

RULES AND REGULATIONS FOR
CHAPTER 19, GUIDELINES
HOUSTON CITY CODE

FLOODPLAIN

Approved

Director: 

Michael S. Marcotte, P.E., DEE

City Engineer: 

Mark L. Loethen, P.E.

February 1, 2009
Effective Date

Office of the Director
Department of Public Works and Engineering
City of Houston

Chapter 19

FLOOD PLAIN*

These Guidelines have been issued by the Director of Public Works and Engineering (“the Director”) of the City of Houston (“the City”) pursuant to Chapter 19 of the City of Houston Code of Ordinances (“the Ordinance”), as amended and effective on September 1, 2008. The issuance of a *permit* for *development* within the floodplain (“*Development Permit*”) and other activities authorized or required under the Ordinance will be governed by the terms of the Ordinance. *It is not the purpose of these Guidelines to restate the provisions of the Ordinance*; rather, these Guidelines (represented by text in gray boxes) establish an operational and procedural framework for administration of the Ordinance as contemplated by Section 19-1 (f) of the Ordinance. Therefore, these Guidelines should be read in conjunction with the Ordinance. Copies of the Ordinance and these Guidelines may be obtained at the City’s Floodplain Management Office (FMO), 3300 Main Street, and both documents may also be accessed via the City’s website at www.houstontx.gov. For the convenience of the user, applicable terms that are defined in the Ordinance, or elsewhere in the Code of Ordinances, have been capitalized in these Guidelines. Additionally, to the extent practicable, these Guidelines have been organized by section numbers that correspond to the equivalent section numbers of the Ordinance.

ARTICLE I.

IN GENERAL

The following is a list of acronyms and abbreviations used throughout these supplementary Guidelines to the Ordinance:

BFE	Base Flood Elevation
BPA	Building Permit Application
CLOMR	Conditional Letter of Map Revision
CLOMR-F	Conditional Letter of Map Revision – Fill
EC	Elevation Certificate
FEMA	Federal Emergency Management Agency
FCO	Floodway Conveyance Offset Volume
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMO	Floodplain Management Office
HAG	Highest Adjacent Grade
HCFCDD	Harris County Flood Control District
HEC-HMS	Hydrologic Engineering Center - Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center - River Analysis System
ICC	Increased Cost of Compliance
ILMS	Integrated Land Management System
LAG	Lowest Adjacent Grade
LFD	Letter of Final Determination
LOMR	Letter of Map Revision
NAVD	North American Vertical Datum
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum
RSDE	Residential Substantial Damage Estimator
SFHA	Special Flood Hazard Area
SWMM	Storm Water Management Model
TALCB	Texas Appraiser Licensing and Certification Board
TSARP	Tropical Storm Allison Recovery Project

Sec. 19-1. Statement of purpose.

- (a) The purpose of this chapter is 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 the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public.
 - (3) Minimize prolonged business interruptions.
 - (4) Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in floodplains.
 - (5) Provide for the sound use and development of floodprone areas in such a manner as to minimize the future flood-blight areas.

- (b) This chapter provides a regulatory system to monitor the issuance of plats and permits to reduce the likelihood that development within this city will increase the dangers of flooding. To accomplish this purpose, this chapter utilizes the following methods:
 - (1) Restrictions or prohibitions of land uses that are dangerous to health, safety or property in times of flood, or cause excessive increases in flood heights or velocities.
 - (2) Requirements that land uses particularly vulnerable to floods, including facilities that serve such land uses, be protected against flood damage at the time of initial construction.
 - (3) Maintenance of control of the alteration of natural floodplains, stream channels, and natural protective barriers, which are involved in the accommodation of floodwaters.
 - (4) Mitigation of filling, grading, dredging and other development which may increase flood damage.
 - (5) Prevention or regulation of the construction of flood barriers which will unnaturally divert floodwaters or which may otherwise increase flood hazards to other lands.

- (c) The degree of regulation for flood protection established by this chapter is considered reasonable for regulatory purposes and is based on maps promulgated by the Federal

Emergency Management Agency which are required to be used as a condition of obtaining flood insurance. These maps are 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. Neither the regulations established hereunder nor the issuance of permits hereunder or other approvals granted pursuant to this chapter are intended to imply that lands outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damage.

- (d) These rules and regulations shall be applicable throughout the city. The special flood hazard areas identified by the Federal Emergency Management Agency in the scientific and engineering report entitled, "The Flood Insurance Study for the City of Houston", dated June 18, 2007, with accompanying flood insurance rate maps and flood boundary-floodway maps, and any subsequent revisions or amendments thereto are hereby adopted by reference and declared to be a part of this chapter. The provisions of this chapter shall take precedence over any less restrictive conflicting laws, ordinances, codes, or official determinations. For purposes of this chapter, the city engineer shall determine which of these conflicting laws are most restrictive and his decision in this regard shall be final.

Flood Insurance Rate Maps. All plan reviews will be based on the effective *Flood Insurance Rate Maps (FIRM)*, *Flood Insurance Studies (FIS)*, and all other related data as established in Section 19-4.

National Flood Insurance Program (NFIP) Map Amendments and Revisions. FEMA is responsible for maintaining the NFIP *FIRMs*. Periodically, FEMA will revise the *FIRM*, as was done for TSARP in cooperation with HCFCD and participating jurisdictions within Harris County including the City of Houston. However, FEMA provides mechanisms for individuals, private organizations, and public agencies to modify *flood* hazard map information on an as-needed basis. The available mechanisms for modifying *FIRM* data are identified and described as follows:

1. Conditional Letter of Map Amendment (CLOMA): FEMA's comment on a proposed *structure* or group of *structures* that would, if constructed, be located on existing natural ground above the *BFE* on a portion of a legally defined parcel of land that is partially inundated by the *base flood*.
2. Letter of Map Amendment (LOMA): When issued by FEMA, removes a *structure* or lot from the SFHA.
3. Conditional Letter of Map Revision (CLOMR): FEMA's comment on a proposed project that would, if constructed, affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory *floodway*, the effective *BFEs*, or the SFHA.
4. Letter of Map Revision (LOMR): FEMA's modification to an effective *FIRM* that is generally based on the implementation of physical measures that affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory *floodway*, the effective *BFEs*, or the SFHA.
5. Conditional Letter of Map Revision – Fill (CLOMR-F): FEMA's comment on a proposed project that would, if completed, result in a modification of the SFHA through the placement of *fill* outside the existing regulatory *floodway*.

6. Letter of Map Revision – Fill (LOMR-F): FEMA’s modification of the SFHA shown on the *FIRM* based on the placement of *fill* outside of the existing regulatory *floodway*.

FEMA Forms. FEMA requires certain forms to be completed and submitted for approval depending on the type of map modification being sought by an applicant. The forms and instructions are available for download from the FEMA website at http://www.fema.gov/plan/prevent/fhm/frm_form.shtm. The following is a brief summary of the purpose of each form:

MT-EZ: This form is used to request that FEMA remove a single *structure* or parcel of land from the SFHA. FEMA approval of the application results in a LOMA. The application requires certification by a licensed land surveyor, professional engineer, or architect, but **does not require coordination with, or the signature approval of, the city engineer.**

FEMA’s issuance of a LOMA removes the federal requirement that *flood* insurance be obtained in order to qualify for a federally-insured mortgage. The City of Houston recommends the purchase of *flood* insurance by homeowners, renters, and business owners whether a home or building is located inside or outside of the SFHA.

MT-1: This form is used to request a CLOMA, LOMA, CLOMR-F, or LOMR-F. This application is completed when multiple *structures* or parcels of land are to be removed from the SFHA. The MT-1 is commonly submitted by a developer wishing to remove all or part of a residential or commercial *development* from the SFHA. **The application requires the signature of the city engineer on the Community Acknowledgement form.** FEMA also requires certification by a licensed land surveyor, professional engineer, or architect.

MT-2: This form is used to request a CLOMR or LOMR. This application is completed when a planned or actual modification to the *FIRM* is based on one or more of the following:

- Physical change to a channel, *development* of *flood* control *structures*, or similar activity
- Improved methodology and/or data
- Revision of *floodway* boundaries
- Other

The application requires certification by a licensed land surveyor and/or professional engineer, and the **signature of the city engineer.** Prior to completing review of an MT-2 application, the City Engineer will request a signed “Letter of Concurrence” from the HCFCD stating that the hydrologic and/or hydraulic methodology has been reviewed and that HCFCD is in agreement with the methods and results included with the application. Modeling data should be submitted on CD. Excluding complex analyses, the “Letter of Concurrence” from HCFCD will be issued to the FMO typically within two weeks. New *development* in Zone A will require delineation of the *floodway* boundaries and application for a CLOMR in order to secure a *development permit* from the FMO.

Submittals. The MT-1 or MT-2 requestor must submit four (4) complete copies of the application and supporting documentation to the FMO for review. A copy will be submitted to HCFCD for a “Letter of Concurrence”. Following a successful review, the package will be submitted to the city engineer for signature. The requestor will be contacted when the signed forms are returned to the FMO. One complete package will be retained by the FMO.

The requestor is responsible for submitting the application to FEMA. The requestor should not include payment with the documents submitted to the FMO, as the documents will be returned to the requestor for submittal to FEMA. The requestor is also responsible for posting any public notices that may be required by FEMA as part of the application. Verification that any required notices have been or will be properly

posted must be included with the application package. The transmittal letter of the application and supporting document to FEMA by the applicant should be copied to the FMO for their files.

- (e) The flood insurance study and the flood insurance rate map, and any subsequent revisions or amendments thereto that are being administered as provided in Section 19-4 of this Code, shall be available for public inspection in the office of the city engineer during normal business hours. The city engineer shall be custodian of these records for all purposes.

The above-referenced documents are available and maintained at the FMO at 3300 Main. For purposes of these Guidelines, the FMO is considered to be part of the office of the city engineer.

- (f) The director of the public works and engineering department is authorized to promulgate guidelines for administration of this chapter that are consistent with the requirements of this chapter and applicable state and federal laws and regulations.

Effective Date. These Guidelines shall become effective immediately upon being signed by the Director. Amendments may be made as required and become a part of these Guidelines on the date approved.

Sec. 19-2. Definitions.

As used in this chapter the following words and terms shall have the following meanings unless the context of their usage clearly indicates another meaning:

Terms defined in this section are shown in *italics* when used in the Guidelines.

AO, AH, or VO Zones (areas of shallow flooding) shall mean those areas designated on the flood insurance rate map with a one percent or greater 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.

Addition shall mean any alteration to an existing structure that increases its footprint.

This definition does not necessarily include vertical expansions. In other words, a second floor may be added that increases a *structure's* square footage without triggering the definition of *addition*, as long as the footprint of the *structure* at grade level does not increase. [Refer to Section 19-33, Base flood elevation requirements in special flood hazard areas, for further discussion of *addition*.]

Basement shall mean any area of a building having its floor subgrade (below natural ground elevation) on all sides.

Base flood shall mean a flood having a one percent chance of being equalled or exceeded in any one year.

Base flood elevation (BFE) or base flood level shall mean the elevation above mean sea level that floodwaters have been calculated to reach during the base flood at a specific location.

Base flood level--See definition of "base flood elevation."

Board--See definition for "general appeals board."

Breakaway wall shall mean an open wooden lattice, insect screening or any other suitable building material approved by the city engineer that is not part of the structural support of the associated structure and that is intended to collapse under wind and water loads without causing collapse, displacement or other structural damage to the elevated portion of the structure or damage to the structural integrity of the structure on which breakaway walls are used. In addition, breakaway walls must be designed so that if carried downstream they will not cause damage to any other structure. Breakaway walls must have a design safe loading resistance of not less than ten and not more than 20 pounds per square foot. Use of breakaway walls that exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by city or state codes) may be permitted only if a professional engineer, licensed in the State of Texas, certifies that the designs proposed meet the following conditions:

- (1) Wall collapse shall result from a water load less than that which would occur during the base flood; and
- (2) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (structural and nonstructural). Maximum wind and water loading values to be used in this determination shall each have a one percent chance of being equaled or exceeded in any given year (one hundred-year mean recurrence interval).

Certificate of compliance shall mean a notarized statement, from the applicant for any permit issued under this chapter, to the effect that the applicant has received all permits, licenses, or approvals then required by federal law, statute or regulation, including but not limited to, permits issued under the authority of Section 404 of the Federal Water Pollution Control Act Amendments of 1972, or required by or under any statute, rule or regulation of the State of Texas.

Coastal high hazard area--See definition of V1 through V30 Zones, VE Zones or V Zones.

Conveyance shall mean, unless otherwise determined by the city engineer, the flow of water during the base flood with a velocity that is greater than one foot per second or a depth that is greater than one foot.

Cost of improvement shall mean that cost required for any addition, restoration, repair, or other construction that increases the value of the structure based on an estimate prepared, signed, and dated by a professional engineer or architect, each licensed by the State of Texas, or other documentation acceptable to the city engineer.

[Refer to Section 19-17 (a), Development Permit Application/Improvements, for further discussion of *cost of improvement*.]

Cost of restoration shall mean that cost required to restore a structure to its condition prior to the event causing damage, based on an estimate prepared, signed, and dated by an insurance adjustor, professional engineer or architect, each licensed by the State of Texas, or other documentation acceptable to the city engineer.

[Refer to Section 19-17 (a), Development Permit Application/Improvements, for further discussion of *cost of restoration*.]

Critical facilities shall mean facilities that materially affect the public health and welfare. Such facilities include, but are not be limited to:

- (1) Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a flood;

This facility type includes Institutional Groups I-2 and I-4 in Use and Occupancy Classification, Section 308 of the 2003 International Building Code.

- (2) Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for flood response activities before, during, and after a flood;

Vehicles and equipment storage facilities as referenced above are those that are related to emergency response activities.

- (3) Public and private utility facilities that are vital to maintaining or restoring normal services to flooded areas before, during and after a flood; and

This facility type includes power generation and transmission; water and wastewater treatment storage and transmission; natural gas and petroleum processing, storage, and transmission; and telecommunications facilities.

- (4) Structures or facilities that produce, use, treat, store, or dispose of highly volatile, flammable, explosive, toxic, and/or water-reactive materials.

This facility type includes facilities referenced in High-Hazard Group H in Use and Occupancy Classification, Section 307 of the 2003 International Building Code.

[Refer to Section 19-33(d) for special requirements for *critical facilities* located in areas subject to a 0.2 percent or greater chance of flooding annually.]

Development shall mean 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 or storage of equipment or materials.

Development permit shall mean a permit issued under the provisions of this chapter for any development of a site located within a special flood hazard area. The term shall also include a permit for the placement of a recreational vehicle for more than 180 days in Zones A1-A30, AH and AE.

Elevation certificate shall mean a statement from an engineer or surveyor licensed by the State of Texas on the most current FEMA form certifying that the lowest floor of the structure has been elevated at least as high as required by this chapter. *FIRM* or *flood insurance rate map* shall mean the official flood insurance rate map promulgated by the federal insurance administrator of the Federal Emergency Management Agency which delineates both the special flood hazard areas and the risk premium zones applicable to the city, as amended and supplemented from time to time. Under certain circumstances as provided in section 19-4 of this Code, the effective FIRM may be supplemented with additional flood elevation data for purposes of the administration of this chapter.

Fill shall mean any material that is placed in an area and increases the elevation of that area or displaces water volume.

Flood shall mean a general and temporary condition of complete or partial inundation of normally dry land areas from:

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

Floodproofing shall mean 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.

Floodproofing certificate shall mean a certificate issued by a registered professional engineer licensed in the State of Texas which states that he has developed and/or reviewed the structural design, specifications, and plans for the construction of the structures or improvements covered by the certificate and that the design and methods of

construction are in accordance with accepted standards of practice for meeting the following requirements:

- (1) The floodproofing methods used are adequate to withstand the flood depths, pressures, velocities, impact and uplift forces and other factors associated with the base flood; and,
- (2) Together with attendant utility and sanitary facilities, the structures are designed so that below the base flood level the structures are watertight with walls impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.

Floodway shall mean 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 the height specified for the site in the flood insurance study.

Floodway conveyance offset volume shall mean the volume of material that must be excavated and removed from the special flood hazard area to provide a storage volume necessary to reduce loss of conveyance associated with development within the floodway.

Floodway conveyance offset (FCO) volume will be computed using the following standard formula:

$$\text{FCO (cubic yards)} = 0.0004 * (\text{Bldg Footprint}) * (\text{Pier Area}) * e^{-0.21 * d}$$

Where:

FCO =	Floodway conveyance offset volume required (in cubic yards)
Bldg Footprint =	Area of proposed building footprint (in square feet)
Pier Area =	Cross-sectional area of piers between natural ground and BFE perpendicular to flow direction (in square feet)
d =	depth of 100-year flood at building (in feet)
e =	natural logarithm base

This volume must be provided on the applicant's property or mitigation site in accordance with Section 19-43(d). The floodway conveyance offset volume should be calculated separately from volumes calculated for floodplain fill mitigation or stormwater detention.

Flood insurance rate map--See definition of "FIRM."

Flood insurance study shall mean the effective report provided by the Federal Emergency Management Agency containing current flood profiles of the water surface elevations of the base flood as well as the flood boundary-floodway map.

Functionally dependent use shall mean 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.

General appeals board shall mean that board organized and created under the provisions of the Building Code.

Highest adjacent grade shall mean the highest natural elevation of the ground surface next to the proposed walls of a structure immediately prior to construction.

Historic structure means any structure that is:

- (1) Listed individually in the National Register of Historic Places 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; or
- (3) Individually listed on the Texas Inventory of Historic Places.

Lake Houston shall mean, for purposes of this chapter, the shoreline of an area bounded on the south by the Lake Houston Dam, on the northwest by the West Lake Houston Parkway Bridge and on the northeast by an imaginary line running generally east to west that intersects the confluence of Luce Bayou and the East Fork of the San Jacinto River, and is more particularly described as beginning at a point located at 30° 2' 31.67" N, 95° 7' 12.09" W and running generally west to 30° 2' 32.02" N, 95° 7' 36.14" W.

Lowest floor means the lowest floor of the lowest enclosed area (including basement) of a structure. An unfinished or flood-resistant enclosure, used 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 design requirements of this chapter or any other state or federal statute, rule, or regulation.

Manufactured home shall mean 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 including, but not limited to, a manufactured home as defined in section 29-1 of this Code.

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 including, but not limited to, a manufactured home park or manufactured home subdivision as defined in section 29-1 of this Code.

Market value shall mean the value of a structure as established by one of the following:

[Refer to Section 19-17 (a), Development Permit Application/Improvements, for further discussion of *market value*.]

- (1) The improvement value assigned to the structure by the central appraisal district for the county in which the structure is located;
- (2) The computed actual cash value as determined by the FEMA-approved Residential Substantial Damage Estimator (RSDE) methodology;
- (3) An appraisal performed by a certified real estate appraiser licensed by the Texas Appraiser Licensing and Certification Board; or
- (4) Any other similar method acceptable to the city engineer.

Market value shall not include land value.

Mean high tide shall mean the average of all recorded high tides as recorded and reported by the National Weather Service.

Mean sea level shall mean the National Geodetic Vertical Datum (NGVD) of 1929 or other datum, to which base flood elevations shown on the FIRM are referenced.

Minimum flood protection elevation shall mean the base flood elevation plus 12 inches.

Modular home shall mean a structure or building module that is manufactured at a location other than the location where it is installed and used as a residence by a consumer, transportable in one or more sections on a temporary chassis or other conveyance device, and designed to be used as a permanent dwelling when installed and placed upon a permanent foundation system. This term shall include the plumbing, heating, air conditioning and electrical systems contained in the structure. This term does not include a manufactured home as defined herein or building modules utilizing concrete or masonry as the primary structural component.

New construction shall mean the initial construction of a structure.

Permit shall mean a development permit issued under the provisions of this chapter.

Plat means any of the following: a Class II or Class III subdivision plat and a street dedication plat as those terms are defined in chapter 42 of this Code or a manufactured home subdivision plat as that term is used in chapter 29 of this Code.

Recreational vehicle shall mean a vehicle that is:

- (1) Built on a single chassis;
- (2) Four hundred 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.

Repetitive loss shall mean flood-related damage sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each flood event, on the average, equals or exceeds 25% of the market value of the structure before the damage occurred. For the purpose of this definition, the market value of a structure is established on October 1, 2006, or on the date of the first flood-related loss, whichever occurs later.

This definition of *repetitive loss* is included in the Ordinance to facilitate applications for Individual Cost of Compliance (ICC) benefits from the NFIP. The more common definition of *repetitive loss* used by FEMA refers to a *structure* that has had two or more claims of more than \$1,000 paid by the NFIP within any 10-year period since 1978.

Riverine means relating to, formed by, or resembling a river (including tributaries), stream or brook.

Special area--See definition of "special flood hazard area."

Special flood hazard area or *special area* shall mean the land in the floodplain within the city, that is subject to a one percent or greater chance of flooding in any given year and is designated as unnumbered A Zones, AE Zones, AO Zones, AH Zones, A1 through A99 Zones, VO Zones, V1 through V30 Zones, VE Zones or V Zones.

Start of construction (for other than new construction or substantial improvements under the Coastal Barrier Resources Act, 16 U.S.C. § 3501 et seq.) shall include substantial improvement, and shall mean the date the building permit was issued, provided the actual start of construction, repair, reconstruction, 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 placement of concrete slabs 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 a 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.

Structure shall mean an edifice or building of any kind or piece of work that is artificially built up or composed of parts joined together in a definite manner, including, but not limited to, a modular home or a manufactured home, or a gas or liquid storage tank when such tank is principally located above ground.

Substantial damage shall mean the damage of any origin sustained by a structure whereby the cost of restoration of the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure. For the purpose of this definition, the market value refers to the value of the structure immediately preceding the event that caused substantial damage.

Substantial improvement shall mean 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 the start of construction of the improvement. This term shall include structures that have incurred repetitive loss or substantial damage, regardless of the repair work performed. The term shall not include either:

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

Utilities shall mean all building utilities including, but not limited to, electrical, heating, ductwork, ventilating, plumbing, air conditioning equipment, and any other service facilities.

Utility construction permit means a permit issued to a developer under chapter 47 of this Code to construct a water or sewer main.

V1 through V30 Zones or VE Zones or V Zones or coastal high hazard area shall mean an area subject to high velocity waters, including but not limited to, hurricane wave wash or tsunamis.

Variance shall mean a grant of relief to a person from the requirements of this chapter that allows development in a manner otherwise prohibited by this chapter.

Watercourse shall mean any river, channel or stream for which base flood elevations have been identified in the flood insurance study for the city.

Sec. 19-3. Certain prohibitions relating to recreational vehicles.

All recreational vehicles placed in Zones A1-30, A99, AH, AE or V, VE, V1-30 on the FIRM must be:

- (1) On the site for less than 180 consecutive days, and ready for highway use; or
- (2) Be permitted under article IV herein and meet the elevation and anchoring requirements for manufactured homes.

A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site by quick disconnect type utilities and security devices, has no permanently attached additions and has current vehicle registration and inspection stickers or tags affixed.

Sec. 19-4. Use of other flood hazard data to supplement the effective firm.

- (a) From time to time elevation and flooding studies are undertaken by or under the auspices of the Federal Emergency Management Agency and local political subdivisions, such as the Harris County Flood Control District, that have responsibility to abate flooding. Upon determination that the data generated by such a study appears to be reliable and based upon sound engineering and surveying practices and further that the study's data indicate that the effective FIRMs are materially inaccurate, the city engineer may cause the study data to be administered for purposes of this chapter as though it were a part of the effective FIRM. Any such determination shall be issued in writing and a copy shall be placed on file in the office of the city secretary.
- (b) Where the study data are being administered as provided in subsection (a), the following procedures shall apply:
 - (1) To the extent of any inconsistencies between the study data and the effective FIRM, the more restrictive base flood elevations and special flood hazard areas shall be controlling, and in no instance may any determination or designation that is based on the effective FIRM be reduced by study data.
 - (2) If alternative base flood elevations exist for the property because of the administration of supplemental data as provided in this section 19-4, the applicant shall provide two surveys, one of which shall be based in the effective FIRM and one of which shall be based on the study data.
 - (3) Any applicant for a plat, permit or other approval that is denied because of the application of the study data may appeal the denial of the permit, plat or other approval based on the validity of the study data as applied to the applicant's property or project. The appeal shall be considered in the same manner as a

variance application under article II of the chapter. In any such appeal, the city engineer shall provide the documentation for the study data; however, the burden of demonstrating that the study data are incorrect as applied to the applicant's property shall rest upon the applicant, and must be supported by the agency then responsible for the study data. Any appeal pursuant to this section shall not result in the change in any of the study data. In addition, if the study data being used has been published by the Federal Emergency Management Administration for comment as a draft or preliminary FIRM:

- a. The appeal process shall be limited to the application of the study data by the city to the specific application that is the subject of the appeal;
 - b. The appeal process shall not be regarded as an appeal under part 67, or a request for map amendment under part 69, of Title 44 of the Code of Federal Regulations;
 - c. Any outcome of the appeal to the city is in no way binding on the Federal Emergency Management Administration, nor will it affect or limit any action the agency may take; and
 - d. Any challenge to the use of the study data as the basis for a FIRM should be separately addressed to the Federal Emergency Management Administration under the applicable federal rules.
- (c) For any special flood hazard area for which a floodway has not been designated, the applicant may submit an engineering analysis by a registered professional engineer licensed in the State of Texas that defines the floodway with respect to the site for which a development permit is sought.

Secs. 19-5--19-10. Reserved.

ARTICLE II.

REGULATORY SYSTEM FOR PERMITS AND PLATS

DIVISION 1.

GENERALLY

Sec. 19-11. In general.

No building permit, paving permit, utility construction permit or other permit required for a structure or development shall be issued, and no plat shall be approved, unless the applicant demonstrates that the permit or plat meets the applicable requirements of this chapter, or unless a variance, excepting such structure or development from the provisions of this chapter, is granted under the terms of this chapter.

Sec. 19-12. Duties of city engineer.

The city engineer is charged with exercising best engineering judgement in the administration and implementation of the provisions of this chapter. His duties in this regard shall include, but are not limited to, the following:

- (1) Maintaining and holding open for public inspection all records pertaining to the provisions of this chapter including a record of all floodproofing certificates filed hereunder with the specific elevation (in relation to mean sea level) to which such structures are floodproofed.
- (2) Reviewing, approving, or denying all applications for development permits required by the adoption of this chapter.
- (3) Reviewing applications for development permits to ensure that all necessary licenses, approvals, or permits have been obtained from those federal, state or local governmental agencies from which prior approval is required.
- (4) Where interpretation is needed as to the exact location of the boundaries of the special flood hazard areas (for example, where there appears to be a conflict between a mapped boundary and actual field conditions), making the necessary interpretation of the maps which shall be liberally construed by the city engineer in favor of inclusion of the site in a special flood hazard area.
- (5) Notifying adjacent communities, the Harris County Flood Control District and the Texas Commission on Environmental Quality prior to any alteration or relocation of a watercourse within the city, and submitting evidence of such notification to the Federal Emergency Management Agency.
- (6) Cooperate with the responsible local, state and federal agency to maintain the flood-carrying capacity of the altered or relocated portion of any watercourse within the city.
- (7) When and where base flood elevation data has not been provided, obtaining, reviewing and reasonably utilizing any base flood elevation data and floodway data available from a federal, state or other source including any information obtained in connection with the provisions of section 19-13(b) of this chapter, as criteria in administering the applicable provisions of this chapter.
- (8) Where an amendment or supplement to a FIRM that is being administered as provided in section 19-4 of this Code expresses base flood elevation based on different data than the FIRM it amends or supplements, reconciling the conflicting data to determine the more restrictive base flood elevation.

DIVISION 2.

PLAT PROCEDURE

Sec. 19-13. Plat approval; issuance.

- (a) Any person who is required or elects to obtain a plat shall also comply with the provisions of this chapter, if applicable.
- (b) When a person files an application for approval of a plat, the approval of the plat is subject to the approval of a drainage plan for the property that is the subject of the plat application if the property is located in whole or in part in a special flood hazard area within the city. The drainage plan shall include the base flood elevation data for the property certified as true and correct on the face of the drainage plan by a registered professional engineer licensed in the State of Texas. If alternative base flood elevations exist for the property because of the administration of supplemental data as provided in section 19-4 of this Code, the drainage plan shall include both base flood elevations.

Drainage Plan for Platting. Before a final *subdivision plat* may be approved for any property, all or a portion of which is located inside the floodplain, a drainage plan for the property being platted must be submitted and approved by the city engineer. The purpose of the drainage plan is to illustrate the existing and proposed drainage patterns for the property being platted, and to demonstrate that the proposed project complies with all City regulations and is unlikely to adversely impact the floodplain or other parcels adjacent to the property being platted. Flow and volume calculations, as described below, will be estimates based on the preliminary design of the proposed *development*. The *development permit* application will include the detailed final calculations based on the final design.

The drainage plan shall include the following:

1. A topographic map of existing and proposed conditions, showing existing and proposed drainage patterns and drainage area boundaries;
2. Estimates of site run-on and run-off peak flows under existing and proposed conditions, with specific attention paid to how changes in overland flow might affect other parcels;
3. All points of storm water discharge for the property;
4. The *BFE* with adjustment and the applicable *FIRM* panel(s);
5. A map showing proposed areas of cut and *fill*, including estimates of *fill* mitigation requirements, or a statement that no *fill* is proposed to be placed below the *BFE* on this site;
6. The location of floodplain storage mitigation (or a statement that none is required);
7. Minimum first floor elevations for any *structures* planned for the site;
8. Calculations of detention requirements due to increased impervious cover and reduced time of concentration of the proposed *development*, as required by Chapter 42 of the Code of Ordinances and Chapter 9 of Public Works and Engineering's Infrastructure Design Manual;
9. The location of detention facilities (or a statement that no detention is required);
10. A statement that the drainage plan is conceptual in nature and the final drainage plan shall be in conformance with this conceptual drainage plan;
11. The signature and seal of a registered professional engineer licensed in the state of Texas; and
12. A signature line for the approval of the city engineer or his designee.

Final construction drawings may satisfy the requirement for a drainage plan if all of the above-listed elements are included and the drawings are available for review by the city engineer.

- (c) The city engineer shall review the drainage plan and determine whether the development will be reasonably safe from flooding and whether such proposed development is:
 - (1) Consistent with the need to minimize flood damage within the special flood hazard area;
 - (2) To be constructed so that all public utility facilities including, but not limited to, sanitary sewer, gas, water and electrical systems are located and constructed so as to minimize flood damage from the base flood;
 - (3) To be constructed so that drainage is provided to reduce exposure of such development to flood hazards; and
 - (4) Would comply with the applicable requirements of article III of this chapter.
- (d) If the proposed development satisfies the criteria in subsection (c) of this section, the city engineer shall approve the drainage plan and shall so notify the city planning commission in writing.
- (e) The city planning commission shall not approve a final plat until the city engineer has approved the drainage plan for that site. If the proposed development requires mitigation pursuant to section 19-17 or section 19-43 of this Code, the final plat and deed shall identify the location and volume of the mitigation as a feature of the property. The obligation to have a mitigation feature shall run with all the land covered by the development permit. The owner of the land shall have the obligation to have and comply with the development permit unless that obligation is transferred to another person pursuant to rules and regulations promulgated by the director pursuant to subsection (f) of section 19-1 of this Code.

[Refer to Section 19-17 (c) and Section 19-43(d) for further discussion of mitigation.]

Secs. 19-14, 19-15. Reserved.

DIVISION 3.

PERMIT PROCESS

Sec. 19-16. Regulatory process for permits; term.

- (a) Any development within a special flood hazard area shall be unlawful without a development permit, regardless of whether a plat is required under chapter 42 of this Code. A development permit is required in addition to any other permit that may be required for the development activities.

Building *permit* applications for residential and commercial remodels with estimated costs equal to or less than \$10,000 and \$15,000, respectively, that do not involve an *addition* to the existing *structure* (i.e., an

increase in the footprint of the *structure*), are not reviewed by the FMO and do not require a *development permit*. Remodel activities limited to these cost thresholds are considered to be non-*substantial improvements* and, therefore, compliant with the requirements of this Ordinance. Remodel applications for the repair of *flood* damage are routed to the FMO for a *development permit* regardless of the estimated cost of repair.

- (b) A development permit will expire if development has not commenced within 18 months of issuance, and upon completion of the project for which it is granted, or after five years has elapsed from the date of permit issuance, whichever occurs first.

Sec. 19-17. Development permit application.

- (a) An applicant for a development permit shall submit a development permit application on forms furnished by the city engineer for that permit along with plans in duplicate, drawn to scale, showing:

The two sets of all plans, drawn to scale, must be signed and sealed by a professional engineer and/or architect, as appropriate, licensed to practice in the state of Texas. The city engineer may waive the requirement for signed and sealed plans for minor projects if all other *permit* requirements are satisfied.

For remodeling projects that are not *substantial improvements* and that are internal to an existing *structure* (i.e., do not involve an *addition*), and are non-structural in nature, the FMO will not require submittals of plans showing elevations, as set forth in Section 19-17 (a).

- (1) The existing topography and the location, dimensions, and elevation of any proposed alterations;

Proposed topography must be clearly distinguishable from the existing topography. The plan set must include at least one topographic drawing characterizing the existing and proposed ground surface elevations across the site. Merely submitting *highest adjacent grade* (HAG) and lowest adjacent grade (LAG) elevation data from the FEMA-approved EC will not be deemed sufficient to characterize the construction site. Landscape improvements not included in the construction plans are not covered by the *development permit* and must be applied for separately. Elevations must tie to a monument as identified on the effective *FIRM*.

- (2) Existing and proposed structures;

The plan set must include a site drawing of existing and proposed *structures*. All existing and proposed *structures* must be located on the site plan and dimensioned on plan and elevation sheets. In addition, existing and/or proposed fences, boundary walls, and retaining walls shall be identified by type and location. Elevations must tie to a monument as identified on the effective *FIRM*.

- (3) The location of the proposed alterations in relation to special flood hazard areas;

The drawings should show the location of the property in relation to the SFHA and should also reference the *FIRM* panel by number. Please see the discussion for Section 19-1 (d), “Flood Insurance Rate Maps.”]

- (4) Elevation in relation to mean sea level of the lowest floor of all proposed structures and substantial improvements;

The planned elevation in relation to *mean sea level* of the *lowest floor* of all proposed *structures* and substantially improved *structures* must be noted on plan and elevation views. Elevations must tie to a monument as identified on the effective *FIRM*.

- (5) Elevation in relation to mean sea level to which any structures will be or have been floodproofed;

If *floodproofing* is proposed for non-residential *new construction* or *substantial improvement* of non-residential existing *structures*, the planned elevation in relation to *mean sea level* to which such *structure* will be floodproofed must be noted on the plan and elevation views. Elevations must tie to a monument as identified on the effective *FIRM*.

- (6) If the site is adjacent to a watercourse or drainage channel, the definition of how that watercourse or drainage channel will be impacted;

If the proposed *development* site is adjacent to a *watercourse* or drainage channel, the plan set must include a discussion of the potential impacts of the proposed *development* on such *watercourse* or channel.

- (7) Base flood elevations from effective FIRM data for all structures and substantial improvements; except that, this information is not required for Zone A where base flood elevation data has not been provided and must be developed from federal, state, or other sources; and

Development sites greater than 15,000 square feet in area must include elevation contours set to a maximum increment of 1.0 foot. Topography at smaller sites may be displayed using spot elevations, but the number and distribution of data points must be sufficient to completely characterize the site. Elevations must tie to a monument as identified on the effective *FIRM*.

- (8) For all new construction, additions to existing structures, and substantial improvements, all base flood elevation lines and corresponding labels, as shown on the FIRM, that intersect the proposed development, as well as the nearest base flood elevation lines and corresponding labels both upstream and downstream of the site.

These features may be shown on a vicinity map that includes the site of the proposed *development*. The corresponding label shown on the *FIRM* and referenced above is the *BFE* number. If a *development* site is partially located in the SFHA, a site topographic map will establish the SFHA boundary. For large sites, a varying *BFE* may be appropriate if the *BFE* of the related channel varies along the extent of the site. Applicants are encouraged to contact the FMO to discuss *BFE* requirements prior to detailed project design. Where the site topographic map delineates the SFHA boundary, that portion of the site that lies outside of the SFHA will not be regulated under the Ordinance, except that areas of a site disconnected from the SFHA, but with elevations below the *BFE*, will be regulated under the Ordinance. Site-specific

SFHA boundaries are established from additional field survey data or from map data whenever adequate field survey data is unavailable. Elevations must tie to a monument as identified on the effective *FIRM*.

If a *development* site is partially located in the *floodway*, the site topographic map will include the *floodway* boundary, and that portion of the site that lies outside of the *floodway* will not be regulated under Section 19-43. *Floodway* boundaries must be established from published *FIRM* data.

Each sheet in the plans on which elevations are marked shall include the vertical datum and adjustment, consistent with the effective *FIRM*, along with the site benchmark used for vertical control; except that, if the plan elevations are not on the same vertical datum as the base flood elevations shown on the effective *FIRM*, each sheet in the plans on which elevations are marked shall also show tabulated vertical datum differences.

Development Permit Application. A *permit* for *development* in the SFHA is obtained from the City's FMO, located in the Code Enforcement Building at 3300 Main. The step-by-step application process is described as follows: [Reference Exhibit A for Residential and Commercial Development Flowchart.]

1. Applicant completes Building Permit Application (BPA) and receives a project number at the cashiers' area directly inside the main entrance off Francis Street.
2. Residential applicant may proceed to One Stop where plans will be routed to appropriate departments for review. One Stop personnel screen the location to determine if the project is in the SFHA. If all or any part of a project site is located in the SFHA, the application will be routed to the FMO.

Residential applicants may choose to walk plans through appropriate departments for approvals, including the FMO. In this event, the plans must be reviewed by One Stop prior to approval of the BPA to verify that all appropriate departments have reviewed and approved the plans. If the project site is located in the SFHA and has not been reviewed and approved by the FMO, the applicant will be directed to the FMO to obtain a *development permit*.

3. Non-residential applicants must route plans through Commercial Plan Review. Commercial Plan Review personnel screen the location to determine if the project is in the SFHA. If all or any part of a project site is located in the SFHA, the application will be routed to the FMO. Non-residential applicants are not allowed to walk plans through for the initial plan review process.
4. Applications are often rejected on initial review by the FMO and other departments if the proposed project does not comply with applicable building codes and regulations. In such cases, review comments are entered into the Integrated Land Management System (ILMS). A hard copy of the review comments is attached to routed plans after the review process by all relevant departments is completed.
5. If an application is rejected by the FMO at the initial review, any applicant for a *development permit* may schedule an appointment with FMO staff to discuss whether corrective action may be taken. Applicants are discouraged from visiting the office without an appointment, as the waiting time to see plan review staff may be quite lengthy. FMO plan review staff assigns priority to routed applications and plans that have come from Commercial Plan Review and to applicants who have made appointments.

6. Potential applicants for a *development permit* are encouraged to contact the FMO prior to initiating detailed project design to clarify floodplain regulations and required plan review documents. Contact the FMO at 713-535-7666 to schedule an appointment.

Required Documentation. The nature of the proposed *development* activity will determine the minimum required documentation to be submitted with the BPA.

Improvements. For improvements to be made to, and wholly contained within the footprint of, an existing *structure*, the *cost of improvement* and the *market value* of the *structure* must be provided in order to determine if such improvements are “substantial.” (See definitions in Section 19-2.)

The cost of the proposed improvements or repairs may be documented by a signed, sealed, and dated cost estimate provided by a professional engineer or architect, each licensed by the state of Texas. A cost estimate prepared, signed and dated by an insurance adjustor, licensed by the state of Texas, may be provided to document the cost of repairing a damaged *structure*. The city engineer may accept a notarized contract of work signed and dated by the property owner and a contractor, or other similar documentation deemed acceptable by the FMO. The cost estimate or contract should include detailed line items establishing the nature of the work to be performed. The NFIP Final Proof of Loss Statement provides adequate documentation of the actual cash value of repairs related to *flood* damage. In addition, the FEMA-approved Residential Substantial Damage Estimator (RSDE) software may be used to provide a cost estimate for repairing *flood*-damaged *structures*.

The city engineer may accept an owner-certified cost estimate when the property owner proposes to construct the improvements or repairs. In such cases, the cost estimate must itemize the cost of materials and a reasonable estimate of the *market value* of labor for work performed by the owner. The FMO has developed a form which may be used for owner self-certification of cost. Demolition and/or cleanup of damaged building components are not considered as part of the cost of repair. Replacement of contents is not considered part of the cost of repairing a *structure*.

The *market value* of a *structure* may be documented by the central appraisal district records for the county in which the *structure* is located; by the computed actual cash value calculated by the RSDE software; by an appraisal performed by a certified real estate appraiser licensed by the Texas Appraiser Licensing and Certification Board (TALCB); or, by another similar method acceptable to the city engineer. A person licensed or certified in another state may register with the TALCB, as described in §153.25 of Title 22 of the Texas Administrative Code, in order to provide appraisal services in accordance with the Ordinance. The NFIP Final Proof of Loss Statement provides acceptable documentation of the pre-event *market value* of *flood*-damaged *structures*. A *market value* established by means other than county central appraisal district records can be submitted to the appropriate appraisal district for review and concurrence prior to determining if a proposed improvement is *substantial*.

If a proposed improvement is *substantial* (cost is greater than or equal to 50% of *market value*), the applicant must provide a FEMA-approved *Elevation Certificate* documenting that the first floor elevation of the *structure* complies with the requirements of Section 19-33. If the *structure* cannot comply with Section 19-33, then a “Construction Plans” *Elevation Certificate* and building plans must be submitted indicating that the proposed improvements will include elevating or *floodproofing* the *structure* to at least the *minimum flood protection elevation*. Residential *structures* must be elevated. *Utilities* must also be protected to the *minimum flood protection elevation*.

If a proposed improvement is *non-substantial* (i.e., cost is less than 50% of *market value*), a *development permit* may be issued by the FMO if the application meets all other criteria. Elevation or *floodproofing* of

a non-complying *structure* (i.e., first floor lower than *minimum flood protection elevation*) is not required, but applicants are advised to undertake reasonable efforts to protect their property from potential damage due to flooding.

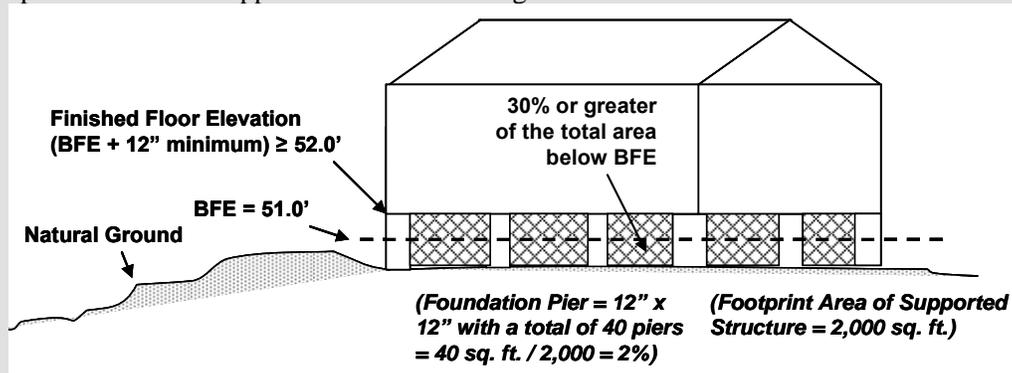
Additions. An *addition* to an existing *structure* must also comply with the requirements of Section 19-33. If the proposed *addition* represents a *substantial improvement* to the existing *structure*, then the existing *structure* must also be brought into compliance with Section 19-33. An application for a *development permit* must contain the same documentation as is required for *new construction*.

- (b) The applicant shall also provide a certificate of compliance with copies of all supporting permits, licenses and approvals, and a floodproofing certificate where floodproofing is or may be required by the applicable provisions of this chapter.
- (c) For areas that the city engineer has determined have no conveyance capacity, the applicant shall submit documentation that demonstrates that the development will not, at any time, diminish the storage volume of the special flood hazard area and:
 - (1) Identifies an amount of fill associated with pier and beam construction that, although the amount may be approaching zero, is recognized by the city engineer as sufficiently important to be addressed, but for which mitigation is not required, in accordance with rules and regulations promulgated by the director pursuant to subsection (f) of section 19-1 of this Code;; or
 - (2) Demonstrates that any loss of storage volume will be mitigated on-site, such that there is no net fill; or
 - (3) Demonstrates that any loss of storage volume will be mitigated off-site in accordance with rules and regulations promulgated by the director pursuant to subsection (f) of section 19-1 of this Code; or
 - (4) Demonstrates any combination of items (1) through (3) of this subsection.

Areas of no conveyance capacity; storage volume; mitigation. For *new construction* and *additions* to existing *structures* located in the SFHA, construction plans submitted with the *development permit* application must demonstrate that the proposed *development* will not diminish the storage volume of the SFHA.

1. The foundation is composed of pier and beam construction, and the cross-sectional area of the piers does not exceed 5% of the area of the footprint of the supported *structure*. To the extent that cross-sectional area exceeds this allowance, mitigation will be required for the volume calculated by the additional area multiplied by the height of the *BFE* above the average natural ground elevation beneath the supported *structure*. Further, there must be no restriction to the flow of floodwaters beneath the supported *structure*. This requirement may be satisfied by latticework, or similar material, surrounding the perimeter of the supported *structure* from ground level to the *BFE* or

higher. The open area from ground level to the *BFE* shall be 30% or greater of the total area defined by the perimeter of the supported *structure* from ground level to the *BFE*.



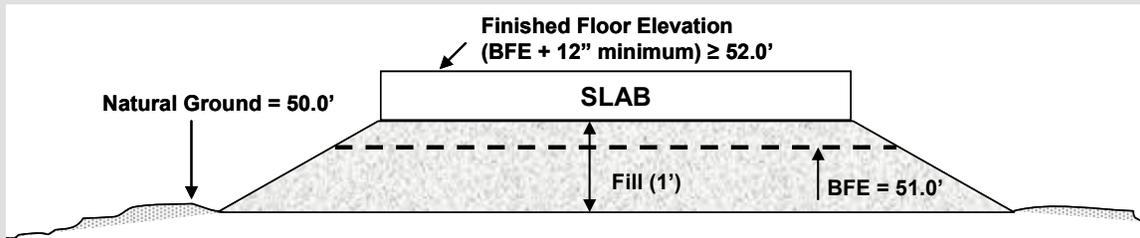
2. On-site mitigation is proposed to compensate for *fill* placed below the *BFE* in the SFHA. Detailed drawings of a proposed mitigation facility are required, and the applicant must meet all other requirements of the Ordinance.
 - a. No *fill* may be placed until excavated material has been removed from the SFHA.
 - b. Excavated volume that will be below the water surface of a permanent body of water is not mitigation.
 - c. In general, excavation within the SFHA and below the *BFE* is the only acceptable method of mitigation of *fill* placed below the *BFE* in the SFHA. However, the city engineer may approve excavated volume outside of the SFHA that is hydraulically connected to the SFHA if such a method meets all of the requirements for off-site mitigation, as listed in item 3 of this discussion, except that the phrase "mitigation outside-the-SFHA" is substituted for the term "off-site mitigation."
 - d. Property owners in the SFHA of the watershed cannot rely on excavation from channel improvement projects (such as those conducted by HCFCO or the U.S. Army Corps of Engineers) as mitigation. Property owners in the SFHA cannot have the *fill* from a channel improvement project placed on their property unless they provide mitigation that is independent of the channel improvement project (i.e., channel excavation will not serve as mitigation for the property owners), except under the following conditions:
 - 1) FEMA has issued a CLOMR finding that the area of the SFHA to be filled will be removed from the SFHA by excavation related to the channel improvement project; and
 - 2) The applicant has provided satisfactory documentation to the city engineer that work on the channel improvement project has progressed to a point where the proposed area of *fill* would not be inundated by the waters of the *base flood*.
 - e. The mitigation facility must be able to fill with water as the water surface in the SFHA rises and drain freely as the water in the SFHA subsides, unless the city engineer approves mechanical methods (e.g., pumps) to discharge water from the mitigation facility.
 - f. The mitigation facility site must be located within 1/4 mile of the area where the applicant proposes to place *fill* and within the same watershed. The city engineer may consider exceptions to this policy on a case-by-case basis if the *permit* applicant demonstrates that the proposed mitigation site is hydraulically equivalent to the area being filled.
 - g. The city engineer may approve subsurface mitigation facilities in situations where surface mitigation is not feasible. In such cases, the mitigation facility must be easily accessible for visual inspection.
 - h. Prior to completion of the project, and/or occupancy of a *structure*, the applicant must provide as-built surveys and engineering calculations that demonstrate that there has been no net addition of *fill* in the floodplain.

3. A plan for off-site mitigation must satisfy all of the requirements for on-site mitigation, in addition to the following requirements:
 - a. The city engineer must review and approve each application for an off-site mitigation facility.
 - b. A certification from the mitigation site owner must be submitted that states that the required mitigation volume is available for this project. This certification must indicate the specific allowable volumes.
 - c. Prior to introducing *fill* to the site, the applicant must provide an engineering certification that demonstrates that all excavation for off-site mitigation has been completed.
 - d. The owner of the off-site mitigation facility shall execute a legal covenant restricting the use of the land occupied by the facility. [Reference Exhibit B for a Notice of Floodplain Mitigation Facility Covenant template.]

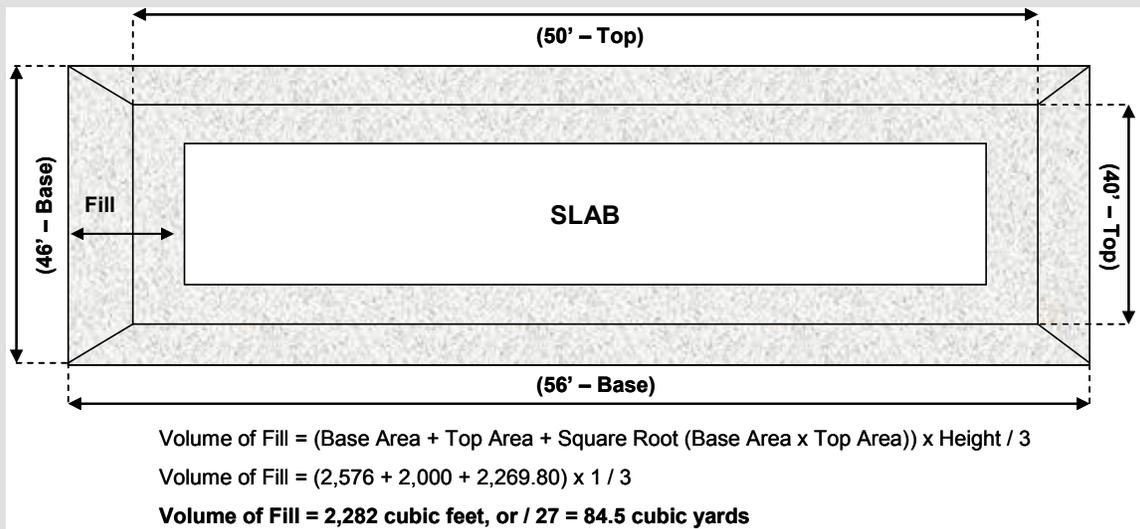
4. Submittals for 19-17 (c) (2) or (3); Mitigation. When requesting a *development permit* that proposes to place *fill* in the SFHA, the applicant must demonstrate mitigation of the *fill*, and include the drawings described below in the full plan set (submitted for other City of Houston *permit* applications). Drawings must be signed and sealed by a registered professional engineer licensed in the State of Texas. The applicant is encouraged to discuss these requirements with the FMO prior to applying for a *permit* and developing the mitigation plan.
 - a. All mitigation plan drawings must be clearly identified as such and be separate from other site drawings.
 - b. Drawings must be presented in plan and cross-section view to indicate existing conditions and proposed *development* in sufficient detail to characterize the potential impact on the floodplain. A vicinity map may be necessary if some required elements (e.g., *FIRM* cross-sections) are far from the proposed *development*; however, all mitigation must occur in the same watershed as the *development*.
 - c. Drawings must document the relevant survey bench marks and *FIRM* elevation reference marks used to construct elevations on the drawings. Datum conversion calculations must be presented.
 - d. Plan view drawing(s) must indicate:
 - 1) Pre-*development* ground and *structure* elevations
 - 2) Proposed ground and *structure* elevations
 - 3) *BFEs* at the location of all proposed *structures*
 - 4) *FIRM* SFHA/*floodway* boundaries
 - 5) *FIRM* cross-section location(s) and *BFEs*
 - 6) Shaded, cross-hatched, etc., to differentiate between areas proposed to be cut and those proposed to be filled
 - 7) Locations of cross-sections
 - 8) Hydraulic connection between floodplain and the mitigation area(s), including the flowline elevations of all hydraulic connections
 - e. Drawings must indicate:
 - 1) Sufficient representative cross-sections to define volumes proposed to be excavated and those proposed to be filled
 - 2) Existing and proposed ground and *structure* elevations
 - 3) *BFEs* at each cross-section
 - f. The drawings must include tabulated engineering calculations of cut and *fill* volumes (below *BFE*) associated with the cross-sections, or calculations of cut and *fill* volumes may be developed using programs such as AutoCAD (Autodesk's Land Development Desktop) or Microstation (Eagle Point). In such cases, tabulations of cross-sections are not required in the plan set. However, the software and methodology employed to develop the quantities must be identified in the mitigation plan. A contact phone number must be included with the note for further information, and a CD containing the relevant software files must be submitted with the plan.

- g. Plans for a mitigation facility must include a management plan consistent with the requirements of the Storm Water Quality Guidance Manual and the Select Minimum Design Criteria for Implementation of Best Management Practices for Storm Water Runoff Treatment, both 2001 editions, City of Houston.
- h. Any other pertinent information requested by the city engineer.

Example Mitigation Plan – Elevation View



Example Mitigation Plan – Plan View



5. Further requirements after a *development permit* is issued:
- a. The holder of the *development permit* cannot introduce *fill* to the site until an engineering certification is provided that indicates that all mitigation excavation has been completed or that *fill* is only placed as it is excavated (below the *BFE*) from the mitigation area.
 - b. Prior to completion of the project and/or occupancy of a *structure*, the holder of the *development permit* must provide as-built surveys and engineering calculations to demonstrate that there has been no net addition of *fill* in the SFHA. These drawings should follow the same requirements as the plan drawings discussed in item # 4.
 - c. The owner of the mitigation facility must provide the City with an annual certification of inspection signed by a registered professional engineer to confirm that the facility is functioning as approved in the *development permit*. For the purpose of this requirement, a mitigation facility is defined as a depressed area including an outfall drainage *structure*, similar in nature to a storm water detention facility.

d. Where mitigation has been accomplished by site grading, and where no mitigation facility as defined in c. above is present, the owner of the property will be required to certify annually on a city-provided form that the mitigation site is functioning properly, i.e., that no *fill* for landscaping or other purposes has been added to the mitigation area.

6. A mitigation plan may create a surplus of volume. This excess volume may be reserved and utilized for mitigating future onsite *development* that would result in *fill* being introduced below that *BFE*. When future *development* plans are submitted for permitting, the plan set must include the original mitigation plan drawings to substantiate that an excess of volume was created by that *development*. The “future” mitigation plan may utilize this excess volume according to the regulations in force at the time of application for the “future” *permit*. Potentially, a change in the *BFE* related to a “future” map revision could impact the amount of surplus volume available for future mitigation. Regardless, the FMO should be consulted regarding the availability of surplus mitigation volume prior to design of the “future” *development*.

7. Mitigation credit may be created when a *development permit* is sought to demolish an existing *structure* or *fill* is proposed to be removed. The activity may result in a net increase in floodplain storage volume.

The removal of concrete, asphalt, brick, stone, or other solid construction materials used for foundations, patios, driveways, or similar construction; and earthen materials used for elevation or in landscaping may be counted for mitigation credit. Building components, other than the foundation, such as walls, cabinetry, plumbing, and fixtures, may not be counted for mitigation credit. Only materials removed below the *BFE* may be counted as a credit toward the mitigation requirement. In no case will mitigation credit be created for removing natural features such as trees.

Plan and elevation drawings of existing *structures* must be included with the plan set such that the existing displacement volume of the *structures* may be calculated and compared with the displacement volume of the proposed *structures*. Details of the existing foundation(s) of the *structure(s)*, the relevant *BFE* (effective *FIRM*), and existing first floor elevation must be included. If the existing *structures* are floodproofed, this information should also be disclosed. Also, the details of any proposed changes to parking or landscaped areas should be shown and assessed to determine potential impacts to floodplain storage.

8. A location within the *floodway* may be used for mitigation of *fill* in the SFHA provided that the mitigation design meets all the requirements of Sections 19-17 and 19-43.

Mitigation banking. The use of surplus mitigation volume to compensate for the loss of floodplain storage volume due to *development* at a separate site (offsite) is termed “mitigation banking”. Surplus mitigation volume may not be used to compensate for offsite *development* mitigation without the written approval of the city engineer. A request for approval of mitigation banking should be submitted to the FMO. Each request will be evaluated independently based on the merits of the proposal and the potential benefits for the floodplain.

(d) For areas that the city engineer has determined to have conveyance capacity and for areas for which the city engineer has made no determination of conveyance capacity, the applicant shall submit an engineering analysis certified by a professional engineer licensed in the State of Texas that demonstrates that the development will not, at any time, either change the conveyance capacity or diminish storage volume of the special flood hazard area; except that, if the applicant submits a Conditional Letter of Map

Revision approved by the Federal Emergency Management Agency, the engineering analysis need only demonstrate that the development will not, at any time, diminish storage volume of the special flood hazard area.

Conveyance Policy. *Development* in portions of the SFHA that have *conveyance* capacity must meet permitting requirements above and beyond the requirements of Subsection 19-17 (c); however, all of the *fill* mitigation requirements of that subsection apply to areas of *conveyance* capacity as well.

The city engineer has defined areas within 100 feet of the boundary of the regulatory *floodway* and areas where the depth from the *BFE* to natural ground is 18 inches, or greater, to have *conveyance* capacity. The Office of the City Engineer is developing maps delineating areas of *conveyance* capacity to facilitate the permitting process; but ultimately, the *development permit* applicant is responsible for demonstrating that the proposed *development* location does not possess *conveyance* capacity to avoid having to satisfy the requirements of this subsection.

The proposed *development* must not change the existing *conveyance* capacity of the project site. *Conveyance* capacity of a site is understood to mean the ability of the site to convey water at the *BFE* from the upstream end to the downstream end of the site with a given total change in water surface elevation (total head loss). The level of analysis and documentation that must be provided to obtain a *development permit* will vary with the size and complexity of the proposed *development*. At a minimum, the analysis must include the following elements:

- Develop a site plan that includes existing topography and *structures* with *conveyance* flow paths and directions indicated across the site. *Conveyance* flow paths may not necessarily align with the centerline of the modeled stream. Show areas of ineffective flow on the site plan, extending offsite as necessary.
- On the existing conditions site plans, identify points of flow constriction for each flow path. Depending on the nature of the site, there may be only one flow path and one constriction point, or there may be several flow paths and constriction points.
- Establish cross-sections at constriction points. Depending on the nature of the site, a single cross-section may intersect more than one flow path and constriction point.
- For each cross-section, determine appropriate roughness (“n”) values, based on site-specific conditions. Choose the appropriate “n” value from the table that follows this discussion and document roughness selection with aerial and/or site photographs.
- For each cross-section, calculate the *conveyance* (K) for existing conditions; where $K = 1.49 AR^{2/3} / n$, and the depth of the cross-section is established from the *BFE*.
- Develop a site plan that includes proposed topography, *structures*, *conveyance* flow paths and directions in a manner similar to that employed for existing conditions. Show areas of ineffective flow on the proposed site plan, extending offsite as necessary.
- Identify proposed points of flow constriction and construct cross-sections for the proposed conditions. Identify site-specific proposed roughness values along the proposed cross-sections and document how these roughness values were determined. Calculate the *conveyance* for the proposed conditions.
- Cross-sections should not span the entire floodplain; rather, they should be limited to the site boundaries so that the calculations compare existing and proposed *conveyance* across the site. If the profile of the site varies significantly in width perpendicular to the direction of flow, portions of the site may need to be compared independently of each other with *conveyance* maintained in each of the areas. Similarly, if the existing and proposed conditions vary significantly, the cross-sections used for comparison may not be in the exact same location, but should be representative of the flow in that portion of the site.

- Compare the proposed *conveyance* capacity with the existing *conveyance* capacity. The proposed site must strive to maintain the existing level of *conveyance*.
- *Conveyance* calculations must be included in the documentation. These calculations may be performed using a model such as HEC-RAS, in which case model outputs showing *conveyance* must be provided at each cross-section and model inputs must be provided.
- A *conveyance* loss of no more than 0.5% of existing levels will be considered.
- For complex sites, or if the *conveyance* increases more than 0.5%, the applicant should review the analysis and proposed conditions with the floodplain office. A No Adverse Impact analysis as described in Section 19-43 of these Guidelines may also be required.

Type of Channel and Description	Normal
A. Natural Streams	
1. Main Channels	
a. Clean, straight, full, no rifts or deep pools	0.030
b. Same as above, but more stones and weeds	0.035
c. Clean, winding, some pools and shoals	0.040
d. Same as above, but some weeds and stones	0.045
e. Same as above, lower stages, more ineffective slopes and sections	0.048
f. Same as "d" but more stones	0.050
g. Sluggish reaches, weedy, deep pools	0.070
h. Very weedy reaches, deep pools, or floodways with heavy stands of timber and brush	0.100
2. Flood Plains	
a. Pasture no brush	
1. Short grass	0.030
2. High grass	0.035
b. Cultivated areas	
1. No crop	0.030
2. Mature row crops	0.035
3. Mature field crops	0.040
c. Brush	
1. Scattered brush, heavy weeds	0.050
2. Light brush and trees, in winter	0.050
3. Light brush and trees, in summer	0.060
4. Medium to dense brush, in winter	0.070
5. Medium to dense brush, in summer	0.100
d. Trees	
1. Cleared land with tree stumps, no sprouts	0.040
2. Same as above, but heavy sprouts	0.060
3. Heavy stand of timber, few down trees, little undergrowth, flow below branches	0.100
4. Same as above, but with flow into branches	0.120
5. Dense willows, summer, straight	0.150
3. Mountain Streams, no vegetation in channel, banks usually steep, with trees and brush on banks submerged	
a. Bottom: gravels, cobbles, and few boulders	0.040
b. Bottom: cobbles with large boulders	0.050

B. Lined or Built-Up Channels		
1. Concrete		
a. Trowel finish		0.013
b. Float finish		0.015
c. Finished, with gravel bottom		0.017
d. Unfinished		0.017
e. Gunite, good section		0.017
f. Gunite, wavy section		0.022
g. On good excavated rock		0.020
h. On irregular excavated rock		0.027
2. Concrete bottom float finished with sides of:		
a. Dressed stone in mortar		0.017
b. Random stone in mortar		0.020
c. Cement rubble masonry, plastered		0.020
d. Cement rubble masonry		0.025
e. Dry rubble or riprap		0.030
3. Gravel bottom with sides of:		
a. Formed concrete		0.020
b. Random stone in mortar		0.023
c. Dry rubble or riprap		0.033
4. Brick		
a. Glazed		0.013
b. In cement mortar		0.015
5. Metal		
a. Smooth steel surfaces		0.012
b. Corrugated metal		0.025
6. Asphalt		
a. Smooth		0.013
b. Rough		0.016
7. Vegetal lining		
C. Excavated or Dredged Channels		
1. Earth, straight and uniform		
a. Clean, recently completed		0.018
b. Clean, after weathering		0.022
c. Gravel, uniform section, clean		0.025
d. With short grass, few weeds		0.027
2. Earth, winding and sluggish		
a. No vegetation		0.025
b. Grass, some weeds		0.030
c. Dense weeds or aquatic plants in deep channels		0.035
d. Earth bottom and rubble side		0.030
e. Stony bottom and weedy banks		0.035
f. Cobble bottom and clean sides		0.040
3. Dragline-excavated or dredged		
a. No vegetation		0.028
b. Light brush on banks		0.050
4. Rock cuts		
a. Smooth and uniform		0.035
b. Jagged and irregular		0.040
5. Channels not maintained, weeds and brushed		
a. Clean bottom, brush on sides		0.050
b. Same as above, highest stage of flow		0.070
c. Dense weeds, high as flow depth		0.080
d. Dense brush, high stage		0.100

- (e) The director shall, from time to time, prepare and submit for approval by motion of the city council a schedule of fees that shall be paid by an applicant for a development permit or a variance, as set forth in section 19-21 of this Code. Payment of any applicable fees when due is a condition of the processing of any application under this article.

The schedule for the *development permit* fees is based on the type and location of the proposed *development*, the size of the proposed *development*, and its ranking in terms of the effort and time required to process the *permit*. The following table breaks down the *development permit* categories and their corresponding fees.

PROJECT TYPE	PERMIT CLASS				
	Non-conveyance		Conveyance **	Floodway	Fee
	w/ Mitigation*	w/o Mitigation			
Single Family Residential					
Non-Sustantial/No Addition	N/A	1	1	N/A	\$ 100
New	2	2	2	N/A	\$ 300
Substantial Improvement/Addition	2	2	2	N/A	\$ 300
Residential Re-plat	2	2	2	N/A	\$ 300
Floodway/Existing Structure - Section 19-43(b)	N/A	N/A	N/A	3	\$ 600
Floodway/Vacant Land - Section 19-43(c)	N/A	N/A	N/A	3	\$ 600
Floodway (Transfer of Title Inspection)	N/A	N/A	N/A	1	\$ 100
Commercial/Multi-Family Residential					
Non-Sustantial/No Addition	N/A	2	2	N/A	\$ 300
Grading and Fill Sitework < 1 acre	4	N/A	5	N/A	\$1,225; \$1,635
Grading and Fill Sitework ≥ 1 acre	5	N/A	6	N/A	\$1,635; \$2,045
Substantial Improvement/Addition < 1 acre	4	4	6	N/A	\$1,225; \$2,045
Substantial Improvement/Addition ≥ 1 acre	5	5	7	N/A	\$1,635; \$2,450
Redevelopment < 1 acre	5	5	7	N/A	\$1,635; \$2,450
Redevelopment ≥ 1 acre	6	6	7	N/A	\$2,045; \$2,450
New < 1acre	5	5	7	N/A	\$1,635; \$2,450
New ≥ 1 acre	5	5	7	N/A	\$2,045; \$2,450
Floodway/Existing Structure - Section 19-43(b)	N/A	N/A	N/A	7	\$ 2,450
Floodway/Vacant Land - Section 19-43(c)	N/A	N/A	N/A	7	\$ 2,450
Floodway (Transfer of Title Inspection)	N/A	N/A	N/A	1	\$ 100
NOTES					
* Mitigation refers to the compensation of the loss of floodplain storage volume (requires cut and fill calculations)					
** Conveyance refers to that part of the floodplain that is not in the floodway and where velocity is greater than 1 fps					

- (f) In addition to other responsibilities under this Code or the Construction Code, the city engineer shall review each permit application to verify compliance with the provisions of this chapter.

Sec. 19-18. Additional requirements for permit applications.

At the discretion of the city engineer, an applicant may be required to submit any or all of the following:

- (1) Plans with the "official coordinate system" of the city as defined in section 33-81 of this Code as their horizontal datum. Where required, each sheet shall be marked with horizontal datum information and with the combined scale factor required to convert from surface coordinates to grid coordinates;
- (2) Datum differences between the vertical datum and adjustment of elevations used on the sheet and any other vertical datum(s) and adjustment(s) typically used in the watershed tabulated on each sheet in the plans on which elevations are marked, or separate survey(s) based on said additional vertical datum(s) and adjustment(s);
- (3) A survey of property ownership of the site, which is signed and sealed by public surveyor licensed in the State of Texas;
- (4) An interim drainage plan for the site during the activity;
- (5) An indication of the source of fill material and the proposed disposal site, if applicable, and the expected duration of the activity;
- (6) An engineering analysis signed and sealed by a registered professional engineer licensed in the State of Texas as required by the city engineer; and
- (7) Any other relevant documentation requested by the city engineer.

Sec. 19-19. Review.

- (a) The city engineer shall review permit applications and the plans submitted in accordance with sections 19-17 and 19-18 of this Code and shall either approve or deny the issuance of the permit. Approval or denial of a permit by the city engineer shall be based on compliance with the applicable provisions of this chapter. In addition to employing the standards contained in article III of this chapter, the city engineer may deny a permit application if the issuance of the permit could result in:
 - (1) Danger to life or property due to flooding or erosion damage in the vicinity of the site;

- (2) Susceptibility of the development and the contents of any structure to flood damage and the effect of such damage on the individual owner;
 - (3) Danger that materials may be swept onto other lands to the injury of others;
 - (4) Impairment of the access to and exit from the site in times of flood for ordinary and emergency vehicles; or
 - (5) Unusually high costs of providing governmental services during and after flood conditions, including maintenance and repair of streets, bridges, public utilities and facilities such as sewer, gas, electrical and water systems.
- (b) In connection with this determination, the city engineer shall consider the following factors:
- (1) Unusual circumstances affecting the expected height, velocity, duration, rate of rise and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site in the presence of floodwaters;
 - (2) The necessity of a waterfront location for the structure, where applicable; and
 - (3) The lack of alternative locations not subject to flooding or erosion damage for the proposed use.
- (c) A permittee shall submit an elevation certificate to the city engineer before the framing of a structure has started. Failure to do so may result in the revocation of a permit issued hereunder.

The City requires an original EC (City of Houston approved format), signed and sealed by a licensed surveyor or professional engineer to be submitted to the FMO at three times during the course of a *development* project:

- 1. When plans are submitted for the permitting process;
- 2. Prior to framing the *structure*; and
- 3. Prior to receiving the final inspection (photographs required on final EC).

- (d) The city engineer may enter any structure or premises to perform any duties or responsibilities imposed by this chapter.

The City will perform the following tasks:

- 1. Investigate reported violations and enforce the elements of the ordinance as described in Sections 19-91 and 19-92;
- 2. Inspect *development* sites before, during, and after construction to ensure that the project is completed according to the terms of the *development permit*; and
- 3. Inspect mitigation facilities periodically to ensure that the facility is properly maintained to perform the function for which it was permitted.

Sec. 19-20. Variance procedure.

- (a) Any applicant for a permit may apply for a variance from the requirements of this chapter. Except as may be otherwise provided in subsection 19-22(f), a variance may be sought only on the basis that the imposition of the requirements of this chapter for the issuance of a permit to the applicant constitutes an exceptional hardship.
- (b) An applicant may file a request for variance at any time. However, no variance may be granted for development on vacant land in a floodway, and no variance may be granted after an applicant has complied with the provisions of this chapter and a permit has been issued. An applicant shall file the application for a variance on a written form to be supplied by the city engineer, and shall specify in connection therewith:

Construction of new structures on previously vacant land in the floodway must comply with the requirements of Section 19-43(d). The city engineer will not grant variances to those requirements. For the purpose of determining whether the city engineer may grant a variance, vacant land in the floodway is real estate on which no residential or commercial structure exists at the time an application for a development is submitted. Refer to section 19-22(f) for further discussion of *variance*.

- (1) The particular requirement from which a variance is sought;
 - (2) The nature of the hardship presented by the imposition of the requirements;
 - (3) The proposed alternative method or procedure to be utilized in lieu of the required method, practice or procedure that is proposed;
 - (4) The effect of the proposed construction on flood levels within the city;
 - (5) The estimated cost in dollars of complying with the requirement;
 - (6) The estimated cost in dollars of construction by the proposed alternative method of procedure;
 - (7) The size, in acres, of the land area or the number of lots involved in the permit application; and
 - (8) The existence of lots contiguous to or surrounding the land area which are located below the base flood level.
- (c) In addition, the applicant shall file a verified acknowledgment that:
- (1) The granting of a variance for construction below the flood level will result in increased flood insurance rates commensurate with the increased risk resulting from the reduced lowest floor elevation; and,
 - (2) Construction below the base flood level increases risks to life and property to the

applicant and the residents of this city and the surrounding area.

Sec. 19-21. Restriction on applicants; fee for application.

A variance application may be filed by the owner of the property or the attorney-in-fact for the owner of such property. Such application shall be submitted as a verified statement. A fee as provided in subsection 19-17(e) of this Code shall accompany each variance application.

Sec. 19-22. Review by the board of variance application; determination by city engineer.

- (a) The city engineer shall receive, and transmit to the general appeals board, all applications for variances, except for those applications specified in subsection 19-22(f). Except for those applications specified in subsection 19-22(f), the board shall be the body that determines whether a variance is to be granted. The board may consider the granting of a variance under the following circumstances:

The city engineer will review the application for *variance* and forward the application under cover letter to the *general appeals board*. Based on the merits of the application, the city engineer will select one of the following options when forwarding the application to the *general appeals board*:

1. Recommend approval of the application,
2. Recommend denial of the application, or
3. Offer no recommendations on the issue.

- (1) The application is for the reconstruction, rehabilitation, or restoration of an historic structure and the reconstruction, rehabilitation, or restoration of the structure will not preclude the structure's continued designation as an historic structure.
- (2) The application is for improvement of an existing structure that is required to correct an existing violation of a state or local health, sanitary or safety code specification that has been identified by the neighborhood protection official and that is the minimum necessary to ensure safe living conditions.
- (3) The application is for a development for which the city engineer finds that the granting of the variance is consistent with the procedures and standards established for the granting of variances. As the lot size increases, the burden on the applicant to provide a technical justification in favor of a variance under the facts of the case shall increase.
- (4) The application is for an addition, new construction of, or substantial improvements to, a structure necessary for the conduct of a functionally dependent use provided that:
 - a. The applicable requirements of sections 19-20, 19-21 and 19-22 are met;
 - b. The structure will be protected by methods designed to minimize flood damage during the base flood; and

- c. The structure will create no additional threats to public safety.
- (5) The variance is in effect an appeal from the application of a special flood hazard area or base flood elevation determination or both being administered on the basis of supplemental data pursuant to section 19-4 of this Code and the applicant demonstrates, with the concurrence of the agency then responsible for the study data, that the determination is scientifically or technically incorrect. The variance shall be limited to approval, with or without conditions, or denial of the permit, plat or other approval that was denied and shall not constitute a change in the study data.

The board shall deny variances to disaggregated lots of proposed larger developments or subdivisions or structures when that larger development has been the subject of or included within a permit application that has been previously disapproved by the city engineer.

- (b) In addition, in order to grant a variance, the board must affirmatively find that:
 - (1) The imposition of the requirements of this chapter constitutes an exceptional hardship on the applicant;
 - (2) No feasible method or procedure is currently available to comply with the requirement; and
 - (3) The imposition of the requirements of this chapter to the particular circumstances would be unjustified in light of a good and sufficient cause which can be demonstrated to the board.
- (c) In granting a variance, the board must find that the variance, if allowed, will not have the effect of:
 - (1) Increasing flood level height due to impedance of the stream of channel flow;
 - (2) Introducing or increasing any threat to public safety;
 - (3) Creating a nuisance which unreasonably interferes with the use of adjacent property;
 - (4) Causing a fraud to be worked upon the public or any individual member of the public;
 - (5) Causing extraordinary public expense for any reason; and;
 - (6) Creating conflict with the codes and ordinances of the city, or with any provisions of a state or federal regulation other than the applicable requirements of this

chapter.

- (d) The board, in granting a variance, shall grant only the minimum variance necessary to afford relief from the complained of hardship.
- (e) A notice of variance shall be addressed to the applicant, and shall be signed by the chairman of the board or in his absence, the vice-chairman, and shall state:
 - (1) The issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance commensurate with the increased risk resulting from the reduced lowest floor elevation; and,
 - (2) The construction under a variance of any structure below the base flood level may increase risks to life and property to the applicant and the residents of this city and the surrounding area.

Upon receipt of the notice of variance, the applicant shall file a copy of that notice in the permanent deed records of the county or counties in which the property is located. Upon the receipt of a copy of the notice of variance certified by the county clerk of the county in which the property is located, the city engineer shall issue a permit complying with all provisions of this chapter with the exception of the variance granted.

- (f) The city engineer shall grant a variance for reconstruction of a structure damaged by fire, hail, wind or other event that is not flooding, if the applicant proposes to reconstruct on an existing foundation that is currently below the minimum flood protection elevation, and the reconstruction will not increase the footprint of the foundation.

The city engineer will review the application for reconstruction to verify that the proposed structure will utilize the existing foundation structure (with no footprint increases). If the elevation of the foundation structure is not in compliance with the requirements of Chapter 19, a notice of variance shall be addressed to the applicant, signed by the City Engineer, and shall state:

(1) The issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance commensurate with the increased risk resulting from the reduced lowest floor elevation; and,

(2) The construction of any structure below the base flood level may increase risks to life and property, which may affect not only the applicant but also the residents of this city and the surrounding area.

Upon receipt of the notice of variance, the applicant shall file a copy of that notice in the permanent deed records of the county or counties in which the property is located and provide evidence of such recordation to the Floodplain Management Office.

- (g) The city engineer shall maintain a permanent public record of all notices of variance and the variances granted. The written justification for the granting of each variance shall be included in such records.

- (h) The denial of a variance by the board shall be final and is not subject to reconsideration.

Sec. 19-23. Revocation of permits.

- (a) In addition to the remedies provided in section 19-91 of this Code, whenever the city engineer finds that there are grounds for revocation of a permit, he shall give written notice to the permittee by personal service or by certified mail, return receipt requested, addressed to the applicant at the address set forth in the permit application. That notice shall set forth:
 - (1) The specific grounds upon which the permit in question may be revoked;
 - (2) The fact that there will be a hearing before the board in which the city will seek the revocation of the permit;
 - (3) The date, time and place of such hearing; and
 - (4) The fact that the permittee may appear in person or be represented by an attorney.
- (b) All hearings shall be held by the board. The chair of the board or, in the chair's absence, the vice-chair of the board, shall serve as the hearing officer for all hearings held hereunder, moderating the discussion and ensuring the rules of this section are observed. However, no person shall perform the duties of hearing officer under this section if the person has participated in the investigation or has prior knowledge of the allegations or circumstances discovered in the course of said investigation except as may be set forth in the notice given pursuant to this section.
- (c) All hearings shall be conducted under rules consistent with the nature of the proceedings; provided, however, that the following rules shall apply to such hearings:
 - (1) All parties shall have the right to representation by a licensed attorney, though an attorney is not required.
 - (2) Each party may present witnesses in his own behalf.
 - (3) Each party has the right to cross-examine all witnesses.
 - (4) Only evidence presented before the board at such hearing may be considered in rendering the final order.
- (d) If the permittee fails to appear at the hearing at the date and time specified, the city engineer shall establish a case on behalf of the city that presents sufficient evidence, that unless it were otherwise rebutted, shows that grounds exist for revocation of the permit in question.

- (e) After completion of the presentation of evidence by all parties appearing, the board shall make written findings and render a written order as to whether or not there are grounds for revocation of the permit. If there are such grounds, the board shall revoke the permit; provided, the board may, in the interest of justice, take such other lesser actions as the board may deem appropriate including, but not limited to, the temporary suspension of the permit, the revision of the permit, or the addition of permit conditions. A true and accurate copy of the board's order shall be personally delivered or mailed by certified mail, return receipt requested, to the permittee.
- (f) In the event a permit is revoked, suspended, or revised hereunder by the board, the city shall not be liable to any person for any refund of any part of the any permit fees.
- (g) The denial of a permit or the revocation, suspension, or revision of a permit may be appealed to the city council upon the filing of a written application therefor with the city secretary within ten days after the board's written order is rendered. Although referred to as an appeal, the hearing before city council will be held in the same manner as the matter was heard by the board. Such an appeal of a revocation, suspension, or revision of a permit shall not operate to suspend the board's order thereupon.

Secs. 19-24--19-30. Reserved.

ARTICLE III.

STANDARDS FOR FLOOD HAZARD REDUCTION

DIVISION 1.

GENERALLY

Sec. 19-31. General construction of structures.

All structures, including modular homes, shall be constructed, regardless of location within the city, so as to be reasonably safe from flooding. For those structures located within a special flood hazard area, the provisions of the Construction Code and division 2 of this article shall apply. For those structures to be constructed in a watercourse or floodway, the provisions of the Construction Code and divisions 2 and 3 of this article shall apply. For those structures located within a coastal high hazard area, the provisions of the Construction Code and divisions 2 and 4 of this article shall apply.

DIVISION 2.

STANDARDS IN SPECIAL FLOOD HAZARD AREAS

Sec. 19-32. General standards.

All new construction and improvement of any existing structure in special flood hazard areas shall be performed so as to keep the structure reasonably safe from flooding and in accordance with the following standards:

- (1) All improvements shall be designed or so modified so as to be adequately anchored to prevent flotation, collapse, or lateral movement of the structure in the presence of floodwaters;
- (2) All improvements shall be constructed by methods and practices so as to minimize flood damage;
- (3) All improvements shall be constructed with materials and equipment resistant to flood damage;
- (4) All electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities shall be designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding;
- (5) All water supply systems shall be designed to prevent or eliminate infiltration of floodwaters into the system;
- (6) All sanitary sewer systems shall be designed to prevent or eliminate infiltration of floodwaters into the structure's systems and discharge of sewage into floodwaters;
- (7) All on-site disposal systems, including but not limited to sewage treatment plants and septic tank systems located on the site of the structure, shall be located so as to prevent impairment of the function of those systems in the presence of floodwaters and to prevent contamination of floodwaters from those systems during flooding; and
- (8) Fully enclosed areas below the lowest floor that are used solely for parking, building access or storage in an area other than a basement and 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 architect or professional engineer licensed in the State of Texas or meet or exceed the following minimum criterion: have 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, with the top of all such openings no higher than one foot above grade or BFE, whichever is lower. Openings may be equipped with screens, louvers, valves, or other coverings or devices, provided that they permit the automatic entry and exit of floodwaters.

Construction below BFE. Fully enclosed spaces below the *BFE* must be designed to automatically equalize hydrostatic *flood* forces on exterior walls by allowing for the entry and exit of floodwaters (FEMA has published guidance material covering this subject in Technical Bulletin 1-93 (FIA-TB-1, 4/93), "Openings in Foundation Walls for Buildings Located in Special Flood Hazard Areas.") This requirement may be accomplished by meeting the criteria for non-engineered-certified design or by obtaining professional certification of the design. These two options are discussed later in this section.

Attached garages with floor slabs below *BFE* are considered to be enclosed areas, and openings are required in the exterior walls and/or the garage doors. All openings must be specifically designed to allow for the free flow of floodwaters.

Buildings elevated on solid wall foundations must meet certain requirements if the enclosed space is not to be considered a *basement*. *Fill* placed around the exterior of the foundation wall must be graded so that the grade inside the enclosed area is equal to or higher than the adjacent grade outside the building on at least one side of the *structure*. **If the grade inside the foundation walls is above BFE, openings are not required.**

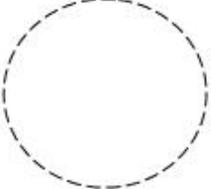
Non-residential buildings that are floodproofed to meet the requirements of Section 19-33 are not considered to be enclosed spaces subject to regulation under Section 19-32 (8).

Criteria for non-engineer certified design:

1. Openings should be placed on at least two exterior walls of each enclosed space, if feasible.
2. If a *structure* has more than one enclosed space, each space must have openings on exterior walls to allow floodwater to enter directly.
3. For each enclosed space, the total area of all openings must be at least one square inch per square foot of enclosed space.
4. The bottom of each opening can be no higher than one foot above the adjacent exterior grade.
5. Any louvers, screens, or other opening covers must not block or impede the automatic flow of floodwaters into and out of the enclosed space.
6. All enclosed spaces must be constructed with accessible entry to *permit* annual inspection and maintenance.

Professionally-certified design:

Professional design certification must include the name, title, address, signature, date of signature, type of license, license number, and professional seal of the certifier. The FMO will furnish an example of a certification statement upon request. The design certification should appear on the plan sheet that illustrates the design of the enclosed space.

Project Name _____		 <p style="text-align: center;">PROFESSIONAL SEAL</p>
I, _____ do hereby certify that the opening(s) designed for installation in the aforementioned building will allow for the automatic equalizing of hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwater during floods up to and including the base (100-year) flood.		
Signature _____	Date _____	
Title _____		
Type of License _____	License Number _____	
Address _____		

Drainage in Enclosed Spaces. Regardless of the method selected for equalizing hydrostatic forces imposed by floodwaters on exterior walls, floodwaters entering the enclosed space must be free to exit the space as *flood* levels subside and must provide for surface water equalization within 30 minutes. A number of mechanisms to evacuate floodwater from enclosed spaces include natural drainage through porous, well-drained soils; drainage systems such as perforated pipes; drainage tiles; gravel or crushed stone drainage by gravity; and mechanical means (e.g., pumps). The drainage system may be designed and certified by a registered professional engineer, licensed in the state of Texas. If not certified, a drainage system must:

1. Allow floodwaters to enter and exit the enclosed area by gravity flow; and
2. Have a number and size of openings sufficient to provide not greater than 0.1 foot of head loss.

Calculations must be provided with the plan set demonstrating that the proposed drainage system will meet these requirements.

Mitigation Requirements for Enclosed Spaces. The floodplain storage volume displaced by *fill*, including earthen materials and structural components, placed below the *BFE* must be mitigated according to the requirements described in the Guidelines for Section 19-17 (c).

Documentation Requirements. The locations, dimensions, elevations, and details of all system components referenced in the preceding discussion must be included in the plan set submitted with the *permit* application.

Sec. 19-33. Base flood elevation requirements in special flood hazard areas.

- (a) The following additional requirements shall apply in Zones A1-30, AE, AH, A and A99:
 - (1) All additions to, and new construction and substantial improvement of, any residential structures within the special flood hazard areas shall have the lowest floor and all utilities elevated to at least the minimum flood protection elevation. If the flood elevation of a garage attached to an addition is lower than the minimum flood protection elevation, the garage must meet the requirements of item (8) of section 19-32 of this Code.

- (2) All additions to, and new construction and substantial improvement of, nonresidential structures:
 - a. Shall be elevated to at least the minimum flood protection elevation measured to the lowest floor; or
 - b. Shall, along with sanitary sewerage facilities, be floodproofed to the minimum flood protection elevation.

Information on *floodproofing* may be obtained from the FEMA guidance manual titled “Floodproofing Non-Residential Structures” (FEMA 102), May 1986, or in the FEMA Technical Bulletin 3-93 (FIA-TB-3, 4/93), “Non-Residential Floodproofing – Requirements and Certification”.

The *minimum flood protection elevation* is equal to the *BFE* plus 12 inches. [Refer to Section 19-2, Definitions, for further guidance.]

- (b) The following additional requirements shall apply in Zone AO:
 - (1) All additions to, and new construction and substantial improvement of, any residential structure within Zone AO shall have the lowest floor and all utilities elevated above the highest adjacent grade to at least 12 inches above the depth number in feet specified on the FIRM for the site or at least three feet above the highest adjacent grade if no depth number is specified. If the floor elevation of a garage attached to an addition is lower than the minimum flood protection elevation, the garage must meet the requirements of item (8) of section 19-32 of this Code.
 - (2) All additions to, and new construction and substantial improvement of, any nonresidential structure within Zone AO shall have the lowest floor elevated above the highest adjacent grade at least 12 inches above the depth number specified in feet on the FIRM or at least three feet above the highest adjacent grade where no depth number is specified or, together with utility and sanitary sewerage facilities, be completely floodproofed to or above that level.

The *minimum flood protection elevation* is equal to the *BFE* plus 12 inches. [Refer to Section 19-2, Definitions, for further guidance.]

- (c) All structures to be constructed in whole or in part within these zones shall be designed with adequate drainage paths around structures on slopes to guide floodwaters around and away from those structures.
- (d) For critical facilities located in an area that is subject to a 0.2 percent or greater chance of flooding in any given year (shaded Zone X), all additions, new construction, and substantial improvements shall have the lowest floor elevated or floodproofed to at least 12 inches above the elevation that is subject to a 0.2

percent or greater chance of flooding.

Critical facilities that are located on the second story or higher of a multi-story *structure* where the first floor elevation is at or above grade are assumed to be compliant with this elevation requirement if the *structure* is located in shaded Zone X. An applicant for a building *permit* for a *critical facility* that meets this condition will not be required to obtain a *development permit* from the FMO.

Sec. 19-34. Reserved.

Secs. 19-35--19-40. Reserved.

DIVISION 3.

DEVELOPMENT IN A WATERCOURSE AND FLOODWAY

Sec. 19-41. Generally.

In addition to complying with the standards set out in division 2 of this article, development in a watercourse or a floodway shall comply with the provisions of this division.

Sec. 19-42. Watercourses.

The alteration or relocation of any watercourse maintained by a county or a county agency shall not be permitted unless the county engineer who is responsible for flood control in the county in which the property is located certifies in writing to the city engineer that the flood-carrying capacity of the watercourse will be the same as or greater than the flood-carrying capacity that existed prior to the proposed development.

Sec. 19-43. Floodways.

When requesting a permit for development in the floodway, the applicant must submit a letter addressed to the city engineer specifying which subsection of Section 19-43, (a), (b), (c), (d), or (e) applies to the proposed development. The letter must be accompanied by documentation demonstrating fulfillment of the requirements of the specified subsection. If a No Adverse Impact Certification is required (see the discussion following Section 19-43 (f)), it must also be enclosed with the submittal letter

- (a) Except as may be otherwise provided in this chapter, no permit shall hereafter be issued for a development to be located in any floodway, or any special flood hazard area for which a floodway has not been designated, if that development provides for:
 - (1) Encroachment by the deposition of fill, or other similar construction, within the floodway, or the special flood hazard area if no floodway has been designated; or
 - (2) New construction, additions to existing structures, or substantial improvement of any structure within the floodway, or the special flood hazard area if no floodway has been designated.

The general restriction stated herein shall not apply to a repair or renovation that is not a substantial improvement.

Restriction on Development in the Floodway. Despite the general risks associated with *development* in the *floodway*, a *development permit* may be issued if performance standards are met. Refer to Section 19-2 and Section 19-17(a) for the definition of *fill*. The applicant is also encouraged to discuss the provisions of this section with the FMO and the city engineer at an early stage of the project.

The *floodway* is a *conveyance zone* and proposed *development* within the *floodway* must comply with the requirements of Section 19-17 (d).

If the site of a proposed *development* is partially located within the *floodway*, the requirements of this section apply only to that portion of the site located within the *floodway*. A site plan submitted to secure a *development permit* must clearly delineate the *floodway* boundary.

Pursuant to Section 19-12 (7), the city engineer will utilize a study defining a *floodway* in areas where a *floodway* and *BFEs* have not been defined (e.g., Zone A). If a *development permit* applicant can meet the requirements of Section 19-43 without delineating the *floodway* boundary, then no study is required. Otherwise, the *development permit* applicant must develop the study in accordance with the following options:

1. The permit applicant will submit a Form MT-2 to the FMO along with all other documents necessary for *development permit* issuance, including supporting materials that would be required to request a CLOMR from FEMA. The *permit* applicant should refer to Section 19-1 (d), FEMA Forms, for details on FEMA Form MT-2. The MT-2 and supporting documentation will be reviewed by the FMO and HCFCFCD. A *development permit* will be issued to the applicant if the FMO and HCFCFCD approve of the MT-2 documentation and if all other *permit* requirements have been satisfied. The FMO will monitor construction to assure that the work performed is consistent with that described in the MT-2 and other documentation provided to secure the *development permit*. The *permit* applicant is encouraged, but not required, to submit a Form MT-2 to request a LOMR from FEMA following completion of construction.
2. If the proposed *development* consists of a single family residence (one dwelling) to be constructed on a tract of 15,000 square feet in area or less and no channel improvements are included within the scope of the project, the *permit* applicant will submit a *conveyance* analysis consistent with the requirements of Section 19-17 (d) to the city engineer for review and approval. The *conveyance* analysis will be submitted with a cover letter addressed to the city engineer and will contain an approval line for signature by the city engineer.

A non-*substantial improvement* to an existing *structure* or a non-structural *development* that does not result in an encroachment within the *floodway* may be permitted. The city engineer will determine whether the proposed *development* would encroach on the *floodway*. For non-structural *development* not to be considered an encroachment, the applicant must demonstrate that the *conveyance* capacity of the *floodway* will not be diminished, no net *fill* will be introduced to the site within the *floodway* boundaries, and the off-site sheet flow of adjacent properties will not be affected.

If a proposed improvement is non-*substantial*, the application should include documentation demonstrating the non-*substantial* nature of the improvement.

(b) For those facilities necessary to protect the health, safety and welfare of the general public, the city engineer may issue a permit for development of a site or the new construction, addition to an existing structure, or substantial improvement of a structure within the floodway, or any special flood hazard area for which a floodway has not been designated, if a professional engineer licensed in the State of Texas submits supporting documentation or an engineering analysis acceptable to the city engineer and written certification to the effect that:

- (1) The cumulative effect of the proposed development when combined with all other existing development, and if a floodway has not been designated, all anticipated development, will not have an adverse effect on flood levels at any point within the city during occurrence of the base flood;
- (2) The construction will not impede the flow of floodwaters; and
- (3) The construction will not result in an adverse effect on the conveyance capacity during the occurrence of the base flood.

The city engineer may issue a permit for the facilities so long as the development will be in compliance with elevation, construction and analysis requirements of this ordinance. For this reason, a potential applicant is urged to present the proposed project to the city engineer prior to detailed design to establish if the project will qualify. Proposed improvements that are substantial improvements will require the entire structure to be brought into compliance with elevation, construction and analysis requirements of this ordinance. Structures permitted under this section will have their lowest horizontal members at least 18 inches above the BFE (as is required for bridges). The foundation must be composed of pier and beam construction, and the cross-sectional area of those piers can not exceed 5% of the area of the footprint of the supported structure. A No Adverse Impact Certification, described following Section 19-43 (f), must also be submitted with the permit application.

(c) The city engineer shall issue a permit for development for an addition to, or for the replacement or substantial improvement of, a structure in a floodway, or any special flood hazard area for which a floodway has not been designated, if the city engineer determines that:

- (1) The bottom of its lowest horizontal structural member will be elevated at least 18 inches above the base flood level;
- (2) The foundation system for the structure will be pier and beam construction; and
- (3) The applicant has paid all fees required by section 19-17(e) of this Code.

If the city engineer cannot so determine, then the city engineer shall deny the permit.

The city engineer shall issue a permit for the addition, replacement or substantial improvement of an existing floodway structure so long as the city engineer can determine that the development will be in compliance with elevation, construction and analysis requirements of this ordinance. For this reason, a potential applicant is urged to present the proposed project to the city engineer prior to detailed design to establish if the project will qualify. Proposed improvements that are substantial improvements will require the entire structure to be brought into compliance with elevation, construction and analysis requirements of this ordinance. Structures permitted under this section will have their lowest horizontal members at least 18 inches above the BFE (as is required for bridges). The foundation must be composed of pier and beam construction, and the cross-sectional area of those piers can not exceed 5% of the area of the footprint of the supported structure.

A No Adverse Impact Certification, described following Section 19-43 (f), must also be submitted with the permit application.

- (d) While the community acknowledges the increased risks associated with development on vacant land in the floodway, the city engineer shall issue a permit for such development in a floodway, or any special flood hazard area for which a floodway has not been designated, if the city engineer determines that:
- (1) The bottom of the lowest horizontal structural member of the structure will be elevated at least 18 inches above the base flood level;
 - (2) The foundation system for the structure will be pier and beam construction;
 - (3) The applicant has submitted an engineering analysis acceptable to the city engineer, certified by a professional engineer licensed in the State of Texas, that demonstrates that the applicant will provide floodway conveyance offset volume at a rate defined by the city engineer. The floodway conveyance offset volume may be provided on applicant's site or at an off-site mitigation facility located within one-quarter mile upstream and in the same watershed as the site. If the applicant chooses to provide off-site mitigation, the applicant shall also comply with the requirements of section 19-17(c); and
 - (4) The applicant has paid all fees required by section 19-17(e) of this Code.

If the city engineer cannot so determine, then the city engineer shall deny the permit. If the applicant cannot provide the on-site or off-site mitigation required by item (3) of this subsection, the applicant may request the city to provide mitigation for the development upon payment of the cost of the mitigation as established by the city council.

For the purposes of calculation of floodway conveyance offset, vacant land in the floodway is real estate on which no residential or commercial structure exists at the time the application for development permit is submitted.

The engineering analysis requires the applicant to compute the necessary Floodway Conveyance Offset (FCO) volume necessary to mitigate the proposed development in the floodway. This volume computed using the following equation:

$$\text{FCO (cubic yards)} = 0.0004 * (\text{Bldg Footprint}) * (\text{Pier Area}) * e^{-0.21 * d}$$

Where:

FCO =	Floodway conveyance offset volume required (in cubic yards)
Bldg Footprint =	Area of proposed building footprint (in square feet)
Pier Area =	Cross-sectional area of piers between natural ground and BFE perpendicular to flow direction (in square feet)
d =	depth of 100-year flood at building (in feet)
e =	Natural base logarithm

For Example: 3,000 sf single family residence; 16-inch by 16-inch piers; 5 piers in flow direction and 2 foot deep in floodplain. FCO = 10.5 cubic yards

The FCO is in addition to any mitigation volumes required for stormwater detention or floodplain fill. The same designated volume provided can not be assigned to compensate for multiple requirements. Applicant must show details on the site plan for the location of the FCO volume and provide computations to support the design.

Mitigation banking. The use of surplus mitigation volume to compensate for the FCO volume due to *development* at a separate site (offsite) is termed “mitigation banking.” Surplus mitigation volume may not be used to compensate for offsite *development* mitigation without the written approval of the city engineer. A request for approval of mitigation banking should be submitted to the FMO. Each request will be evaluated independently based on the merits of the proposal and the potential benefits for the floodplain.

The mitigation facility site must be located within 1/4 mile upstream of the area where the applicant proposes to construct on vacant floodway land and must be within the same watershed.

If on-site FCO mitigation volume cannot be provided by the applicant and the applicant is unable to locate off-site mitigation banking to meet the FCO requirements, the applicant must pay the City of Houston \$60 per cubic yard of FCO volume. This payment is the City’s cost for FCO volume that must be provided at an appropriate City-defined facility. The City Engineer must approve payment and the applicant must demonstrate that it has exhausted all options to comply with on-site or off-site FCO volume requirements. Economic hardship will not be considered an appropriate criterion to support a request for payment in lieu of mitigation.

- (e) The city engineer shall issue a permit for development for the construction of a bridge or the repair or replacement of an existing bridge in a floodway, or any special flood hazard area for which a floodway has not been designated, if the city engineer determines that:

- (1) The cumulative effect of the proposed construction when combined with all existing development, and if a floodway has not been designated, all anticipated development, will result in a zero increase in flood levels at any point within the city during occurrence of the base flood; and
- (2) The bottom of the lowest horizontal structural member of the bridge, excluding the pilings or columns, will be elevated at least 18 inches above the base flood level. If the city engineer determines that construction to this elevation is not practical based upon the application of sound engineering principles to the proposed construction, the elevation geometry, the attendant roadway geometry, and the necessity for the bridge to be built or reconstructed in the proposed location, the city engineer may approve deviation from this standard.

If the city engineer cannot so determine, then the city engineer shall deny the permit.

Fulfillment of the bridge requirements in Section 19-43 (e) may be demonstrated by the submission of a No Adverse Impact Certification as discussed following Section 19-43 (f) along with a copy of the complete plans for the proposed bridge clearly showing the *BFE* and the elevations of the lowest horizontal member of the bridge. The requirement of 18 inches of clearance from the *BFE* to the elevation of the lowest horizontal member of the *structure* applies along the full length of the bridge from abutment to abutment.

If the applicant requests a deviation from the 18 inch requirements of Section 19-43 (e) (2), the applicant is encouraged to coordinate closely with the city engineer's office during the design of the bridge. Conditions that might allow such a deviation include, but are not limited to: limiting access to parcels near the bridge, causing large increases in flow downstream that cannot be reasonably mitigated, or causing improper sight lines for driving. The request for a deviation from the 18 inch requirement should be prepared in writing, should be based on sound engineering principles, and should address some, or all, of the following subjects, as applicable:

- The achievement of 18 inches of freeboard is not technically feasible
- Providing 18 inches of freeboard would not provide a benefit to the general public
- Providing 18 inches of freeboard would create a public safety problem

The proposed design for a bridge with less than 18 inches of freeboard will be rigorously reviewed by the city engineer, and deviations from this standard will only be approved if the justification is reasonable and thoroughly documented. For this reason, applicants for a *development permit* under Section 19-43 (e) are urged to contact the city engineer early in the design phase. If a deviation is anticipated, the No Adverse Impact certification should not be prepared until the proposed design of the bridge has been approved by the city engineer. The city engineer's approval of the proposed bridge design does not satisfy all requirements for a *development permit*. The No Adverse Impact analysis, including any necessary mitigation measures, must also be accepted by the city engineer.

The following describes the process to secure approval of a deviation from the 18 inch standard:

1. Prepare preliminary design to identify if deviation will be requested.
2. Submit letter, including supporting documentation and justification, for city engineer approval of requested deviation. Letter should include approval line for city engineer's signature.
3. Develop final plans and prepare No Adverse Impact certification.

4. Submit signed and sealed final plans to secure a *development permit*.

- (f) Whenever a permit is denied pursuant to section 19-43 (a), (b), (c) or (e) of this Code and the general appeals board finds and determines in writing that:
- (1) The improvement is insubstantial;
 - (2) This insubstantial construction will not increase flood levels during occurrence of the base flood; and
 - (3) This insubstantial improvement will not impede the flow of floodwaters, then the city engineer shall issue a permit only if all of the other applicable provisions of this chapter have been met by the applicant for the permit.

No Adverse Impact Certification. Sections 19-17 (d), 19-43 (a), 19-43 (b), 19-43 (c), and 19-43 (e) of this Ordinance require that the applicant demonstrate to the city engineer that the proposed *development* will not adversely affect the floodplain. “No Adverse Impact Certification” generally describes the documentation required to demonstrate compliance with these sections of the ordinance.

Where required under Sections 19-17 (d), 19-43 (a), 19-43 (b), 19-43 (c), or 19-43 (e), the applicant must provide a letter addressed to the city engineer certifying that the proposed *development* will cause No Adverse Impact to the floodplain or *floodway*. The letter must be signed and sealed by a registered professional engineer licensed in the state of Texas. Along with the certification letter, the applicant must also submit documentation, satisfactory to the city engineer, in support of compliance with the No Adverse Impact provisions of the ordinance. The extent of the required documentation will depend on the nature and complexity of the proposed *development*, and the applicant is encouraged to discuss these requirements with the FMO prior to performing the no impact analysis or applying for a *permit*. In addition, since HCFCFCD will review many, if not all, of these certifications, the applicant should consider writing one report meeting the requirements of this section as well as the HCFCFCD report requirements (Chapter 19 of the HCFCFCD Criteria Manual). Finally, if the project alters the floodplain or the *floodway*, a CLOMR shall be required. In that case, the applicant should consider the appropriate FEMA documentation requirements.

Typically, supporting documentation that will aid the city engineer in reviewing the application will consist of all, or part, of the following:

1. Detailed drawings of the site that indicate existing conditions and the proposed *development*. The drawings must offer plan and cross-section views sufficient to characterize the proposed *development* and the potential impact on the floodplain and *floodway*. The drawings must indicate natural ground elevations, floodplain and *floodway* boundaries, *BFE(s)*, proposed excavation and/or *fill*, building footprint(s), and first floor elevations or lowest horizontal member elevations of proposed *structures*.
2. Hydrologic and hydraulic analyses, if necessary, sufficient to demonstrate that the proposed *development* will not impede the flow of floodwaters or increase the *BFE* anywhere in the city during the occurrence of the *base flood*.
3. Any other pertinent information requested by the city engineer.

The floodplains and *floodways* in the City of Houston have been defined using HEC-HMS (Hydrologic Modeling System) and HEC-RAS (River Analysis System) models of the local waterways. These models were developed by the U.S. Army Corps of Engineers Hydrologic Engineering Center. In a typical No Adverse Impact analysis, the “duplicate effective” model is obtained from FEMA or HCFCFCD, as applicable, and a “corrected effective” model is constructed, as necessary, to correct errors in the “duplicate effective” model. An “existing” conditions model is then prepared containing man-made changes in conditions since the preparation of the FIS model, not including the proposed *development*. Next, an “impact” model is produced that reflects the impacts of the project without any mitigating steps.

An impact is an increase in water surface elevation at any cross-section along the full extent of the model greater than 0.00 ft under conditions of the *base flood*. Finally, a “mitigated” model is produced which reflects the water surface elevations in the watershed when mitigation projects are included. The entire length of the effective model must be used in determining impacts and mitigation.

Where the proposed *development* is to be located upstream of the limit of detailed study, as indicated on the *FIRM*, the applicant must define existing conditions BFEs and *floodway* boundaries from the limit of defined study to a point upstream of the proposed *development*, pursuant to Section 19-12 (7). This model would be the “existing” conditions model mentioned previously. In determining the impact of the proposed *development* for areas upstream of the limit of detailed study, the analysis must address the cumulative effects of anticipated future *development* in addition to the effects of existing *development*. However, since the city engineer defines anticipated *development* as *development* that occurs following the city and/or county *development* guidelines for drainage, and since those requirements call for no increases in flow rates from future *developments*, the anticipated future flows for areas outside the limit of detailed study should be equal to existing conditions flows. In these cases, a map and an accompanying hydrologic and hydraulic report must be submitted delineating the extents of the *floodway* from the effective limit of detailed study through the upstream limits of the proposed *development*. Guidance for hydrology, hydraulics and *floodway* modeling is provided by the HCFCD Criteria Manual under “Watershed Modeling Method.” Guidance for determining flow rates upstream of the Limit of Detailed Study may be found in the TSARP white paper titled “Determining Discharges in Upstream Reaches of Subareas.”

A typical No Adverse Impact hydrologic and hydraulic analysis may include, but is not limited to, the tasks described below, as determined necessary by the engineer analyzing the proposed *development* (project) area or as may be required by the city engineer based on a review of the project. These procedures are similar to the FEMA LOMR modeling procedures, and those procedures can be used as a reference.

Hydrology (e.g., changes to sub-area flows or storage-discharge relationships):

1. Updates to the hydrologic model as necessary to create the corrected effective and existing conditions models described above.
2. Updates to the hydrologic model to represent changes in the runoff due to the project (e.g., percent imperviousness, percent channelization, detention facilities).
3. Modeling of the project area with a combined storm sewer/overland flow model (e.g., SWMM) using tailwater values developed from HEC-HMS and HEC-RAS and integrating the storm sewer outflows into the HEC-HMS hydrologic model.
4. Modeling of off-line detention facilities using spreadsheets or a program such as SideHYD, a side-weir modeling program.
5. Updates to the impact and mitigated conditions hydrologic model(s) to represent anticipated *development* (applicable only where the proposed *development* is inside the SFHA and outside the limits of detailed study).

Hydraulics:

1. Updated cross-section data in the project area to reflect changes to the watershed since the original model was developed.
2. New cross-sections in the project area to increase model resolution in the area of interest (e.g., cross-sections around a proposed bridge).
3. Changes to existing or additional cross-sections, bridges, or other model features to represent proposed conditions.

Both Hydrology and Hydraulics:

Updated storage-discharge values in the hydrologic models (for each of the corrected effective, existing, impact, and mitigated conditions models).

The No Adverse Impact Certification report submitted with the application should include the following details. Upon review, the city engineer may ask for additional details as necessary.

1. A description of the nature of changes to the model that were made in developing the corrected effective, existing, impact and mitigated conditions models.
2. A thorough description of any new models or extensions to existing models (e.g., to extend a floodplain definition upstream of the limit of detailed study or to define *floodways* in *special flood hazard areas* for which a *floodway* has not been designated, or a SWMM model of a proposed storm sewer system) that were developed as part of the No Adverse Impact analysis.
3. A description of which hydrologic models were used with which hydraulic models, as there may be duplicate effective, corrected effective, existing, impact, and mitigated conditions models for both the hydrology and the hydraulics.
4. Tabulated results for each cross-section showing the one percent peak flows and water surface elevations for the duplicate effective, corrected effective, existing, impact and mitigated conditions models, and the difference between mitigated conditions and existing conditions for flows and water surface elevations. In this table, water surface elevation differences should be rounded to the nearest 0.01 feet. Tabulated results for the ten percent event should be included with analyses that require coordination with HCFCD.
5. Figures showing hydrographs that may be illustrative of important changes to the system (e.g., existing and impact outflow hydrographs from the project area, combined hydrographs in the channel just downstream of the project, or impact hydrographs into a detention pond and mitigated hydrographs exiting the pond).
6. Electronic media (e.g., CD) containing the actual models used in the No Adverse Impact analysis
7. A description of the electronic model files, clearly indicating which HEC-HMS projects and model runs; HEC-RAS projects and plans; and/or other models contained on the electronic media correspond to the duplicate effective, corrected effective, existing, impact, and mitigated conditions models, or any other models referred to in the report. A listing of the model versions that were used in the analysis (e.g., HEC-RAS version 3.1.3). This model description and version information may be included on the electronic media, rather than in the printed report, at the applicant's discretion.

Sec. 19-44. Boathouses and piers; Lake Houston.

Where a floodway has been designated, the city engineer may issue a permit for construction of a boathouse or pier provided the proposed development meets the requirements for bridge construction outlined in 19-43(e) of this Code. No development permit shall be necessary for construction of a boathouse or a pier on Lake Houston.

Lake Houston limits are defined for the purpose of permitting certain structures. An applicant proposing to construct a pier or and boathouse within the boundaries defined as Lake Houston is not required to submit a conveyance analysis as would be required under Section 19-43 for new construction in the floodway. However, any applicant that proposes to construct a dock, pier, boathouse or bulkhead that will place fill within the 100-year floodplain is required to provide mitigation in accordance with section 19-17(d).

Sec. 19-45- -19-50. Reserved.

DIVISION 4.

COASTAL HIGH HAZARD AREAS

Sec. 19-51. Generally.

Within special flood hazard areas, certain areas have been designated as coastal high hazard areas. These areas have special flood hazards associated with high velocity waters requiring additional conditions on construction within these areas.

Sec. 19-52. Building restrictions.

- (a) In addition to the requirements of division 2 of this article, the following provisions shall apply in coastal high hazard areas:
- (1) All buildings or structures shall be located landward of the reach of the mean high tide.
 - (2) All structures shall be elevated so that the bottom of the lowest horizontal structural member of the lowest floor, exclusive of pilings or columns, is elevated at least the minimum flood protection elevation, with all space below the lowest horizontal structural member open so as not to impede the flow of water.
 - (3) All structures shall be elevated on and securely anchored to adequately anchored pilings or columns in order to withstand velocity waters and hurricane wave wash and to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components.
 - (4) Pilings or columns used as structural support shall be designed and anchored so as to withstand velocity water and hurricane wave wash and to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components (wind and water loading values shall each have a one percent chance of being equaled or exceeded in any given year (100-year mean recurrence interval)).
 - (5) There shall be no fill used as structural support of any structure.
 - (6) There shall be no alteration of the topography prior to development that would increase potential flood damage.
 - (7) Breakaway walls are allowed below the base flood elevation but the space enclosed by breakaway walls may be used only for parking of vehicles, building access, or storage.

- (8) If breakaway walls are utilized, the space enclosed by the breakaway walls shall not be used for human habitation.
- (9) No alteration, repair, reconstruction, or improvement to a structure or other obstruction shall enclose or obstruct the space below the lowest floor, except for breakaway walls as provided herein.
- (b) When a development permit application is filed under the provisions of section 19-17, a registered professional engineer licensed in the State of Texas shall develop or review the structural design, specifications and plans for the construction and shall certify that the design and methods of construction of the structure to be built are in accordance with accepted standards of practice for meeting the provisions of subsections (a)(2), (a)(3) and (a)(4) hereof when built. Plans for any structure that include breakaway walls must be specifically identified as such when submitted to the city engineer for approval.

Secs. 19-53--19-60. Reserved.

ARTICLE IV.

MANUFACTURED HOMES

DIVISION 1.

REQUIREMENTS IN ADDITION TO MANUFACTURED HOME CODE

Sec. 19-61. Generally.

- (a) The provisions of this chapter shall be in addition to all other requirements, standards, and restrictions contained in the Code of Ordinances relating to manufactured homes, including, but not limited to, chapter 29 of the Code of Ordinances. In the event of conflict between the requirements of this chapter and any other requirement of the Code of Ordinances, the provisions of this chapter shall prevail.
- (b) The applicants for a city manufactured home permit where the manufactured home will be located within a special flood hazard area shall submit a development permit application and shall comply with the standards set forth in this chapter specifically including those standards contained in this article.

Secs. 19-62--19-70. Reserved.

DIVISION 2.

PLACEMENT STANDARDS

Sec. 19-71. Generally.

All manufactured homes shall be placed in locations in the city that are reasonably safe from flooding, and the city engineer is hereby authorized to promulgate such written standards as may be deemed appropriate to determine such flood safety. In addition to such standards within special flood hazard areas, the requirements of this division 2 shall apply.

Sec. 19-72. Flood safety.

The manufactured home and its site and substantial improvements to manufactured home sites shall:

- (1) Be designed or modified to prevent flotation, collapse, or lateral movement of the manufactured home in the presence of floodwaters;
- (2) Be constructed with materials and types of utility equipment which are resistant to flood damage; and,
- (3) Be constructed by methods and practices that minimize flood damage.

Sec. 19-73. Utility systems protection.

- (a) All new and replacement water supply systems for manufactured homes shall be designed to prevent or eliminate the infiltration of floodwaters into the water supply system and the utility system supplying water to the manufactured homes.
- (b) All new and replacement sanitary sewage systems for manufactured homes shall be designed to prevent:
 - (1) The infiltration of floodwaters into such system; and,
 - (2) Discharge from such systems into floodwaters.
- (c) All on-site disposal systems, including but not limited to, sewage treatment plants and septic tanks located on the lot or site of the manufactured home or connected by a utility system to the manufactured home, shall be located so as to:
 - (1) Prevent impairment of the function of the system during flooding; and

- (2) Prevent contamination of floodwaters from the system during flooding.

Sec. 19-74. Special requirements for manufactured homes.

All manufactured homes placed in, and all substantial improvements to manufactured home sites within, special flood hazard areas shall be secured as follows:

- (1) *Anchors:* All manufactured homes shall be elevated and anchored to resist flotation, collapse, or lateral movement in the presence of floodwaters by providing over-the-top or frame ties to ground anchors. All ground anchors shall be set in concrete poured to a depth resistant to natural erosion caused by floodwater. In addition, all anchoring systems shall comply with all applicable provisions of state law or regulations. All components of the anchoring system for manufactured homes shall be capable of carrying a force of 4,800 pounds.
- (2) *Tie-downs:*
 - a. Over-the-top ties shall be provided at each of the four corners of the manufactured home.
 - b. Manufactured homes in excess of 50 feet in length shall have two side ties in addition to the above-described corner ties, which shall be placed at intermediate locations; manufactured homes less than 50 feet in length shall have one additional tie per side.
- (3) *Frame ties:*
 - a. A frame tie shall be placed at each corner of the manufactured home.
 - b. Manufactured homes in excess of 50 feet in length shall have five additional ties placed on each side at intermediate locations; manufactured homes less than 50 feet in length shall have four additional ties per side placed at intermediate locations.
- (4) *Additions to manufactured homes:* All additions to a manufactured home shall be anchored in the same manner as a manufactured home.
- (5) *Flood elevation of manufactured home:*
 - a. The stand or lot on which a manufactured home is placed shall be elevated on a permanent foundation so that the lowest floor of the manufactured home is at least at the minimum flood protection elevation.
 - b. Adequate surface drainage and access for a hauler shall be provided at each manufactured home lot or stand and at the entrance of a manufactured home park or subdivision.

- c. A manufactured home placed on pilings shall be placed on a lot large enough to permit steps wholly on the manufactured home lot.
- d. Pilings shall be placed in stable soil not more than ten feet apart, center to center, and shall be reinforced if they extend more than six feet above ground level. A registered professional engineer licensed in the State of Texas must certify in writing that the size, strength, and treatment processes for wooden pilings and methods of reinforcement for those pilings are sufficient to prevent flotation, collapse or lateral movement of the manufactured home in the presence of floodwaters.

Sec. 19-75. Manufactured home placement in a floodway or coastal high hazard area.

Manufactured homes to be placed in a floodway or a coastal high hazard area shall also specifically comply with divisions 3 and 4 of article III of this chapter.

Secs. 19-76--19-80. Reserved.

DIVISION 3.

SUBDIVISIONS AND DEVELOPMENT

Sec. 19-81. Plats for manufactured home parks and subdivisions.

No plat shall be issued for a manufactured home park or subdivision unless it complies with the provisions of section 19-13 and the provisions of this article.

Sec. 19-82. Evacuation plan.

All persons who operate a manufactured home park or subdivision within any special flood hazard area and who are licensed by the city under chapter 29 of the Code of Ordinances shall file an evacuation plan with the fire chief indicating alternate vehicular access and escape routes for such park or subdivision prior to the granting of a permit.

Secs. 19-83--19-90. Reserved.

ARTICLE V.

ENFORCEMENT

Sec. 19-91. Actions authorized to enforce chapter.

- (a) The city, acting through the city attorney or any other attorney representing the city, is hereby authorized to file an action in a court of competent jurisdiction to:

- (1) Enjoin any person from violating the terms, conditions and restrictions of any permit issued under this chapter;
- (2) Enjoin the violation of the provisions of this chapter;
- (3) Recover civil penalties for violation of the terms, conditions and restrictions of any permit issued under this article;
- (4) Recover civil penalties for violation for the provisions of this article; or
- (5) Recover damages from the owner of a site in an amount adequate for the city to undertake any construction or other activity necessary to bring about compliance with this chapter.

This authority is in addition to all provisions of this Code and the Construction Code relative to the definition of offenses and the provision of penalties for violations of such ordinances.

- (b) The city, acting through the city attorney or any other attorney representing the city, is hereby authorized to enter into agreements in lieu of litigation to achieve compliance with the terms, conditions and restrictions of any permit issued under this article or the provisions of this article.
- (c) The city engineer is authorized to:
 - (1) Whenever any work authorized by a development permit is being performed contrary to the provisions of this chapter, or other pertinent laws or ordinances implemented through the enforcement of this article, order the work (other than work to cure a violation) stopped by notice in writing served on any persons performing the work or causing the work to be performed. Any such persons shall forthwith stop the work until authorized by the city engineer to proceed with the work.
 - (2) At the time a stop order is issued, the person performing the work and the permit holder shall be given notice of a right to a hearing on the matter pursuant to Section 116.2 of the Building Code for permits authorized by that Code. Upon request, such a hearing shall be held within three business days unless the permit holder or person who was performing the work requests an extension of time. Any stop order that has been issued shall remain in effect pending any hearing that has been requested unless the stop order is withdrawn by the city engineer.

Sec. 19-92. Criminal sanctions.

Any person violating any provision of this chapter within the corporate limits of the city shall be guilty of a misdemeanor punishable by a fine of not less than \$250.00 nor more than \$2,000.00. Each day that any violation continues shall constitute a separate offense.

Enforcement. Placement of *fill* in an SFHA without a *development permit*, or placement in non-compliance with the conditions of a *development permit*, or placement of *fill* before mitigation of the *fill* volume is complete, or any other action in violation of Chapter 19, Code of Ordinances, shall be subject to Sections 19-91 and 19-92.

Chapter 19, Guidelines
Exhibits Table of Contents

Exhibit A: Residential and Commercial Development Flowchart

Exhibit B: Notice of Floodplain Mitigation Facility Covenant Template

Exhibit A: Residential and Commercial Development Flowchart

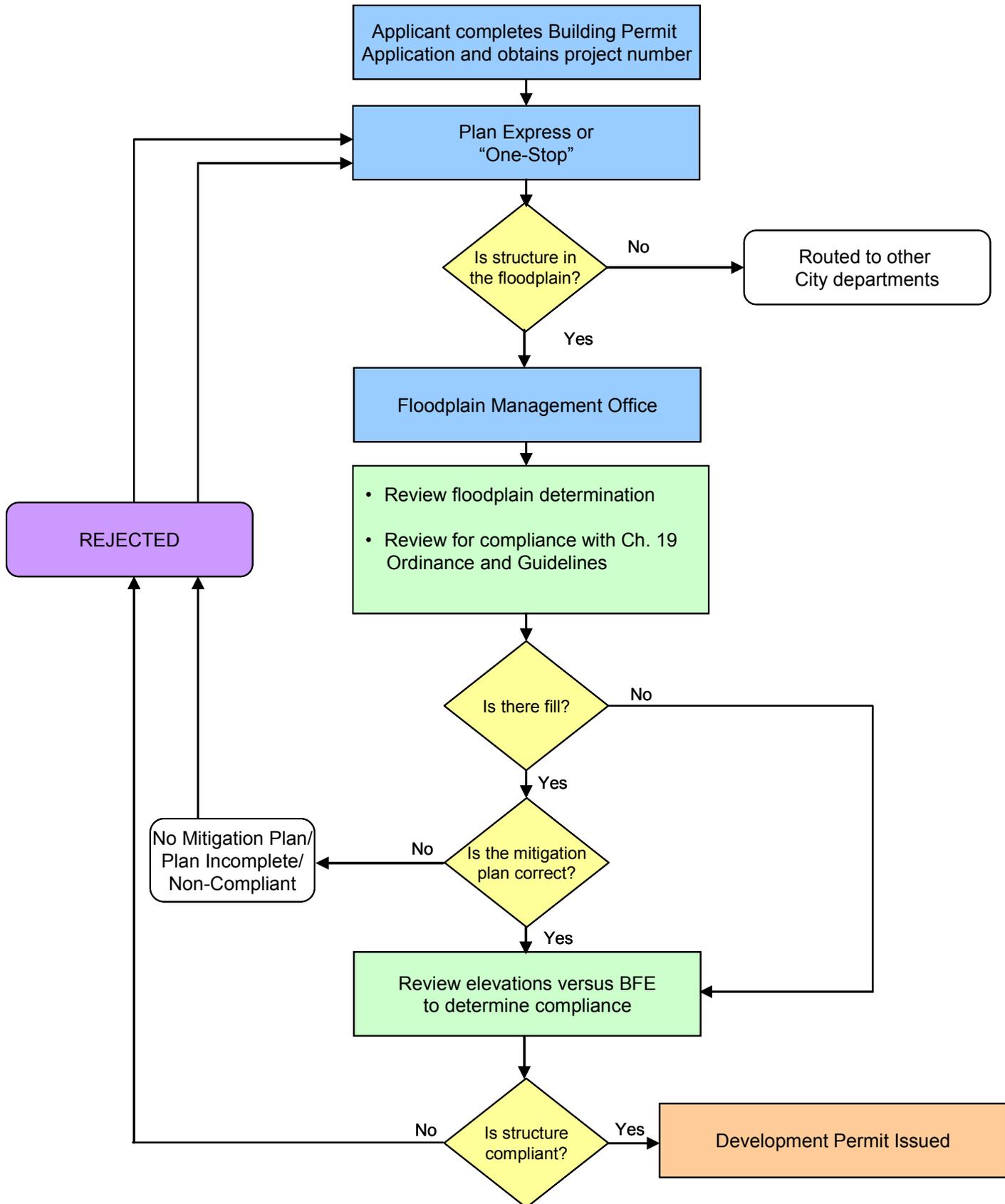


Exhibit B: Notice of Floodplain Mitigation Facility Covenant Template

NOTICE OF FLOODPLAIN MITIGATION FACILITY COVENANT

State of Texas §
 §
County of Harris §

KNOW ALL BY THESE PRESENTS:

WHEREAS, [owner/agent name] is the owner of a [size of parcel in acres] of land out of the [name of survey, abstract], Houston, Harris County, Texas, and more particularly described on Exhibit "I" (metes and bounds description of the property) attached hereto (the "Property"); and

WHEREAS, the Property has a floodplain mitigation facility located on it in compliance with a Development Permit issued by the City of Houston (the "City") for development(s) located in the City of Houston at [address of property], as more particularly described on Exhibit "II" (mitigation facility site drawing) attached hereto;

NOW, THEREFORE, in consideration of receipt of the Development Permit, Owner hereby covenants, which covenant shall run with the land, that the floodplain mitigation facility will be maintained on the Property by Owner and its successors and assigns, including but not limited to future owners of the Property, until such time as the obligation to maintain such facility is released by the City and such release is recorded in the real property records of Harris County, Texas.

IN WITNESS HEREOF, this instrument is executed effective this the _____ day of _____, 200_.

[Owner name]

[Name and title]

State of Texas §
 §
County of Harris §

The within and foregoing instrument was acknowledged before me this _____ day of _____, 200_, by [owner/agent name].

Witness my hand and official seal.

Notary Public, State of Texas

(Notary Seal)