage', 'Basin Development Factor', and 'Percent Impervious' are subjective to the designer's discretion.

Response: The method described in USGS Scientific Investigation Report 2019-5143 will be allowed for the calculation of Urbanized flows.

Public Comment No. 12: Runoff Calculations Methods USGS Regression Equations Sec 2.3.3 Page 11

USGS regression equations has an urbanization factor that is applied. Why requirement to use Basin Factor through NSS?

Response: The method described in USGS Scientific Investigation Report 2019-5143 will be allowed for the calculation of Urbanized flows.

Public Comment No. 13: Runoff Calculations Methods Modified Rational Method Sec 2.4.1 Page 12

The document states, "Design of storm sewer systems shall maintain the hydraulic grade line below any gutter elevation and any manhole top lid/ rim elevation." Please clarify the design for which the hydraulic grade line (HGL) will be required to adhere to this statement. Also recommend replacing the word "required" the sentence "In addition to Manning's equation, use of the other design methods may be required to adequately size storm sewer facilities" with "allowed" which will allowing pipe sizing based on HGL calculations instead of strictly Manning's equations.

Response: Hydraulic grade line calculations for on-grade systems will be based on the 25-year storm event; sump location systems will be based on the 50-year event in accordance with the design requirements in 3.3.1. The intent of the "In addition to Manning's equation....." statement is that using Manning's equation alone for pipe sizing may not be adequate, which would "require" the use of another calculation to verify the pipe sizing.

Public Comment No. 14: Runoff Calculations Methods Modified Rational Method Sec 2.4.1 Page 12

HGL below any gutter elevation and any MH TR - for public only? Should not be required for private.

Response: DCM requirements apply to public storm sewer systems only. It is recommended that the design of private storm sewer systems use the criteria in the DCM, however, design calculations for private systems will be left to the discretion of the design engineer.

Public Comment No. 15: Runoff Calculations Methods Backwater Profile Sec 2.4.2 Page 12
by Kendall Dillon (Crafton Tull)

Twenty acres seems too small to require a Hec-ras analysis. Forty acres or more seems more appropriate.

Response: 20 Acres will be used to require a HEC-RAS analysis. Channels falling into this category will be adjacent to proposed structures. The hydraulic analysis will be used to establish min finished floor elevations. A normal depth calculation in these locations may not be adequate.

Public Comment No. 16: Runoff Calculations Methods Backwater Profile Sec 2.4.2 Page 12
What would be required method to analyze open channels with drainage area 20 acres or less?

Response: Normal depth calculations could be used in channels meeting the criteria. The engineer will be responsible to determine the most applicable method to use.

Public Comment No. 17: Runoff Calculations Methods Backwater Profile Sec 2.4.2 Page 12
The acreage requirement for the useage requirement of HEC-RAS or HEC-2 varies throughout this document. See 5.3, 5.5.1, 5.5.2 and 5.5.3. I would
recommend it be consistent and be 40-acres. Request all DA below 40 Ac. be permitted to be calculated by a normal depth open channel flow
calculation.

Response: 20 Acres will be used to require a HEC-RAS analysis and all inconsistent references will be corrected. Channels falling into this category will be adjacent to proposed structures. The hydraulic analysis will be used to establish min finished floor elevations. A normal depth calculation in these locations may not be adequate.

Public Comment No. 18: Roadway Drainage Design Flow Sec 3.2.1 Page 13
Reference to "Section 2-5" should be changed to "Table 2-5".

Response: Table numbering in Section 2 will be revised and numbering inconsistencies throughout the DCM will be addressed.

Public Comment No. 19, 20 and 22: Roadway Drainage Roadway Flow Capacity Sec 3.2.2 Page 13

1. It is our opinion that 0.40% minimum street grade should be allowed with the requirement that concrete valley gutters be required at intersections. We have built miles of street at 0.40% with no issues. If there is no consideration of keeping the 0.40%, then

0.50% should be used but definitely not 0.60%. Appears the street capacity equation does not account for any flow above the crown and should not be used for local streets.
2. Why are we switching to 0.6% here? 0.4% has been adequate. Could require 0.6% through intersection or could require a trickle channel through the intersection.
3. Why are we switching to 0.6% here? 0.4% has been adequate. Could require 0.6% through intersection or could require a trickle channel through the intersection.

Response: This policy change for a minimum slope of 0.60% was implemented several years ago. A minimum design slope of 0.40% often is constructed less than 0.40%, resulting in areas of ponding water in the gutters and, in particular, in the areas upstream of driveways. City staff believe the 0.60% design slope will help eliminate these ponding areas. Subdivision Regulations will be revised to reflect this requirement.

Public Comment No. 21: Roadway Drainage Roadway Flow Capacity Sec 3.2.2 Page 13
Flow equation - This drastically reduces the calculated flow in streets as it does not consider area or anything above the crown. If this intended for arterial it should be clarified and the old calculation shall be permitted for locals, collectors etc.

Response: The 25-year storm can be curb deep in residential streets. Capacity can be calculated accordingly. This will remain unchanged from current policy and ordinance. Water spread on 4-lane arterial streets will be limited to 1 lane in each direction.

Public Comment No. 23: Sec 3.3 Page 14
Flow by questions

Response: No response required

Public Comment No. 24, 25 and 26: Roadway Drainage Inlet Design Sec 3.3.1c Page 14
1. Requiring the edge of a driveway to be 20 feet from the centerline will likely eliminate several lots in a residential development which equates to thousands of dollars lost. It seems that a minimum finish floor / garage elevation can be required on these lots and adequately address the issue.
2. The placement of driveway edges to within 20 feet from the C.L. of the connection street at a 'T' intersection should only be required if the proposed finish floor elevation of the house and or garage is placed below the top of curb of the adjacent street. If one foot of freeboard is provided between the FFE of House/Garage; then, the driveway offsetting requirement could be waived.
3. Driveway edge for a lot along a T-intersection shall have a min offset of 20 feet from the center line of the intersecting street - This should be revised to an either or situation as to not cause a reduction in lots for a developer. Either driveway edge shifted or Min. FF requirement 1' above TC at T intersection.

Response: This paragraph will be modified to require the edge driveway to be 20 ft from the centerline of the intersecting street or to elevate the finished floor elevation of the garage to be 1' above the top of curb. If the minimum finished floor of the garage is raised, a 2-part permit will be required.

Public Comment No. 27: Roadway Drainage Inlet Design Sec 3.3.1e Page 15
Mis-spelled word in line 7, “lager”.

Response: The spelling will be corrected.

Public Comment No. 28: Roadway Drainage Inlet Design Sec 3.3.1F Page 15
Why 15 feet? Since bollards are placed, consider 20 feet.

Response: The maximum width of a flume opening will remain at 15 feet to discourage parking at the flume entrance. Bollard spacing of 4 foot maximum will be added to this paragraph.

Public Comment No. 29: Roadway Drainage Design and Construction Sec 3.3.2 Page 17
Inlet capacity - this criteria says an inlet captures the same runoff if it is in a sump, on a 1% grade or a 8% grade. Tests and publications by FHWA and other organizations have proven that the capacity of the inlet is based on depth of water in the curb which is based on street slope. Changing the interception criteria to FHWA will cause larger inlets and possible more inlets but it will help remove surface water off the street. Also, using the City criteria results in larger flows at sumps because by pass from inlets upstream is not accounted for.

Response: The HEC-22 method can be used if the design engineer chooses to. The FHWA HEC-22 method shows different interception rates and will result in larger and more inlets.

Public Comment No. 30: Roadway Drainage Design and Construction Sec 3.3.2 Page 3-2
Several locations in the manual and ordinance the City indicates "the land within th 50-year urbanized boundary shall be reserved in a common area or private drainage easement." However, on a recent job we were asked to use the OKC Urbanized Q100? Please clarify Q50 or Q100.

Response: The referenced section and page in this comment are not referring to the posted final draft of DCM on the website.

Public Comment No. 31: Roadway Drainage Inlet Design Sec 3.3.1e Page 15
Curb inlets larger than Design 2-4 are not allowed - Why no longer allowing 2-5? There are instances that it does not interfere with

Response: Section 3.3.1e allows the use of Des 2-5 inlets with the approval of the City Engineer.

Public Comment No. 32: Roadway Drainage Inlet Design Sec 3.3.1e Page 15
Inlets located in cul-de-sacs can be no larger than a Design 2-0 - Why is this being applied across the board. I understand R-1 where there is not adequate room between driveways but larger lots there is plenty of room between driveways for something bigger than 2-0.

Response: Section 3.3.1e allows the use of inlets larger than Des 2-0 with the approval of the City Engineer.

Public Comment No. 33: Roadway Drainage Grated Street Inlets Sec 3.4.1 Page 16
Grated Street Inlets function very well. They offer a lot of capacity and a minimize the area in front of lots that reduce conflicts with driveways. Why can they not be constructed any longer?

Response: This paragraph will be amended to allow the use of grated street inlets with the approval of the City Engineer.

Public Comment No. 34: Roadway Drainage Design 5, 6 and 7 Inlets Sec 3.5.1.5 Page 3.7
Enforce the 404 permitting and COE coordination as stated in the manual that says "if any fill or dredging occurs within the 2 year floodplain of a USGS Quad map blue line stream…" Currently, engineers are required to submit a letter/ exhibit to the COE if the blue line stream is on the subject property or near a site even if the plans clearly show no grading within the creek/ blue line stream banks. Recommend changing the current requirement for a SWQ permit to be in place prior to final plans being approved. Many private project plans are developed prior to a contractor being hired as the contractors are waiting to bid the plans once they are approved (similar to an OKC public project.)

Response: The referenced section and page in this comment are not referring to the posted final draft of DCM on the website.

Public Comment No. 35: Roadway Drainage Design 5, 6 and 7 Inlets Sec 3.5.2, 3.5.3 Page 16, 17
Don't recommend have the statement "or in paving within an apartment complex," this is an unnecessary statement that doesn't need to be in the manual. Stating being used in parking lots covers the application of apartment complexes.

Response: The wording in these sections will be revised to remove references to apartment complexes.

Public Comment No. 36: Roadway Drainage Design 5, 6 and 7 Inlets Sec 3.5.3 Page 17
Paragraph 2, sentence 1 - Recommend adding word "Flume" after "100-year overflow" as to not confuse the possible use on other potential overflow devices is flumes are the only thing that will be allowed. This goes for any other sump condition that an overflow device can be installed, please specify if only flumes will be allowed or if other type structures (grates or boxes) will be excepted.

Response: The wording in this paragraph will be changed to "overflow route" instead of "overflow flume".

Public Comment No. 37: Roadway Drainage Design 5, 6 and 7 Inlets Sec 3.5.3 Page 17
Who is going to pay for all the new more stringent drainage standards? Some of these changes raise the cost by 4 times. Specifically design 5, 6, 7. This requires 4 times more inlets.

Response: The City is in the process of preparing cost comparisons to demonstrate the estimated cost differences due to the requirements of the revised ordinance and criteria manual.

Public Comment No. 38: Roadway Drainage Box Inlets Sec 3.6.1 Page 17
Where does 9 inches come from? Can this be increased to 12 inches?

Response: The allowable height of the opening is restricted to 9" due to safety considerations. If a greater height of opening is required at a specific location due to site constraints, it can be discussed with staff for consideration.

Public Comment No. 39: Roadway Drainage Closed Storm Sewer Sec 3.7.1 Page 18
If an overflow flume cannot be achieved at a sump location will other overflow structures (grates or boxes) be allowed to be installed?

Response: Section 3.3.1 E allows for the inlets and pipes to be designed to carry the Q100 if an overflow structure cannot be constructed.

Public Comment No. 40: Roadway Drainage Closed Storm Sewer Sec 3.7.1 Page 18
Referencing incorrect section for capacity calculations, should be referencing 2.4. Recommend rewording this paragraph because it is written as if manning equation will control the sizing and not the HGL calculations. Also state the design storm required for HGL calculations.

Response: The second paragraph of this section will be revised to reference Sec 2.4. Manning's equation shall be used to size the pipe sizes, not HGL. HGL analysis shall be performed as a check.

Public Comment No. 41: Roadway Drainage Closed Storm Sewer Sec 3.7.1 Page 18
The capacity calculations for closed storm sewer are referenced with Manning's equation or other design methods. Please provide names of 'other design methods'.

Response: The other methods will include the calculation of the in the system in accordance with the requirements of the DCM. The calculations can be prepared with commercially available software and spreadsheets, and will be left to the discretion of the engineer.

Public Comment No. 42: Roadway Drainage Closed Storm Sewer Sec 3.7.1 Page 18
Storm sewer system is connecting to an existing storm sewer system, water surface elevation at the full flow condition of the downstream storm sewer pipe shall be used as the tailwater

elevation for the HGL analysis - Contradicts Sec. 16.13.2 of DO. Should be removed from DO and requirement should be put here.

Response: This section will be revised to state that a Manning's capacity calculation and an inlet control calculation will be required to establish the tailwater elevation for the hydraulic grade line calculation. The engineer must use discretion and engineering judgement to ensure an accurate calculation of the hydraulic grade line in the existing system.

Public Comment No. 43,44, 63, 64, and 65: Roadway Drainage Closed Storm Sewer Sec 3.7.2 Page 19

1. HP pipe should be stated as an option for all storm sewer applications including closed system sewer crossing a public street. Add HP pipe to the allowable products to be used for closed storm sewer crossing a public street. Polypropylene pipe is widely used throughout OKC.
2. We have had good results using High-performance Polypropylene (HP) and would like to see it considered for all projects including public streets including crossings. There may be a cost savings to projects and will help implement the increased storm sewer capacity requirements. This is not HDPE which we rarely use
3. HP pipe should be stated as an option for all storm sewer applications including all culverts crossing publicly funded streets or other improvements to be dedicated to the city. Add HP pipe to the allowable products to be used for culverts crossing publicly funded streets. Polypropylene pipe is widely used throughout OKC. ADS pipe is used regularly throughout Oklahoma on many construction projects (Amazon, Costco, Target, Walmart, etc), in particular OKC and the surrounding metroplex. Not only will the material last longer, it also comes in longer and lighter joints to ensure faster and safer installation. It should be used on all projects in OKC (public or private), no matter the location of the construction site.
4. Properly bedded the pipe stiffness is more than adequate for longitudinal runs under pavement. The pipe joints are far superior to any other pipe. We represent roughly 80 smaller cities, towns, and water districts, and find the product far superior to other types of pipes.
5. Oklahoma County District #3 has been installing HP pipe under County Roadways, City of Edmond and Oklahoma City roadways for storm sewer systems and roadway culvert crossings for the last 7 years. Our crew can off load pipe by hand and install more LF pipe per day than RCP and CMP. The HP pipe joints are better (water tight) than plain end concrete and easier to install than Bell and Spigot RCP. If all pipe under roadways is required to be backfilled with crushed rock, then HP pipe should be allowed as an equivalent pipe product. Less joints means less potential for joint failure. Everyone on my crew at District #3 prefers to install HP pipe over RCP and CMP.

Response: At this time, the City of Oklahoma City will not allow the use of HP pipe under any public streets. Public Works is evaluating projects constructed with HP pipe crossing under public paving. A determination will be made once the data has been gathered and studied. However, HP pipe is permitted for use in all areas outside of the

pavement, behind the curbs, for public streets. HP pipe can be used in private storm systems and under private streets or paving, at the discretion of the engineer.

Public Comment No. 45: Roadway Drainage Closed Storm Sewer Sec 3.7.2 Page 19
2nd paragraph states minimum cover shall be 2 feet from top of the finished grade to the top of the pipe. Does finished grade mean top of paving or top of curb?

Response: In the case of crossing a public street, finished grade elevations will refer to the top of the finished paving. If top of curb elevations are used, there would be less than 2' of cover at the gutter line.

Public Comment No. 46: Roadway Drainage Closed Storm Sewer Sec 3.7.2 Page 19
How may wraps of filter fabric strip shall be used on joints?

2nd Paragraph, 1st Sentence: 2 feet of cover requirement over the top of pipe is referenced with soil cover; while, the same sentence uses the word "finish grade". Please clarify. The 2 feet of cover should be measured from top of finished paving/grass grades.

Response: The number of wraps will be dependent on what is required to achieve the 2' overlap on each side of the joint. The requirement is to provide 2' of cover from the FG, whether grass or paving.

Public Comment No. 47, 48, and 68: Roadway Drainage Closed Storm Sewer Sec 3.7.2 Page 19

1. A closed storm sewer within a public drainage easement, next to curbs, and between houses shall either be RCP with "O" rings, RCB, or High-Performance Polypropylene (HP) pipe with watertight (WT) gaskets. All joints on RCP, RCB, and HP shall be wrapped with a continuous filter fabric strip overlapping 2 feet on each side of the pipe joint to ensure proper protection. - This should be a white book requirement...Not DCM or DO requirement. Also request that HDPE be considered based on the requirement to wrap joints and back fill to 1' above pipe.
2. High-Density Polyethylene Pipe (HDPE) shall only be allowed in private improvements or developments - Request to be considered for public improvements and no crushed rock backfill requirement under paving for private storm.
3. All joints on RCP, RCB, and CMP shall be wrapped with a continuous filter fabric strip overlapping 2 feet on each side of the pipe joint to ensure proper protection - Request HDPE be considered.

Response: The type of material will be included in the DCM. The material specifications will be specified in the White Book. Public Works monitored projects using HDPE behind the curb. There was joint separation and failure on these locations, and the City Engineer will not allow the use of this pipe material. HDPE can be used on private systems at the discretion of the design engineer.

Public Comment No. 49: Roadway Drainage Closed Storm Sewer Sec 3.7.2 Page 19
Please clarify the statement "A closed storm sewer shall not be located under paving parallel to the centerline of the roadway unless specifically approved by the City Engineer." Not parallel would indicate that pipes would need to be skewed or perpendicular to the roadway which I don't think you intend to say. I believe it should be reworded to say "located under paving along the centerline."

Response: A closed storm sewer system will not be allowed under the pavement, unless specifically approved by the City Engineer.

Public Comment No. 50, 52, 56, and 58: Roadway Drainage Closed Storm Sewer Sec 3.7.3 Page 20

1. Erosion control and dissipation measures is typically needed at the end of storm sewers. If the adjacent property owner is not willing to grant an easement then the storm sewer needs to be stopped short of the property line and adequate erosion control placed at the end of the storm sewer up to the property limits. The last sentence needs to be stricken.
2. All closed storm sewers must be extended to the property limits of the improved development - This is not practical. In a lot of situations the storm sewer would stop at a creek or drainage ditch within the property. Also need to allow for room for scour protection at discharge of pipe such as rip rap.
3. Language requiring the receipt of a temporary easement from an adjacent property owner needs to be stricken.
4. A temporary easement from the adjoining property owners shall be obtained by the developer if necessary - Getting easement from adjacent property owner should not be required as it is not possible in all situations.
5.

Response: Erosion control measures such as riprap need to be included in the drainage easement. The erosion control items, and the drainage easement must extend to the property line. If the erosion control measures extend outside of the developer's property, a permanent drainage easement must be obtained from the adjacent property owner. If offsite grading is required, a temporary drainage easement must be obtained from the adjacent property owner.

Public Comment No. 51 and 53: Roadway Drainage Closed Storm Sewer Sec 3.7.3 Page 20

1. For situations with cover constraint over the pipes or needing required separations with other crossing utilities, arch/elliptical pipes may be used. In these instances, if the arch/elliptical pipe is downstream of the circular pipe; then, crown of downstream arch/elliptical pipe can not be matched with the upstream circular pipe. In such cases, at least inverts shall be matched if a drop structure is not possible.

2. When tying two storm sewer reaches together, the crowns of the upstream pipe and the downstream pipe shall match - This needs to be clarified for round pipe only. Arch or elliptical would need to match bottom in many situations.

Response: It is acknowledged that arch and elliptical pipe may be required in some locations due to cover constraints. In these locations, the crowns of the pipes may not be able to match, and the inverts of the pipes may be matched.

Public Comment No. 54 and 55: Roadway Drainage Closed Storm Sewer Sec 3.7.4 Page 20

1. Why can't a manhole be used for situations where 3 or more pipes connect? Manholes (5' and 6') are used all the time in Sanitary Sewer applications to collect 3 or more lines greater than 18". Manholes allow the design of more favorable entrance and exit angles as well as eliminates the need to obscure junction box sizes. Recommend allowing the use of manholes (up to 6') with a concrete troughs for horizontal direction changes for pipes 48" and smaller, if angle is such that the wall thickness between penetrations is minimum 6" thick.
2. Section talks about requiring the concrete jct. boxes for connecting three or more pipes of 18 inches or larger. The current OKC Construction Standard D-202 is for masonry jct. box. The OKC Construction Standard D-203 for concrete jct. box is for pipes 36 inches or larger.

Response: This paragraph will be revised to allow the use of larger diameter manholes with the approval of the City Engineer. The design engineer will be required to submit documentation or drawings showing that sufficient manhole wall distance will remain between the pipe openings such that the structural integrity of the manhole is not diminished.

Public Comment No. 57: Roadway Drainage Closed Storm Sewer Sec 3.7.5 Page 20
by Mark Grubbs (Grubbs Consulting)

A 3-foot cutoff wall is required at all pipe/culvert outfalls - 3' cut off wall should not be required in low flow, low velocity outfall situations. This is an over engineered requirement for all situations. You are requiring scour protection for high discharge velocities on top of this. This should be reconsidered as it is redundant.

Response: Cut-off walls will be required for public storm systems. Cut-off walls for outlets of private systems can be eliminated at the discretion of the design engineer.

Public Comment No. 59: Roadway Drainage Closed Storm Sewer Sec 3.7.5 Page 20
The 100-year water surface in the receiving stream shall be used as the beginning elevation of any storm system hydraulic grade line (HGL) calculation - Does not make sense to use 100-yr

HGL on a 50-yr design. Corresponding HGL should be used for corresponding frequency design.

Response: Hydraulic grade line analysis is required when there is not a free discharge condition at the outlet of the pipe. In these cases, a backwater effect based on downstream constraints will exist. The constraints that must be considered include the Q100 WSEL from the receiving stream, detention pond, or channel.

Public Comment No. 60: Bridges and Culverts Sec 4.2 Page 21
Paragraph 2: Should there be language here that allows for residential driveway culverts which can utilize other pipe materials besides concrete?
Paragraph 3: Why does there need to be a minimum size of RCB? Given the common issue that we face with flat terrain and lack of head, having the ability to design a low profile RCB is critical.

Response: The materials called out in this paragraph are applicable for culverts crossing public streets. The pipe material used for private driveway culverts will be left to the discretion of the design engineer. The minimum size RCB is stated for maintenance issues.

Public Comment No. 61: Bridges and Culverts Sec 4.2 Page 21
The overtopping and freeboard requirements will be costly if implemented on all projects without a method for the City to assess cost/benefits. Please incorporate a risk assessment to determine the most cost-effective structure size. (i.e., the overtopping of a highly travelled arterial street would be different than a low traffic volume rural roadway).

Response: The design criteria will be the same for all locations and will be applied for all replacement and reconstructed bridges and culverts. Changes to this policy may be approved by the City Engineer.

Public Comment No. 62: Bridges and Culverts Sec 4.2 Page 21
The minimum allowable size of RCB culvert is 4'x3'. Is it the same minimum size allowed if RCB is part of closed storm sewer system?

If the RCB is part of closed storm sewer system; it should be designed per Manning's equation.

Response: Yes, the minimum size will still apply in closed systems. Closed storm sewer systems including an RCB will be subject to the same criteria as a closed pipe system.

Public Comment No. 66: Bridges and Culverts Sec 4.3 Page 21
Delete the following sentence (last sentence of the first paragraph): "If the minimum cover cannot be achieved a Class IV pipe shall be used." Add the following sentence to ensure that Paragraph 4.3 matches Paragraph 3.7.2: "Any variation from the 2' minimum cover must be pre-approved by the City Engineer as stated in Paragraph 3.7.2."

Response: This paragraph is referencing culverts crossing public streets and other improvements to be dedicated to the public, and this requirement will remain.

Public Comment No. 67: Bridges and Culverts Sec 4.3 Page 21
by Kendall Dillon (Crafton Tull)

Why require a minimum slope of 0.5%? If anything, base it upon the velocity.

Response: This paragraph is referencing culverts crossing public streets and other improvements to be dedicated to the public. The use of 0.50% as a minimum, will provide a velocity adequate for preventing siltation of the structure. This paragraph allows the use of a flatter slope with the approval of the City Engineer.

Public Comment No. 69: Bridges and Culverts Sec 4.3 Page 21
Bridges and culverts shall follow the alignment and grade of the natural channel whenever possible. Minimum slope of culverts shall equal 0.5% unless the site condition or slope of natural channel requires use of a flatter slope, with the approval of City Engineer - Min design slope should not be set at 0.5%. Should be based on velocity min. of 2 ft/sec. A lot of storm sewer is designed at less than 0.5% because unable to achieve 0.5% in a lot of instances.

Response: The requirements of this section make the allowance for situations where a slope of 0.50% cannot be reasonably obtained. A flatter slope may be used, with the approval of the City Engineer.

Public Comment No. 70: Bridges and Culverts Sec 4.4.2.1 Page 24
The exponent for D in the denominator should be 2.5, not 25.

Response: That value will be corrected.

Public Comment No. 71, 72, 73, and 79: Open Channels Sec 5.3 Page 25

1. "10 acres" conflicts with Section 2.4.2. Requiring a Hec-ras analysis on basins over 40 acres seems more appropriate.
2. This section calls for 10 acres or larger of the drainage area; while, section 2.4.2 calls for drainage area larger than 20 acres for flood study per HEC-RAS/HEC-2. Please clarify.
3. HEC-RAS or HEC-2 computer programs shall be used to perform hydraulic analysis on open channels with drainage areas greater than 10 acres - Contradicts 2.4.2 of DCM. Request that this requirement be set at 40 acres. Request all DA below 40 Ac. be permitted to be calculated by a normal depth open channel flow calculation.
4. The analyses of all open channels shall use approved methods of flow calculations such as HEC-RAS or HEC-2 - Contradicts 2.4.2 and 5.3 of DCM. Request that this requirement be set at 40 acres. Request all DA below 40 Ac. be permitted to be calculated by a normal depth open channel flow calculation.

Response: This value will be revised to 20 acres to be consistent with previous sections.

Public Comment No. 74: Open Channels Sec 5.4 Page 25
nhannel - mispelled.

Response: Spelling will be corrected.

Public Comment No. 75: Design and Construction of Detention Ponds Sec 6.4 Page 30
1' freeboard. Freeboard on detention pond "mattress effect", we call it "sofa effect" in Edmond, creates a lot of issues for the entire 100, it was intended to be "emergency overflow."

Response: This paragraph will be amended to state that the emergency overflow must pass the entire Q100 without overtopping the pond dam. The minimum 1-foot freeboard will apply to the 100-year water surface elevation with the primary outlet functioning properly. The minimum finished floor elevation will be set based on the 100-year water surface elevation in the pond under the scenario that the primary outlet is blocked and only the emergency spillway is functioning.

Public Comment No. 76: Open Channels Sec 5.5 Page 26
Why does an open channel with capacity to convey the 100 year still need one foot of freeboard?

Response: This will allow for a "safety factor" to account for flow around curves, blockages, obstructions, or unforeseen downstream conditions. The city is experiencing flooding situations in numerous locations where the channel was designed for the 100-year flood but is still exceeding the channel banks. This has become a maintenance issue with erosion behind the channel walls.

Public Comment No. 77: Open Channels Sec 5.5 Page 26
Please add provisions to allow alternative methods of controlling erosion and scour. The current guidelines do not allow for "green" options that can be required on federal funded projects.

Response: The types of channels referenced in this section will generally be constructed at developer or at the City's expense. If the situation arises where Federal regulations require the use of a "green" option, they can be discussed and approved by the City Engineer.

Public Comment No. 78: Open Channels Sec 5.5 Page 26
For all design and construction details for channel designs shall include 1 foot of free board from 100-year water surface elevations as calculated - 1' of freeboard on channel should not be required. Barry Lodge said this was not the intent. Request to be removed.

Response: The 1-foot freeboard requirement is in place as a public safety measure. This appears to be a misunderstanding of the question that was asked. When this answer was given, it was in reference to a question asking if the easement required for natural

channels would be for the 100-year WSE plus 1 foot. That will not be required. The 1-foot freeboard on designed open channels will remain. Please see response for Public Comment No. 76.

Public Comment No. 80: Open Channels Sec 5.5.2 Page 26
by Kendall Dillon (Crafton Tull)

Consideration should be given to reducing this number from 40 acres to 20 acres.

Language should be added that allows for open channels less than 40 acres when off-site drainage needs to be intercepted, collected and concentrated in order to convey it through a storm sewer system. It is a common scenario to have off-site drainage that sheet flows onto a development site. Since it is not concentrated at a point, it is necessary to utilize an interceptor channel to collect the water and convey it to point to which it can then be conveyed through a storm sewer system.

Response: It has been the City requirement for years to use a closed storm sewer system for drainage areas up to 40 acres. If the situation arises where this requirement can't be met, it can be discussed and approved by the City Engineer.

Public Comment No. 81 and 82: Open Channels Sec 5.5.2 Page 26

1. The analyses of all open channels shall use approved methods of flow calculations such as HEC-RAS or HEC-2 - Contradicts 2.4.2 and 5.3 of DCM. Request that this requirement be set at 40 acres. Request all DA below 40 Ac. be permitted to be calculated by a normal depth open channel flow calculation.
2. All open channels shall use approved methods of flow calculations capacity analysis shall be performed using HEC-RAS or HEC-2 - Contradicts 2.4.2 and 5.3 of DCM. Request that this requirement be set at 40 acres. Request all DA below 40 Ac. be permitted to be calculated by a normal depth open channel flow calculation.

Response: The DCM states a concrete channel can be used for drainage areas greater than 40 acres. The current ordinance and City policy require the use of a closed storm sewer system for drainage areas up to 40 acres.

Public Comment No. 83: Design and Construction of Detention Ponds Sec 6 Page
Especially in areas where there is no known flooding of structures, detention exemptions should be given to projects with approved Preliminary plats where detention was not previously required. This will produce an extreme hardship on numerous development projects.

Response: One of the goals of this revision to the ordinance and the creation of this DCM is help prevent flooding situations before they occur and not simply react after the fact. Therefore, all new development sites will be required to provide on-site detention, unless a waiver is granted in accordance with the Drainage Ordinance and this DCM.

Consideration will be given to multi-phase developments that have been started to relax or reduce the detention requirement for specific phases of the development. An approved Preliminary Plat for a development will not automatically eliminate the detention requirement.

Public Comment No. 84: Design and Construction of Detention Ponds Sec 6.1 Page 28
Once it is determined by the City that detention is not required during preliminary determination and Developer proceeds with final plans; there is enormous amount of risk involved for the Developer to go back and add detention to the site. Therefore, the preliminary determination by the City should be made on solid evidence that detention is or not required and such decision should not be changed during plan approvals.

Response: Paragraph 6.1 will be revised. Since the ordinance will require detention at all locations, there will not be a "preliminary determination". If a waiver has been granted based on submitted and approved calculations, that waiver will be honored for that particular Final Plat.

Public Comment No. 85: Design and Construction of Detention Ponds Sec 6.1 Page 28
Therefore, preliminary determinations can change prior to the approval of plans. If at any time during the review process, and before approval, it is determined that the subject development will cause or increase flooding downstream, improvement and enhancement to planned detention ponds will be required - This is unfair to the Engineer and developer and should not be the case. Detention will now be required in all situations unless a waiver is approved. If waiver approved then the decision should not change at any time during the review and approval process.

Response: Paragraph 6.1 will be revised. Since the ordinance will require detention at all locations, there will not be a "preliminary determination". If a waiver has been granted based on submitted and approved calculations, that waiver will be honored for that particular Final Plat.

Public Comment No. 86: Design and Construction of Detention Ponds Sec 6.2.1 Page 29
Analysis of upstream condition assuming it provides detention. Barry and Michelle seemed a bit contrary. We should all get on a call about this.

Response: Per discussions between City staff and DCM consultants, no response is required for this comment.

Public Comment No. 87: Design and Construction of Detention Ponds Sec 6.2.1 Page 29
1st bullet point: If an offsite upstream drainage area is developed with a permitted detention pond and it discharges onto the property considered for development, then, the offsite upstream "To Pond" drainage area shall be evaluated as undeveloped area in both, i.e., historic and proposed models.

Response: An additional bullet point will be added to clarify this section. If there is a developed site, with a permitted detention pond that discharges onto a property

considered for development, the off-site conditions existing prior to that development would be used for the historic and proposed conditions models. That would apply to all areas, not only the "to Pond" area.

Public Comment No. 88: Design and Construction of Detention Ponds Sec 6.2.1 Page 29
If an offsite upstream drainage area discharges onto the property considered for development, then the entire offsite area shall be evaluated in the current existing conditions at the time of the proposed development - This should be modified to state that any upstream DA may be considered as historic if such property has provided detention.

Response: An additional bullet point will be added to clarify this section. If there is a developed site, with a permitted detention pond that discharges onto a property considered for development, the off-site conditions existing prior to that development would be used for the historic and proposed conditions models. That would apply to all areas, not only the "to Pond" area.

Public Comment No. 89: Design and Construction of Detention Ponds Sec 6.3.1 Page 30
In the sentence "The trickle channel shall be constructed of concrete, a minimum of 2 feet wide and 6 inches deep, with a minimum slope of 0.4%." I recommend replacing the word deep with "thick". Deep can be misinterpreted to mean 6" deep flume type structure.

Response: This paragraph will be revised to state that the concrete trickle channel must 4 feet wide, 2 inches deep at the center, with the concrete being 6 inches thick.

Public Comment No. 90: Design and Construction of Detention Ponds Sec 6.3.1 Page 30
by Kendall Dillon (Crafton Tull)

Consideration of design criteria (emergency overflows, 1 ft freeboard, etc) should be given to small detention facilities with low flows.

Response: This paragraph will be amended to state that the emergency overflow must pass the entire Q100 without overtopping the pond dam. The minimum 1 foot freeboard will apply to the 100-year water surface elevation with the primary outlet functioning properly. Additionally, the minimum finished floor elevation will be set based on the 100-year water surface elevation in the pond under the scenario that the primary outlet is blocked and only the emergency spillway is functioning. An exception to the 1-foot freeboard requirement is provided for parking lot detention areas.

Public Comment No. 91: Design and Construction of Detention Ponds Sec 6.3.1 Page 29
Last sentence on page 29 is vague and does not apply to other detention pond modelling methods; which do not rely on calculating the storage capacity of pond based on critical storm durations. Such methods are HEC-HMS, PondPack, etc. Please clarify.

Response: For site that has a large bypass area, the storm durations that produce highest water surface elevation and the maximum discharge from the site/pond may be different. Therefore, the referenced requirement will remain in the DCM. Detention

calculations for most of the ponds for residential/commercial developments will not be prepared using HEC-1 or HEC-HMS. HEC-1 and HEC-HMS models are generally prepared using a 24-hour storm, the input lag times, with the peak elevations and discharges that occur around the center of that 24-hour period. If a HEC-1 or HEC-HMS model is required it will be evaluated in accordance with the model parameters.

Public Comment No. 92: Design and Construction of Detention Ponds Sec 6.3.1 Page 29
All detention pond facilities, except parking lot storage ponds, must be designed to allow for 1 foot of freeboard - Was 10% additional storage considered in lieu of 1' freeboard. 1' freeboard is excessive on small ponds. Maybe the lesser of 10% additional storage and 1' of freeboard? Is top of pond enclosure at the overflow weir elevation or top of berm? Big difference here.

Response: The 1-foot freeboard requirement is in place to allow for the emergency overflow spillway to function without overtopping the pond dam/embankment. The required 1-foot freeboard is measured from the calculated 100-year water surface elevation based on the primary outlet structure functioning properly.

Public Comment No. 93: Design and Construction of Detention Ponds Sec 6.4 Page 30
The concrete overflow structure shall function with all other discharge elements fully blocked without exceeding the allowable historic discharge rate from the pond/ site. What is this analysis going to look like? Edmond requires us to show the weir can handle the 100 year event in case of total blockage and completely full pond, but not attenuate. I don't know how you design an emergency overflow weir to handle Q100 flows but attenuate the same as the primary outfall structure? Does this requirement apply to all storm events?

Response: This paragraph will be amended to state that the emergency overflow must pass the entire Q100 without overtopping the pond dam. The minimum 1-foot freeboard will apply to the 100-year water surface elevation with the primary outlet functioning properly. Additionally, the minimum finished floor elevation will be set based on the 100-year water surface elevation in the pond under the scenario that the primary outlet is blocked and only the emergency spillway is functioning.

Public Comment No. 94: Design and Construction of Detention Ponds Sec 6.4 Page 31
Concerning the detention pond overflow spillway, the DCM states that "The concrete overflow structure shall function with all other discharge elements fully blocked without exceeding the allowable historic discharge rate from the pond/ site." The seems to indicate that you would, in essence, have two outlet structures to limit post-developed flows to pre-developed flows. Instead, I would recommend that the overall spillway be designed to carry only the 100-year post-development flow rate to keep from overtopping the detention pond.

Response: This paragraph will be amended to state that the emergency overflow must pass the entire Q100 without overtopping the pond dam. The minimum 1-foot freeboard will apply to the 100-year water surface elevation with the primary outlet functioning properly. Additionally, the minimum finished floor elevation will be set based on the 100-year water surface elevation in the pond under the scenario that the primary outlet is blocked and only the emergency spillway is functioning.

Public Comment No. 95: Design and Construction of Detention Ponds Sec 6.4 Page 31
The manual mentions that the overflow spillway must not exceed the allowable historic discharge rate from the pond/ site. This is not a common practice for any communities in our geographic region. This means that you essentially have 2 designed outlet structures and the capacity above the overflow spillway would need to be greatly increased making the "free board" way larger than 1 ft in most cases in order to release at the 100 year rate with all other elements blocked. It is typical in other communities that the overflow structure be designed so that it release at a rate that would not over top the pond (w/ 1 ft of free board) if all other elements are blocked.

Response: This paragraph will be amended to state that the emergency overflow must pass the entire Q100 without overtopping the pond dam. The minimum 1-foot freeboard will apply to the 100-year water surface elevation with the primary outlet functioning properly. Additionally, the minimum finished floor elevation will be set based on the 100-year water surface elevation in the pond under the scenario that the primary outlet is blocked and only the emergency spillway is functioning.

Public Comment No. 96: Design and Construction of Detention Ponds Sec 6.4 Page 31
Why is it necessary that the overflow spillway on every pond be concrete? This does not seem reasonable especially on smaller, low flow facilities.

The requirement that the overflow discharge cannot exceed the historic rate is requiring double detention. Hopefully detention on top of detention is not the intent? Please clarify.

Response: The concrete overflow spillway allows for construction of the spillway to be as close to the design as possible, which in turn, allows the control of the flow to be as close to the design as possible. In addition, the potential for erosion of the outlet structure is greatly reduced. Other spillway materials may allowed with the approval of the City Engineer. However, the use of materials other concrete for the emergency spillway will require the submittal of detailed as-built drawings of the spillway demonstrating that the spillway was constructed in accordance with the approved plans.

This paragraph will be amended to state that the emergency overflow must pass the entire Q100 without overtopping the pond dam. The minimum 1-foot freeboard will apply to the 100-year water surface elevation with the primary outlet functioning properly. Additionally, the minimum finished floor elevation will be set based on the 100-year water surface elevation in the pond under the scenario that the primary outlet is blocked and only the emergency spillway is functioning.

Public Comment No. 97: Design and Construction of Detention Ponds Sec 6.4 Page 31
Other flexible lining materials should be considered for spillway, too. The sight of concrete spillways in residential development is pretty ugly and other flexible lining materials promote green stormwater facilities.

Response: The concrete overflow spillway allows for construction of the spillway to be as close to the design as possible, which in turn, allows the control of the flow to be as close to the design as possible. In addition, the potential for erosion of the outlet

structure is greatly reduced. Other spillway materials may be allowed with the approval of the City Engineer. However, the use of materials other concrete for the emergency spillway will require the submittal of detailed as-built drawings of the spillway demonstrating that the spillway was constructed in accordance with the approved plans.

Public Comment No. 98: Design and Construction of Detention Ponds Sec 6.4 Page 31
Concrete overflow spillway - My comment is 2-fold here. Why a concrete overflow weir mandatory? This is overkill for some of these smaller detention ponds. Why not require it when design velocities over a certain threshold. Why not allow for flexamat? Concrete overflow weir can be an eyesore. Secondly you are requiring detention on top of detention if you require the overflow weir to regulate the 100-year historic as well! Then you are requiring 1' of freeboard above that (when the primary outlet is blocked). This is extremely excessive. Overflow weir should be required to handle developed flow in an overflow situation. It should not be required to regulate the 100-year historic flow. Furthermore, min FF should be set 1' above the 100-yr utilizing primary outlet.

Response: The concrete overflow spillway allows for construction of the spillway to be as close to the design as possible, which in turn, allows the control of the flow to be as close to the design as possible. In addition, the potential for erosion of the outlet structure is greatly reduced. Other spillway materials may be allowed with the approval of the City Engineer. However, the use of materials other concrete for the emergency spillway will require the submittal of detailed as-built drawings of the spillway demonstrating that the spillway was constructed in accordance with the approved plans.

This paragraph will be amended to state that the emergency overflow must pass the entire Q100 without overtopping the pond dam. The minimum 1-foot freeboard will apply to the 100-year water surface elevation with the primary outlet functioning properly. Additionally, the minimum finished floor elevation will be set based on the 100-year water surface elevation in the pond under the scenario that the primary outlet is blocked and only the emergency spillway is functioning.

Public Comment No. 99: Design and Construction of Detention Ponds Sec 6.5 Page 31
Add injection molded thermoplastic chambers to the acceptable list of underground storage facilities. Please revise the first numbered item 1 in Paragraph 6.5 to the following: "1. Composed of reinforced concrete pipe (RCP), polyvinyl chloride pipe (PVC), high-performance polypropylene (HP), or injection molded thermoplastic chambers." See attached sheet for additional supporting information on injection molded thermoplastic chambers.

Response: Injection molded thermoplastic chambers will be added to the list of acceptable underground detention methods. However, the "aggregate void volume" will not be allowed to be included as part of the storage volume of the detention system.

Public Comment No. 100: Design and Construction of Detention Ponds Sec 6.5 Page 31
Add injection molded thermoplastic chambers to the acceptable list of underground storage facilities.

Response: Injection molded thermoplastic chambers will be added to the list of acceptable underground detention methods. However, the "aggregate void volume" will not be allowed to be included as part of the storage volume of the detention system.

Public Comment No. 101: Design and Construction of Detention Ponds Sec 6.5 Page 31
Surface ponds - Why is written permission being required? We are utilizing these more and more due to rising land prices. Should be at the discretion of the engineer/ developer.

Response: Injection molded thermoplastic chambers will be added to the list of acceptable underground detention methods. However, the "aggregate void volume" will not be allowed to be included as part of the storage volume of the detention system.

Public Comment No. 102: Design and Construction of Detention Ponds Sec 6.5 Page 31
Concerning underground detention. I would request that plastic chamber and aggregate systems be allowed.

Response: This section will be revised to allow underground detention to be used at the discretion of the design engineer.

Public Comment No. 103: Design and Construction of Detention Ponds Sec 6.5 Page 31
Why is written permission being required? We are utilizing these more and more due to rising land prices. Should be at the discretion of the engineer/developer. Pre-fab underground detention systems such as Stormtech, Contech, Stormtrap, etc. should be permitted. Also why limiting the connection to the public storm to two materials?

Response: This section will be revised to allow underground detention to be used at the discretion of the design engineer.

Injection molded thermoplastic chambers will be added to the list of acceptable underground detention methods. However, the "aggregate void volume" will not be allowed to be included as part of the storage volume of the detention system.

All connections to the public system will be required to be made with RCP or HP pipe since those are the only materials currently allowed for public storm sewer systems.

Public Comment No. 104: Design and Construction of Detention Ponds Sec 8.3 Page A-6
Remove the composite "c" value as an options. We have been required to base the "c" value strictly off OKC zoning classification only.

Response: The referenced section and page in this comment are not referring to the posted final draft of DCM on the website.

Public Comment No. 105: Design and Construction of Detention Ponds Sec 9.2.1 Page 9-1
The DCM states "a flood study is required to obtain the 50-year urbanized boundary". We have been asked to provide this for the Q100. We feel this should remain the Q50 limits and not be increased to the Q100.

Response: The referenced section and page in this comment are not referring to the posted final draft of DCM on the website.

Public Comment No. 106: Design and Construction of Detention Ponds Sec 9.2.4 Page 9-2
The DCM states "for platted subdivisions. the preliminary plat shall show the 50-year urbanized floodplain is contained in a common area, drainage easement or deed restriction". We feel this should remain the Q50 limits and not be increased to the Q100.

Response: The referenced section and page in this comment are not referring to the posted final draft of DCM on the website.

Public Comment No. 111
My question is why we are still using outdated and inaccurate FEMA maps from 2008 and USGS studies from 2006 in the SW sector to determine drainage studies, etc. for new development. Why are the flood elevations not being revised or steps being taken to lower the flood elevations now since there is flooding in the SW sector?
Why is the city not looking at a CRS rating to maybe lower flood insurance rates if new elevations are implemented by FEMA on a revision of flood levels? What are the plans of the City of Oklahoma City in this regard.

Response:

FEMA is responsible for revising and issuing all updates to the Flood Insurance Rate Maps. As required by FEMA, the City adopts all updated maps by ordinance through action of the City Council. Therefore, the City is using the most current FEMA maps available. The USGS study provides flow rates and calculated water surface elevations for urbanized conditions. The City requires new structures in or adjacent to mapped floodplains to have the lowest floor elevated to at least 1 foot above the urbanized water surface elevation, which exceeds the FEMA requirement of having the lowest floor elevation at the 100-year water surface elevation published in the FEMA Flood Insurance Study. When an urbanized study is not available, the developer is required to provide an up-to-date study. The City does participate in the Community Rating System, and actively looks for ways to improve the CRS rating and thereby reduce the cost of flood insurance in the City. Reviews of the CRS rating are conducted every 5 years. The next review for the City CRS rating is scheduled for 2023.

Public Comment No. 112 through 116:

1. The rational method has been around forever and many people are used to using it. However, in my experience, it seems to under-predict flow rates by as much as 50%. This prompted ODOT to required “modifiers” for the less frequent storms (25% for the 100-year). I have had developers submit a stormwater detention model using the same subbasins as in the storm sewer analysis and clearly showed SCS method flow rates

going into the pond that were double what they were designing the storm sewers for. (Bixby). I would recommend limiting to 10-20 acres for the storm sewer system only and require free-flowing pipes instead of allowing them to run under head.

2. If you have a rational method drainage basin with both flat and steep slopes, many times the runoff for just the steep part of the basin will produce a higher flow rate than that from the larger combined drainage basin. I will look for my copy of "Voodoo Hydrology" and send it to you. I got a kick out of it.
3. I personally believe that detention calculations using modified rational method will produce so much less volume than one using an SCS method hydrograph that the pond will be easily overrun and perhaps overtop. Plus, the industry standard is to use a 24-hour "balanced" storm (the more intense parts are in the middle) so the if you have an intense storm longer than the small basin's time of concentration the volume in the pond will be used up before the peak. I have grown up in the evolution of Tulsa's stormwater management programs and have witnessed many pond dams breach or be damaged before the City of Tulsa went to a 24-hour storm requirement.
4. I personally believe that detention calculations using modified rational method will produce so much less volume than one using an SCS method hydrograph that the pond will be easily overrun and perhaps overtop. Plus, the industry standard is to use a 24-hour "balanced" storm (the more intense parts are in the middle) so the if you have an intense storm longer than the small basin's time of concentration the volume in the pond will be used up before the peak. I have grown up in the evolution of Tulsa's stormwater management programs and have witnessed many pond dams breach or be damaged before the City of Tulsa went to a 24-hour storm requirement.
5. The Design Criteria Manual refers to using "fully urbanized conditions as determined by current Zoning for the area". In the ordinance it the flow rates to be used for the 100-year flood are either: (1) the FEMA flow rates from the effective models, (2) USGS (USGS Open File Report 83-26) historical "urbanized" information for the City studies for streams and rivers, or (3) new hydrology for unstudied FEMA drainage basins for portions of the City. This is a little confusing. Since you refer to these options as "whichever is higher" couldn't you call for fully urbanize conditions based on current zoning. In the 1983 USGS study, it states: "Note elevations and discharges based on existing conditions on upper Bluff Creek and Crooked Oak Creek were computed by the Corps of Engineers in which a 90 percent urbanization was assumed. Therefore, the flood elevations listed under urban factor RL = 4.1 are sometimes lower than the existing conditions from the flood insurance study because of the difference in computation methods and urbanization assumptions." This statement makes it clear that the assumptions in the study produced flow rates and water surface elevations based on urbanization that are even lower that 90% urbanized assumptions the USACE made on Bluff Creek and Crooked Oak. Why not just call for fully urbanized flow rates if that is your intention? The definition for BASE FLOOD could be: Base Flood means the flood having a one percent change of being equaled or exceeded in any given year based on FEMA effective flow rates or fully urbanized flow rates based on zoning, whichever is higher, and is also referred to as the 100-year frequency flood." That would carry itself throughout all of the references to the 100-year frequency flood.

Response: Thank you for your comments. We will take your comments under consideration. The City of OKC appreciates your comments and interest in the process of updating and revising this Drainage Criteria Manual.

Public Comment No. 117
Will Development Services be reviewing all private storm sewer regardless of size? Is the PV plan requirement for private storm sewer of a certain size being removed?

Response: Development Services will require private storm sewer plans to be designed, signed, and sealed by an Engineer. The private storm sewer plans will be submitted to Development Services as part of the building permit submittal There will no longer be a requirement for private plans to be submitted through Public Works The private storm sewer systems will be inspected by Development Services inspectors.

Public Comment No. 118: Design and Construction of Detention Ponds Sec 6 Page 28
Since detention is considered private, will it now be reviewed by Development Services or will it still be reviewed by Public Works? Will the DP submittal requirement and process remain as it currently is? Is Autodesk Storm and Sanitary Analysis an acceptable modeling method for detention pond design?

Response: Detention pond plans and calculations will still be submitted to Public Works for review and approval using the currently existing process and procedure. The AutoDesk Storm and Sanitary Analysis software is acceptable for use in the detention pond design.

Public Comment No. 119: Design and Construction of Detention Ponds Sec 6.5 Page 31
Are Contech underground detention systems acceptable?

Response: Injection molded thermoplastic chambers will be added to the list of acceptable underground detention methods. The "aggregate void volume" will not be allowed to be included as part of the storage volume of the detention system. Specific brand names or manufacturers will not be added to the DCM.

Public Comment No. 120: Design and Construction of Detention Ponds Sec 6.5 Page 31
Recommend adding to the manual or ordinance the required review process/ steps and the required material to be submitted for review for each of the sets publics works will be reviewing (DD, DP, PV?) This will help limit the confusion on when a certain type of public review is required as well as what will be required for that review (documents needed to submit).

Response: A flowchart of the review process for Technical Review is being prepared by Public Works, and will be included in the DCM.

Public Comment No. 121
Section line roads revision, triple the storm water cost. Who pays for this?

Response: The City is in the process of preparing cost comparisons to demonstrate the estimated cost differences due to the requirements of the revised ordinance and criteria manual.

Public Comment No. 122
Weirs will be huge, pond will be taller, double the inlets, double pipe diameter. Who pays for all this? This City pays millions of dollars for sidewalks that go nowhere, surely the City can fund some drainage issues.

Response:

The paragraph concerning detention pond and spillway design will be amended to state that the emergency overflow must pass the entire Q100 without overtopping the pond dam. The minimum 1-foot freeboard will apply to the 100-year water surface elevation with the primary outlet functioning properly. Additionally, the minimum finished floor elevation will be set based on the 100-year water surface elevation in the pond under the scenario that the primary outlet is blocked and only the emergency spillway is functioning.

Public Comment No. 123
We suggest that the application of the Drainage Criteria Manual should be integrated into the new capital/GO Bond/MAPS projects going forward, because the projects from previous capital/GO Bond/MAPS projects were budgeted under the previously existing design criteria so they will be impacted if not allowed to finish those projects under the existing criteria.

Response: Thank you for your comments. The City of OKC appreciates your comments and interest in the process of updating and revising this Drainage Criteria Manual. It is the intent that the drainage design for all projects, either publicly or privately funded, will be based on the Drainage Ordinance and design requirements that are in effect at the time of the design. Projects that are currently part of the 2017 Bond Issue will be monitored for impacts to the projects due to the requirements of the revised ordinance and criteria manual.

Public Comment No. 124The way HGL/EGL is calculated doesn't account for inlet control. I've seen many storm sewers sized using only Manning's equation and not checking for inlet control and accounting for that upstream. For example, a recent project I'm working on in Edmond has an existing 18" pipe at 15% or so and the previous engineer sized the pipe using Manning's. When checked for inlet control it needed to be upsized to a 24" pipe and lowered or the upstream HGL was going to be above the upstream structures, violating City code. It may be a majority of the storm sewers in OKC will be flat enough to where a majority of the pipes will be outlet controlled, but the consultants here (from my observations) do not know to look for inlet control. There are software packages out there that can run those checks and carry that upstream.

Response: Thank you for your comments. We will take your comments under consideration. The City of OKC appreciates your comments and interest in the process of updating and revising this Drainage Criteria Manual.

Public Comment No. 125
Energy losses at junctions also are not accounted for.

Response: Energy losses can be accounted for in the software used to prepare the hydraulic grade line calculations.

Public Comment No. 126
Sizing of inlets on grade should be sized per HEC-22. I've seen engineers use the capacities given in the criteria manual that seem to be for inlets in sag locations. Bypass needs to be carried downstream to the next inlet.

Response: HEC-22 for the design of the storm sewer inlets is acceptable, and an alternative method.

Public Comment No. 127
Clogging factors for inlets. Not sure if these are being accounted for in sizing.

Response: Clogging factors can be accounted for in the software used to prepare the hydraulic grade line calculations.

Public Comment No. 128
Scour protection. I'm seeing issues around town where there hasn't been much thought into scour at storm sewer outlets or weir structures at detention outlets. My neighborhood in particular (Castlebrook Crossing @ SW 29th and Sara Rd.) where we have a detention outlet structure that didn't have scour protection extended all the way to the bottom of the creek that the detention discharges into. The small amount of riprap shown in the plans has washed away and now the creek banks have scoured underneath the detention outlet. I'm seeing this also at flumes. Mostly seeing this being done by consultants that primarily do most of the residential subdivisions in town.

Response: Thank you for your comments. We will take your comments under consideration. The City of OKC appreciates your comments and interest in the process of updating and revising this Drainage Criteria Manual.

Public Comment No. 129
The City specs need to reference current ASTM and AASHTO design specifications. To save some hassle, it would be a good idea to state that special designs would need to be approved by engineering.

Response: Thank you for your comments. The City of OKC appreciates your comments and interest in the process of updating and revising this Drainage Criteria Manual. This will be considered in the update of the white book.

Public Comment No. 130
I recommend a detail be added to the standard details for a box culvert trench (maybe copy the ODOT detail and modify the fit). The detail should be sure to address the backfill requirements between the culvert and trench walls (likely Type A).

Response: Thank you for your comments. Public Works is working on updating our reinforced concrete box standards and will consider your comments. The City of OKC appreciates your comments and interest in the process of updating and revising this Drainage Criteria Manual.

Public Comment No. 131

Tthe City should address quality control for precast culverts. The fairgrounds project had box sections delivered that were damaged and there wasn't any guidance in the specs on acceptance criteria. We also had joint issues that left large gaps in the joints after the sections were installed. All the issues were addressed, but it may benefit the City to place some criteria in the specifications for the above. I believe ASTM has some specifications regarding tolerances of precast culvert construction and recommendations on repair.

Response: Thank you for your comments. Public Works is working on updating our reinforced concrete box standards and will consider your comments. The City of OKC appreciates your comments and interest in the process of updating and revising this Drainage Criteria Manual.

Public Comment No. 132

Joint gaskets and joint wrap. I don't believe the City has a current specification for these. I was told once by City staff that the contractor should know to wrap the box culvert joints per the slotted drain inlet detail, but I argue that the contractor wouldn't look at that detail for construction of a precast box culvert. A specification specifically for RCB and RCP wrap would be helpful.

Response: Thank you for your comments. Public Works is working on updating our reinforced concrete box standards and will consider your comments. The City of OKC appreciates your comments and interest in the process of updating and revising this Drainage Criteria Manual.