

ARKANSAS RIVER LOW WATER DAM PROJECT

DOCUMENT SEARCH – FLOODPLAIN REQUIREMENTS AND ORDINANCES

UPDATED JUNE 2013

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MESHEK
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CIVIL & WATER RESOURCE ENGINEERING
GEOGRAPHIC INFORMATION SYSTEMS

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ARKANSAS RIVER LOW WATER DAM PROJECT

DOCUMENT SEARCH – FLOODPLAIN
REQUIREMENTS AND ORDINANCES

ORIGINALLY PREPARED DECEMBER
2009

UPDATED JUNE 2013 TO INCLUDE
BIXBY, OK AND TO UPDATE
ORDINANCES

Executive Summary

On March 13, 2009, CH2M-Hill authorized Meshek and Associates, PLC to begin this Document Search for the Arkansas River Corridor Projects, Task No. 1, Environmental Scoping, to identify the stakeholders and affected agencies and to summarize the roles and responsibilities of the stakeholders and agencies in regard to future project implementation and long-term management responsibilities. On December 5, 2012, CH2M-Hill authorized Meshek and Associates, PLC to revise the existing Technical Memorandum summarizing the evaluation of available data, possible effects of the project and additional data collection necessary to complete the preliminary constraint or impact analyses, for the addition of the Bixby, OK site.

This information will help facilitate future decision making, including identification and evaluation of preferred alternatives and associated requirements for more detailed analysis and permitting during a later phase of the project.

The stakeholders and agencies include:

- Tulsa County
- The City of Sand Springs
- The City of Tulsa
- The City of Jenks
- The City of Bixby
- The Federal Emergency Management Agency (FEMA)
- The Oklahoma Water Resources Board (OWRB)
- The Tulsa District Corps of Engineers (USACE)
- The Southwest Power Administration (SWPA)

Items located as part of this Document Search include:

- Municipal and County floodplain ordinances, including Zoning Codes and Subdivision Regulations as applicable
- Communities' Certified Floodplain Administrators List,
- Federal Emergency Management Agency (FEMA) Floodplain and Floodway Requirements,
- Municipal and County Stormwater Drainage Criteria,
- Oklahoma Water Resource Board Requirements, and
- Additional permit requirements.

In addition to the existing data sets, the following previous studies were reviewed as part of this task:

- Phase 3 Report: Restoration Plan for the Arkansas River Corridor Project Ecosystem
- Restoration Study in Conjunction with Future Low Water Dam Requirements (Cherokee CRC, 2008)
- Zink Dam Sedimentation Study, Final Report (W.R. Holway and Associates, 1983)
- Vision for the Arkansas River Corridor at Tulsa (TVA, 2008).

Findings of the Document Search include:

1. According to George Robbins (Southwest Power Administration), there is no single document that explains the decision making process used in determining hydropower generation times and amounts. Instead, the day to day and week to week power releases are determined based on the SWPA customer's needs and the Arkansas River system inflow-storage conditions at the time of making the decision. The Corps and SWPA keep in daily or weekly contact to discuss possible outflow requirements at Keystone to fulfill the flood control operational needs, low flow needs and any other conditions going on at the time in question. In addition, other items such as the Least Tern Nesting issues come into play. The SWPA and the Greg Estep with the Tulsa District Corps of Engineers will need to be kept in the loop on this project from this point forward.
2. The Level of Protection by ordinance is the 1% (100-year storm) for all entities.
3. All entities have a "no-rise" requirement for any project impacting the floodplain.
4. The Cities of Tulsa, Jenks, and Bixby as well as Tulsa County, require consideration of full urbanization for designs. The City of Sand Springs, FEMA, and the State of Oklahoma (OWRB) do not require consideration of full urbanization.
5. The Level of Protection required (at least to be analyzed) for future designs is as follows:
 - a. Tulsa County – 1% storm, full urbanization, 1-foot of freeboard as well as consideration of the effect of improvements on the Levee Design Storm (350,000 cfs).
 - b. City of Sand Springs – 1% storm, existing urbanization, and 1-foot of freeboard.
 - c. City of Tulsa – 1% storm, full urbanization, 1-foot of freeboard.
 - d. City of Jenks – 1% storm, full urbanization, 1-foot of freeboard inside of the levee. Outside of the levee, and impacting this project, insurable structures must be built 2 feet above the 1986 flood level.
 - e. City of Bixby - 1% storm, full urbanization, and 1-foot of freeboard.
 - f. FEMA – 1% storm, existing urbanization, no freeboard.
 - g. Oklahoma Water Resources Board – State of Oklahoma - 1% storm, existing urbanization, and no freeboard. This impacts mostly state highways or other state property.
 - h. US Army Corps of Engineers – Requires following the process described in Executive Order 11988. This process is described herein:

"The guidelines address an eight-step process that agencies should carry out as part of their decision-making on projects that have potential impacts to or within the floodplain. The eight steps, which are summarized below, reflect the decision-making process required in Section 2(a) of the Order.

1. *Determine if a proposed action is in the base floodplain (that area which has a one percent or greater chance of flooding in any given year).*
2. *Conduct early public review, including public notice.*

3. *Identify and evaluate practicable alternatives to locating in the base floodplain, including alternative sites outside of the floodplain.*
4. *Identify impacts of the proposed action.*
5. *If impacts cannot be avoided, develop measures to minimize the impacts and restore and preserve the floodplain, as appropriate.*
6. *Reevaluate alternatives.*
7. *Present the findings and a public explanation.*
8. *Implement the action.*

Among a number of things, the Interagency Task Force on Floodplain Management clarified the EO with respect to development in flood plains, emphasizing the requirement for agencies to select alternative sites for projects outside the flood plains, if practicable, and to develop measures to mitigate unavoidable impacts.”

6. Compensatory storage is required by the Cities of Sand Springs, Tulsa, Jenks and Bixby.
7. The steady-state hydraulic modeling to be used is the 2004 HEC-RAS model prepared by the USACE with a 1% flow rate of 205,000 cfs, which is the effective FEMA model.
8. Recommendations for Critical Facility Protection (from the City of Tulsa Multi-Hazard Mitigation Plan).
 - a. Critical facilities require a higher level of protection because they are vital public facilities, reduce pollution of floodwaters by hazardous materials, and ensure that the facilities will be operable during emergencies. The Community Rating System (CRS) provides credit for regulations protecting critical facilities from the 500-year flood.
 - b. Critical facilities should be constructed on properly compacted fill and have the lowest floor (including basement) elevated at least one foot above the elevation of the 500-year flood. A critical facility should have at least one access road connected to land outside the 500-year floodplain capable of supporting a 4,000-pound vehicle. The top of the road must be no lower than six inches (6”) below the elevation of the 500-year flood.
9. There must be consideration of the impacts of any improvements on the Levee System, including Tulsa (Constructed 1938, Improved 1945), West Tulsa (Constructed 1938, Improved 1945) and Jenks (Constructed 1949). The Levee Systems design flow rate is 350,000 cfs. This is a Tulsa County requirement.
10. Recommendations from the **Final Report, Phase II Master Plan and Pre-Reconnaissance Study for the Arkansas River Corridor, Tulsa County, OK** - New Regional River Corridor Model recommendations:

- a. Impacts from conceptual full development of the corridor, as shown in the Arkansas River Corridor Master Plan, for the 1986 flood event and the 350,000 cfs flood event.
 - b. Sensitivity analysis
 - c. Identification of a conceptual full development fringe at the 350,000 cfs flood event
 - d. Potential impacts to flood protection capabilities provided by levees
 - e. Dam Breach Analysis
11. Arkansas River Corridor Recommendations from the **Phase II Master Plan**
- a. When construction or other action is proposed within the River Corridor and within the boundaries of the 500-year floodplain, an evaluation of the flood hazards should be
 - b. Improvements that by design may be flooded (parking lots, open air facilities, etc) during a 100-year flood event should require a hydraulic report showing that zero rise to the 100 year floodplain will occur because of the improvements and a requirement that the area for conveyance of floodwaters that existed prior to the improvements is maintained.
 - c. Local jurisdictions are encouraged to establish minimum development criteria, in addition to the current minimum FEMA regulations for construction within the boundaries of the Arkansas River Floodplain that requires building construction at a height of one foot above the 1986 flood event (307,800 cfs) along with the requirement for zero rise to the 100 year floodplain and allowing the same conveyance for floodwater. The best information available including FEMA and local regulatory flood maps and the updated hydraulic model of the Arkansas River performed by USACE in December of 2004, as well as the proposed regional model, when available, should be used in the design of construction projects to help reduce the risk of loss of life and property.
 - d. When federal funds are involved with a project within the Arkansas River Corridor, Executive Order 11988 regarding Flood Plain Management will be followed. Unless higher local standards are established pursuant to these recommendations all floodplain development is required to comply with the minimum standards as established by the Federal Emergency Management Agency.
 - e. Facilities that are critical to the health and welfare of the general population should not be located in the 500-year floodplain. Critical facilities include nursing homes, shelters, police and fire stations and hospitals.
12. Also from the **Phase II Master Plan** - When federal funds are involved with a project within the Arkansas River Corridor, Executive Order 11988 regarding Flood Plain Management will be followed. Unless higher local standards are established pursuant to these recommendations all floodplain development is required to comply with the minimum standards as established by the Federal Emergency Management Agency.
13. From the **VISION 2025 ARKANSAS RIVER CORRIDOR ECOSYSTEM RESTORATION PLAN** - FEMA NFIP Compliance - A key factor in the design or modification of structures such as the weirs, which are located within the 100-year floodplain, is that they would have no impact on the FEMA

100-yr flood and 100-year floodway elevations of the Arkansas River as stipulated by the FEMA NFIP. The city of Tulsa and Tulsa County both participate in the NFIP (FEMA, 2007). [Note: The Cities of Sand Springs and Jenks participate in the NFIP as well.]

14. Recommendations from the **Final Arkansas River Corridor Master Plan Phase I Vision Plan** - Consistent delineation, regulation, and control of the 100-year floodplain. Constituent city governments *[previously]* felt the need for an updated hydraulics and hydrology model (H&H) long before this Vision Plan effort was commissioned. Recent development along the river corridor has also illustrated the need for a comprehensive re-delineation of the regulatory floodplain throughout the study area. As of the date of this document *[August 2004]*, the USACE is starting a detailed H&H study which can result in a regional delineation of the regulatory floodplain for the Arkansas River. It would also aid river-oriented development if a common approach to addressing floodplain issues were adopted by the 5 municipal governments. This will aid the private sector by making the development process more predictable.
15. Recommendations from the **Phase II Report on Hydrology, Hydraulics, and Low Water Dams Arkansas River Corridor Tulsa, OK May 2005**, are to identify the impact of the project on:
 - a. The flooding limits on the Arkansas River for the maximum spillway discharge, 940,000 cfs.
 - b. The flooding limits in the event of a dam breach.
 - c. The previously identified maximum historical outflow from Keystone Lake (344,000) cfs during the October 1986 flood).
 - d. The maximum recorded flow at the United States Geological Survey (USGS) Tulsa gage of 301,800 cfs from this same flooding event.
16. Additional requirements related to design from the **Phase II Report on Hydrology, Hydraulics, and Low Water Dams Arkansas River Corridor Tulsa, OK May 2005** include:
 - a. As with the original Zink Lake Dam, the operational concept is proposed to maintain a fixed pool level between 0 cfs flow and approximately 10,000 cfs flow.
 - b. A hydraulic operator will cause the gates to open or close based on signals from an upstream level controller.
 - c. Above some yet to be determined flow rate, the bascule gates are fully opened on the bottom of the Arkansas River, allowing Arkansas River flows to pass both through the entire gate opening and over the fixed ogee weir.
 - d. The bascule gates will begin to close once the flows decrease to some yet to be determined rate.
 - e. The hydraulic operators on the bascule gates are set to a “fully open” fail safe operation in the event of loss of hydraulic pressure or mechanical failure to assure that each low water dam would not cause an upstream flooding impact in the event of a mechanical failure.
 - f. Each low water dam is required to be hydraulically designed to pass the Base Flood flow, currently understood to be the 100-Year flood event, without causing a rise in the

Section 1 - Excerpts from Previous Studies

In addition to the existing data sets, the following previous studies will be reviewed as part of this task: *Phase 3 Report: Restoration Plan for the Arkansas River Corridor Project Ecosystem Restoration Study in Conjunction with Future Low Water Dam Requirements* (Cherokee CRC, 2008); *Zink Dam Sedimentation Study, Final Report* (W.R. Holway and Associates, 1983); and *Vision for the Arkansas River Corridor at Tulsa* (TVA, 2008).

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 - d. The bascule gates will begin to close once the flows decrease to some yet to be determined rate.
 - e. The hydraulic operators on the bascule gates are set to a “fully open” fail safe operation in the event of loss of hydraulic pressure or mechanical failure to assure that each low water dam would not cause an upstream flooding impact in the event of a mechanical failure.
 - f. Each low water dam is required to be hydraulically designed to pass the Base Flood flow, currently understood to be the 100-Year flood event, without causing a rise in the upstream water surface elevation, in accordance with FEMA, the City of Tulsa, the U.S. Army Corps of Engineers, and Tulsa County floodplain management criteria.

Section 2 - Communities Certified Floodplain Administrators List

Tulsa County

Terry West, CFM
500 S. Denver Ave.
Tulsa OK 74103
(918) 596-5730

Sand Springs

T.J. Davis, CFM
P.O. Box 338
Sand Springs, OK 74063
(918) 246-2582

Tulsa

Harold Tohlen, CFM
175 E 2nd St
Tulsa, OK 74103
(918) 596-1846

Jenks

Robert Carr, CFM
P.O. Box 2007
Jenks, OK 74037
(918) 299-5883

Bixby

Erik Enyart, CFM
P.O. Box 70
Bixby OK 74008-0070
(918) 366-4430

State of Oklahoma

J. Gavin Brady, CFM
NFIP State Coordinator, OWRB
440 S. Houston, Rm #2
Tulsa, OK 74127
(918) 581-2924

Section 3 - Permit Requirements.

Tulsa County

Building Permit (Floodplain Development)



TULSA COUNTY APPLICATION FOR BUILDING PERMIT

APP. # _____

STREET ADDRESS _____

OWNER _____

PROPOSED USE FOR BUILDING _____

CONTRACTOR NAME _____

CONTRACTOR # _____

INSURANCE _____

CONSTRUCTION TO START _____

Two sets of plans are required for all Building Permit Applications. One set will be returned stamped "Approved" when accepted and must be available at the construction site. A plot plan must be included with each set of plans showing the arrangement of the building and all other existing buildings on the property. All required dimensions, etc., must be shown to enable the County Inspector to make a determination relative to the application.

TYPE OF WORK TO BE DONE

☐ NEW BUILDING☐ ACCESSORY☐ INTERIOR REMODELING☐ ENLARGE EXISTING BUILDING☐ REPAIR - NO EXPANSION☐ OTHER (Describe)

DECLARED VALUATION FOR WORK TO BE DONE (Valuation to Include All Fixed Equipment to Operate and be Used in Proposed Building).

\$ _____

ARCHITECT OR DESIGNER _____

NAME OF PARTY TO BE NOTIFIED WHEN APPLICATION HAS BEEN APPROVED OR REJECTED.

PHONE _____

ADDRESS _____

The following signature constitutes certification that all data is true and correct and that the applicant intends to comply fully with all representations made hereon.

DATE _____

SIGNATURE OF
APPLICANT _____

BOA FILE NO. _____

DO NOT WRITE BELOW THIS LINE — FOR OFFICE USE ONLY

☐ ZONING APPROVED CZM # _____ ☐ ZONED _____ ☐ ZONING DENIED _____

☐ PLANS APPROVED☐ PLANS NOT APPROVED _____

This property is located on FIRM Panel No. 40143CO _____ K Dated: 8-03-09
Community No.: 400462-

☐ Is **NOT** located in a Special Flood Hazard Area.☐ **IS** located in a Special Flood Hazard Area.

FIRM zone designation is _____.

100-Year flood elevation at the site is _____ Ft. NGVD.

☐ The property is located in a **FLOODWAY**.

APPLICATION FEE	\$ <u>25.00</u>
ZONING	\$ <u>10.00</u>
FLOOD REVIEW	\$ <u>10.00</u>
SB 1182	\$ <u>4.00</u>
BUILDING	\$ _____
TOTAL	\$ _____

**D.E.Q.
FILE NO.**

REMARKS _____

ATTACH PLANS REVIEW FORM AND DRAFT BUILDING PERMIT.

DATE _____ PLANS EXAMINER _____

City of Sand Springs

Floodplain Development

CITY OF SAND SPRINGS
FLOODPLAIN DEVELOPMENT PERMIT
APPLICATION

Date of Application_____

Name of Applicant_____

Address_____

Phone_____

Doing business as_____

Address_____

Phone_____

Property covered by Application

Township_____ Range_____ Section_____

Lot_____ Block_____ Subdivision_____

Street Address_____

Owner_____

Address_____

Phone_____

Description of Proposed use_____

Vicinity Sketch Attached _____

Nearest creek or river_____

% of property in Floodplain_____

Does project alter a natural or man-made watercourse_____

Signature of Applicant

=====

Office Use Only

NFIP Community #400211 Panel #_____, Suffix K

Date of Firm: 06-15-81; Revised 07-19-93; Revised 09-22-99; Revised 08-03-09

Parcel I.D.#_____

Comments_____

City of Tulsa

Watershed Development Permit



CITY OF TULSA

Watershed Development Permit Application

Note: Please print or type all data

Date: _____

A/P #: _____

• CONSTRUCTION ADDRESS _____ SUITE No. _____

• CONTRACTOR ACCOUNT No. _____ No. OF PLANS _____ No. OF PAGES OF ONE SET OF PLANS & SPECIFICATIONS _____

• CONTRACTOR: _____ ADDRESS: _____

CITY _____ STATE _____ ZIP _____ PHONE No: (____) _____

• ARCHITECT/DESIGNER _____ ADDRESS _____

CITY _____ STATE _____ ZIP _____ PHONE No: (____) _____

• TYPE OF WORK: (FIRST LINE REQUIRES 2 COPIES OF PLANS. SECOND LINE REQUIRES 5 COPIES OF PLANS.)

☐ STORMWATER CONNECTION ☐ EARTH CHANGE ☐ STORMWATER DRAINAGE ☐ FLOODPLAIN ☐ FLOODWAY (2 COPIES OF PLANS)

☐ MINOR SEWER REVISION ☐ MINOR WATER REVISION ☐ RIGHT OF WAY MINOR CONSTRUCTION** ☐ FIRE HYDRANT (5 COPIES OF PLANS)

☐ ARTERIAL ☐ NON ARTERIAL ☐ NEW ☐ RELOCATE

☐ OTHER: _____

• DESCRIBE PROPOSED USE IN DETAIL: _____

• IS THE PROPERTY SERVED WITH A SEPTIC SYSTEM? ☐ YES ☐ NO

• OWNER: _____ ADDRESS: _____

CITY _____ STATE _____ ZIP _____ PHONE No: (____) _____

• ARE YOU PLANNING NEW CONSTRUCTION OR ENLARGEMENT OF EXISTING CONSTRUCTION (INCLUDING PARKING)? ☐ YES ☐ NO

LEGAL DESCRIPTION OF CONSTRUCTION
PROPERTY:

LOT

BLOCK

ADDITION

DAY TIME CONTACT PERSON(S) FOR PLAN CONSULTATION:

PHONE NO.

FAX NUMBER

ADDRESS

EXHIBIT THE FOLLOWING DETAILS (WHEN APPLICABLE) ON THE PLANS: SCALE, DIMENSIONS, EXISTING & PROPOSED TOPOGRAPHY & NORTH ARROW

* A SEPARATE PERMIT IS REQUIRED FOR NEW CONSTRUCTION OR A USE CHANGE*

**RIGHT OF WAY MINOR CONSTRUCTION WILL REQUIRE A RIGHT OF WAY PERMIT FROM THE RIGHT OF WAY DEPARTMENT PRIOR TO START OF CONSTRUCTION

City of Tulsa

Permit Certification

I CERTIFY THAT I AM ONE OF THE FOLLOWING:

- ☐ OWNER OR LESSEE OF THE PROPERTY ON WHICH PERMIT WORK IS TO BE PERFORMED.
- ☐ AGENT OF THE PROPERTY OWNER OR LESSEE FOR WHICH PERMIT WORK IS TO BE PERFORMED.
- ☐ LICENSED ENGINEER OR ARCHITECT EMPLOYED IN CONNECTION WITH THE WORK.

IF THE APPLICATION IS MADE BY A PERSON OTHER THAN THE OWNER, ONE OF THE FOLLOWING MUST BE PROVIDED:

- ☐ I HAVE ATTACHED AN AFFIDAVIT OF THE PROPERTY OWNER FOR WHICH PERMIT WORK IS TO BE PERFORMED.
- ☐ I HAVE ELECTED TO PROVIDE THIS WITNESSED, SIGNED STATEMENT.

NAME OF APPLICANT: (PRINT)	SIGNATURE:	CITY BUILDING OFFICIAL:

AFFIDAVIT AS TO EASEMENTS, DEDICATIONS AND RIGHTS OF WAY

I, _____ BEING DULY SWORN UPON OATH, STATE THAT I HAVE RESEARCHED AND EXAMINED OR CAUSED TO BE RESEARCHED AND EXAMINED ALL RECORDED DOCUMENTS AND INSTRUMENTS RELATING TO SAID REAL PROPERTY, AND THAT ALL RECORDED EASEMENTS, DEDICATIONS AND RIGHTS OF WAY ARE KNOWN TO ME AND ARE DELINEATED ON THE PLOT PLAN WHICH IS A PART OF THE APPLICATION FOR BUILDING PERMIT FOR NEW CONSTRUCTION AND/OR ENLARGEMENTS OF AN EXISTING BUILDING.

IT IS UNDERSTOOD THAT ISSUANCE OF SUCH BUILDING PERMIT DOES NOT AUTHORIZE OR PERMIT CONSTRUCTION OF A PERMANENT STRUCTURE OVER OR UPON ANY EASEMENT, DEDICATION OR RIGHT OF WAY.

SIGNATURE

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ DAY OF _____, 20_____.

NOTARY PUBLIC

MY COMMISSION EXPIRES: _____



CITY OF TULSA
WATERSHED DEVELOPMENT PERMIT
APPLICATION FOR EARTH CHANGE ONLY

Date: _____
A/P#: _____
Master Project #: _____

Note: Please print or type all data.

GENERAL INFORMATION

CONSTRUCTION ADDRESS _____

COMMON NAME OF PROJECT: _____

LEGAL DESCRIPTION OF PROPERTY: LOT _____ BLOCK _____ SUBDIVISION _____

PROJECT SIZE (ACRES) _____

DOES EXCAVATION CUT OR FILL EXCEED FOUR FEET (4')? [] YES [] NO (IF YES, A SEPARATE ZONING CLEARANCE ONLY PERMIT IS REQUIRED)

IS ANY WORK IN A FLOODPLAIN? [] YES [] NO (IF YES, EARTH CHANGE ONLY PERMIT NOT ALLOWED.)

TYPE OF WORK: EARTH CHANGE ONLY (INCLUDES ALL EROSION CONTROL)

NO. OF PLAN SETS (3 REQUIRED) _____ NO. OF SHEETS IN ONE SET OF PLANS _____

NO. OF COPIES OF SP3 (MINIMUM OF 5 REQUIRED IF SITE IS 1 ACRE OR LARGER) _____

CONTRACTOR INFORMATION

CONTRACTOR: _____ ADDRESS: _____

CITY _____ STATE _____ ZIP _____ PHONE NO: () _____

CONTRACTOR ACCOUNT NO. _____

PRIMARY POINT OF CONTACT _____

(INDIVIDUAL TO BE CALLED TO PICK UP PERMIT)

ENGINEER/DESIGNER

ENGINEER/DESIGNER _____ ADDRESS _____

CITY _____ STATE _____ ZIP _____ PHONE NO. () _____ FAX: () _____

SECONDARY POINT OF CONTACT (INDIVIDUAL FOR DESIGN QUESTIONS) _____

APPLICANT

NAME (PRINTED) _____ COMPANY _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

PHONE NO. () _____ FAX: () _____

SIGNATURE: _____ DATE: _____

City of Jenks

Floodplain Development



City of Jenks
Application for Floodplain Development Permit

Date of Application: _____ Permit No.: _____

Name of Owner/Applicant: _____

Address of Owner: _____

Location of Permit Area (Address or Legal Description): _____

Legal Description: Section: _____ Township: _____ Range: _____

Purpose for Request:

- | | | | | |
|---|---|----------------------------------|--|----------------------------------|
| ☐ Building Permit | ☐ Other Structures | ☐ Filling | ☐ Excavation | ☐ Grading |
| ☐ Utility Construction | ☐ Dredging or Mining | ☐ Paving | ☐ Drilling Operations | ☐ Other |

Brief Description of Proposed Work (attach separate sheet if needed): _____

Watershed: _____

Nearest Creek or Tributary: _____

Complete Applicable Questions

1. Total drainage area of watercourse: _____ acres.
2. Regulatory flood elevation: _____
3. Has site previously flooded? ☐ Yes ☐ No
4. Is site subject to frequent flooding? ☐ Yes ☐ No
5. Is safe access available during times of flood? ☐ Yes ☐ No
6. Is any part of proposal within existing floodway district? ☐ Yes ☐ No
7. Have all necessary prior approval permits been obtained from Federal, State or Local Government Agencies? ☐ Yes ☐ No

During the Occurrence of a Regulatory Flood Will the Proposal:

- | | <u>Yes</u> | <u>No</u> | <u>N/A</u> |
|--|--------------------------|--------------------------|--------------------------|
| 1. Reduce capacity of channels/floodways/watercourse in floodplain area. | ☐ | ☐ | ☐ |
| 2. Measurable increase flood flows/heights/damage on off-site properties. | ☐ | ☐ | ☐ |
| 3. Individually or combined with other existing or anticipated development expose additional upstream/downstream/adjacent properties to adverse flood effect. | ☐ | ☐ | ☐ |
| 4. Increase velocities/volumes of flood waters sufficiently to create significant erosion of floodplain soils on subject property or other property upstream/downstream. | ☐ | ☐ | ☐ |
| 5. Encroach on Floodway causing increase in flood levels. | ☐ | ☐ | ☐ |
| 6. Provide compensatory storage for any measurable loss of flood storage capacity. | ☐ | ☐ | ☐ |

Firm Map Panel Number: _____

Base Flood Elevation: _____

Required Floor Elevation: _____

Proposed Floor Elevation: _____

Existing Ground Elevation: _____

As Built Certification Elevation: _____

Floodplain Defined By: ☐ FIRM ☐ Flood Studies ☐ High water Marks
☐ Community Identification ☐ Other

Attach the following (if applicable)

1. Scale drawings (11"x17" size) showing location, dimensions, elevation of existing and proposed structures, proposed landscape alterations and location of the relative floodplain area.
2. Lowest floor elevation (including basement) of all proposed structures.
3. Elevation to which any non-residential structure shall be flood proofed.
4. Certification by registered professional engineer, architect, or land surveyor that flood elevation criteria are met as set forth in Section 820, paragraph d of the Zoning Code.
5. Extent to which watercourse or natural drainage will be altered or relocated.
6. Elevation Certificate with all applicable information completed as required.

FOR CITY OF JENKS USE ONLY

☐ **APPROVED** ☐ **DISAPPROVED**

Condition(s) for Approval:

Reason(s) for Denial:

Issued by: _____ Title: _____

Date: _____

City of Bixby

.

Earth.Change.Permit

Building.Permit



City of Bixby

Earth Change Permit Application

Applicant: _____

Address: _____

Telephone: _____

Fax: _____

Email: _____

Please note, all information and items listed below must be completed and submitted prior to application review.

Complete		Submittal Items	Staff Comment
Y	N		
☐	☐	Legal description of property with name and address of legal owner	
☐	☐	Area sketch and boundary line survey	
☐	☐	Type-written description of proposal	
☐	☐	Type of Earth Change ___ Excavating ___ Grading ___ Landfilling ___ Re-grading ___ Berming ___ Dike	
☐	☐	Does lot or tract of record contain any natural or man-made water course?	
☐	☐	Is lot or tract in flood plain area?	
☐	☐	Name of Watershed: _____	
☐	☐	Drainage Area (acres): _____	
☐	☐	Grading Plan showing areas, types, and extents of change	
☐	☐	Erosion and sediment control plans	
☐	☐	Construction Schedule	

Applicant Signature and Date:

_____ / _____

BUILDING PERMIT

CITY OF BIXBY

STREET ADDRESS

☐ ZONING CLEARANCE PERMIT ☐ BUILDING PERMIT☐ DEMOLITION PERMIT ☐ SIGN PERMIT

DATE

No.

OWNER	LEGAL DESCRIPTION	LOT	BLOCK	ADDITION	NO								
CONTRACTOR					Valuation								
ADDRESS		SECTION	TWP.	RANGE	<table border="1"> <tr> <td>Rev. Fee</td> <td></td> </tr> <tr> <td>Zoning</td> <td></td> </tr> <tr> <td>Building</td> <td></td> </tr> <tr> <td>Total</td> <td>\$ -</td> </tr> </table>	Rev. Fee		Zoning		Building		Total	\$ -
Rev. Fee													
Zoning													
Building													
Total	\$ -												

PROPOSED USE

☐ PRINCIPAL BUILDING OR USE
☐ ACCESSORY BUILDING OR USE

ZONING DISTRICT	DISTRICT	SUP. DIST.	BOARD OF ADJUSTMENT - NO	USE UNIT NUMBER	USE BY	☐ INTERPRETATION	☐ SP
					RIGHT	VARIANCE	EXCEPTION

LOT INFORMATION	FRONTAGE	AVERAGE DEPTH	LOT AREA	LAND AREA PER D. U.	PARKING SPACES	LOADING BERTHS
-----------------	----------	---------------	----------	---------------------	----------------	----------------

USE CONDITIONS

FINANCING: FHA ☐ VA ☐ OTHER ☐

ESTIMATED COST OF BUILDING

BUILDING INFORMATION	STRUCTURE	FRONT (FROM CENTER LINE STREET)	SIDE	SIDE REAR	FROM CENTERLINE MAJOR STREET	LIVABILITY SPACE
	SET BACK					
	WIDTH	LENGTH	HEIGHT	FLOOR AREA	NO. FLOORS	BUILDING AREA
	NO DWELLING UNITS	FLOOR	EXT. WALLS	INT. WALLS	ROOF	CEILING
	TYPE CONSTRUCTION		EASEMENTS	OTHER RESTRICTIONS		

TYPE OF WORK

 TO BE DONE ☐ NEW BUILDING ☐ ENLARGE EXISTING BLDG ☐ REPAIR - NO EXPANSION ☐ INTERIOR REMODELING ☐ OCCUPANCY ☐ ACCESSORY

ZONING OFFICER	APPLICANT'S SIGNATURE	INSPECTOR
----------------	-----------------------	-----------

INSPECTION RECORD	DATE	INSPECTOR	COMMENT	SPECIAL FEATURES REQUIRED
FOUNDATIONS				DEVELOPMENT FEE SEWER TAP WATER TAP
FRAMING				WATER METER DEP ELECTRICAL PERMIT PLUMBING PERMIT
FINAL				MECHANICAL PERMIT INSPECTIONS
CERT. OF OCCUPANCY				ZONING/BLDG FEE \$ - TOTAL \$ -

TCL

BUILDING PERMIT # _____ **DATE:** _____

LOT: _____ **BLOCK:** _____ **ADDITION:** _____

BUILDING CONT: _____ **PHONE:** _____

E MAIL: _____

**ELECTRICAL
CONT:** _____ **PHONE:** _____

E MAIL: _____

**PLUMBING
CONT:** _____ **PHONE:** _____

E MAIL: _____

**MECHANICAL
CONT:** _____ **PHONE:** _____

E MAIL: _____

BUILDING		ELECTRICAL		PLUMBING		MECHANICAL	
FOOTING		TEMP POLE		ROUGH		ROUGH	
SLAB		ROUGH		TOP-OUT		DUCTS O	
FRAME		TEMP BLDG		SEWER		DUCTS U	
FINAL		FINAL		EX GAS		FINAL	
				FINAL			

COMMENTS: _____

State of Oklahoma

Floodplain Development

NOTICE OF INTENT
For Proposed Development on State Owned
or Operated Property

Mail or fax this notice to: **Planning and Management Division**
 Oklahoma Water Resources Board
 3800 North Classen Blvd.
 Oklahoma City, OK 73118
 (405) 530-8800 (405) 530-8900 (FAX)

1. Applicant: _____
Address: _____

Contact Person: _____
Telephone #: _____

2. General Description of Development: _____

(i.e. building, bridges, roads, substantial additions/rehabilitations, utilities, mining, dredging, drilling, filling, excavating, raising/lowering of grade, paving, materials storage, etc.)

3. Location of Proposed Development (attach map(s))

(a) Legal Description:

____ ¼ of ____ ¼ of ____ ¼ of Section ____ Twp. ____ Rge. ____ County _____
____ ¼ of ____ ¼ of ____ ¼ of Section ____ Twp. ____ Rge. ____ County _____
____ ¼ of ____ ¼ of ____ ¼ of Section ____ Twp. ____ Rge. ____ County _____

(b) If proposed development is located within the corporate limits of an incorporated town or city, please provide names or numbers (if numbered) of roads, streets, or thoroughfares that bound the area of the proposed development:

On the North _____
On the South _____
On the East _____
On the West _____

I verify that the above information is true and accurate to the best of my knowledge.

Signed by: _____
(Applicant)

Type name and title

Attested by: _____

Type name and title

OWRB USE ONLY

Date Reviewed: _____

Community Panel Number: _____

Date of Map: _____

Flood Zone: _____

Permit Application Needed: _____
Yes/No

Response to Applicant Mailed: _____

PERMIT APPLICATION
For Proposed Development on State Owned
Or Operated Property Within Floodplains

Mail this application to:

Planning and Management Division
Oklahoma Water Resources Board
3800 North Classen Blvd.
Oklahoma City, OK 73118
(405) 530-8800
(405) 530-8900 (FAX)

PERMIT APPLICATION NO. _____ (OWRB USE)

1. Applicant: _____
 Address: _____

Contact Person: _____
Telephone Number: _____

2. General Description of Development: _____

(i.e. building, bridges, roads, substantial additions/rehabilitations, utilities, mining, dredging, drilling, filling, excavating, raising/lowering of grade, paving, materials storage, etc.)

3. Location of Proposed Development (attach map(s)):

(a) Legal Description
_____¹/₄ of _____¹/₄ of _____¹/₄ of Section _____ Twp. _____ Rge. _____ County _____
_____¹/₄ of _____¹/₄ of _____¹/₄ of Section _____ Twp. _____ Rge. _____ County _____
_____¹/₄ of _____¹/₄ of _____¹/₄ of Section _____ Twp. _____ Rge. _____ County _____

- (b) If proposed development is located within the corporate limits of an incorporated town or city, please provide names or numbers (if numbered) of roads, streets, or thoroughfares that bound the area of the proposed development:

On the North _____
On the South _____
On the East _____
On the West _____

- (c) Name of tributary, creek, lake, waterbody (attach floodplain map): _____

4. Attach preliminary engineering/project report(s) for this proposed development.
5. Attach hydrologic/hydraulic study(s) that address potential impacts to the floodplain from the proposed development.

6. Provide proposed lowest finished floor elevation(s) of the proposed development (if applicable):

Provide lowest adjacent grade elevation:

Provide base flood elevation:

7. Provide copies of any coordination notices with local community officials on the proposed development.

8. Were alternative development locations outside the floodplain area considered? **YES/NO**. If yes, please detail locations and reasons why they were not pursued:

I verify that the above information is true and accurate to the best of my knowledge and that the proposed development (if permitted) will be constructed in accordance with the Oklahoma Water Resources Board's rules and regulations.

Signed by:

(Applicant)

Type name and title

Attested by:

Type name and title

Certified by:

(Registered Professional Engineer required to certify application for development permit for bridges and roads. See OAC 785:55-1-4(e))

Type name and title

(SEAL)

"ATTACHMENT A"
Application No. _____
(For OWRB Use Only)

ODOT
APPLICATION FOR PERMIT
For Proposed Development on State Owned
Property Within Regulatory Floodplain

Submit application to: Planning and Management Division
Oklahoma Water Resources Board
3800 N. Classen Blvd.
Oklahoma City, OK 73118
(405)530-8800; FAX (405) 530-8900

Application may be sent by facsimile transmission, but must be followed by U.S. Postal Service mail or interagency mail submission of hardcopy.

1. **Applicant:** Oklahoma Department of Transportation, 200 N.E. 21st Street, Oklahoma City, OK 73105

Contact Person: Leslie Lewis, P.E., CFM

Telephone Number: (405) 521-6500

2. **ODOT Project No.:** _____ **J/P No.:** _____

Proposed Let Date: _____

3. **Location of Proposed Development**

County : _____ **Community Name:** _____

Map Number: _____ **Zone:** _____

Highway: _____

Creek/ River Name: _____

Legal Description: _____

Physical Location: _____

4. **Category of Proposed Construction or Development:**

___ construction of roadway and bridges

___ placement of structures

___ filling, grading, channelizing, drilling, mining and excavating

___ other development or substantial improvement

___ all of the above

5. **Description of Proposed Construction or Development:**

Computed BFE elev. (Upstream of Structure) _____

6. **PROFESSIONAL ENGINEER CERTIFICATION:** I hereby verify that the above stated information is true and correct to the best of my knowledge. I further verify that the proposed construction or development subject of this application will meet the applicable requirements of the Rules of the Oklahoma Water Resources Board and regulations of the Federal Emergency Management Agency concerning floodplain management. Copies of the hydrologic and hydraulic studies that address potential impacts to the regulatory floodplain from the proposed construction or development are available at the Oklahoma Department of Transportation.

(P.E. Seal)

Signature of Professional Engineer

Name of Professional Engineer (Print of Type)

Title of Professional Engineer

Oklahoma P.E. Certification No.

Date

FOR OWRB USE

Date application received:_____

Application reviewed by:_____

Regulatory floodplain construction or development verified: ____ Yes ____ No

Individual permit

Recommendation for permit issuance:_____

Permit issuance approved:_____

Date

Permit No. _____

OWRB FPM 12/23/2011

Section 4 - FEMA Floodplain and Floodway Requirements

Title 44: Emergency Management and Assistance

PART 65—IDENTIFICATION AND MAPPING OF SPECIAL HAZARD AREAS

Excerpts (Total Document follows in the Appendix)

Regarding changes in the BFE and footprint of the floodplain:

§ 65.3 Requirement to submit new technical data.

A community's base flood elevations may increase or decrease resulting from physical changes affecting flooding conditions. As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify the Administrator of the changes by submitting technical or scientific data in accordance with this part. Such a submission is necessary so that upon confirmation of those physical changes affecting flooding conditions, risk premium rates and flood plain management requirements will be based upon current data.

§ 65.4 Right to submit new technical data.

(a) A community has a right to request changes to any of the information shown on an effective map that does not impact flood plain or floodway delineations or base flood elevations, such as community boundary changes, labeling, or planimetric details. Such a submission shall include appropriate supporting documentation in accordance with this part and may be submitted at any time.

(b) All requests for changes to effective maps, other than those initiated by FEMA, must be made in writing by the Chief Executive Officer of the community (CEO) or an official designated by the CEO. Should the CEO refuse to submit such a request on behalf of another party, FEMA will agree to review it only if written evidence is provided indicating the CEO or designee has been requested to do so.

(c) Requests for changes to effective Flood Insurance Rate Maps (FIRMs) and Flood Boundary and Floodway Maps (FBFMs) are subject to the cost recovery procedures described in 44 CFR part 72. As indicated in part 72, revisions requested to correct mapping errors or errors in the Flood Insurance Study analysis are not to be subject to the cost-recovery procedures.

§ 65.5 Revision to special hazard area boundaries with no change to base flood elevation determinations.

(a) *Data requirements for topographic changes.* In many areas of special flood hazard (excluding V zones and floodways) it may be feasible to elevate areas with engineered earthen fill above the base flood elevation. Scientific and technical information to support a request to gain exclusion from an area of special flood hazard of a structure or parcel of land that has been elevated by the placement of engineered earthen fill will include the following:

(1) A copy of the recorded deed indicating the legal description of the property and the official recordation information (deed book volume and page number) and bearing the seal of the appropriate recordation official (*e.g.*, County Clerk or Recorder of Deeds).

(2) If the property is recorded on a plat map, a copy of the recorded plat indicating both the location of the property and the official recordation information (plat book volume and page number) and bearing the seal of the appropriate recordation official. If the property is not recorded on a plat map, FEMA requires copies of the tax map or other suitable maps to help in locating the property accurately.

(3) A topographic map or other information indicating existing ground elevations and the date of fill. FEMA's determination to exclude a legally defined parcel of land or a structure from the area of special flood hazard will be based upon a comparison of the base flood elevations to the lowest ground elevation of the parcel or the lowest adjacent grade to the structure. If the lowest ground elevation of the entire legally defined parcel of land or the lowest adjacent grade to the structure are at or above the elevations of the base flood, FEMA will exclude the parcel and/or structure from the area of special flood hazard.

(4) Written assurance by the participating community that they have complied with the appropriate minimum floodplain management requirements under §60.3. This includes the requirements that:

(i) Existing residential structures built in the SFHA have their lowest floor elevated to or above the base flood;

(ii) The participating community has determined that the land and any existing or proposed structures to be removed from the SFHA are "reasonably safe from flooding", and that they have on file, available upon request by FEMA, all supporting analyses and documentation used to make that determination;

(iii) The participating community has issued permits for all existing and proposed construction or other development; and

(iv) All necessary permits have been received from those governmental agencies where approval is required by Federal, State, or local law.

(5) If the community cannot assure that it has complied with the appropriate minimum floodplain management requirements under §60.3, of this chapter, the map revision request will be deferred until the community remedies all violations to the maximum extent possible through coordination with FEMA. Once the remedies are in place, and the community assures that the land and structures are “reasonably safe from flooding,” we will process a revision to the SFHA using the criteria set forth in §65.5(a). The community must maintain on file, and make available upon request by FEMA, all supporting analyses and documentation used in determining that the land or structures are “reasonably safe from flooding.”

(6) Data to substantiate the base flood elevation. If we complete a Flood Insurance Study (FIS), we will use those data to substantiate the base flood elevation. Otherwise, the community may submit data provided by an authoritative source, such as the U.S. Army Corps of Engineers, U.S. Geological Survey, Natural Resources Conservation Service, State and local water resource departments, or technical data prepared and certified by a registered professional engineer. If base flood elevations have not previously been established, we may also request hydrologic and hydraulic calculations.

(7) A revision of floodplain delineations based on fill must demonstrate that any such fill does not result in a floodway encroachment.

(b) *New topographic data.* A community may also follow the procedures described in paragraphs (a)(1) through (6) of this section to request a map revision when no physical changes have occurred in the area of special flood hazard, when no fill has been placed, and when the natural ground elevations are at or above the elevations of the base flood, where new topographic maps are more detailed or more accurate than the current map.

(c) *Certification requirements.* A registered professional engineer or licensed land surveyor must certify the items required in paragraphs (a)(3) and (6) and (b) of this section. Such certifications are subject to the provisions under §65.2.

(d) *Submission procedures.* Submit all requests to the appropriate address serving the community's geographic area or to the FEMA Headquarters Office in Washington, DC.

§ 65.6 Revision of base flood elevation determinations.

(a) *General conditions and data requirements.* (1) The supporting data must include all the information FEMA needs to review and evaluate the request. This may involve the requestor's performing new hydrologic and hydraulic analysis and delineation of new flood plain boundaries and floodways, as necessary.

(2) To avoid discontinuities between the revised and unrevised flood data, the necessary hydrologic and hydraulic analyses submitted by the map revision requestor must be extensive enough to ensure that a logical transition can be shown between the revised flood elevations, flood plain boundaries, and floodways and those developed previously for areas not affected by the revision. Unless it is demonstrated that it would not be appropriate, the revised and unrevised base flood elevations must match within one-half foot where such transitions occur.

(3) Revisions cannot be made based on the effects of proposed projects or future conditions. Section 65.8 of this subchapter contains provisions for obtaining conditional approval of proposed projects that may affect map changes when they are completed.

(4) The datum and date of releveled of benchmarks, if any, to which the elevations are referenced must be indicated.

(5) Maps will not be revised when discharges change as a result of the use of an alternative methodology or data for computing flood discharges unless the change is statistically significant as measured by a confidence limits analysis of the new discharge estimates.

(6) Any computer program used to perform hydrologic or hydraulic analyses in support of a flood insurance map revision must meet all of the following criteria:

(i) It must have been reviewed and accepted by a governmental agency responsible for the implementation of programs for flood control and/or the regulation of flood plain lands. For computer programs adopted by non-Federal agencies, certification by a responsible agency official must be provided which states that the program has been reviewed, tested, and accepted by that agency for purposes of design of flood control structures or flood plain land use regulation.

(ii) It must be well-documented including source codes and user's manuals.

(iii) It must be available to FEMA and all present and future parties impacted by flood insurance mapping developed or amended through the use of the program. For programs not generally available from a Federal agency, the source code and user's manuals must be sent to FEMA free

of charge, with fully-documented permission from the owner that FEMA may release the code and user's manuals to such impacted parties.

(7) A revised hydrologic analysis for flooding sources with established base flood elevations must include evaluation of the same recurrence interval(s) studied in the effective FIS, such as the 10-, 50-, 100-, and 500-year flood discharges.

(8) A revised hydraulic analysis for a flooding source with established base flood elevations must include evaluation of the same recurrence interval(s) studied in the effective FIS, such as the 10-, 50-, 100-, and 500-year flood elevations, and of the floodway. Unless the basis of the request is the use of an alternative hydraulic methodology or the requestor can demonstrate that the data of the original hydraulic computer model is unavailable or its use is inappropriate, the analysis shall be made using the same hydraulic computer model used to develop the base flood elevations shown on the effective Flood Insurance Rate Map and updated to show present conditions in the flood plain. Copies of the input and output data from the original and revised hydraulic analyses shall be submitted.

(9) A hydrologic or hydraulic analysis for a flooding source without established base flood elevations may be performed for only the 100-year flood.

(10) A revision of flood plain delineations based on topographic changes must demonstrate that any topographic changes have not resulted in a floodway encroachment.

(11) Delineations of flood plain boundaries for a flooding source with established base flood elevations must provide both the 100- and 500-year flood plain boundaries. For flooding sources without established base flood elevations, only 100-year flood plain boundaries need be submitted. These boundaries should be shown on a topographic map of suitable scale and contour interval.

(12) If a community or other party seeks recognition from FEMA, on its FHBM or FIRM, that an altered or relocated portion of a watercourse provides protection from, or mitigates potential hazards of, the base flood, the Federal Insurance Administrator may request specific documentation from the community certifying that, and describing how, the provisions of §60.3(b)(7) of this subchapter will be met for the particular watercourse involved. This documentation, which may be in the form of a written statement from the Community Chief Executive Officer, an ordinance, or other legislative action, shall describe the nature of the maintenance activities to be performed, the frequency with which they will be performed, and the title of the local community official who will be responsible for assuring that the maintenance activities are accomplished.

(13) Notwithstanding any other provisions of §65.6, a community may submit, in lieu of the documentation specified in §65.6(a)(12), certification by a registered professional engineer that the project has been designed to retain its flood carrying capacity without periodic maintenance.

(14) The participating community must provide written assurance that they have complied with the appropriate minimum floodplain management requirements under §60.3 of this chapter. This includes the requirements that:

(i) Existing residential structures built in the SFHA have their lowest floor elevated to or above the base flood;

(ii) The participating community has determined that the land and any existing or proposed structures to be removed from the SFHA are “reasonably safe from flooding,” and that they have on file, available upon request by FEMA, all supporting analyses and documentation used to make that determination;

(iii) The participating community has issued permits for all existing and proposed construction or other development; and

(iv) All necessary permits have been received from those governmental agencies where approval is required by Federal, State, or local law.

(15) If the community cannot assure that it has complied with the appropriate minimum floodplain management requirements under §60.3, of this chapter the map revision request will be deferred until the community remedies all violations to the maximum extent possible through coordination with FEMA. Once the remedies are in place, and the community assures that the land and structures are “reasonably safe from flooding,” we will process a revision to the SFHA using the criteria set forth under §65.6. The community must maintain on file, and make available upon request by FEMA, all supporting analyses and documentation used in determining that the land or structures are “reasonably safe from flooding.”

(b) *Data requirements for correcting map errors.* To correct errors in the original flood analysis, technical data submissions shall include the following:

(1) Data identifying mathematical errors.

(2) Data identifying measurement errors and providing correct measurements.

(c) *Data requirements for changed physical conditions.* Revisions based on the effects of physical changes that have occurred in the flood plain shall include:

(1) *Changes affecting hydrologic conditions.* The following data must be submitted:

(i) General description of the changes (e.g., dam, diversion channel, or detention basin).

(ii) Construction plans for as-built conditions, if applicable.

(iii) New hydrologic analysis accounting for the effects of the changes.

(iv) New hydraulic analysis and profiles using the new flood discharge values resulting from the hydrologic analysis.

(v) Revised delineations of the flood plain boundaries and floodway.

(2) *Changes affecting hydraulic conditions.* The following data shall be submitted:

(i) General description of the changes (e.g., channelization or new bridge, culvert, or levee).

(ii) Construction plans for as-built conditions.

(iii) New hydraulic analysis and flood elevation profiles accounting for the effects of the changes and using the original flood discharge values upon which the original map is based.

(iv) Revised delineations of the flood plain boundaries and floodway.

(3) *Changes involving topographic conditions.* The following data shall be submitted:

(i) General description of the changes (e.g., grading or filling).

(ii) New topographic information, such as spot elevations, cross sections grading plans, or contour maps.

(iii) Revised delineations of the flood plain boundaries and, if necessary, floodway.

(d) *Data requirements for incorporating improved data.* Requests for revisions based on the use of improved hydrologic, hydraulic, or topographic data shall include the following data:

- (1) Data that are believed to be better than those used in the original analysis (such as additional years of stream gage data).
 - (2) Documentation of the source of the data.
 - (3) Explanation as to why the use of the new data will improve the results of the original analysis.
 - (4) Revised hydrologic analysis where hydrologic data are being incorporated.
 - (5) Revised hydraulic analysis and flood elevation profiles where new hydrologic or hydraulic data are being incorporated.
 - (6) Revised delineations of the flood plain boundaries and floodway where new hydrologic, hydraulic, or topographic data are being incorporated.
- (e) *Data requirements for incorporating improved methods.* Requests for revisions based on the use of improved hydrologic or hydraulic methodology shall include the following data:
- (1) New hydrologic analysis when an alternative hydrologic methodology is being proposed.
 - (2) New hydraulic analysis and flood elevation profiles when an alternative hydrologic or hydraulic methodology is being proposed.
 - (3) Explanation as to why the alternative methodologies are superior to the original methodologies.
 - (4) Revised delineations of the flood plain boundaries and floodway based on the new analysis(es).
- (f) *Certification requirements.* All analysis and data submitted by the requester shall be certified by a registered professional engineer or licensed land surveyor, as appropriate, subject to the definition of “certification” given at §65.2 of this subchapter.
- (g) *Submission procedures.* All requests shall be submitted to the FEMA Regional Office servicing the community's geographic area or to the FEMA Headquarters Office in Washington, DC, and shall be accompanied by the appropriate payment, in accordance with 44 CFR part 72.

§ 65.7 Floodway revisions.

(a) *General.* Floodway data is developed as part of FEMA Flood Insurance Studies and is utilized by communities to select and adopt floodways as part of the flood plain management program required by §60.3 of this subchapter. When it has been determined by a community that no practicable alternatives exist to revising the boundaries of its previously adopted floodway, the procedures below shall be followed.

(b) *Data requirements when base flood elevation changes are requested.* When a floodway revision is requested in association with a change to base flood elevations, the data requirements of §65.6 shall also be applicable. In addition, the following documentation shall be submitted:

(1) Copy of a public notice distributed by the community stating the community's intent to revise the floodway or a statement by the community that it has notified all affected property owners and affected adjacent jurisdictions.

(2) Copy of a letter notifying the appropriate State agency of the floodway revision when the State has jurisdiction over the floodway or its adoption by communities participating in the NFIP.

(3) Documentation of the approval of the revised floodway by the appropriate State agency (for communities where the State has jurisdiction over the floodway or its adoption by communities participating in the NFIP).

(4) Engineering analysis for the revised floodway, as described below:

(i) The floodway analysis must be performed using the hydraulic computer model used to determine the proposed base flood elevations.

(ii) The floodway limits must be set so that neither the effective base flood elevations nor the proposed base flood elevations if less than the effective base flood elevations, are increased by more than the amount specified under §60.3 (d)(2). Copies of the input and output data from the original and modified computer models must be submitted.

(5) Delineation of the revised floodway on the same topographic map used for the delineation of the revised flood boundaries.

(c) *Data requirements for changes not associated with base flood elevation changes.* The following data shall be submitted:

- (1) Items described in paragraphs (b) (1) through (3) of this section must be submitted.
- (2) Engineering analysis for the revised floodway, as described below:
 - (i) The original hydraulic computer model used to develop the established base flood elevations must be modified to include all encroachments that have occurred in the flood plain since the existing floodway was developed. If the original hydraulic computer model is not available, an alternate hydraulic computer model may be used provided the alternate model has been calibrated so as to reproduce the original water surface profile of the original hydraulic computer model. The alternate model must be then modified to include all encroachments that have occurred since the existing floodway was developed.
 - (ii) The floodway analysis must be performed with the modified computer model using the desired floodway limits.
 - (iii) The floodway limits must be set so that combined effects of the past encroachments and the new floodway limits do not increase the effective base flood elevations by more than the amount specified in §60.3(d)(2). Copies of the input and output data from the original and modified computer models must be submitted.
- (3) Delineation of the revised floodway on a copy of the effective NFIP map and a suitable topographic map.
- (d) *Certification requirements.* All analyses submitted shall be certified by a registered professional engineer. All topographic data shall be certified by a registered professional engineer or licensed land surveyor. Certifications are subject to the definition given at §65.2 of this subchapter.
- (e) *Submission procedures.* All requests that involve changes to floodways shall be submitted to the appropriate FEMA Regional Office servicing the community's geographic area.

§ 65.8 Review of proposed projects.

A community, or an individual through the community, may request FEMA's comments on whether a proposed project, if built as proposed, would justify a map revision. FEMA's comments will be issued in the form of a letter, termed a Conditional Letter of Map Revision, in accordance with 44 CFR part 72. The data required to support such requests are the same as those required for final revisions under §§65.5, 65.6, and 65.7, except as-built certification is not required. All such requests shall be submitted to the FEMA Headquarters Office in

Washington, DC, and shall be accompanied by the appropriate payment, in accordance with 44 CFR part 72.

§ 65.9 Review and response by the Administrator.

If any questions or problems arise during review, FEMA will consult the Chief Executive Officer of the community (CEO), the community official designated by the CEO, and/or the requester for resolution. Upon receipt of a revision request, the Federal Insurance Administrator shall mail an acknowledgment of receipt of such request to the CEO. Within 90 days of receiving the request with all necessary information, the Federal Insurance Administrator shall notify the CEO of one or more of the following:

- (a) The effective map(s) shall not be modified;
- (b) The base flood elevations on the effective FIRM shall be modified and new base flood elevations shall be established under the provisions of part 67 of this subchapter;
- (c) The changes requested are approved and the map(s) amended by Letter of Map Revision (LOMR);
- (d) The changes requested are approved and a revised map(s) will be printed and distributed;
- (e) The changes requested are not of such a significant nature as to warrant a reissuance or revision of the flood insurance study or maps and will be deferred until such time as a significant change occurs;
- (f) An additional 90 days is required to evaluate the scientific or technical data submitted; or
- (g) Additional data are required to support the revision request.
- (h) The required payment has not been submitted in accordance with 44 CFR part 72, no review will be conducted and no determination will be issued until payment is received.

[51 FR 30315, Aug. 25, 1986; 61 FR 46331, Aug. 30, 1996, as amended at 62 FR 5736, Feb. 6, 1997]

§ 65.10 Mapping of areas protected by levee systems.

- (a) *General.* For purposes of the NFIP, FEMA will only recognize in its flood hazard and risk mapping effort those levee systems that meet, and continue to meet, minimum design,

operation, and maintenance standards that are consistent with the level of protection sought through the comprehensive flood plain management criteria established by §60.3 of this subchapter. Accordingly, this section describes the types of information FEMA needs to recognize, on NFIP maps, that a levee system provides protection from the base flood. This information must be supplied to FEMA by the community or other party seeking recognition of such a levee system at the time a flood risk study or restudy is conducted, when a map revision under the provisions of part 65 of this subchapter is sought based on a levee system, and upon request by the Federal Insurance Administrator during the review of previously recognized structures. The FEMA review will be for the sole purpose of establishing appropriate risk zone determinations for NFIP maps and shall not constitute a determination by FEMA as to how a structure or system will perform in a flood event.

(b) *Design criteria.* For levees to be recognized by FEMA, evidence that adequate design and operation and maintenance systems are in place to provide reasonable assurance that protection from the base flood exists must be provided. The following requirements must be met:

(1) *Freeboard.* (i) Riverine levees must provide a minimum freeboard of three feet above the water-surface level of the base flood. An additional one foot above the minimum is required within 100 feet in either side of structures (such as bridges) riverward of the levee or wherever the flow is constricted. An additional one-half foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee, is also required.

(ii) Occasionally, exceptions to the minimum riverine freeboard requirement described in paragraph (b)(1)(i) of this section, may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support a request for such an exception. The material presented must evaluate the uncertainty in the estimated base flood elevation profile and include, but not necessarily be limited to an assessment of statistical confidence limits of the 100-year discharge; changes in stage-discharge relationships; and the sources, potential, and magnitude of debris, sediment, and ice accumulation. It must be also shown that the levee will remain structurally stable during the base flood when such additional loading considerations are imposed. Under no circumstances will freeboard of less than two feet be accepted.

(iii) For coastal levees, the freeboard must be established at one foot above the height of the one percent wave or the maximum wave runoff (whichever is greater) associated with the 100-year stillwater surge elevation at the site.

(iv) Occasionally, exceptions to the minimum coastal levee freeboard requirement described in paragraph (b)(1)(iii) of this section, may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support a request for such an exception. The material presented must evaluate the uncertainty in the estimated base flood loading conditions. Particular emphasis must be placed on the effects of wave attack and overtopping on the stability of the levee. Under no circumstances, however, will a freeboard of less than two feet above the 100-year stillwater surge elevation be accepted.

(2) *Closures*. All openings must be provided with closure devices that are structural parts of the system during operation and design according to sound engineering practice.

(3) *Embankment protection*. Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability. The factors to be addressed in such analyses include, but are not limited to: Expected flow velocities (especially in constricted areas); expected wind and wave action; ice loading; impact of debris; slope protection techniques; duration of flooding at various stages and velocities; embankment and foundation materials; levee alignment, bends, and transitions; and levee side slopes.

(4) *Embankment and foundation stability*. Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided shall evaluate expected seepage during loading conditions associated with the base flood and shall demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (COE) manual, "Design and Construction of Levees" (EM 1110-2-1913, Chapter 6, Section II), may be used. The factors that shall be addressed in the analyses include: Depth of flooding, duration of flooding, embankment geometry and length of seepage path at critical locations, embankment and foundation materials, embankment compaction, penetrations, other design factors affecting seepage (such as drainage layers), and other design factors affecting embankment and foundation stability (such as berms).

(5) *Settlement*. Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained within the minimum standards set forth in paragraph (b)(1) of this section. This analysis must address embankment loads, compressibility of embankment soils,

compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in the COE manual, “Soil Mechanics Design—Settlement Analysis” (EM 1100–2–1904) must be submitted.

(6) *Interior drainage.* An analysis must be submitted that identifies the source(s) of such flooding, the extent of the flooded area, and, if the average depth is greater than one foot, the water-surface elevation(s) of the base flood. This analysis must be based on the joint probability of interior and exterior flooding and the capacity of facilities (such as drainage lines and pumps) for evacuating interior floodwaters.

(7) *Other design criteria.* In unique situations, such as those where the levee system has relatively high vulnerability, FEMA may require that other design criteria and analyses be submitted to show that the levees provide adequate protection. In such situations, sound engineering practice will be the standard on which FEMA will base its determinations. FEMA will also provide the rationale for requiring this additional information.

(c) *Operation plans and criteria.* For a levee system to be recognized, the operational criteria must be as described below. All closure devices or mechanical systems for internal drainage, whether manual or automatic, must be operated in accordance with an officially adopted operation manual, a copy of which must be provided to FEMA by the operator when levee or drainage system recognition is being sought or when the manual for a previously recognized system is revised in any manner. All operations must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP.

(1) *Closures.* Operation plans for closures must include the following:

(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists for the completed operation of all closure structures, including necessary sealing, before floodwaters reach the base of the closure.

(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

(iii) Provisions for periodic operation, at not less than one-year intervals, of the closure structure for testing and training purposes.

(2) *Interior drainage systems.* Interior drainage systems associated with levee systems usually include storage areas, gravity outlets, pumping stations, or a combination thereof. These drainage systems will be recognized by FEMA on NFIP maps for flood protection purposes only if the following minimum criteria are included in the operation plan:

(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists to permit activation of mechanized portions of the drainage system.

(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

(iii) Provision for manual backup for the activation of automatic systems.

(iv) Provisions for periodic inspection of interior drainage systems and periodic operation of any mechanized portions for testing and training purposes. No more than one year shall elapse between either the inspections or the operations.

(3) *Other operation plans and criteria.* Other operating plans and criteria may be required by FEMA to ensure that adequate protection is provided in specific situations. In such cases, sound emergency management practice will be the standard upon which FEMA determinations will be based.

(d) *Maintenance plans and criteria.* For levee systems to be recognized as providing protection from the base flood, the maintenance criteria must be as described herein. Levee systems must be maintained in accordance with an officially adopted maintenance plan, and a copy of this plan must be provided to FEMA by the owner of the levee system when recognition is being sought or when the plan for a previously recognized system is revised in any manner. All maintenance activities must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP that must assume ultimate responsibility for maintenance. This plan must document the formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and systems are maintained. At a minimum, maintenance plans shall specify the maintenance activities to be performed, the frequency of their performance, and the person by name or title responsible for their performance.

(e) *Certification requirements.* Data submitted to support that a given levee system complies with the structural requirements set forth in paragraphs (b)(1) through (7) of this section must

be certified by a registered professional engineer. Also, certified as-built plans of the levee must be submitted. Certifications are subject to the definition given at §65.2 of this subchapter. In lieu of these structural requirements, a Federal agency with responsibility for levee design may certify that the levee has been adequately designed and constructed to provide protection against the base flood.

§ 65.12 Revision of flood insurance rate maps to reflect base flood elevations caused by proposed encroachments.

(a) When a community proposes to permit encroachments upon the flood plain when a regulatory floodway has not been adopted or to permit encroachments upon an adopted regulatory floodway which will cause base flood elevation increases in excess of those permitted under paragraphs (c)(10) or (d)(3) of §60.3 of this subchapter, the community shall apply to the Federal Insurance Administrator for conditional approval of such action prior to permitting the encroachments to occur and shall submit the following as part of its application:

- (1) A request for conditional approval of map change and the appropriate initial fee as specified by §72.3 of this subchapter or a request for exemption from fees as specified by §72.5 of this subchapter, whichever is appropriate;
- (2) An evaluation of alternatives which would not result in a base flood elevation increase above that permitted under paragraphs (c)(10) or (d)(3) of §60.3 of this subchapter demonstrating why these alternatives are not feasible;
- (3) Documentation of individual legal notice to all impacted property owners within and outside of the community, explaining the impact of the proposed action on their property.
- (4) Concurrence of the Chief Executive Officer of any other communities impacted by the proposed actions;
- (5) Certification that no structures are located in areas which would be impacted by the increased base flood elevation;
- (6) A request for revision of base flood elevation determination according to the provisions of §65.6 of this part;
- (7) A request for floodway revision in accordance with the provisions of §65.7 of this part;

(b) Upon receipt of the Federal Insurance Administrator's conditional approval of map change and prior to approving the proposed encroachments, a community shall provide evidence to the Federal Insurance Administrator of the adoption of flood plain management ordinances incorporating the increased base flood elevations and/or revised floodway reflecting the post-project condition.

(c) Upon completion of the proposed encroachments, a community shall provide as-built certifications in accordance with the provisions of §65.3 of this part. The Federal Insurance Administrator will initiate a final map revision upon receipt of such certifications in accordance with part 67 of this subchapter.

Section 5 - Oklahoma Water Resource Board Requirements

Oklahoma Floodplain Management Act

Floodplain Management Act

82 O.S. §§1601-1618

§1601. Short title.

Chapter 23 of this title shall be known and may be cited as the Oklahoma Floodplain Management Act.

§1602. Purpose of act.

A. The State of Oklahoma recognizes the personal hardships and economic distress caused by flood disasters; in particular, the loss of life from floods, the physical and emotional impact of flooding on individuals and communities, public and private property damage and disruption, the increased cost for disaster relief and the need for preservation and restoration of the natural resources and functions of floodplains. Oklahoma also recognizes that it has become uneconomical for private insurance industry alone to make flood insurance available to those in need of such protection on reasonable terms and conditions. Recognizing these problems, Congress enacted the National Flood Insurance Act of 1968, which, among other things, requires the development of a unified national program for floodplain management which sets out a framework for national goals towards which agencies at all levels of government and in the private sector can work each within its own mission and role.

B. The purpose of the Oklahoma Floodplain Management Act pursuant to the most current version of a unified program for floodplain management is to:

1. Protect the natural and beneficial functions of the floodplain, to reduce damage and disruption to property from floods, to reduce costs of disaster relief and to reduce injury and loss of life from floods;
2. Assist state agencies, local government and the private sector in developing local floodplain management programs and in obtaining training and funding therefore; and

3. Procure flood insurance for those citizens that desire to participate in this federal program.

§1603. Definitions.

As used in the Oklahoma Floodplain Management Act:

1. "Area of jurisdiction" means:
 - a. all of the lands within an incorporated town or city, for a municipality,
 - b. all of the unincorporated areas of the county, for a county, or
 - c. all property owned or operated by the state, for the state;
2. "Board" means the Oklahoma Water Resources Board;
3. "Dwelling unit" means a place of residence and may be a single or multiple-dwelling building;
4. "Flood" or "flooding" means general and temporary conditions of partial or complete inundation of normally dry land areas from the overflow of lakes, streams, rivers or any other inland waters;
5. "Floodplain" means the land adjacent to a body of water which has been or may be covered by flooding, including, but not limited to, the one-hundred-year flood;
6. "Floodplain board" means an administrative and planning board, for floodplain management, of a county, a municipality or the state or the planning commission of a municipality or a county if so designated by the governing body of the municipality or county;
7. "Floodplain regulations" means the codes, ordinances and other regulations relating to the use of land and construction within the channel and floodland and construction within the channel and floodplain areas including, but not limited to, zoning ordinances, platting regulations, building codes, housing codes, setback requirements and open area regulations;

8. "Floodway" means the channel of a stream, watercourse or body of water and those portions of floodplains which are reasonably required to carry and discharge the floodwater or floodflow of any river or stream;
9. "One-hundred-year flood" means a flood which has a one percent (1%) chance of occurring each year, based upon the criteria established by the Oklahoma Water Resources Board; and
10. "Program" means the overall national flood insurance program authorized by the National Flood Insurance Act of 1968 (42 U.S.C. 4001-4128) as amended.

§1604. County and municipal floodplain boards – Land use rules and regulations.

A. To allow participation in the program, the Oklahoma Water Resources Board, boards of county commissioners and municipal governing bodies are authorized to establish floodplain board for their respective area of jurisdiction which may adopt, administer and enforce floodplain management rules and regulations, for the purpose of:

1. The delineation of floodplain and floodways;
2. The preservation of the capacity of the floodplain to carry and discharge regional floods;
3. The minimization of flood hazards;
4. The establishment and charging of reasonable fees, not to exceed Five Hundred Dollars (\$500.00), for services provided by the Board, county commissioners and municipalities in the administration of their responsibilities pursuant to the Oklahoma Floodplain Management Act.
5. The regulation of the use of land in the floodplain; and
6. The protection of the natural and beneficial functions of the floodplain, reducing damage to property from floods, reducing injury and loss of life from floods, and allowing communities to be eligible for flood insurance.

B. The rules and regulations shall be based on adequate technical data and competent engineering advice and shall be consistent with local and regional comprehensive planning.

C. The rules and regulations shall be approved by the Oklahoma Water Resources Board, the county or the municipality, as the case may be, by appropriate order, resolution or ordinance.

§1605. County, municipal and state floodplain board – Composition – Term – Compensation.

A. 1. A county floodplain board shall be composed of five (5) members to be appointed by the board of county commissioners.

2. All the members of the board shall be residents of the county and shall own or operate real property within the unincorporated area of the county;

3. Two members shall be appointed for terms of two (2) years, two members shall be appointed for terms of four (4) years and one member shall be appointed for a term of six (6) years. Thereafter, all appointments shall be made for terms of six (6) years.

4. All members shall serve without compensation. Members may be removed by the board of county commissioners for cause after a public hearing for that purpose.

5. Vacancies shall be filled by additional appointments for the unexpired term only.

B. 1. A municipal floodplain board shall be composed of five (5) members to be appointed by the municipal governing body. All the members of the board shall be residents of the municipality.

2. Membership of floodplain boards in existence prior to the effective date of this act shall remain as currently constituted. Membership for boards created subsequent to the effective date of this act shall consist of two members appointed for terms of two (2) years, two members appointed for terms of four (4) years and one member appointed for a term of six (6) years. Thereafter, all appointments shall be made for terms of six (6) years.

3. All members shall serve without compensation.

4. Members may be removed by the municipal governing body for cause after a public hearing for that purpose.

5. Vacancies shall be filled by additional appointments for the unexpired term only.

C. A state floodplain board shall be composed of the members of the Oklahoma Water Resources Board. All members shall serve without additional compensation.

§1606. Establishment and delineation of floodplains and one-hundred-year flood elevations for Oklahoma.

The Oklahoma Water Resources Board shall develop, adopt and promulgate criteria and rules for aiding the floodplain boards in the establishment and delineation of the floodplains and the one-hundred-year flood elevations for Oklahoma.

§1607. Floodplain definitions and one-hundred-year elevations to be submitted.

The floodplain boards shall delineate and submit to the Oklahoma Water Resources Board all floodplain definitions and one-hundred-year flood elevations within their respective area of jurisdiction, using methods consistent with the criteria and rules developed by the Board.

§1608. Floodplain regulations – Requirements – Contents

All floodplain boards that choose to participate in the program shall adopt floodplain regulations, which shall conform with the requirements necessary to establish eligibility and to maintain participation in the program and shall include the following:

1. Regulations for any platting of land in floodplains, construction of dwelling units and commercial or industrial structures in floodplains, and all other construction in the floodplains, which may divert, retard or obstruct floodwater and threaten public health, safety and welfare;
2. Regulations which establish minimum flood protection elevations and flood damage prevention requirements for use of structures and facilities which are located in a floodplain or are vulnerable to flood damage. Regulations adopted under this section are to be in accordance with any applicable state and local laws, regulations and ordinances.
3. Regulations which provide for coordination by the floodplain board with all other interested and affected political subdivisions and state agencies. The regulations of a floodplain board shall not apply to the use of usual farm buildings

for agricultural purposes, the planting of agricultural crops or the construction of farm ponds; and

4. Counties and municipalities that choose to participate in the program and utilize a floodplain manager are encouraged to attend the floodplain development management classed offered by the National Flood Insurance Program and any additional annual continuing education classes offered by the Oklahoma Water Resources Board.

§1609. Cooperative agreements for delineation of floodplains and adoption of regulations.

Floodplain boards may enter into cooperative agreements pursuant to the “Interlocal Cooperation Act” for the delineation of floodplains and adoption of regulations within the floodplains.

§1610. Promulgation floodplain rules – Procedure.

A. Floodplain rules enacted pursuant to the Oklahoma Floodplain Management Act shall only be promulgated by the Oklahoma Water Resources Board in accordance with the Administrative Procedures Act.

B. Floodplain regulations enacted pursuant to the Oklahoma Floodplain Management Act shall only be adopted by the county or municipal floodplain boards adopted by the county or municipal floodplain boards after a public hearing at which parties in interest and other citizens have an opportunity to be heard. At least thirty (30) days prior to the hearing, a notice of the time and place of hearing shall be published in a newspaper of general circulation regularly published nearest the area of jurisdiction.

§1611. Redefining floodplain upon completion of flood control protective work.

Within one hundred eighty (180) days after the completion of construction of any flood control protective works, the floodplain board in its area of jurisdiction shall redefine the floodplain as altered by the works. The new floodplain definition and one-hundred-year flood elevations shall then be submitted to the Oklahoma Water Resources Board

§1612. Construction or development in floodplain area prohibited – Exceptions.

A. After a floodplain board has submitted to the Oklahoma Water Resources Board definitions of all floodplains and one-hundred-year flood elevations within its area of jurisdiction, all platting of land, all construction of dwelling units or commercial or industrial structures, and all future development within the delineated floodplain area is prohibited unless:

1. Floodplain regulations have been adopted pursuant to the Oklahoma Floodplain Management Act for such areas and are in full force and effect;
2. Prior to regulations having been adopted, a special permit is granted by the floodplain board; or
3. A special permit is granted by the state floodplain board, if development or construction is to be on lands owned or held in trust by the state. provided, that notice of such construction or development must be afforded to all concerned governmental entities within thirty (30) days of the decision to undertake such construction or development.

B. Special permits authorized by subsection A of this section may be issued when the applicable floodplain board determines that construction or development in the floodplain in question is not a danger to persons or property. In making its determination, the floodplain board shall comply with Section 1610 of this title.

§1613. Existing prior use may continue – Conditions.

Any use that exists prior to May 13, 1980, which does not meet the minimum standards specified and authorized by the Oklahoma Floodplain Management Act may continue. However, unless brought into compliance with the minimum standards set forth in regulations adopted pursuant to the Oklahoma Floodplain Management Act such uses may be not substantially altered, enlarged or added to.

§1614. Business needs to be considered in promulgating floodplain rules and preparing floodplain regulations.

The Oklahoma Water Resources Board in promulgating rules pursuant to Section 1606 of this title and floodplain boards in preparing floodplain management regulations shall give due consideration to the needs of an industry, including agriculture, whose business requires that it be located within a floodplain.

§1615. Variances.

A. The floodplain board may grant variances for uses which do not satisfy the requirements of the Oklahoma Floodplain Management Act upon presentation of adequate proof that compliance with the local floodplain regulations adopted pursuant to the Oklahoma Floodplain Management Act will result in an arbitrary and unreasonable taking of property without sufficient benefit or advantage to the people. However, no variance shall be granted where the effect of the variance will be to permit the continuance of a condition which unreasonably creates flooding hazards. Any variance so granted shall not be construed as to relieve any person who receives it from any liability imposed by the Oklahoma Floodplain Management Act or by other laws of the state.

B. Any person seeking a variance shall file a petition with the floodplain board, accompanied by a filing fee of Twenty-five Dollars (\$25.00).

C. The floodplain board shall exercise wide discretion in weighing the equities involved and the advantages and disadvantages to the applicant and to the public at large when determining whether the variance shall be granted. The floodplain board shall conduct a hearing which complies with all requirements of the Oklahoma Floodplain Management Act for public notice. In no case shall variances be effective for a period longer than twenty (20) years. A copy of any variance issued shall be sent to the Oklahoma Water Resources Board within fifteen (15) days of issuance.

§1616. Appeals.

A. Appeals of any decision of the Oklahoma Water Resources Board shall be in accordance with the Administrative Procedures Act.

B. Appeals of the decision of a county or municipal floodplain board shall be taken to the board of adjustment for the area of jurisdiction involved in the appeal or to the governing body of the county or municipality where no board of adjustment exists. Appeals may be taken by any person aggrieved or by a public officer, department, board or bureau affected by any decision of the floodplain board in administering the floodplain board's regulations. The appeal shall be taken within a period of not more than ten (10) days, by filing written notice with the appellant body and the floodplain board, stating the grounds thereof. An appeal shall stay all proceedings in furtherance of the action appealed from unless the floodplain board from which the appeal is taken shall certify to the appellant of body that by reason of facts stated in the certificate a stay

would, in its opinion, cause imminent peril to life or property. The appellant body shall have the following powers and duties:

1. To hear and decide appeals where it is alleged that there is error of law in any order, requirement, decision or determination made by the floodplain board in the enforcement of the floodplain board's regulations.
2. In exercising its powers, the appellant body may reverse or affirm wholly or partly, or may modify the order, requirement, decision or determination as ought to be made, and to that end shall have all the powers of the floodplain board from which the appeal is taken.
3. In acting upon any appeal, the appellant body shall apply the principals, standards and objectives set forth and contained in all applicable regulations and plans adopted.

§1617. New structures, fills, excavations or other uses prohibited without written authorization – Violations.

A. No new structure, fill, excavation or other floodplain use that is unreasonably hazardous to the public or that unduly restricts the capacity of the floodway to carry and discharge the regional flood shall be permitted without securing written authorization from the floodplain board in which the floodplain is located.

B. Any person convicted of violating the provisions of this section shall be guilty of a misdemeanor.

§1618. Application of Act.

The provisions of this act shall not apply to those counties, municipalities or other agencies who are in compliance with federal floodplain regulations and are participating in the program prior to the effective date of this act.

§1619. Repealed by Laws 1989, c. 154, §2, operative July 1, 1989.

Section 6 – Floodplain Ordinances

Tulsa County

The adopted floodplain ordinance language, as required by the Oklahoma Water Resources Board (OWRB), is included in the Zoning Code and in the Subdivision Regulations

**CHAPTER 10
FLOODWAY ZONING DISTRICT**

1000.	General Provisions
1010.	General Floodway Regulations
1020.	Permitted Uses
1030.	Special Exception Uses
1040.	Special Exception Uses, Requirements and Procedures
1050.	Nonconforming Uses
1060.	Amendments to Floodway Zoning Maps

SECTION 1000. GENERAL PROVISIONS

1000.1 Findings of Fact

A. Adverse Effects Resulting from Flooding

Flood hazard areas situated within the zoning jurisdiction of Tulsa County are subject to periodic inundation which, when the hazard areas are improperly developed, results in loss of life and property, presents health and safety hazards, disrupts commerce and governmental services, requires extraordinary public expenditures for flood protection and relief, and impairs the tax base, all of which adversely affect the public health, safety and general welfare.

B. General Causes of these Flood Effects

These flood effects are caused by:

1. The cumulative effect of obstructions in floodplains causing increases in flood heights and velocities.
2. The occupancy of floodplain areas by uses vulnerable to floods or hazardous to other lands which are inadequately elevated or otherwise not protected from flood damages.
3. Encroachment on the channel cross-section and storage capacity of the floodplain area which increases flood heights or velocities.
4. Urbanization of the drainage basin outside the floodplain area which accelerates runoff and adversely affects flood peaks.

1000.2 Statement of Purposes

It is the purpose of this Code to promote the public health, safety and general welfare and to minimize those effects described in Section 1000.1(A) by provisions designed to:

- A. Restrict or prohibit uses, including public uses, which are dangerous to health, safety, or property in terms of flood or cause increases in flood heights or velocities.
- B. Require that uses vulnerable to floods, including public facilities which serve such uses, shall be protected against flood damage at the time of initial construction.
- C. Identify lands which are subject to flooding hazards to inform and protect individuals from purchasing properties which may not be suited for their intended purposes because of flood hazard.
- D. Comply with the regulations of the National Flood Insurance Program as established by the Federal Insurance Administration of the United States Department of Housing and Urban Development.
- E. To minimize expenditure of public money for costly flood control projects.
- F. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public.

1000.3 Lands to Which Ordinance Applies

This Ordinance shall apply to all lands within the zoning jurisdiction of Tulsa County, Oklahoma, shown on the Official Zoning Map as being located within the boundaries of the Floodway District.

1000.4 Reference to the Official Zoning Map

The Official Zoning Map, together with all explanatory matter thereon and attached thereto, is hereby adopted by reference and declared to be a part of this Code. The Official Zoning Map is maintained in the office of the County Board of Adjustment.

1000.5 Compliance

No structure or land shall hereafter be used and no structure shall be located, extended, converted or structurally altered without full compliance with the terms of this Ordinance and other applicable regulations which apply to uses within the jurisdiction of this Ordinance.

1000.6 Abrogation and Greater Restrictions

It is not intended by this Ordinance to repeal, abrogate or impair any existing easements, covenants, or deed restrictions. However, where this Ordinance imposes greater restrictions, the provisions of this Ordinance shall prevail.

1000.7 Interpretation

In their interpretation and application, the provisions of this chapter shall be held to be minimum requirements and should be liberally construed to accomplish their intended purposes and shall not be deemed a limitation or repeal of any other powers granted by state statutes.

1000.8 Warning and Disclaimer of Liability

The degree of flood protection required by this chapter is considered reasonable for regulatory purposes and is based on engineering and scientific methods of study. Larger floods may occur on rare occasions. Flood heights may be increased by manmade or natural causes. This chapter does not imply that areas outside the Floodway District or land uses permitted within such District will be free from flooding or flood damages. This chapter shall not create liability on the part of Tulsa County or any officer or employee thereof for any flood damages that result from reliance on this chapter or any administrative decision lawfully made thereunder.

1000.9 Severability

If any section, clause, provision or portion of this chapter is adjudged unconstitutionally or invalid by a court of competent jurisdiction, the remainder of this chapter shall not be affected thereby.

SECTION 1010. GENERAL FLOODWAY REGULATIONS

The following general regulations apply to the use of land located within an FD Floodway District:

- A. New construction, substantial improvements, or other development (including fill) shall not be approved if it:
 - 1. Adversely affects the capacity of channels or floodways of any watercourse herein identified as in the Floodway District to convey the regulatory flood.
 - 2. Would measurably increase flood flows or flood heights or increase flood damage upon off site properties during the occurrence of the regulatory flood.
 - 3. Would individually, or when combined with all other existing and anticipated development, expose additional upstream, downstream, or adjacent properties to adverse flood effects that would otherwise not be exposed to such effects due to the regulatory flood.
 - 4. Increase velocities or volumes of floodwaters to the extent that significant erosion of floodplain soils would occur either on the subject property or on some other property upstream or downstream.
- B. Encroachments in floodways, including fill, new construction, substantial improvements, and other development that would result in any increase in flood levels during the occurrence of the regulatory flood shall be prohibited.

- C. All new construction and substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure.
- D. All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage.
- E. All new construction or substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.
- F. All new and replacement water supply systems shall be flood-proofed.
- G. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems and discharges from the systems into floodwaters.
- H. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.
- I. The placement of any mobile home shall be prohibited.

SECTION 1020. PERMITTED USES

The following uses having a low flood damage potential and not obstructing flood flows shall be permitted within the Floodway District to the extent that they are not prohibited by any other ordinance and provided that they do not require buildings, structures, fill or storage of materials or equipment that adversely affect or in any way diminish the capacity of the floodway to carry the regulatory flood.

- A. Use Unit 1.
- B. Agricultural uses such as general farming, pasture, grazing, outdoor plant nurseries, horticulture, viticulture, truck farming, forestry, sod farming, and wild crop harvestry.
- C. Private and public recreational uses such as golf courses, tennis courts, golf driving ranges, archery ranges, picnic grounds, boat launching ramps, swimming areas, parks, game farms, fish hatcheries, fishing areas, hiking and horseback riding trails.
- D. Residential uses such as lawns, gardens, parking areas and play areas.

SECTION 1030. SPECIAL EXCEPTION USES

Within the Floodway District, certain uses (listed below) may be permitted by the Board of Adjustment, after adherence to the procedural requirements for a special exception, as provided in Section 1040 of this chapter, and upon the Board's finding that:

- A. The use meets the requirements of Section 1010 of this chapter.
- B. The use will not impair the appropriate use of neighboring property and that the use will be in keeping with the spirit and intent of this Code.
- C. No structure (temporary or permanent), fill (including fill for roads and levees), deposit, obstruction, storage of materials or equipment or other use, acting alone or in combination with existing or future uses, adversely affects or in any way diminishes the capacity of the floodway to carry the regulatory flood.
- D. Structures are not designed for human habitation.
- E. Structures have a low flood damage potential.
- F. Structures are to be constructed and placed on the building site so as to offer the minimum obstruction to the flow of floodwaters.
 - 1. Whenever possible, structures are to be constructed with the longitudinal axis parallel to the direction of flood flow; and
 - 2. So far as practicable, structures are to be placed approximately on the same flood flow lines as those adjoining structures.
- G. The use will not include the storage or processing of materials that are in time of flooding buoyant, flammable, explosive or could be injurious to human, animal or plant life.

The uses which may be permitted by the Board of Adjustment are:

- A. Parking;
- B. Temporary amusement enterprises;
- C. Industrial-commercial uses such as loading areas, parking areas, airport landing strips, drive-in theaters, roadside stands, signs and billboards;
- D. Extraction of sand, gravel and other materials;
- E. Marinas, boat rentals, docks, piers, wharves;
- F. Railroads, streets, bridges, utility facilities not permitted as of right and pipelines;
- G. Storage yards for equipment, machines or materials;
- H. Kennels and stables;
- I. Uses or structures accessory to permitted or special exception uses;
- J. Other uses similar in nature to areas described in Section 1020, or 1030, which are consistent with the purposes set out in Section 1000.2 of this chapter.

SECTION 1040. SPECIAL EXCEPTION USES, REQUIREMENTS AND PROCEDURES

The Special Exception Uses authorized for approval within Floodway Zoning Districts are subject to the requirements established by this Chapter, the minimum requirements set out below and such additional safeguards or conditions as may be imposed by the Board of Adjustment.

1040.1 Special Exception Administrative Procedure; Required Information

- A. No application for a special exception shall be accepted for filing by the Board unless it is accompanied by plans in triplicate drawn to scale showing the nature, location, dimensions and elevation of the lot, existing or proposed structures, fill, storage of materials, floodproofing measures, and the relationship of the above to the location of the channel floodway and regulatory flood protection elevation.
- B. One copy of the plans submitted by the applicant shall be immediately forwarded by the Clerk of the Board to the County Engineer for technical assistance in evaluating the proposed project in relation to its potential impact on flood heights and velocities; its flood damage potential; and the adequacy of the plans for protection. The Board's transmittal shall bear a notation advising the County Engineer concerning the date the application is scheduled for public hearing.
- C. On or before the date scheduled for public hearing, the County Engineer shall advise the Board concerning the adequacy of the plans submitted by the applicant.
- D. If at time of public hearing either the Board or the County Engineer deems the plans submitted by the applicant to be inadequate for determining the suitability of the particular site for the proposed use, the Board shall require the applicant to furnish such of the following additional information which may be necessary for making a proper determination:
 - 1. A typical valley cross-section showing the channel of the stream, elevation of land areas adjoining each side of the channel, cross-sectional areas to be occupied by the proposed development, and high water information.
 - 2. Plan (surface view) showing elevations or contours of the ground; pertinent structure, fill or storage elevations; size, location and spatial arrangement of all proposed and existing structures on the site; location and elevations of street, water supply, sanitary facilities, photographs existing land uses and vegetation upstream and downstream, soil types and other pertinent information.
 - 3. Profile showing the slope of the bottom of the channel or flow line of the stream.
 - 4. Specifications for building construction and materials, floodproofing, filling, dredging, grading, channel improvement, storage of materials, water supply, and sanitary facilities.

- E. Subsequent to the presentation of all required information and plans by the applicant and upon due consideration of all technical evaluations thereof the Board shall determine the specific flood hazard at the site and shall evaluate the suitability of the proposed use in relation to the flood hazard and the other natural features of the site.

1040.2 Factors Upon Which the Decision of the Board Shall be Based

In passing upon such application, the Board shall consider all relevant factors specified in other sections of this Chapter and:

- A. The effects upon lands upstream, downstream and in the immediate vicinity.
- B. The effect upon the flood stage and flood velocity.
- C. Whether a demand for additional public expenditures for flood protection or prevention will be created.
- D. Whether a demand for additional flood relief payments will be created.
- E. The danger to life and property due to flooding or erosion damage.
- F. The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner.
- G. The danger that materials may be swept onto other lands to the injury of others.
- H. The compatibility of the proposed use with existing and anticipated development.
- I. The safety of access to the property in terms of flood for ordinary and emergency vehicles.
- J. The costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilities and facilities such as sewer, gas, electrical, and water systems.
- K. The expected heights, velocity, duration, rate of rise and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site.
- L. The availability of alternative locations, not subject to flooding or erosion damage, for the proposed use.
- M. The relationship of the proposed use to the Comprehensive Plan for that area.

1040.3 Conditions Attached to Special Exceptions

Upon consideration of the factors listed above and the purposes of this Chapter, the Board may attach such conditions to the granting of Special Exceptions or Variances as it deems necessary to further the purposes of this Chapter. Among such conditions without limitation because of specific enumeration may be included:

- A. Modification of waste disposal and water supply facilities;
- B. Limitations on periods of use and operation;
- C. Imposition of operational controls, sureties and deed restrictions;
- D. Requirements for construction of channel modifications, dikes, levees and other protective measures.
- E. Floodproofing measures such as the following shall be designed consistent with the flood protection elevation for the particular areas, flood velocities, duration, rate of rise, hydrostatic and hydrodynamic forces and other factors associated with the regulatory flood. The Board of Adjustment shall require that the applicant submit a plan or document certified by a registered professional engineer that the floodproofing measures are consistent with the regulatory flood protection elevation and associated flood factors for the particular area. The following floodproofing measures may be required without limitation because of specific enumeration:
 - 1. Anchorage to resist flotation and lateral movement.
 - 2. Installation of watertight doors, bulkheads and shutters, or similar methods of construction.
 - 3. Reinforcement of walls to resist water pressures.
 - 4. Use of paints, membranes or mortars to reduce seepage of water through walls.
 - 5. Addition of mass or weight to structures to resist flotation.
 - 6. Installation of pumps to lower water levels in structures.
 - 7. Construction of water supply and waste treatment systems so as to prevent the entrance of floodwaters.
 - 8. Pumping facilities or comparable practices for subsurface drainage systems for buildings to relieve external foundation wall and basement flood pressures.
 - 9. Construction to resist rupture or collapse caused by water pressure or floating debris.

10. Installation of valves or controls on sanitary and storm drains which will permit the drains to be closed to prevent backup of sewage and storm waters into the buildings or structures. Gravity drainage of basements may be eliminated by mechanical devices.
11. Location of all the applicant's electrical equipment circuits and installed electrical appliances in a manner which will assure they are not subject to flooding and to provide protection from inundation by the regulatory flood.
12. Location of any structural storage facilities for chemicals, explosives, buoyant materials, flammable liquids or other toxic materials which could be hazardous to public health, safety, and welfare in a manner which will assure that the facilities are situated at elevations above the height associated with the regulatory flood protection elevation, or are adequately floodproofed to prevent flotation of storage containers, or damage to storage containers which could result in the escape of toxic materials into floodwaters.

SECTION 1050. NONCONFORMING USES

1050.1 Special Regulations

The provisions of this section specifically govern nonconforming uses located in FD zoning districts and they shall be interpreted as supplemental to the provisions of Chapter 14 of this Code which generally governs nonconforming uses. In the event of any conflict between this section and the provisions of Chapter 14 of this Code, such conflict shall be resolved in favor of the requirements established by this section.

1050.2 Conditions

A structure or the use of a structure or premises which was lawful before the passage of amendment of this chapter but which is not in conformity with the provisions of this chapter may be continued, subject to the following conditions:

- A. Unless first approved by the Board of Adjustment, no repair or reconstruction of any destroyed structure shall exceed 50 percent of its current replacement cost immediately prior to its destruction. If any nonconforming use or structure is destroyed by any means, including floods, to an extent of more than 50 percent, it shall not be reconstructed except in conformity with the provisions of this chapter.
- B. Uses or adjuncts thereof which are or become nuisances shall not be entitled to continue as nonconforming uses.
- C. Except as provided in subsection (B) above, any use which has been permitted as a Special Exception Use shall be considered a conforming use.

SECTION 1060. AMENDMENTS TO FLOODWAY ZONING MAPS

1060.1 Special Requirements

Amendments to FD Zoning Maps shall be initiated and processed in the manner specified in Chapter 17 of this Code; provided, however, all such proposed amendments shall be subject to the special requirements pertaining thereto which are established by this section.

1060.2 Requirement for Approval

District boundaries may be amended only if the amendment meets one of the two following requirements:

- A. A flood control project of the federal, state, county or city government, or a private person, has substantially altered the boundaries of the District, or if proposed improvements have not been constructed, the actual construction thereof has been assured by the submission and acceptance of a bond or other acceptable financial arrangements; or
- B. Flood data compiled subsequent to the adoption of the District Maps indicates that the District boundaries should be changed.

1060.3 Recommendation of County Engineer

All applications shall be transmitted in writing by the Planning Commission to the County Engineer. Prior to any public hearing by the Planning Commission upon such application, the County Engineer shall review the application and thereafter transmit to the Planning Commission written report as to whether or not the application meets the required standard for approval; the County Engineer shall recommend the denial of any application which fails to meet the required standard.

City of Sand Springs

CHAPTER 23

FLOODWAY SUPPLEMENTAL DISTRICT

- 23.01. Findings**
- 23.02. Purposes**
- 23.03. Methods**
- 23.04. Definitions**
- 23.05. Lands Involved**
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- 23.16. Flood Hazard Reduction**
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SECTION 23.01. FINDINGS

- (1) The flood hazard areas of the City of Sand Springs are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the public health, safety and general welfare.
- (2) These flood losses are created by the cumulative effect of obstructions in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, floodproofed, or otherwise protected from flood damage.
- (3) For additional and current regulations pertaining to this subject refer to Ordinance No. 828, adopted May 17, 1993, as amended.

SECTION 23.02. PURPOSES

It is the purpose of this chapter to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

- (1) Protect human life and health;
- (2) Minimize expenditure of public money for costly flood control projects;
- (3) Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- (4) Minimize prolonged business interruptions;
- (5) Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in floodplains;
- (6) Help maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas; and,
- (7) Insure the potential buyers are notified that property is in a flood area.

SECTION 23.03. METHODS

In order to accomplish its purposes, this Chapter uses the following methods:

- (1) Restrict or prohibit uses that are dangerous to health, safety, or property in times of flood, or cause excessive increases in flood heights or velocities;
- (2) Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- (3) Control the alteration of natural floodplains, stream channels, and natural protective barriers, which are involved in the accommodation of flood waters;
- (4) Control filling, grading, dredging and other development which may increase flood damage; and
- (5) Prevent or regulate the construction of flood barriers which will increase flood hazards to other lands.

SECTION 23.04. DEFINITIONS

Unless specifically defined below, words or phrases used in this Chapter shall be interpreted to give them the meaning they have in common usage and to give this Chapter its most reasonable application.

Appeal - A request for a review of the Public Works Department's interpretation of any provision of this Chapter.

Area of Shallow Flooding - A designated AO zone on a community's Flood Insurance Rate Map (FIRM) with base flood depths from one to three feet. This condition occurs where a clearly defined channel does not exist, where the path of flooding is unpredictable and indeterminate, and where velocity flow may be evident.

Area of Special Flood Hazard - The land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year.

Base Flood - The flood having a one percent chance of being equaled or exceeded in any given year.

Development - Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations.

Existing Manufactured Home Park or Manufactured Home Subdivision - A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale for which the construction of facilities for servicing the lot on which the manufactured home is to be affixed (including, at a minimum, the installation of utilities, either final site grading or the pouring of concrete pads, and the construction of streets) is completed before the effective date of this Chapter.

Expansion of an Existing Manufactured Home Park or Manufactured Home Subdivision - The preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, either final site grading or pouring of concrete pads, or the construction of streets).

Flood or Flooding - A general and temporary condition of partial or complete inundation of normally dry land areas from:

- (1) The overflow of inland waters.
- (2) The unusual and rapid accumulation or runoff of surface waters from any source.

Floodplain or Flood Prone Areas - An area of special flood hazard as designated on the FIRM for the City of Sand Springs.

Flood Insurance Rate Map (FIRM) - An official map of a community, on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.

Flood Insurance Study - The official report provided by the Federal Insurance Administration. The report contains flood profiles, the water surface elevation of the base flood, as well as the FIRM.

Floodway - The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

Habitable Floor - Any floor usable for living purposes, which includes working, sleeping, eating, cooking or recreation, or a combination thereof. A floor used for storage purposes only is not a habitable floor.

Mean Sea Level – For purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929 or other datum to which base flood elevations shown on community's FIRM are referenced.

New Manufactured Home Park or Manufactured Home Subdivision - A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale for which the construction of facilities for servicing the lot on which the manufactured home is to be affixed (including, at a minimum, the installation of utilities, either final site grading or the pouring of concrete pads, and the construction of streets) is completed on or after the effective date of this Chapter.

Riverine – On or near the banks of a river, or produced by a river or rivers.

Start of Construction - The first placement of permanent construction of a structure (other than a manufactured home) on a site, such as the pouring of slabs or footings or any work beyond the stage of excavation. Permanent construction does not include land preparation, such as clearing, grading, and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory building, such as garages or sheds not occupied as dwelling units or not as part of the main structure. For a structure (other than a manufactured home) without a basement or poured footings, the start of construction includes the first permanent framing or assembly of the structure or any

part thereof on its piling or foundation. For manufactured homes not within a manufactured home park or manufactured home subdivision, start of construction means the affixing of the manufactured home to its permanent site. For manufactured homes within a manufactured home park or manufactured home subdivision, start of construction is the date on which the construction of facilities for servicing the site on which the manufactured home is to be affixed (including, at a minimum, the construction of streets, either final site grading or the pouring of concrete pads, and installation of utilities) is completed.

Structure - A walled and roofed building, including a gas or liquid storage tank that is principally above ground, as well as a manufactured home.

Substantial Damage – Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50% of the assessed value by the County Assessor's office.

Substantial Improvement - Any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either:

- (1) Before the improvement or repair is started, or
- (2) If the structure has been damaged and is being restored, before the damage occurred.

For the purposes of this definition substantial improvement is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term does not, however, include either:

- (1) Any project for improvement of a structure to comply with existing state or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions, or
- (2) Any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

Variance - A grant of relief to a person from the requirements of this Chapter when specific enforcement would result in unnecessary hardship. A variance, therefore, permits construction or development in a manner otherwise prohibited by this Chapter.

SECTION 23.05. LANDS INVOLVED

This Chapter shall apply to all areas of special flood hazard within the jurisdiction of the City of Sand Springs.

SECTION 23.06. ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD

The areas of special flood hazard identified by the Federal Insurance Administration on its Flood Insurance Rate Map (FIRM), Community No. 400211, dated July 26, 1974, and any revisions thereto are hereby adopted by reference and declared to be a part of this Chapter.

SECTION 23.07. FLOODPLAIN DEVELOPMENT PERMIT

A floodplain development permit shall be obtained by any persons, firm or corporation prior to development in any floodplain area.

SECTION 23.08. COMPLIANCE

No structure or land shall hereafter be located, altered, or have its use changed without full compliance with the terms of this Chapter and other applicable regulations.

SECTION 23.09. ABROGATION AND GREATER RESTRICTIONS

This Chapter is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this Chapter and another conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

SECTION 23.10. SEVERABILITY

In case any portion of this Chapter shall be invalid or unconstitutional, as declared by a court of competent jurisdiction, the remainder of this Chapter shall not thereby be invalid, but shall remain in full force and effect.

SECTION 23.11. INTERPRETATION

In the interpretation and application of this Chapter, all provisions shall be:

- (1) Considered as minimum requirements;
- (2) Liberally construed in favor of the governing body; and,
- (3) Deemed neither to limit nor repeal any other powers granted under State statutes.

SECTION 23.12. WARNING AND DISCLAIMER OF LIABILITY

The degree of flood protection required by this Chapter is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. On rare occasions greater floods can and will occur and flood heights may be increased by man-made or natural causes. This Chapter does not imply that the land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This Chapter shall not create liability on the part of the City of Sand Springs or any officer or employee thereof for any flood damages that result from reliance on this Chapter or any administrative decision lawfully made thereunder.

SECTION 23.13. LOCAL ADMINISTRATOR

- (1) The Public Works Department is hereby appointed to administer and implement the provisions of this Chapter.
- (2) The duties and responsibilities of the Public Works Department shall include, but not be limited to, the following:
 - (a) Maintain and hold open for public inspection all records pertaining to the provisions of this Chapter.
 - (b) Review, approve or deny all applications for development permits required by Section 23.07 of this Chapter.
 - (c) Review permits for proposed development to assure that all necessary permits have been obtained from those federal, state or local governmental agencies from which prior approval is required;

- (d) Where interpretation is needed as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions) the Public Works Department shall make the necessary interpretation;
- (e) Notify adjacent communities and the Oklahoma Water Resources Board prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Insurance Administration;
- (f) Assure that maintenance is provided within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished; and
- (g) When current base flood elevation data has not been provided by the Federal Insurance Administration, the Public Works Department shall obtain, review, and reasonably utilize any base flood elevation data available from a federal, state, or other qualified source, in order to administer the provisions of Section 23.16.

SECTION 23.14. PERMIT PROCEDURES

- (1) Application for a development permit shall be presented to the Public Works Department on forms furnished by the department and may include, but not be limited to, plans in duplicate drawn to scale showing the location, dimensions and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of special flood hazard. Additionally, the following information is required:
 - (a) Elevation in relation to mean sea level, of the lowest floor (including basement) of all proposed structures;
 - (b) Elevation in relation to mean sea level to which any non residential structure shall be floodproofed;
 - (c) A certificate from a registered professional engineer or architect that the non-residential floodproofed structure shall meet the flood-proofing criteria of section 23.16, subsection (2) (b).
 - (d) Description of the extent to which any watercourse or natural drainage will be altered or relocated as a result of proposed development.

- (2) Approval or denial of a development permit by the Public Works Department shall be based on all of the provisions of this Chapter and the following guidelines:
- (a) The danger to life and property due to flooding or erosion damage;
 - (b) The susceptibility of the proposed facility and its contents to flooding damage and the effect of such damage on the individual owner;
 - (c) The danger that materials may be swept onto other lands to the injury of others;
 - (d) The potential aggravation of flooding related to existing and anticipated development posed by the proposed use;
 - (e) The safety of access to the property in times of flood for ordinary and emergency vehicles.
 - (f) The costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilities and facilities such as sewer, gas, electric, and water system.
 - (g) The expected heights, velocity, duration, rate of rise and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site.
 - (h) The necessity to the facility of a waterfront location, where applicable;
 - (i) The relationship of the proposed use to the Comprehensive Plan for the City of Sand Springs.

SECTION 23.15. VARIANCE AND APPEAL PROCEDURES

- (1) The City Council (Council) shall hear and render judgment on requests for variances from the requirements of this Chapter.
- (2) The Council shall hear and render judgment on an appeal only when it is alleged there is an error in any requirements, decision, or determination made by the Public Works Department in the enforcement or administration of this Chapter.

- (3) Any person or persons aggrieved by the decision of the Council may appeal such decision in the courts of competent jurisdiction.
- (4) The Public Works Department shall maintain a record of all actions involving an appeal and shall report variances to the Federal Insurance Administration upon request.
- (5) Variances may be issued for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places, without regard to the procedures set forth in the remainder of this section.
- (6) Generally, variances may be issued for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing the relevant factors in Section 23.14, Subsection (2) have been fully considered. As the lot size increases beyond the one-half acre, the technical justification required for issuing the variance increases.
- (7) Upon consideration of the factors noted above and the intent of this Chapter, the Council may attach such conditions to the granting of variances as it deems necessary to further the purpose and objectives of this Chapter (Section 23.02).
- (8) Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result. Prerequisites for granting variances:
 - (a) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
 - (b) Variance shall only be issued upon:
 - [i] A showing of good and sufficient cause,
 - [ii] A determination that failure to grant the variance would result in exceptional hardship to the applicant, and
 - [iii] A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.

SECTION 23.15

- (c) Any applicant to whom a variance is granted shall be given written notice that the structure will be permitted to be built with a lowest floor elevation no more than 2 feet below the base flood elevation, and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.
- (9) An appeal shall be taken within ten days from the determination complained of by filing with the Public Works Department a notice of appeal, specifying the grounds thereof.
- (10) A request for a variance shall be initiated by the filing of an application with the Public Works Department.
- (11) The Council shall give ten full days public notice by publication in a newspaper of general circulation and conduct a public hearing before acting on an appeal from the determination of the Public Works Department or before granting a variance from the requirements of this Chapter. The public notice shall contain the legal description and street address or approximate location of the property in question. The notice shall also contain the date, time, and place of the hearing and the relief or variance requested. The party seeking relief or variances shall be responsible for the accuracy of the information contained in the legal notice and for the cost of publication of the legal notice.

SECTION 23.16. FLOOD HAZARD REDUCTION

- (1) General Standards. In all areas of special flood hazards the following provisions are required:
 - (a) All new construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure;
 - (b) All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage;
 - (c) All new construction or substantial improvements shall be constructed with materials and utility equipment resistant to flood damage;
 - (d) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;
 - (e) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the system and discharges from the systems into flood waters; and

- (f) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.
- (2) Specific Standards. In all areas of special flood hazards where base flood elevation data has been provided as set forth by:
- (a) The Federal Insurance Administration;
 - (b) A federal, state, city, or other source that has been reviewed and approved by the Public Works Department; and
 - (c) As set forth in Section 23.16, Subsection (3) (c) the following provisions in addition to those under Section 23.16 (1) are required:
 - (i) Residential Construction - New construction or substantial improvement of any residential structure shall have the lowest floor, including basement, elevated to or above the base flood elevation. A registered professional engineer, architect, or land surveyor shall submit a certification to the building inspector that the standard of this subsection is satisfied.
 - (ii) Non-residential Construction - New construction or substantial improvement of any commercial, industrial or other non-residential structure shall either have the lowest floor, including basement, elevated to the level of the base flood elevation or, together with attendant utility and sanitary facilities, be flood-proofed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall submit a certification to the Public Works Department that the standards of this subsection are satisfied.
 - (iii) Manufactured Homes:
 - [1] No manufactured home shall be placed in a floodway, except in an existing manufactured home park or existing manufactured home subdivision.
 - [2] All manufactured homes shall be anchored to resist flotation, collapse, or lateral movement. Specific requirements shall be:

- [a] Over-the-top ties at each of the four corners of the manufactured home, with two additional ties per side at intermediate locations and manufactured homes less than 50 feet long requiring one additional tie per side;
- [b] Frame ties at each corner of the home with five additional ties per side at intermediate points and manufactured homes less than 50 feet long requiring four additional ties per side;
- [c] All components of the anchoring system be capable of carrying a force of 4,800 pounds;
- [d] Any additions to the manufactured home be similarly anchored.

(3) Standards for Subdivision Proposals

- (a) All subdivision proposals shall be consistent with Section 23.02 and Section 23.03 of this Chapter.
- (b) All proposals for the development of subdivisions shall meet development permit requirements of Section 23.14, and the provisions of Section 23.16 of this Chapter.
- (c) Base flood elevation data shall be generated for subdivision proposals and other proposed development which is greater than the lesser of 50 lots or 5 acres, if not otherwise provided pursuant to Section 23.06 or Section 23.14(2) (g) of this Chapter.
- (d) All subdivision proposals shall have adequate drainage provided to reduce exposure to flood hazards.
- (e) All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage.

SECTION 23.17. PENALTIES

- (1) Fine Imposed: Any person, firm, corporation or other legal entity violating the requirements of this Chapter, or any conditions made pursuant thereto, shall be guilty of an offense and, upon conviction thereof, shall be fined not more than \$35.00 and each day's violation thereof shall constitute a separate offense.
- (2) Fine Not Exclusive Remedy: In addition to fine, the City may institute appropriate actions or proceedings at law or equity for the enforcement of the provisions of this Chapter or to correct the violations thereof. The conviction and punishment of any person hereunder shall not relieve such person, from the responsibility to correct prohibited conditions or to remove prohibited buildings, structures, obstructions or improvements, nor prevent the enforcement, correction, or removal thereof.

City of Tulsa

Title 11-A - Stormwater Management and Hazard Mitigation Program – Chapter 3. - Watershed Development Regulations

CHAPTER 3. - WATERSHED DEVELOPMENT REGULATIONS

Section 300. - Purpose.

To protect the general health, safety and welfare of the residents of the City of Tulsa from the hazards and danger of stormwater run-off, the City shall:

- A. Regulate the methods for handling and disposing of stormwater run-off in the watersheds of the jurisdictional area of the City and further regulate the design, construction and maintenance of the stormwater drainage system;
- B. Regulate the development, excavation, grading, regrading, paving, landfilling, berming and diking of land within the watersheds of the City;
- C. Regulate development within flood plains in order to assure that development is not dangerous to health, safety or property due to stormwater run-off, and does not increase flood heights or velocities, and to comply with the regulations of the National Flood Insurance Program;
- D. Inform individuals of lands which are identified as subject to hazard from the regulatory flood; and
- E. Regulate the connection to and use of the stormwater drainage system.

(Ord. Nos. 16959, 17285)

Section 301. - Scope and definitions.

- A. **Scope.** The provisions of this chapter shall apply to and be binding upon every person, firm, agency, institution or corporation, and every entity which seeks to develop, redevelop, grade, regrade, excavate, landfill, berm or dike land subject to the jurisdiction of the City.
- B. **Definitions.** For purposes of this chapter, the following words and phrases shall have the meanings given herein.
 - 1. **Alter or alteration of a watercourse** means any change to the stormwater drainage system or to the land surface which changes the conveyance capacity of the stormwater drainage system.
 - 2. **Appeal** means a request for a review of the Director's interpretation of any provision of this chapter or a request for a variance.
 - 3. **Area of shallow flooding** means a designated AO, AH or VO zone on the City's Flood Insurance Rate Map (FIRM) with a one percent (1%) or greater annual chance of flooding to an average depth of one (1) to three (3) feet where a clearly defined channel does not exist, where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.
 - 4. **Area of special flood hazard** is the land in the flood plain within the City subject to a one percent (1%) or greater chance of flooding in any given year. The area may be designated as Zone A on the Flood Hazard Boundary Map (FHBM). After detailed rate making has been completed in preparation for publication of the FIRM, Zone A usually is refined into Zones A, AE, AH, AO, A1-99, VO, V1-30, VE or V. (See Flood Hazard Area)
 - 5. **Base flood** means the flood having a one percent (1%) chance of being equaled or exceeded in any given year and is the regulatory flood.
 - 6. **City Drainage Standards** are the criteria, standards and specifications for stormwater drainage, earth change and flood plain development adopted by the City by resolution.

7. **Critical feature** means an integral and readily identifiable part of a flood protection system, without which the flood protection provided by the entire system would be compromised.
8. **Detention** means the temporary storage and controlled release of stormwater run-off.
9. **Detention facility** means a facility that provides temporary storage of stormwater run-off and controlled release of this run-off.
10. **Development** means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, berming, diking, excavating or drilling operations.
11. **Earth change** means excavating, grading, regrading, landfilling, berming or diking of land within the City.
12. **Elevated building** means a non-basement building:
 - a. built, in the case of a building in Zones A 1-30, AE, A, A99, AO, AH, B, C, X and D, to have the top of the elevated floor, or in the case of a building in Zones V 1-30, VE or V, to have the bottom of the lowest horizontal structure member of the elevated floor elevated above the ground level by means of pilings, columns (posts and piers) or shear walls parallel to the flow of the water, and
 - b. adequately anchored so as not to impair the structural integrity of the building during a flood of up to the magnitude of the base flood.

In the case of Zones A 1-30, AE, A, A99, AO, AH, B, C, X, D, "elevated building" also includes a building elevated by means of fill or solid foundation perimeter walls with openings sufficient to facilitate the unimpeded movement of flood waters. In the case of Zones V 1-30, VE or V, "elevated building" also includes a building otherwise meeting the definition of "elevated building," even though the lower area is enclosed by means of breakaway walls if the breakaway walls meet the standards of Section 60.3(e)(5) of the National Flood Insurance Program regulations.
13. **Existing construction or existing structures** means, for the purpose of determining flood insurance rates, structures for which the "start of construction" commenced before the effective date of the FIRM or before January 1, 1975, for FIRMs effective before that date.
14. **Federal Emergency Management Agency (FEMA)** means the federal agency responsible for administering the National Flood Insurance Program.
15. **Flood or flooding** means a general and temporary condition for partial or complete inundation of normally dry land areas from:
 - a. the overflow of inland waters, or
 - b. the unusual and rapid accumulation or run-off of surface waters from any source.
16. **Flood hazard area** means an area of special flood hazard.
17. **Flood Insurance Rate Map (FIRM)** means an official map of a community on which the Federal Emergency Management Agency has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.
18. **Flood Insurance Study** is the official report provided by the Federal Emergency Management Agency. The report contains flood profiles, water surface elevation of the base flood and the Flood Boundary-Floodway Map.
19. **Flood plain** means any land area susceptible to being inundated by water from any source. (See definition of flooding.)

20. **Flood protection system** means those physical structural works for which funds have been authorized, appropriated and expended and which have been constructed specifically to modify flooding in order to reduce the extent of the areas within a community subject to a "special flood hazard" and the extent of the depths of associated flooding. Such a system typically includes hurricane tidal barriers, dams, reservoirs, levees or dikes. These specialized flood-modifying works are those constructed in conformance with sound engineering standards.
21. **Floodway** is that portion of the flood hazard area identified by the Federal Emergency Management Agency as the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the regulatory flood without cumulatively increasing the water surface elevation more than one (1) foot.
22. **Full development/full urbanization** is full potential urbanization of the contributing watershed considering the Comprehensive Plan and land use regulations.
23. **Full development flood fringe** is that portion of the flood plain area between the outer boundary of the flood plain and the outer boundary of the flood hazard area. This area reflects the effects of full development of the watershed and extends to where the contributory drainage area is forty (40) acres or more.
24. **Functionally dependent use** means a use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, but does not include long-term storage or related manufacturing facilities.
25. **Highest adjacent grade** means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.
26. **Levee** means a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding.
27. **Levee system** means a flood protection system which consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices.
28. **Lowest floor** means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood-resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor, provided that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirement of Section 60.3 of the National Flood Insurance Program regulations.
29. **Manufactured home** means a structure transportable in one (1) or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. For flood plain management purposes, the term "manufactured home" also includes park trailers, travel trailers and other similar vehicles placed on a site for greater than one hundred eighty (180) consecutive days. For insurance purposes, the term "manufactured home" does not include park trailers, travel trailers or other similar vehicles.
30. **Mean sea level** means the National Geodetic Vertical Datum (NGVD) of 1929, or other datum, to which base flood elevations are shown.
31. **Natural state** means the cover and topography of land before any development or, in areas where there has already been development, the state of the area and topography of land on the date of December 22, 1977.

32. **New construction** means, for flood plain management purposes, structures for which the "start of construction" commenced on or after the effective date of a flood plain management regulation adopted by the City.
33. **One hundred year frequency rainstorm** is the rainstorm having an average statistical frequency of occurrence in the order of once in one hundred (100) years, although the rainstorm may actually occur in any year.
34. **Regulatory flood** is the flood having a one percent (1%) chance of being equaled or exceeded in any given year.
35. **Regulatory flood plain** is the area subject to flooding by the regulatory flood based on the full development of the watershed and where the contributing drainage area is forty (40) acres or more as designated by the City.
36. **Sedimentation facilities** include debris basins, sedimentation traps, berms, interceptor ditches, land terraces, hay bales and vegetation ground cover.
37. **Start of construction** includes substantial improvement and means the date the building permit was issued, provided that the actual start of construction, repair, reconstruction, placement or other improvement was within one hundred eighty (180) days of the permit date. The actual start means either the first placement of permanent construction or a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets or walkways; nor does it include excavation for basement, footing, piers or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure.
38. **Stormwater Drainage Advisory Board** is the Advisory Board established in Chapter 1 of this title.
39. **Stormwater Technical Advisory Group** is the Technical Advisory Group established by the Stormwater Drainage Advisory Board for the purpose of reviewing and recommending to the Stormwater Drainage Advisory Board on issues pertaining to drainage standards, Watershed Development Permit appeals and requests for variances.
40. **Stormwater run-off** is that portion of the rainfall that is drained into the stormwater drainage system.
41. **Structure** means a walled and roofed building that is principally above ground, including a gas or liquid storage tank, as well as a manufactured home.
42. **Substantial improvement** means any repair, reconstruction or improvement of a structure, the cost of which equals or exceeds fifty percent (50%) of the market value of the structure, either before the improvement or repair is started or, if the structure has been damaged and is being restored, before the damage occurred. For purposes of this definition, "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term does not, however, include any projects for improvement of a structure to comply with existing state or local health, sanitary or safety code specifications which are solely necessary to assure safe living conditions, or any alterations of a structure listed on the National Register of Historic Places or State Inventory of Historic Places.
43. **Variance** means a grant of relief to a person from the requirements herein when specific enforcement would result in unnecessary hardship. A variance, therefore, permits construction

or development in a manner otherwise prohibited by this chapter. (For full requirements, see Section 60.6 of the National Flood Insurance Program regulation.)

44. **Violation** means the failure of a structure or other development to be in full compliance with the City's flood plain management regulations. A structure or other development without the elevation certificate, other certifications or other evidence of the compliance required in Section 60.3(b)(5), (c)(4), (c)(10), (d)(3), (e)(2), (e)(4) or (e)(5) of the National Flood Program regulations is presumed to be in violation until such time as that documentation is provided.
45. **Watercourse** means any depression serving to give direction to a current of stormwater where the drainage area above the same is five (5) acres or more.
46. **Watershed** means the physical area from which water drains into a creek.
47. **Water surface elevation** means the height, in relation to the National Geodetic Vertical Datum (NGVD) of 1929 (or other datum, where specified) of floods of various magnitudes and frequencies in the flood plains of coastal or riverine areas.

(Ord. Nos. 16959, 17285)

Section 302. - Watershed development permits.

- A. **Watershed Development Permits.** Unless specifically exempted, a Watershed Development Permit, as required by this chapter, shall be obtained prior to the commencement of any development, redevelopment, building, excavating, grading, regrading, paving, landfilling, berming or diking of any property within the City.
- B. **Permit Classification and Requirements.** Watershed Development Permit requirements shall be determined by the magnitude of the effects the proposed development could have on the stormwater drainage system in accordance with the following classifications.
 1. **Floodway Watershed Development Permit (FW).** A Floodway Watershed Development Permit shall be obtained prior to any development or earth change where the same is located in the floodway.
 2. **Flood Plain Watershed Development Permit (FP).** A Flood Plain Watershed Development Permit shall be obtained prior to any development or earth change where the same is located in the regulatory flood plain.
 3. **Stormwater Drainage Watershed Development Permit (SD).** A Stormwater Drainage Watershed Development Permit shall be obtained prior to any development whose discharge at the point it leaves the site is greater than that which can be conveyed in a fifteen (15) inch diameter conduit.
 4. **Stormwater Connection Watershed Development Permit (SC).** All other development being more than an earth change and not exempted herein shall be required to obtain a Stormwater Connection Watershed Development Permit.
 5. **Earth Change Watershed Development Permit (EC).** An Earth Change Watershed Development Permit shall be obtained prior to any earth change.
- C. **Exemptions.** A Watershed Development Permit shall not be required for the following activities:
 1. Bona fide agricultural and farming operations which constitute the principal use of any lot or tract of ground in the City and which meet the requirement of the Zoning Code of the City of Tulsa;
 2. Customary and incidental routine grounds maintenance, landscaping, and home gardening which does not require a special exception or a variance under the Zoning Code, or a building

permit, and which does not affect stormwater drainage entering or leaving any public right-of-way;

3. Emergency repairs of a temporary nature made on public or private property which are necessary for the preservation of life, health or property, and which are made under such circumstances where it would be impossible or impracticable to obtain a Watershed Development Permit;
4. Temporary excavation for the purpose of repairing or maintaining any public street, public utility facility or any service lines related thereto; and
5. Routine maintenance of the stormwater drainage system that does not alter the initial design capacity of an improved drainage system or does not alter the conveyance capacity of a natural channel that is in a well-maintained condition.

D. Application for Watershed Development Permit.

1. **General Requirements.** Applications for a development permit required under this section shall be submitted to the Development Services Division of the Economic Development Department and shall be accompanied by a development site plan. The Director of Development Services shall review the information furnished by the applicant and determine whether a Floodway Watershed Development Permit (FW), Flood Plain Watershed Development Permit (FP), Stormwater Drainage Watershed Development Permit (SD), Stormwater Connection Watershed Development Permit (SC) or an Earth Change Watershed Development Permit (EC) is required or whether the activity is exempt.
2. **Permit Application.** The application and development site plan shall contain such information as required in City Drainage Standards.
3. **Inactive Permit Application Denial.** Failure of an applicant to provide all the information required by the Development Services Division of the Economic Development Department within sixty (60) days of receipt by the applicant of the request for the information shall result in the application's being denied unless an extension is granted in writing by the Development Services Division of the Economic Development Department.

(Ord. Nos. 16959, 17285; Ord. No. 22250, § 1, 6-10-2010)

Section 303. - Subdivision plats, re-plats, lot-splits and building permit approval.

All subdivision plats, re-plats, lot-splits and building permits shall be approved by the Public Works Department. The review and approval of any plat, re-plat, lot-split or building permit by the Public Works Department shall require the submittal and acceptance of drainage plans as required in City drainage standards or in the Plumbing Code.

(Ord. Nos. 16959, 17285)

Section 304. - Policies and standards for approval of watershed development permits, subdivision plats, lot-splits and building permits.

- A. **General policies.** The issuance of watershed development permits and approval of subdivision plats, lot-splits and building permits shall be governed by the following general policies of the City:
1. The development shall not create a public hazard upon any property within the City or in immediately adjacent areas through the obstruction, impairment, sedimentation, blockage or alteration of the stormwater drainage system;

2. The development shall provide a sufficient stormwater drainage system for the conveyance of stormwater run-off received from upstream and from the subject property in a one hundred (100) year frequency rainstorm with due allowance having been made for full urbanization of the watershed when the quantity of stormwater may be increased; and
 3. The development shall not result in additional identifiable adverse flooding of other property.
- B. **Specific policies and standards.** The decision to deny a watershed development permit or to reject drainage plans for a subdivision plat, lot-split or building permit shall be accompanied by a statement of the reasons for such action. A development permit shall be issued if, upon review of the application therefor, it is found that the development meets and complies with the policies and standards hereinafter set out and duly adopted by the City by resolution.
- C. **Drainage policies and standards.**
1. **Policies.**
 - a. The stormwater drainage system shall be designed to pass the stormwater run-off received from upstream and from the subject property in a one hundred (100) year frequency rainstorm under full urbanization.
 - b. Development shall be constructed so that it will not increase the frequency of flooding or the depth of inundation of structures.
 - c. Peak flows shall not be increased at any location for any storm, up to and including the one hundred (100) year storm, which will result in the inundation of unprotected structures not previously subject to inundation as a result of that same frequency storm.
 - d. Regulation of peak flows to allowable levels, as determined by subparagraphs (b) and (c) herein, shall be achieved by on-site or off-site storage as provided in the City drainage standards.
 - e. Subject to requirements for watershed development permits and of the City drainage standards, downstream conveyance may be improved to compensate for increased flows if such improvements comply with the policies of this chapter.
 - f. Dumping of any material into the stormwater drainage system is prohibited.
 2. **Standards.**
 - a. The Director shall prepare standards for stormwater drainage facilities which shall become City drainage standards after approval by resolution by the governing body of the City.
 - b. All roofs, paved areas, yards, courts and courtyards, other than for one-family or two-family residential structures, shall drain into a separate storm sewer system or to an approved place of disposal.
 - c. In the case of one-family and two-family residential structures, stormwater may be discharged onto flat areas such as streets or lawns if drainage is provided so that the stormwater will flow away from the building.
- D. **Erosion and sediment control policies and standards.**
1. **Policies.**
 - a. All developments shall be designed, constructed and completed in a manner which minimizes the exposure of bare earth to precipitation.
 - b. Development shall be constructed only if appropriate sedimentation facilities are installed and maintained throughout the construction period.

2. **Standards.** The policies governing watershed development, as it affects erosion and sediment control, shall be implemented by City drainage standards which shall specifically regulate the design, installation, maintenance and removal of sedimentation and erosion control facilities and structures and shall establish acceptable methods and practices for controlling soil sedimentation and erosion.
- E. **Regulatory flood plain area policies and standards.** The Director shall, from time to time, prepare maps defining the one hundred (100) year, fully urbanized flood plains within the City. When adopted as official Regulatory Flood Plain Maps by the governing body of the City, the maps shall be made available to the public.

The provisions of this subsection shall apply to development within the identified regulatory flood plain areas graphically shown by the maps adopted by the City of Tulsa Resolution No. 13729, dated December 22, 1977, and amendments thereto.

1. **Regulatory flood plain area policies.**

- a. Development which is dangerous to health, safety or property in times of flood or which would cause excessive increases in flood heights or velocities shall be restricted or prohibited.
- b. Uses vulnerable to floods, including facilities which serve such uses, shall be protected against flood damage at the time of initial construction.
- c. The alteration of natural flood plains, stream channels and watercourses shall be controlled.
- d. Filling, grading, dredging and other development which may increase flood damage shall be controlled.
- e. The construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards to other lands in and outside the City shall be prevented or regulated.
- f. The approval or denial of a Floodway Watershed Development Permit or a Flood Plain Watershed Development Permit by the Director shall be based on the provisions of this chapter and the following relevant factors:
 - (1) the danger to life and property due to flooding or erosion damage;
 - (2) the susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;
 - (3) the danger that materials may be swept onto other lands to the injury of others;
 - (4) the compatibility of the proposed use with existing and anticipated development;
 - (5) the safety of access to the property in times of flood for ordinary and emergency vehicles;
 - (6) the costs of providing governmental services during and after flood conditions, including maintenance and repair of streets and bridges, and public utilities and facilities such as sewer, gas, electrical and water systems;
 - (7) the expected heights, velocity, duration, rate of rise and sediment transport of the floodwaters expected at the site;
 - (8) the availability of alternative locations not subject to flooding or erosion damage for the proposed use; and
 - (9) the relationship of the proposed use to the comprehensive plan for that area.

2. Regulatory flood plain area standards.

a. General requirements within regulatory flood plain areas.

- (1) All new construction and substantial improvements including placement of prefabricated buildings and manufactured homes shall be designed (or modified) and adequately elevated and anchored to prevent flotation, collapse or lateral movement of the structure.
- (2) All new construction or substantial improvements shall be by methods and practices that minimize or eliminate flood damage.
- (3) All new construction or substantial improvements shall utilize materials and utility equipment resistant to flood damage.
- (4) All new and replacement water supply systems shall be floodproofed.
- (5) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters.
- (6) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.
- (7) New structures shall be placed with their longitudinal axis parallel to the predicted direction of flow of flood waters or be placed so that their longitudinal axis are on lines parallel to those of adjoining structures.
- (8) Filling or development which diminishes the flood storage capacity of any regulatory flood plain area shall be compensated for as specified in the City drainage standards.

b. Development requirements in the regulatory flood plain areas.

- (1) All new construction and substantial improvements of any residential structure within the regulatory flood plain area shall have the lowest floor, including basement, elevated at least one (1) foot above the regulatory flood elevation with full urbanization. A registered professional engineer, architect or land surveyor shall submit a certification to the Director that the elevation requirement has been met.
- (2) All new construction and substantial improvements of any commercial, industrial or other non-residential structure shall either have the lowest floor, including basement, elevated at least one (1) foot above the regulatory flood elevation with full urbanization, or together with attendant utility and sanitary facilities, be floodproofed so that at least below one (1) foot above the regulatory flood level with full urbanization, the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall submit certification to the Director that this standard regarding floodproofing has been satisfied. A registered professional engineer, architect or land surveyor shall submit a certification to the Director that the elevation requirement has been met.
- (3) All manufactured homes shall be elevated and anchored to prevent flotation, collapse or lateral movement from the regulatory flood with full urbanization. Acceptable methods of elevating and anchoring shall be set out in the City drainage standards. Methods of anchoring may include but are not limited to use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable state and local anchoring requirements for resisting wind forces.

- (4) All manufactured homes to be placed in the regulatory flood plain shall have the lowest floor elevated at least one (1) foot above the regulatory flood with full urbanization. A registered professional engineer, architect or land surveyor shall submit a certification to the Director that the elevation requirement has been met.
 - (5) An evacuation plan indicating vehicular access and escape routes for manufactured home parks and subdivisions located in or surrounded by regulatory flood plain areas shall be filed with the Public Works Department and the Tulsa Area Emergency Management Agency. The owner of the manufactured home park or subdivision shall be responsible for filing vehicular access and escape routes with the Public Works Department and the Tulsa Area Emergency Management Agency and shall see that each tenant thereof has received an evacuation plan prior to the tenant's moving into the manufactured home park or subdivision.
 - (6) Placement of manufactured homes within the adopted regulatory floodway is prohibited except in a legally pre-existing manufactured home park or subdivision.
 - (7) All new construction and substantial improvements, with fully enclosed areas below the lowest floor that are subject to flooding, shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet the following minimum criteria:
 - (a) a minimum of two (2) openings having a total net area of not less than one (1) square inch for every square foot of enclosed area subject to flooding shall be provided,
 - (b) the bottom of all openings shall be no higher than one (1) foot above grade and
 - (c) openings may be equipped with screens, louvers, valves or other coverings or devices, provided that they permit the automatic entry and exit of flood waters.
- c. **Standards for subdivision proposals in regulatory flood plain areas.**
- (1) All subdivision proposals shall have adequate drainage provided to reduce exposure to flood effects and shall comply with the provisions of this chapter and the City drainage standards.
 - (2) All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage.
 - (3) Regulatory Flood Plain area delineation shall be clearly shown on all preliminary plats and final plats submitted for approval.
 - (4) All subdivision proposals, including manufactured home parks greater than fifty (50) lots or five (5) acres, whichever is lesser, shall show the water surface elevation of the base flood with full urbanization. When the fully urbanized base flood elevation data has not been provided, the Director shall obtain, review and reasonably utilize any base flood elevation data and floodway data available from a federal, state or other source in order to administer this provision.
- d. **Standards for areas of shallow flooding (AO/AH Zones).**
- (1) All new construction and substantial improvements of residential structures shall have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the City's Flood Insurance Rate Map (FIRM) (at least two [2] feet if no depth number is specified).

- (2) All new construction and substantial improvements of nonresidential structures shall have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the City's Flood Insurance Rate Map (FIRM) (at least two [2] feet if no depth number is specified), or together with attendant utility and sanitary facilities be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads of effects of buoyancy. A registered professional engineer or architect shall submit a certification to the Director that the standards of this section are satisfied. There shall be adequate drainage paths around structures on slopes to guide flood waters around and away from the proposed structures.
 - (3) The foregoing requirements of this subparagraph are minimal requirements and shall not relieve any new construction or substantial improvements from meeting and complying with additional requirements and provisions of this chapter.
3. **Area of special flood hazard, policies and standards.** In all special flood hazard areas, the following policies and standards shall apply.
 - a. New construction, substantial improvements or other development (including fill) shall not be approved in a special flood hazard area if it:
 - (1) adversely affects the capacity of channels or floodways of any watercourse in the flood plain area to convey the regulatory flood or any flood of more frequent occurrence,
 - (2) would measurably increase flood flows or flood heights or increase flood damage upon off-site properties during the occurrence of the regulatory flood or any flood of more frequent occurrence,
 - (3) would individually or cumulatively, when combined with all other existing and anticipated development assuming an equal degree of encroachment for a significant reach on both sides of the stream or watercourse, increase flood levels or expose additional upstream, downstream or adjacent properties to adverse flood effects that would otherwise not be exposed to such effects due to flooding during the regulatory flood or any flood of more frequent occurrence,
 - (4) increases velocities or volumes of flood waters to the extent that significant erosion of flood plain soils would occur either on the subject property or on some other property upstream or downstream, or
 - (5) does not provide compensatory storage for any measurable loss of flood storage capacity.
 - b. Encroachments in special flood hazard areas including fill, new construction, substantial improvements and other development that would result in any increase in flood levels during the occurrence of the regulatory flood or any flood of more frequent occurrence shall be prohibited.
 - c. Encroachments in the floodways including fill, new construction, substantial improvements and other development are prohibited unless the encroachments will not result in any increase of flood levels for the regulatory flood or any flood of more frequent occurrence, and certification demonstrating that the encroachments will not result in such increase in flood levels is provided by a professional registered engineer or architect.
4. **Special flood hazard area notice.**

- a. Every owner of real property, any part of which is located in a special flood hazard area as depicted and shown on a Flood Insurance Rate Map adopted by the City, is hereby required to notify in writing every tenant of the real property of the location of the property in a designated special flood hazard area and to obtain and keep for inspection upon request by the Director or his authorized representative written acknowledgment of the receipt of the notice signed by each of the tenants.

The notice shall be given and the acknowledgment thereof obtained prior to any of the tenants taking possession of or occupying the real property or, in the case of property already rented or leased prior to the effective date of this provision, within sixty (60) days after its adoption and publication. The notice and acknowledgment shall be in a separate document and not a part of any other document, such as a lease, and it shall be substantially in the following form:

NOTICE TO TENANT OF LOCATION IN FLOOD HAZARD AREA

Notice is hereby given that the following-described real property is located within a flood hazard area as graphically shown on flood insurance rate maps as reviewed and adopted by the City of Tulsa:

(Put in legal description and address of property being leased or rented.)

Further information may be obtained from the Public Works Department of the City of Tulsa.

Dated this _____ day of _____, A.D. _____.

(Signature of Owner or Agent of Owner)

ACKNOWLEDGMENT OF TENANT

The undersigned tenants of the above-described real property hereby acknowledge receipt of notice that such property is located within a flood hazard area, as graphically shown on the Flood Insurance Rate Maps adopted by the City of Tulsa.

Dated this _____ day of _____, A.D. _____.
(Signature of all tenants required)

I, _____ (name) the tenant _____ (address) acknowledge that I have received an Evacuation Plan for _____ manufactured home park.

(Signature of Tenant)

- b. All departments, agencies, boards, commissions and employees of the City, charged with the responsibilities of issuing permits for manufactured homes or modular homes in a special flood hazard area, including the issuance of permits for hook-up of utilities to the same, shall refrain and be prohibited from issuing any such permit unless the applicant for such permit provides a copy of the notice and acknowledgment properly signed by an owner and all tenants as required herein.
- c. Every owner of real property, any part of which is located in a special flood hazard area as shown on Flood Insurance Rate Maps as reviewed and adopted by the City, is required to notify in writing every purchaser of the real property of the location of the property in a designated special flood hazard area. The notice shall be given at least ten (10) days prior to closing of sale and prior to any purchaser taking possession of or occupying the real property.

5. Special flood hazard maps.

- a. **Establishing the areas of special flood hazard.** The areas of special flood hazard identified by the Federal Emergency Management Agency in a scientific and engineering report entitled "The Flood Insurance Study for City of Tulsa, Oklahoma," dated April 15, 1982, with accompanying Flood Insurance Rate Maps and Flood Boundary-Floodway Maps (FIRM and FBFM) and any revisions thereto are adopted by reference and declared to be a part of this chapter.

(NOTE: FEMA has designated flood hazard areas [A Zones] for the City of Tulsa by the publication of Flood Boundary and Floodway Maps and by publishing a notice of final flood elevations for flood hazard areas on Flood Insurance Rate Maps. The City must adopt regulations meeting the FEMA minimum requirements for adequate flood plain management for these flood hazard areas in order to qualify for the sale of federally-subsidized flood insurance. Risk premium rates for flood insurance are charged based on the FEMA flood hazard area and flood elevation determinations. Banks, savings and loan associations, or similar institutions regulated, supervised or insured by a federal instrumentality are required by Federal law as a condition of making a loan in a flood hazard area to notify the purchaser of such flood hazards, in writing, a reasonable period of time in advance of the signing of the purchase agreement, lease or other documents involved in the transaction.)

- b. **FEMA map corrections and amendments.**

(NOTE: The Flood Boundary and Floodway Maps and Flood Insurance Rate Maps are revised by FEMA when there is a change of community regulatory flood elevations due to changed physical conditions or where the flood elevations are technically incorrect. FEMA also issues letters of map amendment to owners or lessees of property which have been inadvertently included in a flood hazard area [A Zone].)

The Public Works Department shall review and comment on all proposed revisions to FEMA flood hazard areas and flood elevations within the City of Tulsa prior to action by FEMA on those proposals.

The Public Works Department shall submit technical data to FEMA in order to maintain the Flood Boundary and Floodway Maps and Flood Insurance Rate Maps with current data.

The revised FEMA Flood Insurance Rate Maps shall be adopted biannually after public notice by the City. Subsequent to such adoption, the Clerk shall cause copies of the FEMA maps to be delivered to and acknowledgment of receipt of such delivery to be obtained from the Mayor's Office, the Public Works Department, the Tulsa Metropolitan Area Planning Commission, the Indian Nations Council of Governments, the City-County Library, and its branches and to County Clerks in Tulsa, Osage and Rogers counties. Additional copies of the maps shall be provided to these County Clerks for distribution as information to County Engineers and Hydrologists and County Tax Assessors.

Notice shall be sent by the Public Works Department to appraisers, surveyors, realtors and lending institutions informing them that revised maps have been adopted and explaining where copies of the revised FEMA maps are located or where they may be obtained.

6. **Flood plain area notice.** The Public Works Department shall mail annually a notice to owners or occupants of structures within or touched by the regulatory flood plain areas, to provide information as to the status of the flood hazard for each property.

(Ord. Nos. 16959, 17173, 17285, 17466, 18838)

Section 305. - Responsibilities of the Director of Public Works.

The responsibilities of the Director in administering the requirements of Subsection 304.E, Regulatory Flood Plain Area Policies and Standards, shall include:

- A. Maintaining and holding open for public inspection all records pertaining to the provisions of this chapter, including the actual elevation of the lowest floor (including basement) of all new and substantially improved structures in the regulatory flood plain and, for structures that have been floodproofed, the elevation to which the structure was floodproofed;
- B. Reviewing, approving or denying all applications for development permits required by Section 302 of this chapter;
- C. Reviewing permits for proposed development to assure that all necessary permits have been obtained from those federal, state or local government agencies from which prior approval is required;
- D. Making the necessary interpretation where interpretation is needed as to the exact location of the boundaries of the special flood hazard area (for example, where there appears to be a conflict between a mapped boundary and actual field conditions);
- E. Notifying, in riverine situations, adjacent communities and the Oklahoma Water Resources Board prior to any alteration or relocation of a watercourse, and submitting evidence of such notification to the Federal Emergency Management Agency;
- F. Assuring that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained;
- G. When regulatory flood elevation data has not been provided by the Federal Emergency Management Agency, obtaining, reviewing and reasonably utilizing any base flood elevation data available from a federal, state, city or other source; and
- H. Redefining within one hundred-eighty (180) days prior to the expected completion date of construction of any flood control protective works, the regulatory flood plain area as altered by the works; and submitting the new special flood hazard area definition and new regulatory flood elevation to FEMA for revision of the Flood Insurance Rate Maps.

(Ord. Nos. 16959, 17285)

Section 306. - Administrative procedures.

A. Watershed development permit administrative criteria.

- 1. **Permit fees.** Permits authorized by the provisions of this chapter shall be effective only upon payment of the appropriate fee as set out in the duly adopted drainage standards. Fees are payable:
 - a. prior to the time the permit is issued by the Public Works Department if the watershed development permit is applied for through direct application to the Public Works Department, or
 - b. prior to the time the building permit is issued if the watershed development permit application was made in connection with a building permit application.
- 2. **Effective date and expiration of watershed development permit.** The watershed development permit effective date shall be the date as stamped in the approval box of the permit and permits shall be valid only when signed by an authorized representative of the City.

Any watershed development permit issued shall become invalid if the authorized work is not commenced within six (6) months after issuance of the permit or, if the authorized work is suspended or abandoned, for a period of six (6) months after the time of commencing the work, unless an extension has been granted in writing by the Public Works Department. One six (6) month extension will be routinely granted by the Public Works Department if requested by the applicant in writing.

- B. **Appeals.** Any person who is aggrieved by a decision, requirement, ruling or interpretation of this chapter or of the City drainage standards may request review thereof by the Director. The determination of the Director may be appealed by such person to the Stormwater Drainage Advisory Board by written notice of appeal filed with the Director within ten (10) days of his determination. The decision of the Stormwater Drainage Advisory Board may be appealed to the governing body of the City of Tulsa by such person or by the Director by written notice of appeal filed with the Office of the City Clerk within ten (10) days of decision by the Stormwater Drainage Advisory Board.
- C. **Variances.** The Stormwater Drainage Advisory Board upon application, after hearing and subject to the procedural and substantive standards hereinafter set forth, may grant such variances from the terms of this chapter as will not cause detriment to the public good, safety or welfare nor be contrary to the spirit, purposes and intent of this chapter where by reason of unique and exceptional physical circumstance or condition of a particular property, the literal enforcement of the requirements of this chapter will result in an unreasonable hardship.
 - 1. Applications for variance from the provisions of the Flood Plain Area Standards shall be made by the filing of a written request with the Public Works Department.
 - 2. The following additional prerequisites are required for variances as to requirements of Subsection 304.E, Regulatory Flood Plain Area Policies and Standards:
 - a. A variance shall be granted only upon a determination that the variance is the minimum necessary to afford relief, considering the flood hazard;
 - b. Variances shall be granted only upon (1) showing of good and sufficient cause, (2) a finding that failure to grant the variance would result in exceptional hardship to the applicant, and (3) a finding that the granting of a variance would not result in increased flood heights, additional threats to public safety or extraordinary public expense, nor create nuisances, cause fraud on or victimization of the public nor conflict with existing local laws or ordinances;
 - c. Any applicant to whom a variance is granted shall be given written notice that the structure will be permitted to be built with a lowest floor elevation no more than a specified number of feet below the regulatory flood elevation and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation;
 - d. A variance may be granted for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places without regard to the procedures set forth in Section 304 of this chapter;
 - e. Upon consideration of the factors noted above and the intent of this chapter, the Stormwater Drainage Advisory Board may attach such conditions to the granting of variances as it deems necessary to further the purpose and objectives herein; and
 - f. A variance shall not be granted within any designated floodway if any increase in flood levels during the regulatory flood discharge would result.
- D. **Appeal and variance process.** Upon accepting a notice of appeal or an application for a variance, the Public Works Department shall:

1. Require the appellant or applicant to furnish the names and mailing addresses of all owners of the subject property and of all owners of property within a three-hundred (300) foot radius of the exterior boundary of the property as shown by County tax records;
2. Schedule a hearing date before the Stormwater Drainage Advisory Board;
3. Mail written notice to all owners of the subject property and to all owners of property within a three-hundred (300) foot radius of the exterior boundary of the subject property indicating that an appeal or variance has been requested and when a hearing will be held; and
4. Refer the notice of appeal or application for variance to the Stormwater Technical Advisory Group for review and recommendation to the Stormwater Drainage Advisory Board.

(Ord. Nos. 16959, 17285, 17303)

Section 307. - Enforcement and penalties.

- A. **Notification of noncompliance.** If, at any time, a development occurs which is not in accordance with the provisions of this chapter or a watershed development permit, including conditions and approved modifications thereof, a written notice to comply shall be given by the City which shall state the nature and location of the alleged noncompliance, and shall specify remedial steps necessary to bring the project into compliance. The responsible parties shall have such time as may be allowed in the written notice to correct all noted deficiencies. The time allowed shall be reasonable and shall be determined by the nature of the deficiency and whether or not it creates a nuisance or hazard.
- B. **Revocation or suspension of watershed development permit.** A watershed development permit may be revoked or suspended according to the provisions given herein.
 1. **Grounds for revocation or suspension.** A watershed development permit may be revoked or suspended upon the occurrence of any one of the following events:
 - a. A violation of any condition of the permit;
 - b. A violation of any provision of this chapter or any other applicable law, ordinance, rule or regulation pertaining to the watershed development permit; or
 - c. The existence of any condition or the doing of any act constituting fraud, or creating a nuisance or hazard, or endangering human life or the property of others.
 2. **Notice and order of revocation or suspension.** Upon the occurrence of any of the events above listed, the Director may cause to be served upon the permit holder a notice and order suspending or revoking the permit, specifying the grounds for the suspension or revocation and advising the holder that he is entitled to a hearing before the Director at a time, place and date specified in the notice and order, and further advising the holder that if the holder fails to appear at the time, place and date therein specified, the Director's order for suspension or revocation of the holder's permit shall be final.
 3. **Hearing before the Director.** At the hearing before the Director, the permit holder shall be afforded the opportunity to respond to the charges of the Director and to present information to show why his permit should not be revoked or suspended. After such hearing, the Director may either affirm, modify or reverse his order for suspension or revocation of the holder's permit, and shall notify the holder in writing of his decision within five (5) days of the date of the hearing. The Director's decision shall be final, unless the permit holder appeals the decision to the Stormwater Drainage Advisory Board as provided herein.
 4. **Appeals.** An appeal from the Director's decision to the Stormwater Drainage Advisory Board ("Board") shall be by written notice of appeal filed with the Director within ten (10) days of the receipt of the Director's decision. The Director shall place the appeal on the agenda of the next

regular or special meeting of the Board and shall notify the permit holder of the time, place and date of such meeting. The decision of the Board may be appealed to the governing body of the City by the permit holder or the Director by written notice of appeal filed with the City Clerk within ten (10) days of the decision of the Board. If no appeal is taken to the governing body as herein provided, the decision of the Board shall be final.

5. **Service.** Notices and orders required by this subsection shall be served upon each party concerned, either personally or by certified mail, addressed to the individual contracting party or permit holder at the address given on the contract document or permit application filed with the City.
 6. **Stop work order.** Upon the suspension or revocation of a watershed development permit by the Director, the Director may issue a stop work order on all construction activity on the subject property which may be directly or indirectly related to site drainage and which is being performed pursuant to any permits, licenses, franchises or contracts issued or approved by the City. Such stop work order may order a work stoppage on all construction activity on buildings or structures and appurtenances thereto, including building, electrical, plumbing, mechanical and street work, storm sewers, sanitary sewers, gas lines and all utilities including gas, electric, telephone and cable television.
- C. **Penalty.** Unless otherwise provided herein, every person, firm, corporation or other legal entity violating any of the provisions of this chapter or conditions made pursuant thereto shall be guilty of an offense and, upon conviction thereof, shall be punished by imprisonment in the City jail for a period of not more than ninety (90) days and/or by a fine of not more than Five Hundred Dollars (\$500.00), excluding costs.
- D. **Fine or imprisonment not exclusive remedies.** In addition to fine or imprisonment, the City may institute appropriate actions or proceedings at law or equity to enforce the provisions of this chapter or City drainage standards or to correct violations thereof. The conviction and punishment of any person hereunder shall not relieve the person of the responsibility to correct prohibited conditions or to remove prohibited buildings, structures, obstructions or improvements nor prevent the enforcement, correction or removal thereof.

Section 308. - Warning and disclaimer of liability.

The City recognizes that, although the degree of flood protection required by this chapter is considered reasonable for regulatory purposes and is based on scientific and engineering considerations, on rare occasions greater floods can and will occur, and flood heights may be increased by man-made or natural causes. These provisions do not imply that land outside the flood plain areas or that uses permitted within such areas will be free from flooding or flood damages. These provisions shall not create liability on the part of the City of Tulsa or any officer or employee thereof for any flood damages that result from reliance on this chapter or any administrative decision lawfully made thereunder.

(Ord. Nos. 16959, 17285)

City of Jenks

Jenks City Code 2011:

Article 17. Regulation of Earth Changes.

Article 8. Flood Damage Prevention

JENKS CITY CODE 2011

**CONTAINING ALL OF THE ORDINANCES
OF THE CITY OF JENKS, OKLAHOMA
OF A PERMANENT AND GENERAL NATURE
PASSED THROUGH
JUNE 20, 2011
AND STILL IN EFFECT ON THAT DATE**

COMPILED, REVISED AND CODIFIED

BY

**STEPHEN L. OAKLEY
CITY ATTORNEY**

**ROBERT BELL
PLANNING DIRECTOR**

JENKS, OKLAHOMA

- (A) An appeal from any action, decision, ruling, judgment, or order of the Board of Adjustment may be taken by any person or persons, jointly or severally, or any taxpayer, or any officer, department, board or bureau of the city to the district court by filing notice of appeal with the city clerk and with the Board of Adjustment within sixty (60) days from the filing of the decision of the board, which notice shall specify the grounds of such appeal. Upon filing of the notice of appeal as herein provided, the said board shall transmit forthwith to the court clerk of the county the original or certified copy of all the papers constituting the record in the case, together with the order, decision or ruling of the board.
- (B) An appeal to the district court from the Board of Adjustment stays all proceedings in furtherance of the action appealed from, unless the chairman of the Board of Adjustment, from which the appeal is taken, certified to the court clerk, after the notice of appeal shall have been filed, that by reason of the facts stated in the certificate a stay in his opinion would cause imminent peril to life or property. In such case, proceedings shall not be stayed otherwise than by a restraining order which may be granted by the district court upon application or notice to the administrative officer in charge of the enforcement of the terms and provisions of the article, and upon notice to the chairman of the Board of Adjustment from which the appeal is taken, and, upon due cause being shown, the court may reverse or affirm, wholly or partly, or modify the decision brought up for review.

Article 6. Administration

16-6-1. Zoning Officer.

- (A) The provisions of this article shall be administered and enforced by the city manager or his authorized representative, who shall have the right to enter upon any premises for the purpose of making inspection of buildings or premises necessary to carry out his duties hereunder.
- (B) The Planning Commission shall supervise the official zoning map, and the city manager shall keep the same up-to-date with all changes and amendments.

Article 7. Lot Splits

§16-7-1. Lot Splits.

- (A) Any person desiring to divide a tract by splitting a lot shall comply with all the guidelines for the same as set forth in the Jenks Sub-Division Regulations.
- (B) An Application for a lot split shall be accompanied by a fee of One Hundred Dollars (\$100.00), to the City of Jenks, at the time of filing such application. (Ord. #596, Sept. 16, 1985)

Article 8 Flood Damage Prevention – Authorization, Findings of Fact, Purpose and Methods

§ 16-8-1. Statutory Authorization

The Legislature of the State of Oklahoma has in (statutes) 82 O.S. §§1601-1620 delegated the responsibility of local governmental units to adopt regulations designed to minimize flood losses. Therefore, the City of Jenks, Oklahoma City Council does ordain as follows:

§ 16-8-2. Findings of Fact

- (A) The flood hazard areas of the City of Jenks are subject to periodic inundation that results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the public health, safety and general welfare.
- (B) These flood losses are created by the cumulative effect of obstructions in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazards areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, floodproofed or otherwise protected from flood damage.
- (C) Articles 8, 9, 10, 11, 12 and 13 shall be referred to as the Jenks Flood Damage Prevention Ordinance.

§ 16-8-3 Statement of Purpose

- (A) It is the purpose of this ordinance to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:
 - (1) Protect human life and health;
 - (2) Minimize expenditure of public money for costly flood control projects;
 - (3) Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
 - (4) Minimize prolonged business interruptions;
 - (5) Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in floodplains;
 - (3) Help maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas, and;
 - (7) Insure that potential buyers are notified that property is in a flood area.

§ 16-8-4. Methods of Reducing Flood Loss

- (A) In order to accomplish its purposes, this ordinance uses the following methods:
 - (1) Restrict or prohibit uses that are dangerous to health, safety or property in times of flood, or cause excessive increases in flood heights or velocities;

- (2) Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- (3) Control the alteration of natural floodplains, stream channels, and natural protective barriers, which are involved in the accommodation of flood waters;
- (4) Control filling, grading, dredging and other development which may increase flood damage;
- (5) Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.

Article 9 Flood Damage Prevention - Definitions

§ 16-9-1. Definitions

- (A) Unless specifically defined below, words or phrases used in this ordinance shall be interpreted to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

ALLUVIAL FAN FLOODING - means flooding occurring on the surface of an alluvial fan or similar landform which originates at the apex and is characterized by high-velocity flows; active processes of erosion, sediment transport, and deposition; and unpredictable flow paths.

APEX - means a point on an alluvial fan or similar landform below which the flow path of the major stream that formed the fan becomes unpredictable and alluvial fan flooding can occur.

AREA OF SHALLOW FLOODING - means a designated AO, AH, or VO zone on a community's Flood Insurance Rate Map (FIRM) with a one percent chance or greater annual chance of flooding to an average depth of one to three feet where a clearly defined channel does not exist, where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.

AREA OF SPECIAL FLOOD HAZARD - is the land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year. The area may be designated as Zone A on the Flood Hazard Boundary Map (FHBM). After detailed ratemaking has been completed in preparation for publication of the FIRM, Zone A usually is refined into Zones A, AE, AH, AO, A1-99, VO, V1-30, VE or V.

BASE FLOOD - means the flood having a one percent chance of being equaled or exceeded in any given year.

BASE FLOOD ELEVATION – means the elevation above mean sea level of the base flood.

BASEMENT - means any area of the building having its floor sub-grade (below ground level) on all sides.

BOARD – means the Oklahoma Water Resources Board.

CRITICAL FEATURE - means an integral and readily identifiable part of a flood protection system, without which the flood protection provided by the entire system would be compromised.

DEVELOPMENT - means any man-made change in improved and unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

ELEVATED BUILDING - means a non-basement building (i) built, in the case of a building in Zones A1-30, AE, A, A99, AO, AH, B, C, X, and D, to have the top of the elevated floor, or in the case of a building in Zones V1-30, VE, or V, to have the bottom of the lowest horizontal structure member of the elevated floor elevated above the ground level by means of pilings, columns (posts and piers), or shear walls parallel to the floor of the water and (ii) adequately anchored so as not to impair the structural integrity of the building during a flood of up to the magnitude of the base flood. In the case of Zones A1-30, AE, A, A99, AO, AH, B, C, X, and D, "elevated building" also includes a building elevated by means of fill or solid foundation perimeter walls with openings sufficient to facilitate the unimpeded movement of flood waters. In the case of Zones V1-30, VE, or V, "elevated building" also includes a building otherwise meeting the definition of "elevated building," even though the lower area is enclosed by means of breakaway walls if the breakaway walls met the standards of Section 60.3(e)(5) of the National Flood Insurance Program regulations.

EXISTING CONSTRUCTION - means for the purposes of determining rates, structures for which the "start of construction" commenced before the effective date of the FIRM or before January 1, 1975, for FIRMs effective before that date. "Existing construction" may also be referred to as "existing structures."

EXISTING MANUFACTURED HOME PARK OR SUBDIVISION - means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before the effective date of the floodplain management regulations adopted by a community.

EXPANSION TO AN EXISTING MANUFACTURED HOME PARK OR SUBDIVISION- means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).

FLOOD OR FLOODING - means a general and temporary condition of partial or complete inundation of normally dry land areas from:

1. The overflow of inland or tidal waters.
2. The unusual and rapid accumulation or runoff of surface waters from any source.

FLOOD INSURANCE RATE MAP (FIRM) - means an official map of a community, on which the Federal Emergency Management Agency has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.

FLOOD INSURANCE STUDY - is the official report provided by the Federal Emergency Management Agency. The report contains flood profiles, water surface elevation of the base flood, as well as the Flood Boundary-Floodway Map.

FLOODPLAIN OR FLOOD-PRONE AREA - means any land area susceptible to being inundated by water from any source (see definition of flooding).

FLOODPLAIN ADMINISTRATOR – means a person accredited by the Board and designated by a floodplain board or community, to administer and implement laws and regulations relating to the management of the floodplains.

FLOODPLAIN MANAGEMENT - means the operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to emergency preparedness plans, flood control works and floodplain management regulations.

FLOODPLAIN MANAGEMENT REGULATIONS - means zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as a floodplain ordinance, grading ordinance and erosion control ordinance) and other applications of police power. The term describes such state or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction.

FLOOD PROTECTION SYSTEM - means those physical structural works for which funds have been authorized, appropriated, and expended and which have been constructed specifically to modify flooding in order to reduce the extent of the areas within a community subject to a "special flood hazard" and the extent of the depths of associated flooding. Such a system typically includes hurricane tidal barriers, dams, reservoirs, levees or dikes. These specialized flood modifying works are those constructed in conformance with sound engineering standards.

FLOOD PROOFING - means any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.

FLOODWAY (REGULATORY FLOODWAY) - means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

FUNCTIONALLY DEPENDENT USE - means a use, which cannot perform its

intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, but does not include long-term storage or related manufacturing facilities.

HIGHEST ADJACENT GRADE - means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

HISTORIC STRUCTURE - means any structure that is:

- (1) Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
- (2) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
- (3) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of Interior; or
- (4) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:
 - a) By an approved state program as determined by the Secretary of the Interior or;
 - b) Directly by the Secretary of the Interior in states without approved programs.

LEVEE - means a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.

LEVEE SYSTEM - means a flood protection system, which consists of a levee, or levees, and associated structures, such as closure, and drainage devices, which are constructed and operated in accordance with sound engineering practices.

LOWEST FLOOR - means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking or vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; provided that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirement of Section 60.3 of the National Flood insurance Program regulations.

MANUFACTURED HOME - means a structure transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a

permanent foundation when connected to the required utilities. The term "manufactured home" does not include a "recreational vehicle".

MANUFACTURED HOME PARK OR SUBDIVISION - means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

MEAN SEA LEVEL - means, for purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929 or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map are referenced.

NEW CONSTRUCTION - means, for the purpose of determining insurance rates, structures for which the "start of construction" commenced on or after the effective date of an initial FIRM or after December 31, 1974, whichever is later, and includes any subsequent improvements to such structures. For floodplain management purposes, "new construction" means structures for which the "start of construction" commenced on or after the effective date of a floodplain management regulation adopted by a community and includes any subsequent improvements to such structures.

NEW MANUFACTURED HOME PARK OR SUBDIVISION - means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after the effective date of floodplain management regulations adopted by a community.

RECREATIONAL VEHICLE - means a vehicle which is:

- (1) Built on a single chassis;
- (2) 400 square feet or less when measured at the largest horizontal projections;
- (3) Designed to be self-propelled or permanently towable by a light duty truck; and
- (4) Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use

START OF CONSTRUCTION - (for other than new construction or substantial improvements under the Coastal Barrier Resources Act (Pub. L. 97-348)), includes substantial improvement and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement, or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for basement, footings, piers or foundations or the erection of temporary forms; nor does it include the installation

on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

STRUCTURE - means a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home.

SUBSTANTIAL DAMAGE - means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

SUBSTANTIAL IMPROVEMENT - means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before "start of construction" of the improvement. This includes structures, which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either:

- (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary conditions or
- (2) Any alteration of a "historic structure" provided that the alteration would not preclude the structure's continued designation as a "historic structure."

VARIANCE - is a grant of relief to a person from the requirement of this ordinance when specific enforcement would result in unnecessary hardship. A variance, therefore, permits construction or development in a manner otherwise prohibited by this ordinance. (For full requirements see Section 60.6 of the National Flood Insurance Program regulations.)

VIOLATION - means the failure of a structure or other development to be fully compliant with the community's floodplain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in Articles 8, 9, 10, 11 and 12 of Chapter 16 of the Jenks City Code is presumed to be in violation until such time as that documentation is provided.

WATER SURFACE ELEVATION - means the height, in relation to the National Geodetic Vertical Datum (NGVD) of 1929 (or other datum, where specified), of floods of various magnitudes and frequencies in the floodplains of coastal or riverine areas.

Article 10 Flood Damage Prevention – General Provisions

§ 16-10-1. Lands to Which This Ordinance Applies

- (A) The ordinance shall apply to all areas of special flood hazard within the jurisdiction of the City of Jenks, Oklahoma.

§ 16-10-2. Basis for Establishing the Areas of Special Flood Hazard

- (A) The areas of special flood hazard identified by the Federal Emergency Management Agency in a scientific and engineering report entitled, "The Flood Insurance Study for Tulsa County, Oklahoma and Incorporated Areas" dated August 3, 2009, with accompanying Flood Insurance Rate Map (FIRM) are hereby referenced to be effective on August 3, 2009 and before along with any future revisions thereof that are individually adopted by the Jenks City Council are hereby adopted by reference and declared to be a part of this ordinance.
- (B) That all provisions of the flood management regulations of Section 60.3(d) of the National Flood Insurance Program (44CFR 59 et seq.) as amended are hereby incorporated by reference and will determine standards for development unless existing Jenks ordinances or state requirements impose a higher standard, in which event the higher or restrictive standard shall apply.

§ 16-10-3. Establishment of Development Permit

- (A) A Development Permit shall be required to ensure conformance with the provisions of this ordinance.

§ 16-10-4. Compliance

- (A) No structure or land shall hereafter be located, altered, or have its use changed without full compliance with the terms of this ordinance and other applicable regulations.

§ 16-10-5. Abrogation and Greater Restrictions

- (A) This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

§ 16-10-6. Interpretation

- (A) In the interpretation and application of this ordinance, all provisions shall be:
- (1) Considered as minimum requirements;
 - (2) Liberally construed in favor of the governing body; and
 - (3) Deemed neither to limit nor repeal any other powers granted under State statutes.

§ 16-10-7. Warning and Disclaimer of Liability

- (A) The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. On rare occasions greater floods can and will occur and flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of the community or any official or employee thereof for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

Article 11 Flood Damage Prevention - Administration

§ 16-11-1. Designation of the Floodplain Administrator

- (A) The City Engineer is hereby appointed the Floodplain Administrator to administer and implement the provisions of this ordinance and other appropriate sections of 44 CFR (National Flood Insurance Program Regulations) pertaining to floodplain management.

§ 16-11-2. Duties and Responsibilities of the Floodplain Administrator

- (A) Duties and responsibilities of the Floodplain Administrator shall include, but not be limited to, the following:
- (1) Become accredited by the Board in accordance with Title 82 O.S. 1601-1618, as amended
 - (2) Maintain and hold open for public inspection all records pertaining to the provisions of this ordinance.
 - (3) Review permit application to determine whether proposed building site, including the placement of manufactured homes, will be reasonably safe from flooding.
 - (4) Review, approve or deny all applications for development permits required by adoption of this ordinance.
 - (5) Review permits for proposed development to assure that all necessary permits have been obtained from those Federal, State or local governmental agencies (including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334) from which prior approval are required.
 - (6) Where interpretation is needed as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions) the Floodplain Administrator shall make the necessary interpretation.

- (7) Notify, in riverine situations, adjacent communities and the State Coordinating Agency that is the Oklahoma Water Resources Board, prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency.
- (8) Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained.
- (9) When base flood elevation data has not been provided in accordance with Article 10, § Section 16-10-2, the Floodplain Administrator shall obtain, review and reasonably utilize any base flood elevation data and floodway data available from a Federal, State or other source, in order to administer the provisions of Article 12.
- (10) When a regulatory floodway has not been designated, the Floodplain Administrator must require that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.
- (11) Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Program regulations, a community may approve certain development in Zones A1-30, AE, AH, on the community's FIRM which increases the water surface elevation of the base flood by more than one foot, provided that the community **first** applies for a conditional FIRM revision through FEMA (Conditional Letter of Map Revision).

§ 16-11-3. Permit Procedures

- (A) Application for a Development Permit shall be presented to the Floodplain Administrator on forms furnished by him/her and may include, but not be limited to, plans in duplicate drawn to scale showing the location, dimensions, and elevation of proposed landscape alterations, existing and proposed structures, including the placement of manufactured homes, and the location of the foregoing in relation to areas of special flood hazard. Additionally, the following information is required:
 - (1) Elevation (in relation to mean sea level), of the lowest floor (including basement) of all new and substantially improved structures;
 - (2) Elevation in relation to mean sea level to which any nonresidential structure shall be floodproofed;
 - (3) A certificate from a registered professional engineer or architect that the nonresidential floodproofed structure shall meet the flood proofing

criteria of Article 12, Section 16-12-2 (2);

- (4) Description of the extent to which any watercourse or natural drainage will be altered or relocated as a result of proposed development.
- (5) Maintain a record of all such information in accordance with Article 11, Section 16-11-2(1).
- (B) Approval or denial of a Development Permit by the Floodplain Administrator shall be based on all of the provisions of this ordinance and the following relevant factors:
 - (1) The danger to life and property due to flooding or erosion damage;
 - (2) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;
 - (3) The danger that materials may be swept onto other lands to the injury of others;
 - (4) The compatibility of the proposed use with existing and anticipated development;
 - (5) The safety of access to the property in times of flood for ordinary and emergency vehicles;
 - (6) The costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilities and facilities such as sewer, gas, electrical and water systems;
 - (7) The expected heights, velocity, duration, rate of rise and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site;
 - (8) The necessity to the facility of a waterfront location, where applicable;
 - (9) The availability of alternative locations, not subject to flooding or erosion damage, for the proposed use;
 - (10) The relationship of the proposed use to the comprehensive plan for that area.

§ 16-11-4. Variance Procedures

- (A) The Jenks City Council shall act as the Appeal Board and shall hear and render judgment on requests for variances from the requirements of this ordinance.
- (B) The Appeal Board shall hear and render judgment on an appeal only when it is alleged there is an error in any requirement, decision, or determination made by the Floodplain Administrator in the enforcement or administration of this

ordinance. Such Appeal shall be in writing in care of the City Clerk and filed within thirty (30) days of the decision or determination appealed from.

- (C) Any person or persons aggrieved by the decision of the Appeal Board may appeal such decision in the courts of competent jurisdiction.
- (D) The Floodplain Administrator shall maintain a record of all actions involving an appeal and shall report variances to the Federal Emergency Management Agency upon request.
- (E) Variances may be issued for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places, without regard to the procedures set forth in the remainder of this ordinance.
- (F) Variances may be issued for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing the relevant factors in § Section 16-11-3 (2) of this Article have been fully considered. As the lot size increases beyond the one-half acre, the technical justification required for issuing the variance increases.
- (G) Upon consideration of the factors noted above and the intent of this ordinance, the Appeal Board may attach such conditions to the granting of variances as it deems necessary to further the purpose and objectives of this ordinance (Article 8, Section 16-8-3).
- (H) Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result. If a variance is granted for construction within a floodway it shall only be upon approval of the City Council and in compliance with all requirements of the City Engineer.
- (I) Variances may be issued for the repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.
- (J) Prerequisites for granting variances:
 - (1) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
 - (2) Variances shall only be issued upon:
 - (a) Showing a good and sufficient cause; and
 - (b) A determination that failure to grant the variance would result in exceptional hardship to the applicant, and
 - (c) A determination that the granting of a variance will not result in

increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.

- (3) Any applicant receiving a variance shall be notified in writing that the structure permitted with the lowest floor elevation constructed below the base flood elevation, the cost of flood insurance will be commensurate with the increased risk resulting from the lowest floor elevation constructed below the BFE.
- (K) Variances may be issued by a community for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that:
 - (1) The criteria outlined in Article 11, Section 16-11-4 (1)-(9) are met, and
 - (2) The structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.

Article 12 Flood Damage Prevention – Provisions For Flood Hazard Reduction

§ 16-12-1. General Standards

- (A) In all areas of special flood hazards the following provisions are required for all new construction and substantial improvements:
 - (1) All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy;
 - (2) All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage;
 - (3) All new construction or substantial improvements shall be constructed with materials resistant to flood damage;
 - (4) All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.
 - (5) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;
 - (6) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the system and discharge from the systems into flood waters; and,

- (7) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

§ 16-12-2. Specific Standards

- (A) In all areas of special flood hazards where base flood elevation data has been provided as set forth in (i) Article 10, § Section 16-10-2, (ii) Article 11, § Section 16-11-2 (8), or (iii) Article 12, § Section 16-12-3 (3), the following provisions are required:
 - (1) Residential Construction - new construction and substantial improvement of any residential structure shall have the lowest floor (including basement), elevated one foot above the base flood elevation. A registered professional engineer, architect, or land surveyor shall submit a certification to the Floodplain Administrator that the standard of this subsection as proposed in Article 11, Section 16-11-3 (1) a., is satisfied.
 - (2) Nonresidential Construction - new construction and substantial improvements of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to the base flood level or together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice as outlined in this subsection. The Floodplain Administrator shall maintain records of all certifications including the specific elevation (in relation to mean sea level) to which any structure is floodproofed. Also, the minimum development criteria for projects outside the levee and within the boundaries of the Arkansas River Floodplain, but not within the river channel or floodway, is all structures shall be built at a height one foot above the 1986 flood event (approximately 350 year floodplain or a 306,000 cfs release from Keystone Dam) along with the requirement for zero rise to the 100 year floodplain allowing the same conveyance for floodwaters.
 - (3) Enclosures - new construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria:

- a) A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.
 - b) The bottom of all openings shall be no higher than one foot above grade.
 - c) Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.
- (4) Manufactured Homes -
- a) Require that all manufactured homes to be placed within Zone A on a community's FHBM or FIRM shall be installed using methods and practices, which minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces.
 - b) Require that manufactured homes that are placed or substantially improved within Zones A1-30, AH, and AE on the community's FIRM on sites (i) outside of a manufactured home park or subdivision, (ii) in a new manufactured home park or subdivision, (iii) in an expansion to an existing manufactured home park or subdivision, or (iv) in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as a result of a flood, be elevated on a permanent
 - c) foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.
 - d) Require that manufactured homes be placed or substantially improved on sites in an existing manufactured home park or subdivision with Zones A1-30, AH and AE on the community's FIRM that are not subject to the provisions of paragraph (4) of this section be elevated so that either:
 - e) The lowest floor of the manufactured home is at the base flood elevation, or
 - f) Placed on reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement

support the manufactured home chassis.

- (5) Recreational Vehicles - Require that recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM either:
 - a) Be on the site for fewer than 180 consecutive days,
 - b) Be fully licensed and ready for highway use, or
 - c) Meet the permit requirements of Article 11, Section 16-11-3 (1), and the elevation and anchoring requirements for "manufactured homes" in paragraph (4) of this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.

§ 16-12-3. Standards for Subdivision Proposals

- (A) All subdivision proposals including the placement of manufactured home parks and subdivisions shall be consistent with Article 8, Sections 16-8-2 through 4 of this ordinance.
- (B) All proposals for the development of subdivisions including the placement of manufactured home parks and subdivisions shall meet Development Permit requirements of Article 10, Section 16-10-3; Article 11, Section 16-11-3; and the provisions of Article 12 of this ordinance.
- (C) Base flood elevation data shall be generated for subdivision proposals and other proposed development including the placement of manufactured home parks and subdivisions which is greater than 50 lots or 5 acres, whichever is lesser, if not otherwise provided pursuant to Article 10, Section 16-10-2 or Article 11, Section 16-11-2 (8) of this ordinance.
- (D) All subdivision proposals including the placement of manufactured home parks and subdivisions shall have adequate drainage provided to reduce exposure to flood hazards.
- (E) All subdivision proposals including the placement of manufactured home parks and subdivisions shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize or eliminate flood damage.

§ 16-12-4. Standards for Areas of Shallow Flooding

- (A) Located within the areas of special flood hazard established in Article 10, Section 16-10-2, are areas designated as shallow flooding. These areas have special flood hazards associated with base flood depths of 1 to 3 feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and where velocity flows may be evident. Such flooding is characterized by ponding or sheet flow; therefore, the following provisions

apply:

- (1) All new construction and substantial improvements of **residential** structures have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified).
- (2) All new construction and substantial improvements of **non-residential** structures;
 - a) Have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified), or;
 - b) Together with attendant utility and sanitary facilities be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads of effects of buoyancy.
- (3) A registered professional engineer or architect shall submit a certification to the Floodplain Administrator that the standards of this Section, as proposed in Article 11, Section 16-11-3 (1) a., are satisfied.
- (4) Require within Zones AH or AO adequate drainage paths around structures on slopes, to guide floodwaters around and away from proposed structures.

§ 16-12-5. Floodways

- (A) Floodways - located within areas of special flood hazard established in Article 10, Section 16-10-2, are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of floodwaters that carry debris, potential projectiles and erosion potential, the following provisions shall apply:
 - (1) Encroachments are prohibited, including fill, new construction, substantial improvements and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.
 - (2) If Article 12, Section § 16-12-5 (1) above is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of Article 12.
 - (3) Under the provisions of 44 CFR Chapter 1, Section 65.12, of the

National Flood Insurance Regulations, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community **first** applies for a conditional FIRM and floodway revision through FEMA.

Article 13 Flood Damage Prevention – Enforcement and Penalties For Noncompliance

§ 16-13-1 Fine Imposed

- (A) No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this ordinance and other applicable regulations. Any person, firm, corporation or other legal entity violating the requirements of this ordinance, or any conditions made pursuant thereto, shall be guilty of an offense and, upon conviction thereof, shall be fined not more than \$100 and each day's violation thereof shall constitute a separate offense, plus applicable court costs.

§ 16-13-2 Fine Not Exclusive Remedy

- (A) In addition to fine, the City may institute appropriate actions or proceedings at law or equity for the enforcement of the provisions of this ordinance or to correct the violations thereof. The conviction and punishment of any person hereunder shall not relieve such person from the responsibility to correct prohibited conditions or to remove prohibited buildings, structures, obstructions, or improvements, nor prevent the enforcement, corrections or removal thereof.

§ 16-13-3 Certification

- (A) It is hereby found and declared by the City of Jenks City Council that severe flooding has occurred in the past within its jurisdiction and will certainly occur within the future; that flooding is likely to result in infliction of serious personal injury or death, and is likely to result in substantial injury or destruction of property within its jurisdiction; in order to effectively comply with minimum standards for coverage under the National Flood Insurance Program; and in order to effectively remedy the situation described herein, it is necessary that this ordinance become effective immediately. (Amended June 15, 2009, Ord. #1250)

City of Bixby

Chapter 10 of the Bixby City Code - STORM DRAINAGE, DETENTION AND EARTH CHANGE (Ord. 854, 9-9-2002; amd. 2006 Code)

Chapter 2 - FLOOD DAMAGE PREVENTION

Chapter 3 - EARTH CHANGES

Title 13 FLOOD CONTROL

Chapter 1 DRAINAGE REGULATIONS

13-1-1: OBSTRUCTIONS, ACCUMULATIONS:

No person shall allow any filth, dirt or other obstructions of any kind to accumulate in any gutter, drainageway or bar ditch adjoining their property, and all owners or occupants of property located within the city are required to keep the drainageways or bar ditches adjoining the premises owned or occupied by them open, clean and free from trash and of other obstructions to the easy and rapid flow of water through such ditch, and to maintain the ditch at a low enough elevation to permit drainage to flow easily along the way established for such drainage. (2006 Code)

13-1-2: ELEVATIONS; DUTY OF PROPERTY OWNERS:

The city manager is authorized to determine, with assistance of such other officials or engineers of the city as may be necessary, the elevation and area necessary to be cleaned for the use of flowing water through and over the waterway or bar ditch, and the adjoining property owner or occupant is forbidden to allow any filth, dirt or other obstructions of any kind to accumulate which will reduce the flowage in any manner. (2006 Code)

13-1-3: PENALTY:

Except as stated otherwise, violations of this chapter are punishable as provided in section [1-4-1](#) of this code. (2006 Code)

Chapter 2 FLOOD DAMAGE PREVENTION

ARTICLE A. GENERAL PROVISIONS

13-2A-1: DEFINITIONS:

The following words, terms and phrases, when used in this chapter, including articles A through D, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning. Unless specifically defined below, words or phrases used in this chapter, including articles A through D, shall be interpreted to give them the meaning they have in common usage and to give this chapter its most reasonable application.

AREA OF SHALLOW FLOODING: A designated AO and AH zone on the city flood insurance rate map (FIRM) with a one percent (1%) chance or greater annual chance of flooding to an average depth of one to three feet (3'), where a clearly defined channel does not exist, where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.

AREA OF SPECIAL FLOOD HAZARD: The land in the floodplain subject to a one percent (1%) or greater chance of flooding in any given year. The area may be designated as zones A, AE, AH, AO, AR and A1-99 on the flood insurance rate map and the floodway hazard boundary map.

BASE FLOOD: The flood having a one percent (1%) chance of being equaled or exceeded in any given year.

BASEMENT: Any area of the building having its floor subgrade (below ground level) on all sides.

CRITICAL FEATURE: An integral and readily identifiable part of a flood protection system, without which the flood protection provided by the entire system would be compromised.

DEVELOPMENT: Any manmade change in improved and unimproved real estate, including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, or storage of equipment or materials.

DEVELOPMENT PERMIT: Any building permit and/or earth change permit which allows the construction of a structure or the movement of earth on a lot.

ELEVATED BUILDING: A nonbasement building built, in the case of a building in zones A, AE, AO, AH, AR and A99, to have the top of the elevated floor, to have the bottom of the lowest horizontal structural member of the elevated floor elevated above the ground level by means of pilings, columns (posts and piers), or shear walls; and adequately anchored so as not to impair the structural integrity of the building during a flood of up to the magnitude of the base flood. In the case of zones A, AE, AO, AH, AR and A99, the term "elevated building" also includes a building elevated by means of fill or solid foundation perimeter walls with openings sufficient to facilitate the unimpeded movement of floodwaters.

EXISTING CONSTRUCTION: Structures for which the start of construction commenced before September 28, 1979. "Existing construction" may also be referred to as "existing structures".

EXISTING MANUFACTURED HOME PARK OR SUBDIVISION: A manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets and either final site grading or the pouring of concrete pads) is completed before the effective date of the floodplain management regulations adopted by the city.

EXPANSION TO AN EXISTING MANUFACTURED HOME PARK OR SUBDIVISION: The preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets and either final site grading or the pouring of concrete pads).

FLOOD INSURANCE RATE MAP (FIRM): An official map of the city, on which the federal emergency management agency (FEMA) has delineated both the areas of special flood hazard and the risk premium zones applicable.

FLOOD INSURANCE STUDY: The official report provided by the federal emergency management agency (FEMA). The report contains flood profiles, water surface elevations of the base flood, as well as the flood boundary-floodway map.

FLOOD OR FLOODING: A general and temporary condition of partial or complete inundation of normally dry land areas from the unusual and rapid accumulation or runoff of surface waters from any source.

FLOOD PROTECTION SYSTEM: Physical structural works for which funds have been authorized, appropriated and expended and which have been constructed specifically to modify flooding in order to reduce the extent of the areas within the city subject to a special flood hazard and the extent of the depths of associated flooding. These specialized flood modifying works are those constructed in conformance with sound engineering design standards.

FLOODPLAIN OR FLOOD PRONE AREA: Any land area susceptible to being inundated by water from any source.

FLOODPLAIN MANAGEMENT: The operation of an overall program or corrective and preventive measures for reducing flood damage, including, but not limited to, emergency preparedness plans, flood control works and floodplain management regulations.

FLOODPLAIN MANAGEMENT REGULATIONS: Zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as a floodplain ordinance, grading ordinance and erosion control ordinance) and other applications of the police power. The term describes such state or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction.

FLOODPROOFING: Any combination of structural and nonstructural additions, changes or

adjustments to structures, which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.

FLOODWAY OR REGULATORY FLOODWAY: The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

HABITABLE FLOOR: Any floor usable for purposes, which includes: working, sleeping, eating, cooking, recreation or a combination thereof. A floor used for storage purposes only in a residential zone is not a habitable floor.

HIGHEST ADJACENT GRADE: The highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

HISTORIC STRUCTURE: Any structure that is: a) listed individually in the National Register of Historic Places, a listing maintained by the department of interior or preliminarily determined by the secretary of the interior as meeting the requirements for individual listing on the national register; b) certified or preliminarily determined by the secretary of the interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the secretary to qualify as a registered historic district; c) individually listed on a state inventory of historic places with historic preservation programs, which have been approved by the secretary of the interior; d) individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified the secretary of the interior.

LEVEE: A flood protection system which consists of a levee or levees, and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from flooding.

LEVEE SYSTEM: A flood protection system which consists of a levee or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices.

LOWEST FLOOR: The lowest floor of the lowest enclosed area, including basement. An unfinished or flood resistant enclosure, usable solely for the parking of vehicles, building access or storage, in an area other than a basement area, is not considered a building's lowest floor; provided, that such enclosure is not built so as to render the structure in violation of the applicable nonelevation design requirement of section 60.3 of the national flood insurance program regulations.

MANUFACTURED HOME: A structure transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. For floodplain management purposes, the term "manufactured home" also includes park trailers, travel trailers and other similar vehicles placed on a site for greater than one hundred eighty (180) consecutive days. For insurance purposes, the term "manufactured home" does not include park trailers, travel trailers and other similar vehicles.

MANUFACTURED HOME PARK OR SUBDIVISION: A parcel or contiguous parcels or land

divided into two (2) or more manufactured home lots for rent or sale.

MEAN SEA LEVEL: The national geodetic vertical datum (NGVD) of 1929, to which base flood elevations shown on the city flood insurance rate map are referenced.

NEW CONSTRUCTION: Structures for which the start of construction commenced after September 28, 1979.

100-YEAR FLOOD: Flood designation to indicate the one percent (1%) chance of flooding in any five year.

START OF CONSTRUCTION: The date the building permit was issued, provided the actual start of construction, repair, reconstruction, placement or other improvement was within one hundred eighty (180) days of the permit date. The "actual start" means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any other work beyond the stage of excavation; or the placement of a manufactured home on a foundation. "Permanent construction" does not include land preparation, such as clearing, grading and filling; nor does it include excavation for basements, footings, piers or foundations, or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure.

STRUCTURE: A walled and roofed building, including a gas or liquid storage tank, that is principally aboveground, as well as a manufactured home.

SUBSTANTIAL DAMAGE: Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed fifty percent (50%) of the market value of the structure before the damage occurred.

SUBSTANTIAL IMPROVEMENT: Any repair, reconstruction or improvement of a structure, the cost of which equals or exceeds fifty percent (50%) of the market value of the structure either before the improvement or repair is started or, if the structure has been damaged and is being restored, before the damage occurred. For the purpose of this definition, "substantial improvement" is considered to occur when the first alteration affects the external dimensions of the structure. The term does not, however, include either any project for improvement of a structure to comply with existing state or local health, sanitary or safety code specifications which are solely necessary to assure safe living conditions, or any alteration of a structure listed on the National Register of Historic Places, or a state inventory of historic places.

VARIANCE: A grant of relief to a person or corporation from the requirements of this chapter, including articles A through D, when specific enforcement would result in unnecessary hardship or when an applicant presents an assuredly effective alternative for realization of the loss mitigation objective. A variance therefor permits construction or development in a manner otherwise prohibited by this chapter.

VIOLATION: The failure of a structure or other development to be fully compliant with the city floodplain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in this

chapter, including articles A through D, is presumed to be in violation until such time as that documentation is provided.

WATER SURFACE ELEVATION: The height, in relation to the national geodetic vertical datum (NGVD) of 1929, of floods of various magnitudes and frequencies in the floodplains of riverine areas. (2006 Code)

13-2A-2: STATUTORY AUTHORIZATION:

The legislature of the state has, in the state statutes, delegated the responsibility to local governmental units to adopt regulations designed to minimize flood losses (OFMA act title 82, sections 1601 through 1619). (2006 Code)

13-2A-3: FINDINGS OF FACT:

- A. Adverse Effects Resulting From Flooding: The flood hazard areas of the city are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the public health, safety and general welfare.
- B. These flood losses are created by the cumulative effect of obstructions in floodplains which cause an increase in flood heights and velocities; by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated or otherwise not protected from flood; encroachment on the channel cross section and storage capacity of the floodplain area which increases flood heights or velocity; urbanization of the drainage basin outside the floodplain area which accelerates runoff and adversely affects flood peaks, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, floodproofed or otherwise protected from flood damage. (2006 Code)

13-2A-4: STATEMENT OF PURPOSE:

It is the purpose of this chapter, including articles A through D, to promote the public health,

safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

- A. Protect human life and health;
- B. Minimize expenditure of public money for costly flood control projects;
- C. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- D. Minimize prolonged business interruptions;
- E. Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in floodplains;
- F. Restrict or prohibit uses, including public uses, which are dangerous to health, safety or property in terms of flood or cause increases in flood heights or velocities;
- G. Require that uses vulnerable to floods, including public facilities, which serve such uses, shall be protected against flood damage at the time of initial construction;
- H. Identify lands which are subject to flooding hazards, to inform and protect individuals from purchasing properties, which may not be suited for their intended purposes because of flood hazard;
- I. Comply with the regulations of the national flood insurance program (NFIP); and
- J. Help maintain a stable tax base by providing for the sound use and development of flood prone areas in such a manner as to minimize future flood blight areas. (2006 Code)

13-2A-5: METHODS OF REDUCING FLOOD LOSSES:

In order to accomplish its purposes, this chapter, including articles A through D, uses the following methods:

- A. Restrict or prohibit uses that are dangerous to health, safety or property in times of flood, or cause excessive increases in flood heights or velocities.
- B. Require that uses vulnerable to floods, including facilities, which serve such uses, be protected against flood damage at the time of initial construction.
- C. Control the alteration of natural floodplains, stream channels and natural protective barriers, which are involved in the accommodation of floodwaters.
- D. Control filling, grading, dredging and other development, which may increase flood damage.
- E. Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands. (2006 Code)

13-2A-6: LANDS APPLICABLE:

This chapter, including articles A through D, shall apply to all areas of special flood hazard within the jurisdiction of the city, and all areas not in the special flood hazard area that contribute to a storm basin that affect a special flood hazard area. (2006 Code)

ARTICLE B. ADMINISTRATION AND ENFORCEMENT

13-2B-1: BASIS FOR ESTABLISHING AREAS OF SPECIAL FLOOD HAZARD:

The areas of special flood hazard (SFHA) identified by the federal emergency management agency (FEMA) in scientific and engineering reports entitled "The Flood Insurance Study For Tulsa County, Oklahoma And Incorporated Areas" dated August 3, 2009, and "The Flood Insurance Study For Wagoner County, Oklahoma And Incorporated Areas" dated April 17, 2012, and "The Flood Insurance Study For Tulsa County, Oklahoma And Incorporated Areas" dated October 16, 2012, with their accompanying flood insurance rate maps (FIRMs), delineating floodplains and floodways and special flood hazard areas, attached hereto, are hereby adopted by reference and declared to be a part of this chapter. (Ord. 2090, 8-27-2012)

13-2B-2: COMPLIANCE:

No structure or land shall hereafter be located, altered or have its use changed without full compliance with the terms of this chapter and other applicable regulations and ordinances. (2006 Code)

13-2B-3: ABROGATION AND GREATER RESTRICTIONS:

This chapter is not intended to repeal, abrogate or impair any existing easements, covenants or deed restrictions. However, where this chapter and another provision conflict or overlap, whichever imposes the more stringent restrictions shall prevail. (2006 Code)

13-2B-4: INTERPRETATION:

In their interpretation and application, the provisions of this chapter shall be held to be minimum requirements and should be liberally construed to accomplish their intended purposes and shall not be deemed a limitation or repeal of any other powers granted by state statutes. (2006 Code)

13-2B-5: WARNING AND DISCLAIMER OF LIABILITY:

The degree of flood protection required by this chapter is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. On rare occasions, greater floods can and will occur and flood heights may be increased by manmade or natural causes. This chapter does not imply that land outside the areas of special flood hazard or uses permitted within such areas will be free from flooding or flood damages. This chapter shall not create liability on the part of the city or any official or employee thereof for any flood damages that result from reliance on this chapter or any administrative decision lawfully made hereunder. (2006 Code)

13-2B-6: DESIGNATION OF FLOODPLAIN ADMINISTRATOR:

The city planner, or person designated by the city manager, is hereby appointed the floodplain administrator to administer and implement the provisions of this chapter and other appropriate sections of 44 CFR (national flood insurance program regulations) pertaining to floodplain management. (2006 Code)

13-2B-7: DUTIES AND RESPONSIBILITIES OF ADMINISTRATOR:

Duties and responsibilities of the floodplain administrator shall include, but not be limited to, the following:

- A. Maintain and hold open for public inspection all records pertaining to the provisions of this chapter.
- B. Review permit applications to determine whether proposed building sites would be reasonably safe from flooding.
- C. Review, approve or deny all applications for development permits required by this chapter, including articles A through D.
- D. Review building applications for general compliance with federal, state and local governmental agencies permits (including section 404 of the federal water pollution control act amendments of 1972, 33 USC 1334).

- E. Where interpretation is needed as to the exact location of the boundaries of the areas of special flood hazard, the floodplain administrator shall make the necessary interpretation.
- F. Notify, in riverine situations, adjacent communities and any other agency, prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the federal emergency management agency (FEMA).
- G. Verify that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained.
- H. When base flood elevation data has not been provided in accordance with section [13-2B-1](#) of this article, the floodplain administrator shall obtain, review and reasonably utilize any base flood elevation data and floodway data available from federal, state or other sources, in order to administer the provisions of this chapter, including articles A through D.
- I. When a regulatory floodway has not been designated, the floodplain administrator must require that no new construction, substantial improvements or other development, including fill, shall be permitted within zones A1-30 and AE on the FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot (1') at any point. (2006 Code)

13-2B-8: DEVELOPMENT/EARTH CHANGE PERMIT REQUIRED:

A building permit and/or earth change permit¹ shall be required to ensure conformance with the provisions of this chapter, including articles A through D. (2006 Code)

13-2B-9: PERMIT PROCEDURES:

- A. Application: Application for a development permit (building permit and/or earth change permit) shall be submitted to the city for review by the city staff and floodplain

administrator, and may include, but not be limited to, plans in duplicate drawn to a minimum scale of one inch equals two hundred feet (1" = 200'), showing the location, dimensions and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of special flood hazard. In addition to the requirements of earth change permit and/or subdivision regulations, the following information is required:

1. Elevation, in relation to mean sea level, of the lowest floor of all new and substantially improved structures.
2. Elevation in relation to mean sea level to which any nonresidential structure shall be floodproofed.
3. A certificate from a registered professional engineer or architect that the nonresidential floodproofed structures shall meet the flooding criteria in this chapter, including articles A through D.
4. Description of the extent to which any watercourse or natural drainage will be altered or relocated as a result of proposed development.

B. Factors For Approval Or Denial: Approval or denial of a development permit by the floodplain administrator shall be based on all of the provisions of this chapter, including articles A through D, and the following relevant factors:

1. The danger of life and property due to flooding or erosion damage.
2. The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner.
3. The danger that materials may be swept onto other lands to the injury of others.
4. The compatibility of the proposed use with existing and anticipated development.
5. The safety of access to the property in times of flood for ordinary and emergency vehicles.
6. The cost of providing governmental services during and after flood conditions, including maintenance and repair of streets and bridges, public utilities and facilities such as sewer, gas, electrical and water systems.
7. The expected heights, velocity, duration, rate of rise and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site.
8. The availability of alternate locations, not subject to flooding or erosion damage, for the proposed use.
9. The relationship of the proposed use to the comprehensive land use plan for that area. (2006 Code)

13-2B-10: REVOCATION OR SUSPENSION OF PERMIT:

- A. Conditions: Any permit granted under this chapter, including articles A through D, may be revoked or suspended by the floodplain administrator upon written notice to the permit holder, specifying the grounds for such revocation or suspension. A permit may be revoked or suspended upon the occurrence of any one of the following events:
1. Violation of any condition of the development permit.
 2. Violation of any provision of this chapter, including articles A through D, or any other applicable law, ordinance, rule or regulation pertaining to the development permit.
 3. Existence of any condition or the doing of any act constituting or creating a hazard or endangering human life or property of others.
- B. Serving Notices And Orders: Notices and orders required by this section shall be served upon the party concerned, either personally or by certified mail, addressed to the individual contracting party or permit holder at the address given on the development permit application filed with the floodplain administrator. (2006 Code)

13-2B-11: NOTIFICATION OF NONCOMPLIANCE:

At any time an act is performed which is not in accordance with this chapter, including articles A through D, and including conditions and approved modifications thereof, a written notice to comply shall be given by the floodplain administrator stating the nature of the alleged noncompliance. The responsible parties shall have such time as may be allowed in writing by the floodplain administrator to correct all noted deficiencies. The time allowed shall be reasonable and shall be determined by the nature of the deficiency. (2006 Code)

13-2B-12: VARIANCE PROCEDURES:

- A. Requests: The board of adjustment shall hear and render judgment on requests for variances from the requirements of this chapter, including articles A through D.

- B. Authority: The board of adjustment shall hear and render judgment when it is alleged there is an error in any requirement, decision or determination made by the floodplain administrator in the enforcement of this chapter, including articles A through D.
- C. Persons Permitted: Any person aggrieved by the decision of the board of adjustment may appeal such decision in the courts of competent jurisdiction.
- D. Records Maintained; Reporting: The floodplain administrator shall maintain a record of all actions involving an appeal and shall report variances to the federal emergency management agency (FEMA) upon request.
- E. Historic Places: Variances may be issued for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places, or a state inventory of historic places, without regard to the procedures set forth in the remainder of this section.
- F. Lot Size: Variances may be issued for new construction and substantial improvements to be erected on a lot of one-half ($1/2$) acre or less in size, contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing the relevant factors in section [13-2A-4](#) of this chapter have been fully considered. As the lot size increases beyond the one-half ($1/2$) acre, the technical justification required for issuing the variance increases.
- G. Conditions Attached: Upon consideration of the factors noted above and the intent of this chapter, including articles A through D, the board of adjustment may attach such conditions to the granting of variances as it deems necessary to further the purpose and objectives of this chapter, including articles A through D.
- H. Increase In Flood Levels Prohibited: Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result.
- I. Prerequisites: Prerequisites for granting variances:
 - 1. Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.

2. Variances shall only be issued upon a showing of good and sufficient cause; a determination that failure to grant the variance would result in exceptional hardship to the applicant; and a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, fraud on or victimization of the public, or conflict with existing laws or ordinances.
3. Any applicant to whom a variance is granted shall be given written notice that the structure will be permitted to be built with the lowest floor elevation below the base flood elevation, and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.

J. Functionally Dependent Uses: Variances may be issued for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use; provided, that the criteria outlined in subsections A through I of this section are met; and provided, that the structure or other development is protected by methods that minimize flood damages during the base flood create no additional threats to public safety. (2006 Code)

13-2B-13: PENALTY:

Except as stated otherwise, violations of this chapter, including articles A through D, are punishable as provided in section [1-4-1](#) of this code. (2006 Code)

ARTICLE C. FLOOD HAZARD REDUCTION

13-2C-1: STANDARDS FOR AREAS OF SPECIAL FLOOD HAZARD:

In all areas of special flood hazard, the following provisions are required for all new construction and substantial improvements:

- A. New construction, substantial improvements or other development (including fill) shall not be approved if it: 1) adversely affects the capacity of channels or floodways of any watercourse; 2) would measurably increase flood flows or flood heights, or increase flood damage upon off site properties during the occurrence of flooding; 3) would individually or, when combined with all other existing and anticipated development, expose additional upstream, downstream or adjacent properties to adverse flood affects that would otherwise not be exposed to such affects due to the regulatory flood; and 4) increase

velocities of volumes of floodwaters to the extent that significant erosion of floodplain soils would occur either on the subject property or on some other property upstream or downstream.

- B. Encroachments in floodways, including fill, new construction, substantial improvements, and other development that would result in any increase in flood levels during the occurrence of the regulatory flood shall be prohibited.
- C. All new construction or substantial improvements shall be designed or modified, and adequately anchored, to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.
- D. All new construction and substantial improvements shall be constructed with materials resistant to flood damage.
- E. All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage.
- F. All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and located at least one foot (1') above base flood elevation so as to prevent water from entering or accumulating within the components during conditions of flooding.
- G. All new and replacement water supply systems shall be designed to minimize or eliminate the infiltration of floodwaters into the system.
- H. New and replacement sanitary sewage systems shall be designed to minimize or eliminate the infiltration of floodwaters into the system and discharge from the system into floodwaters.
- I. On site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding. (2006 Code)

13-2C-2: SPECIFIC STANDARDS FOR CERTAIN AREAS:

In all areas of special flood hazard where base flood elevation data has been provided, the following provisions are required:

- A. Residential Construction: New construction and substantial improvement of any residential structure, including manufactured homes, shall have the lowest floor elevated to one foot (1') or more above the base flood elevation. A registered professional land surveyor or engineer shall submit an "elevation certificate" to the floodplain administrator that the standard of this subsection is satisfied. The elevation certificate shall be submitted on completion of the lowest habitable floor and approved by the city prior to continuance of construction.
- B. Nonresidential Construction: New construction and substantial improvements shall either have the lowest floor elevated to one foot (1') or more above the base flood elevation or, together with attendant utility and sanitary facilities, be designed so that below the base flood elevation the structure is watertight and walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A registered professional engineer or architect shall develop and/or review structural design, specifications and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice as outlined in this subsection. A record of such certification, which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained by the floodplain administrator. A registered professional land surveyor or engineer shall submit an "elevation certificate" to the floodplain administrator.
- C. Enclosures: New construction and/or substantial improvements with fully enclosed areas, located below the lowest floor, and subject to flooding, shall be designed to automatically equalize hydrostatic floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria:
 - 1. A minimum of two (2) openings having a total of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.
 - 2. The bottom of all openings shall be no higher than one foot (1') above grade.
 - 3. Openings may be equipped with screens, louvers, valves or other coverings or devices; provided, that they permit the automatic entry and exit of floodwaters.

- D. **Manufactured Homes:** Require that all manufactured homes to be placed within zone A, AE, AH, AO, AR and A99, as designated on the current FIRM map, shall be installed using methods and practices, which minimize flood damage with the lowest habitable floor located at least one foot (1') above base flood elevation; with all electrical, heating, ventilation, plumbing, air conditioning equipment and other service facilities located at least one foot (1') above base flood elevation. A registered professional land surveyor or engineer shall submit an "elevation certificate" to the floodplain administrator that the standard of this subsection is satisfied. For the purpose of this requirement, manufactured homes shall be elevated and anchored to resist flotation, collapse or lateral movement. Methods of anchoring may include, but are not limited to, use of over the top or frame ties to ground anchors. This requirement is in addition to applicable state and local anchoring requirements for resisting wind forces. (2006 Code)

13-2C-3: MINIMUM STANDARDS FOR SUBDIVISIONS:

- A. Standards shall apply to all subdivisions, including manufactured home parks, proposed to be located within a hazard area of a 100-year, one percent (1%) flood zone, with a designation of A, AE, AH, AO, AR, A99 or floodway, as defined by the current flood insurance rate map (FIRM) as published, amended and approved by FEMA.
- B. Subdivisions, including manufactured home parks, adjacent to or containing a zoned hazard area, as determined by the current FIRM map within the platted area, shall only be approved after review by a registered engineer licensed to do business in the state, with detailed information outlining any adverse affect on the flood basin in which the proposed subdivision or manufactured home park is located.
- C. Building lots shall not be platted within an area of special flood hazard without the expressed approval of the city engineer and floodplain administrator.
- D. Redevelopment and infill of lots in an existing subdivision shall be done only in accordance with the provisions of this chapter, including articles A through D. Redevelopment not delineated by this chapter, including articles A through D, must be approved by an ordinance adopted by the city council.
- E. All development is subject to an earth change or floodplain permit.

- F. Base flood elevation data shall be generated for subdivisions, including manufactured home parks.
- G. All subdivisions, including manufactured home parks, shall have adequate drainage to reduce exposure to flood hazards.
- H. All subdivisions, including manufactured home parks, shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize or eliminate flood damage. (2006 Code)

13-2C-4: MINIMUM STANDARDS FOR AREAS OF SHALLOW FLOODING (AO/AH ZONES):

Located within the areas of special flood hazard established on the current FIRM map are areas designated as shallow flooding. These areas have special flood hazards associated with base flood depths of one to three feet (3') where a clearly defined channel does not exist and where the path of flooding is unpredictable and where velocity flow may be evident, such flooding is characterized by ponding or sheet flow; therefore, the following provisions apply:

- A. All new construction and substantial improvements of residential structures have the lowest floor (including basement) elevated above the highest adjacent grade at least one foot (1') higher than the depth number specified in feet on the FIRM map (at least 4 feet if no depth number is specified). A registered professional land surveyor shall submit an "elevation certificate" to the floodplain administrator that the standard of this section is satisfied.
- B. All new construction and substantial improvements of nonresidential structures have the lowest floor (including basement) elevated above the highest adjacent grade at least one foot (1') higher than the depth number specified in feet on the FIRM map (at least 4 feet if no depth number is specified), together with attendant utility and sanitary facilities be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads or effects of buoyancy.

- C. A registered professional engineer or architect shall submit a certification to the floodplain administrator that the standards of this section are satisfied. A registered professional land surveyor or engineer shall submit an "elevation certificate" to the floodplain administrator that the standards of this section are satisfied. (2006 Code)

13-2C-5: FLOODWAYS:

Since the floodway is an extremely hazardous area due to the velocity of floodwaters, which carry debris, potential projectiles and erosion potential, the following provisions shall apply:

- A. Encroachments are prohibited, including fill, new construction, substantial improvements and other development unless certification by a professional engineer or architect is provided demonstrating that encroachments shall not result in any increase in flood levels within the city during the occurrence of the base flood discharge.
- B. All new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of this article. (2006 Code)

ARTICLE D. NONCONFORMING USES

13-2D-1: SPECIAL REGULATIONS:

The provisions of this article shall govern nonconforming uses located in a special flood hazard area, and they shall be interpreted as supplemental to the provisions of [title 11, chapter 11](#) of this code, which generally govern nonconforming uses. In the event of any conflict between this article and the provisions of [title 11, chapter 11](#) of this code, such conflict shall be resolved in favor of the requirements established in this article. (2006 Code)

13-2D-2: NONCONFORMING CONDITIONS:

A structure, including manufactured homes, or the use of a structure on premises which were lawful before the passage of this chapter, including articles A through D, but did not conform to the provisions of this chapter, including articles A through D, may be continued, subject to the following conditions:

- A. No repair or reconstruction of any destroyed structure shall exceed fifty percent (50%) of its current replacement cost immediately prior to its destruction. If any nonconforming use or structure is destroyed by any means, including floods, to an extent of more than fifty percent (50%), it shall not be reconstructed except in conformity with the provisions of this article;
- B. The fifty percent (50%) threshold for reconstruction shall be cumulative over the life of the structure;
- C. Uses or adjuncts thereof which are or become a nuisance shall not be entitled to continue as nonconforming uses; and
- D. Any use permitted as a special exception that does not conform to this chapter, including articles A through D, shall be considered a nonconforming use. (2006 Code)

Chapter 3

EARTH CHANGES¹

ARTICLE A. GENERAL PROVISIONS

13-3A-1: DEFINITIONS:

The following words, terms and phrases, when used in this chapter, including articles A and B, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning. Unless specifically defined below, words or phrases used in this chapter, including articles A and B, shall be interpreted to give them the meaning they have in common usage and to give this chapter its most reasonable application:

EARTH CHANGE: Excavating, grading, regrading, filling, berming or diking land within the city.

EARTH CHANGE PERMIT: A permit issued by the city authorizing excavation, grading, regrading, filling, berming or diking of property.

TRACT: Any parcel of land subject to the provisions of this chapter, including articles A and B. (2006 Code)

13-3A-2: REMEDIAL ACTION IN ADDITION TO PENALTY:

In addition to fine or imprisonment, the city may institute appropriate actions or proceedings at law or equity for the enforcement of the provisions of this chapter, including articles A and B, or adopted city engineering design standards, or to correct violations thereof, and, if applicable and appropriate, the city may institute appropriate actions or proceedings at law or equity against any surety company, escrow holder or any third party who has affirmatively acted as surety or guarantor for the faithful performance of the permit holder's work. (2006 Code)

13-3A-3: PURPOSE:

This chapter, including articles A and B, is enacted for the purposes of protecting the general health, safety and welfare of the citizens of the city from the hazards and danger of flooding and inadequate or improper drainage by imposing standards and conditions upon the excavating, grading, regrading, filling, berming and diking of land within the city. (2006 Code)

13-3A-4: SCOPE:

The provisions of this chapter, including articles A and B, shall apply to and be binding upon every person in the city who seeks to develop, redevelop, grade, regrade, excavate, fill, berm or dike land within the city. (2006 Code)

13-3A-5: LANDS APPLICABLE:

This chapter, including articles A and B, shall apply to all lands within the jurisdiction of the city. (2006 Code)

13-3A-6: COMPLIANCE:

No land shall hereafter be developed, redeveloped, graded, regraded, excavated, filled, bermed or diked without full compliance with the terms of this chapter, including articles A and B, and other applicable regulations. (2006 Code)

13-3A-7: ABROGATION AND GREATER RESTRICTIONS:

It is not intended by this chapter, including articles A and B, to repeal, abrogate or impair any existing easements, covenants or deed restrictions. However, where this chapter, including articles A and B, imposes greater restrictions, the provisions of this chapter, including articles A and B, shall prevail. All other ordinances inconsistent with this chapter, including articles A and B, are hereby repealed to the extent of their inconsistency only. (2006 Code)

13-3A-8: INTERPRETATION:

In the interpretation and application, the provisions of this chapter, including articles A and B, shall be considered as minimum requirements as determined by the city engineer; and deemed neither to limit or repeal any of the other powers granted under state statutes. (2006 Code)

13-3A-9: WARNING AND DISCLAIMER OF LIABILITY:

The degree of protection required by this chapter, including articles A and B, is considered reasonable for regulatory purposes and is based on engineering and scientific methods of study and computations. This chapter, including articles A and B, does not imply that land uses permitted will be free from hydraulic or wind erosion or flooding. This chapter, including articles A and B, its application or enforcement shall not create liability on the part of the city or any officer or employee thereof for any damages that result from reliance on this chapter, including articles A and B, or any administrative decision lawfully made thereunder. (2006 Code)

13-3A-10: STANDARDS ESTABLISHED:

The regulations governing the design, installation, maintenance, siltation, erosion control,

and the utilization of all detention/drainage structures and facilities shall be by established ordinances, standards and policies. (2006 Code)

13-3A-11: PENALTY:

Except as stated otherwise, violations of this chapter, including articles A and B, are punishable as provided in section [1-4-1](#) of this code. (2006 Code)

ARTICLE B. PERMIT REQUIREMENTS

13-3B-1: PERMIT REQUIRED:

Unless specifically exempted, an "earth change permit", as defined in section [13-3A-1](#) of this chapter, and regulated by this chapter, shall be obtained from the city engineer as approved by the city council prior to the commencement of placing any fill, excavating, grading, regrading, filling, berming or diking of any tract or the realignment or relocation of drainage routes within the city. Applications shall be submitted in accordance with the city storm water drainage criteria as set forth in [title 8, chapter 6, article A](#) of this code. (2006 Code)

13-3B-2: SEPARATE PERMIT FOR EACH TRACT; TRANSFERABILITY:

A separate permit shall be required for each separate, noncontiguous tract, and no permit shall be transferable without the prior written consent of the city manager. (2006 Code)

13-3B-3: EXEMPTIONS:

An earth change permit shall not be required for the following activities:

- A. Bona fide agricultural and farming operations which constitute the principal use of a tract of ground in the city and which meets the requirements of the zoning code of the city.

- B. Customary and incidental routine grounds maintenance, landscaping and home gardening which does not require a zoning use exception, a minor zoning variance or a building permit, and which does not affect natural drainage, and which does not affect storm water drainage upon entering and leaving any public easement and/or right of way. However, to qualify for this exemption, a letter shall be filed with the city engineer stating the type of work to be performed, along with a summary statement concerning the effects the proposed project will have on the existing and future drainage systems of the area and the quantity of cut or fill. Any exemptions must be approved by the city engineer in writing.
- C. Emergency repairs of a temporary nature made on public or private property which are necessary for the preservation of life, health or property, and which are made under such circumstances where it would be impossible or impracticable to obtain an earth change permit. Notification of such emergency repairs shall be made in writing to the city engineer within seventy two (72) hours.
- D. Temporary excavation for the purpose of maintaining or repairing any public street, public utility or any service line related thereto. (2006 Code)

13-3B-4: APPLICATION:

- A. General Requirements: Unless excepted by the provisions of this article, any person desiring to effect an earth change shall file a written application for an earth change permit with the city engineer. Applications shall be in such form and content as the city engineer shall establish and shall be accompanied by the payment of a permit fee, as established by resolution of the city council. The site plan and design standards established by the applicant and approved by the city engineer, or imposed by the city council, shall become conditions upon the issuance of the earth change permit. No changes in an approved plan shall be made without prior written approval of the city engineer.
- B. Contents: Each earth change permit application shall contain the following information and three (3) sets of scaled drawings:
 - 1. The name and address of the legal owner of the tract.
 - 2. A vicinity sketch of the site, including a legal description of such tract, and a boundary line survey as may be required by the city engineer.

3. Existing and proposed contours at one foot (1') intervals, or as required by the city engineer.
 4. Location of any structure or natural features on the site.
 5. Location of any proposed additional structures or developments on the site.
 6. Location of any structures or natural features on the tracts adjacent to the site and within fifty feet (50') of the tract boundary line.
 7. Plans of all drainage provisions, retaining walls, cribbing, planting and erosion control measures to be constructed in connection with or as a part of the proposed work, together with a map showing the drainage area of lands tributary to the site, estimated runoff of the area served by any drains, and floodplain boundaries with floodplain elevation and/or watercourse locations.
 8. A schedule indicating the anticipated completion date of the project, starting and completion dates of the project construction sequence and the time of exposure of each area prior to the completion of the effective erosion and sediment control measures.
 9. Owner's statement and signature certifying that the approved plans will be implemented under the direct supervision of a registered professional engineer, if required by the city engineer.
 10. Hydraulic and hydrologic analysis for runoff and/or detention facilities, if on site detention is deemed necessary.
 11. Hydraulic and hydrologic analysis for any alterations within the flood hazard area, or for the alteration of any watercourse.
 12. Estimate of the quantity of excavation and fill involved, with drawings indicating each separate excavation or fill.
 13. Plans for control of on site and off site sedimentation for the prevention of deposits of sediment from the tract upon any other off site public or private property or watercourse during all phases of the project construction.
 14. A summary statement concerning the effects the proposed project will have on the existing and future drainage systems of the area.
- C. Additional Information: If the city engineer is unable to determine from the application submitted that it meets the policies and standards governing the issuance of the requested permit, the city engineer shall request the applicant, in writing, to furnish such additional information as may be essential to such determination.

- D. Duplication Of Information: Any documents, drawings or other information which were submitted by the applicant in conjunction with the processing of any drainage plan previously approved by the city shall not be required to be resubmitted with the earth change permit application, except at the request of the city engineer. (2006 Code)

13-3B-5: ISSUANCE POLICIES:

Issuance of the earth change permits shall be governed by the following policies of the city:

- A. No earth change shall be permitted which creates a public hazard upon any property within the city through the obstruction, impairment, sedimentation, blockage or alteration of any storm sewer drain or any existing surface watercourse.
- B. No earth change shall be permitted which will channelize, obstruct or impede any watercourse in a manner which is inconsistent with accepted engineering practices and/or the adopted engineering design standards of the city.
- C. All earth changes shall be designed, constructed and completed in a manner, which minimizes the time of exposure of bare earth to the elements.
- D. Construction activity on individual tracts shall be conducted only if appropriate sedimentation facilities are installed and maintained throughout the construction period to minimize sediment from any such tract being deposited upon any off site public or private property or watercourse during all phases of project construction.
- E. The requirements and conditions of an approved drainage plan shall be incorporated as a condition upon the issuance of any earth change permit, where applicable.
- F. There shall be an application fee established by resolution of the city council. No permit shall be issued without this fee being paid in full. (2006 Code)

13-3B-6: ADMINISTRATIVE PROCEDURES:

- A. Review; Conditions Imposed: After receipt of an earth change permit application, the city engineer shall review the application and determine if the application is consistent with the policies and standards established by this article. The city engineer shall review all earth change permits and shall attach such conditions thereto as may be determined necessary and reasonable to prevent hazard to life or property, or otherwise likely to create a public nuisance. Such conditions may include, but are not limited to, submission of a drainage plan, specified finished grade, land contours, installation of retaining walls, drains, detention facilities or other drainage facilities, specified erosion control measures, furnishing any necessary public easements and a specified method for performing the work thereby authorized. The city engineer shall notify the applicant of any additional requirements upon review of the application. After receipt of such additional information as may have been required by the city engineer, or as may have been determined to be necessary during a conference with an applicant, a final decision shall be made by the city engineer.
- B. Expiration Date: The city engineer shall designate an expiration date, not to exceed twelve (12) months, on the earth change permit based on the construction schedule, as submitted by the applicant.
- C. Hearing; Decision Of City Council: The city engineer shall schedule the application for a hearing before the city council and shall report findings and recommendations to the city council for approval, approval subject to conditions, or denial of the earth change permit by the city council. The city council shall review the recommendations of the city engineer and approve, approve per the city engineer's conditions, approve with additional conditions, deny or require further review of the application.
- D. Issuance Of Permit: Upon approval, the city council will direct the city engineer or designee to issue the earth change permit. (2006 Code)

13-3B-7: NOTIFICATION OF NONCOMPLIANCE:

If at any time the work being performed in accordance with an earth change permit does not conform to the approved permit, including conditions and approved modifications thereof, a written notice to comply shall be given to the permit holder by the city engineer or designee stating the nature and location of the alleged noncompliance. The permit holder shall have such time as may be allowed in writing by the city engineer or designee to correct all noted deficiencies. The time allowed shall be reasonable and shall be determined by the nature of the deficiency and whether or not it creates a nuisance or hazard. (2006 Code)

13-3B-8: TEMPORARY SUSPENSION:

An earth change permit may be temporarily suspended by the city engineer or designee upon the existence of any conditions or the doing of any act constituting or creating a condition which endangers human life or may cause severe property damage to others. The city engineer or designee may issue an immediate stop work order as provided under subsection [13-3B-9C](#) of this article. The city engineer or designee shall, upon issuance of a temporary suspension, give the permit holder written notice specifying the grounds for such temporary suspension. (2006 Code)

13-3B-9: SUSPENSION OR REVOCATION:

- A. Circumstances: An earth change permit may be suspended or revoked upon the occurrence of any one of the following events:
1. Violation of any material condition of the permit.
 2. Violation of any provision of this chapter, including articles A and B, or any other applicable law, rule or regulation pertaining to the earth change permit.
 3. Existence of any condition or the doing of any act constituting or creating a nuisance, hazard or endangering human life or property of others.
- B. Validity: Following the issuance of an earth change permit, in accordance with the foregoing sections under this chapter, such earth change permit shall be in force and in effect and valid for a period of twelve (12) months. If, upon the expiration of twelve (12) months following granting of the earth change permit, the project as originally contemplated under the earth change permit has not been accomplished, then, in that event, the earth change permit shall be considered as revoked and void. After such expiration of twelve (12) months and ensuing revocation, a new application for an earth change permit will have to be resubmitted and reconsidered pursuant to the criteria presented within this chapter.
- C. Stop Work Order: Upon the suspension or revocation of an earth change permit by the city engineer or designee, there shall be issued a stop work order on all construction activity on the permit holder's tract which may be directly or indirectly related to site drainage and which is being performed pursuant to any permits, licenses, franchises or contracts issued or approved by the city. Such order may order a work stoppage on all construction activity on buildings or structures and all appurtenances thereto, including building, electrical, plumbing, mechanical and street work, storm sewers, sanitary sewers

and all utilities, including gas, electric, telephone and cable television. Notices and orders required by this subsection shall be served upon the parties concerned either personally or by certified mail, addressed to the individual contracting party or permit holder at the address given on the permit application filed with the city. (2006 Code)

Section 7 - Engineering Design Criteria

Tulsa County

street in an approved Planned Unit Development or townhouse development.

3. *Zoning Requirements.* Lot dimensions, yards, building setback lines, land area and lot area shall conform to the requirements of the Zoning Code or PUD requirements.
4. *Private Sewer and/or Water.* Where a proposed subdivision is not served by public sewer and/or public water, lot dimensions and area shall conform to the requirements of the Oklahoma Department of Environmental Quality (see Appendix A for Standards).
5. *Double Frontage and Reverse Frontage.* Double frontage and reverse frontage lots shall be avoided except where necessary to provide separation of residential development from through traffic or overcome specific disadvantages of terrain and orientation.
6. *Corner Lots.* Corner lots shall exceed the minimum lot width requirements in order to provide adequate building area on the lot due to the required building setbacks on both streets.
7. *Lot Lines.* Side lot lines should be at right angles to or radial to street lines or to the tangent of curving streets. Lot lines not at right angles to or radial to street lines or to the tangent of curving streets should show bearings of the lot lines.

4.6 EASEMENTS.

1. *Utility Easements.* The Planning Commission may require easements of a minimum perimeter width of seventeen and a half 17.5' feet, or an increase in or reduction of width as requested by each utility company, and when necessary on other lot lines, for poles, wires, conduits, sanitary sewers, gas, water, power, and other utility lines.
2. *Drainage Easements.* Suitable drainage easements as required by the adopted design criteria of the City or County as applicable shall be provided on the subdivision plat. Drainage shall be collected as necessary to prevent consecutive drainage to lots on blocks in excess of 4 lots each.
3. *Easements Subject to Technical Advisory Committee.* The location, width, and alignment of all easements shall be subject to review by the Technical Advisory Committee prior to approval.

4.7 FLOODPLAIN AREAS.

Lands identified by the official FEMA and/or floodplain maps of the City or County of Tulsa, as appropriate, which are subject to flooding hazards and periodic inundation, shall not be subdivided into lots, tracts or parcels for any use which would be incompatible with such flooding hazards, unless:

- (a) improvements, meeting the standards and requirements of the City or County of Tulsa, Ordinances, Resolutions and Design Requirements, as appropriate, designed so as to render such land safe for residential or other uses are made, or satisfactorily guaranteed on such land meeting the City Public Works Director or County Engineer's or their designees' approval; or
- (b) the intended use of the land is permitted by adopted ordinances or resolutions of the City or County of Tulsa, as appropriate, because such use has no adverse impact and will not obstruct flood flows; or
- (c) the intended use of the land is permitted by Special Exception or Variance as outlined in ordinances or resolutions of the City or County, as appropriate, or adopted policy of the City or County of Tulsa.

4.8 STORMWATER DRAINAGE AND DETENTION FACILITIES.

- 1. The stormwater drainage system shall be designed and constructed in accordance with the Adopted Ordinances, Resolutions standards and design requirements as adopted by the City or County, as appropriate, and shall be so designed to collect and pass the runoff from a 100-year frequency flood under conditions of full urbanization. The 2, 5, 10, 50, 100 year flows shall be modeled and 500 year flow analyzed. The entire flow shall be confined within the said stormwater drainage systems.
- 2. The stormwater detention facility if required by City or County adopted standards, shall be designed and constructed in accordance with said standards.

4.9 PUBLIC PARKS AND OPEN SPACES.

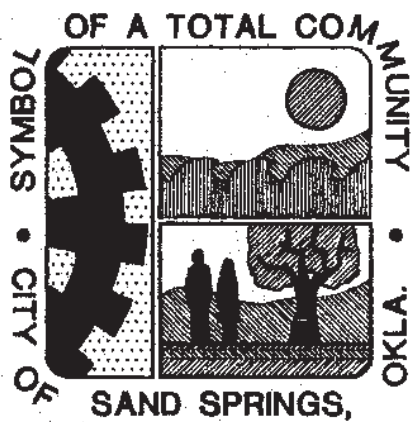
Residential subdivisions should provide open spaces, suitably located and of reasonable size for parks, playgrounds, play lots, play fields, or other recreational areas sufficient to serve the subdivision. Land that is designated for public open spaces according to the City or County Park and Recreation Plan should be dedicated to the public. Applicants are encouraged to coordinate dedications with the appropriate Parks Departments.

4.10 OIL AND GAS EXTRACTION SITES - RESIDENTIAL SUBDIVISIONS.

- 1. *Existing Operative/Inoperative Wells:*
 - (a) shall be indicated on the face of the plat;
 - (b) all abandoned, inactive wells shall be properly plugged;

City of Sand Springs

CITY OF SAND SPRINGS, OKLAHOMA/ SAND SPRINGS MUNICIPAL AUTHORITY



ENGINEERING DESIGN CRITERIA AND STANDARD SPECIFICATIONS FOR CONSTRUCTION

ENGINEERING DESIGN CRITERIA

SECTION I

AND

STANDARD SPECIFICATIONS

FOR CONSTRUCTION

SECTION II

FOR THE

**CITY OF SAND SPRINGS, OKLAHOMA/
SAND SPRINGS MUNICIPAL AUTHORITY**

Adopted by the City Council and Municipal Authority on the 10th day of February, 1992, and amended on the 18th day of May, 1992.

FOR ADDITIONAL COPIES, CONTACT:

**PUBLIC WORKS DEPARTMENT
CITY OF SAND SPRINGS
100 East Broadway
Room 212
Sand Springs, Oklahoma 74063
Phone: (918) 245-8751**

(07-18-92)

SECTION I
ENGINEERING DESIGN CRITERIA
FOR THE
CITY OF SAND SPRINGS, OKLAHOMA
SAND SPRINGS MUNICIPAL AUTHORITY
June 1992

(05-18-92)

**CITY OF SAND SPRINGS, OKLAHOMA
SAND SPRINGS MUNICIPAL AUTHORITY**

**ENGINEERING DESIGN CRITERIA
AND
STANDARD SPECIFICATIONS FOR CONSTRUCTION**

Amendments and/or Supplements to the Document

<u>Approval Date</u>	<u>Ordinance # (By CC)</u>	<u>Resolution # (By MA)</u>	<u>Effective Date</u>	<u>Action</u>
02-12-92	806	92-M04	03-15-92	Adoption of Criteria and Specifications.
05-18-92	813	92-M12	06-21-92	Add Definitions and Variance Procedures.
11-09-92	824	93-M02	11-09-92	Specification changes related to detector tape, sidewalk requirements, gate valves, tapping sleeves and manhole connections.
11-09-92	(Minor Variance changed by staff)		11-09-92	Incorporate pressure class designation for ductile iron pipe, Section 201.1 of the Specifications.

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5.0 STORMWATER DRAINAGE CRITERIA

5.1 Runoff

1. All stormwater runoff shall be subject to review and approval by the City Engineer with regard to analysis, design and construction of drainageway facilities. The appropriate public authority shall have the right to maintain or to cause to be maintained the drainageway system for its intended purposes. If a stormwater master drainage plan is adopted for the area under consideration, then the provisions of the plan shall be adhered to.

The drainage system, both public and private, may consist of storm sewers (which are closed conduits); improved channels constructed in conformity with adopted City Standards; unimproved drainageways left in their natural condition; the areas covered by restricted drainageway easements for the purpose of providing overland flow; and all appurtenances to the above including inlet, manholes, junction boxes, headwalls, dissipators, culverts, etc. All portions of the drainage system that exist on dedicated rights-of-way or restricted drainage easements shall be owned and maintained by the City, unless provided otherwise by agreement or covenant.

The drainage system plans shall show both plan and profile views of the proposed improvements. Any manhole or access point to the system that is buried out of sight shall be dimensioned to permanent objects in the vicinity.

2. The stormwater drainage system shall be designed to receive and pass the runoff from a 100-year frequency rainstorm under full urbanization. Full urbanization is defined as the total development in an area that is anticipated. The entire flow shall be confined within the said stormwater drainage system.
3. The stormwater collection system shall be designed either:
 - A. To pass a minimum of the runoff from a 5-year frequency rainstorm in a pipe network with overland flow capacities so that the combination of any two will pass the runoff from a 100-year frequency rainstorm under fully urbanized conditions.

- B. Or, to pass the entire runoff from a 100-year frequency rainstorm in the pipe network. Should the entire runoff from a 100-year frequency rainstorm be conveyed in a pipe network, a nominal frequency rainstorm shall be designed to carry flow in the event of inlet blockage or bypass.

The Overland flow portion of the collector system shall be confined to dedicated rights-of-way, or restricted drainage easements to assure that stormwater can pass through the development without inundating the lowest level of any building, dwelling, or structure. Restricted drainage easements shall be shown on the plat. The main channel of the drainage system shall not be bound to carrying the 5-year frequency rainstorm in a pipe network.

4. The rational method of runoff analysis may be used for the design of the closed pipe networks of the storm sewer system up to drainage areas of 100 acres. For drainage areas over 100 acres, a hydrograph method shall be used.
5. The Rainfall Intensity Curves prepared from TP-40 and National Weather Service HYDRO-35 (June 1977 or latest edition) shall be used for design in determining the rainfall.
6. The Oklahoma Department of Transportation Technical Manual (latest edition) shall be used for determining the basic "C" values.

A weighted "C" value shall be determined with minimum values of 0.45 for residential (RS and RD), 0.65 for multifamily (RM) and 0.90 for industrial and commercial areas. Unplatted areas with 300 feet either side of an arterial shall be either considered commercial or shall be in accordance with the comprehensive plan in estimating runoff coefficients.

The weighted "C" value shall be increased by 25 percent for the 100-year frequency rainstorm.

7. The distance between inlets, as well as the distance to the first inlet, shall be determined by the following, whichever is less:
 - A. For the 5-year frequency rainstorm two driving lanes must remain open for streets on grade.

- B. For the 100-year frequency rainstorm, one driving lane must remain open for streets on grade.
- Further, the depth of flow shall not exceed curb deep.
- C. A maximum time of concentration of 10 minutes to the first inlet shall be used for single or multifamily residential areas.
- D. A maximum time of concentration of 5 minutes to the first inlet shall be used for commercial and industrial areas.
- E. 600 feet.
8. At sump locations, the water depth shall not exceed 12 inches above the top of the curb, or 18 inches above the top of the grate, whichever is less, for the 100-year frequency rainstorm.
9. Where sump collection systems are used, an overflow route shall be established in the event of complete blockage of the sump.
10. Runoff from areas greater than one half (1/2) acre outside the roadway shall be collected before it reaches the roadway. Parking lots shall have internal drainage systems so as to reduce concentrated flow into streets. This item does not apply to single family residential lots.
11. Inlets shall be located at intersections to collect the flow from crossing the intersection. Inlets at intersections shall be located so they do not encroach upon the curb return. No drainage structure shall be permitted at a wheelchair ramp.
12. Drainage areas, runoff from 5-year and 100-year frequency rainstorms, time of concentration, and inlet design for each inlet shall be summarized and tabulated on the plans. This summary table shall also be a part of the drainage calculations.

The flows and velocities for each pipe and open channel shall be summarized and tabulated as above.

If a tract of land under development has a floodplain area within its boundary, then a hydraulic (backwater) analysis of the existing and proposed drainage system shall be provided to show any impact the proposed development has on the floodplain area and elevation.

13. Trapezoidal channels shall be designed with a hard lined low flow channel, such as concrete. The low flow channel shall branch off to pick up any storm sewers discharging into the channel. The top of the sides of the low flow channel shall be a minimum of 6 inches lower than the adjacent main channel bottom. This is to insure that the drainage runs over and into the low flow channel and not erodes around it. The minimum cross slope on the bottom of the trapezoidal channel shall be 2 percent. The easement for the trapezoidal channel shall include 10 feet additional width along the top of the bank for an access road.
14. Roughness coefficients for drainage design will be as listed in tables 5-5 and 5-6, figure 5-5, pages 109 through 123, of "Open Channel Hydraulics" by Ven Te Chow (published by McGraw-Hill Book Company, 1959, or latest edition).
15. The minimum velocity in any drainage system shall be 2.5 feet per second, for all events of 5-year frequency and greater. The maximum velocity in a pipe shall be 30 feet per second and the maximum velocity in an unlined ditch shall be 6 feet per second.
16. Culverts shall be sized using either Kutters or Mannings charts, and the Federal Highway Administration's inlet control charts, for the design flow. The slope used for design shall be the slope of the invert of the culvert.
17. No pipe shall be installed downstream having a diameter smaller than the pipe from which it is receiving water.
18. Concrete pipe shall not be less than C-76 Class III. Corrugated metal pipes shall meet Oklahoma Department of Transportation gauge requirements for fill heights, and bituminous coated and lined.
19. Junctions between different pipe sizes shall be made with the top inside of the downstream pipe no higher than the top inside of the upstream pipe.
20. A manhole or junction box shall be required at all changes of grade, changes in alignment, and junctions between two or more different size pipes.
21. The horizontal distance between pipes being placed in the same trench shall be a minimum of two feet or one-third the diameter of the larger pipe, whichever is greater. This would include multiple pipe crossings for culvert purposes.

22. The minimum storm sewer pipe size shall be 15 inches. Use of smaller pipes, such as for detention pond outlets, shall require prior approval by the City Engineer's office.
23. Radius pipes will not be used on storm sewers having a diameter of 36 inches or less. Radius pipes may be used on storm sewers larger than 36 inches. The radius of the curve shall be no less than 5 times the diameter of the pipe. The degree of deflection shall be no more than $7 \frac{1}{2}$ degrees per joint of radius pipe, or the pipe manufacturer's recommendation, whichever is less. The City is allowed to require radius pipe, should the energy loss be excessive and thereby detrimental to the system.
24. A minimum of 6 inches cover shall be provided over pipes and box culverts to the bottom of the subgrade in paved areas except when the box culverts are built with the top at grade.
25. All storm sewers shall be shown in profile, showing flow-line, size, type and grade. Profiles shall show the natural and proposed ground line at the center line of the storm sewer. Stationing shall be continuous through manholes, along the main (longest) line, to the top of the system. Branch lines shall be stationed, starting from 0+00, from their connection with the main line. Lines shall be stationed on the profile drawing from left to right increasing upstream.
26. The radius of curve for a box structure shall be a minimum of 3 times the maximum width of the box structure, but not less than 50 feet.
27. New box culverts and bridges shall have adequate capacity to pass 100-year fully urbanized flows with one foot of free board under the low chord. A backwater analysis shall be provided to illustrate compliance with this requirement.
28. Pipes discharging at a steep gradient into drainageways and detention facilities shall be provided with a head-wall and energy dissipators. A steep gradient is defined as an energy grade line whose outlet velocity is greater than six feet per second.
29. The centerline radius of a curve on an improved open channel shall be a minimum of 3 times the top width at the design flow or 100 feet, whichever is greater.

30. All improved channels shall be provided with a minimum of one foot of freeboard above normal depth of the runoff from a 100-year frequency rainstorm.

At all bends in improved channels, the amount of freeboard shall be increased by the following equation:

$$H = \frac{V * b}{64.4 * r}$$

Where: H is Height of freeboard in feet.
V is the average Velocity in feet per second.
b is the Width of the channel at the design water surface in feet.
r is the Radius of curvature of the channel centerline in feet.

The increased freeboard height shall be maintained a minimum of one channel width upstream and downstream of the bend.

31. When storm sewers are constructed in fill areas, all materials in fill areas shall be compacted to a 95 percent standard proctor density prior to the trenching and laying of the pipe.
32. Maximum spacing between manholes or junction boxes shall not exceed 400 feet for pipes of 15 inches and 500 feet for pipes greater than 15 inches.
33. All junction boxes and manholes shall be built with the Standard Manhole Ring and Cover at grade.
34. A manhole or junction box shall be constructed at the P.C. or P.T. of all curves in sewers.
35. Borrow ditches, when allowed, shall not exceed 4 feet in depth. Culverts shall be sized to handle the 5-year or larger storm (minimum 15" diameter). The side slopes on the bank next to the road shall be 4 feet horizontal to 1 foot vertical, or flatter. The side slope on the opposite bank shall be maintainable.
36. A Maintenance Bond or Irrevocable Letter of Credit shall be posted in accordance with Section 1.1.6 of these Design Criteria in an amount equal to 100 of the determined amount of construction costs for a two-year period.

5.2 STORAGE

1. The detention storage requirements shall be that excess runoff from an 100-year frequency storm.

The excess runoff is that runoff generated due to urbanization which is greater than the runoff historically generated under existing conditions, for a given frequency storm.

Peak release rates from developments shall not exceed the existing runoff that occurred before development for all storm frequencies up to and including the 100-year frequency storm. As a minimum, the 5-year and 100-year storms shall be investigated.

If a stormwater master drainage plan is adopted in the area under consideration, then the provisions of the plan shall be adhered to.

2. For the design of stormwater storage facilities, the following methods are approved for the use:

<u>Method</u>	<u>Drainage Area</u>
HEC-1 Snyder's Method	Greater than 10 acres
HEC-1 SCS Method	2 to 2000 acres
Modified Rational Approach with volume factors*	Less than 10 acres
Graphical method*	Less than 2 acres

*These methods are available from the City.

3. U S Weather Bureau Technical Paper No. 40 and National Weather Service HYDRO-35 (June, 1977) shall be used for rainfall information.
4. The rainfall pattern shall be used in accordance with the modeling technique selected.
5. For Snyder's synthetic unit hydrograph method, the loss rates in determining the runoff/hydrograph shall be an initial loss of 0.5 inches and a uniform loss of 0.08 inches per hour for the subsequent hours once the initial losses are satisfied.
6. All calculations for detention facilities shall be submitted for review by the City.

The submittal shall include hydrographs for both existing and developed conditions, detention facility stage-area-volume relationships, outlet structure details, and a stage versus time analysis through the facility.

7. The intent of the stormwater detention requirements shall be identified at the preliminary plat stage of the project review. The 100-year frequency rainstorm floodplain areas and stormwater detention site locations shall be shown on the preliminary plat to illustrate how these areas will be managed during and after construction.

The 100-year frequency rainstorm floodplain is defined as the area of land that the runoff from the 100-year frequency rainstorm inundates.

8. Detention facilities should be located in areas which require a minimum of maintenance.
9. Detention facilities may be located in the floodplain area or flood hazard area, providing the floodplain area and the flood hazard area are determined with the facility in place and that no rise in the water surface offsite of the development results from the installation of the facility except that permitted by City Ordinance.
10. Additional detention storage, in excess of the required storage for a drainage area, can be provided to satisfy the detention requirements for a tract of land downstream of the detention facility, providing the detention facility is constructed prior to the development of the downstream tract.
11. All detention facilities shall be designed "dry" unless a special maintenance agreement, in writing, has been approved by the City.
12. A minimum number of detention facilities is encouraged for each development.
13. If runoff has a natural tendency to drain in several directions for a given development tract of land where detention is required, then detention storage shall be provided for the biggest drainage area. Additionally detention storage may be provided, at the same facility, to satisfy detention requirements for a separate drainage area on the same development, provided that:
 - A. The whole developmental tract of land is in the same watershed.
 - B. The smaller drainage area(s) that, has/have been compensated for does/do not, either singly or in

combination, adversely impact the health, welfare and safety of the general public downstream.

14. If a tract of land being developed is located in more than one drainage area, then grading work to divert flows from one drainage area to another will not be permitted. Compensatory storage will not be permitted in one drainage area for that required in another.

A drainage area is defined as an area of land that funnels stormwater runoff to a common point at the downhill side of that tract being developed.

15. Detention facilities may be used for compensatory storage when encroaching into the floodplain area provided that the overall drainage system does not:

- A. Cause a rise in the water surface elevation beyond the extent of the developmental tract of land.
- B. Adversely impact adjacent properties by an increase in velocity.

16. All dikes and spillways on detention facilities shall have typical cross sections shown on the plans.

17. Side slopes on detention facilities shall not be steeper than 4:1. (Horizontal: Vertical). Steeper side slope may be allowed should the site conditions necessitate; however, methods for proper erosion control must be established and illustrated, and the procedures for maintaining these steeper side slopes must be established and shown on the plan.

18. Detention facilities shall be provided with a low flow channel from the inlet to the outlet structure to transmit low flows and the low flow channel shall be approved by the City, the low flow channel shall be concrete lined and of sufficient width and geometry to allow for proper maintenance. The maintenance procedure shall be shown on the plans.

19. The easements for the storm sewers and detention ponds shall appear on the plat.

20. An accessway at least 20 feet wide shall be provided to any detention area. Access may be provided by frontage on a dedicated public street or by an access easement from a dedicated public street to the detention area. The access road shall have a maximum grade of 10 percent. The access road shall be paved, 12 feet wide,

from the top of the bank to the bottom of the detention pond and in the bottom of the detention pond to locations of high maintenance.

21. If the detention facility is approved by the City to serve areas outside the subdivision in which it is located, such additional areas shall be specifically identified in the provision for detention.
22. An operations and maintenance guide shall be prepared to illustrate the proper use and care of the detention facility, and by who, when and how.
23. Any dam or berm constructed shall be designed and constructed by a Registered Professional Engineer.
24. Spillways on detention facility dams shall be constructed to pass the 500-year flood event with a minimum of one (1) foot of freeboard on the earth dam structure. All detention facilities shall meet the Oklahoma Water Resources Board's requirements.
25. All earth slopes and areas subject to erosion, such as, adjacent to trickle channels, inlet structures, and outlet structures, shall be slab sodded with bermuda sod or protected with other erosion control measures. All other earth surfaces, with the area designated for detention pond site, shall have an established growth of bermuda grass or other approved species. All grass covered areas shall be fertilized, to current recommendations, watered and in an established growing condition prior to completion and approval of the detention pond.
26. Detention facilities shall be environmentally sound and compatible with the area (neighborhood). Where feasible, multiple uses for the facilities should be established.
27. The maintenance responsibility for on site detention facilities shall depend upon the zoning. If the area is zoned for single family residential, including duplexes, the maintenance responsibility shall belong to the City. If the area is otherwise zoned, the maintenance responsibility shall belong to the private sector. A written agreement between the development and the City defining the maintenance responsibility shall be made prior to the development's acceptance by the City.

28. A Maintenance Bond or Irrevocable Letter of Credit shall be posted in accordance with Section 1.1.6 of these Design Criteria in an amount equal to 100 percent of the determined amount of construction costs for a two-year period.

5.3 DETENTION FACILITIES

1. Definition

- A. A regional detention facility is a stormwater detention facility and collection system which provides stormwater detention capacity for all new development in a defined drainage area.
- B. An on-site detention facility is a stormwater detention facility built on the site of the development to provide detention storage for that development.
- C. Major developments are defined as any development which is planned to have greater than 1/2 acre of impervious surfaces. For single family residential lot development, the impervious surface is assumed to include 2700 square feet per building lot, unless better information is available. An impervious surface shall include all surfaces which do not allow an appreciable amount of infiltration. This includes, but not limited to roads, driveways, roofs and parking lots both paved and gravel.
- D. Minor development is a development which is less than a major development.
- E. An existing problem is defined as stormwater runoff from the 100-year frequency rainfall event which flows out of the drainage easement. If there is no drainage easement covering the watercourse, then a problem is when the runoff flows out of its channel banks in developed areas. In undeveloped areas without a drainage easement, a problem is when the runoff flows out of its channel banks and overtops roads and/or impacts structures.

2. Regional Detention Facility in Place or Planned

When there is a regional detention facility in place in the drainage area where development is planned, or one is planned in the near future, then all new development

may incorporate the regional detention facility into the design of the drainage system for the development.

3. No Regional Detention Facility

When there is no regional detention facility constructed or planned in the near future for a particular drainage area where development is planned, then the following shall apply:

- A. When there is an existing drainage problem downstream of the development, then new major development is required to provide on-site detention. The method of maintenance shall be set forth in the deed restrictions.

The only exception to on-site detention is new construction of a single family home on an existing lot, tract or parcel, which has not complied with the storm drainage detention requirements of this ordinance.

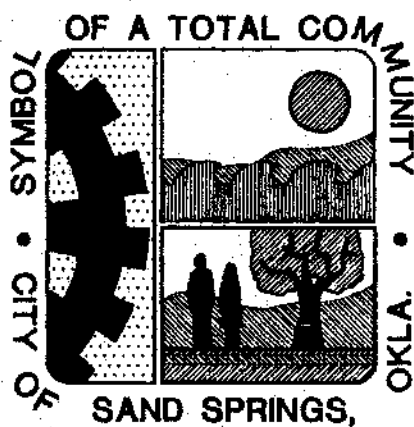
- B. When there is no drainage problem downstream of the development, then new development shall build on-site detention facilities, unless the development can show that the development will not produce a problem downstream.

4. Maintenance Responsibility

- A. The property owners in the development shall be responsible for maintenance to its detention facility in a minor residential, commercial or industrial development. If the detention facility is privately maintained, then the maintenance requirements shall be set forth in the deed restriction and the City shall be party to these deed restrictions.

- B. The City shall be responsible for the maintenance of detention facilities in major residential developments. If the detention facility is to be publicly maintained then the detention facility and access to it shall be deeded to the City.

CITY OF SAND SPRINGS, OKLAHOMA/ SAND SPRINGS MUNICIPAL AUTHORITY



ENGINEERING DESIGN CRITERIA AND STANDARD SPECIFICATIONS FOR CONSTRUCTION

ENGINEERING DESIGN CRITERIA

SECTION I

AND

STANDARD SPECIFICATIONS

FOR CONSTRUCTION

SECTION II

FOR THE

**CITY OF SAND SPRINGS, OKLAHOMA/
SAND SPRINGS MUNICIPAL AUTHORITY**

Adopted by the City Council and Municipal Authority on the 10th day of February, 1992, and amended on the 18th day of May, 1992.

FOR ADDITIONAL COPIES, CONTACT:

**PUBLIC WORKS DEPARTMENT
CITY OF SAND SPRINGS
100 East Broadway
Room 212
Sand Springs, Oklahoma 74063
Phone: (918) 245-8751**

(07-18-92)

SECTION I
ENGINEERING DESIGN CRITERIA
FOR THE
CITY OF SAND SPRINGS, OKLAHOMA
SAND SPRINGS MUNICIPAL AUTHORITY
June 1992

(05-18-92)

CITY OF SAND SPRINGS, OKLAHOMA
SAND SPRINGS MUNICIPAL AUTHORITY

ENGINEERING DESIGN CRITERIA
AND
STANDARD SPECIFICATIONS FOR CONSTRUCTION

Amendments and/or Supplements to the Document

<u>Approval Date</u>	<u>Ordinance # (By CC)</u>	<u>Resolution # (By MA)</u>	<u>Effective Date</u>	<u>Action</u>
02-12-92	806	92-M04	03-15-92	Adoption of Criteria and Specifications.
05-18-92	813	92-M12	06-21-92	Add Definitions and Variance Procedures.
11-09-92	824	93-M02	11-09-92	Specification changes related to detector tape, sidewalk requirements, gate valves, tapping sleeves and manhole connections.
11-09-92	(Minor Variance changed by staff)		11-09-92	Incorporate pressure class designation for ductile iron pipe, Section 201.1 of the Specifications.

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5.0 STORMWATER DRAINAGE CRITERIA

5.1 Runoff

1. All stormwater runoff shall be subject to review and approval by the City Engineer with regard to analysis, design and construction of drainageway facilities. The appropriate public authority shall have the right to maintain or to cause to be maintained the drainageway system for its intended purposes. If a stormwater master drainage plan is adopted for the area under consideration, then the provisions of the plan shall be adhered to.

The drainage system, both public and private, may consist of storm sewers (which are closed conduits); improved channels constructed in conformity with adopted City Standards; unimproved drainageways left in their natural condition; the areas covered by restricted drainageway easements for the purpose of providing overland flow; and all appurtenances to the above including inlet, manholes, junction boxes, headwalls, dissipators, culverts, etc. All portions of the drainage system that exist on dedicated rights-of-way or restricted drainage easements shall be owned and maintained by the City, unless provided otherwise by agreement or covenant.

The drainage system plans shall show both plan and profile views of the proposed improvements. Any manhole or access point to the system that is buried out of sight shall be dimensioned to permanent objects in the vicinity.

2. The stormwater drainage system shall be designed to receive and pass the runoff from a 100-year frequency rainstorm under full urbanization. Full urbanization is defined as the total development in an area that is anticipated. The entire flow shall be confined within the said stormwater drainage system.
3. The stormwater collection system shall be designed either:
 - A. To pass a minimum of the runoff from a 5-year frequency rainstorm in a pipe network with overland flow capacities so that the combination of any two will pass the runoff from a 100-year frequency rainstorm under fully urbanized conditions.

- B. Or, to pass the entire runoff from a 100-year frequency rainstorm in the pipe network. Should the entire runoff from a 100-year frequency rainstorm be conveyed in a pipe network, a nominal frequency rainstorm shall be designed to carry flow in the event of inlet blockage or bypass.

The Overland flow portion of the collector system shall be confined to dedicated rights-of-way, or restricted drainage easements to assure that stormwater can pass through the development without inundating the lowest level of any building, dwelling, or structure. Restricted drainage easements shall be shown on the plat. The main channel of the drainage system shall not be bound to carrying the 5-year frequency rainstorm in a pipe network.

- 4. The rational method of runoff analysis may be used for the design of the closed pipe networks of the storm sewer system up to drainage areas of 100 acres. For drainage areas over 100 acres, a hydrograph method shall be used.
- 5. The Rainfall Intensity Curves prepared from TP-40 and National Weather Service HYDRO-35 (June 1977 or latest edition) shall be used for design in determining the rainfall.
- 6. The Oklahoma Department of Transportation Technical Manual (latest edition) shall be used for determining the basic "C" values.

A weighted "C" value shall be determined with minimum values of 0.45 for residential (RS and RD), 0.65 for multifamily (RM) and 0.90 for industrial and commercial areas. Unplatted areas with 300 feet either side of an arterial shall be either considered commercial or shall be in accordance with the comprehensive plan in estimating runoff coefficients.

The weighted "C" value shall be increased by 25 percent for the 100-year frequency rainstorm.

- 7. The distance between inlets, as well as the distance to the first inlet, shall be determined by the following, whichever is less:
 - A. For the 5-year frequency rainstorm two driving lanes must remain open for streets on grade.

- B. For the 100-year frequency rainstorm, one driving lane must remain open for streets on grade.
- Further, the depth of flow shall not exceed curb deep.
- C. A maximum time of concentration of 10 minutes to the first inlet shall be used for single or multifamily residential areas.
- D. A maximum time of concentration of 5 minutes to the first inlet shall be used for commercial and industrial areas.
- E. 600 feet.
8. At sump locations, the water depth shall not exceed 12 inches above the top of the curb, or 18 inches above the top of the grate, whichever is less, for the 100-year frequency rainstorm.
9. Where sump collection systems are used, an overflow route shall be established in the event of complete blockage of the sump.
10. Runoff from areas greater than one half (1/2) acre outside the roadway shall be collected before it reaches the roadway. Parking lots shall have internal drainage systems so as to reduce concentrated flow into streets. This item does not apply to single family residential lots.
11. Inlets shall be located at intersections to collect the flow from crossing the intersection. Inlets at intersections shall be located so they do not encroach upon the curb return. No drainage structure shall be permitted at a wheelchair ramp.
12. Drainage areas, runoff from 5-year and 100-year frequency rainstorms, time of concentration, and inlet design for each inlet shall be summarized and tabulated on the plans. This summary table shall also be a part of the drainage calculations.

The flows and velocities for each pipe and open channel shall be summarized and tabulated as above.

If a tract of land under development has a floodplain area within its boundary, then a hydraulic (backwater) analysis of the existing and proposed drainage system shall be provided to show any impact the proposed development has on the floodplain area and elevation.

13. Trapezoidal channels shall be designed with a hard lined low flow channel, such as concrete. The low flow channel shall branch off to pick up any storm sewers discharging into the channel. The top of the sides of the low flow channel shall be a minimum of 6 inches lower than the adjacent main channel bottom. This is to insure that the drainage runs over and into the low flow channel and not erodes around it. The minimum cross slope on the bottom of the trapezoidal channel shall be 2 percent. The easement for the trapezoidal channel shall include 10 feet additional width along the top of the bank for an access road.
14. Roughness coefficients for drainage design will be as listed in tables 5-5 and 5-6, figure 5-5, pages 109 through 123, of "Open Channel Hydraulics" by Ven Te Chow (published by McGraw-Hill Book Company, 1959, or latest edition).
15. The minimum velocity in any drainage system shall be 2.5 feet per second, for all events of 5-year frequency and greater. The maximum velocity in a pipe shall be 30 feet per second and the maximum velocity in an unlined ditch shall be 6 feet per second.
16. Culverts shall be sized using either Kutters or Mannings charts, and the Federal Highway Administration's inlet control charts, for the design flow. The slope used for design shall be the slope of the invert of the culvert.
17. No pipe shall be installed downstream having a diameter smaller than the pipe from which it is receiving water.
18. Concrete pipe shall not be less than C-76 Class III. Corrugated metal pipes shall meet Oklahoma Department of Transportation gauge requirements for fill heights, and bituminous coated and lined.
19. Junctions between different pipe sizes shall be made with the top inside of the downstream pipe no higher than the top inside of the upstream pipe.
20. A manhole or junction box shall be required at all changes of grade, changes in alignment, and junctions between two or more different size pipes.
21. The horizontal distance between pipes being placed in the same trench shall be a minimum of two feet or one-third the diameter of the larger pipe, whichever is greater. This would include multiple pipe crossings for culvert purposes.

22. The minimum storm sewer pipe size shall be 15 inches. Use of smaller pipes, such as for detention pond outlets, shall require prior approval by the City Engineer's office.
23. Radius pipes will not be used on storm sewers having a diameter of 36 inches or less. Radius pipes may be used on storm sewers larger than 36 inches. The radius of the curve shall be no less than 5 times the diameter of the pipe. The degree of deflection shall be no more than $7\frac{1}{2}$ degrees per joint of radius pipe, or the pipe manufacturer's recommendation, whichever is less. The City is allowed to require radius pipe, should the energy loss be excessive and thereby detrimental to the system.
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At all bends in improved channels, the amount of freeboard shall be increased by the following equation:

$$H = \frac{V * b}{64.4 * r}$$

Where: H is Height of freeboard in feet.
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b is the Width of the channel at the design water surface in feet.
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The increased freeboard height shall be maintained a minimum of one channel width upstream and downstream of the bend.

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Graphical method*	Less than 2 acres

*These methods are available from the City.

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5. For Snyder's synthetic unit hydrograph method, the loss rates in determining the runoff/hydrograph shall be an initial loss of 0.5 inches and a uniform loss of 0.08 inches per hour for the subsequent hours once the initial losses are satisfied.
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13. If runoff has a natural tendency to drain in several directions for a given development tract of land where detention is required, then detention storage shall be provided for the biggest drainage area. Additionally detention storage may be provided, at the same facility, to satisfy detention requirements for a separate drainage area on the same development, provided that:
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- A. Cause a rise in the water surface elevation beyond the extent of the developmental tract of land.
- B. Adversely impact adjacent properties by an increase in velocity.

16. All dikes and spillways on detention facilities shall have typical cross sections shown on the plans.

17. Side slopes on detention facilities shall not be steeper than 4:1. (Horizontal: Vertical). Steeper side slope may be allowed should the site conditions necessitate; however, methods for proper erosion control must be established and illustrated, and the procedures for maintaining these steeper side slopes must be established and shown on the plan.

18. Detention facilities shall be provided with a low flow channel from the inlet to the outlet structure to transmit low flows and the low flow channel shall be approved by the City, the low flow channel shall be concrete lined and of sufficient width and geometry to allow for proper maintenance. The maintenance procedure shall be shown on the plans.

19. The easements for the storm sewers and detention ponds shall appear on the plat.

20. An accessway at least 20 feet wide shall be provided to any detention area. Access may be provided by frontage on a dedicated public street or by an access easement from a dedicated public street to the detention area. The access road shall have a maximum grade of 10 percent. The access road shall be paved, 12 feet wide,

from the top of the bank to the bottom of the detention pond and in the bottom of the detention pond to locations of high maintenance.

21. If the detention facility is approved by the City to serve areas outside the subdivision in which it is located, such additional areas shall be specifically identified in the provision for detention.
22. An operations and maintenance guide shall be prepared to illustrate the proper use and care of the detention facility, and by who, when and how.
23. Any dam or berm constructed shall be designed and constructed by a Registered Professional Engineer.
24. Spillways on detention facility dams shall be constructed to pass the 500-year flood event with a minimum of one (1) foot of freeboard on the earth dam structure. All detention facilities shall meet the Oklahoma Water Resources Board's requirements.
25. All earth slopes and areas subject to erosion, such as, adjacent to trickle channels, inlet structures, and outlet structures, shall be slab sodded with bermuda sod or protected with other erosion control measures. All other earth surfaces, with the area designated for detention pond site, shall have an established growth of bermuda grass or other approved species. All grass covered areas shall be fertilized, to current recommendations, watered and in an established growing condition prior to completion and approval of the detention pond.
26. Detention facilities shall be environmentally sound and compatible with the area (neighborhood). Where feasible, mutiple uses for the facilities should be established.
27. The maintenance responsibility for on site detention facilities shall depend upon the zoning. If the area is zoned for single family residential, including duplexes, the maintenance responsibility shall belong to the City. If the area is otherwise zoned, the maintenance responsibility shall belong to the private sector. A written agreement between the development and the City defining the maintenance responsibility shall be made prior to the development's acceptance by the City.

28. A Maintenance Bond or Irrevocable Letter of Credit shall be posted in accordance with Section 1.1.6 of these Design Criteria in an amount equal to 100 percent of the determined amount of construction costs for a two-year period.

5.3 DETENTION FACILITIES

1. Definition

- A. A regional detention facility is a stormwater detention facility and collection system which provides stormwater detention capacity for all new development in a defined drainage area.
- B. An on-site detention facility is a stormwater detention facility built on the site of the development to provide detention storage for that development.
- C. Major developments are defined as any development which is planned to have greater than 1/2 acre of impervious surfaces. For single family residential lot development, the impervious surface is assumed to include 2700 square feet per building lot, unless better information is available. An impervious surface shall include all surfaces which do not allow an appreciable amount of infiltration. This includes, but not limited to roads, driveways, roofs and parking lots both paved and gravel.
- D. Minor development is a development which is less than a major development.
- E. An existing problem is defined as stormwater runoff from the 100-year frequency rainfall event which flows out of the drainage easement. If there is no drainage easement covering the watercourse, then a problem is when the runoff flows out of its channel banks in developed areas. In undeveloped areas without a drainage easement, a problem is when the runoff flows out of its channel banks and overtops roads and/or impacts structures.

2. Regional Detention Facility in Place or Planned

When there is a regional detention facility in place in the drainage area where development is planned, or one is planned in the near future, then all new development

may incorporate the regional detention facility into the design of the drainage system for the development.

3. No Regional Detention Facility

When there is no regional detention facility constructed or planned in the near future for a particular drainage area where development is planned, then the following shall apply:

- A. When there is an existing drainage problem downstream of the development, then new major development is required to provide on-site detention. The method of maintenance shall be set forth in the deed restrictions.

The only exception to on-site detention is new construction of a single family home on an existing lot, tract or parcel, which has not complied with the storm drainage detention requirements of this ordinance.

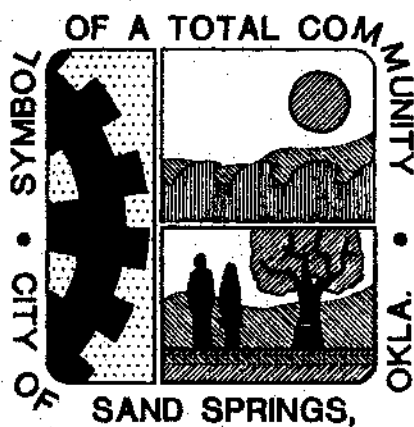
- B. When there is no drainage problem downstream of the development, then new development shall build on-site detention facilities, unless the development can show that the development will not produce a problem downstream.

4. Maintenance Responsibility

- A. The property owners in the development shall be responsible for maintenance to its detention facility in a minor residential, commercial or industrial development. If the detention facility is privately maintained, then the maintenance requirements shall be set forth in the deed restriction and the City shall be party to these deed restrictions.

- B. The City shall be responsible for the maintenance of detention facilities in major residential developments. If the detention facility is to be publicly maintained then the detention facility and access to it shall be deeded to the City.

CITY OF SAND SPRINGS, OKLAHOMA/ SAND SPRINGS MUNICIPAL AUTHORITY



ENGINEERING DESIGN CRITERIA AND STANDARD SPECIFICATIONS FOR CONSTRUCTION

ENGINEERING DESIGN CRITERIA

SECTION I

AND

STANDARD SPECIFICATIONS

FOR CONSTRUCTION

SECTION II

FOR THE

**CITY OF SAND SPRINGS, OKLAHOMA/
SAND SPRINGS MUNICIPAL AUTHORITY**

Adopted by the City Council and Municipal Authority on the 10th day of February, 1992, and amended on the 18th day of May, 1992.

FOR ADDITIONAL COPIES, CONTACT:

**PUBLIC WORKS DEPARTMENT
CITY OF SAND SPRINGS
100 East Broadway
Room 212
Sand Springs, Oklahoma 74063
Phone: (918) 245-8751**

(07-18-92)

SECTION I
ENGINEERING DESIGN CRITERIA
FOR THE
CITY OF SAND SPRINGS, OKLAHOMA
SAND SPRINGS MUNICIPAL AUTHORITY
June 1992

(05-18-92)

CITY OF SAND SPRINGS, OKLAHOMA
SAND SPRINGS MUNICIPAL AUTHORITY

ENGINEERING DESIGN CRITERIA
AND
STANDARD SPECIFICATIONS FOR CONSTRUCTION

Amendments and/or Supplements to the Document

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5.0 STORMWATER DRAINAGE CRITERIA

5.1 Runoff

1. All stormwater runoff shall be subject to review and approval by the City Engineer with regard to analysis, design and construction of drainageway facilities. The appropriate public authority shall have the right to maintain or to cause to be maintained the drainageway system for its intended purposes. If a stormwater master drainage plan is adopted for the area under consideration, then the provisions of the plan shall be adhered to.

The drainage system, both public and private, may consist of storm sewers (which are closed conduits); improved channels constructed in conformity with adopted City Standards; unimproved drainageways left in their natural condition; the areas covered by restricted drainageway easements for the purpose of providing overland flow; and all appurtenances to the above including inlet, manholes, junction boxes, headwalls, dissipators, culverts, etc. All portions of the drainage system that exist on dedicated rights-of-way or restricted drainage easements shall be owned and maintained by the City, unless provided otherwise by agreement or covenant.

The drainage system plans shall show both plan and profile views of the proposed improvements. Any manhole or access point to the system that is buried out of sight shall be dimensioned to permanent objects in the vicinity.

2. The stormwater drainage system shall be designed to receive and pass the runoff from a 100-year frequency rainstorm under full urbanization. Full urbanization is defined as the total development in an area that is anticipated. The entire flow shall be confined within the said stormwater drainage system.
3. The stormwater collection system shall be designed either:
 - A. To pass a minimum of the runoff from a 5-year frequency rainstorm in a pipe network with overland flow capacities so that the combination of any two will pass the runoff from a 100-year frequency rainstorm under fully urbanized conditions.

- B. Or, to pass the entire runoff from a 100-year frequency rainstorm in the pipe network. Should the entire runoff from a 100-year frequency rainstorm be conveyed in a pipe network, a nominal frequency rainstorm shall be designed to carry flow in the event of inlet blockage or bypass.

The Overland flow portion of the collector system shall be confined to dedicated rights-of-way, or restricted drainage easements to assure that stormwater can pass through the development without inundating the lowest level of any building, dwelling, or structure. Restricted drainage easements shall be shown on the plat. The main channel of the drainage system shall not be bound to carrying the 5-year frequency rainstorm in a pipe network.

4. The rational method of runoff analysis may be used for the design of the closed pipe networks of the storm sewer system up to drainage areas of 100 acres. For drainage areas over 100 acres, a hydrograph method shall be used.
5. The Rainfall Intensity Curves prepared from TP-40 and National Weather Service HYDRO-35 (June 1977 or latest edition) shall be used for design in determining the rainfall.
6. The Oklahoma Department of Transportation Technical Manual (latest edition) shall be used for determining the basic "C" values.

A weighted "C" value shall be determined with minimum values of 0.45 for residential (RS and RD), 0.65 for multifamily (RM) and 0.90 for industrial and commercial areas. Unplatted areas with 300 feet either side of an arterial shall be either considered commercial or shall be in accordance with the comprehensive plan in estimating runoff coefficients.

The weighted "C" value shall be increased by 25 percent for the 100-year frequency rainstorm.

7. The distance between inlets, as well as the distance to the first inlet, shall be determined by the following, whichever is less:
 - A. For the 5-year frequency rainstorm two driving lanes must remain open for streets on grade.

- B. For the 100-year frequency rainstorm, one driving lane must remain open for streets on grade.
- Further, the depth of flow shall not exceed curb deep.
- C. A maximum time of concentration of 10 minutes to the first inlet shall be used for single or multifamily residential areas.
- D. A maximum time of concentration of 5 minutes to the first inlet shall be used for commercial and industrial areas.
- E. 600 feet.
8. At sump locations, the water depth shall not exceed 12 inches above the top of the curb, or 18 inches above the top of the grate, whichever is less, for the 100-year frequency rainstorm.
9. Where sump collection systems are used, an overflow route shall be established in the event of complete blockage of the sump.
10. Runoff from areas greater than one half (1/2) acre outside the roadway shall be collected before it reaches the roadway. Parking lots shall have internal drainage systems so as to reduce concentrated flow into streets. This item does not apply to single family residential lots.
11. Inlets shall be located at intersections to collect the flow from crossing the intersection. Inlets at intersections shall be located so they do not encroach upon the curb return. No drainage structure shall be permitted at a wheelchair ramp.
12. Drainage areas, runoff from 5-year and 100-year frequency rainstorms, time of concentration, and inlet design for each inlet shall be summarized and tabulated on the plans. This summary table shall also be a part of the drainage calculations.

The flows and velocities for each pipe and open channel shall be summarized and tabulated as above.

If a tract of land under development has a floodplain area within its boundary, then a hydraulic (backwater) analysis of the existing and proposed drainage system shall be provided to show any impact the proposed development has on the floodplain area and elevation.

13. Trapezoidal channels shall be designed with a hard lined low flow channel, such as concrete. The low flow channel shall branch off to pick up any storm sewers discharging into the channel. The top of the sides of the low flow channel shall be a minimum of 6 inches lower than the adjacent main channel bottom. This is to insure that the drainage runs over and into the low flow channel and not erodes around it. The minimum cross slope on the bottom of the trapezoidal channel shall be 2 percent. The easement for the trapezoidal channel shall include 10 feet additional width along the top of the bank for an access road.
14. Roughness coefficients for drainage design will be as listed in tables 5-5 and 5-6, figure 5-5, pages 109 through 123, of "Open Channel Hydraulics" by Ven Te Chow (published by McGraw-Hill Book Company, 1959, or latest edition).
15. The minimum velocity in any drainage system shall be 2.5 feet per second, for all events of 5-year frequency and greater. The maximum velocity in a pipe shall be 30 feet per second and the maximum velocity in an unlined ditch shall be 6 feet per second.
16. Culverts shall be sized using either Kutters or Mannings charts, and the Federal Highway Administration's inlet control charts, for the design flow. The slope used for design shall be the slope of the invert of the culvert.
17. No pipe shall be installed downstream having a diameter smaller than the pipe from which it is receiving water.
18. Concrete pipe shall not be less than C-76 Class III. Corrugated metal pipes shall meet Oklahoma Department of Transportation gauge requirements for fill heights, and bituminous coated and lined.
19. Junctions between different pipe sizes shall be made with the top inside of the downstream pipe no higher than the top inside of the upstream pipe.
20. A manhole or junction box shall be required at all changes of grade, changes in alignment, and junctions between two or more different size pipes.
21. The horizontal distance between pipes being placed in the same trench shall be a minimum of two feet or one-third the diameter of the larger pipe, whichever is greater. This would include multiple pipe crossings for culvert purposes.

22. The minimum storm sewer pipe size shall be 15 inches. Use of smaller pipes, such as for detention pond outlets, shall require prior approval by the City Engineer's office.
23. Radius pipes will not be used on storm sewers having a diameter of 36 inches or less. Radius pipes may be used on storm sewers larger than 36 inches. The radius of the curve shall be no less than 5 times the diameter of the pipe. The degree of deflection shall be no more than $7\frac{1}{2}$ degrees per joint of radius pipe, or the pipe manufacturer's recommendation, whichever is less. The City is allowed to require radius pipe, should the energy loss be excessive and thereby detrimental to the system.
24. A minimum of 6 inches cover shall be provided over pipes and box culverts to the bottom of the subgrade in paved areas except when the box culverts are built with the top at grade.
25. All storm sewers shall be shown in profile, showing flow-line, size, type and grade. Profiles shall show the natural and proposed ground line at the center line of the storm sewer. Stationing shall be continuous through manholes, along the main (longest) line, to the top of the system. Branch lines shall be stationed, starting from 0+00, from their connection with the main line. Lines shall be stationed on the profile drawing from left to right increasing upstream.
26. The radius of curve for a box structure shall be a minimum of 3 times the maximum width of the box structure, but not less than 50 feet.
27. New box culverts and bridges shall have adequate capacity to pass 100-year fully urbanized flows with one foot of free board under the low chord. A backwater analysis shall be provided to illustrate compliance with this requirement.
28. Pipes discharging at a steep gradient into drainageways and detention facilities shall be provided with a head-wall and energy dissipators. A steep gradient is defined as an energy grade line whose outlet velocity is greater than six feet per second.
29. The centerline radius of a curve on an improved open channel shall be a minimum of 3 times the top width at the design flow or 100 feet, whichever is greater.

30. All improved channels shall be provided with a minimum of one foot of freeboard above normal depth of the runoff from a 100-year frequency rainstorm.

At all bends in improved channels, the amount of freeboard shall be increased by the following equation:

$$H = \frac{V * b}{64.4 * r}$$

Where: H is Height of freeboard in feet.
V is the average Velocity in feet per second.
b is the Width of the channel at the design water surface in feet.
r is the Radius of curvature of the channel centerline in feet.

The increased freeboard height shall be maintained a minimum of one channel width upstream and downstream of the bend.

31. When storm sewers are constructed in fill areas, all materials in fill areas shall be compacted to a 95 percent standard proctor density prior to the trenching and laying of the pipe.
32. Maximum spacing between manholes or junction boxes shall not exceed 400 feet for pipes of 15 inches and 500 feet for pipes greater than 15 inches.
33. All junction boxes and manholes shall be built with the Standard Manhole Ring and Cover at grade.
34. A manhole or junction box shall be constructed at the P.C. or P.T. of all curves in sewers.
35. Borrow ditches, when allowed, shall not exceed 4 feet in depth. Culverts shall be sized to handle the 5-year or larger storm (minimum 15" diameter). The side slopes on the bank next to the road shall be 4 feet horizontal to 1 foot vertical, or flatter. The side slope on the opposite bank shall be maintainable.
36. A Maintenance Bond or Irrevocable Letter of Credit shall be posted in accordance with Section 1.1.6 of these Design Criteria in an amount equal to 100 of the determined amount of construction costs for a two-year period.

5.2 STORAGE

1. The detention storage requirements shall be that excess runoff from an 100-year frequency storm.

The excess runoff is that runoff generated due to urbanization which is greater than the runoff historically generated under existing conditions, for a given frequency storm.

Peak release rates from developments shall not exceed the existing runoff that occurred before development for all storm frequencies up to and including the 100-year frequency storm. As a minimum, the 5-year and 100-year storms shall be investigated.

If a stormwater master drainage plan is adopted in the area under consideration, then the provisions of the plan shall be adhered to.

2. For the design of stormwater storage facilities, the following methods are approved for the use:

<u>Method</u>	<u>Drainage Area</u>
HEC-1 Snyder's Method	Greater than 10 acres
HEC-1 SCS Method	2 to 2000 acres
Modified Rational Approach with volume factors*	Less than 10 acres
Graphical method*	Less than 2 acres

*These methods are available from the City.

3. U S Weather Bureau Technical Paper No. 40 and National Weather Service HYDRO-35 (June, 1977) shall be used for rainfall information.
4. The rainfall pattern shall be used in accordance with the modeling technique selected.
5. For Snyder's synthetic unit hydrograph method, the loss rates in determining the runoff/hydrograph shall be an initial loss of 0.5 inches and a uniform loss of 0.08 inches per hour for the subsequent hours once the initial losses are satisfied.
6. All calculations for detention facilities shall be submitted for review by the City.

The submittal shall include hydrographs for both existing and developed conditions, detention facility stage-area-volume relationships, outlet structure details, and a stage versus time analysis through the facility.

7. The intent of the stormwater detention requirements shall be identified at the preliminary plat stage of the project review. The 100-year frequency rainstorm floodplain areas and stormwater detention site locations shall be shown on the preliminary plat to illustrate how these areas will be managed during and after construction.

The 100-year frequency rainstorm floodplain is defined as the area of land that the runoff from the 100-year frequency rainstorm inundates.

8. Detention facilities should be located in areas which require a minimum of maintenance.
9. Detention facilities may be located in the floodplain area or flood hazard area, providing the floodplain area and the flood hazard area are determined with the facility in place and that no rise in the water surface offsite of the development results from the installation of the facility except that permitted by City Ordinance.
10. Additional detention storage, in excess of the required storage for a drainage area, can be provided to satisfy the detention requirements for a tract of land downstream of the detention facility, providing the detention facility is constructed prior to the development of the downstream tract.
11. All detention facilities shall be designed "dry" unless a special maintenance agreement, in writing, has been approved by the City.
12. A minimum number of detention facilities is encouraged for each development.
13. If runoff has a natural tendency to drain in several directions for a given development tract of land where detention is required, then detention storage shall be provided for the biggest drainage area. Additionally detention storage may be provided, at the same facility, to satisfy detention requirements for a separate drainage area on the same development, provided that:
 - A. The whole developmental tract of land is in the same watershed.
 - B. The smaller drainage area(s) that, has/have been compensated for does/do not, either singly or in

combination, adversely impact the health, welfare and safety of the general public downstream.

14. If a tract of land being developed is located in more than one drainage area, then grading work to divert flows from one drainage area to another will not be permitted. Compensatory storage will not be permitted in one drainage area for that required in another.

A drainage area is defined as an area of land that funnels stormwater runoff to a common point at the downhill side of that tract being developed.

15. Detention facilities may be used for compensatory storage when encroaching into the floodplain area provided that the overall drainage system does not:

- A. Cause a rise in the water surface elevation beyond the extent of the developmental tract of land.
- B. Adversely impact adjacent properties by an increase in velocity.

16. All dikes and spillways on detention facilities shall have typical cross sections shown on the plans.

17. Side slopes on detention facilities shall not be steeper than 4:1. (Horizontal: Vertical). Steeper side slope may be allowed should the site conditions necessitate; however, methods for proper erosion control must be established and illustrated, and the procedures for maintaining these steeper side slopes must be established and shown on the plan.

18. Detention facilities shall be provided with a low flow channel from the inlet to the outlet structure to transmit low flows and the low flow channel shall be approved by the City, the low flow channel shall be concrete lined and of sufficient width and geometry to allow for proper maintenance. The maintenance procedure shall be shown on the plans.

19. The easements for the storm sewers and detention ponds shall appear on the plat.

20. An accessway at least 20 feet wide shall be provided to any detention area. Access may be provided by frontage on a dedicated public street or by an access easement from a dedicated public street to the detention area. The access road shall have a maximum grade of 10 percent. The access road shall be paved, 12 feet wide,

from the top of the bank to the bottom of the detention pond and in the bottom of the detention pond to locations of high maintenance.

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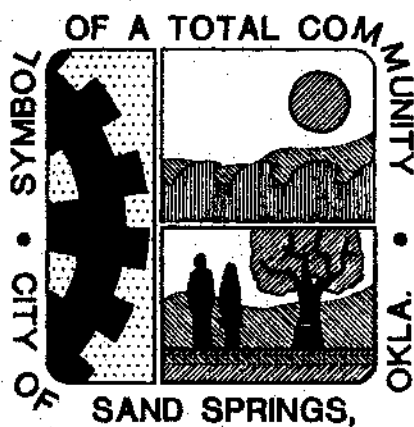
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FOR ADDITIONAL COPIES, CONTACT:

**PUBLIC WORKS DEPARTMENT
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Phone: (918) 245-8751**

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SECTION I
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FOR THE
CITY OF SAND SPRINGS, OKLAHOMA
SAND SPRINGS MUNICIPAL AUTHORITY
June 1992

(05-18-92)

CITY OF SAND SPRINGS, OKLAHOMA
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ENGINEERING DESIGN CRITERIA
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5.0 STORMWATER DRAINAGE CRITERIA

5.1 Runoff

1. All stormwater runoff shall be subject to review and approval by the City Engineer with regard to analysis, design and construction of drainageway facilities. The appropriate public authority shall have the right to maintain or to cause to be maintained the drainageway system for its intended purposes. If a stormwater master drainage plan is adopted for the area under consideration, then the provisions of the plan shall be adhered to.

The drainage system, both public and private, may consist of storm sewers (which are closed conduits); improved channels constructed in conformity with adopted City Standards; unimproved drainageways left in their natural condition; the areas covered by restricted drainageway easements for the purpose of providing overland flow; and all appurtenances to the above including inlet, manholes, junction boxes, headwalls, dissipators, culverts, etc. All portions of the drainage system that exist on dedicated rights-of-way or restricted drainage easements shall be owned and maintained by the City, unless provided otherwise by agreement or covenant.

The drainage system plans shall show both plan and profile views of the proposed improvements. Any manhole or access point to the system that is buried out of sight shall be dimensioned to permanent objects in the vicinity.

2. The stormwater drainage system shall be designed to receive and pass the runoff from a 100-year frequency rainstorm under full urbanization. Full urbanization is defined as the total development in an area that is anticipated. The entire flow shall be confined within the said stormwater drainage system.
3. The stormwater collection system shall be designed either:
 - A. To pass a minimum of the runoff from a 5-year frequency rainstorm in a pipe network with overland flow capacities so that the combination of any two will pass the runoff from a 100-year frequency rainstorm under fully urbanized conditions.

- B. Or, to pass the entire runoff from a 100-year frequency rainstorm in the pipe network. Should the entire runoff from a 100-year frequency rainstorm be conveyed in a pipe network, a nominal frequency rainstorm shall be designed to carry flow in the event of inlet blockage or bypass.

The Overland flow portion of the collector system shall be confined to dedicated rights-of-way, or restricted drainage easements to assure that stormwater can pass through the development without inundating the lowest level of any building, dwelling, or structure. Restricted drainage easements shall be shown on the plat. The main channel of the drainage system shall not be bound to carrying the 5-year frequency rainstorm in a pipe network.

- 4. The rational method of runoff analysis may be used for the design of the closed pipe networks of the storm sewer system up to drainage areas of 100 acres. For drainage areas over 100 acres, a hydrograph method shall be used.
- 5. The Rainfall Intensity Curves prepared from TP-40 and National Weather Service HYDRO-35 (June 1977 or latest edition) shall be used for design in determining the rainfall.
- 6. The Oklahoma Department of Transportation Technical Manual (latest edition) shall be used for determining the basic "C" values.

A weighted "C" value shall be determined with minimum values of 0.45 for residential (RS and RD), 0.65 for multifamily (RM) and 0.90 for industrial and commercial areas. Unplatted areas with 300 feet either side of an arterial shall be either considered commercial or shall be in accordance with the comprehensive plan in estimating runoff coefficients.

The weighted "C" value shall be increased by 25 percent for the 100-year frequency rainstorm.

- 7. The distance between inlets, as well as the distance to the first inlet, shall be determined by the following, whichever is less:
 - A. For the 5-year frequency rainstorm two driving lanes must remain open for streets on grade.

- B. For the 100-year frequency rainstorm, one driving lane must remain open for streets on grade.
- Further, the depth of flow shall not exceed curb deep.
- C. A maximum time of concentration of 10 minutes to the first inlet shall be used for single or multifamily residential areas.
- D. A maximum time of concentration of 5 minutes to the first inlet shall be used for commercial and industrial areas.
- E. 600 feet.
8. At sump locations, the water depth shall not exceed 12 inches above the top of the curb, or 18 inches above the top of the grate, whichever is less, for the 100-year frequency rainstorm.
9. Where sump collection systems are used, an overflow route shall be established in the event of complete blockage of the sump.
10. Runoff from areas greater than one half (1/2) acre outside the roadway shall be collected before it reaches the roadway. Parking lots shall have internal drainage systems so as to reduce concentrated flow into streets. This item does not apply to single family residential lots.
11. Inlets shall be located at intersections to collect the flow from crossing the intersection. Inlets at intersections shall be located so they do not encroach upon the curb return. No drainage structure shall be permitted at a wheelchair ramp.
12. Drainage areas, runoff from 5-year and 100-year frequency rainstorms, time of concentration, and inlet design for each inlet shall be summarized and tabulated on the plans. This summary table shall also be a part of the drainage calculations.

The flows and velocities for each pipe and open channel shall be summarized and tabulated as above.

If a tract of land under development has a floodplain area within its boundary, then a hydraulic (backwater) analysis of the existing and proposed drainage system shall be provided to show any impact the proposed development has on the floodplain area and elevation.

13. Trapezoidal channels shall be designed with a hard lined low flow channel, such as concrete. The low flow channel shall branch off to pick up any storm sewers discharging into the channel. The top of the sides of the low flow channel shall be a minimum of 6 inches lower than the adjacent main channel bottom. This is to insure that the drainage runs over and into the low flow channel and not erodes around it. The minimum cross slope on the bottom of the trapezoidal channel shall be 2 percent. The easement for the trapezoidal channel shall include 10 feet additional width along the top of the bank for an access road.
14. Roughness coefficients for drainage design will be as listed in tables 5-5 and 5-6, figure 5-5, pages 109 through 123, of "Open Channel Hydraulics" by Ven Te Chow (published by McGraw-Hill Book Company, 1959, or latest edition).
15. The minimum velocity in any drainage system shall be 2.5 feet per second, for all events of 5-year frequency and greater. The maximum velocity in a pipe shall be 30 feet per second and the maximum velocity in an unlined ditch shall be 6 feet per second.
16. Culverts shall be sized using either Kutters or Mannings charts, and the Federal Highway Administration's inlet control charts, for the design flow. The slope used for design shall be the slope of the invert of the culvert.
17. No pipe shall be installed downstream having a diameter smaller than the pipe from which it is receiving water.
18. Concrete pipe shall not be less than C-76 Class III. Corrugated metal pipes shall meet Oklahoma Department of Transportation gauge requirements for fill heights, and bituminous coated and lined.
19. Junctions between different pipe sizes shall be made with the top inside of the downstream pipe no higher than the top inside of the upstream pipe.
20. A manhole or junction box shall be required at all changes of grade, changes in alignment, and junctions between two or more different size pipes.
21. The horizontal distance between pipes being placed in the same trench shall be a minimum of two feet or one-third the diameter of the larger pipe, whichever is greater. This would include multiple pipe crossings for culvert purposes.

22. The minimum storm sewer pipe size shall be 15 inches. Use of smaller pipes, such as for detention pond outlets, shall require prior approval by the City Engineer's office.
23. Radius pipes will not be used on storm sewers having a diameter of 36 inches or less. Radius pipes may be used on storm sewers larger than 36 inches. The radius of the curve shall be no less than 5 times the diameter of the pipe. The degree of deflection shall be no more than $7\frac{1}{2}$ degrees per joint of radius pipe, or the pipe manufacturer's recommendation, whichever is less. The City is allowed to require radius pipe, should the energy loss be excessive and thereby detrimental to the system.
24. A minimum of 6 inches cover shall be provided over pipes and box culverts to the bottom of the subgrade in paved areas except when the box culverts are built with the top at grade.
25. All storm sewers shall be shown in profile, showing flow-line, size, type and grade. Profiles shall show the natural and proposed ground line at the center line of the storm sewer. Stationing shall be continuous through manholes, along the main (longest) line, to the top of the system. Branch lines shall be stationed, starting from 0+00, from their connection with the main line. Lines shall be stationed on the profile drawing from left to right increasing upstream.
26. The radius of curve for a box structure shall be a minimum of 3 times the maximum width of the box structure, but not less than 50 feet.
27. New box culverts and bridges shall have adequate capacity to pass 100-year fully urbanized flows with one foot of free board under the low chord. A backwater analysis shall be provided to illustrate compliance with this requirement.
28. Pipes discharging at a steep gradient into drainageways and detention facilities shall be provided with a head-wall and energy dissipators. A steep gradient is defined as an energy grade line whose outlet velocity is greater than six feet per second.
29. The centerline radius of a curve on an improved open channel shall be a minimum of 3 times the top width at the design flow or 100 feet, whichever is greater.

30. All improved channels shall be provided with a minimum of one foot of freeboard above normal depth of the runoff from a 100-year frequency rainstorm.

At all bends in improved channels, the amount of freeboard shall be increased by the following equation:

$$H = \frac{V * b}{64.4 * r}$$

Where: H is Height of freeboard in feet.
V is the average Velocity in feet per second.
b is the Width of the channel at the design water surface in feet.
r is the Radius of curvature of the channel centerline in feet.

The increased freeboard height shall be maintained a minimum of one channel width upstream and downstream of the bend.

31. When storm sewers are constructed in fill areas, all materials in fill areas shall be compacted to a 95 percent standard proctor density prior to the trenching and laying of the pipe.
32. Maximum spacing between manholes or junction boxes shall not exceed 400 feet for pipes of 15 inches and 500 feet for pipes greater than 15 inches.
33. All junction boxes and manholes shall be built with the Standard Manhole Ring and Cover at grade.
34. A manhole or junction box shall be constructed at the P.C. or P.T. of all curves in sewers.
35. Borrow ditches, when allowed, shall not exceed 4 feet in depth. Culverts shall be sized to handle the 5-year or larger storm (minimum 15" diameter). The side slopes on the bank next to the road shall be 4 feet horizontal to 1 foot vertical, or flatter. The side slope on the opposite bank shall be maintainable.
36. A Maintenance Bond or Irrevocable Letter of Credit shall be posted in accordance with Section 1.1.6 of these Design Criteria in an amount equal to 100 of the determined amount of construction costs for a two-year period.

5.2 STORAGE

1. The detention storage requirements shall be that excess runoff from an 100-year frequency storm.

The excess runoff is that runoff generated due to urbanization which is greater than the runoff historically generated under existing conditions, for a given frequency storm.

Peak release rates from developments shall not exceed the existing runoff that occurred before development for all storm frequencies up to and including the 100-year frequency storm. As a minimum, the 5-year and 100-year storms shall be investigated.

If a stormwater master drainage plan is adopted in the area under consideration, then the provisions of the plan shall be adhered to.

2. For the design of stormwater storage facilities, the following methods are approved for the use:

<u>Method</u>	<u>Drainage Area</u>
HEC-1 Snyder's Method	Greater than 10 acres
HEC-1 SCS Method	2 to 2000 acres
Modified Rational Approach with volume factors*	Less than 10 acres
Graphical method*	Less than 2 acres

*These methods are available from the City.

3. U S Weather Bureau Technical Paper No. 40 and National Weather Service HYDRO-35 (June, 1977) shall be used for rainfall information.
4. The rainfall pattern shall be used in accordance with the modeling technique selected.
5. For Snyder's synthetic unit hydrograph method, the loss rates in determining the runoff/hydrograph shall be an initial loss of 0.5 inches and a uniform loss of 0.08 inches per hour for the subsequent hours once the initial losses are satisfied.
6. All calculations for detention facilities shall be submitted for review by the City.

The submittal shall include hydrographs for both existing and developed conditions, detention facility stage-area-volume relationships, outlet structure details, and a stage versus time analysis through the facility.

7. The intent of the stormwater detention requirements shall be identified at the preliminary plat stage of the project review. The 100-year frequency rainstorm floodplain areas and stormwater detention site locations shall be shown on the preliminary plat to illustrate how these areas will be managed during and after construction.

The 100-year frequency rainstorm floodplain is defined as the area of land that the runoff from the 100-year frequency rainstorm inundates.

8. Detention facilities should be located in areas which require a minimum of maintenance.
9. Detention facilities may be located in the floodplain area or flood hazard area, providing the floodplain area and the flood hazard area are determined with the facility in place and that no rise in the water surface offsite of the development results from the installation of the facility except that permitted by City Ordinance.
10. Additional detention storage, in excess of the required storage for a drainage area, can be provided to satisfy the detention requirements for a tract of land downstream of the detention facility, providing the detention facility is constructed prior to the development of the downstream tract.
11. All detention facilities shall be designed "dry" unless a special maintenance agreement, in writing, has been approved by the City.
12. A minimum number of detention facilities is encouraged for each development.
13. If runoff has a natural tendency to drain in several directions for a given development tract of land where detention is required, then detention storage shall be provided for the biggest drainage area. Additionally detention storage may be provided, at the same facility, to satisfy detention requirements for a separate drainage area on the same development, provided that:
 - A. The whole developmental tract of land is in the same watershed.
 - B. The smaller drainage area(s) that, has/have been compensated for does/do not, either singly or in

combination, adversely impact the health, welfare and safety of the general public downstream.

14. If a tract of land being developed is located in more than one drainage area, then grading work to divert flows from one drainage area to another will not be permitted. Compensatory storage will not be permitted in one drainage area for that required in another.

A drainage area is defined as an area of land that funnels stormwater runoff to a common point at the downhill side of that tract being developed.

15. Detention facilities may be used for compensatory storage when encroaching into the floodplain area provided that the overall drainage system does not:

- A. Cause a rise in the water surface elevation beyond the extent of the developmental tract of land.
- B. Adversely impact adjacent properties by an increase in velocity.

16. All dikes and spillways on detention facilities shall have typical cross sections shown on the plans.

17. Side slopes on detention facilities shall not be steeper than 4:1. (Horizontal: Vertical). Steeper side slope may be allowed should the site conditions necessitate; however, methods for proper erosion control must be established and illustrated, and the procedures for maintaining these steeper side slopes must be established and shown on the plan.

18. Detention facilities shall be provided with a low flow channel from the inlet to the outlet structure to transmit low flows and the low flow channel shall be approved by the City, the low flow channel shall be concrete lined and of sufficient width and geometry to allow for proper maintenance. The maintenance procedure shall be shown on the plans.

19. The easements for the storm sewers and detention ponds shall appear on the plat.

20. An accessway at least 20 feet wide shall be provided to any detention area. Access may be provided by frontage on a dedicated public street or by an access easement from a dedicated public street to the detention area. The access road shall have a maximum grade of 10 percent. The access road shall be paved, 12 feet wide,

from the top of the bank to the bottom of the detention pond and in the bottom of the detention pond to locations of high maintenance.

21. If the detention facility is approved by the City to serve areas outside the subdivision in which it is located, such additional areas shall be specifically identified in the provision for detention.
22. An operations and maintenance guide shall be prepared to illustrate the proper use and care of the detention facility, and by who, when and how.
23. Any dam or berm constructed shall be designed and constructed by a Registered Professional Engineer.
24. Spillways on detention facility dams shall be constructed to pass the 500-year flood event with a minimum of one (1) foot of freeboard on the earth dam structure. All detention facilities shall meet the Oklahoma Water Resources Board's requirements.
25. All earth slopes and areas subject to erosion, such as, adjacent to trickle channels, inlet structures, and outlet structures, shall be slab sodded with bermuda sod or protected with other erosion control measures. All other earth surfaces, with the area designated for detention pond site, shall have an established growth of bermuda grass or other approved species. All grass covered areas shall be fertilized, to current recommendations, watered and in an established growing condition prior to completion and approval of the detention pond.
26. Detention facilities shall be environmentally sound and compatible with the area (neighborhood). Where feasible, mutiple uses for the facilities should be established.
27. The maintenance responsibility for on site detention facilities shall depend upon the zoning. If the area is zoned for single family residential, including duplexes, the maintenance responsibility shall belong to the City. If the area is otherwise zoned, the maintenance responsibility shall belong to the private sector. A written agreement between the development and the City defining the maintenance responsibility shall be made prior to the development's acceptance by the City.

28. A Maintenance Bond or Irrevocable Letter of Credit shall be posted in accordance with Section 1.1.6 of these Design Criteria in an amount equal to 100 percent of the determined amount of construction costs for a two-year period.

5.3 DETENTION FACILITIES

1. Definition

- A. A regional detention facility is a stormwater detention facility and collection system which provides stormwater detention capacity for all new development in a defined drainage area.
- B. An on-site detention facility is a stormwater detention facility built on the site of the development to provide detention storage for that development.
- C. Major developments are defined as any development which is planned to have greater than 1/2 acre of impervious surfaces. For single family residential lot development, the impervious surface is assumed to include 2700 square feet per building lot, unless better information is available. An impervious surface shall include all surfaces which do not allow an appreciable amount of infiltration. This includes, but not limited to roads, driveways, roofs and parking lots both paved and gravel.
- D. Minor development is a development which is less than a major development.
- E. An existing problem is defined as stormwater runoff from the 100-year frequency rainfall event which flows out of the drainage easement. If there is no drainage easement covering the watercourse, then a problem is when the runoff flows out of its channel banks in developed areas. In undeveloped areas without a drainage easement, a problem is when the runoff flows out of its channel banks and overtops roads and/or impacts structures.

2. Regional Detention Facility in Place or Planned

When there is a regional detention facility in place in the drainage area where development is planned, or one is planned in the near future, then all new development

may incorporate the regional detention facility into the design of the drainage system for the development.

3. No Regional Detention Facility

When there is no regional detention facility constructed or planned in the near future for a particular drainage area where development is planned, then the following shall apply:

- A. When there is an existing drainage problem downstream of the development, then new major development is required to provide on-site detention. The method of maintenance shall be set forth in the deed restrictions.

The only exception to on-site detention is new construction of a single family home on an existing lot, tract or parcel, which has not complied with the storm drainage detention requirements of this ordinance.

- B. When there is no drainage problem downstream of the development, then new development shall build on-site detention facilities, unless the development can show that the development will not produce a problem downstream.

4. Maintenance Responsibility

- A. The property owners in the development shall be responsible for maintenance to its detention facility in a minor residential, commercial or industrial development. If the detention facility is privately maintained, then the maintenance requirements shall be set forth in the deed restriction and the City shall be party to these deed restrictions.

- B. The City shall be responsible for the maintenance of detention facilities in major residential developments. If the detention facility is to be publicly maintained then the detention facility and access to it shall be deeded to the City.

City of Tulsa

Stormwater Design Criteria: Chapter 300 - Stormwater Policy and Standards

CHAPTER 300

Chapter 300 STORMWATER POLICY AND STANDARDS

301 GOALS

Drainage and flood control in the City of Tulsa and its environs are an integral part of the comprehensive planning process. Drainage is a subsystem of a larger and more comprehensive urban system. The goals of the City of Tulsa are:

- **To protect the general health, safety, and welfare of the residents of the City of Tulsa**
- **To minimize property damage from flooding**
- **To minimize water quality degradation by preventing siltation and erosion of the City waterways**
- **To ensure the safety of the City's streets and right-of-ways**
- **To increase the recreational opportunities of the City of Tulsa and to encourage the retention of open space**
- **To foster other beneficial uses of the real property within the boundaries of the City of Tulsa**
- **To ensure corrective measures which are consistent with the overall goals, policies, standards and criteria of the City of Tulsa.**
- **To preserve environmental quality, social well-being and economic stability.**
- **To minimize future operations and maintenance expenses.**
- **To minimize need for rescue and relief efforts associated with flooding which is generally undertaken at the expense of the public.**
- **To ensure that all development within the City of Tulsa provides for the proper handling of storm water runoff from a site such that for all studied frequency floods there are: no increases in peak downstream discharges or velocities and no increases in water surface elevations which result in additional damages to downstream structures.**

302 PRINCIPLES

302.1 Urban Sub-System

The City of Tulsa considers stormwater drainage a sub-system of the overall urban system and requires development planning to include the allocation of space for drainage facilities that are compatible with the City of Tulsa Comprehensive Plan.

302.2 Multi-Purpose Resource

The City of Tulsa considers storm runoff a multi-purpose resource with the potential for other uses and encourages these multi-purpose uses. Natural drainage channels and techniques shall be given priority consideration in preparation of stormwater drainage system designs and shall be designed or improved as an integral part of the landscape of the area in accordance with the following guidelines:

- A. Storm sewers shall be utilized in all development up to a drainage area of 40 acres. Storm sewers may be used or required for larger drainage areas where there are no viable alternatives to fit the site or geographic conditions or to meet the requirements of this MANUAL at the discretion of the CITY ENGINEER. Storm sewers may be used to alleviate existing drainage problems and when required in the approved Master Drainage Plans, subject to the approval of the CITY ENGINEER.

However, the design of any development shall provide for the maximum use of open channels and natural streams and detention storage (where required) to control runoff rates. Open channels are allowed when delineated in the approved Master Drainage Plans for those areas smaller than 40 acres that would otherwise be storm-sewered. The City may require open channels for other drainage ways for just cause.

- B. Drainage channel improvements shall be developed and designed to preserve and protect trees and other worthy botanical and geological features to the maximum extent practicable. Vegetation shall be preserved when feasible. Riparian habitat shall be maintained when feasible, during improvements
- C. Wherever channel improvements are required to accommodate storm runoff in a specified manner, the designs shall provide maximum practical utilization of turf, sodding, and natural ground surface protection techniques in order to protect the environment by reducing erosion potential.
- D. Water quality control measures shall be incorporated into stormwater management designs, subject to approval of the Director. Additionally, impacts on receiving water quality shall be assessed for all flood management projects.

302.3 Jurisdictional Boundaries

The City of Tulsa will cooperate with other jurisdictions to unify drainage efforts and assure an integrated plan, as outlined in the ORDINANCES, Chapter 1, Section 103H, which gives the Director the authority to “Seek the cooperation of counties and municipalities within the area in minimizing the contribution of all stormwater drainage systems to flooding and, in particular, cooperate with other affected political jurisdictions in preparing and implementing master drainage plans.”

302.4 Preventive Measures

The City of Tulsa considers preventive drainage measures to be less costly to the taxpayer than retro-fit drainage measures over the total life of the project and will have planned and implemented, where possible, those measures during urbanization.

303 WATERSHED DEVELOPMENT ORDINANCE

303.1 Purpose

Chapter 3 of the ORDINANCES provides for watershed development regulations “To protect the general health, safety, and welfare of the residents of the City of Tulsa from the hazards and danger of stormwater run-off” and to minimize water quality degradation.

303.2 Drainage Policies

Section 206.3.1 of Ordinance No. 16959 established a set of drainage policies which are incorporated into this MANUAL. It was amended by Ordinances 17285 and 21316. These policies (with titles and emphasis added) are repeated below for reference purposes.

303.2.1 Stormwater Drainage System Capacity

“The stormwater drainage system shall be designed to pass the stormwater run-off received from upstream and from the subject property in a 1% (100-year) frequency rainstorm under full urbanization.”

In this MANUAL, the “1% (100-year) frequency rainstorm under full urbanization” is the **“regulatory 1% (100-year) storm”**.

303.2.2 Development Impact on Flooding

“Development shall be constructed so that it will not increase the frequency of flooding or the depth of inundation of structures.”

303.2.3 Development Impact on Flood Peaks

“Peak flows shall not be increased at any location for any storm, up to and including the Regulatory 1% (100-year) Storm, which will result in the inundation of unprotected structures not previously subject to inundation as a result of that same frequency storm.”

303.2.4 Detention Requirements for Development

“Regulation of peak flows to allowable levels, as determined by subparagraphs (b) [303.2.2] and (c) [303.2.3] of the ORDINANCES, shall be achieved by on-site or off-site storage as provided in the City Drainage Standards.”

This requirement will be subject to the conditions of the master drainage plan and any determination on allowing the developer to pay a fee in lieu of stormwater detention.

303.2.5 Increase in Downstream Conveyance

“Subject to requirements for Watershed Development Permits and of the City Drainage Standards, downstream conveyance may be improved to compensate for increased flows if such improvements comply with the policies of this chapter.”

303.2.6 Dumping

“Dumping of any material into the stormwater drainage system without a permit is prohibited.”

304 REGIONAL AND LOCAL PLANNING

304.1 Stormwater Management Master Drainage Plans

304.1.1 Master Drainage Plans

The City of Tulsa will prepare, adopt and periodically update master plans for the drainage ways within its jurisdictional boundaries. These master plans set forth the guidelines for improvement and maintenance of the existing and future drainage facilities for all future development and any redevelopment. A project in compliance with the master plan will also be in general compliance with this MANUAL.

304.1.2 Criteria for Master Drainage Plans

In preparation of the master drainage plans and updates to master drainage plans, the policy, standards and criteria set forth in this MANUAL shall be used as a guideline for identifying required facilities. However, the benefit/cost relationship must also be considered when retrofitting drainage facilities, and therefore the CITY ENGINEER may relax the criteria as deemed necessary.

304.1.3 State Funded Projects

When projects will be funded (in whole or in part) by the State of Oklahoma, the more stringent criteria will apply to the project.

304.2 Operation and Maintenance

Continual maintenance of storm drainage facilities is required to ensure they will function as designed. Maintenance of detention facilities involves removal of debris and sediment and repair of the embankment and appurtenances. Sediment and debris must also be periodically removed from channels and storm sewers. Trash racks and street inlets must be regularly cleared of debris to maintain discharge capacity. Channel bank erosion, damage to drop structures, crushing of pipe inlets and outlets, and deterioration to the facilities must be repaired to avoid reduced conveyance capability, unsightliness, and ultimate failure.

304.2.1 Maintenance Access

The City of Tulsa requires that maintenance access be provided to all storm drainage facilities for operational and maintenance purposes through acceptance of the project by the City. After

acceptance, permanent access shall be protected by a dedicated right of way or easement. The right of way or easement shall be shown on final plats or final development plans and shall clearly state that the purpose is for stormwater management facilities.

304.2.2 Interim Stormwater Drainage System Maintenance

Drainage facilities provided by the developer shall be fully and properly maintained from construction through final acceptance of the development improvements by the City of Tulsa.

304.2.3 Private Stormwater Drainage System Maintenance

It shall be the responsibility of all property owners to maintain private drainage facilities with a tributary watershed area of less than 40 acres as follows:

- A. Mow and provide maintenance of drainage channels and their slopes for that portion of the channel lying within their property limits
- B. Keep clear all drainage channels within the boundaries of their properties in accordance with the requirements of this MANUAL
- C. Prevent any and all drainage interferences, obstructions, blockages, or other adverse effects upon drainage into, through, or out of the property
- D. Control the erosion of the drainage channels and the deposition of materials into the drainage channels from the property.

304.2.4 Easements and Rights-of-Way

Easements will be required for all stormwater management facilities not in public rights of way; including:

- Storm sewers
- Channels
- Storage areas
- Other hydraulic structures
- All portions of the public stormwater drainage system that cross more than 2 lots or 2 properties

Easements shall:

- Not allow restriction of the drainage purposes.
- Clearly identify that the purpose includes operation and maintenance of stormwater management facilities
- Be shown on all plats, including widths and specific purposes (i.e.: storm sewer, maintenance access, channel, etc.)

The widths of easements are determined by:

- The size of the storm sewer, its depth, and the equipment needed to remove, replace or repair the sewer.
- The width of the easement for channels, storage areas and other structures is generally determined by the size of the facility and the equipment needed for maintenance, typically covering the entire facility plus 20 feet for maintenance access.

TABLE 301 REQUIRED OPERATIONS, MAINTENANCE EASEMENTS & RESERVE AREAS (NOT WITHIN A PUBLIC RIGHT OF WAY)	
DRAINAGE FACILITY	MINIMUM EASEMENT RESERVE AREA WIDTH
1. Storm Sewer	Refer to the City of Tulsa Infrastructure Development Process Manual , Figure 8-4.
2. Storm Sewer Overflow, Where Required	As required to contain surface overflow in an overland drainage easement. Refer to Policy 305.4.3. C
3. Open Channel	Top width plus 20 feet; five feet on one side and 15 feet on the side with the maintenance access road.
4. Post-development 1% (100-year) Regulatory Floodplain	Area sufficient to contain the regulatory 1% (100-year) post-development floodplain
5. Open Space Detention Facilities	As required to access and contain storage volume and associated facilities plus 20 feet of maintenance access around the perimeter.
6. Parking Lot and Underground Detention Facilities	As required to access and contain storage volume and associated facilities.

Drainage easements (see Table 301 above) shall be shown on the Final Plats and Final Development Plan and shall state that the City has the right of access on the easements which shall be kept clear of obstructions to the flow and/or maintenance access.

304.3 Water Quality Control

Chapter 5 of the ORDINANCES establishes methods to regulate City of Tulsa's municipal separate storm sewer system and enables the City to comply with all applicable state and federal laws and regulations, including the federal Clean Water Act, 33 U.S.C. §§ 1251, et seq., the Oklahoma Environmental Quality Act, 27A O.S.2001, §§ 1-1-101, et seq., and stormwater regulations contained in 40 CFR Part 122, EPA Administered Permit Programs - the National Pollutant Discharge Elimination System (NPDES). The objectives of this chapter shall permit the City of Tulsa to:

- Regulate the contribution of pollutants into the municipal separate storm sewer system through the stormwater discharges of any user;
- Control the introduction into the municipal separate storm sewer system of spills, dumping, or the disposal of materials other than stormwater;
- Prohibit illicit discharges into the municipal separate storm sewer system;
- Carry out inspections, surveillance and monitoring procedures necessary to determine compliance and noncompliance with this chapter;
- Comply with its Oklahoma Pollution Discharge Elimination System (OPDES) Municipal Storm Water Discharge Permit conditions and any other federal or state law or regulation pertaining to stormwater quality; and
- Provide for enforcement remedies that include fines for violations of this Chapter.

304.3.1 Oklahoma Water Resources Board

In recognition of the policies of the Oklahoma Water Resources Board, the City of Tulsa will cooperate with state agencies in programs that prevent the violation of the state's water quality standards, pursuant to Title 82 O.S. 1981, Paragraph 1085.2.

304.3.2 OPDES Stormwater Permit

In recognition of the OPDES stormwater discharge permit, the City of Tulsa requires the planning and incorporation of measures into future development plans that will improve the quality of urban storm runoff. The recommended measures, or Best Management Practices, shall be in accordance with the OPDES stormwater discharge permit and the criteria set forth in this MANUAL for control of erosion and sedimentation from construction activities (Chapter 1000) and criteria for water quality enhancement (Chapter 1100).

304.4 Floodplain Management

304.4.1 Development within the Regulatory Floodplain

The City of Tulsa has adopted floodplain regulations that are set forth in the ORDINANCES, Chapter 3, Section 304. These regulations may be accessed online using the following link: City of Tulsa Revised Ordinances Title 11-A Chapter 3 Section 304.

304.4.2 Regulatory Floodplain Maps

The City of Tulsa has adopted Regulatory Maps that are of a higher standard than the FEMA FIRM maps described in the ORDINANCES Section 304.5. These maps identify the boundaries of the regulatory 1% (100-year) storm. These maps are available from the City of Tulsa

Engineering Services Department or online at <http://www.cityoftulsa.org/city-services/flood-control/regulatory-floodplain-map-atlas.aspx>, and represent those areas for which floodplain regulations are applicable. Any changes to the regulatory floodplain as a result of any development activity must be approved by the CITY ENGINEER and submitted for updates to the Regulatory Maps as a part of that development activity.

304.4.3 Reserve Area

A reserve area shall be platted containing the regulatory 1% (100-year) floodplain.

304.5 FEMA Requirements

304.5.1 The National Flood Insurance Program

The City of Tulsa participates in the National Flood Insurance Program (NFIP). This program allows residents to obtain flood insurance at federally subsidized rates. FEMA has designated Special Flood Hazard Areas (SFHA) on the Flood Insurance Rate Map (FIRM) for the City of Tulsa (see FEMA's website at www.fema.gov to view the FIRM). The FIRM delineates flood risk information for "existing conditions" at the time of the Effective Flood Insurance Study (FIS) for each creek. The NFIP regulations allow FEMA to revise and amend the FIRM and FIS reports as warranted, **or** after receiving and evaluating a request from community officials (the ADMINISTRATOR) and individual property owners. Therefore, any development that takes place in, or otherwise affects the SFHA shall require the approval of the ADMINISTRATOR and the submittal of adequate supporting data for review and approval by FEMA.

FEMA's role in floodplain management is detailed on FEMA's website at www.fema.gov. This site additionally provides the requirements for each of the following methods of obtaining FEMA approval of a revisions or amendment to the FIRM.

304.5.2 Letter of Map Amendment

Limitations imposed by the scales at which the FIRM for the City of Tulsa is prepared may have resulted in individual properties being inadvertently included in SFHAs. To correct these inadvertent inclusions, a Letter of Map Amendment (LOMA) may be applied for from FEMA. A LOMA results from an administrative procedure that involves the review of technical data submitted by the owner or lessee of property who believes the property has incorrectly been included in a designated SFHA. A LOMA amends the currently effective FEMA map and establishes that a specific property is not located in an SFHA.

304.5.3 Letter of Map Revisions Based on Fill

The Floodplain Administrator (FPA) will not approve a Letter of Map Revision based on Fill (LOMR-F) in the City of Tulsa without supporting documentation verifying compliance with City ORDINANCES. The placement of fill in the floodplain shall require hydraulic studies to determine the upstream and downstream effect.

304.5.4 Conditional Letter of Map Revision

FEMA's review and comment on a project that is **proposed** within the SFHA is referred to as a Conditional Letter of Map Revision (CLOMR). A CLOMR comments on whether the proposed project meets the minimum floodplain management criteria of the NFIP and, if so, what revisions will be made to the City's FIRM if the project is completed as proposed. A CLOMR is required to be obtained from FEMA before a project can be built if the project includes any work within the designated floodway, or if the project would require any change in the effective hydraulic model, the delineated 1% (100-year) flood floodplain, or the effective flood profiles.

Detailed information on the CLOMR can be obtained at: <http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/clomr.shtm>. Additionally, application forms can be obtained at: http://www.fema.gov/plan/prevent/fhm/dl_mt-2.shtm.

304.5.5 Letter of Map Revision

A Letter of Map Revision (LOMR) is a request that FEMA officially amend or revise the FIRM to reflect "existing conditions", such as an "as-built" project. Adequate supporting data shall be submitted to FEMA after approval of the FPA. A LOMR is required as a follow-up to the CLOMR, or if any work has been completed within the designated floodway, or if the project requires any change in the effective hydraulic model, the delineated 1% (100-year) floodplain, or the effective flood profiles. No occupancy permits will be approved until the LOMR is approved by the City for submittal to FEMA.

Detailed information on the LOMR and submittal requirements can be obtained at: <http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/lomr.shtm>. The application forms are also obtained at: http://www.fema.gov/plan/prevent/fhm/dl_mt-2.shtm.

304.6 Watershed Transfer of Storm Runoff

The inter-basin transfer of stormwater between the following watersheds is not allowed:

- BIGHEART CREEK
- HARLOW CREEK
- PARKVIEW CREEK
- OAK CREEK
- LOWER BASIN
- BIRD CREEK
- CHERRY CREEK
- RED FORK CREEK
- COAL CREEK
- COOLEY CREEK
- CROW CREEK
- SWAN CREEK
- TRAVIS CREEK
- DIRTY BUTTER CREEK
- DOWNTOWN TULSA
- FLAT ROCK CREEK
- FRED CREEK
- FRY DITCH NO 2
- GARDEN CITY BASIN
- HAIKEY CREEK
- JOE CREEK EAST BRANCH
- JOE CREEK WEST BRANCH
- LITTLE JOE CREEK
- MINGO CREEK

- MINGO CREEK TRIBUTARIES
LB1-LB12 AND RB1-RB12
- MOOSER CREEK
- HAGER CREEK
- NICKEL CREEK
- PERRYMAN DITCH BASIN
- SOUTH TULSA
- SPUNKY CREEK
- ADAMS CREEK
- SALT CREEK
- VENSEL CREEK

Intra-basin transfers between sub-basins within those drainage basins shown above are allowed, subject to approval of the ADMINISTRATOR, on a case-by- case basis, if such intra-basin transfers cause no increase in flooding.

304.7 Acceptance of Existing Stormwater Drainage Systems

The City of Tulsa will consider acceptance of existing stormwater drainage facilities not constructed under these criteria for ownership and maintenance without modification to the system using the following guidelines:

- A. The system must be capable of conveying the regulatory 1% (100-year) storm flow using the criteria presented in this MANUAL.
- B. The system must be reasonably maintainable with legal access to all facilities using the standards for access presented in these criteria.
- C. Facilities submitted as part of previously approved plats, but not building permits, will be considered for acceptance.
- D. Channels must meet the minimum standards of:
 1. Maximum side slopes of 3:1
 2. Maximum regulatory 1% (100-year) storm design flow velocity as set forth in these criteria with suitable vegetation and other erosion control facilities
 3. The regulatory 1% (100-year) storm flow must be contained within the channel banks
- E. Storm sewer systems must meet the minimum standards of:
 1. Manholes at changes in pipe sizes and vertical alignment.
 2. The requirements for manholes at changes in horizontal alignment will be considered on a case by case basis.
 3. Manholes or other appropriate maintenance access must not be spaced farther apart than 500 feet, per Table 802.
 4. The sewer must be structurally sound and not subject to imminent failure.

305 TECHNICAL STANDARDS AND CRITERIA

305.1 Drainage Design and Technical Criteria

The City of Tulsa requires that all storm drainage facilities be planned and designed in accordance with the criteria set forth in this MANUAL. The criteria will be revised or amended as new technology is documented.

305.2 Drainage Construction Plans

Approval of plans for construction of any development drainage facility shall be subject to the procedures/requirements of this manual <http://www.cityoftulsa.org/media/20127/idpmanual.pdf>.

305.3 Storm Runoff Determination

305.3.1 Unit Hydrograph Method

The City of Tulsa requires that the timing of peak flows be taken into account by using a hydrograph method for computing storm runoff for the design of stormwater conveyance systems (channels, bridges, storm sewer systems), and for the design of detention systems (detention ponds). These systems shall be designed for fully urbanized conditions using computer models HEC-HMS or HEC-1 (other models may be used with the approval of the CITY ENGINEER).

305.3.2 Rational Method

The Rational Method may be used to compute frequency discharges for a project if the time of concentration is less than 10 minutes for the entire watershed draining to the point of discharge from the project. The Rational Method may be used for individual curb and gutter inlet design. The Rational Method shall not be used for detention pond design or for bridge design. When using the Rational Method, a C value of 0.90 shall be used for business and industrial areas. Multipliers shall be applied for all development when the rational method is used as specified in Chapter 0600 of this Manual. A “C” value for residential property shall be used as specified in Chapter 600 or computed using actual impervious surfaces, whichever is greater.

305.4 Drainage Facility Performance

The City of Tulsa requires the following minimum performance standards for drainage facilities:

305.4.1 Detention

For all stormwater detention facilities, the releases shall not exceed the pre-development runoff conditions for the 100% (1-year), 50% (2-year), 20% (5-year), 10% (10-year), 2% (50-year), and 1% (100-year), 24 hour storms under fully urbanized conditions and must be conveyed to a public stormwater conveyance system with no increase in flow rates downstream. Table 302 below outlines the various requirements.

Table 302 Freeboard Requirements for Stormwater Detention Facilities			
Embankment or Excavated Pond	1% (100-year) water surface elevation depth	1% (100-year) water surface elevation	0.2% (500-year) water surface elevation
Embankment or Excavated	< 18-inches	Contained within a dedicated stormwater detention easement	
Embankment	18-inches to 6 feet	Contained within the detention facility with one foot of freeboard to the top of the embankment*	Contained within the detention facility with no freeboard to the top of the embankment
Embankment	> 6 feet		Contained within the detention facility with one foot of freeboard to the top of the embankment.*
Excavated	>18-inches	Contained within the detention facility with one foot of freeboard to the top of the embankment.*	

*unless more stringent OWRB dam safety requirements control, as outlined in Title 785:25-3-3 of the Oklahoma Administrative Code, found at http://www.oar.state.ok.us/viewhtml/785_25-3-3.htm.

305.4.2 Open Channels and Swales

Facilities shall be designed to convey the flood produced by the regulatory 1% (100-year) storm with one foot of freeboard.

- A. Facilities with vegetative linings shall be designed with sufficiently high roughness coefficients (minimum 0.05) in anticipation of infrequent mowing and for improved stormwater quality as indicated in Section 703.2.

305.4.3 Storm Sewers and Overland Relief Swales

- A. A storm sewer shall be required for drainage basins smaller than 40 acres. For larger drainage basins, an open channel may be used.
- B. Storm sewer systems shall be designed to convey the regulatory 1% (100-year) flow rate under fully urbanized conditions.
- C. When storm sewers are located between buildings or lots rather than in the right of way of a street, a reserve area shall be platted that prohibits structures from blocking the flow. A swale shall be designed within the reserve. The swale shall be sized to convey the regulatory 1% (100-year) flow rate under fully urbanized conditions for the area draining to the inlet(s) in the sump immediately upstream from the sump.

- D. All buildings that are adjacent to an overland drainage easement shall have 1' of freeboard above the highest water surface elevation in the swale to the finished floor elevation. Finished floor or building pad elevations shall be shown on the plat.
- E. The overland drainage easement language shall state on the plat that the easement is provided for overland flow of stormwater, that the area shall be maintained by the property owner at its prescribed elevation and that the owner is prohibited from constructing a fence, wall or planting that inhibits the intended overland relief.

305.4.4 Bridges and culverts

- A. All bridges and those culverts that have a flow area larger than that of a single 48-inch RCP shall be designed to pass the flow produced by the regulatory 1% (100-year) storm with 1 foot of freeboard from the water surface to the low chord of the bridge or the inside top of the culvert.
- B. Culverts shall be designed to pass the flow produced by the regulatory 1% (100-year) storm with 1 foot of freeboard from the water surface to the inside top for structures under roadways for which backwater from 100% blockage would flood upstream properties, regardless of the flow rate.
- C. Culverts that are sized to be equal to or less than a single 48-inch RCP or an equivalent RCB may be designed to pass the flow produced by the regulatory 1% (100-year) storm under fully urbanized conditions with maximum headwater to culvert diameter (or rise) ratio of 1.5. These culverts shall be designed to have overland relief in an overland drainage easement or right-of-way assuming 100% blockage of the culvert.
- D. Culverts and longitudinal street grades for all streets shall be designed without street overtopping for floods produced by all storms up to and including the regulatory 1% (100-year) storm.
- E. Culverts shall be designed such that backwater from the culvert does not inundate any structures.
- F. Culverts and embankment protective measures shall be designed to minimize embankment damage during overflow.

305.5 Roadway Drainage Systems

305.5.1 Storm Sewer Systems

The City of Tulsa allows the use of streets in the stormwater drainage system for storm runoff with the limitation that the depth of flow at the gutter flow line shall not cause inundation of more than the outside lane or inundation of the crown of the street, whichever is less. The City of Tulsa does not allow the use of streets for cross street flow, except as discussed in Section 801.6.

305.5.2 Curb Inlets

All new curb inlets shall be offset inlets as detailed in Chapter 800.

305.5.3 Location of Storm Sewer Line

Storm sewer lines shall be placed behind the curb if possible or in the center of driving lanes, but never in the wheel path of any street, or along the centerline of arterial streets with an even number of lanes.

305.5.4 Side Ditches

Side ditches shall convey the regulatory 1% (100-year) flow rate, and have a maximum depth of 30 inches, regardless of right-of-way width or cross slope, with a paved bottom. Maximum side ditch cross slope shall be 3:1.

306 DRAINAGE IMPROVEMENT RESPONSIBILITY

306.1 Developer Responsibility

It shall be the responsibility of any individual engaged in the activity of land development or improvement to:

- A. Control and manage all drainage within and from the development including the control and management of any determined, approved increase in runoff volume or rate.
- B. Prepare all drawings, plans, specifications, statements, studies, justifications, impacts and other data required by this MANUAL to assure that all assigned responsibilities have been sufficiently and correctly incorporated.
- C. Provide detention facilities, or storm sewers, or improved or natural channels, or a combination thereof to assure control and management of increased runoff.
- D. Prevent soil deposition, sedimentation, and erosion from any surface of the site into a drainage way provided or created within the development, and from the site into downstream drainage ways.
- E. Prevent any and all drainage obstructions from interfering with drainage through or adjacent to the development from discharge sources upstream. Temporary or permanent bypass channels or other improvements may be required.
- F. Improve or modify any and all stormwater drainage systems and channels lying within the development to a level that meets all requirements of this MANUAL.
- G. As an option at the discretion of the ADMINISTRATOR, improve or modify stormwater drainage systems downstream from the development for problem areas identified in the Master Drainage Plans (and provide easements or rights of way for such) in accordance with the recommendations of the Master Drainage Plans.
- H. Prevent any aggravation of existing flooding, drainage, erosion, runoff, pollution, or other stormwater management problem within any adjacent area either upstream or downstream.
- I. Provide for transferring ownership and maintenance of drainage facilities to a homeowner's association.

- J. Comply with other applicable provisions of this MANUAL.

306.2 Property Owner Responsibility

The property owner shall control all stormwater runoff and drainage from points and surfaces on the property and maintain channels or other drainage facilities within his property in accordance with section 304.2 of this MANUAL.

306.3 City of Tulsa Responsibility

The responsibility of the City of Tulsa, within the limitations of the City budget, shall be to:

- A. Repair and maintain the channels and their slopes when located within or upon public rights-of-way, or as stated in the language of a dedicated drainage easement.
- B. Make necessary improvements to the stormwater drainage systems of the City as defined by the adopted master plans that will not be improved by or during private development.
- C. Improve and maintain floodway and floodplain areas that are dedicated public areas, rights-of-way, park lands, or publicly-owned buildings or development.
- D. Improve and maintain all publicly-owned stormwater drainage systems outside the floodplain fringe area, as defined the Chapter 1300, Glossary.

306.4 Engineer Responsibility

The responsibility of the engineer in the planning and design of public drainage facilities is as follows:

- A. The engineer shall prepare the necessary drainage analysis and facility designs in accordance with the provisions of this MANUAL and shall certify that they are in compliance, subject to approved technical variances.
- B. The engineer shall use sound professional judgment and standard engineering practice when recommending technical variances.

307 DEVELOPMENT POLICY

307.1 Downstream Effects

All development, including infill development that increases the total impervious area above that which previously existed and/or concentrates the flow offsite in a manner different from that which previously existed and is detrimental to adjacent properties shall have mitigating stormwater controls.

307.2 Downstream Drainage System Capacity

No increased flow from development will be allowed beyond the capacity of the downstream drainage system.

307.3 Fee-In-Lieu of Detention

All development, including infill development, may pay a fee-in-lieu of onsite stormwater detention, subject to the discretion of the ADMINISTRATOR depending on its location in the watershed and the potential for adverse impacts downstream. The property owner's engineer must submit his or her recommendation for allowing a fee-in-lieu of onsite detention to be paid, along with all supporting data.

307.4 Site Drainage Plans

All development projects, including single lot residential projects, shall submit drainage plans. The Drainage and Detention Report, is required, is discussed further in Chapter 5, Section 503.

308 LOT DRAINAGE

Any development of a lot within the City of Tulsa, including development in new subdivisions, development in existing subdivisions that do not have a detailed drainage plan, and infill development, shall be accomplished in accordance with the following requirements:

All lots shall be developed and graded in accordance with the City of Tulsa Building Code.

- A. Each lot is required to accept and convey off-site drainage of upstream areas as if they were fully developed.
- B. The development on each lot shall not alter the pre-development course of water flowing onto the lot in such a manner as to restrict drainage from the upstream areas or to cause additional damage to upstream structures.
- C. The development on each lot shall not produce off-site drainage in such a manner as to cause additional damage to downstream structures.
- D. Off-site drainage from each lot shall be diverted into a public storm water conveyance system or, if that is not possible, off-site drainage shall be accomplished in a manner to be approved by the CITY such that no additional damage to downstream structures occurs.
- E. Drains or swales shall be constructed to ensure drainage away from the structure.
- F. The first finished floor of any structure shall be 12" above the flow line of the street drainage system at the point where surface water from the front of the lot drains into said drainage system. See Section 308H if surface water from the front of the lot does not drain to the street.
- G. Lots shall be graded to drain surface water away from foundation walls such that the lowest adjacent grade to the structure is a minimum of 12" above the drainage path flow line of surface water flowing around the structure. This grading shall have a minimum fall of 6 inches within the first 10 feet. If lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, the nearest adjacent grade must still be a minimum of 12" above the drainage path flow line.

- H. Impervious surfaces within 10 feet of the building foundation shall be sloped a minimum of 2 percent away from the building.
- I. Crawlspace shall not be used for mechanical and electrical equipment or storage purposes of any kind except for that area of the crawlspace that is 12" above the flow line of the street drainage system at the point where surface water from the front of the lot drains into said drainage system. If surface water from the front of the lot does not drain to the street, only the area within the crawlspace that is one foot above the lowest adjacent grade may be used.
- J. Driveways shall be shaped so that the high point of the driveway is at least 8-inches higher than the adjacent gutter or edge of paving.
- K. Storm water runoff from buildings that is collected in an underground collection system shall be: a) diverted to the street drainage system or b) discharged on the downhill portion of the lot at a point that is not less than 1/3 of the distance between the property line and the building away from the property line.

308.1 Lot Drainage for New Developments

In addition to the requirements in Section 308, each lot in a new residential or commercial development shall be accomplished in accordance with the following guidelines:

- A. A Full Drainage and Detention Report for the subdivision shall be submitted in accordance with Section 502. This Full Report identifies and defines solutions to drainage problems at each lot.
- B. No more than 2 lots or ½ acre shall be allowed to drain onto an adjacent lot unless it drains into an approved stormwater drainage system component within a drainage easement.
- C. Conveyance features between lots shall be within designated drainage easements capable of conveying the design flood (100-year flood with full urbanization).

308.2 Lot Drainage in Existing Subdivisions That Do Not Have a Detailed Drainage Plan and Infill Lot Development

In addition to the requirements in Section 308, each infill lot development shall be accomplished in accordance with the following guidelines:

- A. A single lot grading and drainage plan shall be submitted showing the flow pattern of stormwater as it enters and the leaves the property. See Figures 501, 502 and 503.
- B. After review of the grading and drainage plan by Development Services, a more detailed Drainage and Detention Report may be required in accordance with Section 503.

City of Jenks

City of Jenks Engineering Design Criteria

**CITY OF JENKS
DESIGN CRITERIA AND TECHNICAL SPECIFICATIONS**

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CITY OF JENKS
DESIGN CRITERIA
AND
TECHNICAL SPECIFICATIONS
FOR

STREETS
DRAINAGE
DETENTION
EARTH CHANGE
SANITARY SEWER
WATER SYSTEMS

June 16, 1980

Resolution No. 45

RESOLUTION NO. 45

RESOLUTION TO ADOPT DESIGN CRITERIA AND
TECHNICAL SPECIFICATIONS FOR STREETS, DRAINAGE,
SANITARY SEWERS, AND WATERWORKS FOR THE CITY OF
JENKS, OKLAHOMA.

WHEREAS, the Jenks City Council on August 20, 1973 did
adopt Design Criteria for Paving and Drainage Projects; and

WHEREAS, the Jenks City Council on August 23, 1973 did
adopt Design Criteria for Sanitary Sewerage and Waterworks;
and

WHEREAS, the Jenks City Council on June 2, 1975 did
adopt Pavement, Storm Sewer and Open Ditches and Sidewalk
and Driveway Specifications;

WHEREAS, there exists a need to revise the above Design
Criteria and Specifications; to regulate the improvement in
subdivisions of land in the City of Jenks; and

WHEREAS, the City Engineer of the City of Jenks has
submitted for adoption Design Criteria and Technical
Specifications for Streets, Drainage, Sanitary Sewer and
Water Systems;

NOW, THEREFORE, BE IT RESOLVED by the Jenks City
Council that Design Criteria and Technical Specifications
for Streets, Drainage, Sanitary Sewer, and Water Systems be
adopted as amended to regulate subdivision improvements in
the City of Jenks, Oklahoma.

BE IT FURTHER RESOLVED that former Design Criteria for
Sanitary Sewer and Waterworks and Pavement, Storm Sewer, and
Open Ditches and Sidewalk and Drainage Specifications of the
City of Jenks are hereby repealed and these regulations
shall take effect this 16th day of June , 1980, provided
that all plats now pending approval shall be processed under
the former Design Criteria and Specifications.

APPROVED BY THE CITY COUNCIL OF THE CITY OF JENKS,
OKLAHOMA, THIS 16TH DAY OF JUNE 1980.

R.E. O' Donley
Mayor

Attest:

Bernice Foster
City Clerk

John Gerkin
City Attorney

CITY OF JENKS
DESIGN CRITERIA
AND
TECHNICAL SPECIFICATIONS
FOR

STREETS
DRAINAGE
DETENTION
EARTH CHANGE
SANITARY SEWER
WATER SYSTEMS

SECTION 1

DESIGN CRITERIA

Streets

Drainage

Detention

Earth Change

5. City may accept dedication of the entire floodplain area for an unimproved channel.
6. Adequate restrictive easements for dedicated right-of-way must be provided for access and maintenance.
7. The minimum width for all storm sewer easements shall be the outside diameter of pipe plus 10'.
The pipe shall be laid in the center of easement.

1.10 Drainage:

1. All stormwater runoff shall be subject to review and approval by the City Engineer with regard to analysis, design, and construction of drainageway facilities and the appropriate public authority shall have the right to maintain or cause to be maintained the drainageway system for its intended purposes. Drainageway facilities, both public and private, shall consist of all elements necessary to convey stormwater runoff from its initial contact with the earth to its disposition in either the Arkansas River or Polecat Creek. The drainageway system, both public and private, shall consist of storm sewers (which are closed conduits); improved channels constructed in conformity with adopted City Standards; unimproved drainageways left in their natural condition; the areas covered by restricted drainageway easements for the purpose of providing overland flow; and all appurtenances to the above

including inlets, manholes, junction boxes, headwalls, dissipators, culverts, etc. All portions of the drainageway system that exist on dedicated right-of-way or restricted drainageway easements shall be owned and maintained by the City of Jenks.

2. The stormwater collector system shall be designed to pass the runoff from a 100-year frequency rainstorm with full urbanization by one of the following methods:

Pass a minimum of 15-year frequency storm in a pipe network with overland flow capacities so that the combination of the two will pass the runoff from a 100-year frequency rainstorm under full urbanized conditions. Or to pass the entire 100-year flood in the pipe network. The overland flow portion of the collector system shall be confined to dedicated right-of-way, or restricted drainage easements to assure that stormwater can pass through the development without inundating the lowest level of any building, dwelling or structure.

3. The stormwater drainageway system shall be designed to pass the runoff from a 100 year frequency rainstorm under full urbanization. The entire flow shall be confined within the said stormwater drainageway system.

4. The "Rational Method" of runoff analysis shall be used for the design of the closed pipe networks of the storm sewer system up to discharges of 400 cfs. For discharges over 400 cfs, a hydrograph method will be used.
5. Rainfall Intensity Curves prepared from TP-40 and National Weather Service HYDRO-35 (June 1977) shall be used for design when using the rational method.
6. The Oklahoma Department of Transportation Technical Manual dated April, 1970, shall be used for determining the basic "C" values. A weighted "C" value shall be determined with minimum values of .45 for residential, .65 for multifamily and .90 for industrial and commercial areas. Unplatted areas within 300' either side of arterial shall be either considered commercial or shall be in accordance with the comprehensive plan in estimating runoff coefficients.
7. The time of concentration (Tc) shall be determined by first reading the velocity from an approved slope-velocity graph and computing by the formula:

$$T_c = \frac{(\text{Length of Reach (ft.)})}{\text{Velocity (ft./sec.)}} \text{ divided by } 60 = \text{Minutes}$$

8. A maximum time of concentration of 10 minutes to the first inlet shall be used for single and multi-family residential areas.
9. A maximum time of concentration of 5 minutes to the first inlet shall be used for commercial and industrial areas.
10. The distance between inlets shall be determined so that gutter flow for the 15 year storm will not exceed a width of 5 feet per side. The water depth in the street on slopes shall not be deeper than the curb of the street for the 100 year design rainfall. Distance between inlets shall not exceed 600 feet. The water depth at sump locations shall not exceed more than 1' above the top of curb for the 100 year design rainfall.
11. Inlets at intersections shall be located in such a manner that no part of the inlet will encroach upon the return. The flowline and top of curb elevations shall be on all inlets. Inlets shall not be placed on main storm sewer lines.
12. Where possible, runoff from large areas outside the roadway shall be collected before it reaches the roadway. Parking lots shall have internal drainage systems so as to reduce concentrated flow into streets.

13. Drainage areas and the 15 year and 100 year flows to the respective inlets shall be summarized and tabulated on the plans. The summary table shall also be a part of the calculations.
14. Grates and curb inlets shall be sized in accordance with Oklahoma Department of Transportation methods, or other methods approved by the City Engineer.
15. Gutter flow shall be computed by using the "Nomograph for flow in triangular channels", as published in the Hydraulic Engineering Circular No. 12, Federal Highway Administration.
16. Calculations for inlets, pipes and gutter flow shall be summarized.
17. Borrow ditches along arterial streets shall not exceed 3 feet in depth. Culverts shall be sized to handle the 15 year or larger storm.
18. All off roadway inlets up to 24" will be of the standard drop inlet design. The standard inlets larger than 24" may be used upon special review and approval by the City Engineer.
19. Manholes and catch basins shall be stationed on plan sheet using centerline of street stationing with left or right offset dimensions. Inlets with grates shall be stationed at the centerline of the grated section. Inlets without grates shall be stationed at the centerline of the throats.

20. Storm sewer systems shall be closed conduit up to 60" diameter pipe or its hydraulic equivalent. Stormwater drainageway systems that must carry a flow greater than the capabilities of a 60" closed conduit system may be a closed system, an improved channel constructed in accordance with adopted City Standards and adopted floodplain policies, or in accordance with adopted floodplain zoning ordinances.
21. Roughness coefficient for drainage design will be as listed in Tables 5-5 and 5-6, Figure 5-5, pages 109 through 123, of "Open Channel Hydraulics" by Ven Te Chow, published by McGraw-Hill Book Company, 1959.
22. Minimum Velocity in a drainageway system, having a roughness coefficient less than or equal to 0.015, shall be 2.5 fps to avoid sedimentation.
23. Pipes shall be sized using either Kutters or Mannings charts for the design flow. The slope used for design shall be the slope of the invert of the pipe.
24. No pipe shall be installed downstream having a diameter smaller than the pipe from which it is receiving water.

25. Concrete pipe shall not be less than C-76
Class III. Corrugated metal pipes shall meet
Oklahoma State Highway Department gauge
requirements for fill heights.
26. Junctions between different pipe sizes shall be
made with the top inside of the downstream pipe
no higher than the top inside of the upstream pipe.
27. A manhole or junction box shall be required at all
changes of grade, changes in alignment, and
junctions between two or more different size pipes.
28. The horizontal clear distance between pipes being
placed in the same trench shall be a minimum of 2'
or one-third the diameter of the largest pipe,
whichever is greater. This would include multiple
pipe crossings for culvert purposes.
29. Radius pipes will not be used on storm sewers.
30. Manholes of 4' inside diameter shall be used
whenever possible. If the diameter of the manhole
exceeds 4', junction boxes will be used. Junction
boxes must be used whenever manholes can not be
used. The rim elevation shall be indicated on all
manholes and junction boxes. Manhole and junction
boxes may be masonry precast or cast in place.
31. Drainage pipes shall not enter manholes within the
Corbel (neckdown) section. The size of pipe
entering or leaving a 4' diameter manhole shall
not exceed 24".

32. A minimum of 6" cover shall be provided over pipes and box culverts to the bottom of the sub-grade beneath streets except when box culverts are built with the top at grade and structurally designed to withstand H-20 loading.
33. All storm sewers shall be shown in profile, showing flowline, size, type, grade and design discharge. Profiles shall show the natural and proposed ground line at the center line of the storm sewer.
34. The critical depth of flow in culverts shall not be exceeded.
35. Box culverts and bridges shall have adequate capacity to pass 100 year fully urbanized flows with 1' freeboard. Backwater analysis shall be provided by the consulting engineer to illustrate compliance with this requirement.
36. All headwalls shall be broken back design except for culverts under roadway embankment where purpose of headwall is primarily to retain earth.
37. Pipes discharging at a steep gradient into drainageways and detention facilities shall be provided with a slope wall.
38. All open channels shall conform to the City of Jenks standards. The centerline radius of a curve on an improved channel shall be a minimum of 3 times the maximum top width at the design flow depth.

39. All improved channels shall be provided with a minimum of 1' of freeboard.
40. When storm sewers are constructed in fill areas, all materials in fill areas shall be compacted to a 95% standard proctor density prior to the laying of the pipe.
41. Maximum spacing between manholes or junction boxes shall not exceed 300'.

1.11 Detention Facilities:

1. Detention is required for all residential developments of 10 acres or more and for all other developments of 2 acres or more. Peak release rates from the developments should not exceed the natural runoff that occurred before developments for all storms up to and including 100 year storm.
2. Residential development less than 10 acres and all other developments less than 2 acres may also be required by the City Engineer to have detention if the location of the developmental site with respect to the watershed and its inherent flooding problems warrants.
3. Detention will not be required for a developmental site that has 100 year full urbanization drainageway capacity to either the Arkansas River or Polecat Creek.

4. The detention storage requirements shall be that excess runoff generated due to urbanization resulting in less impervious area and alteration of times of concentration due to storm sewerage of the area, overland flows on rights-of-way and alteration of the drainage patterns as a result of earth change, etc., for a 100 year frequency storm.
5. Snyder Synthetic unit hydrograph method, the Soil Conservation Service derivative thereof, the Storm Water Management Model, the Stanford Watershed Model, or Massachusetts Institute of Technology Catchment Model shall be used for the design of all detention facilities.
6. U. S. Weather Bureau Technical Paper No. 40 and National Weather Service HYDRO-35 (June, 1977) shall be used for rainfall information.
7. The duration of the storm used for design shall not be less than two times the time of concentration. The time of concentration is defined as the time for runoff to travel from the furthestmost point in the watershed to the point in question.
8. The time increment used in developing the rainfall distribution and in reading off the ordinates of the unit hydrograph may be rounded off to the nearest whole time interval or to the nearest time increment.

9. The rainfall excess shall be critically arranged in such a way that the largest increment is located one time interval past the center of the duration of the rainfall excess.
10. The loss rates in determining the runoff hydrograph shall be an initial loss of .50 inches and a uniform loss of .08 inches/hr. for the subsequent hours once the initial losses are satisfied.
11. To determine peak release rate a minimum of 5 and 100 year storm frequencies under natural site conditions shall be investigated.
12. All calculations for detention facilities shall be submitted for review by the City Engineer to include hydrographs, outflow structures and a time phase analysis through the facility.
13. Floodplain areas and detention pond locations shall be identified at the preliminary plat stage to illustrate how these areas will be managed during and after construction.
14. If a tract of land under development has a floodplain area within its boundary, the information that must be furnished before the final plat is filed, shall include:

- a. A backwater analysis on the existing drainageway system.
 - b. A backwater analysis on the proposed drainageway system.
15. Detention facilities should not be located in undesirable nonreusable areas that would demand continued high maintenance costs to the City of Jenks. Each facility shall incorporate methods to minimize erosion and other maintenance reducing designs.
16. Detention facilities located in non-reusable locations where soil or other conditions exist that would require continued high maintenance costs after the facility may no longer be needed will be required to have a dual storm sewer system.
17. A dual storm sewer system will not be required for a detention facility. However, the developer should carefully consider any advantages to him that would result from the immediate installation of a dual storm sewer system which would be realized by him upon reversion of ownership.
18. Detention facilities may be located in the Floodplain area or Floodway area when the elimination of the facility could be easily accomplished, thereby returning the site to its natural state.

19. Additional detention storage, in excess of the required storage for a drainage area, can be provided to satisfy the detention requirements for a tract of land downstream of the detention facility, providing the detention facility is constructed prior to the development of the downstream tract.
20. All detention facilities will be designed "dry" unless a special maintenance agreement in writing has been negotiated with the City of Jenks.
21. A minimum number of detention facilities is encouraged for each development.
22. If runoff has a natural tendency to drain in several directions for a given developmental tract of land where detention is required, then detention storage shall be provided for the biggest drainage area. Additional detention storage may be provided, at the same facility, to satisfy detention requirements for a separate drainage area on the same development, provided that:
 - a. The whole developmental tract of land is in the same watershed.
 - b. The smaller drainage area(s) that, has/have been compensated for does/does not, either singly or in combination, adversely impact the health, welfare and safety of the general public downstream.

23. If a tract of land being developed is located in more than one watershed, grading work to divert flows from one watershed to another will not be permitted and compensatory storage will not be permitted in one watershed for that required in another.
24. Detention facilities may be used for compensatory storage when encroaching into the Floodplain area provided that the overall drainageway system does not:
- a. Cause a rise in the water surface elevation beyond the extent of the developmental tract of land.
 - b. Adversely impact adjacent properties by an increase in velocity.
25. All dikes and spillways on detention facilities will show typical cross sections on plans.
26. Access road, with a grade of 10% or less, shall be provided to the detention areas for maintenance purposes.
27. Side slopes on detention facilities shall not be steeper than 3:1.
28. Detention facilities shall be provided with a concrete trickle channel from the inlet to the outlet structure to transmit low flows. The trickle channel shall be constructed in accordance with City Standards.

29. Storm sewer outlets in the slope of the detention pond shall be protected by a Standard Slopewall.
30. Erosion and sediment control practices in and around detention facilities shall be in conformance with the earth change criteria.
31. The detention area shall be identified as a separate area within the plat; it may consist of one or more platted lots, a separate block, or it may be identified as a reserve area.
32. Dedication of the detention facility shall not appear among the plat's restrictive covenants; the format of the dedication shall be consistent with the dedication of public streets.
33. Every plat dedication shall contain an ownership reverter provision. Whether the reverter shall run in favor of the subdivider, an identified third party, or to a designated abutting property shall be determined as follows:
- a. If the detention area meets all applicable subdivision regulation/zoning requirements (area, street frontage, etc.), so as to permit its subsequent redevelopment upon reverter of ownership, at the option of the subdivider, reverter may be in favor of any designated party or one or more abutting properties.

b. If the detention area fails to meet all applicable subdivision regulation/zoning requirements and appropriate variances/special exceptions are not approved by the Jenks Planning Commission/Jenks Board of Adjustment which would permit its proper redevelopment upon reverter of ownership, reverter shall run only in favor of an identified abutting property or properties; if all deficiencies receive variance/special exception approval, reverter shall be governed by paragraph 33a (above).

34. Every plat shall provide an accessway at least 20 feet wide to any required detention area. Access may be provided by frontage on a dedicated public street to the detention area.

35. If the detention facility is approved by the City to serve areas outside the subdivision in which it is located, such additional areas shall be specifically identified in the dedication.

36. In designing the dams for detention facilities, the book titled "DESIGN OF SMALL DAMS" by U.S. Department of the Interior, Bureau of Reclamation shall be used. An analysis shall be furnished of any proposed earthen dam construction soil. Foundation boring for the earthen dam may be requested.

37. The ownership and maintenance responsibility for detention facilities shall remain with the private sector if the facility is an integral usable part of the development. In all other cases, the detention facility will be dedicated to the public and the public will be responsible for the maintenance thereof. In the event the detention facility, as a result of drainageway improvements, becomes unnecessary, the facility by action of the City of Jenks shall revert to the person, firm or corporation making such dedication or his heirs, successor or assignees.

1.12 Earth Change, Soil Erosion and Sedimentation:

1. Introduction

The principles of erosion and sedimentation control can be successfully formulated and implemented by understanding the basic processes of soil erosion and sedimentation. There is a certain amount of erosion and sedimentation that occurs in nature. The process of natural erosion and sedimentation is greatly accelerated due to construction activity. If the accelerated process is not accounted for at the time of construction, the adverse effects, possibly are:

- a. A large increase in area exposed to storm water runoff and soil erosion.

- b. Increased volumes of storm runoff, accelerated soil erosion and sediment yield and higher peak flows caused by:
 - 1. Removal of protective vegetative cover.
 - 2. Exposure of underlying soil or geologic formations less pervious and/or more erodible than original soil surface.
 - 3. Reduce capacity of exposed soils to absorb rainfall due to compaction caused by heavy equipment.
 - 4. Enlarged drainage areas caused by grading operations, diversions and street construction.
 - 5. Shortened times of concentration of surface runoff caused by altering steepness, distance and surface roughness and installation of improved storm drainage facilities.
 - 6. Increased impervious surfaces associated with the construction of streets, buildings, sidewalks and paved driveways and parking lots.
- c. Alteration of the groundwater regime that may adversely affect drainage systems, slope stability and survival of existing and/or newly established vegetation.
- d. Creation of exposures facing south and west that may hinder plant growth due to adverse temperature and moisture conditions.

e. Exposure of subsurface materials that are rocky, acidic, droughty or otherwise unfavorable to the establishment of vegetation.

f. Adverse alteration of surface runoff patterns by construction and development.

2. General Applicability:

Earth change permit applications shall be required for areas shown in the 100 year flood plain on the most recently adopted "FEMA flood maps".

3. Minimum Approval Requirements:

The plans and specifications accompanying the permit application shall contain the following data as deemed applicable by the City Engineer:

- a. A vicinity sketch at the scale of 1 inch to 200 feet indicating the site location as well as the adjacent properties within 500 feet of the site boundaries.
- b. A boundary line survey of the site on which the work is to be performed.
- c. A plan of the site at a minimum scale of 1 inch to 100 feet showing:
 1. Name, address and telephone number of the legal land owner, developer and petitioner.
 2. A timing schedule indicating the anticipated starting and completion dates of the

developments construction sequence and the time of exposure of each area prior to the completion of effective erosion and sediment control measures.

3. Estimate of the quantity of excavation and fill involved.
4. Existing topography at a maximum of 2 foot contour intervals.
5. Proposed topography at a maximum of 2 foot contour intervals.
6. Location of any structure or natural feature on the site.
7. Location of any structure or natural feature on the land adjacent to the site and within 50 feet of the site boundary line.
8. Location of any proposed additional structures or development on site.
9. Plans of all drainage provisions, retaining walls, cribbing, planting erosion control measure, or other temporary or permanent soil erosion control measures, to be constructed in connection with, or as a part of the proposed work together with a map showing the drainage area of land tributary to the site and estimated runoff of the area served by any drains.

- d. The estimated total cost of the required temporary and permanent soil erosion control measures shall be provided.
 - e. Other information or data that may be required by the City Engineer such as a soil investigation report which shall include but not be limited to, data regarding the nature, distribution and supporting ability of existing soils and rock on the site.
4. Principles of Applying Erosion and Sediment Control Criteria.
- a. Plan the development to fit the particular topography, soils, waterways and natural vegetation at a site.
 - b. Expose the smallest practical area of land for the shortest possible time.
 - c. Apply "soil erosion" control practices as a first line of defense against on-site damage.
 - d. Apply "sediment" control practices as a perimeter protection to prevent off-site damage.
 - e. Implement a thorough maintenance and follow up operation.

5. Temporary Structural Practices

a. Dikes:

1. Diversion Dike.
2. Interceptor Dike.
3. Perimeter dike.

b. The design drainage area for dikes shall not exceed 5 acres.

c. The minimum dimensions shall be in accordance with the adopted standards.

d. Swales:

1. Interceptor swale.
2. Perimeter swale.

e. The design drainage area for swales shall not exceed 5 acres.

f. The minimum dimensions shall be in accordance with the adopted standards.

g. Straw Bale Dike:

Where no other practice is feasible a temporary barrier with a life expectancy of three months or less can be installed across the toe of a slope for contributing drainage areas less than half acre, in accordance with the adopted standards.

h. A stabilized construction entrance shall be built in accordance with the adopted standards to reduce or eliminate the tracking or flowing of sediment onto public rights-of-way.

- i. A stone outlet shall be constructed in areas where the entire drainage area to the structure is not stabilized or where there is a need to dispose runoff at a protected outlet or where concentrated flow for the duration of the period of construction needs to be disffused. The structure shall be in accordance with adopted standards.
- j. A grade stabilization structure in the form of a paved chute or flume shall be constructed to prevent erosion, where concentrated flow of surface runoff is to be conveyed down a slope, in accordance with the aopted standards. The maximum allowable drainage area upstream of such a structure shall not exceed 40 acres.
- k. A grade stabilization structure in the form of a pipe slope drain shall be constructed to prevent erosion, where concentrated flowof surface runoff is to be conveyed down a slope, in accordance with the adopted standards. The maximum allowable drainage area upstream of such a structure shall not exceed 5 acres.
- l. Storm water detention facilities may be used temporarily as sediment basins. A temporary outlet structure for the storm water detention facility to work as a sediment pond shall be constructed. At the end of the construction

activity, the developer shall make sure that the outlet structure shall meet the design requirements of a storm water detention facility.

- m. Condition of the detention facility that is used as a sediment pond during construction, shall meet the following requirements at the time of acceptance:

1. It shall be completely cleaned by the developer and be rid of any immediate maintenance.

2. It shall meet all design standards.

6. Permanent Structural Practices

- a. Depending on the development layout, a diversion shall be constructed across a slope more than 15% to:

1. Prevent runoff from higher areas that have a potential for causing erosion and interference with the establishment of vegetation on lower areas.

2. Reduce the length of slopes to minimize soil loss.

- b. Diversions need to be constructed only below stabilized or protected areas in conformance with standards.

- c. Outlets from diversions shall be constructed to discharge in such a manner as not to cause erosion.
- d. Outlets shall be constructed and stablized prior to the operation of diversion.
- e. Storm drain outlet protection shall be provided when converting pipe flow to channel flow. The reduction in velocity shall be consistent with the roughness coefficient of the receiving waterway. The reduction in velocity may be accomplished by:
 - 1. Providing mortared riprap stabilization;
 - 2. Providing energy dissipators;
 - 3. Providing permanent vegetation; depending on the site specific needs.

7. Vegetative Practices

Vegetative practices can be applied very effectively to control erosion. The practices can be either temporary or permanent depending on the site specific needs. The specifications for establishing vegetation both temporary and permanent are briefly outlined below.

a. Temporary Practices

Small grains like oats, rye and wheat, and sudans and sorghums are the most feasible temporary vegetation to control erosion for the Jenks area. This practice is effective

for areas where soil is left exposed for a period of 6 to 12 months. The time period may be shorter during periods of erosion rainfall.

1. Prior to seeding, needed erosion control practices such as diversions, grade stabilization structures, berms, dikes, etc. shall be installed.
2. Temporary vegetative practice is usually applied prior to the completion of final grading of the site.
3. If the area to be seeded has been recently loosened to the extent that an adequate seedbed exists, no additional treatment is required. However, if the area to be seeded is packed, crusted and hard, the top layer of soil shall be loosened by suitable means.
4. Fertilizer shall be applied at a rate of 600 pounds per acre or 15 pounds per 1000 square foot using 10-20-10 or equivalent.
5. Soils known to be highly acidic shall be lime treated.
6. Seeding requirements shall be as specified in the following:

PLANT	PER ACRE	PER 1000 SQ.FT.	PLANTING DATE	DEPTH OF SEEDING
Annual Ryegrass	40 Lbs.	0.9 Lbs.	9/15 - 11/30	1/4 Inch
Elbon Rye	2 Bu.	3.0 Lbs.	8/15 - 11/30	2 Inches
Wheat	2 Bu.	3.0 Lbs.	8/15 - 11/30	2 Inches
Oats	3 Bu.	2.5 Lbs.	8/15 - 11/30	2 Inches
Sorghum	60 Lbs.	1.4 Lbs.	3/1 - 9/15	2 Inches
Sudan Grass	40 Lbs.	0.9 Lbs.	4/1 - 9/15	2 Inches

7. Seeds shall be drilled uniformly.
8. Seeding implements should be used at right angles to the general slope to minimize erosion.
9. After 2 to 3 months of planting the seeded site shall be dressed with 8 pounds per 1000 square feet or 350 pounds per acre of 33-0-0.
10. Areas that are not well covered shall be replanted.
11. The seeded area shall be watered when feasible and needed.

b. Permanent Practices

Bermuda grass, Kentucky 31 Tall Fescue and Weeping Lovegrass are some of the types of permanent vegetation that could be effectively used to control erosion.

1. Prior to seeding, needed erosion control practices such as dikes, swales, diversions, etc. shall be installed.

2. The subgrade shall be loosened evenly to a depth of 2 to 3 inches and 10-20-10 fertilizer (10 pounds per 1000 square feet or 450 pounds per acre) shall be mixed with the loosened surface soil by discing or other suitable means.
3. Soils known to be high acidic shall be lime treated.
4. Planting rate requirements shall be as specified in the following table:

PLANT	PER ACRE	PER 1000 SQ.FT.	PLANTING DATE	DEPTH OF SEEDING
Bermuda Grass	10 lbs.	0.25 lbs.	4/1 - 8/15	0-1/2 Inch
Fescue	40 lbs.	0.90 lbs.	9/1 - 11/1	0-1/2 Inch
Lovegrass	5 lbs.	0.10 lbs.	4/1 - 6/30	0-1/2 Inch

5. Seeds shall be drilled uniformly.
6. Seeding implements should be used at right angles to the general slope to minimize erosion.
7. Mulch will be used where needed.
8. The area shall be watered daily or as often as necessary to maintain adequate soil moisture until the plants grow about 1/2 - 1 inch.

1.13 Floodplain Area Maps:

1. Initial Maps

- a. The City Council shall adopt initial flood plain area maps, developed by the City Engineer, identifying lands subject to flooding hazards and periodic inundation, based on the best available information.
- b. Sources of available information include but are not limited to:

1. Federal Insurance Administration (FIA)
Zone A designated areas with and without flood elevation.
2. High water marks from previous floods;
3. Engineering studies; and
4. Flood prone soils maps.

2. Map Revisions

- a. As new information becomes available, maps will be updated by the City Engineer and adopted by the City Commission.
- b. The regulatory flood will be used in Engineering analysis to determine the floodplain area. Analyses will also include delineation of the floodway.

- c. The regulatory flood will be computed based upon full potential urbanization of the contributing watershed, considering the Comprehensive Plan, adopted Floodplain Management Policies and the Watershed Drainage Plan where adopted.
- d. In calculations of the degrees of watershed urbanization to be considered in flood flow routing:
 - 1. Natural floodplains and those which can be reasonably expected to remain unaltered by man-made changes may be considered as remaining in their natural states.
 - 2. Floodplains altered by existing or anticipated man-made changes shall be considered as having the natural channel eliminated.
 - 3. Where an adopted Watershed Drainage Plan exists, the effects of urbanization shall be determined in accordance with that plan's floodplain development guidelines.
- e. Floodplain area maps shall be limited to delineating those floodplains where the contributing drainage area is approximately 40 acres or more.

- f. Mapping of Floodway Zoning Districts shall be limited to delineating those floodplains where the contributing drainage area is approximately 640 acres or more.

1.14 Determination of Floodway:

1. The floodway is comprised of the channel of a watercourse plus those portions of the adjoining floodplain which are reasonably required to carry and discharge the regulatory flood.
2. A floodplain has two basic functions:
 - a. Carrying and discharging the flood flows (floodway);
 - b. Temporarily storing flood water (floodplain).
3. Any appreciable change in either function of the floodplain can result in an increase in flood heights and/or an increase in velocity.
4. Floodway boundaries shall be determined so that:
 - a. Sufficient area is reserved to carry and convey the regulatory flood.
 - b. Existing floodplain storage capacity is maintained.
 - c. No measurable increase occurs in flood flows, flood heights or potential flood damage and danger to off-site properties.

City of Bixby

City of Bixby Engineering Design Criteria Manual

City of Bixby Engineering Department – January 2011

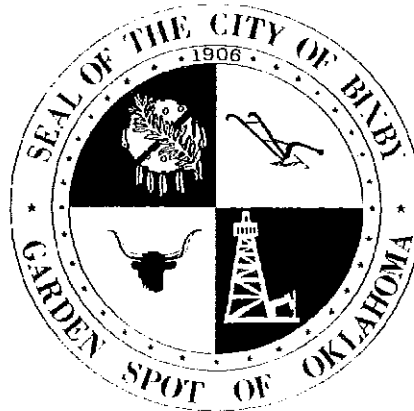
Section B. Drainage and Earth Change

Section D. Storm Water Drainage Criteria

CITY OF BIXBY, OK

Engineering Design Criteria Manual

City of Bixby Engineering Department



January 2011

SECTION B. DRAINAGE AND EARTH CHANGE

B.1. EARTH CHANGE PERMITS.

The application and development site plan shall contain the following information, unless the City Engineer determines that due to the scope and nature of the proposed development some of the information is unnecessary or that additional information is required to determine that the application meets the policies and standards governing the issuance of the requested permit(s). The site plan and design standards established by the application and approved by the City Engineer shall become conditions upon the issuance of the permit(s). No changes in an approved site plan or design standard shall be made without prior written approval of the City Engineer.

B.2. EARTH CHANGE APPLICATIONS.

Provide *five (5)* sets of scale drawings providing the following information:

- B.2.1. Name and address of legal owner.
- B.2.2. Vicinity sketch.
- B.2.3. Legal description of property.
- B.2.4. Boundary line survey.
- B.2.5. Existing and proposed contours at 1 foot intervals.
- B.2.6. Location of any structure or natural feature on site.
- B.2.7. Location of any proposed additional structures or developments on site.
- B.2.8. Location of any structure or natural feature on the land adjacent to the site and within 50 feet of the site boundary line.
- B.2.9. Plans of all drainage provisions, retaining walls, cribbing, planting, erosion control measures, or other temporary or permanent soil erosion control measures to be constructed in connection with or as a part of the proposed work; together with a map showing the drainage area of lands tributary to the site and estimated runoff of the area served by any drains.
- B.2.10. A time schedule indicating the anticipated completion date of the development, starting and completion dates of the development construction sequence, and the time of exposure of each area prior to the completion of the effective erosion and sediment control measures.
- B.2.11. Owner's statement and signature certifying that the approved plans will be implemented under the direct engineering supervision of a registered professional engineer.
- B.2.12. Hydraulic and hydrologic analysis for runoff and/or detention facility/facilities, if on-site detention is deemed necessary.
- B.2.13. Floodplain boundaries and/or watercourse location.
- B.2.14. Hydraulic and hydrologic analysis for any alterations within the flood hazard area, or for the alteration of any watercourse.
- B.2.15. Estimate of the quantity of excavation and fill involved, with drawings indicating each separate excavation or fill.

- B.2.16. Plans for control of on-site and off-site sedimentation for the purpose of preventing the deposit of sediment from the tract under application upon any other off-site public or private property or watercourse during all phases of project construction.
- B.2.17. A summary statement concerning the effect the proposed development will have on the existing and future drainage system(s) of the area.
- B.2.18. Earth Change Permits shall be issued only upon payment of the appropriate fee as established by ordinance by the City Council.

B.3. EXEMPTIONS TO EARTH CHANGE PERMITS.

The City Engineer may approve an exemption to the requirement for an earth change permit for those conditions meeting the exemption requirements listed in the City Code. The Applicant is required to submittal a letter requesting an exemption and provide the following information.

- B.3.1. Address of the property and owner's mailing address, if different.*
- B.3.2. Purpose of the proposed earth change.*
- B.3.3. Acreage affected by the proposed action.*
- B.3.4. Amount of earth to be moved in truckloads or cubic yards.*
- B.3.5. Owner's statement that no drainage channels will be altered and that no adverse effects on other property will be caused by the earth change.*

SECTION D. STORM WATER DRAINAGE CRITERIA

D.1 GENERAL REQUIREMENTS

D.1.1 Master Drainage Plans

If a Storm Water Master Drainage Plan is adopted for the area under consideration, proposed storm water drainage systems shall comply with the provisions of the plan.

D.1.2 Special Drainage Districts

D.1.2.1 Arkansas River Floodplain. *Projects requiring storm water detention that are located within or under the direct influence of Arkansas River Floodplain may utilize storm water detention facilities with outlet structures below the 100-year flood elevation. However, the lowest discharge elevation of the outlet structure shall be constructed above the 50-year flood elevation.*

The storm water detention facility volume may not be counted in the computation of compensatory storage volumes need for floodplain construction.

D.1.2.2 Bixby Creek Drainage Basin. *Projects requiring storm water detention that are located within the Bixby Creek Drainage Basin may provide storm water mitigation through the use of total retention facilities. The facilities must entirely contain the 100-year runoff volume as determined by hydrology calculation for a storm duration of 24-hours. No credit shall be taken for infiltration in establishing the minimum volume. Other design and construction criteria shall be as per detention facility requirements..*

A portion or all of the retention volume may be located below the 100-year flood elevation. Regardless of location, the retention facility volume may not be counted in the computation of compensatory storage volumes need for floodplain construction.

The discharge structure for a total retention facility must be still be designed and constructed to limit the discharge from the facility to pre-development flow rates or less. The outlet structure for the retention facility must also be equipped with a backflow prevention device such as a flap gate to prevent backwater from Bixby Creek or any of its tributaries from entering the retention area. The outlet structure must be designed to allow the entire retention volume to drain freely into Bixby Creek or one of its tributaries once downstream back pressures have subsided.

The retention facility shall be constructed with an overflow structure that allows for the emergency overflow of the 500-year storm event at elevations at least 1 foot below the finished floor elevations of the buildings served.

D.1.3 Storm Drainage System

D.1.3.1 All storm water runoff shall be reviewed and accepted by the City Council with regard to analysis, design and construction of drainage facilities. The appropriate public authority shall have the right to maintain or to cause to be maintained the drainage system for its intended purposes. Floodplain variances must be accepted by the City Council.

Review and acceptance of plans by the City Engineer does not release the

Consulting Engineer from his professional responsibility to meet the planning and design objectives of the project as required by good engineering practice and the City of Bixby.

- D.1.3.2 Drainage facilities, both public and private, shall consist of all elements necessary to convey storm water runoff from its contact with the earth to its disposition in the Arkansas River.**

The drainage system, both public and private, may consist of storm sewers (which are closed conduits); improved channels constructed in conformity with adopted City Standards; unimproved drainageways left in their natural condition; the areas covered by restricted drainage easements for the purpose of providing overland flow; and all appurtenances to the above including inlet, manholes, junction boxes, headwalls, dissipaters, culverts, etc. All portions of the drainage system that exist on dedicated drainage rights-of-way or restricted drainage easements shall be owned and maintained by the City, unless provided otherwise by agreement or covenant.

- D.1.3.3 The storm water drainage system shall be designed to receive and pass the runoff from a 100-year frequency rainstorm within dedicated easements under full urbanization. Full urbanization is defined as the total development in an area that is anticipated. The entire flow shall be confined within the said storm water drainage system.**

Subject to requirements for Earth Change Permits and of the City Drainage Standards, improvement of downstream conveyance may be required if such improvements comply with the policies of this chapter, or if current flooding problems exist, subject to the approval of the City Engineer.

- D.1.3.4 The storm water collection system shall be designed for either of the following conditions:**

A. Convey:

1. A minimum of the runoff from a 5-year frequency rainstorm in a pipe network with overland flow capacities so that the combination of any two will pass the runoff from a 100-year frequency rainstorm under fully urbanized conditions; or
2. The entire runoff from a 100-year frequency rainstorm may be contained in the pipe network. Should the entire runoff from a 100-year frequency rainstorm be conveyed in a pipe network, a bypass system shall be designed considering the pipe network to be 50% blocked. If it can be demonstrated that, in unique situations, property damage or flooding will not occur, a smaller by-pass system may be approved by the City Council.

- B. Where sump collection systems are used, an overflow route shall be established in the event of complete blockage of the sump.**

- C. Runoff from areas greater than one half (1/2) acre outside the roadway shall be collected before it reaches the roadway. Parking lots shall have internal drainage systems so as to reduce concentrated flows into streets. This item does not apply to single-family residential lots on local streets.**

- D. Inlets shall be located at intersections to prevent the flow from crossing the intersection. Inlets at intersections shall be located so they do not encroach upon the curb return. No drainage structure shall be permitted at a wheelchair ramp.
- E. Drainage areas, runoff from 5-year and 100-year frequency rainstorms, time of concentration, and inlet design for each inlet shall be summarized and tabulated on the plans. This summary table shall also be a part of the drainage calculations.

D.1.4 Drainage Easements

- D.1.4.1 Drainage easements will be required for all storm water management facilities, not in public rights of way; including storm sewers, channels, storage areas and other hydraulic structures. Drainage easements need not be exclusive, but other uses shall not restrict the drainage purposes within the easement.
- D.1.4.2 The easement dedication should clearly identify that the purpose includes operation and maintenance of storm water management facilities. Widths and specific purposes (i.e.: storm sewer, maintenance access, channel, etc.) for drainage easements shall be shown on all plats.
- D.1.4.3 For storm sewers, the widths of the easements are determined by the size of the sewer and equipment needed to remove, replace or repair the sewer. *For piped systems, the minimum easement width shall be 10', located entirely on one property.* For channels, storage areas and other structures, the width of the easement is generally determined by the size of the facility and the equipment needed for maintenance. Typically, the easement will cover the entire facility, plus 20 feet for maintenance access.
- D.1.4.4 The overland flow portion of the collector system shall be confined to dedicated rights-of-way, or restricted drainage easements to assure that storm water can pass through the development without inundating the lowest level of any building, dwelling, or structure. Restricted drainage easements shall be shown on the plat. The storm water runoff from no more than 3 lots, or ½ acre whichever is less, shall be allowed onto another lot or between 2 lots. If more lots or area needs to be drained, then an underground storm sewer or *overland drainage channel located in a dedicated overland drainage easement* shall be required.

D.1.5 Maintenance

- D.1.5.1 Owner's Maintenance Responsibility. It shall be the responsibility of all owners of property, whether undeveloped, developed, or undergoing development to:
 - A. Mow and provide minor maintenance of drainage channels and their slopes for that portion of the channel lying within their property line.
 - B. Keep clear all drainage channels within the boundaries of their properties in accordance with the requirements of this article.
 - C. Control all storm water runoff and drainage, erosion and sedimentation from points and surfaces on the property.

- D. Prevent any and all drainage interferences, obstructions, blockages, or other adverse effects upon drainage, into, through, or out of the property.
 - E. Not take any action which will alter or otherwise change designed and installed storm water management control systems and not take any action on existing property that shall adversely affect storm water runoff in any manner contrary to the provisions of this Section, whether temporary, permanent, or a combination thereof.
- D.1.5.2 The City may require improvements, provision of drainage easements, and for provision of improvements, agreements, and/or easements beyond the boundaries of the subdivision, development, or property improvement to facilitate flow of storm water from or through the property, to avoid damage from changed runoff conditions, to provide continuous improvement of the overall storm drainage system, and to accommodate all drainage conditions or requirements. Where storm water runoff flows require the logical extension of any street or its associated drainage in order to prevent flooding, ponding, or uncontrolled runoff, the extension shall be provided by the developer.
- D.1.5.3 During all construction activity and all other non-construction activity developers, property owners and contractors shall be required to keep streets, gutters, inlets, drainage pipes, swales, ditches, drainage channel, and all drainage devices and structures clean and free from debris, sedimentation, soil, and any materials. Any failure to meet this requirement shall, upon notice and failure to immediately correct the notified condition, constitute sufficient grounds for stopping all work until correction is completed.
- D.1.5.4 Developers, property owners, or their legal agents, upon receipt of notice by the City of Bixby that repair or maintenance is required within a channel lying within their property, shall be responsible for effecting such repair or maintenance within the time specified, or the City shall have repair and maintenance performed at the expense of the property owner.
- D.1.5.5 City's Maintenance Responsibility. It shall be the responsibility of the City to:
- A. Repair and maintain drainage channels and their slopes when located within or upon rights-of-way dedicated to the City.
 - B. Develop and implement standards and specifications required to clearly and accurately interpret the physical requirements of this section.
 - C. Design and implement a Drainage Master Plan for urban drainage, storm water management, and flood control.
 - D. Make such necessary improvements of primary and secondary drainage channels that cannot or will not be improved through private development.
 - E. Improve and maintain floodway and flood fringe areas that are dedicated public areas, rights-of-way, parklands, or public-owned buildings or developments.
 - F. Improve and maintain all public-owned drainage channels or systems outside the flood fringe area.

D.1.6 Drainage Reports

D.1.6.1 Report Contents. *The Drainage Report shall contain the information listed below, in the format shown:*

A. Cover Sheet

1. *Project Name*
2. *Project Location*
3. *Engineer's Name, Address, and Telephone Number*
4. *Owner's Name, Address, and Telephone Number*
5. *Submittal Date*

B. Table of Contents

1. *Report Content list and pagination*
2. *Engineer's Certification (from D.1.6.2)*
3. *Registered Engineer's Seal, Signature, and Date*

C. Executive Summary

1. *Brief Project Summary*
 - *Watershed (Arkansas, Fry, Bixby, etc.)*
 - *Development type (residential, commercial, etc.)*
 - *Development area*
 - *Number of lots proposed*
 - *Major Drainage Elements proposed – detention facilities, drainage channels, etc.*
2. *Pre-development and Post-development Discharge Summary Table including Basin Names and Discharge Rates for all storm frequencies.*
3. *Detention Summary Table including for all storm frequencies: water surface elevations, detention volumes, and discharge rates.*
4. *Graph showing relationship between Pre and Post-development discharge rates vs. storm frequency for all Design Points.*
5. *Drainage Channel Summary Table including longitudinal stations, discharge rates, and water surface elevations for critical storm frequencies.*

D. Site Information

1. *Project Name(s)*
2. *Project Location*
3. *Watershed (i.e. Arkansas, Fry, Bixby, etc.)*
4. *Project Area*
5. *Number of Lots*
6. *Site Topography*
7. *Site Soils*
8. *Site Drainage Areas and discharge points*
9. *Off-Site Drainage and discharge points*
10. *Land Use – Pre and Post Project*
11. *Design Point(s)*
12. *Design Objectives/Assumptions*

E. Drainage Basin Summary

1. *Pre-development site map with Drainage Basins, contours, Design Points, and drainage paths used for Time of Concentration/Lag calculations shown. Boundaries shall be drawn for actual, physical basins.*
2. *Post-development site map with Drainage Basins, contours, Design Points, and drainage paths used for Time of Concentration/Lag calculations shown. Boundaries shall be drawn for actual, physical basins.*
3. *Curve Number Calculation Summary Tables for Pre and Post-development conditions including Basin Name, Basin Area, Basin Soil Hydrologic Group, Project Land Use Classification and Weighted CN calculations*
4. *Lag Time Calculation Summary Tables for Pre and Post-development conditions including Basin Names, any Routing Elements, and Lag Times.*

F. Hydrologic Data

1. *Rainfall Model including rainfall frequency, duration, and depth*
2. *HEC-HMS Model schematics for Pre and Post-development*
3. *Pre and Post-development Discharge Summary Tables including Names, Areas (in sq. miles), CN's, Lag Times, and discharge rates for all Basin and Routing Elements for all storm frequencies.*

G. Detention Design Information

1. *Detention Facility Site Plan*
2. *Stage-Storage Data for Proposed Detention and any existing, on-site detention areas (i.e. exist. pond or control structure such as a culvert).*
3. *Discharge Structure Details*
4. *Stage-Discharge for Outlet Structure*
5. *Elevation-Storage-Discharge Table for Proposed Detention and any existing, on-site detention area as described above.*

H. Channel Design Information

1. *Channel Site Plan with Pre and Post-development floodplain boundaries along with proposed drainage easements shown.*
2. *Typical Cross-sections*
3. *Bridge/Culvert Details*
4. *HEC-RAS Model Schematic*
5. *Summary Table including longitudinal stations, discharge rates, floodway width, floodplain width and water surface elevations for critical storm frequencies.*
6. *HEC-RAS water surface profiles for critical storm frequencies.*

I. References

(List as applicable – SCS Soil Surveys, Hydrologic and Hydraulic Literature, Tulsa Stormwater Management Manual, etc.)

J. Appendices

1. *SCS Soils Map and Data Sheets*
2. *Detailed weighted CN Calculations and any Reference Tables used*
3. *Detailed Time of Concentration/Lag Time Calculations and any Reference Charts/Tables used*

4. Detailed Detention Storage Volume Calculations – Elevation, Stage Area, Average End Areas, Incremental Storage Values, Cumulative Storage Values
5. Detailed Discharge Structure Calculations – List of weir and orifice equations with coefficients used along with elevation – discharge calculations. Any Reference Charts/Tables/Computer programs should be included.
6. Detailed HEC-RAS output Reports for Proposed Channels/Bridges
7. Culvert Design Data
8. Channel/Structure Discharge Velocity Calculations
9. Erosion Protection Measure Calculations based on discharge velocities (Rip rap, Energy Dissipator, etc.)
10. Inlet Design Summary Table with drainage inlet names, inlet design designation (i.e. Des 2, Des 2(D), etc.), basin areas, time of concentration calculations, rainfall intensity calculations (5, 50 and 100-year storms), runoff calculations (5, 50, and 100-year storms), street capacity, depth of flow, width of spread on street (5, 50 and 100-year storms), inlet type (sump or on-grade), clogging factors, inlet capacity, bypass flows, and identification bypass flow recipient.
11. Storm Sewer Pipe Design Table with pipe capacity and EGL/HGL calculation chart showing major/minor losses, and EGL/HGL elevations in relation to surface elevations at structures/junctions (i.e. grates, MH rims, etc.). (*Note: Minor losses should be calculated as per the APWA Special Report No. 49, 1981 as shown in Table 1003 and Table 1004 of the Tulsa Stormwater Management Manual.*)

K. CD containing complete HEC-HMS and HEC-RAS files

L. The report shall contain a Certification sheet as follows:

“I hereby certify that this report (plan) for the drainage design of (Name of Development) was prepared by me (or under my direct supervision) in accordance with the provisions of City of Bixby Storm Water Criteria Manual for the owners thereof.”

(SEAL) _____
Signature

D.1.6.2 Additional types and descriptions of information for use in Report preparation that may be specifically required in the Detention Report upon request by City staff include:

General location and description

Location

1. Township, range, section, ¼ section
2. Local streets within and adjacent to the subdivision
3. Major drainageways and facilities
4. Names of surrounding developments

Description of Property

1. Area in acres
2. Ground cover (type of trees, shrubs, vegetation)
3. Major drainageways

Drainage basins and sub-basins

Major Basin Description

1. Reference to major drainageway-planning studies such as Master Drainage Plans, flood hazard delineation reports, and flood insurance rate maps.
2. Major basin drainage characteristics
3. Identification of all drainage system components within 50-feet of the property boundary.

Sub-Basin Description

1. Historic drainage patterns of the property in question
2. Off-site drainage flow patterns and impact of development

Drainage design criteria.

Regulations: Discussion of the optional criteria selected or the deviation from this criteria, if any.

Development Criteria Reference and Constraints

1. Previous drainage studies (i.e., Project master plans) for the site in questions that influence or are influenced by the drainage design and how the plan will affect drainage for the site.
2. Discussion of the drainage impact of site constraints such as streets, utilities, railways, existing structure, and development of site plan

Hydrological Criteria

1. Design rainfall
2. Runoff calculation method – *includes tables that provide all of the data used to calculate the time of concentration (length, slope – 85/10 or other weighted stream slope method, flow type, velocity), lag calculations, Curve Number calculation with HSG verification, all assumptions related to the proposed development including actual or estimated increase in impervious areas and resultant CN changes, revised times of concentration calculations and lag calculations.*
3. Detention discharge and storage calculation method. *Include tables of elevation-area-storage-outflow.*
4. Design storm recurrence intervals
5. Discussion and justification of any criteria or calculation methods used that are not presented in or referenced by this criteria.

Hydraulic Criteria

1. References for calculation of facility capacity
2. Detention outlet type. *Provide calculations for outflow including orifice and weir coefficient assumptions, tailwater effects, inlet vs. outlet control, conservation of existing storage, and compensatory storage calculations.*
3. Grade control structure criteria used. *Provide calculations for controlling velocities at the outlet structures, controlling stream degradation, baffle block placement and effects.*
4. Discussion of any drainage facility design criteria used that are not presented in this criteria.

Drainage facility design

General Discussion of

1. Proposed and typical drainage patterns
2. Compliance with off-site runoff considerations
3. The content of tables, charts, figures, plates, or drawings presented in the report.
4. Anticipated and proposed drainage patterns

Specific Discussion of

1. Drainage problems encountered and solutions at specific design points
2. Detention storage and outlet design
3. Maintenance access and aspects of the design
4. Actual maintenance agreement
5. Easements and/or RPW dedications required

Conclusions

Compliance with new Standards

1. Storm Water Criteria
2. Major Drainageway Planning Studies
3. 100-year floodplain after proposed project

Drainage Concept

1. Effectiveness of drainage design to control damage from storm runoff
2. Influence of proposed development on the Major Drainageway Planning Studies recommendation(s)

Computations

Hydrologic Computations

1. Land use assumptions regarding adjacent properties
2. Minor and major storm runoff at specific design points
3. Historic and fully developed runoff computations at specific design points
4. Hydrographs at critical design points

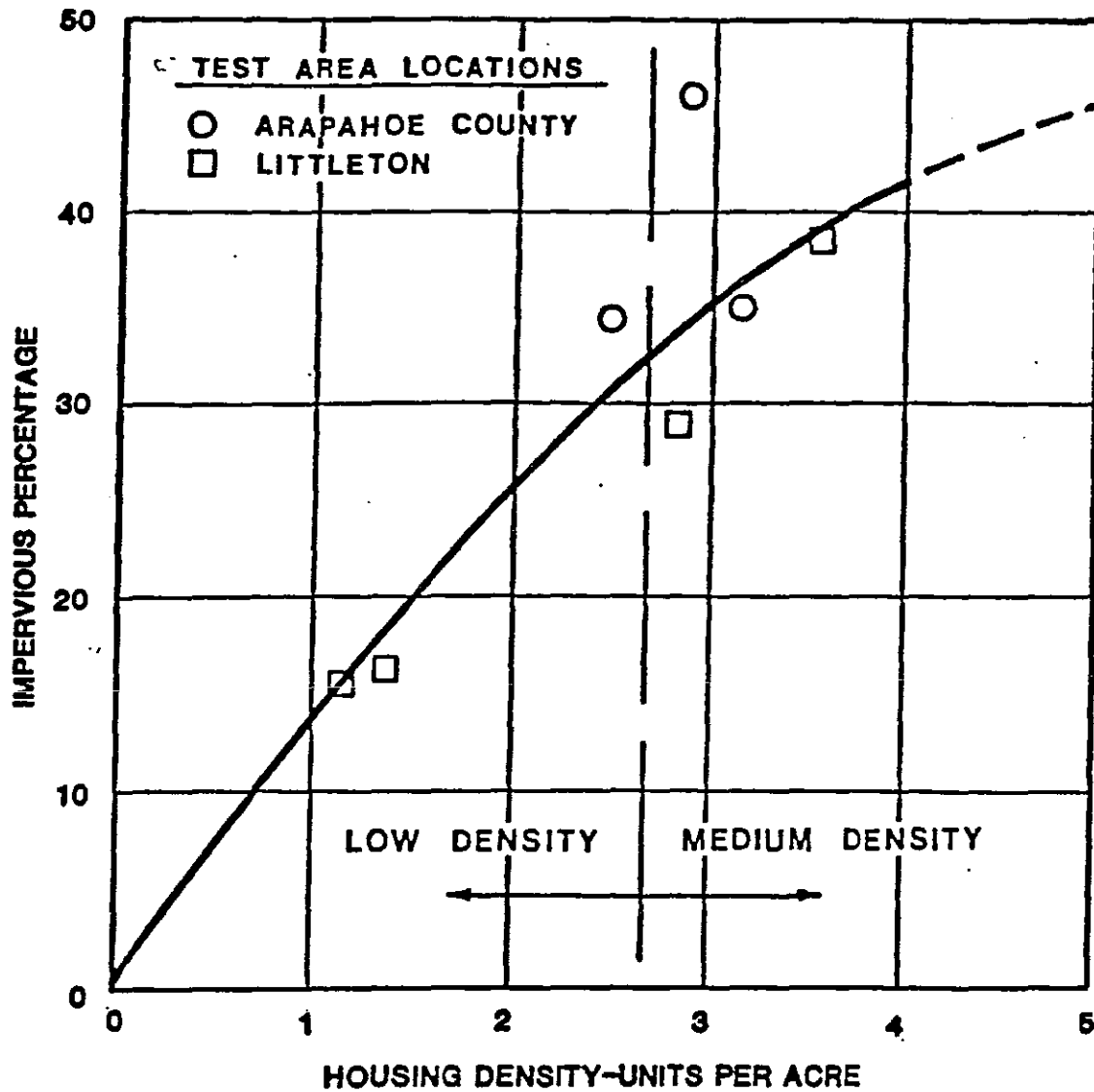
Hydraulic Computations

1. Culvert capacities
2. Storm sewer capacity
3. Street capacity
4. Storm inlet capacity including inlet control rating at connection to storm sewer
5. Open channel design
6. Check and/or channel drop design
7. Detention area/volume capacity and outlet capacity calculations

D.1.6.3 Drawing contents

Sheet-1 – General Location Map: A map shall be provided in sufficient detail to identify drainage flows entering and leaving the development and general drainage patterns. The map should be at a scale of 1" = 200' to 1" = 2000' and show the path of all drainage from the upper end of any off-site basins to the defined major drainageways. The map shall identify any major construction (i.e., Developments, irrigation ditches, existing detention facilities, culverts, main storm sewers), along the entire path of drainage. The size of the drawings shall be a multiple of 8½" x 11".

RESIDENTIAL HOUSING DENSITY VS IMPERVIOUS AREA



SOURCE: CITY OF TULSA STORMWATER CRITERIA MANUAL

D.2 RAINFALL / RUNOFF / FLOODPLAIN REQUIREMENTS

D.2.1 Storm Frequency Rainfall

Two publications were used to develop the design rainfall. The US Department of Commerce, US Weather Bureau "Technical Paper No. 40, Rainfall Frequency Atlas of the United States" (Reference 17) was used for cumulative rainfall data of storm durations greater than 1-hour. The National Oceanic and Atmospheric Administration (NOAA) "Technical Memorandum NWS HYDRO-35" (Reference 18) was used for cumulative rainfall data of storm durations from 5- to 60-minutes.

The cumulative point rainfall data for the 2-, 5- and 10-year storms from the US Department of Commerce requires conversion from a partial-duration series to an annual series. The partial-duration series is a series so selected that their magnitude is greater than a certain base value. If the base value is selected so that the number of values in the series is equal to the number of the record, the series is called an annual exceedance series. This conversion is calculated using the factors listed in Reference 17 and repeated below:

**FACTORS FOR CONVERTING
PARTIAL DURATION SERIES TO ANNUAL SERIES**

RETURN PERIOD	CONVERSION FACTOR
2-YEAR	0.88
5-YEAR	0.96
10-YEAR	0.99

The total rainfall depths for durations of five minutes to 24-hours and for return periods of 1-year to 500-years were developed and are presented in Table D.2.1. The data have been converted to an annual series.

TABLE D.2.1

Duration	TOTAL RAINFALL DEPTHS (U.S. DEPARTMENT OF COMMERCE)							
	Frequency (Return Period)							
	1-year	2-year	5-year	10-year	25-year	50-year	100-year	500-year
5-minute	0.30	0.42	0.55	0.62	0.72	0.80	0.87	1.04
10-minute	0.65	0.77	0.94	1.07	1.24	1.36	1.49	1.70
15-minute	0.89	1.01	1.22	1.39	1.58	1.74	1.93	2.20
30-minute	1.15	1.32	1.73	2.00	2.28	2.58	2.85	3.40
1-hour	1.50	1.62	2.23	2.61	3.04	3.44	3.80	4.75
2-hour	1.76	1.94	2.75	3.25	3.80	4.40	4.75	6.00
3-hour	1.94	2.18	3.05	3.63	4.25	4.75	5.37	6.80
6-hour	2.25	2.44	3.70	4.36	5.20	5.78	6.40	8.25
12-hour	2.75	2.97	4.38	5.15	6.10	6.80	7.60	9.85
24-hour	3.18	3.43	4.98	6.04	7.00	7.78	8.75	11.50

D.2.2 RUNOFF

D.2.2.1 APPROVED METHODS

- A. Table D.2.2 contains methods of runoff which analysis may be used for the design of components of the storm drainage system as applicable.

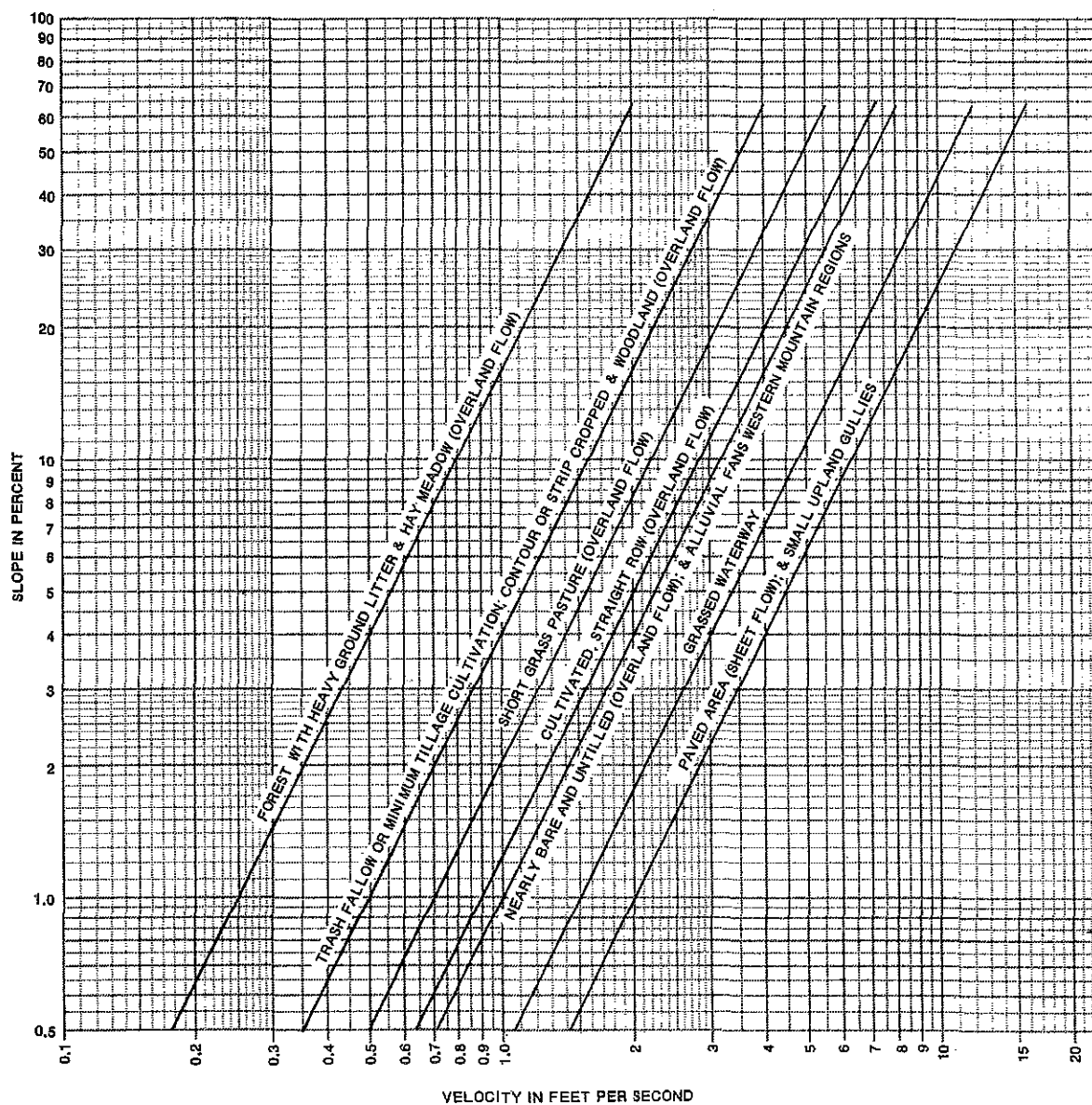


Figure 15.2.--Velocities for upland method of estimating T_c

TABLE D.2.3
RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUSNESS

Land Use or Surface Characteristics	Percent Imperviousness	Runoff Coefficients
BUSINESS:		
Commercial Areas	70 to 95	0.70 to 0.95
Neighborhood Areas	60 to 80	0.50 to 0.70
RESIDENTIAL:		
Single Family	35 to 60	0.30 to 0.65
Multi-unit (detached)	45 to 55	0.40 to 0.60
Multi-unit (attached)	65 to 75	0.60 to 0.75
1/2 acre lot or larger	30 to 45	0.25 to 0.40
Apartments	65 to 75	0.50 to 0.70
INDUSTRIAL		
Light uses	70 to 80	0.50 to 0.80
Heavy uses	80 to 90	0.60 to 0.90
PARKS, CEMETERIES	4 to 8	0.10 to 0.25
PLAYGROUNDS	40 to 60	0.50 to 0.60
RAILROAD YARDS	35 to 45	0.20 to 0.35
UNDEVELOPED AREAS		
Cultivated	30 to 70	0.35 to 0.60
Pasture	20 to 60	0.25 to 0.50
Woodland	5 to 40	0.10 to 0.40
Offsite flow analysis (land use not defined)	35 to 55	0.45 to 0.65
STREETS		
Paved	90 to 100	0.80 to 0.90
Gravel	50 to 70	0.55 to 0.65
DRIVES AND WALKS	90 to 100	0.80 to 0.90
ROOFS	85 to 95	0.80 to 0.90
LAWNS		
Sandy soils	5 to 10	0.10 to 0.20
Clayey soils	10 to 30	0.13 to 0.35

Source: Stormwater Management Criteria Manual, City of Tulsa

TABLE D.2.4
RAINFALL INTENSITY PARAMETERS

Design Storm	Parameter		
	d	e	f
2 Year	56.43	11.5	0.81
5 Year	72	15	0.80
10 Year	82	15	0.80
25 Year	95	15	0.80
50 Year	108	15	0.80
100 Year	120	15	0.80

Source: Drainage Design Manual, ODOT, February, 1988

D.2.3 UNIT HYDROGRAPH METHODS

D.2.3.1 Introduction: A hydrograph method must be used to determine peak runoff rates from watersheds larger than 200 acres, which is the upper limit of the Rational Method and for all detention pond analyses. A hydrograph method is required for all drainage areas larger than two acres. Table D.2.2 indicates methods applicable to various size watersheds. This section contains brief explanations of the various hydrograph methods; however, the design engineer is assumed to be familiar with the basic assumptions and limitations regarding the applicability of the method used.

D.2.3.2 Design Storm Precipitation:

- A. The design storm shall have a duration a minimum of twice the time of concentration for peak flow calculations. For design of detention storage basins, a 24-hour storm shall be used.
- B. A precipitation hyetograph shall be used as the input for all runoff calculations. The specified precipitation is assumed to be uniformly distributed over the watershed. The hyetograph represents average precipitation depths over a computation interval.
- C. The unit duration incremented shall be in multiples of one, two or five minutes (e.g., 1-, 2-, 5-, 10-, or 15-minutes) with the maximum unit duration to be 15 minutes under most circumstances. An acceptable unit storm duration should not exceed one-fifth of the time to peak of the watershed, t_p . As an example, if the watershed has a t_p of 35 minutes, then an appropriate unit storm duration would be five minutes.

D.2.3.3 SCS Unit Hydrograph Method: The Soil Conservation Service (SCS) method is presented in detail in Section 4 of the U.S. Department of Agriculture Soil Conservation Service Engineering Handbook and Model Drainage Manual,

American Association of State Highway and Transportation Officials, 1991. *The U.S. Army Corps of Engineers computer program HEC-HMS shall be employed to utilize the SCS methodology.* The SCS publication TR55 may be used for areas up to 2,000 acres.

D.2.3.4 Snyder Unit Hydrograph Method: This unit hydrograph method is described in detail in Handbook of Applied Hydrology, V.T. Chow, McGraw-Hill Publishing Company, 1964. For this area, two regionalized equations for the lag time of the watershed in terms of time to peak, t_p and unit hydrograph, q_p , shall be used.

The equations are as follows:

The time to peak of the unit hydrograph from the midpoint of unit rainfall, t_p , is computed from the following formula:

$$t_p = 1.40 (LxL_{ca}/S)^{0.376}$$

where

- L = length along the stream from the study point to the upstream limit of the watershed, in miles;
- L_{ca} = length along the stream to a point adjacent to the centroid of the watershed, in miles;
- S = weighted average slope of the basin along the stream to the upstream limit of the watershed.

The time to peak, t_p , is further adjusted for the physical effects of urbanization based on the percentage of channel improvements within the basin. The following equation is used to make that adjustment:

$$adj. t_p = t_p \times 10^{-(0.0034) \times \%Ch}$$

where %Ch = percentage of channel improved.

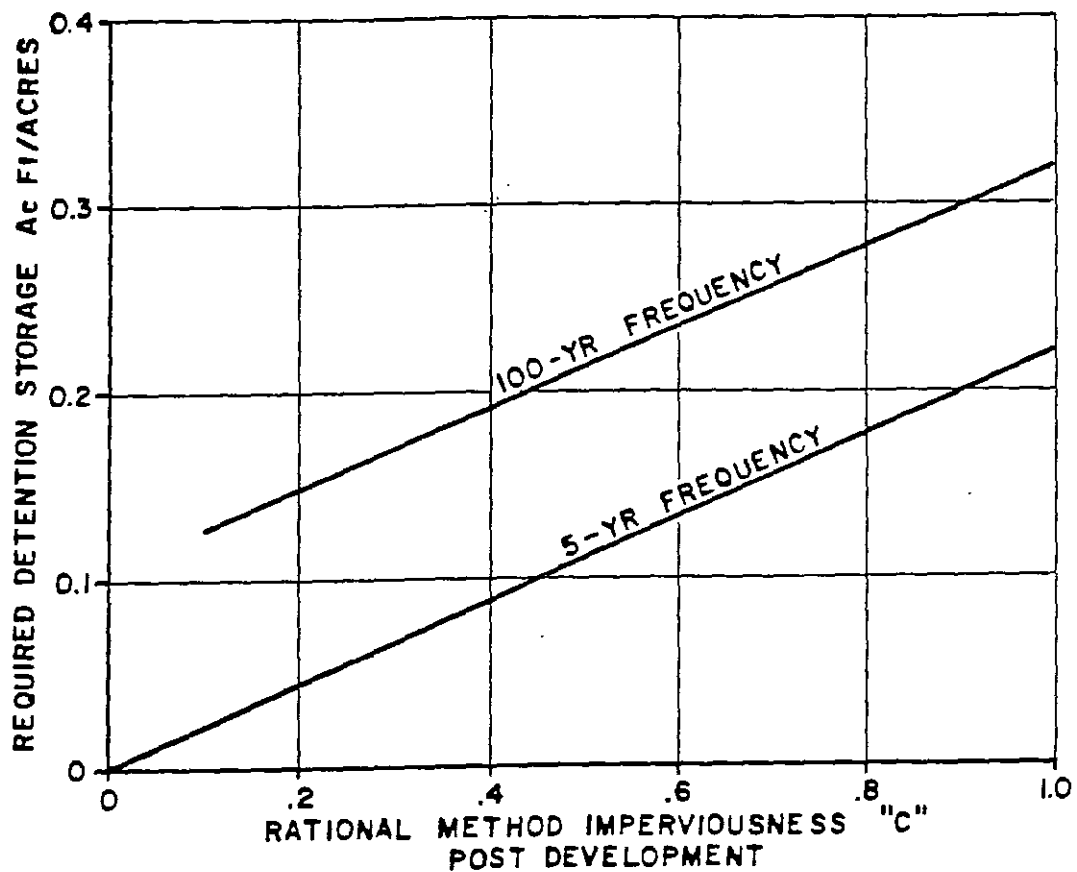
The peak of the unit hydrograph, q_p , is calculated as:

$$q_p = 375 \times (adj. t_p)^{-0.906}$$

Finally, the basin shape factor is computed from the following formula:

$$C_p = \frac{(adj. t_p \times q_p)}{640}$$

UNIT VOLUME DETENTION CURVES



PRE-DEVELOPED 100-YEAR RATIONAL METHOD "C"	(OUTFLOW RATE FOR DRAINAGE CFS/AC)	
	5-YEAR	100-YEAR
.10	0.0	0.6
.20	0.1	1.3
.30	0.2	2.0
.40	0.6	2.9
.60	1.8	4.9
.80	3.6	7.5

SOURCE: CITY OF TULSA STORMWATER CRITERIA MANUAL

D.3 STREET DRAINAGE, INLETS, STORM SEWERS AND CULVERTS

D.3.1 STREET DRAINAGE

D.3.1.1 Depth in Streets: Use of streets for conveyance of storm water runoff shall be within the following limitations:

- A. For the 50-year frequency rainstorm, two driving lanes of arterial streets and one driving lane for collector streets shall remain open. Depth of flow for arterial, collector and local streets shall not exceed 6". Where no curb exists storm water encroachment shall not extend past the street right-of-way.
- B. The 100-year flow shall be contained within the right-of-way.
- C. At sump locations, the water depth shall not exceed 12" above the top of the grate for the 100-year frequency rainstorm.
- D. Where sump collection systems are used, an overflow route shall be established in the event of complete blockage of the sump in accordance with Section E.1.2.

D.3.1.2 Location of Storm Sewers: Storm sewer shall not be placed within the wheel path of any driving lane of the pavement. The preferred location of the storm sewer is according to the following order of priority listed.

- A. Behind the Curb
- B. Down the Center of the Traffic Lane
- C. On Centerline

The traffic lane is defined as the normal width provided for each lane and delineated by pavement stripes.

D.3.1.3 Drainage Impact On Streets

- A. **Sheet Flow** To minimize the effects of hydroplaning and splashing of sheet flow, streets shall be designed with a 2% (1/4" per foot) minimum cross slope. In addition, for arterial streets, the amount of flow permitted in the street is limited to the outside lane before a storm sewer inlet is required.
- B. **Cross Flow**: The depth of cross flow permitted in non-arterial streets, where it cannot be avoided, is limited to the top of curb. Cross flow in arterial streets is not permitted and is strongly discouraged for collectors and residential streets. The cross flow limitations for freeways are determined by the Oklahoma Department of Transportation.

Sump areas will be drained by inlets and a storm sewer system. Omission of the crown to allow water to cross the street and drain into a side street at an intersection shall not be allowed.

- C. **Valley Gutters**: Concrete valley gutters are required in asphalt streets when the longitudinal grade is 1% or less. The width of the valley gutter will be determined by the depth required. The maximum slope of the lateral grade shall be 5%. If a birdbath exists on an asphalt valley greater than 1%, then a concrete valley gutter shall be constructed.

D.3.1.4 Hydraulic Evaluation

A. Curb and Gutter Capacity:

1. The allowable storm capacity of each street section with curb and gutter shall be calculated using the modified Manning's formula:

$$Q = 0.56(Z/n)S^{1/2}Y_T^{8/3}$$

Where Q = discharge in cfs

Z = reciprocal of the street cross slope (S_x , ft/ft)

Y_T = depth of flow at the gutter (feet)

S = longitudinal grade of street (ft/ft)

n = Manning's roughness coefficient

2. Manning's roughness coefficient, n, shall be used according to the applicable construction condition from Table D.3.1.
3. When the street cross section has different cross slopes, capacity computation shall take into account the various cross slopes.

B. Roadside Ditch Capacity: The capacity of a roadside ditch shall be computed using Manning's equation. The allowable flow over the paved portion of the street is computed according to Section D.1.2. This capacity of the roadside ditch and street capacity are combined to determine the entire street section capacity. The paved street portion contributes to the total capacity only when the depth of flow in the roadside ditch is exceeded for the design storm. As in streets with curb and gutter, the maximum allowable depth at the pavement edge shall not exceed the limits set in Section D.1.2.

TABLE D.3.1
MANNING'S N-VALUES FOR
STREET GUTTERS

Construction Type	n
Concrete gutter troweled finish	0.012
Asphalt Pavement	0.013
Smooth texture	0.016
Rough Texture	
Concrete gutter with asphalt pavement	0.013
Smooth	0.015
Rough	
Concrete pavement	0.014
Float finish	0.016
Broom finish	
Brick	0.016

Note: For gutters on flat grade where sediment may accumulate, increase all above values of Manning's "n" by 0.002.

Source: Drainage Design Manual, ODOT, February, 1988

D.3.2 STORM SEWER INLETS

D.3.2.1 Maximum Time of Concentration: A maximum time of concentration to the first inlet of 10 minutes shall be used for single and multifamily residential areas, and 5 minutes for commercial and industrial areas.

D.3.2.2 Allowable Inlet Types:

A. ODOT, CICI-1-X

B. Inlet types shall be in accordance with the City's standard drawings.

C. On arterial streets, offset type inlet, ODOT Standard SSCD-1-15, shall be used.

D.3.2.3 Location of Inlets:

A. Inlets shall be located at all low points in the gutter grade, on side streets at intersections where runoff would flow onto an arterial street or highway and upgrade of bridges to prevent runoff from flowing onto the bridge deck. Inlets are also required when the 5-year depth of flow in the gutter is exceeded.

B. Inlets at intersections shall be located in such a manner that no part of the inlet will encroach upon the curb return. Inlets on a continuous grade in the interior of a block should be placed upstream of a nearby driveway, if possible. The flowline and top of curb elevations shall be shown on all inlets.

D.3.2.4 Spacing Between Inlets: The spacing between inlets shall be such that depths of flow and widths of spread requirements are not violated. The distance between inlets and the distance to the first inlet shall not exceed 600 feet.

D.3.2.5 Interception and Bypass:

A. Some portion of the runoff is allowed to bypass an inlet and combine with the runoff at the next inlet. As many of the inlets as possible should be sump inlets.

B. The type of inlet to be used and the percent of flow to be intercepted at a particular location is left to the judgment of the designer. The objective is to minimize the cost of the storm sewer system while satisfying all of the design criteria. In general, an interception rate of 70 to 80 percent will result in an economical design.

D.3.2.6 Inlets in Sump Condition: When inlets are placed in a sump, emergency overflow shall be provided as described in Section E.1.2.4.A.2. An easement will be provided where overflow occurs outside of public rights of way.

If the overflow for the sump location will discharge directly into a storm water detention facility and if no other upstream inlets are connected to the sump inlet; then, in this case, the inlet and associated piping may be eliminated and the overflow used to convey the full 100-year discharge from the sump directly into the detention facility. The overflow, in this case where the pipe and inlet are omitted, shall be constructed as a concrete channel in a dedicated overland drainage easement and shall entirely contain the 100-year discharge inside the concrete channel.

D.3.2.7 HYDRAULIC DESIGN

A. Methodology: Curb and grate inlet capacities shall be in accordance with FHWA HEC-12 methods.

B. Grate Inlets:

1. Grated inlets without a curb opening are not permitted.
2. The bicycle safe grates (in combination with a curb opening) are the only grates approved within the street right-of-way. Refer to ODOT Standard CIG-1-X.
3. When a grate is used in conjunction with a curb opening directly behind the grate, only the hydraulic capacity of the grate shall be utilized to estimate the flow that is intercepted, since the curb opening portion is reserved to collect debris.
4. Grate interception capacities shall be determined for the specific grate to be used in the project. For example, if the grate inlet is manufactured by Neenah Foundry use Neenah's method of computing the capacity.

C. Curb Opening Inlets: Two types of curb opening inlets are approved. Cast in place concrete inlets, and manufactured metal inlets. Refer to ODOT Standards CICI-1-X or SSCD-1-15. The throats shall be open with no bar dividers.

D.3.3 STORM SEWER PIPE SYSTEM

D.3.3.1 Definitions. A "storm sewer system" refers to a system of inlets, pipes, manholes, junctions, outlets, and other appurtenant structures designed to collect and convey storm runoff to a defined drainageway. A "drainage system" also includes curbs and gutters, roadside ditches, swales, channels, and detention systems for the control of overland runoff. In general, a storm sewer system is required when other parts of the drainage system no longer have the capacity for additional runoff without exceeding the design criteria.

D.3.3.2 Design Criteria

A. Design Storm Frequency:

1. The storm sewer system, beginning at the upstream end with inlets, is required when the allowable street capacity (see Section D.1.2) or overflow capacity is exceeded for the design storm. The "design storm" has three connotations in the City: The design storm for the piped storm sewer system is the 5 year storm, the street and piped storm sewer system combined is the 50 year storm and the piped storm sewer system, street, and ROW combined is the 100 year storm. Minor system and the design storm for the major system, the 5-year and 50/100-year storm respectively. Thus, the storm sewer system should be designed for the larger of the following events:
 - a) The 5-year flow, less the allowable capacity of the gutter or roadside ditch; or

- b) The flow equal to the difference between the 50-year and the allowable street capacity; or
 - c) The flow equal to the difference between the 100-year and the capacity within the ROW.
- 2. The intent is to intercept the 5-year flood and convey the flow in a storm sewer. However, it is impractical to intercept all the runoff in the street at the inlet and some "carry-over" flow will occur. The procedure simply puts a limit on the amount of carry-over flow that can occur in the street.
- B. Construction Materials: Storm sewers may be constructed using reinforced concrete (RCP). *The use of any material other than RCP must be approved by a variance granted by City Council.* The materials, pipes, and appurtenances shall meet the requirements of ODOT.
- C. Vertical Alignment:
 - 1. The sewer grade shall be such that a minimum cover is maintained to withstand AASHTO HS-20 loading on the pipe. The minimum cover depends upon the pipe size, type and class, and soil bedding condition, but shall not be less than one foot from the top of pipe to the finished grade at any point along the pipe. If the pipe encroaches into the street sub-grade, a variance must be granted of the City.

Pipe joints shall be tight fitting. All joints shall have an approved gasket system to prevent infiltration of bedding material and minimize ex-filtration.
 - 2. Manholes will be required whenever there is a change in size, alignment, elevation grade and slope, or where there is a junction of two or more sewers. For sewers equal to or larger than 60" diameter, pre-formed smooth transitions shall be approved by the City Engineer. Pipes entering or leaving a manhole shall have matching soffits unless a variance is granted by the City Engineer. The interior of manholes shall provide smooth grouted fillets and rounded exit openings. The maximum spacing between manholes for various pipe sizes shall be in accordance with Table D.3.3.
 - 3. The minimum clearance between storm sewer and water main (for new construction), either above or below shall be 12". Ductile iron pipe (with proper bedding) or concrete encasement of the water line will be required for clearances of 12" or less when the clearance between existing water mains cannot be maintained.
 - 4. The minimum clearance between storm sewer and sanitary sewer (for new construction), either above or below, shall be 12". In addition, when an existing sanitary sewer main lies above a storm sewer, or within 18" below, the sanitary sewer shall have impervious encasement or be constructed of ductile iron pipe for a minimum of 10' on each side of the storm sewer crossing.
 - 5. Siphons or inverted siphons are not allowed in the storm sewer system.

6. Pumped systems may be considered after all other possibilities have been exhausted, subject to approval by the City Engineer. The pumping plants shall be designed in accordance with the same criteria as gravity systems. Where storage and/or bypass of higher flows are used in conjunction with pumping, a detailed analysis of stage verses discharge shall be submitted for review.
- A. Wet well – Provide a wet well large enough to provide ideal flow conditions for the pump intake.
 - B. Trash removal – Provide a bar grating covered opening sufficient to accommodate 60% blockage and can be cleaned during operation.
 - C. Power supply – 2 – independent sources or a back up generator.
 - D. Capacity – Minimum 5-year capacity with redundant capacity. Controls shall allow for
 - E. Sump drainage – Provide a sump capable of automatically maintaining a “dry” wet well.
 - F. Controls – Electronic emitence or other similar level controls are acceptable.
 - G. Pumps – Primary pumps shall be vertical lift single or multistage type. Pumps shall be placed so that they can be easily removed for repair. All pumps shall have intake screens adequate to protect the impeller from debris.
 - H. Discharge pipes shall be steel or ductile iron. All outlets shall have flap gates.

Table D.3.3
STORM SEWER ALIGNMENT AND SIZE CRITERIA

MANHOLE SPACING:		
Pipe Size	Maximum Spacing for Manholes	Minimum Manhole Size
15" to 24"	300'	4'
27" to 42"	400'	5'
48"	500'	6'
54" to 66"	500'	8'
>66"	500'	junction structure
MINIMUM RADIUS FOR RADIUS PIPE:		
Short radius bends shall not be used on sewers 48" or less in diameter for public systems.		
MINIMUM PIPE DIAMETER:		
Type	Minimum Equivalent Pipe Diameter	Minimum Cross-Sectional Area
Main Trunk	15"	1.23 SF
Lateral from inlet	15"	1.23 SF

Source: Storm water Criteria Manual, City of Tulsa

D. Horizontal Alignment

1. Storm sewer alignment between manholes shall be straight except when accepted in writing by the City Engineer. Approved curvilinear storm sewers may be constructed using pipe bends or radius pipes.
2. A minimum horizontal clearance of ten feet is required between sanitary and water utilities and the storm sewer.
3. The permitted locations for storm sewer within a street right-of-way are: (a) behind the curb, (b) down the center of the driving lane, and (c) on centerline. Behind the curb is the preferred location.

E. Pipe Size: The minimum allowable pipe size for storm sewers is presented in Table D.3.3.

F. Storm Sewer Capacity and Velocity

1. Storm sewer shall be designed to convey the difference between the capacity of the street and the design storm (5-year) flood peaks without surcharging the storm sewer. The sewer may be surcharged during larger floods and under special conditions when approved by the City Engineer.

2. The capacity and velocity shall be based on the Manning's n-values presented in Table D.4.1. The maximum full flow velocity shall be less than 20 fps. Higher velocities may be accepted by the City Engineer if the design includes adequate provisions for uplift forces, dynamic impact forces and abrasion. The minimum velocity in a pipe based on full flow shall be 2.5 fps to avoid excessive accumulations of sediment.
3. The energy grade line (EGL) for the design flow shall be no more than one foot above the final grade at manholes, inlets, or other junctions. To insure that this objective is achieved, the hydraulic grade line (HGL) and the EGL shall be calculated by accounting for pipe friction losses and pipe form losses. Total hydraulic losses will include friction, expansion, contraction, bend, manhole, and junction losses.

G. Storm Sewer Inlets and Outlets

1. Before discharging the runoff from a parking lot of area larger than 0.5 acres, the runoff must first be collected in a storm sewer inlet and connected to the storm sewer within the street right-of-way, or roadway ditch or drainage conduit. Accordingly, the flow in the street shall be reduced by the amount intercepted by the inlet.
2. All storm sewer outlets into open channels shall be constructed with a headwall and wing walls, *concrete slope wall*, or a flared-end-section. When the outlet velocity exceeds six feet per second, erosion control measures shall be taken. If required to prevent erosion, energy dissipaters shall be provided.

D.3.4 Culverts:

- D.3.4.1 **Definition:** A culvert is defined as a closed conduit for the passage of water under an embankment, such as a road, railroad, or driveway. The distinction between a culvert and a sewer is the means by which flow enters the conduit. Flow normally enters a culvert by an open channel, generally at a similar elevation and a culvert usually crosses a street.
- D.3.4.2 **Construction Materials:** Culverts shall be constructed of reinforced concrete in accordance with Table D.5.2. Other materials may be used on a case-by-case basis on acceptance by the City Engineer.
- D.3.4.3 **Hydraulic Design:** Culvert design shall follow the methodology presented in Hydraulic Design of Highway Culverts, Hydraulic Design Series HDS No. 5, FHWA, U.S. Department of Transportation and Drainage Manual, Oklahoma Department of Transportation, 1992.
- D.3.4.4 **Design Frequency:** 100-year without overtopping, with one foot of freeboard below the minimum roadway overflow elevation, unless otherwise approved by the City Engineer.
- D.3.4.5 **Minimum Size:**
- a. Pipe Culverts - 15" equivalent
 - b. Box Culverts - no less than 3' in height

D.3.4.6 Outlet Velocity:

- a. In design of culverts both the minimum and maximum velocities must be considered. A minimum velocity of 3- feet per second at the outlet is required to assure a self-cleaning condition of the culvert.
- b. The outlet area shall include a headwall with wing walls or an end-section in addition to the riprap protection if required. Where outlet velocities exceed six feet per second, erosion control measures shall be taken. Energy dissipaters shall be provided as required.

D.3.4.7 Structural Design: Culverts shall be designed to withstand an HS-20 loading in accordance with the design procedures of AASHTO Standard Specifications for Highway Bridges and with the pipe manufacturer's recommendations. In addition, the AASHTO maximum heights of cover for corrugated metal structures shall also be followed. The minimum cover over top of the pipe shall be 12" unless otherwise accepted by the City Engineer.

D.3.4.8 Driveway Crossings: Driveway culverts shall be sized to pass the 10-year ditch flow capacity without overtopping the driveway. The minimum size culvert shall be a 15" round pipe , or equivalent, for all streets. Sloped headwalls required per the city's Standard Details, not smaller than upstream culvert.

D.3.4.9 Pipe End: Provide *concrete headwall with wingwalls, concrete slope wall, prefabricated culvert end sections* or other approved end treatment.

D.3.5 BRIDGES

D.3.5.1 Bridge: A bridge is constructed with abutments and superstructures, which are typically concrete, steel, or other materials. Since the superstructures are generally not an integral structural part of the abutments, and are therefore free to move, the hydraulic criteria for bridges is different than for culverts. Bridges are also usually constructed with earth or rock inverts, whereas culverts are typically the same material throughout the waterway opening.

D.3.5.2 Hydraulic Design The sizing criteria set forth in Section D.3.4.5 for culverts shall apply with the exception that freeboard for bridges is defined as the vertical clearance of the lowest structural member of the bridge superstructure above the water surface elevation of the design frequency flood. The minimum freeboard shall be 1 foot for the 100-year frequency flood, unless approved by the City.

No rise in water surface is allowed off-site due to the restrictions created by the construction of the bridge, unless approved by both the City Engineer and the affected landowner(s). Legal documentation of such approval is required in the form of an easement or other document as approved by the City Attorney.

D.3.5.3 Velocity: The velocity limitations through the bridge opening are controlled by the potential abutment scour and subsequent erosion protection provided. Using riprap for the channel lining and/or protection of the abutments and wing walls, the maximum channel velocity is limited to 15 fps.

- D.3.5.4 Hydraulic Analysis:** The hydraulic design of bridge crossings shall be in accordance with Drainage Manual, Oklahoma Department of Transportation, 1992.
- D.3.5.5 Inlet and Outlet Configuration:** The design of bridges shall include adequate wing walls of sufficient length to prevent abutment erosion and to provide slope stabilization from the embankment to the channel. Erosion protection on the inlet and outlet transition slopes shall be provided to protect from the erosive forces of eddy current.
- D.3.5.6 Structure Design:** Bridges shall be designed in accordance with AASHTO/ODOT criteria. Rails shall comply with ODOT TR-1 or TR-2 Standard Details.

D.4 OPEN CHANNELS

E.4.1 DESIGN

D.4.1.1 **Channel Geometry:** For trapezoidal channels, the minimum bottom width shall be 4' with side slopes of not steeper than 4 to 1 for sodded sections and a minimum bottom width of 3' with side slopes of not steeper than 1-1/2:1 for paved or rock-lined sections, unless approved by the City Engineer. Where the public may be exposed to hazards and nuisances of open channels, appropriate measures shall be taken to exclude the public from the perilous area.

D.4.1.2 **Manning's "n" - Value:** Manning's Equation in the calculations of hydraulic characteristics of channels will be acceptable. The "n" value used for channels shall be based on the individual channel characteristics, according to Table D.4.1. Designers should anticipate growth of trees as a natural maturation process of the channel. Values less than 0.05 shall be justified.

TABLE D.4.1

MANNING'S N-VALUE FOR OPEN CHANNELS

Channel Type	n-Value Range	Recommended Value
Grass lined - maintained	.029 to .100	
Grass lined - not maintained	.045 to .10	.035
Natural Streams	.025 to .100	Note (1)
Riprap Lined		
1. Ordinary riprap	.025 to .050	.035
2. Gabions	.025 to .050	.035
3. Grouted riprap	.023 to .030	.027
4. Stone mattress	.025 to .033	.028
Concrete Lined		
1. Float finished/wood forms	.013 to .016	Note (2)
	.013 to .016	Note (2)
2. Slip formed	.016 to .023	Note (2)
3. Gunite		
Notes:		
1.	Source: Chow, V.T., Open Channel Hydraulics, McGraw-Hill Book Company, 1959, and pictures	
2.	High value used for capacity determination and low value used for velocity consideration	

- D.4.1.3 **Minimum Slope:** Channels shall have minimum slopes of 0.15% for concrete-lined channels and 0.25% for grass-lined channels. The City Engineer's acceptance is required for channels with a flatter slope.
- D.4.1.4 **Minimum Velocity:** Minimum velocity in a drainageway system shall be 2.5 fps to avoid sedimentation.
- D.4.1.5 **Maximum Velocities:** Velocities shall not exceed 5 fps for sections grass sections depending on soil conditions. Velocities in concrete lined or paved sections shall not exceed 15 fps. The dissipation of energy shall be required at the confluence of improved channels with natural channels through the use of dissipaters, stilling basins and etc. which shall be designed in accordance with FHWA HEC #14 Hydraulic Design of Energy Dissipaters for Culverts and Channels Drainage Manual.
- Velocities offsite shall not exceed those that existed prior to construction.
- D.4.1.6 **Freeboard:** Where practical, the design water surface elevation shall be kept below the level of natural ground. A 1' freeboard above the energy grade line should be added to calculated flow depths to determine minimum channel depths for subcritical flow. For super-critical channels, the freeboard requirement shall be:
- $$H_{FB} = 2.0 + 0.25V(d)^{1/3}$$
- H_{FB} = freeboard height (feet)
- V = Velocity in fps
- d = depth (feet)
- D.4.1.7 **Trickle Channels:** All channels altered or improved from the natural state will require a paved trickle channel unless a variance is granted by the City Engineer. Sodding, or other methods of erosion control shall be required adjacent to the paved channel.
- D.4.1.8 **Concrete Flumes:** Concrete flumes in lieu of enclosed pipe shall be required on a case-by-case basis by the City Engineer, as overflow protection for storm sewer systems, and to drain areas not exceeding five (5) acres in size. All concrete flumes shall extend to the rear of adjacent lots and shall discharge into a dedicated drainage facility or channel.
- D.4.1.9 **Roadside Ditches:** Roadside ditches shall conform with requirements of this section.
- D.4.1.10 **Base Flood Elevation (BFE)** or floodplain boundary changes shall be approved by FEMA.

D.5 HYDRAULIC STRUCTURES

5.1 DEFINITIONS

TABLE D.5.2
CULVERT MATERIALS

PIPE MATERIAL	STANDARD
Reinforced Concrete Pipe	
Round	ASTM C-76 or AASHTO M-170
Elliptical	ASTM C-507 or AASHTO M-207
Arch	ASTM C-506 or AASHTO M-206
Pre-Cast Concrete Manholes	ASTM C-478 or AASHTO M-199
Pre-Cast Concrete Box	ASTM C-789/C-850, AASHTO M-259/273 or ODOT
Concrete Cast-in-Place Box	ODOT Standard
Corrugated Aluminum Alloy:	
Alloy Pipe and Under-drains	AASHTO M-196
Structural Plate	AASHTO M-219
Aluminized Type II Coated	AASHTO M-274
Corrugated Steel	
Metallic coated for sewer/drains	AASHTO M-196
Bituminous Coated pipe/arches	AASHTO M-190
Polymer Pre-coated	AASHTO M-245
Structural Plate	AASHTO M-167
High Density Polyethylene (HDPE)	ASTM D2321-89

*No HDPE greater than 18-inch will be allowed. No HDPE will be allowed under any driving surfaces. No HDPE or *Corrugated Metal Pipe* will be allowed for any public facilities.

D.6 STORAGE

D.6.1 GENERAL

- a. The detention storage shall accommodate the excess runoff from a 100-year frequency storm. The excess runoff is that runoff generated due to urbanization which is greater than the runoff historically generated under existing conditions, for a given frequency storm. Detention facilities shall be designed so that the peak rate of discharge does not exceed that of the pre-development conditions for all storm events up to and including 100-year.
- b. Peak release rates from developments shall not exceed the existing runoff that occurred before development for all storm frequencies up to and including the 100-year frequency storm. Releases for 1, 2, 5, 10, 25, 50, 100, 500-year storms shall not exceed the existing rate. A variance may be allowed for the 500-year storm if dam safety is otherwise compromised, with the approval of the City Engineer.
- c. Generally, urbanization results in more impervious area and a reduction in floodplain storage, both of which contribute to increased flow rates. If improvements are made to any natural channel downstream from an area of 40 acres or more, current floodplain storage must be maintained.
- d. Where available, detention facilities shall be designed using the City's hydrologic and hydraulic models for the watershed to assure that there is no adverse impact from water surface elevation or flow velocity. Otherwise, a hydrologic and hydraulic model will be prepared by the owner's engineer for the analysis.

D.6.2 DESIGN CRITERIA

- a. The design storm for detention shall be a 24-hour storm. Rainfall depths shall be in accordance with Section D.2.1.
- b. The time increment used in developing the rainfall distribution and in reading off the ordinates of the unit hydrograph may be rounded off to the nearest whole time interval or to the nearest time increment.
- c. Rainfall distributions shall be consistent with the modeling technique used.
- d. All calculations for detention facilities shall be submitted for review by the City Engineer. The submittal shall include hydrographs for both existing and developed conditions, detention facility stage-area-volume relationships, outlet structure details, and a stage versus time analysis through the facility.
- e. Floodplain areas and detention facility locations shall be identified at the preliminary plat stage to illustrate how these areas will be managed during and after construction.
- f. If a tract of land under development has a floodplain area within its boundary, the information that must be furnished either with the preliminary plat or before the final plat is submitted, shall include:
 1. A backwater analysis on the existing drainage system.
 2. A backwater analysis on the proposed drainageway system
- g. Detention facilities should be located in areas accepted by the City. Each

facility shall incorporate methods to minimize erosion and other maintenance reducing designs.

- h. Additional detention storage, in excess of the required storage for a drainage area, can be provided to satisfy the detention requirements for a tract of land downstream of the detention facility, providing the detention facility is constructed prior to the development of the downstream tract, with the approval of the City Engineer.
- i. A minimum number of detention facilities is encouraged for each development. Regional detention facilities are encouraged for phased or cooperative development in a drainage basin.
- j. If runoff has a natural tendency to drain in several directions for a given development tract of land where detention is required, then detention storage shall be provided for the biggest drainage area. Additionally, a detention storage may be provided, at the same facility, to satisfy detention requirements for a separate drainage area on the same development, provided that:
 - 1. The whole developmental tract of land is in the same watershed.
 - 2. The smaller drainage area(s) that, has/have been compensated for does/do not, either singly or in combination, adversely impact the health, welfare and safety of the general public downstream. *The downstream impact from any compensated areas shall be specifically discussed in the Detention Report and include a discussion of Pre and Post-development flow rates as well as an analysis of downstream storm water conveyance facilities.*
- k. If a tract of land being developed is located in more than one sub-watershed, of the same overall watershed, grading work to divert flows from one sub-watershed to another will be permitted if there is proper capacity in the receiving stream.
- l. The detention area shall be identified as a separate platted area; as appropriate, it may consist of one or more platted lots, a separate block, or it may be identified as a reserve area.
- m. Provision for the detention facility shall appear among the plat's restrictive covenants.
- n. In the event the detention facility becomes unnecessary as a result of drainage improvements, the facility may be vacated, by action of the City Council, as provided for in the covenants or applicable law.
- o. An access way at least 20 feet wide shall be provided to any required detention area. Access may be provided by frontage on a dedicated public street or by an access easement from a dedicated public street to the detention area.
- p. If the detention facility is approved by the City to serve areas outside the subdivision in which it is located, such additional areas shall be specifically identified in the provision for detention.
- q. Any dam or berm shall be designed in accordance with the dam safety criteria of the Oklahoma Water Resources Board.

- r. The maintenance responsibility for on site detention facilities shall remain with the private sector and appropriate covenants shall be obtained to secure such maintenance.

D.6.3 DESIGN DETAILS

- a. Detention dams or dikes shall be constructed as earth filled and non-overflow type dams. Embankment slopes shall not be steeper than 4: 1. Spillways shall be constructed to pass the 500-year flood event with a minimum of one (1) foot of freeboard on the earth dam structure.
- b. Side slopes on detention facilities shall not be steeper than 4:1.
- c. Access road, with grade of 10% or less, shall be provided to the detention areas for maintenance purposes.
- d. Detention facilities shall be provided with a low flow channel from the inlet to the outlet structure to transmit low flows, and with subsurface drainage as required to maintain a dry surface.
- e. Storm sewer outlets in the slope of the detention pond shall be protected by a reinforced concrete slope wall.
- f. All earth slopes and earth areas subject to erosion, such as, adjacent to low flow channels, inlet structures, and outlet structures shall be slab sodded with Bermuda sod or protected with other erosion control measures. All other earth surfaces, within the area designated for detention facility site, shall have an established growth of Bermuda grass. All covered areas shall be fertilized, watered and in an established growing condition prior to completion and acceptance of the detention facility.
- g. Storm water detention facilities shall be designed as “dry” facilities, with the outlet structure at the lowest elevation in the pond.

With the approval of the City Engineer, a “wet” facility may be allowed to maximize storage. Wet facilities shall have adequate flow through to maintain water levels. Mosquito control shall be incorporated into the maintenance plan.

D.7 SEDIMENTATION CONTROL AND WATER QUALITY

D.7.1 Regulation

- A. This chapter includes standards and requirements for erosion and sedimentation control for construction areas less than 5-acres in size (City Earth Change Permit). For larger construction areas, discharges for storm water are authorized under the Oklahoma Department of Environmental Quality (ODEQ) , Water Quality Division, General Permit (GP-005) for Storm Water Discharges from Construction Activities within the State of Oklahoma.

The control of erosion and sedimentation from construction activities shall be in accordance with this Section and NPDES General Permits for Storm Water Discharges from Construction Sites in the September 9 and September 25, 1992, Federal Register.

- B. The ODEQ adopted a General Permit for Storm Water Discharges from construction activities, which includes discharges from construction with areas greater than 5 acres in size. The objective of the General Permit is to improve water quality by reducing pollutants in storm water discharges. Authorization to discharge under the General Permit is obtained by submitting a Notice-of-Intent (NOI) along with supplemental information, which is briefly described in this Section and ODEQ General Permit for Storm Water Discharges from Construction Activities within the State of Oklahoma.

D.7.2 EXEMPTIONS

- A. Exemptions from the erosion control submittal process are granted by the City for construction areas less than 5-acres or as stipulated in GP-005. A summary of these exemptions is presented below.
 - 1. Bona fide agricultural and farming operations.
 - 2. Customary and incidental routine grounds maintenance, landscaping, and home gardening.
 - 3. Development or improvements on one and two family residential properties at residential single family or duplex density.
 - 4. Emergency repairs of a temporary nature made on public or private property.
 - 5. Temporary excavation for the purpose of repairing or maintaining any public street, public utility facility, or any service lines related thereto.
 - 6. Routine maintenance of the storm water drainage system.
 - 7. Other exemptions as may be granted by the City in writing.

D.7.3 SUBMITTALS

D.7.3.1 Permit Applications

1. All new development disturbing less than 5 acres shall have prepared and implemented an erosion and sedimentation control plan. The plan shall be prepared and will be reviewed in accordance with the criteria presented in this section.
2. New development disturbing an area greater than 5 acres must obtain authorization to discharge under the ODEQ General Permit for Storm Water Discharges from Construction Activities. Notices of Intent must be submitted to:

Storm Water Notice of Intent
Oklahoma Department of Environmental Quality
Water Quality Division
1000 NE Tenth Street
Oklahoma City, OK 73117-1212

Then the City strongly recommends that when a developer files an "NOI" for a development, it will remain in force for the duration of the development, including the development of smaller areas (for example: individual residential lots) that are a part of the larger common plan of the development.

3. Erosion Control Plans are an integral part of the Earth Change Permit. Erosion Control Plans are also related to drainage analysis and report requirements.
4. Erosion and Sedimentation Control Plan approval is required prior to issuance of an Earth Change permit. Since the drainage plan has considerable impact on site grading, erosion control planning and drainage planning should be a concurrent process. However, for some developments, site grading to an interim condition may be desired. To account for cases where site grading will precede final drainage planning, the erosion control plan may be submitted with a Preliminary Drainage Report. Subsequently, the plan will need to be modified to reflect grading changes necessitated by final drainage design.

D.7.3.1 Erosion and Sedimentation Control Report

Purpose: The purpose of the Erosion and Sedimentation Control Report is to identify and define conceptual solutions to the problems which may occur on site and off site as a result of the development. In addition, those problems anticipated on site and off site during development must be addressed in the report. All reports shall be typed on 8-1/2" x 11" paper and bound together. The drawings, figures, plates, tables, and site plan shall be bound with the report or included in a folder/pocket at the back of the report.

- A. **Report Contents:** The narrative report shall contain the applicable information listed:
 1. Name, address, and telephone number of the applicant, landowner,

developer, and engineer.

2. Project description - Briefly describe the nature and purpose of the land disturbing activity, the amount of grading involved, and project location including section, range, and township.
3. Existing site conditions - A description of the existing topography, vegetation, and drainage.
4. Immediate adjacent areas - A description of neighboring areas such as streams, lakes, residential areas, roads, etc., which might be affected by the land disturbance.
5. Soils - A brief description of the soils on the site giving such information as soil names, mapping unit, erosion tendencies, permeability, hydrologic soil group, depth, texture, and soil structure. (This information may be obtained from the S.C.S. soil survey for Tulsa County.)
6. Erosion and sediment control measures - A description of the methods which will be used to control erosion and sedimentation on the site.
7. Permanent stabilization - A brief description, including specifications, of how the site will be stabilized after construction is completed. This information is optional for the initial report but may be required for the report addendum.
8. Storm water management considerations - Explain how storm water will be handled.

Determine detention requirements. This information is optional for the initial report but may be required for the report addendum.
9. Maintenance - A schedule of regular inspections and repair of erosion and control structures should be set forth. This information is optional for the initial report but may be required for the report addendum.

B. Drawing Contents

1. General Location Map: A map shall be provided in sufficient detail to indicate the location of the project site. The map should be at a scale of 1" = 1000' to 1" = 2000' and should indicate the project site in relation to existing topographic, and transportation, features and land boundaries. The map shall show the drainage area of land tributary to the site. The drawing shall be a multiple of 8-1/2" x 11".
2. Sediment and Erosion Control Plan: Map(s) of the proposed development at a scale of 1" = 20' to 1" = 200' on 22" x 34" drawing sheets shall be included. The plan shall show the following:

A boundary line survey of the site on which the work is to be performed.

Existing topography at a maximum of two (2) foot contour intervals. The contours shall extend a minimum of 100-feet beyond the property line (if available).

Proposed topography at a maximum of two (2) foot contour intervals.

Location of any existing structure or natural feature on the site.

Location of any structure or natural feature on the land adjacent to the site and within a minimum of 100 feet of the site boundary line. The map shall show the location of the storm sewer, channel, or creek receiving storm runoff from the site.

Location of any proposed additional structures or development on the site, if known.

Limits of clearing and grading - Areas which are to be cleared and graded.

Detailed Drawings: Detailed drawings and structural practices used that are not referenced in this Manual and other information or detail as may be reasonably required by the City. The size of drawings shall be a multiple of 8-1/2" x 11".

D.7.4 STRUCTURE PRACTICES

D.7.4.1 TEMPORARY STRUCTURAL PRACTICES

A. Dikes:

1. Types
 - a. Diversion dike.
 - b. Interceptor dike.
 - c. Perimeter dike.
2. The design drainage area for dikes shall not exceed 5 acres.
3. The minimum dimensions shall be:
 - a. Top Width - 2'
 - b. Height - 1.5'
 - c. Side Slopes - 2:1 or flatter

B. Swales:

1. Types:
 - a. Interceptor swale.
 - b. Perimeter swale.
2. The design drainage area for swales shall not exceed 5 acres.
3. The minimum dimensions shall be
 - a. Bottom width - 4'
 - b. Depth - 1' min,
 - c. Grade - 1% min.
 - d. Slopes - 2:1 or flatter

- C. Straw Bale Dike: No straw bales will be allowed except in unusual circumstances when no other erosion control method would be effective. Use of

straw bales must be approved by the City Engineer on a case-by-case basis.

- D. **Silt Fence:** Silt fences can be constructed near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. Silt fences may not be used where there is a concentration of water in a channel or other drainage. The following criteria are applicable:
1. **Drainage area** - 2 acre maximum
 2. **Height** - 30" minimum
 3. **Material** - burlap, polypropylene fabric or nylon reinforced polyester netting.
 4. **Support** - Steel fence posts at 8' maximum spacing.
- E. **Entrances:** A stabilized construction entrance shall be built to reduce or eliminate the tracking or flowing of sediment onto public rights of way.
- F. **Stone Outlets:** A stone outlet structure shall be constructed in areas where the entire drainage area to the structure is not stabilized or where there is a need to dispose runoff at a protected outlet or where concentrated flow for the duration of the period of construction needs to be diffused.
- G. **Paved Chute:** A grade stabilization structure in the form of a paved chute or flume shall be constructed to prevent erosion, where concentrated flow of surface runoff is to be conveyed down a slope. The maximum allowable drainage area upstream of such a structure shall not exceed 36 acres.
- H. **Pipe Slope Drain:** A grade stabilization structure in the form of a pipe slope drain shall be constructed to prevent erosion, where concentrated flow of surface runoff is to be conveyed down a slope. The maximum allowable drainage area upstream of such a structure shall not exceed 5 acres.
- I. **Temporary Sedimentation Basin:** Storm water detention facilities may be used temporarily as sediment basins.
1. A temporary outlet structure for the storm water detention facility to work as a sediment pond shall be constructed.
 2. At the end of the construction activity, the developer shall make sure that the outlet structure shall meet the design requirements of a storm water detention facility.
 3. Condition of the detention facility that is used as a sediment pond during construction, shall meet the following requirements at the time of acceptance.
 - a. It shall be completely cleaned by the developer and be rid of any immediate maintenance.
 - b. It shall meet all design standards.
- J. **Sediment Trap:** A sediment trap, a small temporary basin usually installed in a drainageway at a storm drain inlet shall conform to the following criteria:
1. **Drainage area** - 5 acres maximum.
 2. **Trap size** - at least 1800 cubic feet per acre of drainage.
 3. **Embankment:**
 - a. **Height** - 5' maximum
 - b. **Top width** - 3' minimum

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- c. Slopes - 2:1 or flatter

D.7.4.2 PERMANENT STRUCTURAL PRACTICES

- A. Depending on the project layout, a diversion shall be constructed across a slope less than 15% to:
 - 1. Prevent runoff from higher areas having a potential for causing erosion and thereby interfere with the establishment of vegetation on lower areas.
 - 2. Reduce the length of slopes to minimize soil loss.
- B. Diversions need be constructed only below stabilized or protected areas.
- C. Outlets from diversions shall be constructed to discharge in such a manner as not to cause erosion.
- D. Outlets shall be constructed and stabilized prior to the operation of diversion.
- E. Storm drain outlet protection shall be provided when converting pipe flow to channel flow. The reduction in velocity shall be consistent with the roughness coefficient of the receiving waterway. The reduction in velocity may be accomplished by:
 - 1. Providing grouted riprap stabilization;
 - 2. Providing energy dissipaters;
 - 3. Providing permanent vegetation; depending on the site-specific needs.

D.7.5 VEGETATIVE PRACTICES

D.7.5.1 Temporary Vegetative Practices

- 1. Small grains like oats, rye and wheat, and sudans and sorghums are feasible temporary vegetation to control erosion. This practice is effective for areas where soil is left exposed for a period of 6 to 12 months. The time period may be shorter during periods of erosion rainfall.
 - a. Prior to seeding, needed erosion control practices such as diversions, grade stabilization structures, berms, dikes, etc. shall be installed.
 - b. Temporary vegetative practice is usually applied prior to the completion of final grading of the site.
 - c. If the area to be seeded has been recently loosened to the extent that an adequate seedbed exists, no additional treatment is required. However, if the area to be seeded is packed, crusted and hard, the top layer of soil shall be loosened by other suitable means.
 - d. Fertilizer shall be applied at a rate of 600 pounds per acre or 15 pounds per 1000 square foot using 10-20-10 or equivalent.
 - e. Soils known to be highly acidic shall be lime treated.
 - f. Seeding requirements shall be as specified in Table E.7.5.1.
 - g. Seeds shall be drilled or broadcast uniformly.

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Title 44: Emergency Management and Assistance

PART 65—IDENTIFICATION AND MAPPING OF SPECIAL HAZARD AREAS

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AUTHORITY: 42 U.S.C. 4001 *et seq.* ; Reorganization Plan No. 3 of 1978, 43 FR 41943, 3 CFR, 1978 Comp., p. 329; E.O. 12127 of Mar. 31, 1979, 44 FR 19367, 3 CFR, 1979 Comp., p. 376.

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§ 65.1 Purpose of part.

42 U.S.C. 4104 authorizes the Administrator to identify and publish information with respect to all areas within the United States having special flood, mudslide (i.e., mudflow) and flood-related erosion hazards. The purpose of this part is to outline the steps a community needs to take in order to assist the Agency's effort in providing up-to-date identification and publication, in the form of the maps described in part 64, on special flood, mudslide (i.e., mudflow) and flood-related erosion hazards.

[48 FR 28278, June 21, 1983]

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§ 65.2 Definitions.

(a) Except as otherwise provided in this part, the definitions set forth in part 59 of this subchapter are applicable to this part.

(b) For the purpose of this part, a certification by a registered professional engineer or other party does not constitute a warranty or guarantee of performance, expressed or implied. Certification of data is a statement that the data is accurate to the best of the certifier's knowledge. Certification of analyses is a statement that the analyses have been performed correctly and in accordance with sound engineering practices. Certification of structural works is a statement that the works are designed in accordance with sound engineering practices to provide protection from the base flood. Certification of "as built" conditions is a statement that the structure(s) has been built according to the plans being certified, is in place, and is fully functioning.

(c) For the purposes of this part, "reasonably safe from flooding" means base flood waters will not inundate the land or damage structures to be removed from the SFHA and that any subsurface waters related to the base flood will not damage existing or proposed buildings.

[51 FR 30313, Aug. 25, 1986, as amended at 66 FR 22442, May 4, 2001]

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§ 65.3 Requirement to submit new technical data.

A community's base flood elevations may increase or decrease resulting from physical changes affecting flooding conditions. As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify the Administrator of the changes by submitting technical or scientific data in accordance with this part. Such a submission is necessary so that upon confirmation of those physical changes affecting flooding conditions, risk premium rates and flood plain management requirements will be based upon current data.

[51 FR 30313, Aug. 25, 1986]

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§ 65.4 Right to submit new technical data.

(a) A community has a right to request changes to any of the information shown on an effective map that does not impact flood plain or floodway delineations or base flood elevations, such as community boundary changes, labeling, or planimetric details. Such a submission shall include appropriate supporting documentation in accordance with this part and may be submitted at any time.

(b) All requests for changes to effective maps, other than those initiated by FEMA, must be made in writing by the Chief Executive Officer of the community (CEO) or an official designated by the CEO. Should the CEO refuse to submit such a request on behalf of another party, FEMA will agree to review it only if written evidence is provided indicating the CEO or designee has been requested to do so.

(c) Requests for changes to effective Flood Insurance Rate Maps (FIRMs) and Flood Boundary and Floodway Maps (FBFMs) are subject to the cost recovery procedures described in 44 CFR part 72. As indicated in part 72, revisions requested to correct mapping errors or errors in the Flood Insurance Study analysis are not to be subject to the cost-recovery procedures.

[51 FR 30313, Aug. 25, 1986, as amended at 57 FR 29038, June 30, 1992; 61 FR 46331, Aug. 30, 1996; 62 FR 5736, Feb. 6, 1997]

EDITORIAL NOTE: For references to FR pages showing lists of eligible communities, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and at www.fdsys.gov.

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§ 65.5 Revision to special hazard area boundaries with no change to base flood elevation determinations.

(a) *Data requirements for topographic changes.* In many areas of special flood hazard (excluding V zones and floodways) it may be feasible to elevate areas with engineered earthen fill above the base flood elevation. Scientific and technical information to support a request to gain exclusion from an area of special flood hazard of a structure or parcel of land that has been elevated by the placement of engineered earthen fill will include the following:

(1) A copy of the recorded deed indicating the legal description of the property and the official recordation information (deed book volume and page number) and bearing the seal of the appropriate recordation official (e.g., County Clerk or Recorder of Deeds).

(2) If the property is recorded on a plat map, a copy of the recorded plat indicating both the location of the property and the official recordation information (plat book volume and page number) and bearing the seal of the appropriate recordation official. If the property is not recorded on a plat map, FEMA requires copies of the tax map or other suitable maps to help in locating the property accurately.

(3) A topographic map or other information indicating existing ground elevations and the date of fill. FEMA's determination to exclude a legally defined parcel of land or a structure from the area of special flood hazard will be based upon a comparison of the base flood elevations to the lowest ground elevation of the parcel or the lowest adjacent grade to the structure. If the lowest ground elevation of the entire legally defined parcel of land or the lowest adjacent grade to the structure are at or above the elevations of the base flood, FEMA will exclude the parcel and/or structure from the area of special flood hazard.

(4) Written assurance by the participating community that they have complied with the appropriate minimum floodplain management requirements under § 60.3. This includes the requirements that:

(i) Existing residential structures built in the SFHA have their lowest floor elevated to or above the base flood;

(ii) The participating community has determined that the land and any existing or proposed structures to be removed from the SFHA are "reasonably safe from flooding", and that they have on file, available upon request by FEMA, all supporting analyses and documentation used to make that determination;

(iii) The participating community has issued permits for all existing and proposed construction or other development; and

(iv) All necessary permits have been received from those governmental agencies where approval is required by Federal, State, or local law.

(5) If the community cannot assure that it has complied with the appropriate minimum floodplain management requirements under § 60.3, of this chapter, the map revision request will be deferred until the community remedies all violations to the maximum extent possible through coordination with FEMA. Once the remedies are in place, and the community assures that the land and structures are "reasonably safe from flooding," we will process a revision to the SFHA using the criteria set forth in § 65.5(a). The community must maintain on file, and make available upon request by FEMA, all supporting analyses and documentation used in determining that the land or structures are "reasonably safe from flooding."

(6) Data to substantiate the base flood elevation. If we complete a Flood Insurance Study (FIS), we will use those data to substantiate the base flood elevation. Otherwise, the community may submit data provided by an authoritative source, such as the U.S. Army Corps of Engineers, U.S. Geological Survey, Natural Resources Conservation Service, State and local water

resource departments, or technical data prepared and certified by a registered professional engineer. If base flood elevations have not previously been established, we may also request hydrologic and hydraulic calculations.

(7) A revision of floodplain delineations based on fill must demonstrate that any such fill does not result in a floodway encroachment.

(b) *New topographic data.* A community may also follow the procedures described in paragraphs (a)(1) through (6) of this section to request a map revision when no physical changes have occurred in the area of special flood hazard, when no fill has been placed, and when the natural ground elevations are at or above the elevations of the base flood, where new topographic maps are more detailed or more accurate than the current map.

(c) *Certification requirements.* A registered professional engineer or licensed land surveyor must certify the items required in paragraphs (a)(3) and (6) and (b) of this section. Such certifications are subject to the provisions under § 65.2.

(d) *Submission procedures.* Submit all requests to the appropriate address serving the community's geographic area or to the FEMA Headquarters Office in Washington, DC.

[66 FR 22442, May 4, 2001]

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§ 65.6 Revision of base flood elevation determinations.

(a) *General conditions and data requirements.* (1) The supporting data must include all the information FEMA needs to review and evaluate the request. This may involve the requestor's performing new hydrologic and hydraulic analysis and delineation of new flood plain boundaries and floodways, as necessary.

(2) To avoid discontinuities between the revised and unrevised flood data, the necessary hydrologic and hydraulic analyses submitted by the map revision requestor must be extensive enough to ensure that a logical transition can be shown between the revised flood elevations, flood plain boundaries, and floodways and those developed previously for areas not affected by the revision. Unless it is demonstrated that it would not be appropriate, the revised and unrevised base flood elevations must match within one-half foot where such transitions occur.

(3) Revisions cannot be made based on the effects of proposed projects or future conditions. Section 65.8 of this subchapter contains provisions for obtaining conditional approval of proposed projects that may effect map changes when they are completed.

(4) The datum and date of releveled of benchmarks, if any, to which the elevations are referenced must be indicated.

(5) Maps will not be revised when discharges change as a result of the use of an alternative methodology or data for computing flood discharges unless the change is statistically significant as measured by a confidence limits analysis of the new discharge estimates.

(6) Any computer program used to perform hydrologic or hydraulic analyses in support of a flood insurance map revision must meet all of the following criteria:

(i) It must have been reviewed and accepted by a governmental agency responsible for the implementation of programs for flood control and/or the regulation of flood plain lands. For computer programs adopted by non-Federal agencies, certification by a responsible agency official must be provided which states that the program has been reviewed, tested, and accepted by that agency for purposes of design of flood control structures or flood plain land use regulation.

(ii) It must be well-documented including source codes and user's manuals.

(iii) It must be available to FEMA and all present and future parties impacted by flood insurance mapping developed or amended through the use of the program. For programs not generally available from a Federal agency, the source code and user's manuals must be sent to FEMA free of charge, with fully-documented permission from the owner that FEMA may release the code and user's manuals to such impacted parties.

(7) A revised hydrologic analysis for flooding sources with established base flood elevations must include evaluation of the same recurrence interval(s) studied in the effective FIS, such as the 10-, 50-, 100-, and 500-year flood discharges.

(8) A revised hydraulic analysis for a flooding source with established base flood elevations must include evaluation of the same recurrence interval(s) studied in the effective FIS, such as the 10-, 50-, 100-, and 500-year flood elevations, and of the floodway. Unless the basis of the request is the use of an alternative hydraulic methodology or the requestor can demonstrate that the data of the original hydraulic computer model is unavailable or its use is inappropriate, the analysis shall be made using the same hydraulic computer model used to develop the base flood elevations shown on the effective Flood Insurance Rate Map and updated to show present conditions in the flood plain. Copies of the input and output data from the original and revised hydraulic analyses shall be submitted.

(9) A hydrologic or hydraulic analysis for a flooding source without established base flood elevations may be performed for only the 100-year flood.

(10) A revision of flood plain delineations based on topographic changes must demonstrate that any topographic changes have not resulted in a floodway encroachment.

(11) Delineations of flood plain boundaries for a flooding source with established base flood elevations must provide both the 100- and 500-year flood plain boundaries. For flooding sources without established base flood elevations, only 100-year flood plain boundaries need be

submitted. These boundaries should be shown on a topographic map of suitable scale and contour interval.

(12) If a community or other party seeks recognition from FEMA, on its FHBM or FIRM, that an altered or relocated portion of a watercourse provides protection from, or mitigates potential hazards of, the base flood, the Federal Insurance Administrator may request specific documentation from the community certifying that, and describing how, the provisions of § 60.3(b)(7) of this subchapter will be met for the particular watercourse involved. This documentation, which may be in the form of a written statement from the Community Chief Executive Officer, an ordinance, or other legislative action, shall describe the nature of the maintenance activities to be performed, the frequency with which they will be performed, and the title of the local community official who will be responsible for assuring that the maintenance activities are accomplished.

(13) Notwithstanding any other provisions of § 65.6, a community may submit, in lieu of the documentation specified in § 65.6(a)(12), certification by a registered professional engineer that the project has been designed to retain its flood carrying capacity without periodic maintenance.

(14) The participating community must provide written assurance that they have complied with the appropriate minimum floodplain management requirements under § 60.3 of this chapter. This includes the requirements that:

- (i) Existing residential structures built in the SFHA have their lowest floor elevated to or above the base flood;
- (ii) The participating community has determined that the land and any existing or proposed structures to be removed from the SFHA are “reasonably safe from flooding,” and that they have on file, available upon request by FEMA, all supporting analyses and documentation used to make that determination;
- (iii) The participating community has issued permits for all existing and proposed construction or other development; and
- (iv) All necessary permits have been received from those governmental agencies where approval is required by Federal, State, or local law.

(15) If the community cannot assure that it has complied with the appropriate minimum floodplain management requirements under § 60.3, of this chapter the map revision request will be deferred until the community remedies all violations to the maximum extent possible through coordination with FEMA. Once the remedies are in place, and the community assures that the land and structures are “reasonably safe from flooding,” we will process a revision to the SFHA using the criteria set forth under § 65.6. The community must maintain on file, and make available upon request by FEMA, all supporting analyses and documentation used in determining that the land or structures are “reasonably safe from flooding.”

(b) *Data requirements for correcting map errors.* To correct errors in the original flood analysis, technical data submissions shall include the following:

- (1) Data identifying mathematical errors.
- (2) Data identifying measurement errors and providing correct measurements.

(c) *Data requirements for changed physical conditions.* Revisions based on the effects of physical changes that have occurred in the flood plain shall include:

(1) *Changes affecting hydrologic conditions.* The following data must be submitted:

- (i) General description of the changes (e.g., dam, diversion channel, or detention basin).
- (ii) Construction plans for as-built conditions, if applicable.
- (iii) New hydrologic analysis accounting for the effects of the changes.
- (iv) New hydraulic analysis and profiles using the new flood discharge values resulting from the hydrologic analysis.
- (v) Revised delineations of the flood plain boundaries and floodway.

(2) *Changes affecting hydraulic conditions.* The following data shall be submitted:

- (i) General description of the changes (e.g., channelization or new bridge, culvert, or levee).
- (ii) Construction plans for as-built conditions.
- (iii) New hydraulic analysis and flood elevation profiles accounting for the effects of the changes and using the original flood discharge values upon which the original map is based.
- (iv) Revised delineations of the flood plain boundaries and floodway.

(3) *Changes involving topographic conditions.* The following data shall be submitted:

- (i) General description of the changes (e.g., grading or filling).
- (ii) New topographic information, such as spot elevations, cross sections grading plans, or contour maps.
- (iii) Revised delineations of the flood plain boundaries and, if necessary, floodway.

(d) *Data requirements for incorporating improved data.* Requests for revisions based on the use of improved hydrologic, hydraulic, or topographic data shall include the following data:

- (1) Data that are believed to be better than those used in the original analysis (such as additional years of stream gage data).
- (2) Documentation of the source of the data.
- (3) Explanation as to why the use of the new data will improve the results of the original analysis.
- (4) Revised hydrologic analysis where hydrologic data are being incorporated.
- (5) Revised hydraulic analysis and flood elevation profiles where new hydrologic or hydraulic data are being incorporated.
- (6) Revised delineations of the flood plain boundaries and floodway where new hydrologic, hydraulic, or topographic data are being incorporated.

(e) *Data requirements for incorporating improved methods.* Requests for revisions based on the use of improved hydrologic or hydraulic methodology shall include the following data:

- (1) New hydrologic analysis when an alternative hydrologic methodology is being proposed.
- (2) New hydraulic analysis and flood elevation profiles when an alternative hydrologic or hydraulic methodology is being proposed.
- (3) Explanation as to why the alternative methodologies are superior to the original methodologies.
- (4) Revised delineations of the flood plain boundaries and floodway based on the new analysis(es).

(f) *Certification requirements.* All analysis and data submitted by the requester shall be certified by a registered professional engineer or licensed land surveyor, as appropriate, subject to the definition of "certification" given at § 65.2 of this subchapter.

(g) *Submission procedures.* All requests shall be submitted to the FEMA Regional Office servicing the community's geographic area or to the FEMA Headquarters Office in Washington, DC, and shall be accompanied by the appropriate payment, in accordance with 44 CFR part 72.

[51 FR 30314, Aug. 25, 1986, as amended at 53 FR 16279, May 6, 1988; 54 FR 33550, Aug. 15, 1989; 61 FR 46331, Aug. 30, 1996; 62 FR 5736, Feb. 6, 1997; 66 FR 22442, May 4, 2001]

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§ 65.7 Floodway revisions.

(a) *General.* Floodway data is developed as part of FEMA Flood Insurance Studies and is utilized by communities to select and adopt floodways as part of the flood plain management program required by § 60.3 of this subchapter. When it has been determined by a community that no practicable alternatives exist to revising the boundaries of its previously adopted floodway, the procedures below shall be followed.

(b) *Data requirements when base flood elevation changes are requested.* When a floodway revision is requested in association with a change to base flood elevations, the data requirements of § 65.6 shall also be applicable. In addition, the following documentation shall be submitted:

(1) Copy of a public notice distributed by the community stating the community's intent to revise the floodway or a statement by the community that it has notified all affected property owners and affected adjacent jurisdictions.

(2) Copy of a letter notifying the appropriate State agency of the floodway revision when the State has jurisdiction over the floodway or its adoption by communities participating in the NFIP.

(3) Documentation of the approval of the revised floodway by the appropriate State agency (for communities where the State has jurisdiction over the floodway or its adoption by communities participating in the NFIP).

(4) Engineering analysis for the revised floodway, as described below:

(i) The floodway analysis must be performed using the hydraulic computer model used to determine the proposed base flood elevations.

(ii) The floodway limits must be set so that neither the effective base flood elevations nor the proposed base flood elevations if less than the effective base flood elevations, are increased by more than the amount specified under § 60.3 (d)(2). Copies of the input and output data from the original and modified computer models must be submitted.

(5) Delineation of the revised floodway on the same topographic map used for the delineation of the revised flood boundaries.

(c) *Data requirements for changes not associated with base flood elevation changes.* The following data shall be submitted:

(1) Items described in paragraphs (b) (1) through (3) of this section must be submitted.

(2) Engineering analysis for the revised floodway, as described below:

(i) The original hydraulic computer model used to develop the established base flood elevations must be modified to include all encroachments that have occurred in the flood plain since the existing floodway was developed. If the original hydraulic computer model is not available, an alternate hydraulic computer model may be used provided the alternate model has been calibrated so as to reproduce the original water surface profile of the original hydraulic computer model. The alternate model must be then modified to include all encroachments that have occurred since the existing floodway was developed.

(ii) The floodway analysis must be performed with the modified computer model using the desired floodway limits.

(iii) The floodway limits must be set so that combined effects of the past encroachments and the new floodway limits do not increase the effective base flood elevations by more than the amount specified in § 60.3(d)(2). Copies of the input and output data from the original and modified computer models must be submitted.

(3) Delineation of the revised floodway on a copy of the effective NFIP map and a suitable topographic map.

(d) *Certification requirements.* All analyses submitted shall be certified by a registered professional engineer. All topographic data shall be certified by a registered professional engineer or licensed land surveyor. Certifications are subject to the definition given at § 65.2 of this subchapter.

(e) *Submission procedures.* All requests that involve changes to floodways shall be submitted to the appropriate FEMA Regional Office servicing the community's geographic area.

[51 FR 30315, Aug. 25, 1986]

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§ 65.8 Review of proposed projects.

A community, or an individual through the community, may request FEMA's comments on whether a proposed project, if built as proposed, would justify a map revision. FEMA's comments will be issued in the form of a letter, termed a Conditional Letter of Map Revision, in accordance with 44 CFR part 72. The data required to support such requests are the same as those required for final revisions under §§ 65.5, 65.6, and 65.7, except as-built certification is not required. All such requests shall be submitted to the FEMA Headquarters Office in Washington, DC, and shall be accompanied by the appropriate payment, in accordance with 44 CFR part 72.

[62 FR 5736, Feb. 6, 1997]

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§ 65.9 Review and response by the Administrator.

If any questions or problems arise during review, FEMA will consult the Chief Executive Officer of the community (CEO), the community official designated by the CEO, and/or the requester for resolution. Upon receipt of a revision request, the Federal Insurance Administrator shall mail an acknowledgment of receipt of such request to the CEO. Within 90 days of receiving the request with all necessary information, the Federal Insurance Administrator shall notify the CEO of one or more of the following:

- (a) The effective map(s) shall not be modified;
- (b) The base flood elevations on the effective FIRM shall be modified and new base flood elevations shall be established under the provisions of part 67 of this subchapter;
- (c) The changes requested are approved and the map(s) amended by Letter of Map Revision (LOMR);
- (d) The changes requested are approved and a revised map(s) will be printed and distributed;
- (e) The changes requested are not of such a significant nature as to warrant a reissuance or revision of the flood insurance study or maps and will be deferred until such time as a significant change occurs;
- (f) An additional 90 days is required to evaluate the scientific or technical data submitted; or
- (g) Additional data are required to support the revision request.
- (h) The required payment has not been submitted in accordance with 44 CFR part 72, no review will be conducted and no determination will be issued until payment is received.

[51 FR 30315, Aug. 25, 1986; 61 FR 46331, Aug. 30, 1996, as amended at 62 FR 5736, Feb. 6, 1997]

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§ 65.10 Mapping of areas protected by levee systems.

(a) *General.* For purposes of the NFIP, FEMA will only recognize in its flood hazard and risk mapping effort those levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with the level of protection sought through the comprehensive flood plain management criteria established by § 60.3 of this subchapter. Accordingly, this section describes the types of information FEMA needs to recognize, on NFIP maps, that a levee system provides protection from the base flood. This information must be supplied to FEMA by the community or other party seeking recognition of such a levee system at the time a flood risk study or restudy is conducted, when a map revision

under the provisions of part 65 of this subchapter is sought based on a levee system, and upon request by the Federal Insurance Administrator during the review of previously recognized structures. The FEMA review will be for the sole purpose of establishing appropriate risk zone determinations for NFIP maps and shall not constitute a determination by FEMA as to how a structure or system will perform in a flood event.

(b) *Design criteria.* For levees to be recognized by FEMA, evidence that adequate design and operation and maintenance systems are in place to provide reasonable assurance that protection from the base flood exists must be provided. The following requirements must be met:

(1) *Freeboard.* (i) Riverine levees must provide a minimum freeboard of three feet above the water-surface level of the base flood. An additional one foot above the minimum is required within 100 feet in either side of structures (such as bridges) riverward of the levee or wherever the flow is constricted. An additional one-half foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee, is also required.

(ii) Occasionally, exceptions to the minimum riverine freeboard requirement described in paragraph (b)(1)(i) of this section, may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support a request for such an exception. The material presented must evaluate the uncertainty in the estimated base flood elevation profile and include, but not necessarily be limited to an assessment of statistical confidence limits of the 100-year discharge; changes in stage-discharge relationships; and the sources, potential, and magnitude of debris, sediment, and ice accumulation. It must be also shown that the levee will remain structurally stable during the base flood when such additional loading considerations are imposed. Under no circumstances will freeboard of less than two feet be accepted.

(iii) For coastal levees, the freeboard must be established at one foot above the height of the one percent wave or the maximum wave runup (whichever is greater) associated with the 100-year stillwater surge elevation at the site.

(iv) Occasionally, exceptions to the minimum coastal levee freeboard requirement described in paragraph (b)(1)(iii) of this section, may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support a request for such an exception. The material presented must evaluate the uncertainty in the estimated base flood loading conditions. Particular emphasis must be placed on the effects of wave attack and overtopping on the stability of the levee. Under no circumstances, however, will a freeboard of less than two feet above the 100-year stillwater surge elevation be accepted.

(2) *Closures.* All openings must be provided with closure devices that are structural parts of the system during operation and design according to sound engineering practice.

(3) *Embankment protection.* Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result

of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability. The factors to be addressed in such analyses include, but are not limited to: Expected flow velocities (especially in constricted areas); expected wind and wave action; ice loading; impact of debris; slope protection techniques; duration of flooding at various stages and velocities; embankment and foundation materials; levee alignment, bends, and transitions; and levee side slopes.

(4) *Embankment and foundation stability.* Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided shall evaluate expected seepage during loading conditions associated with the base flood and shall demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (COE) manual, "Design and Construction of Levees" (EM 1110-2-1913, Chapter 6, Section II), may be used. The factors that shall be addressed in the analyses include: Depth of flooding, duration of flooding, embankment geometry and length of seepage path at critical locations, embankment and foundation materials, embankment compaction, penetrations, other design factors affecting seepage (such as drainage layers), and other design factors affecting embankment and foundation stability (such as berms).

(5) *Settlement.* Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained within the minimum standards set forth in paragraph (b)(1) of this section. This analysis must address embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in the COE manual, "Soil Mechanics Design—Settlement Analysis" (EM 1100-2-1904) must be submitted.

(6) *Interior drainage.* An analysis must be submitted that identifies the source(s) of such flooding, the extent of the flooded area, and, if the average depth is greater than one foot, the water-surface elevation(s) of the base flood. This analysis must be based on the joint probability of interior and exterior flooding and the capacity of facilities (such as drainage lines and pumps) for evacuating interior floodwaters.

(7) *Other design criteria.* In unique situations, such as those where the levee system has relatively high vulnerability, FEMA may require that other design criteria and analyses be submitted to show that the levees provide adequate protection. In such situations, sound engineering practice will be the standard on which FEMA will base its determinations. FEMA will also provide the rationale for requiring this additional information.

(c) *Operation plans and criteria.* For a levee system to be recognized, the operational criteria must be as described below. All closure devices or mechanical systems for internal drainage, whether manual or automatic, must be operated in accordance with an officially adopted operation manual, a copy of which must be provided to FEMA by the operator when levee or

drainage system recognition is being sought or when the manual for a previously recognized system is revised in any manner. All operations must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP.

(1) *Closures.* Operation plans for closures must include the following:

(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists for the completed operation of all closure structures, including necessary sealing, before floodwaters reach the base of the closure.

(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

(iii) Provisions for periodic operation, at not less than one-year intervals, of the closure structure for testing and training purposes.

(2) *Interior drainage systems.* Interior drainage systems associated with levee systems usually include storage areas, gravity outlets, pumping stations, or a combination thereof. These drainage systems will be recognized by FEMA on NFIP maps for flood protection purposes only if the following minimum criteria are included in the operation plan:

(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists to permit activation of mechanized portions of the drainage system.

(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

(iii) Provision for manual backup for the activation of automatic systems.

(iv) Provisions for periodic inspection of interior drainage systems and periodic operation of any mechanized portions for testing and training purposes. No more than one year shall elapse between either the inspections or the operations.

(3) *Other operation plans and criteria.* Other operating plans and criteria may be required by FEMA to ensure that adequate protection is provided in specific situations. In such cases, sound emergency management practice will be the standard upon which FEMA determinations will be based.

(d) *Maintenance plans and criteria.* For levee systems to be recognized as providing protection from the base flood, the maintenance criteria must be as described herein. Levee systems must

be maintained in accordance with an officially adopted maintenance plan, and a copy of this plan must be provided to FEMA by the owner of the levee system when recognition is being sought or when the plan for a previously recognized system is revised in any manner. All maintenance activities must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP that must assume ultimate responsibility for maintenance. This plan must document the formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and systems are maintained. At a minimum, maintenance plans shall specify the maintenance activities to be performed, the frequency of their performance, and the person by name or title responsible for their performance.

(e) *Certification requirements.* Data submitted to support that a given levee system complies with the structural requirements set forth in paragraphs (b)(1) through (7) of this section must be certified by a registered professional engineer. Also, certified as-built plans of the levee must be submitted. Certifications are subject to the definition given at § 65.2 of this subchapter. In lieu of these structural requirements, a Federal agency with responsibility for levee design may certify that the levee has been adequately designed and constructed to provide protection against the base flood.

[51 FR 30316, Aug. 25, 1986]

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§ 65.11 Evaluation of sand dunes in mapping coastal flood hazard areas.

(a) *General conditions.* For purposes of the NFIP, FEMA will consider storm-induced dune erosion potential in its determination of coastal flood hazards and risk mapping efforts. The criterion to be used in the evaluation of dune erosion will apply to primary frontal dunes as defined in § 59.1, but does not apply to artificially designed and constructed dunes that are not well-established with long-standing vegetative cover, such as the placement of sand materials in a dune-like formation.

(b) *Evaluation criterion.* Primary frontal dunes will not be considered as effective barriers to base flood storm surges and associated wave action where the cross-sectional area of the primary frontal dune, as measured perpendicular to the shoreline and above the 100-year stillwater flood elevation and seaward of the dune crest, is equal to, or less than, 540 square feet.

(c) *Exceptions.* Exceptions to the evaluation criterion may be granted where it can be demonstrated through authoritative historical documentation that the primary frontal dunes at a specific site withstood previous base flood storm surges and associated wave action.

[53 FR 16279, May 6, 1988]

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§ 65.12 Revision of flood insurance rate maps to reflect base flood elevations caused by proposed encroachments.

(a) When a community proposes to permit encroachments upon the flood plain when a regulatory floodway has not been adopted or to permit encroachments upon an adopted regulatory floodway which will cause base flood elevation increases in excess of those permitted under paragraphs (c)(10) or (d)(3) of § 60.3 of this subchapter, the community shall apply to the Federal Insurance Administrator for conditional approval of such action prior to permitting the encroachments to occur and shall submit the following as part of its application:

(1) A request for conditional approval of map change and the appropriate initial fee as specified by § 72.3 of this subchapter or a request for exemption from fees as specified by § 72.5 of this subchapter, whichever is appropriate;

(2) An evaluation of alternatives which would not result in a base flood elevation increase above that permitted under paragraphs (c)(10) or (d)(3) of § 60.3 of this subchapter demonstrating why these alternatives are not feasible;

(3) Documentation of individual legal notice to all impacted property owners within and outside of the community, explaining the impact of the proposed action on their property.

(4) Concurrence of the Chief Executive Officer of any other communities impacted by the proposed actions;

(5) Certification that no structures are located in areas which would be impacted by the increased base flood elevation;

(6) A request for revision of base flood elevation determination according to the provisions of § 65.6 of this part;

(7) A request for floodway revision in accordance with the provisions of § 65.7 of this part;

(b) Upon receipt of the Federal Insurance Administrator's conditional approval of map change and prior to approving the proposed encroachments, a community shall provide evidence to the Federal Insurance Administrator of the adoption of flood plain management ordinances incorporating the increased base flood elevations and/or revised floodway reflecting the post-project condition.

(c) Upon completion of the proposed encroachments, a community shall provide as-built certifications in accordance with the provisions of § 65.3 of this part. The Federal Insurance Administrator will initiate a final map revision upon receipt of such certifications in accordance with part 67 of this subchapter.

[53 FR 16279, May 6, 1988]

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§ 65.13 Mapping and map revisions for areas subject to alluvial fan flooding.

This section describes the procedures to be followed and the types of information FEMA needs to recognize on a NFIP map that a structural flood control measure provides protection from the base flood in an area subject to alluvial fan flooding. This information must be supplied to FEMA by the community or other party seeking recognition of such a flood control measure at the time a flood risk study or restudy is conducted, when a map revision under the provisions of part 65 of this subchapter is sought, and upon request by the Federal Insurance Administrator during the review of previously recognized flood control measures. The FEMA review will be for the sole purpose of establishing appropriate risk zone determinations for NFIP maps and shall not constitute a determination by FEMA as to how the flood control measure will perform in a flood event.

(a) The applicable provisions of §§ 65.2, 65.3, 65.4, 65.6, 65.8 and 65.10 shall also apply to FIRM revisions involving alluvial fan flooding.

(b) The provisions of § 65.5 regarding map revisions based on fill and the provisions of part 70 of this chapter shall not apply to FIRM revisions involving alluvial fan flooding. In general, elevations of a parcel of land or a structure by fill or other means, will not serve as a basis for removing areas subject to alluvial fan flooding from an area of special food hazards.

(c) FEMA will credit on NFIP maps only major structural flood control measures whose design and construction are supported by sound engineering analyses which demonstrate that the measures will effectively eliminate alluvial fan flood hazards from the area protected by such measures. The provided analyses must include, but are not necessarily limited to, the following:

(1) Engineering analyses that quantify the discharges and volumes of water, debris, and sediment movement associated with the flood that has a one-percent probability of being exceeded in any year at the apex under current watershed conditions and under potential adverse conditions (e.g., deforestation of the watershed by fire). The potential for debris flow and sediment movement must be assessed using an engineering method acceptable to FEMA. The assessment should consider the characteristics and availability of sediment in the drainage basin above the apex and on the alluvial fan.

(2) Engineering analyses showing that the measures will accommodate the estimated peak discharges and volumes of water, debris, and sediment, as determined in accordance with paragraph (c)(1) of this section, and will withstand the associated hydrodynamic and hydrostatic forces.

(3) Engineering analyses showing that the measures have been designed to withstand the potential erosion and scour associated with estimated discharges.

(4) Engineering analyses or evidence showing that the measures will provide protection from hazards associated with the possible relocation of flow paths from other parts of the fan.

(5) Engineering analyses that assess the effect of the project on flood hazards, including depth and velocity of floodwaters and scour and sediment deposition, on other areas of the fan.

(6) Engineering analyses demonstrating that flooding from sources other than the fan apex, including local runoff, is either insignificant or has been accounted for in the design.

(d) *Coordination.* FEMA will recognize measures that are adequately designed and constructed, provided that: evidence is submitted to show that the impact of the measures on flood hazards in all areas of the fan (including those not protected by the flood control measures), and the design and maintenance requirements of the measures, were reviewed and approved by the impacted communities, and also by State and local agencies that have jurisdiction over flood control activities.

(e) *Operation and maintenance plans and criteria.* The requirements for operation and maintenance of flood control measures on areas subject to alluvial fan flooding shall be those specified under § 65.10, paragraphs (c) and (d), when applicable.

(f) *Certification requirements.* Data submitted to support that a given flood control measure complies with the requirements set forth in paragraphs (c) (1) through (6) of this section must be certified by a registered professional engineer. Also, certified as-built plans of the flood control measures must be submitted. Certifications are subject to the definition given at § 65.2.

[54 FR 33551, Aug. 15, 1989, as amended at 74 FR 15342, Apr. 3, 2009]

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§ 65.14 Remapping of areas for which local flood protection systems no longer provide base flood protection.

(a) *General.* (1) This section describes the procedures to follow and the types of information FEMA requires to designate flood control restoration zones. A community may be eligible to apply for this zone designation if the Federal Insurance Administrator determines that it is engaged in the process of restoring a flood protection system that was:

(i) Constructed using Federal funds;

(ii) Recognized as providing base flood protection on the community's effective FIRM; and

(iii) Decertified by a Federal agency responsible for flood protection design or construction.

(2) Where the Federal Insurance Administrator determines that a community is in the process of restoring its flood protection system to provide base flood protection, a FIRM will be prepared that designates the temporary flood hazard areas as a flood control restoration zone (Zone AR). Existing special flood hazard areas shown on the community's effective FIRM that are further inundated by Zone AR flooding shall be designated as a "dual" flood insurance rate zone, Zone AR/AE or AR/AH with Zone AR base flood elevations, and AE or AH with base flood elevations and Zone AR/AO with Zone AR base flood elevations and Zone AO with flood depths, or Zone AR/A with Zone AR base flood elevations and Zone A without base flood elevations.

(b) *Limitations.* A community may have a flood control restoration zone designation only once while restoring a flood protection system. This limitation does not preclude future flood control restoration zone designations should a fully restored, certified, and accredited system become decertified for a second or subsequent time.

(1) A community that receives Federal funds for the purpose of designing or constructing, or both, the restoration project must complete restoration or meet the requirements of 44 CFR 61.12 within a specified period, not to exceed a maximum of 10 years from the date of submittal of the community's application for designation of a flood control restoration zone.

(2) A community that does not receive Federal funds for the purpose of constructing the restoration project must complete restoration within a specified period, not to exceed a maximum of 5 years from the date of submittal of the community's application for designation of a flood control restoration zone. Such a community is not eligible for the provisions of § 61.12. The designated restoration period may not be extended beyond the maximum allowable under this limitation.

(c) *Exclusions.* The provisions of these regulations do not apply in a coastal high hazard area as defined in 44 CFR 59.1, including areas that would be subject to coastal high hazards as a result of the decertification of a flood protection system shown on the community's effective FIRM as providing base flood protection.

(d) *Effective date for risk premium rates.* The effective date for any risk premium rates established for Zone AR shall be the effective date of the revised FIRM showing Zone AR designations.

(e) *Application and submittal requirements for designation of a flood control restoration zone.* A community must submit a written request to the Federal Insurance Administrator, signed by the community's Chief Executive Officer, for a flood plain designation as a flood control restoration zone. The request must include a legislative action by the community requesting the designation. The Federal Insurance Administrator will not initiate any action to designate flood control restoration zones without receipt of the formal request from the community that complies with all requirements of this section. The Federal Insurance Administrator reserves the right to request

additional information from the community to support or further document the community's formal request for designation of a flood control restoration zone, if deemed necessary.

(1) At a minimum, the request from a community that receives Federal funds for the purpose of designing, constructing, or both, the restoration project must include:

(i) A statement whether, to the best of the knowledge of the community's Chief Executive Officer, the flood protection system is currently the subject matter of litigation before any Federal, State or local court or administrative agency, and if so, the purpose of that litigation;

(ii) A statement whether the community has previously requested a determination with respect to the same subject matter from the Federal Insurance Administrator, and if so, a statement that details the disposition of such previous request;

(iii) A statement from the community and certification by a Federal agency responsible for flood protection design or construction that the existing flood control system shown on the effective FIRM was originally built using Federal funds, that it no longer provides base flood protection, but that it continues to provide protection from the flood having at least a 3-percent chance of occurrence during any given year;

(iv) An official map of the community or legal description, with supporting documentation, that the community will adopt as part of its flood plain management measures, which designates developed areas as defined in § 59.1 and as further defined in § 60.3(f).

(v) A restoration plan to return the system to a level of base flood protection. At a minimum, this plan must:

(A) List all important project elements, such as acquisition of permits, approvals, and contracts and construction schedules of planned features;

(B) Identify anticipated start and completion dates for each element, as well as significant milestones and dates;

(C) Identify the date on which "as built" drawings and certification for the completed restoration project will be submitted. This date must provide for a restoration period not to exceed the maximum allowable restoration period for the flood protection system, or;

(D) Identify the date on which the community will submit a request for a finding of adequate progress that meets all requirements of § 61.12. This date may not exceed the maximum allowable restoration period for the flood protection system;

(vi) A statement identifying the local project sponsor responsible for restoration of the flood protection system;

(vii) A copy of a study, performed by a Federal agency responsible for flood protection design or construction in consultation with the local project sponsor, which demonstrates a Federal interest in restoration of the system and which deems that the flood protection system is restorable to a level of base flood protection.

(viii) A joint statement from the Federal agency responsible for flood protection design or construction involved in restoration of the flood protection system and the local project sponsor certifying that the design and construction of the flood control system involves Federal funds, and that the restoration of the flood protection system will provide base flood protection;

(2) At a minimum, the request from a community that receives no Federal funds for the purpose of constructing the restoration project must:

(i) Meet the requirements of § 65.14(e)(1)(i) through (iv);

(ii) Include a restoration plan to return the system to a level of base flood protection. At a minimum, this plan must:

(A) List all important project elements, such as acquisition of permits, approvals, and contracts and construction schedules of planned features;

(B) Identify anticipated start and completion dates for each element, as well as significant milestones and dates; and

(C) Identify the date on which “as built” drawings and certification for the completed restoration project will be submitted. This date must provide for a restoration period not to exceed the maximum allowable restoration period for the flood protection system;

(iii) Include a statement identifying the local agency responsible for restoration of the flood protection system;

(iv) Include a copy of a study, certified by registered Professional Engineer, that demonstrates that the flood protection system is restorable to provide protection from the base flood;

(v) Include a statement from the local agency responsible for restoration of the flood protection system certifying that the restored flood protection system will meet the applicable requirements of Part 65; and

(vi) Include a statement from the local agency responsible for restoration of the flood protection system that identifies the source of funds for the purpose of constructing the restoration project and a percentage of the total funds contributed by each source. The statement must demonstrate, at a minimum, that 100 percent of the total financial project cost of the completed flood protection system has been appropriated.

(f) *Review and response by the Federal Insurance Administrator.* The review and response by the Federal Insurance Administrator shall be in accordance with procedures specified in § 65.9.

(g) *Requirements for maintaining designation of a flood control restoration zone.* During the restoration period, the community and the cost-sharing Federal agency, if any, must certify annually to the FEMA Regional Office having jurisdiction that the restoration will be completed in accordance with the restoration plan within the time period specified by the plan. In addition, the community and the cost-sharing Federal agency, if any, will update the restoration plan and will identify any permitting or construction problems that will delay the project completion from the restoration plan previously submitted to the Federal Insurance Administrator. The FEMA Regional Office having jurisdiction will make an annual assessment and recommendation to the Federal Insurance Administrator as to the viability of the restoration plan and will conduct periodic on-site inspections of the flood protection system under restoration.

(h) *Procedures for removing flood control restoration zone designation due to adequate progress or complete restoration of the flood protection system.* At any time during the restoration period:

(1) A community that receives Federal funds for the purpose of designing, constructing, or both, the restoration project shall provide written evidence of certification from a Federal agency having flood protection design or construction responsibility that the necessary improvements have been completed and that the system has been restored to provide protection from the base flood, or submit a request for a finding of adequate progress that meets all requirements of § 61.12. If the Administrator determines that adequate progress has been made, FEMA will revise the zone designation from a flood control restoration zone designation to Zone A99.

(2) After the improvements have been completed, certified by a Federal agency as providing base flood protection, and reviewed by FEMA, FEMA will revise the FIRM to reflect the completed flood control system.

(3) A community that receives no Federal funds for the purpose of constructing the restoration project must provide written evidence that the restored flood protection system meets the requirements of Part 65. A community that receives no Federal funds for the purpose of constructing the restoration project is not eligible for a finding of adequate progress under § 61.12.

(4) After the improvements have been completed and reviewed by FEMA, FEMA will revise the FIRM to reflect the completed flood protection system.

(i) *Procedures for removing flood control restoration zone designation due to non-compliance with the restoration schedule or as a result of a finding that satisfactory progress is not being made to complete the restoration.* At any time during the restoration period, should the Federal Insurance Administrator determine that the restoration will not be completed in accordance with the time frame specified in the restoration plan, or that satisfactory progress is not being made to restore the flood protection system to provide complete flood protection in accordance with the restoration plan, the Federal Insurance Administrator shall notify the community and the

responsible Federal agency, in writing, of the determination, the reasons for that determination, and that the FIRM will be revised to remove the flood control restoration zone designation. Within thirty (30) days of such notice, the community may submit written information that provides assurance that the restoration will be completed in accordance with the time frame specified in the restoration plan, or that satisfactory progress is being made to restore complete protection in accordance with the restoration plan, or that, with reasonable certainty, the restoration will be completed within the maximum allowable restoration period. On the basis of this information the Federal Insurance Administrator may suspend the decision to revise the FIRM to remove the flood control restoration zone designation. If the community does not submit any information, or if, based on a review of the information submitted, there is sufficient cause to find that the restoration will not be completed as provided for in the restoration plan, the Federal Insurance Administrator shall revise the FIRM, in accordance with 44 CFR Part 67, and shall remove the flood control restoration zone designations and shall redesignate those areas as Zone A1-30, AE, AH, AO, or A.

[62 FR 55717, Oct. 27, 1997]

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§ 65.15 List of communities submitting new technical data.

This section provides a cumulative list of communities where modifications of the base flood elevation determinations have been made because of submission of new scientific or technical data. Due to the need for expediting the modifications, the revised map is already in effect and the appeal period commences on or about the effective date of the modified map. An interim rule, followed by a final rule, will list the revised map effective date, local repository and the name and address of the Chief Executive Officer of the community. The map(s) is (are) effective for both flood plain management and insurance purposes.

[51 FR 30317, Aug. 25, 1986. Redesignated at 53 FR 16279, May 6, 1988, and further redesignated at 54 FR 33551, Aug. 15, 1989. Redesignated at 59 FR 53599, Oct. 25, 1994]

EDITORIAL NOTE: For references to FR pages showing lists of eligible communities, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and at www.fdsys.gov.

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§ 65.16 Standard Flood Hazard Determination Form and Instructions.

(a) Section 528 of the National Flood Insurance Reform Act of 1994 (42 U.S.C. 1365(a)) directs FEMA to develop a standard form for determining, in the case of a loan secured by improved real estate or a mobile home, whether the building or mobile home is located in an area identified by the Director as an area having special flood hazards and in which flood insurance under this title is available. The purpose of the form is to determine whether a building or mobile

home is located within an identified Special Flood Hazard Area (SFHA), whether flood insurance is required, and whether federal flood insurance is available. Use of this form will ensure that required flood insurance coverage is purchased for structures located in an SFHA, and will assist federal entities for lending regulation in assuring compliance with these purchase requirements.

(b) The form is available by written request to Federal Emergency Management Agency, PO Box 2012, Jessup, MD 20794; ask for the Standard Flood Hazard Determination form. It is also available by fax-on-demand; call (202) 646-3362, form #23103. Finally, the form is available through the Internet at <http://www.fema.gov/nfip/mpurfi.htm>.

[63 FR 27857, May 21, 1998]

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§ 65.17 Review of determinations.

This section describes the procedures that shall be followed and the types of information required by FEMA to review a determination of whether a building or manufactured home is located within an identified Special Flood Hazard Area (SFHA).

(a) *General conditions.* The borrower and lender of a loan secured by improved real estate or a manufactured home may jointly request that FEMA review a determination that the building or manufactured home is located in an identified SFHA. Such a request must be submitted within 45 days of the lender's notification to the borrower that the building or manufactured home is in the SFHA and that flood insurance is required. Such a request must be submitted jointly by the lender and the borrower and shall include the required fee and technical information related to the building or manufactured home. Elevation data will not be considered under the procedures described in this section.

(b) *Data and other requirements.* Items required for FEMA's review of a determination shall include the following:

(1) Payment of the required fee by check or money order, in U.S. funds, payable to the National Flood Insurance Program;

(2) A request for FEMA's review of the determination, signed by both the borrower and the lender;

(3) A copy of the lender's notification to the borrower that the building or manufactured home is in an SFHA and that flood insurance is required (the request for review of the determination must be postmarked within 45 days of borrower notification);

(4) A completed Standard Flood Hazard Determination Form for the building or manufactured home, together with a legible hard copy of all technical data used in making the determination; and

(5) A copy of the effective NFIP map (Flood Hazard Boundary Map (FHBM) or Flood Insurance Rate Map (FIRM)) panel for the community in which the building or manufactured home is located, with the building or manufactured home location indicated. Portions of the map panel may be submitted but shall include the area of the building or manufactured home in question together with the map panel title block, including effective date, bar scale, and north arrow.

(c) *Review and response by FEMA.* Within 45 days after receipt of a request to review a determination, FEMA will notify the applicants in writing of one of the following:

(1) Request submitted more than 45 days after borrower notification; no review will be performed and all materials are being returned;

(2) Insufficient information was received to review the determination; therefore, the determination stands until a complete submittal is received; or

(3) The results of FEMA's review of the determination, which shall include the following:

(i) The name of the NFIP community in which the building or manufactured home is located;

(ii) The property address or other identification of the building or manufactured home to which the determination applies;

(iii) The NFIP map panel number and effective date upon which the determination is based;

(iv) A statement indicating whether the building or manufactured home is within the Special Flood Hazard Area;

(v) The time frame during which the determination is effective.

[60 FR 62218, Dec. 5, 1995]

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