North Central Texas Council of Governments

Integrating Transportation and Stormwater Infrastructure

Inventory of Zoning, Building Codes, and Stormwater Ordinances Memo

July 2026

The Texas General Land Office provided guidance, oversight, and funding for this study.

This study was also funded by the Texas Water Development Board and Texas Department of Transportation.

integrating Transportation & Stormwater Infrastructure

Integrating Transportation and Stormwater Infrastructure (TSI)

Green Stormwater Infrastructure, Low Impact Development, iSWM, and Floodplain supporting ordinances in the West Study Area

Katie Hunter, NCTCOG

Aledo

Source: https://library.municode.com/TX/aledo/codes/code_of_ordinances?nodeId=CH66SU_ARTIICOFAPO_S66-64STDRINPO

Chapter 66 – Subdivisions

Article II. Community Facilities Policy

Sec. 66-64. - Storm drainage installation policy.

(Ord. No. 2007-01, § 39, 1-25-2007)

(d) (4)

When it is anticipated that additional runoff incident to the development of the subdivision will overload an existing downstream drainage facility, whether natural or manmade, and result in hazardous conditions, the city may withhold approval of the subdivision, until appropriate provision has been made to accommodate the problem, and plans have been submitted which include all necessary off-site improvements, including storm sewer systems, channel grading, driveway adjustments, culvert improvements, etc. Detention systems on said subdivision may be required in this case. The developer's engineer may be required to submit studies proving adequacy of downstream systems to allow development.

(Ord. No. 2007-01, § 33, 1-25-2007)

Chapter 66 – Subdivisions

Article II. Community Facilities Policy

Section 66-58 Parkland dedication policy

(2) 5.

Careful consideration will be given to the need for development of linear parks around natural drainage and wooded areas that provide potential recreational uses. The floodplain (based upon 100-year storm) and floodway will be accepted for park development in the following ratios:

(i)Floodplain and natural drainage areas should not exceed 75 percent of the total park site.

(ii)

At least 50 percent of the required dedicated parkland should have slopes in range of two to five percent, well-drained, and suitable for active use development.

(iii)

Floodplain acreage will be accepted at a ratio of 1:1 (1 floodplain: 1 dedication requirement). There will be no reduction in credit for dedication of floodplain as compared to non-floodplain property, provided the dedication satisfies subsections (2)5(i) and (2)5(ii) of this section. Floodway property is accepted at a ratio of 50 percent of the required dedication.

(iv)

When development occurs near a floodway that is designated as part of the city's greenbelt/trail system or determined to be suitable for trail development by the city council, the developer will be required to develop that section of the greenbelt/trail system that occurs within his development. The developer will construct the trails and adjacent facilities in accordance with the city's design criteria and specifications for parks. In order to facilitate greenbelt/trail development, the city council may, at its discretion, credit the developer up to 100 percent of the required land dedication and development fee. The cost for the trail's development will be borne by the developer and will not exceed the required park development fee.

# # #

Source: https://www.aledotx.gov/sites/g/files/vyhlif6511/f/pages/city_of_aledo_-_unified_development_code.pdf

Aledo Unified Development Code – 12.07.23

Article 3- Development Standards

3. Site Design and Development Standards

3.1.Applicability: Table 3.2-1 shall establish the applicability of this section to new development and redevelopment.

3.2.Off-Street Parking

a. Purpose: The regulations of this section are intended to ensure provision of off-street parking and loading facilities in rough proportion to the generalized parking, loading, and transportation demands of different land uses. By requiring such facilities, it is the intent of this section to help avoid the negative effects associated with spillover parking into adjacent neighborhoods, while at the same time avoiding the negative environmental and urban design effects that can result from large surface parking lots and other vehicular use areas. The provisions of this section are also intended to help protect the public health, safety, and general welfare by:

iii. Providing methods to help reduce stormwater runoff and the heat island effect of large, paved parking areas; and

5. Open Space Standards

5.1 Applicability

a. All development subject to this article shall set aside the following minimum amounts of land area as public or privately maintained open space that meets the standards of this section. i. For single-family developments with more than five units: at least 200 square feet per unit. ii. For non-residential and mixed-use buildings with a gross floor area greater than 10,000 and up to 50,000 square feet: 5 percent of total gross site area. iii. For non-residential and mixed-use buildings with a gross floor area greater than 50,000 square feet: 7 percent of total gross site area.

5.2 Open Space Design Standards

a. Purpose: Public open spaces are set aside for the use and enjoyment of a development's residents, employees, or users. Public open space serves numerous purposes, including preservation of natural areas and resources, ensuring greater resident access to open areas and recreation, reducing the heat island effect, enhancing pg. 89 stormwater quality, providing public health benefits, and providing for the general health and welfare of the citizens of Aledo

Alvarado

Source: https://ecode360.com/42204656

City of Alvarado Code of Ordinances Chapter 34 Subdivisions

Article V Improvements Prior to Acceptance

§ 34-128: Storm drainage.

An adequate storm sewer system consisting of inlets, pipes, and other underground structures with approved outlets and channels shall be constructed where runoff or stormwater and the prevention of erosion cannot be accommodated satisfactorily by surface drainage facilities. Areas subject to flood conditions will not be considered for development until adequate drainage has been provided

Anetta South

Landscaping

Source: https://www.annettasouth.org/wp-content/uploads/2018/04/Zoning-Ordinance-2018-4-10.pdf

City of Anneta South Ordinance No 2018-4-10 Rewrite of Zoning Ordinance 008, subsequently amended Effective as of April 11, 2018

Chapter 9 Landscaping Requirements

1.9.1 Purpose: A)The purpose of these landscape requirements is to protect the public health, safety and welfare by requiring that new development is adaptive to the existing natural areas and sensitive to sustaining the existing tree canopy and Texas native landscape thereby reducing heat build-up, air pollution, soil erosion and reduction of the rate of storm water drainage as well as providing for the control of the density of development.

C) Required Landscaping Standards

2) Street Trees a) For all development, a minimum of one

(4) inch caliper, eight foot (8) height tree shall be required every 25 linear feet of linear feet of public street frontage within the landscaped planting strip .

3) For all single detached residential development lots a minimum of one (1) tree shall be located in the front yard of each lot and one (1) tree in the rear yard of each lot.

4) Where landscaping is intended to provide a visual screen, the species, quantity, maturity (size), and spacing of the initial plantings shall be sufficient to provide a functional screen within a single growing season.

5) Vegetative mater shall cover seventy-five (75) percent of any landscape area.

6) Storm water detention facilities do not meet the landscape requirements unless a rain garden is approved.

Arlington

Source: https://cdnsm5-hosted.civiclive.com/UserFiles/Servers/Server_14481062/File/City%20Hall/Depts/City%20Secretary/City_Code_of_Ordinances/UDCChapter.pdf

City of Arlington Unified Development Code

Article 5. Design and Development Standards

Section 5.2.2

b. Landscape Island design

i) All landscaped areas shall be protected by a raised concrete curb. The Zoning Administrator may approve a curbless design for stormwater BMP or Low Impact Design (LID) purposes

https://cdnsm5-hosted.civiclive.com/UserFiles/Servers/Server_14481062/File/City%20Hall/Depts/City%20Secretary/City_Code_of_Ordinances/UDCChapter.pdf

Section 5.4 Off street parking and loading

5.4.1 Purpose

The regulations of this section are intended to ensure provision of off-street parking and loading facilities in rough proportion to the generalized parking, loading, and transportation demands of different land uses. By requiring such facilities, it is the intent of this section to help avoid the negative effects associated with spillover parking into adjacent neighborhoods, while at the same time avoiding the negative environmental and urban design effects that can result from parking lots and other vehicular use areas. The provisions of this section are also intended to help protect the public health, safety, and general welfare by:

A. Helping avoid and mitigate traffic congestion;

B. Encouraging multi-modal transportation options and enhanced pedestrian safety;

C. Providing methods to help reduce stormwater runoff and the heat island effect of large paved parking areas; and

D. Providing flexible methods of responding to the transportation and access demands of various land uses in different areas of the city.

5.10.3. COMMON OPEN SPACE STANDARDS

A. Areas Counted as Common Open Space The features and areas identified in Table 5.10-A shall be credited towards the common open space requirements of this section:

TABLE 5.10-A: Areas Counted As Open Space

Area Counted as Common Open Space	Description	Design and Maintenance Requirements
NATURAL FEATURES 	Includes any of the following: • Flood hazard and conveyance areas; • Water features, including wetlands, drainage channels, and lakes; • Hillsides and exposed slopes of 15% or more; and • Wildlife habitat areas for threatened and endangered species.	Where natural features exist, the developer or owner shall give priority to its preservation as common open space. Placement of a conservation easement over the protected natural feature areas is encouraged. In reviewing the proposed location of common open spaces, the Zoning Administrator shall use all applicable plans, maps, and reports to determine whether significant resources exist on a proposed site that should be protected. Maintenance is limited to a minimum removal and avoidance of hazards, nuisances, or unhealthy conditions.

Azle

Source: https://ecode360.com/39133608

City of Azel Code of Ordinances

Subdivision Ordinance

Part 14.2 Integrated Development Process

14.2.2 Steps in the Development Process

Step 1. Review Local Requirements and Municipality Processes

Opportunities for special types of development (e.g., clustering) or special land use opportunities (e.g., conservation easements or tax incentives) must be investigated. In addition, there may be an ability to partner with a local community for the development of greenways or other riparian corridor or open space developments.

Step 5. Complete Operations and Maintenance Plan

An Operations and Maintenance Plan shall be developed in accordance with this section. The plan shall be included in the Final iSWM Plan. It needs to clearly state which entity has responsibility for operation and maintenance of temporary and permanent stormwater controls and drainage facilities to ensure they function properly from the time they are first installed.

Benbrook

Source: https://library.municode.com/tx/benbrook/codes/code_of_ordinances?nodeId=CD_ORD_TIT16SU_CH16.28DESTRE_16.28.020EA

Benbrook Texas Code of Ordinances

Subdivisions

Chapter 16.20 Engineering plans and standard specifications for public works construction

16.20.007 - Preliminary iSWM site plan.

For a standard plat, this sheet shall be submitted with the preliminary plat and shall be at the same scale as the preliminary plat. For a minor plat, this sheet shall be submitted with the final plat. The preliminary iSWM ^{TM} site plan should consist of maps, narrative, and supporting design calculations (hydrologic and hydraulic) for the proposed stormwater management system, and shall include the following sections:

A.Existing Conditions Hydrologic Analysis. Provide an existing condition hydrologic analysis for stormwater runoff rates, volumes, and velocities which includes:

1.Existing conditions data developed in the conceptual iSWM ™ site plan;

2.All existing stormwater conveyances and structural control facilities;

3.Direction of flow and exits from the site;

4.Analysis of runoff provided by off-site areas upstream of the project site;

5.Methodologies, assumptions, site parameters and supporting design calculations used in analyzing the existing conditions site hydrology.

B.Project Description and Design Considerations. Provide an updated description of the project and the considerations and factors affecting the design approach that have changed between the conceptual and preliminary plans, including:

1.A description of the overall project and the site plan showing facility locations, roadways, etc.;

2.A discussion of the applicable local criteria and how it will be integrated into the design of the project;

3.Evaluate the integrated site design practices and their applicability to this site;

4.A discussion of any credits for integrated site design being requested;

5.A discussion of the water quality treatment techniques (pollution prevention practices) that are to be utilized on this site, if applicable;

6.A determination of groundwater recharge considerations, if applicable, for this site;

7.Identify hotspot land uses, if applicable, and how runoff will be addressed.

C.Post-Development Hydrologic Analysis. Provide a post-development hydrologic analysis for stormwater runoff rates, volumes, and velocities, which includes:

1.A topographic map of developed site conditions (minimum two-foot contour interval recommended) with post development basin boundaries indicated;

2.Total area of post development impervious surfaces and other land cover areas for each subbasin affected by the project;

3.Runoff calculation for flood control and streambank protection for each subbasin, as well as any applicable water quality calculations;

4.Location and boundaries of proposed natural feature protection and conservation areas;

5.Documentation and calculations for any applicable site design credits or water quality volume reduction methods being used;

6.Methodologies, assumptions, site parameters and supporting design calculations used in analyzing the post-development conditions site hydrology;

7.Supporting documentation that there is existing streambank protection/reinforcement or that the planned development will provide streambank protection downstream;

8.Supporting calculations for a downstream peak flow analysis to show safe passage of post-development design flows downstream. Document point downstream at which analysis ends, and how it was determined.

Burleson

Source*:* https://ecode360.com/39937843

City of Burleson Code of Ordinances

Appendix

Appendix A subdivision and Development

Article 6 Drainage and Environmental Standards

6.6 **Stormwater mitigation.**

(**Ord. No. CSO#1215-12-2019**, § 1, 1-6-2020)

(a) Stormwater storage (detention) shall be required as follows:

(1) Single-family, single-family attached, and two-family subdivisions.

Stormwater storage shall be designed and constructed when any of the following situations exist:

a. The release rate of stormwater runoff from the proposed development exceeds the capacity of the existing downstream drainage system.

b. The development will create structural (building) flooding or significantly worsen known structural (building) flooding.

(2) Commercial and multi-family development.

Stormwater storage shall be designed and constructed with any commercial or multi-family developments one acre or larger in size. The size of the development shall be based upon the area of land shown on the preliminary plat, or if a preliminary plat was not required, a final plat.

(b) In lieu of the storage, the developer may:

(1) Employ an engineer to document that the excess flow will not be detrimental or hazardous to structures (buildings), vehicular traffic, or pedestrian traffic.

(2) Elect to design and construct a facility that will mitigate any hazardous condition or habitable structure flooding.

Source: https://ecode360.com/39936847

Chapter 86 Landscaping, Trees and Vegetation

Article III Landscaping Standards

§ 86-103**Landscaping generally.**

(Ord. No. B-726(A0310), § 1, 3-15-2010)

Landscape installation is required as follows:

(a) Landscaping of 20 percent of the total lot shall be required, unless credits are obtained by additional plantings as set forth in section **86-106**. Landscaping which includes the planting of

new and the retention of existing shrubs, trees, and flowering plants in excess of the minimum standards established in this section, may not reduce the landscape requirement to less than ten percent of the total lot area;

(b) Where the construction is to be a single phase or multi-phase development, only the area being constructed in the current phase shall be required to comply with the landscape regulations. However, each phase will be required to meet the landscaping requirements as it is being developed;

(c) The use of native and adapted, drought tolerant plants is encouraged to meet requirements of this section;

Cedar Hill

Source:
https://library.municode.com/tx/cedar_hill/codes/code_of_ordinances?nodeId=PTIICOOR_CH13NAENRE_ARTVSTMAOR_DIV2PRRE_S13-145REBEMAPR

Cedar Hill Code of Ordinances

Chapter 13- Natural and Environmental Resources

Article V- Stormwater Management Ordinances

Division 2- Prohibitions and Requirements

Section 13-45- Required best management practices

Sec. 13-145. - Required best management practices.

(a)The owner of any business activity, operation, or facility that may cause a discharge of pollutants to the storm drainage system shall implement and maintain at their own expense, BMP as necessary or required by the city to prevent the discharge of pollutants to the storm drainage system.

(b)Typical BMP's for the City of Cedar Hill are located and available in the most current version of the City of Cedar Hill Manual for General Design Standards for Paving, Drainage Systems, Water and Sanitary Sewer Lines, City Standard Construction Details and the North Central Texas Council of Governments (NCTCOG) Integrated Stormwater Management (iSWM) Technical Manual.

(Ord. No. 2011-444, § 1, 8-16-11)

https://library.municode.com/tx/cedar_hill/codes/code_of_ordinances?nodeId=PTIICOOR_CH13NAENRE_ARTIVTRPR_DIV5URFOFU

Chapter 13 - NATURAL AND ENVIRONMENTAL RESOURCES

ARTICLE IV. - TREE PRESERVATION

DIVISION 5. - URBAN FOREST FUND

Sec. 13-91. - Establishment of urban forest fund.

(1)

Account established. The city's finance department shall establish an interest-bearing account into which mitigation fees collected under this article are deposited and to which interest is allocated. Interest earned on the account into which the mitigation fees are deposited shall be considered funds of the account and shall be used solely for the purposes described in section 13-92.

(2)

Fee established. A mitigation fee hereby is established in the amount of one hundred fifty dollars ($150.00) per caliper inch for each protected tree removed and that has not been otherwise mitigated pursuant to this article.

(3)

Collection of fees. Mitigation fees shall be collected either at the time of application for approval of a tree protection plan required under division 2, or at the time of building permit application for fees due under division 3.

Dallas

https://smartsurfacespolicy.org/policies/dallas-urban-corridor-districts-permeable-surface-requirements/

Ordinance mentioning permeable pavement

CHAPTER 51A
DALLAS DEVELOPMENT CODE:
ORDINANCE NO. 19455, AS AMENDED

ARTICLE IV. ZONING REGULATIONS

Division 51A-4.120. Nonresidential District Regulations

SEC. 51A-4.127. URBAN CORRIDOR DISTRICTS.

https://codelibrary.amlegal.com/codes/dallas/latest/dallas_tx/0-0-0-75159

Within specific urban corridor districts, a “minimum of 10 percent of the lot area must be open space in the form of permeable surfaces such as perimeter landscape buffer strip, recreation area, or conservation area,” and “open space areas smaller than 25 square feet or less than 5 feet wide, and landscaping in the public right-of-way, are not counted towards this 10 percent requirement.”

Ordinance defining open space lots

CHAPTER 51A DALLAS DEVELOPMENT CODE:
ORDINANCE NO. 19455, AS AMENDED

ARTICLE XIII. FORM DISTRICTS

Division 51A-13.300. District Regulations

SEC. 51A-13.304. DEVELOPMENT TYPES.
https://codelibrary.amlegal.com/codes/dallas/latest/dallas_tx/0-0-0-93830

The code defines an "Open Space Lot" as "[a] development type located and designed to accommodate civic open space or natural area worthy of preservation," gives several examples of types of open space lot—including, for example, a green, a landscaped median, and a community garden—and provides impervious area maximum for most types. https://smartsurfacespolicy.org/policies/dallas-open-space-lots-pervious-requirements/

Landscaping and Tree preservation ordinance

CHAPTER 51A DALLAS DEVELOPMENT CODE:
ORDINANCE NO. 19455, AS AMENDED
ARTICLE V. FLOODPLAIN AND ESCARPMENT ZONE REGULATIONS.

Division 51A-5.200. Escarpment Regulations.

SEC. 51A-5.208. VEGETATION PLAN

https://codelibrary.amlegal.com/codes/dallas/latest/dallas_tx/0-0-0-85450

The City -of Dallas's landscaping and tree preservation rules acknowledge the "urban growth and development with its alteration of the natural topography, vegetation, and creation of impervious cover can have a negative effect on the ecological balance of an area by causing increases in air temperatures and accelerating the processes of runoff, erosion, and sedimentation." The rules go on to acknowledge that "the city can and should be protected through the conservation and enhancement of the unique natural beauty, environment, and vegetative space in this area," including by ensuring storm water filtration and preserving the urban forest. https://smartsurfacespolicy.org/policies/dallas-landscaping-and-tree-preservation/

LID design options ordinance

CHAPTER 51ADALLAS DEVELOPMENT CODE:
ORDINANCE NO. 19455, AS AMENDED

ARTICLE X. LANDSCAPE AND TREE CONSERVATION REGULATIONS

Division 51A-10.120. Landscaping.

SEC. 51A-10.126. LANDSCAPE DESIGN OPTIONS (LID)

(8) Conservation. The applicant may create a conservation area on the property. The conservation area must occupy at least five percent of the lot area. Maximum of 25 points

(A) Option 1: Tree preservation in the development impact area. Large or medium trees maintained in the development impact area may be used to meet design option requirements and to meet the requirements for site tree credit in Section 51A-10.125. The trees must be protected and maintained in areas required by this article. Two points for each tree up to a maximum of 10 points. Significant trees may attain five points.

(B) Option 2: Habitat preservation. The applicant must preserve existing healthy native and mixed species grassland or woodland areas. Five points.

(C) Option 3: Habitat preservation and restoration using an active management plan. The applicant may create or restore natural habitat conditions if designed and implemented by a qualified professional. Site maintenance must be continual for the purpose of sustaining the vegetated area. The option may be combined with low impact development design for the drainage functions of the property. 10 points.

(D) Option 4: Habitat preservation and restoration - adjacent to primary natural areas. The applicant may preserve and restore land areas adjacent to wetlands, creeks, floodplain, and slopes which help protect creeks, habitat, slopes, and woodland in primary natural areas from the site construction. This option may be combined with pedestrian amenities. The area must be at least five percent of building site area. 15 points.

(9) Low impact development (LID). The applicant may improve the property with low impact development design to manage stormwater flow and provide surface heat abatement. The improvements may be combined for a maximum of 20 points.

(A) Rain garden. Maximum six points.

(i) 1 to 5,000 square feet: three points; and

(ii) each additional 1,000 square feet: one point.

(B) Bioswale. Maximum 10 points per bioswale.

(i) 50 to 100 feet long: three points; and

(ii) each additional 50 feet: one point.

(C) Water-wise plant materials and planting beds. The applicant may provide landscaping that uses water conservation techniques including water-wise plants, mulch, and efficient irrigation. Maximum 10 points.

(i) In a minimum of 50 percent of landscape areas: three points.

(ii) In a minimum of 80 percent of landscape areas: five points.

(iii) Low-water consumption grasses for 80 percent of turf surfaces: three points.

(iv) Low-water consumption grasses for all turf surfaces: five points.

https://codelibrary.amlegal.com/codes/dallas/latest/dallas_tx/0-0-0-92034

Tree replacement alternative ordinance (LID)

CHAPTER 51A DALLAS DEVELOPMENT CODE:
ORDINANCE NO. 19455, AS AMENDED

ARTICLE X.
LANDSCAPE AND TREE CONSERVATION REGULATIONS.

Division 51A-10.130. Urban Forest Conservation

SEC. 51A-10.135. ALTERNATIVE METHODS OF COMPLIANCE WITH TREE REPLACEMENT REQUIREMENTS. (LID)

(a) In general. If the building official determines that, due to restrictive site conditions, it would be impracticable or imprudent for the responsible party to plant a replacement tree on the tree removal property, the responsible party shall comply with one or more of the mitigation methods in this section.

(b) Mitigation by legacy trees.

(c) Habitat preservation and restoration areas.

(d) Sustainable development incentives

(4) Green site points.

(D) Low impact development.

(ii) Bioswale.

(iii) Water-wise plant materials and planting beds.

(f) Conservation easement.

Etc.

https://codelibrary.amlegal.com/codes/dallas/latest/dallas_tx/0-0-0-92267

“In October 2015, the City adopted an impervious surface-based stormwater fee schedule (City of Dallas, 2015)

Complete Streets Design Manual

January 2016, the City adopted the Complete Streets Design Manual—which includes a Green Streets component, and promotes green infrastructure "wherever feasible" on future bond-funded streets projects (City of Dallas, 2016)

In 2018, the City adopted the Resilient Dallas plan, developed under a grant with the Rockefeller 100 Resilient Cities program (City of Dallas, 2018b) Included in this plan was an initiative to "promote partnership efforts to implement green infrastructure in neighborhoods disproportionately vulnerable to the impacts of urban heat island- effects, poor water quality and poor air quality", and features the work with TNC, Texas A&M AgriLife and TPL to "compile existing flooding and drainage analyses across the City into a comprehensive map to identify gaps and nature-based solutions to reduce flooding (7A2)"

In October 2019, the City adopted new design criteria manuals that integrated the regional green infrastructure design criteria into the Paving, Street and Drainage Design Manuals These manuals outline opportunities for implementation and encourage their use in all projects in Dallas (City of Dallas, 2019a)

In 2020, the City adopted the Dallas Comprehensive Environmental and Climate Action Plan (CECAP) that included actions to incorporate green infrastructure to mitigate adverse impacts of development (WR10), establish an urban greening factor that quantifies how new development projects contribute to urban greening for stormwater runoff, increase and improve access to green spaces within vulnerable communities to reduce impact of urban heat island, localized flooding and improve public health (EG1), and to assess opportunities for blue-green-gray infrastructure in the public realm to reduce flood risk (EG2) (City of Dallas, 2020b)

"EPA worked with the City to identify the following codes, ordinances, standards, guidelines, and plans that could have bearing on green infrastructure implementation and should be subject to review:

- Water Conservation Ordinance, Landscape and Tree Preservation Ordinance (and revisions proposed by the Urban Forest Advisory Committee)
- Dallas Development Code, City of Dallas iSWM Criteria and Design Manual for Site Development and Construction (iSWM Manual)
- Tax Increment Financing (TIF) District Design Manual
- City of Dallas Complete Streets Design Manual, Dallas Development Guide
- Off-Street Parking and Driveways Handbook"

https://www.nature.org/content/dam/tnc/nature/en/documents/GSIanalysisREVFINAL.pdf

https://www.epa.gov/sites/default/files/2015-10/documents/dallas-report-508.pdf

Dallas County

Easements crossing preserves, encouraging native grass and wildflowers?

Dallas County Code

ARTICLE IV. - PARKS AND PRESERVES

DIVISION 1. - GENERALLY

Sec. 50-202. - Easements crossing preserves; restoration of preserve property. When appropriate, easement contracts shall require the utility/entity seeking the easement to keep their easements free of trees and to reseed the easements with nature grass and/or wildflowers that are appropriate to the soil, slope and geology of the area when the land is disturbed by easement-related use. In addition, they will also require the utility/entity to notify the county, in advance, of when they will be entering and utilizing the easement. Any modifications to existing easements or requests for new easements must be approved by the commissioners court and by the granting entity, if applicable, if grant funds have been used to acquire the property.

https://www.dallascounty.org/Assets/uploads/docs/comcrt/county-code/DallasCountyCode-09102024.pdf

Forest Hill

Post-Construction Ordinance

Code of Ordinances

Chapter 7 Health and Sanitation

Article 7.07 Stormwater Runoff and Pollution Control

Division 2 Construction Site Regulations
§ 7.07.035 Post-construction stormwater management.

(a) Applicability.

Post-construction stormwater BMPs are required on development or redevelopment construction projects that are expected to disturb at least one acre of land and fall in one or more of the following criteria:

(1) Construction of any type of commercial car wash facility.

(2) Construction of an automotive fueling facility including convenience stores.

(3) Construction of an automotive maintenance or repair facility.

(4) Restaurants (fast food or sit-down) with grease collection and disposal.

(5) Other land uses deemed to have a high potential of pollutant discharge into the MS4 as determined by the city engineer.

https://ecode360.com/40586652

Tree ordinance

Chapter 4 Building Regulations

Article 4.08 Trees and Landscaping

4.08.001 Purpose and intent

b) This article is also intended to minimize erosion and stormwater runoff, provide buffers between neighboring properties, preserve historic streetscapes, minimize the visual and environmental impacts of paved surfaces and buildings, and ensure landscaping in conjunction with new development and redevelopment in a manner that preserves native vegetation. This article is intended to balance the property rights of individual property owners with those of the overall health, safety and welfare interests of the community. A permit system is utilized, intended to prevent the damage, destruction or removal of a protected tree unless this article and its requirements are met.

(Ordinance 2009005, sec. 1, adopted 4/21/09; 2013 Code, sec. 58-1)

https://ecode360.com/40584819

Grand Prairie

Post construction requirements

Chapter 13 - HEALTH AND SANITATION

ARTICLE XXIII. - STORMWATER DISCHARGES

Sec. 13-607. - Post-construction requirements.

(a)The person or operator must ensure all temporary control measures for erosion control or other BMPs are removed once final stabilization has been achieved.

(b)The person or operator must ensure all long-term operation and maintenance of post-construction stormwater runoff control mechanisms, such as detention and retention basins, dry wells and other measures as described in federal regulations

(Ord. No. 7973, § 2, 7-7-09)

https://library.municode.com/tx/grand_prairie/codes/code_of_ordinances?nodeId=PTIICOOR_CH13HESA_ARTXXIIISTDI_S13-607PONSRE

Grand Prairie Unified Development Code

ARTICLE 8: LANDSCAPE AND SCREENING

8.3.1.3. Landscaping Adjacent to Public Right-of-Way

8.3.1.5. Exceptions, Exemptions and Appeals

6. Stormwater Facilities: Structures designed to manage stormwater runoff (e.g. storm water ponds and wetlands, bio-retention areas, infiltration trench and surface sand filters, enhanced swales and grass channels, filter strips and stream buffers, and green roofs). Stormwater facilities will be landscaped as outlined in Article 17 of the iSWM Design Manual for Site Development (see current version of Drainage Design Manual).

https://www.gptx.org/files/sharedassets/public/v/6/departments/planning/documents/article-08-11.19.24.pdf

Hood County

iSWM

Hood County Development and Compliance

Section 1- Development Permit Regulations

Section 6.10 Erosion and Sedimentation Control Standards

A. Applicability. Temporary and permanent erosion control methods and treatments shall be required for all developments subject to these development permit regulations, in accordance with the storm water quality best management practices for construction activities, prepared by the North Central Texas Council of Governments.

https://hoodcounty.texas.gov/Documents/Departments/Development/Forms/Sec%201_2022-12-13_20221215161519877 8.pdf

Detention pond maintenance-

Hood County Development and Compliance

Section 1- Development Permit Regulations

F. Standards – drainage facilities and flood controls

2. Storm Water Runoff into County Drainage Facilities. The Director of Development may require detention of storm water run-off from any development being released into any County drainage ditch, swale, easement, culvert, or other facility or into any such drainage facility associated with an existing road, whether public or private, if existing downstream facilities are undersized or if downstream jurisdictions have detention requirements. If detention of storm water is required, the owner or property owners' association shall assume full responsibility for maintenance of the lake or pond. This obligation shall run with the land and shall be a continuing obligation.

Open space plan in floodplain

Section 6.9 Park and Recreational Facilities Standards A. Open space plan required. Whenever a proposed development is required to preserve floodplain or open space, or proposes to transfer density pursuant to Section 5.7 of these development permit regulations, an open space plan shall be prepared that contains the following information: 1. All proposed natural floodplains and natural features to be preserved; 2. The proposed on-site open space network serving the project consistent with the County's adopted Open Space Plan, if any;

Freeboard

https://hoodcountytx.documents-on-demand.com/document/6ebb4a4a-3c9e-49cb-a2d4-35bbece543e0/Flood%20Damage%20Prevention%20Order.PDF

Floodplain ordinance

F. Standards – drainage facilities and flood controls d. Private storm drainage and flood control improvements shall be located and designed to eliminate Adverse Impact to upstream, downstream and adjacent property owners.

8. Drainage Design Methodology

b. A drainage area of six hundred forty (640) acres or greater is required within a contributing watershed to create a "floodplain." For areas of flow with less than six hundred forty (640) acres of contributing area, no floodplain shall be defined; however, any concentrated flow will necessitate the dedication of a drainage easement.

9. Floodplain Management a. Development within the floodway is prohibited. b. Development within the floodplain outside of the floodway may be authorized only by obtaining a floodplain development permit issued by the Hood County Development Department. Any structures constructed within the floodplain must be elevated so that the Finished Floor elevation is a minimum of 2 feet above the base flood elevation.

https://hoodcountytx.documents-on-demand.com/document/6ebb4a4a-3c9e-49cb-a2d4-35bbece543e0/Flood%20Damage%20Prevention%20Order.PDF

Johnson county

Freeboard?

Source:
https://www.johnsoncountytx.org/home/showpublisheddocument/17004/638575042145170000

Subdivision Rules and Regulations

Section III, Time Period for Approval of Plat Application

Section IV, Requirements for Plat Application

16. Restrictions of Subdivision:

A copy of the Deed Restrictions and/or Covenants, within the subdivision shall accompany the plat. The Deed Restrictions and/or Covenants and Purchase Contract shall notify lot owners that houses to be built on lots which are lower than the road or roads on which it fronts and/or abuts shall be built at a finished floor elevation of eighteen (18) inches or Subdivision Rules and Regulations of Johnson County Amended July 8, 2024 27 more above the proposed grade of the yard adjacent to the slab on the uphill side of the property in order to prevent storm drainage water from damaging houses on properties that are lower than the road.

Kennedale

Source:
https://library.municode.com/tx/kennedale/codes/code_of_ordinances?nodeId=UNDECO_PTIII DEPRDEST_ART18PONSRU_S18.3RE

Unified Development Code

Part III - Development Provisions and Design Standards

Article 18. Post Construction Runoff

Section 18.3 Requirements

A.General Criteria for Post Construction Runoff Control.

1.All applicable land development sites shall be designed according to the specific performance criteria outlined in the city public works design manual or in conformance with the regional ISWM manual.

2.Prior to design applicants are required to consult with the public works department to determine if they are subject to additional post-construction stormwater design requirements

.B.Minimum Control Requirements. All stormwater management practices shall be designed so that the specific storm frequency storage volumes (e.g., water quality, channel protection, 10-year, 100-year) as identified in the current drainage design manual are met unless the Director of Public Works grants a waiver or the owner is exempt from such requirements. If hydrologic or topographic conditions warrant greater control than that provided by the minimum control requirements, the Director of Public Works may impose any additional requirements deemed necessary to control the volume, timing, and rate of runoff

.C.Site Design Feasibility.

1.Practices. Stormwater management practices for a site shall be chosen based on the physical conditions of the site. Among the factors that should be considered:

a.Topography;

b.Total maximum drainage area;

c.Depth to water table;

d.Soils;

e.Slopes; and

f. Terrain.

2.Guidance. Applicants shall consult the drainage design manual for guidance on the factors that determine site design feasibility when selecting a stormwater management practice.

D.Conveyance Issues. All stormwater management practices shall be designed to convey stormwater and allow for maximum removal of pollutants and reduction in flow velocities, which shall include, but are not be limited to:

1.Use of structural and nonstructural best management practices BMPs and controls;

2.Maximizing of path flow distance from inflow points to outflow points;

3.Protection of inlet and outfall structures; and

4.Elimination of erosive flow velocities

.E.Maintenance Agreements. All stormwater management and/or treatment practices shall have an enforceable operation and maintenance agreement to ensure the system functions as designed. This agreement will include any and all maintenance easements required to access and inspect the stormwater practices, and to perform routine maintenance as necessary to ensure proper functioning of the stormwater practice.

F.Structural Stormwater Practices. Owners are required by the city to implement structural measures to reduce runoff volumes and velocities at sites where downstream infrastructure is insufficient to accommodate developed flows. The following methods shall be considered appropriate for consideration as structural stormwater practices:

1.Swales and channels;

2.Culverts inlets and pipes

;3.Detention;

4.Energy dissipaters;

5.Infiltration trenches;

6.Stormwater ponds;

7.Porous surfaces; and

8.Re-use (rain harvesting, etc.).

G.Use of Other or New Stormwater Practices.

1.New Practices. New and innovative technologies shall be evaluated and are encouraged for use providing that there is sufficient documentation as to their effectiveness and reliability.

2.Alternatives. New structural stormwater practices will not be accepted for inclusion in the city until independent performance data shows that the structural control conforms to local and/or state criteria for treatment, conveyance, maintenance and environmental impact.

Source:
https://library.municode.com/tx/kennedale/codes/code_of_ordinances?nodeId=UNDECO_PTIIIDEPRDEST_ART19FLDAPR_S19.4FLHARE

Article 19- Flood Damage Prevention

Section 19.4 - Flood Hazard Reduction

A.General Standards. In all areas of special flood hazards the following provisions are required for all new construction and substantial improvements:1.All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy;2.All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage;3.All new construction or substantial improvements shall be constructed with materials resistant to flood damage;4.All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding;5.All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system;6.New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the system and discharge from the systems into floodwaters; and7.On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding. B.Specific Standards. In all areas of special flood hazards where base flood elevation data has been provided as set forth in Section 19.2 B, Section 29.6 B.8, or Section 19.4 C.2, the following provisions are required:1.Residential Construction. New construction and substantial improvement of any residential structure shall have the lowest floor (including basement), elevated to two (2) feet above the base flood elevation. A registered professional engineer, architect, or land surveyor shall submit a certification to the Floodplain Administrator that the standard of this subsection as proposed in Section 19.3 A.1, is satisfied.

Lake Worth

Floodplain ordinance

Chapter 3 Building Regulations

Article 9 Flood Damage Prevention

3.09.021 Floodways.

Located within areas of special flood hazard established in section 3.09.007 are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of floodwaters, which carry debris, potential projectiles and erosion potential, the following provisions shall apply:

(1) Encroachments are prohibited, including fill, new construction, substantial improvements and other development, within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.

(2) If subsection (1) above is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of this article.

(Ordinance 1162, sec. 1 (3.1621), adopted 9/10/19)

https://ecode360.com/40368218

Freeboard

Chapter 3 Building Regulations

Article 9 Flood Damage Prevention

3.09.021 Floodways.

3.09.018 **Specific standards for flood hazard reduction.**

In all areas of special flood hazards where base flood elevation data has been provided as set forth in section **3.09.007**, section **3.09.014(8)**, or section **3.09.019(c)**, the following provisions are required:

(1) Residential construction.

New construction and substantial improvement of any residential structure shall have the lowest floor (including basement) elevated to two (2) feet above the base flood elevation. A registered professional engineer, architect, or land surveyor shall submit a certification to the floodplain administrator that the standard of this subsection, as proposed in section **3.09.015(a)(1)**, is satisfied.

https://ecode360.com/40368218

Lakeside

Floodplain Ordinance

Title XV: Land Usage

Flood Hazard Reduction

152.31 SPECIFIC STANDARDS.

In all areas of special flood hazards where base flood elevation data has been provided as set forth in §§ 152.06, 152.21(H) or 152.32(C), the following provisions are required:

(A) *Residential construction.* New construction and substantial improvement of any residential structure shall have the lowest floor (including basement), elevated to two feet above the base flood elevation. A registered professional engineer, architect, or land surveyor shall submit a certification to the Floodplain Administrator that the standard of this division as proposed in § 152.22(A)(1), is satisfied.

https://codelibrary.amlegal.com/codes/lakeside/latest/lakeside_tx/0-0-0-25069

Mansfield

Post-Construction Ordinance

City of Mansfield Stormwater Management Program

Part IV- Stormwater Management Program

4. Post Construction Stormwater Management For New Development/ Redevelopment

4.I. Regulatory Requirement The City of Mansfield has requirements for new development and redevelopment project designs that have the ability to improve stormwater quality. Landscaping, parkland dedication, buffer yard and setback, and erosion and sediment control requirements all assist in improving water quality. The City also has a Natural Resources Preservation Ordinance (or Tree Preservation) to encourage preservation of natural areas.

https://www.mansfieldtexas.gov/DocumentCenter/View/527/Stormwater-Management-Program-PDF

iSWM Ordinance

City of Mansfield Stormwater Management Program

Part IV- Stormwater Management Program

4. Post Construction Stormwater Management For New Development/ Redevelopment

4.II. Post Construction Stormwater Management for New Development/Redevelopment Best Management Practices BMP 4.1 – Drainage Design Criteria Manual – (B) Description - The City adopted the iSWM Manual of 2006 as its Storm Water Management Design Manual in February 2010 to be used in designing stormwater management measures. The City developed specific local criteria explaining which options should be used when designing new developments within Mansfield. The City updated the SWMDM effective July 1, 2014 to require new developments and redevelopments to implement site design or post construction water quality control measures

Floodplain Ordinance

City of Mansfield Stormwater Management Program

Part IV- Stormwater Management Program

4.II. Post Construction Stormwater Management for New Development/Redevelopment Best

Management Practices

BMP 4.2 – Other Ordinances and Regulations – N(B)

Description – The Federal Emergency Management Agency requires municipalities to enact floodplain damage prevention regulations to offer floodplain insurance to residents near or in the floodplain. Given that floodplains are located near major waterways, by restricting development within these areas the City is creating a positive impact on water quality within those waterways. The City will continue to enforce its flood damage prevention ordinance and shall update the ordinance as required by Federal regulations. In addition to floodplain protection, the City has ordinances that require new developments to preserve quality tree canopy. The Subdivision ordinance set rules for building setbacks, parking lot island requirements, landscape buffers, and parkland dedication for residential developments. All of these areas combined will have a positive impact on post development water quality, but the impact is not easily measurable.

Venus

Green Infrastructure Ordinance

Chapter 26 Subdivisions and Development

Article 2. – Residential Subdivisions

Division 1. Generally

Sec. 26-33. - Open and civic spaces.

(a)*Intent.* The intent of this section is to:

(1)Emphasize open space design as a key determinant of Venus' community image and unique identity.

(2)Plan and integrate open and civic space systems into the patterns and structure of streets, blocks and lots to create a coordinated public realm.

(3)Promote good civic design and create focal points for the community, district, neighborhood or development site to which development and site plans should relate.

(4)Integrate natural systems into the design of common or public open spaces to improve stormwater management, and protect water resources.

https://library.municode.com/tx/venus/codes/code_of_ordinances?nodeId=COOR_CH26SUDE_ARTIIRESU_DIV1GE_S26-33OPCISP

Floodplain Ordinance

Chapter 26- Subdivisions and Development

Article 3.- Nonresidential developments

Sec. 26-147. - Requirements for easements.

Natural waterways and channels should be used wherever practical to carry runoff. Any modification to an existing waterway and channel requires approval by the city engineer and city administrator.

(7) Storm drainage easements shall be provided for emergency overflow drainage ways of sufficient width to contain within the easement stormwater resulting from a 100-year frequency storm less the amount of stormwater carried in an enclosed system of a capacity required by the City of Venus.

https://library.municode.com/tx/venus/codes/code_of_ordinances?nodeId=COOR_CH26SUDE_ARTIIINODE_S26-147REEA

iSWM Ordinance?

Chapter 26 Subdivisions and Development

Article 3 –-Nonresidential Developments

Sec. 26-149. - Standard specifications.

Preliminary engineering plans to be submitted with preliminary plat

(2) *Preliminary iSWM drainage site plan.* For a standard plat, this sheet shall be submitted with the preliminary plat and shall be at the same scale as the preliminary plat. The preliminary iSWM TM site plan should consist of maps, narrative, and supporting design calculations (hydrologic and hydraulic) for the proposed stormwater management system, and shall include the following sections:

a.*Existing conditions hydrologic analysis.* Provide an existing condition hydrologic analysis for stormwater runoff rates, volumes, and velocities which includes:

1.Existing conditions data developed in the conceptual iSWM TM site plan;

2.All existing stormwater conveyances and structural control facilities;

3.Direction of flow and exits from the site;

4.Analysis of runoff provided by off-site areas upstream of the project site;

5.Methodologies, assumptions, site parameters and supporting design calculations used in analyzing the existing conditions site hydrology.

Chapter 26- Subdivisions and Developments

Article 3.- Nonresidential Developments

Erosion and sedimentation control.

All construction projects shall include temporary erosion and sedimentation controls in accordance with Item 201 of the Standard Specifications and the Integrated Storm Water Management TM Design Manual for Construction (2003, as amended) published by the North Central Texas Council of Governments.

https://library.municode.com/tx/venus/codes/code_of_ordinances?nodeId=COOR_CH26SUDE_ARTIIINODE_S26-149STSP

White Settlement

Landscaping Ordinance?

Subpart B - LAND DEVELOPMENT ORDINANCES

Chapter 103 - BUILDINGS AND BUILDING REGULATIONS

ARTICLE XI. - LANDSCAPE REGULATIONS

(3)Preserve and improve the natural and urban environment by recognizing that the use of landscaping elements and retention of existing trees can contribute to the processes of air purification, oxygen regeneration, groundwater recharge, abatement of noise, reduction in glare and heat, provision of habitats for wildlife, and enhance the overall beauty of the city.

(Code 2008, § 10-271; Ord. No. 2014-2482, § II, 9-9-2014; altered in 2019 recodification)

https://library.municode.com/tx/white_settlement/codes/code_of_ordinances?nodeId=SPBLADEOR_CH103BUBURE_ARTXILARE

Integrating Transportation and Stormwater Infrastructure (TSI)

Green Stormwater Infrastructure, Low Impact Development, iSWM, and Floodplain supporting ordinances in the North Study Area

Blake Alldredge, Upper Trinity Regional Water District

Argyle

Development Standards of Argyle - Article II Subdivisions. Part 6 Design Standards

Sec. 14.2.87 Preservation of Trees and Native Vegetation

https://library.municode.com/tx/argyle/codes/development_standards?nodeId=ARTIISU_PT6DEST_S14.2.87PRTRNAVE

A. Landscape shall be preserved in its natural state to the greatest extent feasible. Structures, driveways, and parking areas shall be designed and located to fit harmoniously with the natural environment and to minimize the necessity for removing trees, native vegetation, and soil, or the addition of fill. Site clearing, beyond what is necessary to provide locations for structures, driveways, parking, or small yard areas not visible from the street, shall not be permitted.

B. The Developer is reminded that the Zoning Ordinance requires landscaping and bufferyards and that sufficient space on each lot should be provided to accommodate these requirements.

C. The Developer shall prepare and submit a drawing showing the location and species of each tree with a trunk greater than six inches in diameter measured at a point four and one-half feet above the ground. An aerial photo may be substituted for the drawing, if sufficiently detailed to provide the same information.

D. The developer shall leave undisturbed native tree growth to the maximum extent feasible. In addition, each tree removed with a trunk greater than or equal to six inches in diameter measured at a point four and one-half feet above the ground, that was removed for reasons other than the construction of public improvements and/or which was located within the basic footprint of a future residence, must be replaced with comparable mature species with an equal number of caliper inches in appropriate locations to compensate for the loss of such trees. No clear-cutting of lots shall be allowed.

E. To preserve the required mandatory areas of trees from inadvertent damage during construction, a physical barrier shall be erected around the perimeter of these inviolate areas. The barriers will be in place and approved by the Town Inspector before any site clearance can commence. The barrier may consist of a temporary chain-link fence, wooden stake (snow) fence, plastic safety fence or other devices as approved by the Town Inspector. Minimum height of all types of barriers is four feet. Barriers shall remain in place until the final building and landscape site inspections are satisfactorily completed for the issuance of the certificate of occupancy. Only after this time can the barriers be removed.

F. All requirements of the Tree Ordinance in regard to plats must be followed in preparing a plat.

Sec. 14.2.89 Easements
https://library.municode.com/tx/argyle/codes/development_standards?nodeId=ARTIISU_PT6DEST_S14.2.89EA

9. *Floodplain Easements.* Floodplain easements shall be provided along natural drainageways and lakes or reservoirs. Floodplain easements shall encompass all areas beneath the water surface elevation resulting from a storm whose design frequency is 100 years, plus such additional width as may be required to provide ingress and egress to allow maintenance of the banks and for the protection of adjacent property, as determined and required by the Town Engineer.

Article V. Tree Preservation
https://library.municode.com/tx/argyle/codes/development_standards?nodeId=ARTVTRPR

Aubrey

Code of Ordinances, Ch. 3 Building Regulations, Article 7 Flood Damage Prevention

§ 3.07.006 Flood Hazard Reduction Standards https://ecode360.com/40427058

(b) Specific standards.

In all areas of special flood hazards where base flood elevation data has been provided as set forth in section **3.07.004(b)**, section **3.07.005(b)(8)**, or subsection **(c)(3)** of this section, the following provisions are required:

(1) Residential construction.

New construction and substantial improvements of any residential structure shall have the lowest floor (including basement) elevated to two feet above the base flood elevation. A registered professional engineer, architect, or land surveyor shall submit a certification to the floodplain administrator that the standard of this subsection, as proposed in section **3.07.005(c)(1)(A)**, is satisfied.

Ch. 10A, Article 4 Public Sites and Open Spaces https://ecode360.com/40430332

§ 2 Protection of Drainage and Creek Areas

2.01 Natural Preservation Required.

All creeks and drainage channels shall be preserved and protected in their natural condition wherever possible, unless significant storm drainage improvements are required by the City in these areas. All development adjacent to creeks and drainage channels shall be in accordance with the City's Design Standards, and with any other City policies or ordinances related to aesthetics or public access or enjoyment of creeks and waterways.

Ch. 14A, Zoning Ordinance https://ecode360.com/40432683

§ 21 FP – Floodplain District

A. FLOODPLAIN PREFIX TO DISTRICT DESIGNATION. The FP prefix designation constitutes a zoning overlay district, and the addition or removal of the FP prefix constitutes zoning action requiring due process provided under State law. Further public notice to all downstream property owners within the City of Aubrey with like FP zoning is required prior to any such zoning action.

To provide for the appropriate use of land which has a history of inundation or is determined to be subject to flood hazard and to promote the health, safety and general welfare of the community, portions of certain districts are designated with a floodplain prefix FP and shall be subject to the following provisions.

B. PERMITTED USES. In this district no land shall be used except for one or more of the following permitted uses to the extent that they are not prohibited by other regulations or ordinances, and provided that such uses do not require above-ground structures, filling or storage of material or equipment except as herein specifically authorized.

(1) Agricultural activities, including the ordinary cultivation of land or legal forms of animal husbandry.

(2) Electrical substation.

(3) All types of location utilities, including but not limited to water distribution and wastewater collection systems; water and wastewater treatment facilities and water quality/monitoring stations or other structures required to provide water and sewerage, telephone, gas and electrical services.

(4) Parks, community centers, playgrounds, public golf courses.

(5) Private commercial open area amusements such as golf courses, driving ranges, archery courses and similar uses when approved by conditional use zoning action.

(6) Facilities that would warrant no flood protection, such as accessory private open space in conjunction with commercial or residential development, community unit recreational areas or recreation developments.

(7) Parking areas associated with a part of contiguous land use.

No building or structure shall be erected in that portion of a district designated with a floodplain FP prefix other than those listed in this section.

There shall be no dumping, excavation, storage or filling operation within that portion of a district having a floodplain FP prefix designation except under conditions of this Ordinance.

C. CONDITIONS FOR ADDING FP PREFIX DESIGNATION. The City Council may, after a public hearing, amend the zoning classification of any property by adding the floodplain FP prefix designation based on hydraulic engineering studies indicating new boundaries of the area that is subject to inundation by floodwaters. The City Council shall provide for the addition of such floodplain FP prefix designation to the zoning district maps.

D. CONDITIONS FOR REMOVAL OF FP PREFIX DESIGNATION. The City Council, in considering and determining its decision relative to any application for the removal of the floodplain FP prefix designation, shall require the applicant to furnish to the administrator fill and development plans (hydraulic calculations concerning maximum high water and flow rates and their effect on abutting, lateral, and downstream properties) and data concerning the operation, location, function and characteristics of any use of land or building proposed. The application will not be scheduled for public hearing until the city engineer certified information furnished is adequate for review and comment as required in this section.

Bartonville

Ch. 10 A Development Ordinance, Part IV Public Sites and Open Spaces

§ 4.2 Protection of Drainage and Creek Areas https://ecode360.com/39543357

a. Definitions and Methodology for Determining the Floodway Management Area (FMA).

The definitions for “floodway” and “floodway fringe” shall correspond to those set forth by the Federal Emergency Management Agency (FEMA). For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist the local community in the aspect of floodplain management. Under this concept, the area of the 100-year flood is divided into a floodway and floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment in order that the 100-year flood may be

carried without substantial increases in flood heights as defined by FEMA. The area between the floodway and boundary of the 100-year flood is termed the floodway fringe. The floodway fringe is the area which can be used for development by means of fill according to FEMA and Town engineering criteria.

For the purposes of this Ordinance, the Floodway Management Area (FMA) will correspond to the floodway, as defined by FEMA.

b. Areas Where an FMA is Required.

All drainage areas or regulated floodways as referenced by the panel numbers appropriate to the Town of Bartonville on the Floodway and Flood Boundary Map (FIRM maps) shall be included in the FMA. If FEMA does not specify a floodway zone in any of the creeks or their tributaries, it shall be the developer's responsibility to establish and identify the FMA. The determination shall be made by a registered professional engineer and approved by the Town Engineer. Where improvements to a drainage area are required by other ordinances of the Town for the purpose of safety or other reasons related to drainage, those ordinances shall also be observed. The FMA is intended to apply to a creek or channel which is to remain open or in its natural condition. The creek shall remain in its natural state unless improvements are permitted or required by the Town due to the pending development of properties adjacent to or upstream of the required improvements.

Celina

Code of Ordinances Ch. 14 Zoning, Article 14.04 Site Development Standards, Part 2 Landscaping and Tree Preservation

§ 14.04.207 Nonresidential landscape requirements

(5) Signature Open Space https://ecode360.com/39810226

(I) Incorporation and integration of natural features, such as creeks, drainage areas, riparian woodlands, floodplains, and waterways, where and when practical, in compliance with all engineering design standards;

(J) Detention or retention ponds shall be considered if they are meaningfully incorporated into the SOS design, accessible to the public, and meet the base design regulations for detention/retention ponds.

§ 14.04.209 Tree Preservation https://ecode360.com/39810310

Division 7 Subdivision Requirements § 10.03.072(i) https://ecode360.com/39806033

(i) Major creeks.
(1) Definition.

Major creeks shall be defined by the most recent “major creek” map maintained by the city and available to developers upon request.

City of Celina, TX

(2) Major creek restrictions.

All major creeks shall be maintained in an open natural condition. All major creeks are subject to the requirements set forth in the engineering standards and the additional following requirements for all types of development:

(A) The 100-year floodplain and erosion hazard setback shall be dedicated on the final plat to the city as a single lot or shall be owned and maintained by an HOA or POA, pursuant to section 10.03.079(d), HOA requirements, of this ordinance.

(B) At no time shall any portion of the 100-year floodplain encroach upon any single-family or two-family residential lot.

(C) The commission may waive any of these dedication requirements for a replat that was originally platted prior to the adoption of this subdivision ordinance.

(3) Access.

Public access to parks and open space shall be dedicated for maintenance purposes as required by the director of engineering.

(j) Floodplain development requirements.

(1) 100-year floodplain restrictions.

All development proposed adjacent to or within the 100-year floodplain shall be in accordance with this ordinance, the city’s floodplain ordinance, and the engineering design standards. A floodplain development permit and earthwork permit must be submitted and approved by the director of engineering prior to any construction on the site.

Copper Canyon

Code of Ordinances Ch. 13 Utilities https://ecode360.com/39745305

§ 13.05.008 Stormwater discharges associated with construction activities

(d) Best Management Practices

(1) The operator, owner or contractor shall use best management practices to control and reduce the discharge, to the MS4 and water in the state, of sediment, silt, earth, soil, and other materials associated with clearing, grading, excavation, and any other construction activities to the maximum extent practicable. Such best management practices and erosion control measures are

detailed in the North Central Texas Council of Governments iSWM criteria manual for site development and construction and may include, but are not limited to, the following measures:

(A) Ensuring that existing vegetation is preserved where feasible and that disturbed portions of the construction site are stabilized, in accordance with the requirements of the construction permit, on portions of the construction site where construction activities have temporarily or permanently ceased. Stabilization measures may include, but are not limited to the following:

(i) Temporary seeding;

(ii) Permanent seeding;

(iii) Mulching;

(iv) Sod stabilization;

(v) Vegetative buffer strips;

(vi) Protection of trees; and

(vii) Preservation of mature vegetation.

Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities temporarily or permanently ceased, and except as provided herein, shall be initiated no more than fourteen (14) days after the construction activity in that portion of the site has temporarily or permanently ceased.

(8) Installation of permanent structural measures during the construction process to control pollutants in stormwater discharges that will occur after construction operations have been completed. Such installed structural measures may include, but are not limited to, the following:

(A) Stormwater detention structures (including wet ponds);

(B) Stormwater retention structures;

(C) Flow attenuation by use of open vegetative swales and natural depressions;

(D) Other velocity dissipation devices;

(E) Infiltration of runoff on site; and

(F) Sequential systems, which combine several practices.

iSWM is mentioned on page 64 in Copper Canyon's Engineering Design Manual - https://www.coppercanyon-tx.org/DocumentCenter/View/627/Copper-Canyon_Engineering-Design-Manual_2026-02-16

Corinth

Code of Ordinances, Title XV: Land Usage

Chapter 153: Drainage Design Standards

§ 153.01 - ADOPTION OF DRAINAGE DESIGN STANDARDS.
https://library.municode.com/tx/corinth/codes/code_of_ordinances?nodeId=TITXVLAUS_CH153DRDEST_S153.01ADDRDEST

The Drainage Design Manual, otherwise known as the iSWM Local Criteria Manual and other necessary iSWM documents, a copy of which is on file with the City Secretary, is hereby adopted by reference as if set forth fully herein. The Drainage Design Manual shall be maintained as a public record in the office of the City Secretary. In the event a conflict is determined to exist between the Drainage Design Manual as adopted and the other provisions of this chapter, the later provisions shall be construed as controlling and taking precedence over the former.

Unified Development Code, Section 2. Zoning Regulations, Subsection 2.09 Zoning Development

2.09.02. - Tree Preservation
https://library.municode.com/tx/corinth/codes/unified_development_code?nodeId=S2ZORE_SUBSECTION_2.09ZODERE_2.09.02TRPR

A. Purpose

1. The purpose of this Section 2.09.02 is to establish regulations for the preservation and replacement of existing Protected Trees within the City of Corinth and to provide protection of trees during construction, development, or redevelopment of a site. In addition, this Section shall further the following public purposes:

a. Establish a permitting and enforcement process for tree removal;

b. Encourage the preservation and protection of existing Protected Trees and Protected Tree stands and groves through the application of design principles that consider the environmental context of the site, and which include the preservation of open spaces in the design of undeveloped residential and non-residential developments (Examples of context and environmentally sensitive site design include practices that incorporate linear open space linkages to preserve trees within riparian buffer zones, tree groves or stands, and/or more formal open space greens such as plazas that strategically designed to contain groupings of Protected Trees within residential, non-residential, multi-family or mixed use developments);

Section 3. Subdivision Regulations, Subsection 3.05. Subdivision Design Standards

3.05.07 Easements and Dedications
https://library.municode.com/tx/corinth/codes/unified_development_code?nodeId=S3SURE_SUBSECTION_3.05SUDEST_3.05.07EADE

E. Floodplain Easements

1. Floodplain easements shall be provided along natural drainage ways and lakes or reservoirs.

2. Floodplain easements shall be provided in accordance with the recommendation of the Director of Public Works and the Director of Planning to accommodate the one (1) percent fully developed storm drainage flows or the flow of the flood of record, whichever is greater.

3. Floodplain easements shall encompass all areas beneath the water surface elevation of the fully developed one (1) percent storm, plus such additional width as may be required to provide ingress and egress to allow maintenance of the banks and for the protection of adjacent property, as determined by the Director of Public Works.

4. The following full statement of structures shall be placed in the dedication instrument of the Plat: Floodplain Easement Restriction: Construction within the floodplain may only occur with the written approval of the City. A request for construction within the floodplain easement must be accompanied with detailed engineering plans and studies indicating that no flooding will result, that no obstruction to the natural flow of water will result; and subject to all owners or the property affected by such construction becoming a party to the request. Where construction is permitted, all finished floor elevations shall be a minimum of one (1) foot above the 100-year flood elevation as determined by analyzing the ultimate build-out conditions of the entire drainage basin.

a. Existing creeks, lakes, reservoirs, or drainage channels traversing along or across portions of this addition, will remain as an open channel at all times and will be maintained by the individual owners of the lot or lots that are traversed by the drainage courses along or across said lots. The City will not be responsible for the maintenance and operation of said drainage ways or for the control of erosion. Each property owner shall keep the natural drainage channels traversing his property clean and free of debris, silt, or any substance, which would result in unsanitary conditions. The City shall have the right of ingress and egress for the purpose of inspection and supervision of maintenance work by the property owner to alleviate any undesirable conditions, which may occur.

b. The natural drainage channel, as in the case of all natural drainage channels, are subject to storm water overflow and natural bank erosion. The City shall not be liable for damages of any nature resulting from the occurrence of these natural phenomena, nor resulting from a failure of any structure(s) within the natural drainage channels. The natural drainage channel crossing each lot is shown by the floodplain easement line as shown on the plat. If a

Subdivision alters the horizontal or vertical floodplain, a FEMA floodplain map revision may be required.

5.On residential subdivisions with lots less than one-half (½) acre, the land shall be subdivided such that the fully developed floodplain does not encroach into any of the residential lots but entirely contained within common area lots.

Cross Roads

Code of Ordinances, Cha. 3 Building Regulations

Article 3.11 Landscaping and Scenic Conservation https://ecode360.com/40273324

§ 3.11.001**Scope and purpose.**

(a) The purposes of this article are to provide guidelines and standards that will:

(1) Contribute to the visual quality of the community;

(2) Encourage continuity within and between developments;

(3) Provide screening and/or buffering between different land uses;

(4) Reduce soil erosion and damage resulting from stormwater run-off;

(5) Be complementary to the tree preservation and protection ordinance (article **3.08** of this code); and

(6) Support the environmental quality of the town.

Article 3.08 Tree Preservation and Protection

§ 3.08.005 Tree Preservation and Protection https://ecode360.com/40273133#40273172

Ch. 10 Subdivision Regulation https://ecode360.com/42789414

Article 10.07 Developmental Requirements

§ 10.07.008 Easements

(c) Floodplain easements shall be provided on sites along natural creeks to encompass the fully developed 100-year floodplain plus a ten (10) foot buffer on both sides.

Denton

Development Code: Subchapter 7 Development Standards; 7.4 Environmentally Sensitive Areas (ESAs)

Covers: Floodplain Development ESAs, Riparian Buffer and Water-Related Habitat ESAs, Cross Timbers Upland Habitat ESAs, Development Clustering

Environmentally Sensitive Area Primer, page 27
https://www.cityofdenton.com/DocumentCenter/View/493/ESA-Primer-PDF

Waterway Drainage Area	Riparian Buffer from the Centerline	Total Riparian Buffer Width
Less than one (1) square mile	50 feet	100 feet
Greater than one (1) square mile	100 feet	200 feet

Table 3: Riparian buffer width is based on the waterway drainage area

Design Criteria Manuals – covers Stormwater and Floodplain criteria https://tx-denton.civicplus.com/DocumentCenter/View/8462/City-of-Denton-Design-Criteria-Manual?bidId=

Subchapter 7 – Development Standards; 7.5 Drainage; 7.5.3 General Drainage Requirements

https://library.municode.com/tx/denton/codes/development_code?nodeId=CITY_DENTONDECO_SUBCHAPTER_7DEST_7.5DR_7.5.3GEDRRE

H. Floodplain Reclamation-Engineering Criteria.

1. Water Surface Elevation.

a. Alterations of the floodplain shall not result in an increase in the 100-year fully developed watershed water surface elevation on other properties under separate ownership.

b. Alteration of the floodplain that could result in any degree of increased flooding to other properties, adjacent, upstream, or downstream is prohibited.

2. Stream Velocity.

a. Alterations of the floodplain shall not create an erosive water velocity on- or off-site. The mean velocity of stream flow at the site, after fill, shall be no greater than the mean velocity of the stream flow under existing conditions.

b. Alteration to the flood plain that would increase velocities of flood waters to the extent that the significant erosion of flood plain soils will occur either on the subject property or on other properties up or downstream is prohibited.

c. City staff shall determine what constitutes an "erosive" velocity based on analysis of the surface material and permissible velocities for specific cross-sections affected by the proposed alteration, using criteria established in the Stormwater Design Criteria Manual.

3. Valley Storage.

a. Encroachments and/or channelization is strongly discouraged along Pecan, Cooper, Hickory Creek, Milam, and Clear Creeks to prevent the reduction of storage capacity of streams and drainage ways and to prevent increasing discharges downstream.

b. The city restricts the valley storage loss to zero percent reduction for all streams serving with a drainage basin of one square mile or greater in the city. For minor tributaries (drainage basins with less than one square mile), a 15 percent maximum reduction in valley storage shall be allowed.

4. Conveyance. Alterations of the flood plain shall be permitted only to the extent permitted by equal conveyance on both sides of the natural channel. Staff's calculation of the impact of the proposed alteration shall be based on the "equal conveyance" principle in order to insure equitable treatment for all property owners. Under equal conveyance, if the city allows a change in the flood carrying capacity (capacity to carry a particular volume of water per unit of time) on one side of the stream due to a proposed alteration of the flood plain, it shall also allow an equal change to the owner on the other side. The combined change in flood carrying capacity, due to the proposed alteration, plus corresponding alteration to the other side of the stream, shall not cause either an increase in flood elevation or an erosive velocity, or violate the other criteria.

I. Floodplains. Where regulations within this section require a development to make any drainage improvements in or adjacent to a floodplain to provide for the ultimate base flood, the permittee may, in lieu of making the required improvements, restrict development in the area subject to flooding because of the failure to provide for the drainage improvements. In such cases, the area to be left undeveloped shall be dedicated to the public as a floodplain and drainage easement on the final plat.

1. Floodplain Restrictions.

a. Development is prohibited within the floodplain of any stream or water course with a contributing drainage area of one square mile or more. These floodplain areas shall be preserved from all destruction or damage resulting from clearing, grading, or dumping

of earth, waste or material, or stumps. Modifications of this requirement shall be considered by the Floodplain Administrator.

b. The purpose of a floodplain easement is to preserve open space in an area subject to riverine flooding. Construction of new buildings within floodplain easements is prohibited. Filling, grading, or other activities that obstruct flood flows or remove flood storage are prohibited in floodplain easements. Floodplain easement regulations listed in this section also apply to drainage easements dedicated for the purpose of preserving floodplain areas as open space.

c. New fences shall not be permitted within the floodplain, regardless of whether or not there is a drainage easement. The Floodplain Administrator may approve exceptions to this prohibition for specific sites where adequate mitigation measures are provided, as determined by the Floodplain Administrator, such as provision of a breakaway area.

2. Stream Restrictions. Major streams (those with a contributing drainage area of one square mile or more) shall remain in open natural condition; smaller streams or drainage ways (contributing drainage area less than one square mile) may be channelized if allowed by Section 7.4: Environmentally Sensitive Areas, and provided they meet the criteria of the Stormwater Design Criteria Manual.

8.3 Subdivision Design; 8.3.4 Cluster Subdivisions

https://library.municode.com/tx/denton/codes/development_code?nodeId=CITY_DENTONDECO_SUBCHAPTER_8SU_8.3SUDE_8.3.4CLSU

Subchapter 7 – Development Standards; 7.7 Landscaping, Screening, Buffering and Fences; 7.7.5 Landscape and Tree Canopy Requirements

https://library.municode.com/tx/denton/codes/development_code?nodeId=CITY_DENTONDECO_SUBCHAPTER_7DEST_7.7LASCBUFE_7.7.5LATRCARE

3. Qualifying Types of Low Impact Development (LID) Designs. Low Impact Development (LID) options count toward required landscape if installed and maintained pursuant to the North Central Texas Council of Governments Integrated Storm Water Management (iSWM) strategies, including:

a. Bioswales: Bioswales are vegetated swales planted with wet tolerant species of plants or ornamental grasses. They transport, store, and allow infiltration of water, and can be designed as a landscape feature. Bioswales are not grassed, but are planted with a variety of plant species that can withstand occasional water inundation for short periods of time.

b. Grassed Swales: Grassed swales are designed conveyance devices used to transport water over the surface of the ground to a point of disposal that may be a catch basin, ditch, or

water body that will filter, infiltrate, evaporate, and clean the water of total suspended solids and other pollutants. Swales are often appropriate along property lines, public streets, and around buildings.

c. Bioretention Facilities: (a.k.a. Rain Gardens) Bioretention facilities are small shallow depressions planted with a variety of native or ornamental plants that can treat small amounts of runoff to improve water quality. Bioretention facilities are generally small collections of flood-tolerant plants planted on a low site area that naturally collects rainfall.

d. Sand Filters: Sand filters are depressions, trenches, barriers, or sand lens, constructed of porous mineral matter that improve ground water recharge, to filter, clean and trap waterborne pollutants.

Double Oak

Code of Ordinances, Ch. 13 Utilities

Article 13.600 Discharge Regulations of MS4 Storm Sewer System

§ 13.608 Stormwater Discharges Associated with Construction Activities
https://ecode360.com/39609386#39609547

(5) All operators, owners and contractors of construction activities shall use the North Central Texas Council of Governments (NCTCOG) integrated stormwater management (iSWM) criteria manual for site development and construction as a site development tool to minimize the discharge of pollutants to the MS4.

CH. 14A. Comprehensive Zoning Ordinance

§ 17 "FP" Floodplain Overlay Sub-District https://ecode360.com/39609705#39610092

17-1 General Purpose and Description of Flood Plain Overlay Subdistrict:

A flood plain overlay designation on the zoning map is a subdistrict zoning classification that refers to a specific area subject to flooding. When this subdistrict designation "FP" is noted on the official zoning map, it shall designate land areas that have been identified as areas of special flood hazard by flood insurance studies and officially designated as such by the Town Council. This subdistrict shall overlay the basic zoning classification of the property to provide appropriate regulation for the use of such land that has a history of inundation or is determined to be subject to flood hazards. Areas designated on the Zoning District Map by the "FP" overlay designation shall be subject to the following provisions:

17-2 Use Regulations:

A building or premises shall be used only for the following purposes:

1. Agricultural activities including the ordinary cultivation or grazing of land and legal types of animal husbandry permitted by the zoning regulations of the basic zoning district classification of the property.

2. Off-street parking incidental to any adjacent main use permitted in the district.

3. Parks, community centers, playgrounds, public golf courses (no structures), and other recreational areas.

4. Private open space as part of a Community Unit Development of Planned Residential Development.

5. Other uses but only when approved by Specific Use Permit, as provided for in this ordinance.

17-3 No building or structure shall be erected in that portion of any land having a Flood Plain "FP" overlay designation until and unless such building or structure has been approved by the Town Council after engineering studies furnished by the landowner have been made and it is ascertained that such building or structure is not subject to damage by flooding and would not constitute an encroachment, hazard, or obstacle to the movement of flood waters and that such construction would not endanger the value and safety of other property or the public health and welfare.

17-4 An area may be removed from the Flood Plain designation when, through drainage work, grading, flood protection, or specific drainage study, it is determined by the Town Council that the flood hazard has been alleviated.

17-5 The fact that land is, or is not, within a district having a Flood Plain designation shall not be interpreted as assurance that such land or area, is or is not, subject to periodic local flooding.

Flower Mound

Code of Ordinances; Subpart A General Ordinances; Ch. 70 Utilities; Article XII Stormwater Quality Management and Discharge Control

Sec. 70-1015. - Watercourse protection.
https://library.municode.com/tx/flower_mound/codes/code_of_ordinances?nodeId=SPAGEOR_CH70UT_ARTXIISTQUMADICO_DIV3RERE_S70-1015WAPR

Every person or entity owning property through which a watercourse passes, or such owner's lessee shall keep and maintain that part of the watercourse within the property reasonably free of trash, debris, excessive vegetation, and other manmade or unnatural obstacles that would pollute, contaminate or significantly retard the flow of water through the watercourse. In addition, the owner or lessee shall maintain existing privately owned structures within or adjacent to a watercourse. The owner or lessee shall not remove healthy bank vegetation in such a manner as

to increase the vulnerability of the watercourse to erosion. The property owner or such owner's lessee shall be responsible for maintaining and stabilizing that portion of the watercourse that is within their property lines in order to protect against erosion and degradation of the watercourse originating or contributed from their property.

Cross Timbers Conservation Development District requirements can be found at https://library.municode.com/tx/flower_mound/codes/code_of_ordinances?nodeId=SPBLADERE_CH98ZO_ARTIIIDIRE_DIV3AAGDICODIRUDE_S98-277CODEOPST

Subpart B LAND DEVELOPMENT REGULATIONS; CH. 98 Zoning; Article II. SmartGrowth Program; Division 4. Criteria Categories and Applications; Subdivision F. Environmental Quality

https://library.municode.com/tx/flower_mound/codes/code_of_ordinances?nodeId=SPBLADERE_CH98ZO_ARTIISMPR_DIV4CRCAAP_SDFENQU_S98-145WAPR

Sec. 98-145 – Watershed Protection

(a) Restrictions; purpose. No development application or project with a project area greater than one and one-half acres shall be approved if the projected velocity exceeds predevelopment conditions or runoff exceeds the runoff that would occur for single-family residential development, with any additional runoff projected to be generated by development being retained on site and absorbed, evaporated and/or released from the development at a rate not exceeding single-family residential conditions. Erosion-control and pollution-prevention plans shall be adequate to prevent erosional and depositional features such as gullies and accumulations of silt attributable to site development, with such adequacy being determined by the town. The proposed development site design shall include "best management practices," as defined in the town's engineering standards manual. "Best management practices" may include, but are not limited to, the following types of structural and nonstructural practices: wet ponds, dry extended detention ponds, infiltration basins and trenches, porous pavement, bio-retention, organic filters, buffer zones, open space design, urban forestry, conservation easements, stormwater wetlands, grassed swales and filter strips, green parking, alternative turnarounds and water quality inlets. "Best management practices" will be included in a watershed-protection plan and said watershed-protection plan shall evaluate and minimize potential drainage impacts that could negatively affect, destroy or otherwise compromise on- and off-site surface and subsurface water quality, sensitive environmental features (such as riparian vegetation, trees, soils or grassland and prairie vegetation) and wildlife habitats (including terrestrial and aquatic). The watershed-protection plan shall be prepared by a qualified individual or firm designated by the town and must be approved by the town prior to any site development by an applicant. The purpose of this criterion is to mitigate the ill effects of increases in velocity, volume, and pollution of surface runoff on downstream property owners and to protect the overall water quality of the town as a result of rapid and intense urbanization.

(b) Application. For residential projects, applicable to applications for development plans and record plats. For nonresidential projects, applicable to applications for record plats and site plans.

Ch. 90 Subdivisions; Article VI. Standards; Division 8 Parks and Recreational Areas; Sec. 90-449 Park Credit Option
https://library.municode.com/tx/flower_mound/codes/code_of_ordinances?nodeId=SPBLADERE_CH90SU_ARTVIST_DIV8PAREAR_S90-449PACROP

(2) Open space easement. All publicly accessible open space accepted by the town in lieu of otherwise required park land dedication, or the payment of fees in lieu thereof, shall be dedicated to the public as a permanent public access easement, reflected on the face of a plat. All such open space shall be maintained by the property owner(s) or the property owners' association. Changes to a dedicated open space access easement are permitted only after town council approval following a recommendation by the town parks board. Changes to an open space access easement may not reduce the amount of council-approved open space, the amount of land that is publicly accessible, or the accessibility standards outlined in the easement.

(f) Open space types and credit calculation. each area of open space that meets the requirements of this section shall be eligible to receive a town council approved reduction in the amount of park land dedication, or fee payment in lieu thereof, otherwise required. The amount of credit that may be granted for eligible open spaces shall be dependent on whether additional or enhanced amenities are provided, as described herein. Each proposed open space shall be subject to the following open space type-specific criteria and maximum credit eligibility limitations. The planning department shall maintain representative examples of each open space type to provide illustrative guidance, the guide to open space types, on the design, development, character, activation, and location for each open space type.

…

(2) Natural area. A natural area is open space which consists of areas in the flood plain, upland habitat, creeks, water bodies, topographical slopes, and other environmentally sensitive areas. Amenities within the natural area shall be limited to nature trails, paths, and equestrian trails. The size of a natural area may vary depending upon the environmental element being preserved. Natural areas may also be subject to a conservation easement.

a. A natural area must, at a minimum, incorporate the following amenities:

1. A natural area must connect to any trail identified on the town's parks and trails master plan, if the planned trail is present within the development (or contiguous with the development) and is located within 300 feet of the natural area. The natural area must also be accessible from the development's planned commercial or residential areas through the installation of an interconnected system of sidewalks or trails.

2. Paved and/or natural trails that traverse the natural area must be provided, including a defined entrance and signage.
3. Wildlife viewing areas, mountain biking, disc golf, interpretation and education facilities, where conditions permit, are optional but are encouraged.

b. Lighting. Exterior lighting is prohibited except in limited circumstances where low voltage accent lighting may be appropriate.
c. Signage. A natural area may include interpretive kiosks, as deemed appropriate.
d. Landscape design. Natural areas shall incorporate landscaping at entryways or around structures where appropriate. In these situations, sustainable design is preferred.
e. Credit option. If the development satisfies the standards above, the town council may approve a credit towards the required park land dedication, or fees in lieu thereof, on a per acre basis, at a ratio of one and one-half acres of required park land for every one acre of natural area open space provided. In the event additional or enhanced amenities are provided, the town council may increase the credit to a ratio of no more than two and one-quarter acres of required park land for every one acre of natural area open space provided.

…

(9) Calculation. Calculation of the open space eligible for credit shall be in accordance with the following:

a. Eligible open space shall exclude all rights-of-way or easements for streets or alleys, required street buffers and setbacks, required screening and landscaping for parking, storage and refuse areas, parking, parking lot tree islands, utility yards, town trail extensions as outlined in the town parks and trails master plan, and all area plan requirements as set out in the master plan.

b. Floodplain or water impoundments, as identified in section 98-148, shall only be eligible for credit in the natural area open space type. The maximum amount of floodplain or water impoundment that may be counted toward open space credit shall not exceed 50 percent of the allowable natural area open space credit applied to the development. Any amount of floodplain or water impoundment that exceeds this limitation shall be excluded from the credit calculation.

c. Areas of proposed natural area and park open space: 1) containing grades subject to section 98-147, governing topographical slope protection, 2) located outside of the floodplain, and 3) which prohibit public access, may be counted toward up to 50 percent of the allowable natural area or park open space credit only. The remaining 50 percent of the proposed natural area or park open space must not be subject to the protections set forth in section 98-147 and must be publicly accessible.

Frisco

Part II Code of Ordinances; CH. 82 Subdivision Ordinance; Section 8 Subdivision Requirements; Section 8.03 Drainage and Environmental Standards

https://ecode360.com/45517431

(e) Major Creeks.

(1) 100-Year Floodplain Restrictions. For the health, safety and welfare of the City's residents and for the conservation of water, storm drainage and sanitary sewer facilities, the City prohibits development of any portion of a property that lies within the 100-year floodplain of any Major Creek. Major Creeks shall be protected from destruction or damage resulting from clearing, grading, and dumping of earth, waste or other foreign materials. Clearing, grading, excavation or filling of any area within the 100-year floodplain or within any Major Creek shall be prohibited unless authorized in writing by the City.

(2) Major Creek Restrictions. All Major Creeks (See Diagram 8.03-1, Section 12) shall be maintained in an open natural condition. Each Major Creek is subject to the following requirements for all types of development:

a. The 100-year floodplain and Erosion Hazard Setback shall be dedicated on the Final Plat to the City as a single lot or may be owned and maintained by an HOA, pursuant to Section 8.11 of this Ordinance. At no time shall any portion of the 100-year floodplain exist or be within any single-family or two-family residential lot. Erosion Hazard Setback requirements are located in the Engineering Standards.

b. The Commission may waive any of these dedication requirements for a Replat that was originally platted prior to the adoption of this requirement (i.e., the adoption date of the City's Major Creek Ordinance No. 99-09-25, which was on September 21, 1999).

…..

(8) Exceptions for Planned Development. For properties which have an approved Concept Plan that is part of a Planned Development Ordinance adopted prior to the effective date of the Major Creek Ordinance (Ordinance No. 99-09-25), subsection (e)(6) shall not apply; provided, however, said properties are subject to the following conditions:

a. Any lot that backs to the 100-year floodplain shall have a minimum rear yard setback of twenty-five feet (25');

b. Any lot that sides to the 100-year floodplain shall have a minimum side yard setback of fifteen feet (15').

c. Alternating cul-de-sacs and looped streets shall be provided at intervals not to exceed twelve hundred feet (1,200') for access to the 100-year floodplain; and

d. The 100-year floodplain shall be available to public access from the end of a cul-de-sac.

(9) Additional Studies. At the request of the City, the property owner shall submit additional studies, including but not limited to the following, as deemed appropriate and necessary by the City, as part of the Preliminary Plat submittal requirements. These studies shall be considered during review and approval of the Preliminary Plat.

a. Wetland Delineation Study;

b. Habitat Study;

c. Vegetative Study;

d. Erosion Hazard Setback Study;

e. Storm Drainage Study;

f. Riparian (i.e., Tributary) Study;

g. Flood Study; and

h. Downstream Assessment Study.

Ch. 63 Zoning Ordinance; Section 4 Site Development Requirements; Subsection 4.10 Residential Cluster Development Option (not pasting entire code)

https://ecode360.com/45146389

Subsection 4.11 Voluntary Buffer Areas for Creeks and Tributaries

https://ecode360.com/45146452

§ 4.11.02 Benefits of Voluntary Buffer Area.

(A) By allowing the Voluntary Buffer Area to remain undisturbed, residential developments receive a density bonus for the remaining portion of the property.

(B) Area may be counted toward open space requirements.

(C) Other benefits may include avoiding costly and lengthy permit processes and studies by the U.S. Army Corps of Engineers, and incorporation of desirable open space thereby increasing the property value.

(Ordinance 2021-07-47 adopted 7/6/21)

§ 4.11.03 Boundaries of Voluntary Buffer Area.

(A) Riparian buffer and Riparian Buffer Map. Riparian buffers shall be provided as identified by the Director. The Director shall establish and maintain a Riparian Buffer Map. The total buffer width shall be divided equally on both sides of the tributary and in addition to the Erosion Hazard Setback (EHS) in the City's Engineering Design Standards (if applicable).

(B) Major creeks. Major Creek buffers shall be one hundred (100) feet measured from the EHS on both sides of the creek.

(C) Supplemental area.

(1) Tributaries and major creeks also may include other areas to be preserved, identified through any Army Corps of Engineers Section 404 Permit Process.

(2) The Director may also consider supplemental information when making a determination of buffer width or the requirement for a buffer, such as but not limited to:

a. Field verification;

b. Aerial photography; and/or

c. A determination by the U.S. Army Corps of Engineers or a qualified environmental scientist of the presence or absence of jurisdictional wetlands and waters of the United States.

Stormwater Fee Credit Program allows credits to non-residential properties who use stormwater management techniques to reduce pollutants and aid in protecting waterways. Can be found here: https://www.friscotexas.gov/531/Stormwater-Utility-Fee.

Ch. 34 Environment; Article X Stormwater Feature Maintenance

https://ecode360.com/38353676

Engineering Design Standards; Section 4 – Drainage Design Requirements; Page 4-27

https://www.friscotexas.gov/DocumentCenter/View/39413/2025-Design-Standards-ONLY

K. An Erosion Hazard Setback shall be included within the Floodplain Drainage Easement for the channel. The purpose of this setback is to reduce the potential for any damage to property or infrastructure caused by the erosion of the bank. The erosion hazard setback shall be determined as follows, and is provided in Figure 4.4:

1. For stream banks composed of material other than rock, locate the toe of the natural stream bank. Project a 4:1 line sloping away from the bank until it intersects finished grade. From this intersection add 15-ft away from the bank. This shall be the limit of the erosion hazard

setback. For stream banks composed of rock, the 4:1 line may start at the top of rock in the creek bank.

2. Figure 4.4 is intended to illustrate various scenarios under which the erosion hazard setback can be applied. Scenario 1 shows a situation where the setback may be located outside the Floodplain boundaries. Scenarios 2 and 3 show locations where the erosion hazard setback will be located inside the Floodplain boundaries

Section 4.15 Floodplain Alterations; Page 4-30

5. Alterations shall result in no loss of valley storage for a Major Creek, as defined by the Subdivision Ordinance, and a 15% maximum loss of valley storage for any other tributary for any reach, except at bridge and culvert crossings where it can be proven that there are no detrimental effects downstream.

Section 4.18.C Best Management Practices; Page 4-33

2. Biofiltration (Page 4-36)

a. May be included within open space if open space ordinance Subsection 4.13.03 (Nonresidential Open Space Requirements) of Section 4 (Site Development Requirements) of the Zoning Ordinance is met.

b. Reference landscape ordinance Subsection 4.02 (Landscape Requirements) of Section 4 (Site Development Requirements) of the Zoning Ordinance and the Approved Plant Materials on the City Website for plantings to increase vegetative filtration and uptake of stormwater pollutants.

c. Maximum drainage area is five (5) acres per biofiltration system. Multiple biofiltration systems may be required.

d. Biofiltration system shall provide storage capacity for the WQv. The maximum ponding depth is twelve inches (12) above finished grade and contained within the biofiltration system.

e. Drain time shall not exceed forty-eight (48) hours.

f. Engineered media or manufacturers product can be used to adjust coefficient of permeability. Design the coefficient of permeability to include a safety factor of two (2). Minimum design permeability must be demonstrated after installation.

g. Include an underdrain system and overflow outlet.

h. Size overflow outlet for the 100-year storm event. Set outlet opening a minimum three inches above finished grade.

i. Inflow must travel through biofiltration system and not be directly connected to the outfall.

Section 8.02 Stormwater Management Plan (SWMP) Site Controls [iSWM Technical Manual mentioned in this section and GSI BMPs]; Page 8-2

City of Frisco Guide to Developing Near Streams -
https://www.friscotexas.gov/DocumentCenter/View/909/Developing-Near-Streams-PDF?bidId=

Grapevine

Appendix D – Zoning Ordinance No. 82-73

Sec. 51 – Requirement for Open Space and Recreational Areas

https://library.municode.com/tx/grapevine/codes/code_of_ordinances?nodeId=PTIICOOR_APXDZORDNO82-73_S51REOPSPREAR

C. Character and minimum area:

1. Land dedicated or otherwise set aside for open space and park and recreational areas shall be of such size, dimensions, topography, and general character as is reasonably required for the type of use proposed, e.g., open space buffer, active recreation for team or individual sports, playground, tot lot, picnic area, etc.

2. Unique natural areas or flood plains which provide an opportunity for linkage parks may be included in areas dedicated or otherwise set aside or reserved for open space.

3. The minimum amount of open space and park recreational area that shall be dedicated or otherwise reserved pursuant to this Section 51 shall be:(a)In the R-20, R-12.5, R-7.5, R-5.0, and R-TH Districts, 300 square feet per dwelling unit.(b)In all other residential districts, including the PRD-6 and PRD-12 Districts, the open space and recreational area requirements shall be observed.

4. No land dedicated or otherwise reserved in compliance with this Section 51 shall have dimensions smaller than 100 feet in width and 150 feet in depth. In any development which includes wooded areas, flood plains, or other natural amenities which it is desirable to maintain, the city council may grant an exception from the strict application of these minimum dimensions whenever it determines that by doing so the protection and preservation of such areas will be promoted.

Hickory Creek

Code of Ordinances, CH. 3 Building Regulations, Article 3.07 Floods and Drainage, Division 3 Stormwater

Sec. 3.07.085. - Stormwater discharges from construction activities.
https://library.municode.com/tx/hickory_creek/codes/code_of_ordinances?nodeId=CH3BURE_ART3.07FLDR_DIV3ST_S3.07.085STDICOAC

(a) *General requirements.*

(1) All operators of construction sites shall use best management practices to control and reduce the discharge, to the MS4 and to waters of the United States, of sediment, silt, earth, soil, and other material associated with the demolition, clearing, grading, excavation, landfilling, and other construction activities to the maximum extent practicable, including any BMPs capable of installation and/or implementation prior to commencement of construction at the site or in compliance with a schedule for installation and/or implementation in the applicable SWPPP. Permanent BMPs required for post-construction water quality by the NPDES or TPDES General or other ordinances may be used during construction, as appropriate, for erosion, sediment or other pollutant control. They shall be restored to their post-construction function before development or redevelopment activities are completed. Such best management practices and erosion control measures are detailed in the North Central Texas Council of Governments (NCTCOG) iSWM criteria manual for site development and construction and may include, but not be limited to, the following measures:

Highland Village

Ordinances, Title II Buildings and Development, Exhibit 26A Subdivision Ordinance, IV Public Sites and Open Spaces – Section 4 https://ecode360.com/38963633

§ 4.3 Tree mitigation.

A. Tree mitigation plans required (preliminary and final). No subdivider, directly or indirectly, shall cut down, destroy, remove, transplant or effectively destroy through damaging, any protected and/or specimen tree on any real property within the City of Highland Village without first obtaining a final tree mitigation plan by city council. The unauthorized removal of any protected and/or specimen tree shall be a separate offense for the purpose of section 1.12. The preliminary tree mitigation plan shall accompany the preliminary plat and contain the following:

(1) The location, circumference measured at 4-1/2 feet above ground level, height, and common name of all protected and specimen trees contained on property represented on the preliminary plat (indicate by symbol).

(2) The location, caliper width, height, and common name of all trees contained on the preliminary plat that are proposed to be removed or transplanted (indicate by symbol).

(3) The location and dimensions of all existing or proposed public streets, deviations in right-of-way widths, public utility easements, public drainage easements, public fence easements, public pedestrian access easements or other public rights-of-way or easements.

(4) The location of all existing or proposed property lines, lot lines, building lines, setback and yard requirements, and other special relationships or significant features of the proposed subdivision.

(5) The information required herein shall be summarized in legend form on the site plan and shall include the reason for the proposed removal of the protected tree or trees.

B. Final tree mitigation plan. A final tree mitigation plan shall be submitted to the city council concurrent with the final plat. A condition of final plat submission is approval of all engineered construction plans that will affect the final tree mitigation plan. Engineered construction plans must be approved by the city and the final tree mitigation plan and final plat must be approved by the city council prior to the commencement of any site excavation work. Existing and proposed site elevations, grades and major contours must be shown on the final tree mitigation plan. For any tree mitigation plan, approved prior to the effective date of this amendatory ordinance, which deviates, as determined by the city manager or his designee, from the "as built" construction conditions, the applicant/developer may submit to the city council, or the city council may consider [on its own motion for (i) approval, or (ii) approval with conditions to be satisfied subsequent] an "as built" tree mitigation plan to be considered as a final tree mitigation plan under the provisions of this ordinance. Upon satisfaction of any conditions to approval, the applicant/developer shall submit to the city manager or his designee a final tree mitigation plan conforming to the approval with conditions.

§ 4.4 Protection of drainage and creek areas.

A. Definitions and methodology for determining the floodway management area (FMA). The definitions for "floodway" and "floodway fringe" shall correspond to those set forth by the Federal Emergency Management Agency (FEMA). For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist the local community in the aspect of floodplain management. Under this concept, the area of the 100-year flood is divided into a floodway and floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights as defined by FEMA. The area between the floodway and boundary of the 100-year flood is termed the floodway fringe. The floodway fringe is the area which can be used for development by means of fill according to FEMA and city engineering criteria. For the purposes of this ordinance, the floodway management area (FMA)

will correspond to the floodway as defined by FEMA. A FMA is not required adjacent to Lake Lewisville for areas regulated by the Corps of Engineers.

B. Areas where an FMA is required. All drainage areas or regulated floodways as referenced by panel numbers 481105 001 A (or current panel) on the floodway and flood boundary map (FIRM maps) shall be included in the FMA. If FEMA does not specify a floodway zone in any of the above creeks or their tributaries, it shall be the developer's responsibility to establish and identify the FMA. The determination shall be made by a registered professional engineer and in accordance with the flood hazard prevention ordinance and approved by the city engineer. Where improvements to a drainage area are required by other ordinances of the city for the purpose of safety or other reasons related to drainage, those ordinances shall also be observed. The FMA is intended to apply to a creek or channel which is to remain open or in its natural condition. The creek shall remain in its natural state unless improvements are permitted by the city due to the pending development of properties adjacent to or upstream of the required improvements.

C. Ownership and maintenance of the FMA. The area determined to be the FMA shall be designated on and as part of the final plat. Approximate locations shall be shown on zoning change requests and preliminary plats. At the city's option, the FMA shall be protected by one of the following methods:

1. Dedicated to the City of Highland Village; or

2. Easement(s). Creeks or drainageways in tracts which have private maintenance provisions, other than single[-family] or two-family platted lots, can be designated as the FMAs by an easement to the city on the final plat. Subdivisions with platted single-family or two-family lots may designate the FMA by easement, provided there is adequate maintenance provisions, but no lots or portions of lots may be platted in the easement unless specifically allowed by the city. The area designated as FMA may be identified by a tract number; or

3. Certain recreational uses normally associated with or adjacent to floodprone areas (no structures allowed in the FMA), such as golf courses. The uses allowed shall be in conformance with the zoning code and approved by the planning and zoning commission and city council. Prior to acceptance of any drainageway as an FMA by the city, the area shall be cleared of all debris. Floodway management areas dedicated to the city shall be left in a natural state except those areas designated for recreational purposes.

D. Design criteria. The following design criteria shall be required for development adjacent to the FMA:

1. Adequate access must be provided along the FMA for public or private maintenance. An unobstructed area a minimum of 20 feet wide with a maximum 5:1 slope (five feet horizontal to one foot vertical), the length of the floodway shall be provided adjacent to or within the FMA. On the opposite side of the drainage area, an unobstructed area having a minimum width of five feet shall be provided.

2. Lots in the single-family, PD single-family or duplex residential zoning districts shall not be platted in the FMA. If lots back to an FMA, at least two reasonable points of access to the FMA, a minimum of 20 feet in width, shall be provided. Streets and alleys may qualify as access points. All areas of the FMA must be accessible from the access points. Lots used for multifamily may be platted in the FMA if the FMA is identified as an easement and is maintained as open space for use by the residents.

3. Public streets may be approved in the FMA by the planning and zoning commission and city council (if they conform to applicable engineering standards).

4. Public streets may be required to be constructed adjacent to some portions of the FMA to allow access for maintenance or recreational opportunities.

5. Alternate designs to facilitate equal or better access may be permitted if approved by the city engineer.

E. [Exemption.] Drainage areas which have been altered and are not in a natural condition can be exempted from an FMA and this section at the discretion of the city council upon recommendation of the city engineer.

Developer Funded Recreational Areas https://ecode360.com/38962959

§ 26.03.001Purpose.

The purpose of this article is to ensure that sufficient land and facilities are provided to meet the recreational demands and needs of those residents of the city that are created as a result of new residential growth and development. The city finds that linear parks provide passive open space and recreational opportunities for city residents, such as bicycling, running, walking and roller skating. Linear parks also protect natural systems, preserve remaining native tree stands and significant vegetation, and provide riparian habitat for wildlife, all of which are enjoyed by city residents. Consequently, it is the city's intent to require the dedication of linear park land in accordance with the parks and open space master plan as a condition of plat approval, subject to credits as such are defined in this article.

Title I General Ordinances, Ch. 22 Utilities, Article 22.11 Stormwater Management, Division 3 Post-Construction Runoff Control

https://ecode360.com/38961874

§ 22.11.111 Structural stormwater practices.

Owners are required by the city to implement structural measures to reduce runoff volumes and velocities at sites where downstream infrastructure is insufficient to accommodate developed

flows. The following methods shall be considered appropriate for consideration as structural stormwater practices:

(1) Swales and channels;

(2) Culverts, inlets and pipes;

(3) Detention;

(4) Energy dissipaters;

(5) Infiltration trenches;

(6) Stormwater ponds;

(7) Porous surfaces; and

(8) Re-use (rain harvesting, etc.).

Justin

Code of Ordinances, Ch. 52 – Unified Development Code, Article V. Subdivision

Sec. 52-506 – Design Requirements
https://library.municode.com/tx/justin/codes/code_of_ordinances?nodeId=COOR_CH52UNDECO_ARTVSU_S52-506DERE

(2) Final Plats

(i) Floodplain restrictions.

(1) If a floodplain easement is required or proposed, the following full statement of restriction shall be placed in the dedication instrument on the subdivision plat.

"FLOODPLAIN RESTRICTION

No construction shall be allowed within the floodplain easement, without the prior written approval of the City. In order to secure approval, detailed engineering plans and/or studies for the improvements, satisfactory to the City, shall be prepared and submitted by the party or parties wishing to construct within the floodplain. Where construction is permitted, all finished floor elevations shall be a minimum of two (2) feet above the 100 year design frequency storms elevation. Any construction approved within the floodplain shall not unacceptably increase the 100-year design frequency storm elevation."

(2) The following statement shall be required when an unlined improved drainage channel, in a drainage easement, or when a floodplain easement is proposed.

"FLOODPLAIN/DRAINAGEWAY MAINTENANCE

The existing creeks, streams, or ponds (drainage ways) traversing along or across portions of this addition, will remain unobstructed at all times and will be maintained by the individual lot owners, homeowner's association or approved maintenance entity whose lots are traversed by or adjacent to the drainage ways. The City of Justin will not be responsible for the maintenance, erosion control, and/or operation of said drainage ways. Property owners shall keep the adjacent drainage ways traversing their property clean and free of debris, silt or other substances which would result in unsanitary conditions, and the City shall have the right of entry for the purpose of inspecting the maintenance work performed by the property owners. The drainage ways are occasionally subject to storm water overflow and/or bank erosion that cannot be defined. The City of Justin shall not be liable for any damages resulting from the occurrence of these phenomena, nor the failure of any structure(s) within the drainage ways. The drainage way crossing each lot is contained within the floodplain easement lines as shown on the plat."

(3) If a floodway easement is required or proposed, the following full statement of restriction shall be placed in the dedication instrument of the subdivision plat.
"FLOODWAY RESTRICTION
No encroachment, including fill, new construction or improvements shall be allowed within the floodway easement."
Article III. Subdivision Design Standards, Sec. 42-90 Storm Drainage Facilities
(d) Where topography or other conditions are such as to make impractical the inclusion of drainage facilities within public rights-of-way, drainage easements shall be provided across private property to an acceptable outfall or to other public right-of-way.

(1) Drainage easements with a minimum width of 15 feet shall be provided for existing and proposed underground drainage systems. When the system consists of larger diameter pipe or when the depth of the system or the soil conditions dictate, additional easement width shall be provided.

(2) Drainage easements along proposed or existing improved drainage channels shall provide sufficient width to include a channel designed to convey a 100-year design frequency storm plus one foot of free board within its banks and an additional width of 15 feet along each side shall be required to provide ingress and egress for proper maintenance of the facility. The access portion of the easement shall be above the 100-year design frequency storm elevation and accessible to vehicles and equipment. The entire drainage easement shall remain unobstructed at all times. Access to the channel easement must also be provided at a maximum of 1,200 foot spacing along streets or other public right-of-way.

(3) When a proposed drainage system will convey or discharge storm flow across or onto private property outside the subdivision or addition, appropriate drainage easements must be secured by the subdivider.

(4) The widths and lengths of the drainage easements described in items (1) through (3) above shall be substantiated by a drainage study and drainage calculations or other criteria submitted to and approved by the city.

(e) Proposed subdivisions containing a Federal Emergency Management Agency (FEMA) area of special flood hazard must comply with the provisions of the city's flood damage prevention regulations. Floodplain easements shall be provided along natural channels, major creeks, lakes, detention ponds and retention ponds. Floodplain easements shall encompass all areas beneath the water surface elevation resulting from a storm whose design frequency is 100 years, plus such additional width as may be required to provide ingress and egress to allow for the maintenance of the facility and for the protection of adjacent property, as determined and required by the city. The access portion of the easement shall be above the 100-year design frequency storm elevation.

(1) All floodplains or regulated floodways presented on the flood insurance rate map (FIRM) shall be shown on the plat. If the above referenced maps do not specify a flood area along any of the above creeks or their tributaries, it shall be the subdivider's responsibility to establish and identify needed easements.

(2) The city council may, when it deems it necessary for the health, safety or welfare of the present and future population of the area and necessary to the conservation of water, wastewater and drainage facilities prohibit development of any portion of the property which lies within a floodplain. Such a floodplain shall be preserved from any and all destruction or damage resulting from clearing, grading, or dumping of earth, waste material, or stumps, except as specifically approved by the city. When floodway easements, within a floodplain easement, are required or proposed, they shall be shown along the improved or unimproved drainage way. Floodway easements are the unobstructed portion of the floodplain consisting of the primary channel and overbank areas capable of conveying the 100-year frequency discharge without increasing the design flood elevations as defined by FEMA.

Krugerville

Code of Ordinances, Ch. 10A Subdivision Ordinance, Part VIII Design Provisions, Article 45 Easements

45-104. Floodplain Easements: Floodplain easements shall be provided along natural drainage ways and lakes or reservoirs. Floodplain easements shall encompass all areas beneath the water surface elevation resulting from a storm whose design frequency is 100 years, plus such

additional width as may be required to provide ingress and egress to allow maintenance of the banks and for the protection of adjacent property, as determined and required by the City Engineer.

The following full statement of restrictions shall be placed in the dedication instrument of the subdivision plat:

Floodplain Restriction

No construction, without the written approval of the City of Krugerville shall be allowed within a floodplain easement, and then only after detailed engineering plans and studies show that no flooding will result, that no obstruction to the natural flow of water will result; and subject to all owners of the property affected by such construction becoming a party to the request. These engineering studies shall be done in compliance with FEMA (Federal Emergency Management Agency) guidelines which address acceptable studies, methods and limits of work done inside the 100-year floodplain. Where construction is permitted, all finished floor elevations shall be a minimum of one (1) foot above the 100-year flood elevation.

The existing creeks, lakes, reservoirs, or drainage channel traversing along or across portions of this addition will remain as an open channel at all times and will be maintained by the individual owners of the lot or lots that are traversed by or adjacent to the drainage courses along or across said lots. The City of Krugerville will not be responsible for the maintenance and operation of said drainage ways or for the control of erosion. Each property owner shall keep the natural drainage channels traversing adjacent to his property clean and free of debris, silt, or any substance which would result in unsanitary conditions and the City shall have the right of ingress and egress for the purpose of inspection and supervision of maintenance work by the property owner to alleviate any undesirable conditions which may occur. The natural drainage channel, as in the case of all natural drainage channels, are subject to stormwater overflow and natural bank erosion to an extent that cannot be definitely defined. The City of Krugerville shall not be liable for damages of any nature resulting from the occurrence of these natural phenomena, nor resulting from a failure of any structure(s) within the natural drainage channels. The natural drainage channel crossing each lot is shown by the floodplain easement line as shown on the plat.

Keller

Code of Ordinances, Part III Unified Development Code, Article Five Subdivision Design and Improvement Requirements

Section 5.17 – Drainage
https://library.municode.com/tx/keller/codes/code_of_ordinances?nodeId=PTIIIUNDECO_ARTFIVESUDEIMRE_S5.17DR

Developers and builders must refer to the most current Flood Insurance Rate Maps (FIRM) and Flood Boundary-Floodway Maps prepared by the Federal Emergency Management Agency (FEMA) for the City of Keller to determine whether their property is within the boundaries of a designated Flood Hazard Area. Keller's Floodplain Administrator is the Director of Public Works. Plats are reviewed by the Director of Public Works or designee to determine that the potential for flooding in the area will not increase due to the proposed development, and that the proposed development is sufficiently protected from a 100- year frequency storm runoff from a fully developed upstream watershed. If the development area is within a Flood Hazard Area, construction cannot begin until the developer or builder has received an approved Floodplain Development Permit from the Director of Public Works (see Article Nine for permit form).

A. General Requirements.

1.Drainage Facilities. Drainage facilities shall be designed and constructed according to Design Standards and Technical Construction Standards of this UDC so that adequate facilities are provided to serve the development and the entire fully developed watershed. The developer is responsible for construction of all drainage facilities as identified in the drainage study and, in the event that underground water is encountered, a subsurface drainage system shall be installed with discharge of said system being carried to the nearest storm drain system or natural water shed system. The developer shall provide all necessary easements and rights- of-way for drainage facilities.

2. Natural Drainage Pathway. The developer shall ensure that the Post-Development runoff follows the Pre-Development drainage pathway and that the natural water-course is of adequate size to convey peak runoff.

3. No Adverse Effects on Other Properties. The developer shall be responsible for the necessary facilities to provide drainage controls such that properties within the drainage area, whether upstream or downstream of the development, are not adversely affected by runoff from the development.

4. Developer and Engineer Responsible for Design. The requirements set forth in Design Standards and Technical Construction Standards of this UDC are considered minimum requirements. The developer and his engineer shall bear the total responsibility for the adequacy of the design. The review of the drainage design plans by the Director of Public Works or designee in no way relieves the developer of this responsibility.

B. Design of Facilities.

1. Standards. Design and construction of storm sewer systems shall be in accordance with Design Standards and Technical Construction Standards of this UDC. Natural drainage courses, curbs, inlets, manholes, etc., shall be designed and constructed in accordance with these standards.

2. Drainage Study. A drainage study shall be provided for each development in accordance with Design Standards and Technical Construction Standards of this UDC. The study shall be provided to insure that all upstream and downstream watershed components are accounted for and will not be adversely impacted. Adverse impact is considered a tenth of a foot (0.1') maximum increase for one (1), ten (10), and one hundred (100) year water surface elevation (WSEL) and four thousandths of a foot (0.004') if the building is impacted. The study shall include a pre-development versus post development runoff analysis and a storm water runoff routing analysis designed to predict the post development runoff rate and the downstream drainage system ability to accommodate post development runoff.

C. Dedication of Drainage Easements.

1. General Requirements. When a subdivision or addition is traversed by a watercourse, drainage way, channel and/or stream, a drainage easement shall be required. The easement shall substantially conform to the natural alignment of the watercourse, and should be of such width and construction as will be adequate for the purpose (i.e., the easement shall be adequate for an open channel of natural appearance with landscaped banks and sufficient width for maximum potential volume of flow, unless otherwise approved by the City). Any increased velocity, depth, or flow rate shall be mitigated to predevelopment rates. An improved open drainage system or closed drainage system may be allowed if approved by the Director of Public Works as part of a master drainage study.

2. Access Easements. For any drainage easement to be maintained by the City, the property owner must provide sufficient access on each side of and parallel to all floodways and open drainage ways for drainage maintenance purposes. The access shall be above the base flood elevation and have a slope of 6:1 or less and be accessible by vehicles and equipment. Minimum access width and location shall be determined by the Director of Public Works or designee.

3. Drainage Easements. Where topography or other conditions are such as to make impractical the inclusion of drainage facilities within street rights-of-way, perpetual, unobstructed easements at least fifteen feet (15') in width, depending on slopes, for drainage facilities shall be provided across property outside the street rights-of-way and with satisfactory access to the street. Easements shall be indicated on the plat. Drainage easements shall extend from the street to a natural watercourse or to other drainage facilities. When a proposed drainage system will carry water across private land outside the proposed subdivision, an agreement from the property owner shall be secured by the developer.

4. Maintenance of Drainage Easements. Drainage easements will be the property owner's responsibility to keep unobstructed and maintained, including erosion control. Property owners shall keep these drainage ways on their property mowed, clean, and free of debris, silt, or other substances which would result in unsanitary conditions. The City of Keller shall not be responsible for the maintenance or erosion control of the area within the drainage easement.

D. Floodplain Dedication Requirement.

1. All areas within any subdivision located in a floodplain as referenced by the current panel number(s) on the FEMA Flood Insurance Rate Maps (FIRM) in place at the time of subdivision submittal or the City's Master Drainage Plan in effect at the time of submittal, shall be wholly contained in a public drainage easement.

2. The floodplain and floodway shall remain in their natural state except for areas designated for recreational purposes and permitted improvements by the City due to the pending development of properties adjacent to or upstream of the required improvements and.

3. Floodplains and floodways will be the property owner's responsibility to keep unobstructed and maintained, including erosion control. Property owners shall keep floodplains and floodways on their property mowed, clean, and free of debris, silt, or other substances which would result in unsanitary conditions. The City of Keller shall not be responsible for the maintenance or erosion control of the floodplains and floodway area.

4. Drainage easements that encompass floodplain areas shall be in accordance with the City's Drainage Master Plan for drainage facilities.

Section 5.24 – Design Standards
https://library.municode.com/tx/keller/codes/code_of_ordinances?nodeId=PTIIIUNDECO_ARTFIVESUDEIMRE_S5.24DEST

3. Drainage System Improvements.

a. General. The following contains minimum storm drainage design criteria and outlines the design procedures to be employed on drainage projects in the City of Keller.

Plans, profiles, and specifications will be prepared for storm sewer improvements to be constructed. The plans will show the appropriate watershed areas, drainage through the site and/or discharge point, storage volume calculations, run-off coefficient calculations, hydraulic gradients, flow arrows, and other details for the proposed pipe, inlets, manholes, culverts, outlet structures, and other appurtenances for the one (1), ten (10) and one hundred (100) year events. The plans will also show any proposed low impact design (LID) system plans including pervious pavement, bioretention areas, bioswales, etc. Each sheet of the plans and profiles will bear the seal and signature of the licensed professional civil engineer who is responsible for the design.

The developer will pay for the cost of all drainage improvements connected with development of the subdivision, including any necessary off-site channels or storm sewers and acquisition of any required easements.

Discharge of storm drainage will be at a point of adequate capacity or no adverse impact (as previously defined). This will require the developer to provide off-site drainage improvements if an adequate discharge point (defined an outlet of storm water, acceptable to the City Engineer, which does not create adverse impact) does not exist on-site as determined by the provisions provided herein.

Lake Dallas

Code of Ordinances, Ch. 94 Subdivisions, Article V. Drainage

https://library.municode.com/tx/lake_dallas/codes/code_of_ordinances?nodeId=COOR_CH94SU_ARTVDR_S94-154FLEA

Sec. 94-154. - Floodplain easements.

Floodplain easements shall be provided along natural drainageways and lakes or reservoirs. Floodplain easements shall encompass all areas beneath the water surface elevation resulting from a storm whose design frequency is 100 years (or a one-percent annual probability), plus such additional width as may be required to provide ingress and egress to allow maintenance of the banks and for the protection of adjacent property, as determined and required by the city engineer.

Ch. 106 – Utilities, Article IV. Municipal Drainage Utility System, Division 2. Municipal Drainage Utility System Fee Schedule

https://library.municode.com/tx/lake_dallas/codes/code_of_ordinances?nodeId=COOR_CH106UT_ARTIVMUDRUTSY_DIV2MUDRUTSYFESC_S106-125FECR

Sec. 106-125. - Fee credits.

(a) A property owner may petition the city to reduce the drainage utility fee for an individual property to account for on-site storm water management controls that reduce the property's impact to the drainage utility system.
(b) The petition shall be evaluated and the fee adjustment decision determined by the director of public works or the director's designated representative. The evaluation and determination performed by the director of public works shall be based on nondiscriminatory, reasonable and equitable terms in accordance with the Act and this article.

Little Elm

Code of Ordinances; Ch. 54 Flood Control and Prevention; Sec. 54-119 – Standard provisions for storm drainage
https://library.municode.com/tx/little_elm/codes/code_of_ordinances?nodeId=PTIICOOR_CH54FLCOPR_ARTVSTDRCO_S54-119STPRSTDR

(4) In lieu of the improvements of a channel draining an area with a "CA" factor in excess of 1,000, the town council may elect to accept the dedication of all land within the natural 100-year floodplain of the existing drainage channel as a permanent right-of-way.

Appendix – Engineering Design Standards; Sec. 3.0 Drainage Design Requirements.
https://library.municode.com/tx/little_elm/codes/code_of_ordinances?nodeId=PTIICOOR_CH107SUOR_APPENDIXENDEST_S3.0DRDERE

3.3.1.2.2 Post-Construction BMP Selection

Table 4 shows the minimum number of permanent BMPs required based on acreage of post-project impervious area:

Table 4: Minimum Number of Permanent BMPs Required

Impervious Area	Minimum Number of Permanent BMPs
< 5 acres	1
5 acres ≤ Impervious Area ≤ 20 acres	2
> 20 acres	3

The BMPs shall be designed to achieve the water quality design requirements as set forth in Section 3.3.1.3 . The iSWM Technical Manual for Site Development Controls provides guidance on the design and selection of permanent BMPs. It is the responsibility of the engineer to design BMPs that are appropriate address specific site conditions and meet the water quality standards.

Final stabilization of disturbed areas is required for all sites, regardless of size, and shall not be considered a permanent BMP. Final stabilization is defined as 80 percent coverage with no large bare areas on all portions of the site that are the responsibility of the developer.

3.3.1.3.2 Water Quality Volume Requirements

Studies have shown the 85th percentile storm event (i.e., the storm event that is greater than 85 percent of the storms that occur) is a reasonable target event to address the vast majority of

smaller, pollutant-loaded storms. Based on a rainfall analysis, one and five tenths' inches of rainfall has been identified as the average depth corresponding to the 85th percentile storm for North Texas. The runoff from these one and five tenths' inches of rainfall is referred to as the Water Quality Protection Volume (WQ v).

Developments subject to SWQP requirements are required to demonstrate treatment of the WQ v by the installation of permanent BMPs. Calculation of the WQ v shall adhere to procedures outlined in the iSWM Technical Manual for Water Quality. Methods to reduce the required WQ v as outlined in the iSWM manual may also be implemented.

The WQ v shall not be discharged in a period less than 24 hours. The water quality treatment requirement can be met by providing extended detention in stormwater storage facilities designed for mitigation of peak events. In such instances, these facilities shall be allowed to have a total drawdown time greater than 24 hours but no greater than 48 hours. Refer to Chapter 6 for additional guidance and requirements concerning the design of stormwater storage facilities.

Article 107.07 Subdivision Requirements; Sec. 107.08.02 Water, Wastewater and Drainage Requirements and Environmental Standards
https://library.municode.com/tx/little_elm/codes/code_of_ordinances?nodeId=PTIICOOR_CH107SUOR_ART107.08SURE_S107.08.02WAWADRREENST

(5) Storage classification. Storage can be classified by location as follows:

a. Rainfall storage. The storage of water near the point of rainfall occurrence or before storm runoff accumulates significantly. Rainfall storage is usually accomplished by roof top ponding, parking lot ponding, property line swale ponding, and small on-site ponds.

b. Runoff storage. Water stored after storm runoff has accumulated significantly and begun to flow in a drainage system. Runoff storage is usually accomplished by off stream storage, channel storage, or on-stream storage.

(6) Rainfall storage.

a. Rooftops. The building codes require roof load design for rain and snow and its subsequent removal, drainage, or evaporation from the roof. Under no circumstances shall the design for a nonresidential flat roof allow planned ponding.

b. Parking lots. Bioswales are encouraged for use in parking lots rather than curb and gutter between the parking spaces. Water moving across the parking area shall be filtered before entering the sewer system.

c. Recreation areas. Recreation areas, such as sports fields, generally have a substantial area of grass cover which often has a high infiltration rate. Storm runoff from such fields is

minimal. A secondary use of such recreation fields can be made by providing for limited detention storage of runoff from adjacent areas.

d. [Periods of precipitation.] Since these areas are not used during periods of precipitation, detention ponding should not seriously impede their primary use. To minimize after effects, the recreation area should be designed so that it will thoroughly drain. In addition, the vegetation used on the area should be tolerant of periodic inundation and wetness.

e. Property line swales. Subdivision planning and layout requires adequate surface drainage away from buildings. This is obtained by sloping the finished grade in all directions away from the building. The layout often calls for a swale to be located along the back property line, which then drains longitudinally through the block. The use of natural swales for drainage is allowed; concrete flumes are not allowed.

f. Ponding. Temporary ponding facilities along the rear lot line may include small controlled discharges along the back property line or, if the subsoil conditions are favorable, several inches of rainfall could be expected to percolate into the ground during and after a storm.

g. [Subsoil.] Prior to planning for property line swale ponding, the engineer should determine that saturation of the subsoil will not have an adverse effect on building foundations. In cases where significant subsoil problems exist, water should not be ponded or percolated into the ground.

h. Combinations. In many instances, one on-site detention method cannot conveniently or economically satisfy the required or needed amount of stormwater storage. Limitations in storage capacities, site development conditions, soils limitations and other related constraints may require that more than one method be utilized. For example, roof top, parking lot, and surface pond storage might all be required to compensate for the increase in runoff due to development of a particular site. Whatever combinations are suitable may be incorporated into a site development plan.

(j)Shoreline and major creeks.

(1) One-hundred-year floodplain restrictions. For the health, safety, and welfare of the town's residents and for the conservation of water, storm drainage, and sanitary sewer facilities, the town prohibits vertical development of any portion of a property that lies within the 100-year floodplain of any shoreline or major creek. Shorelines and major creeks shall be protected from destruction or damage resulting from clearing, grading, and dumping of earth, waste or other foreign materials. Clearing, grading, excavation or filling of any area within the 100-year floodplain, shoreline, or within any major creek shall be prohibited unless authorized in writing by the town.

(2) Shoreline and major creek restrictions. All shorelines and major creeks shall be maintained in an open natural condition. All shoreline and each major creek is subject to the following requirements for all types of development:

a. The 100-year floodplain and erosion hazard setback shall be dedicated on the final plat to the town as a single lot or shall be owned and maintained by an HOA or POA, pursuant to section 107.08.09, HOA requirements, of this ordinance.

b. At no time shall any portion of the 100-year floodplain exist or be included within any single-family or two-family residential lot.

c. The commission may waive any of these dedication requirements for a replat that was originally platted prior to the adoption of this subdivision ordinance.

Lewisville

Code of Ordinances; Ch. 16 – Utilities; Article X – Stormwater Drainage Utility System

Sec. 16-460 – Stormwater Drainage Utility Credit Charge
https://library.municode.com/tx/lewisville/codes/code_of_ordinances?nodeId=PTIICOOR_CH16UT_ARTXSTDRUTSY_DIV2STDRUTSYRU_S16-460STDRUTCHCR

(a) Any property on which stormwater drainage runoff mitigation measures or best management practices (BMPs) have been implemented or which has on file with the city an approved individual stormwater drainage management permit issued by the Texas Commission on Environmental Quality (TCEQ) may be eligible for a credit to the stormwater drainage utility charge. BMPs that were required as part of development plan approval will not be eligible for such credits.
(b) The credit methodology shall be set forth in an administrative directive to be developed and maintained by the city.
(c) The application for credit shall be in writing and shall include documentation that the department director over the stormwater drainage utility or his designee deems necessary to properly evaluate the rationale for determining the credit for the approved stormwater drainage management techniques. Stormwater drainage credits will begin upon completion and inspection of the approved mitigation measures on the property.
(d) Any property served by a private stormwater drainage facility that is maintained by the city shall not receive a credit and shall be charged the normal monthly stormwater drainage utility charge.
(e) The credit will be only for the impervious area within the total parcel area of the property that receives the stormwater drainage management technique.
(f) The maximum credits available with appropriate documentation and approval by the department director over the stormwater drainage utility or his designee shall be limited

to 50 percent of the total bill applicable to the improved parcel. Credits available are as follows: (1) Mitigation efforts impacting stormwater drainage quality are worth up to 40 percent credit against the original charge; (2) Mitigation efforts impacting stormwater drainage quantity are worth up to 40 percent credit against the original charge.

(g) The department director over the stormwater drainage utility or his designee shall have the right to inspect a mitigation measure or BMP at any reasonable time to determine if it is in compliance with the approved design and continues to be capable of functioning properly. If the measure's performance is affected because it fails to meet the proper operating standards, has been altered, or is in disrepair, the user or customer shall pay the monthly stormwater drainage utility charge at the normal rate, without benefit of reduction, until such time that the facility is brought into total compliance as determined by the director or his designee.

Ch. 16 – Utilities; Article VIII – Discharge Regulations of (MS4) Storm Sewer System; Sec. 16-379 Stormwater discharges associated with construction activities

https://library.municode.com/tx/lewisville/codes/code_of_ordinances?nodeId=PTIICOOR_CH16UT_ARTVIIIDIREMSSTSESY_DIV2STSESYREEN_S16-379STDIASCOAC

(d) Best management practices.

(1) The operator, owner or contractor shall use best management practices to control and reduce the discharge, to the MS4 and water in the state, of sediment, silt, earth, soil, and other materials associated with clearing, grading, excavation, and any other construction activities to the maximum extent practicable. Such best management practices and erosion control measures are detailed in the NCTCOG iSWM manuals and may include, but are not limited to, the following measures:

a. Ensuring that existing vegetation is preserved where feasible and that disturbed portions of the construction site are stabilized, in accordance with the requirements of the construction permit, on portions of the construction site where construction activities have temporarily or permanently ceased. Stabilization measures may include, but are not limited to the following:

1. Temporary seeding;

2. Permanent seeding;

3. Mulching;

4. Sod stabilization;

5. Vegetative buffer strips;

6. Protection of trees; and

7. Preservation of mature vegetation.

Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities temporarily or permanently ceased, and except as provided in (a) and (b) below, shall be initiated no more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

1. Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 21 days, temporary stabilization measures are not required.

2. Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently ceased is precluded by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as practicable.

Where stabilization measures are utilized, erosion and sediment control measures shall remain in place and be maintained until the area of disturbance meets the definition of final stabilization in this article.

b. Use of structural practices to divert flows from exposed soils, store flows, or otherwise limit runoff and the discharge of pollutants from the construction site to the extent feasible;

c. Minimization of the tracking of sediments offsite by vehicles, the generation of dust, and the escape of other wind-blown wastes from the construction site;

d. Prevention of the discharge of building materials, including cement, lime, concrete, and mortar, to the MS4 or water in the state;

e. Providing general good housekeeping measures to prevent and contain spills of paints, solvents, fuels, septic waste, and other hazardous chemicals and pollutants associated with construction, and to ensure proper cleanup and disposal of any such spills in compliance with state, federal, and local requirements;

f. Implementation of proper waste disposal and waste management techniques, including covering and minimizing ground contact with waste materials;

g. Timely maintenance of vegetation, erosion and sediment control measures, and other best management practices in good and effective operating condition; and

h. Installation of permanent structural measures during the construction process to control pollutants in stormwater discharges that will occur after construction operations have been completed. Such installed structural measures may include, but are not limited to, the following:

1.Stormwater detention structures (including wet ponds);

2.Stormwater retention structures;

3.Flow attenuation by use of open vegetative swales and natural depressions;

4.Other velocity dissipation devices;

5.Infiltration of runoff onsite; and

6.Sequential systems, which combine several practices.

Unified Development Code; Subpart 4 Land Development Regulations; Article IX – Public and Private Improvement Regulations; Ch. IX.5 – Utility Easements and Rights-of-Way;

https://library.municode.com/tx/lewisville/codes/unified_development_code?nodeId=SP4LADERE_ARTIXPUPRIMRE_CHIX.5UTEARI-W_SIX.5.3STDREARI-W

Section IX.5.3 – Storm Drainage Easements and Rights-of-Way

D. Open Channels - For all open channels, the floodway shall be dedicated to the City as a public drainage right-of-way. Additional easements shall be dedicated as follows for maintenance. A building setback is also required in accordance with Chapter IX.7 Section 12.B.4. The property owner, property owners' association or homeowners' association is responsible for maintenance.

1. For open channels which carry less than 500 cubic feet per second (CFS) the public right-of-way shall be designed to the widths required to convey the 100-year design frequency flows plus an additional 15-foot wide easement beyond the top of bank on one side to provide for maintenance equipment access.

2. For open channels which carry more than 500 CFS the additional 15 feet of easement width referenced in Subsection a., above shall be provided on both sides of the channel.

Ch. IX. 7 – Drainage and Stormwater Controls; Section IX.7.1 – Purpose

https://library.municode.com/tx/lewisville/codes/unified_development_code?nodeId=SP4LADERE_ARTIXPUPRIMRE_CHIX.7DRSTCO_SIX.7.1PU

The Section describes the requirements for the design, size, type, location and management of storm drainage systems, floodplains, and stormwater controls in accordance with this UDC, the adopted drainage master plans, the City's Drainage Criteria Manual and other standard specifications. These regulations are designed to:

A. Protect human life, health and property;

B. Retain natural floodplains in a condition that minimizes interference with floodwater conveyance and storage as well as aquatic and terrestrial ecosystems;

C. Minimize erosion and sedimentation problems; and

D. Encourage preservation of natural resources such as riparian buffers and/or natural open space areas and utilization of natural design features for stormwater conveyance.

Section IX.7.2. - Design of Drainage Improvements

https://library.municode.com/tx/lewisville/codes/unified_development_code?nodeId=SP4LADERE_ARTIXPUPRIMRE_CHIX.7DRSTCO_SIX.7.2DEDRIM

Drainage and stormwater systems shall be designed in accordance with the City's Drainage Criteria Manual and with this UDC and shall meet the following requirements to manage water quantities and to maintain and improve water quality. Design and management of drainage and stormwater systems shall support and comply with the City's adopted plans and policies to maintain watercourses in natural states and to integrate creeks and drainageways into the City's parks and trail system in accordance with the Park Master Plan and the Trails Master Plan.

A. General Requirements:

1. All storm drainage structures and improvements shall be designed at a minimum to accommodate potential runoff from a storm event of 100-year frequency. The ultimate development of the entire upstream drainage area, whether inside or outside the subdivision or addition, shall be considered and incorporated into the design. Developers are responsible for accurate design, installation and maintenance of drainage improvements.

2. Effect on Downstream Drainage Areas - The owner's engineer, subject to approval by the Director of Engineering, shall also study the effect of each development's stormwater runoff on the existing underground drainage infrastructure immediately downstream of the development. Where it is determined that existing capacity is not available immediately downstream, the owner's engineer shall design a drainage system, detention facility, or parallel system to mitigate the deficiency. If oversize improvements are required, then the City shall participate in the cost as prescribed by these regulations in Article IX.12.6.

3. Major creeks shall remain in open natural condition; smaller creeks or drainage ways may be channelized if approved by the City Engineer and the design meets the requirements of the Drainage Criteria Manual.

4. 100-year floodplains shall be preserved and protected from destruction and damage resulting from clearing, grading or dumping of earth, waste or other materials. Development of any type is prohibited within the floodplain of any stream or drainage way unless a permit is issued in accordance with Volume I, Chapter 5.5 of the Code of Ordinances. Floodplains are subject to the tree preservation requirements contained in Article VIII.4.

5. Structural and/or non-structural storm water management devices shall conform to the standards and specifications of the Drainage Criteria Manual and must be approved by the City Engineer.

a. Innovative drainage concepts may be considered and approved by the City Engineer and designed to:

1) Preserve undisturbed natural habitat;

2) Incorporate individual integrated site design practices into development projects:

3) Limit the amount of impervious surfaces;

4) Utilize open space areas as part of the stormwater management system; and Preserve floodplain buffers.

Section IX.7.12. - Dedication and Maintenance of Drainage Rights-of-Way and Easements

https://library.municode.com/tx/lewisville/codes/unified_development_code?nodeId=SP4LADERE_ARTIXPUPRIMRE_CHIX.7DRSTCO_SIX.7.12DEMADRRI-WEA

Dedication of easements containing public storm sewer systems and fee simple dedication of floodway and 100-year floodplain areas shall be required as follows. Dedication of easements and rights-of-way shall be shown on the final plat or by separate instrument if no plat is required.

A. Where public storm drainage systems that convey off-site stormwater are not located within street rights-of-way, perpetual unobstructed drainage easements shall be provided. The installation of the system and the minimum easement width shall be as shown in Exhibit IX.5.3-1 in Chapter 5. No public drainage easement is required for storm drainage systems that convey only on-site stormwater.

B. For creeks and open drainageways, drainage easements and dedicated rights-of-way must be provided as follows and in accordance with Section IX.7.4 of this Chapter. The City shall determine the minimum required widths of drainage easements and rights-of-way dedications.

1. For single-family and two-family development, the 100-year floodplain must be dedicated in fee simple as a separate lot to the City. No part of a single-family or two-family lot shall include any portion of the 100-year floodplain. A homeowners' association may assume maintenance of the 100-year floodplain area. The homeowners' association's bylaws and covenants, filed of record, shall provide for ongoing maintenance in accordance with the Drainage Criteria Manual.

2. For commercial and multi-family development, the 100-year floodway shall be dedicated in fee simple as a separate lot to the City. The 100-year floodplain may be retained as part of a non-residential or multi-family lot and contained within a dedicated drainage easement. It shall be the property owner's responsibility to maintain the floodway and drainage easement in accordance with the Drainage Criteria Manual. A maintenance easement shall be granted to the City which grants the right but not the obligation to maintain and construct drainage infrastructure if the creek or drainageway is not being properly maintained. A lien may be filed against the property in favor of the City to secure payment of any expenses incurred by the City for maintenance.

3. Adjacent to the dedicated drainage easements and rights-of-way there shall be a minimum 15-foot wide maintenance and access easement along both sides of the creek or open channel. The City Engineer may authorize a single 20-foot wide maintenance and access easement or a reduced maintenance and access easement on both sides, where appropriate. Streets, alleys, hike and bike trails located along or abutting the drainage easement or rights-of-way may serve as part of the maintenance and access area if approved by the City Engineer.

4. A 20-foot building setback must be maintained from all drainage rights-of-way and easements containing an open channel.

The 15' Erosion Hazard Setback is mentioned on page 38 and iSWM Technical Manual Site Development Controls is mentioned on page 41 of Lewisville's Drainage Criteria Manual which can be found at https://www.cityoflewisville.com/home/showpublisheddocument/28505/638606056975670000

Northlake

Code of Ordinances; Exhibit 9A Unified Development Code; Article 9 Design Standards

9.6 Open Space Standards https://ecode360.com/38507651

The designated open space requirements in Conservation Residential Overlay (CRO) and Planned Development (PD) Zoning Districts shall meet the following standards.

A.

Uses permitted in Open Spaces.

The following uses are permitted in open space areas:

1.

Conservation of open land in its natural state (for example, woodland, fallow field, or managed meadow).

2.

Agricultural and horticultural uses, including raising crops or livestock, wholesale nurseries, and associated buildings, excluding residences that are specifically needed to support an active, viable agricultural or horticultural operation. Specifically excluded are commercial livestock operations involving swine, poultry, mink and other animals likely to produce highly offensive odors.

3.

Pastureland for horses used solely for recreational purposes. Equestrian facilities shall be permitted but may not consume more than three-quarters (3/4) of the minimum required open space.

4.

Silviculture, in keeping with established standards for selective harvesting and sustained-yield forestry.

5.

Neighborhood open space uses such as common greens, picnic areas, community gardens, trails and similar low-impact passive recreational uses specifically excluding motorized off-road vehicles, rifle ranges, and other uses similar in character and potential impact as determined by the Town Council.

6.

Active noncommercial recreation areas, such as playing fields, playgrounds, courts and bikeways, provided such areas do not consume more than one-half (1/2) of the minimum required open space or five acres, whichever is less. Playing fields, playgrounds, and courts shall not be located within one hundred (100) feet of abutting properties. Parking facilities for the same shall also be permitted. Such parking facilities shall be unlighted and properly drained; provide safe ingress and egress; and contain no more than ten (10) parking spaces.

7.

Golf courses may constitute up to one-half (1/2) of the minimum required open space but shall not include driving ranges or miniature golf. Their parking areas and any associated structure shall not be included within the minimum open space requirement; their parking and access way shall be paved and may be lighted.

8.

Water supply and sewage disposal systems and stormwater detention areas designed, landscaped, and available for use as an integral part of the open space.

9.

Easements for drainage, access, sewer or water lines, or other public purposes.

10.

Above-ground utility rights-of-way. Above-ground utility and street rights-of-way may traverse conservation areas but shall not count toward the minimum required open space land.

B.

Open Space Design Standards.

1.

Open space shall be laid out in general accordance with the Open Space areas as identified in the Land Use Development Concept Plan of the Town's Comprehensive Plan to ensure that an interconnected network of open space will be provided.

2.

In the Conservation Residential Overlay district, the open space land shall constitute a minimum of forty (40%) percent of the gross acreage of the development. This land shall remain undivided and may be owned and maintained by a property owner association, land trust, another conservation organization recognized by the Town, or a private individual (typically as part of the original ranch). However, in no case shall less than twenty (20%) of the open space be available for the common use and passive enjoyment of the subdivision residents. These ownership options may be combined so that different parts of the open space may be owned by different entities.

3.

Up to five (5%) percent of the total tract acreage may be subject to the Town's parkland dedication requirement.

Table 9.2. Open Space Requirements

Development Type	Total percentage of development preserved	Total amount of preserved development open to general public	Amount of preserved acreage to be applied to parkland dedication
Conservation Residential Overlay	Minimum of 40% of gross acreage is preserved open space	At least 20% of the preserved open space must be open to general public. The remainder may be privately held or otherwise conserved from development.	5% of the preserved acreage may be used towards parkland dedication requirements.
Planned Development	Minimum of 10% of gross acreage is preserved open space	At least 50% of the preserved open space must be open to general public. The remainder may be privately held or otherwise conserved from development.	5% of the preserved acreage may be used towards parkland dedication requirements.

C.

Other Requirements.

1.

No portion of any building lot may be used for meeting the minimum required conservation land. However, active agricultural land with farm buildings, excluding areas used for residences may be used to meet the minimum required open space.

2.

Pedestrian and maintenance access, excluding those lands used for agricultural or horticultural purposes in accordance with this section, shall be provided to open space land in accordance with the following requirements:

a.

Each Conservation Residential Overlay neighborhood shall provide a minimum of one centrally located access point per one-quarter (1/4) mile, a minimum of thirty-five (35) feet in width.

b.

Access to open space used for agricultural purposes may be appropriately restricted for public safety and to prevent interference with agricultural operations.

3.

All open space land areas that are not wooded, farmed or managed as meadows shall be landscaped in accordance with the landscaping requirements listed in section 9.10.

(Ordinance 13-0124A adopted 1/24/13)

§ 9.7Permanent Open Space Protection Through Conservation Easements.

A.

Conservation Residential Overlay Subdivisions.

1.

In Conservation Residential Overlay subdivisions, the open space land that is required to be reserved and created through the subdivision process shall be subject to permanent conservation easements prohibiting future development and defining the range of permitted activities. For example, the clearing of woodland habitat shall be generally prohibited, except as necessary to create trails and active recreation facilities or to install subsurface septic disposal systems or spray irrigation facilities. The determination of necessity shall lie with the Town Council.

(Ordinance 13-0124A adopted 1/24/13)

Article 5 Zoning Districts; § 5.8 Conservation Residential Overlay District Permitted Uses and Development Standards. https://ecode360.com/38506875#38506943

A. General Purpose and Description. This district provides flexibility in designing new rural residential subdivisions with certain open space and floodplain preservation and integration into the design of the subdivision. The district provides for a density of 1 unit per 5 acres but allows for a minimum lot size of 2 acres. The remaining open space areas must constitute a minimum of 40% of the total area.

B. General Regulations. The design of all new subdivisions in the Conservation Residential Overlay District shall be governed by a minimum density of 1 unit per 5 acres and a minimum 2 acre lot size in addition to the following minimum standards:

1. Ownership. The tract of land may be held in single and separate ownership or in multiple ownership. However, when a tract is held in multiple ownership, it shall be planned as a single entity with common authority and common responsibility.

2. Site Suitability. As evidenced in the Preliminary Plat and Final Plat of any subdivision developed in the Conservation Residential Overlay District, the tract incorporating this design option shall be suitable for supporting development in terms of environmental conditions, its size, and its configuration.

3. Sensitive Area Disturbance. The proposed design shall strictly minimize disturbance of Open Space areas as shown on the Northlake Comprehensive Plan Land Use Development Concept map. Lands within the 100-year floodplain, or having slopes in excess of twenty-five percent (25%), constitute such open spaces where disturbance shall be strictly minimized. Demonstration by the applicant that these features will be protected by the proposed application shall be prerequisite to the approval of both the Preliminary Plat and the Final Plat.

C. Use Regulations. Land in the Conservation Residential Overlay District may be used for the following purposes:

1. Uses identified in Table 5.2.

2. Open space areas composing a portion of residential development as specified above and according to requirements of section 9.6

3. The following nonresidential uses in accordance with the standards of section 9.6

a. Farm, ranch, and orchard uses, including horticultural, wholesale nurseries, and the raising of crops, and buildings related to the same.

b. Woodlots, tree preservation lots, game preserve, wildlife sanctuary or other similar uses.

c. Municipal or public uses; public park or recreation area owned and operated by a public or private nonprofit agency; governmental or public utility building or use; not to include business facilities, storage of materials, trucking or repair facilities, the housing of repair crews, private or municipal sanitary landfills.

Oak Point

Ch. 10 Subdivision Regulation; Article 10.03 Subdivision Ordinance; Division 5 Improvements and Acceptance; 10.03.173 Stormwater Control

https://ecode360.com/40974000

(4) General Drainage Requirements

Drainage improvements required.All developments shall provide for any new drainage facilities, the improvement of any existing drainage facilities, channel improvements or grading, driveway adjustments, culvert improvements or any other improvement, drainage facility or work which is necessary to provide for the stormwater drainage needs of the development, in accordance with the requirements and design standards of this section, including but not limited to any drainage facilities, improvements or other work which is necessary to:

(i) Provide for the conveyance of all stormwater from the development when fully developed to an adequate discharge point;

(ii) Fulfill any purpose for which the requirements of this section are imposed;

(iii) Adequately protect the development from flooding, including the effects of the 100-year flood;

(iv) Properly control any increase in the upstream or downstream stage, concentration or water surface elevation caused by the development;

(v) Provide for the conveyance of existing storm drainage flowing through the development.

(B) Off-site drainage. Off-site drainage facilities and improvements shall be provided by the development whenever additional stormwater runoff from the development would adversely affect any off-site property or would overload an existing drainage facility, whether natural or man-made. Where stormwater runoff from three or more acres has been collected or concentrated to one point, it shall not be discharged onto adjacent properties, except into existing creeks, channels or storm drains, unless drainage or flowage easements are obtained for those properties. If the developer cannot obtain the necessary easements to make required off-site drainage improvements, upon the request of the developer after compliance with the provisions of this article, the city may bring condemnation proceedings to obtain the off-site drainage easements.

(C) Permeable (greenbelt) area stormwater control. Any development may provide for stormwater runoff by reserving a sufficient amount of land within the development for landscaping, green space or other permeable areas, excluding detention facilities, if sufficient to alleviate the need for particular drainage facilities or improvements. The city engineer may

require the submission of any drainage computations necessary to determine that the permeable areas reserved are adequate in size, design or location so as not to require particular drainage facilities or improvements. If a plat is approved on that basis, the permeable areas proposed to be reserved shall be shown on the plat or otherwise referenced by the plat, in the manner specified by the city engineer. No buildings, structures or other impermeable improvements shall be constructed or installed in the permeable areas so designated on the final plat.

(D) Detention facilities. Detention facilities may be used to reduce peak discharges where conditions prevent conveying stormwater to an adequate discharge point or studies show that off-site structural facilities will not mitigate hydraulic effects more efficiently. All detention facilities shall comply with the design criteria of this section. A development may provide for drainage by participating in the design and construction of a regional detention facility. Detailed engineering studies of the entire basin shall be required to ensure that the timing of peak flows has not been altered to create higher peak flow elsewhere in the basin. Detention facilities may be constructed in phases, if phased so as to provide for the timely needs of the development.

(E) Floodplains. Where the regulations of this section would require a development to make any drainage improvements in, or adjacent to a floodplain in order to provide for the ultimate base flood, the development may, in lieu of making the required improvements, restrict development in the area that would be subject to flooding by the ultimate base flood because of the failure to provide for the drainage improvements. In such cases the area to be left undeveloped shall be dedicated to the public as a drainage easement on the final plat.

(F) Floodway fringe areas. Where any development would fill a floodway fringe area where the floodway has not been designated on the flood hazard boundary map, the necessary engineering studies to show the limits of the floodway shall be submitted. If the floodway fringe area is not proposed to be filled, the areas within the floodplain which will be necessary to provide for the drainage needs of the development shall be dedicated to the public as a drainage easement on the final plat.

(G) Floodways and improvements.

(i) Generally, floodways serving drainage areas larger than one square mile in area and which are still functioning primarily in a natural and adequate state shall not be altered or improved to provide for the drainage needs of a development, unless there is no other reasonable means or method to provide for such drainage.

(ii) As part of the required improvements, all debris, small brush, vines and other obstructions shall be cleared once from that portion of any channel located within or on the perimeter of the development, as directed by the city engineer, prior to the connection of any utilities for any building within a development. A development may also be required to provide clearing of off-site floodways to the extent necessary to adequately receive or convey stormwater runoff from

the development, based on the roughness coefficient approved during the design process for the final plat.

(iii) Developments discharging stormwater runoff into a floodway shall provide supplemental vegetation, on-site and off-site, when necessary to preserve or restore any disruption to the natural state. The vegetation planted shall be coastal Bermuda grass or similar vegetation proposed by the developer and approved by the city engineer. The vegetation requirement shall apply to any portion of any floodway, on-site or off-site, which would be affected by runoff from the development.

(iv) Any approvals necessary for completion or occupancy of the development may be withheld, including utility connections and certificates of occupancy, unless and until the clearance and vegetation requirements for floodways are satisfied.

Pilot Point

CH. 10 Subdivision Regulations; Article 10.01 General Provisions; Division 4 Subdivision Design Standards; 10.04.014 Drainage

https://ecode360.com/41621029#41621347

(F) Retention (maintains a permanent pool elevation) and detention (no permanent pool storage) shall be constructed only with the approval of the city. Retention/detention ponds shall be encompassed by an easement. The facility will remain the maintenance responsibility of the owner/developer or homeowner's association, unless otherwise accepted by the city. Acceptance by the city will be contingent upon the facility being a part of a dedicated park or other such property which meets with the city's approval at its sole discretion. Utilization of retention ponds and dispersion areas and preservation of major floodplains, etc., shall be strongly encouraged and may be required if a proposed drainage improvement is found to create actual or potential upstream, adjacent or downstream property damage due to the creation of excessive flood velocities or heights.

(c) Storm Drainage System or Facilities Requirements

(3) Easements

(B) Floodplain easements shall be provided on-site along areas that are in a designated flood zone on the effective FEMA FIRM maps. No construction shall be allowed within a floodplain easement without the written approval of the administrator based on a determination that a hydrology/hydraulic analysis is required to determine appropriate easement boundaries and locations.

(d) Major creeks.

(1) The drainage master plan identifies the creeks classified as major creeks in the city.

(2) 100-year floodplain restrictions. For the health, safety and welfare of the city's residents and for the conservation of water, storm drainage and sanitary sewer facilities, the city prohibits development of any portion of a property that lies within the fully developed 100-year floodplain of any major creek. Major creeks shall be protected from destruction or damage resulting from clearing, grading, and dumping of earth, waste or other foreign materials. Clearing, grading, excavation or filling of any area within the fully developed 100-year floodplain or within any major creek shall be prohibited unless authorized in writing by the city and prior to approval of civil construction plans being released by city.

(3) Major creek restrictions. All major creeks shall be protected and maintained in accordance with this article.

(4) Access. Access shall be dedicated for maintenance purposes. Proper access will require a twenty-five-foot (25') rear or side yard setback for adjacent lots not separated by a street. If site conditions warrant, an additional ten-foot (10') paved or other drivable surface between the adjacent lot line and the 100-year floodplain buffer fifty-foot (50') may be required.

(5) Retaining wall(s). Retaining walls may be permitted on lots adjacent to a drainage easement in a residential area in order to reduce the easement width. Retaining walls adjacent to the channel are allowed in nonresidential areas only if the property owner provides an agreement for private maintenance. All retaining walls, regardless of height or location, must be designed and the construction plans sealed by a professional engineer licensed in Texas.

(6) Adjacent street(s) widths. Streets adjacent to a major creek shall have a minimum right-of-way width of fifty feet (50').

(7) Adjacent street(s) types:

(A) Parallel streets. A minimum 60% of the linear frontage of the major creek shall be adjacent to a parallel street.

(B) Cul-de-sac streets. Cul-de-sacs, if allowed, shall comply with the following criteria:

(i) A minimum 50% of an adjacent cul-de-sac bulb shall be open to the major creek and no residential lot shall encroach within the area between this line and the major creek.

(ii) An entry monument(s) or feature(s) as well as landscaping shall be provided at the end of the cul-de-sac and a minimum 10-foot (10') pathway located within a public pedestrian access easement shall be provided as access to the major creek.

(8) Setbacks. Any side or rear lot line adjacent to a major creek shall provide a twenty-five-foot (25') building setback.

(9) Fences.

(10) Exceptions for planned development. For properties which have an approved concept plan that is part of a planned development ordinance adopted prior to the effective date of this article, this section shall not apply; provided, however, said properties are subject to the following conditions:

(A) Any lot that backs to the 100-year floodplain shall have a minimum rear yard setback of twenty-five feet (25');

(B) Any lot that sides to the 100-year floodplain shall have a minimum side yard setback of fifteen feet (15');

(C) Alternating cul-de-sacs and looped streets shall be provided at intervals not to exceed one thousand two hundred feet (1,200') for access to the 100-year floodplain; and

(D) The 100-year floodplain shall be available to public access from the end of a cul-de-sac.

(11) Additional studies. At the request of the city, the property owner shall submit additional studies, including but not limited to the following, as deemed appropriate and necessary by the city, as part of the preliminary plat submittal requirements. These studies shall be considered during review and approval of the preliminary plat.

(A) Wetland delineation study;

(B) Habitat study;

(C) Vegetative study;

(D) Erosion hazard setback study;

(E) Storm drainage study;

(F) Riparian (i.e., tributary) study;

(G) Flood study; and

(H) Downstream assessment study

Pilot Point's Comprehensive Plan discusses preservation of floodplains and open spaces, green infrastructure on page 116. Lakeside Village and Countryside land uses mention cluster developments on pages 120 and 121. Job Center land use discusses green stormwater infrastructure and on-site stormwater management on page 127. Discusses Transportation Resilience on page 143 with upgrades to stormwater management system to prevent flooding of roadways, including GSI. Denton County Greenbelt Plan cited on page 262. Nature and Trees

Context pages 320 – 323. Flood prone areas on page 364.
https://www.pilotpointtx.gov/DocumentCenter/View/6175/Master-Plan-Set-2025?bidId=

Ponder

Code of Ordinances; Title XV Land Usage; Ch. 153 Subdivisions; Final Plat and Construction Plans; § 153.123 Easements

https://library.municode.com/tx/ponder/codes/code_of_ordinances?nodeId=TITXVLAUS_CH153SU_DEPR_S153.123EA

(C) Floodplain easements. Floodplain easements shall be provided along natural drainageways and lakes or reservoirs. Floodplain easements shall encompass all areas beneath the water surface elevation resulting from a storm whose design frequency is 100 years, plus such additional width as may be required to provide ingress and egress to allow maintenance of the banks and for the protection of adjacent property, as determined and required by the town engineer.

Prosper

Cha. 14 Unified Development Code; Part 3 Subdivision Regulation; § 3.04 Subdivision Design Standards

https://ecode360.com/50846414

(N) Drainage and Stormwater

14. Development criteria along creeks, drainage ways and floodplain.

(a) Platting along creeks, drainage ways and floodplain.

(1) No property shall be subdivided through final platting or "phasing" in a manner that is intended to avoid or circumvent the developer's obligation to construct required improvements and/or dedicate required easements including, but not limited to, rights-of-ways, erosion hazard setbacks, and creek stabilization.

(2) For single-family residential lots, dedication of the creek or drainage way to an approved homeowners' association (HOA) shall be required.

a. No portion of a "drainage and floodway easement" for floodplain purposes shall be contained in a single-family residential lot.

b. The limits of a drainage and floodway easement for floodplain shall be dedicated by final plat as a single lot to an HOA, or to the town at the town's sole discretion.

(3) Creeks and drainage ways may be retained as a part of a nonresidential lot, and it shall be the property owner's responsibility to maintain this area, except as otherwise provided.

a. Property located within any floodplain designation (subsequent to any reclamation) or which is subject to, or required to be designated as, an erosion hazard setback easement or another similarly related easement (hereinafter collectively referred to in this section as "no-build areas") shall be designated in a preliminary plat where applicable and final plat as a common area.

b. Floodplain and/or erosion hazard setback easements may be included in and platted in conjunction with a nonresidential lot with buildable area.

c. "Buildable area" shall mean a lot of a size, shape, characteristics and topography which allows for the reasonable construction of improvements and structures allowed in the zoning classification in which it is located.

(4) Structures built on lots adjacent to floodplains shall be constructed so that the finished floor elevation is a minimum 24 inches above the 100 year fully developed floodplain.

(b) Maintenance responsibilities.

(1) A homeowners' association for residential development shall be responsible for maintaining the common area for which a drainage and floodway easement is required.

a. A drainage and floodway easement for maintenance purposes shall be granted to the town and shall grant the right but not the obligation to maintain and construct drainage facilities if the creek or drainage way is not being properly maintained.

b. A lien may be filed against the property in favor of the town to secure payment of any expenses incurred by the town for maintenance.

(2) A drainage and floodway easement for nonresidential lots for maintenance purposes shall be granted to the town. The town shall have the right but not the obligation to maintain and construct drainage facilities if the creek or drainage way is not being properly maintained. Consequently, a lien may be filed against the nonresidential property in favor of the town to secure payment of any expenses incurred by the town for maintenance

(3) Nonresidential properties may create an entity or property owner's association (POA) to maintain creeks or drainage ways, provided the maintenance area is set forth by easement and the entity's by-laws, filed of record, and provide for on-going maintenance.

a. Such easements shall authorize a lien against the POA in favor of the town to secure payment for any expenses incurred if the maintenance entity is not properly maintaining the creek or drainage way.

b. Adequate easements shall be required that give the town the right but not the obligation to maintain and construct drainage facilities if, in the town's sole opinion, the maintenance entity is not properly maintaining the creek or drainage way.

(c) Erosion hazard setbacks.

(1) Erosion hazard setbacks will be utilized to provide creek bank protection for all creeks and drainage ways within the town.

(2) In all cases, a buffer shall be created and protected by easement (See § 10.03.145(d) Drainage and Floodway Easements) for the determined setbacks.

(3) The setback limits may be altered through mechanical creek bank protection if such mechanical stabilization is approved by the Deputy Director of Engineering Services and final platted consistent with the protected bank area.

(4) Where easements for erosion hazard setbacks are established, no building, fence, wall, deck, swimming pool, or other structure shall be located, constructed, or maintained within the area encompassing the setback.

(5) The setback requirement for each creek or drainage way shall be determined as described in the design standards and specifications of the town.

(d) Drainage and floodway easements. All creeks, drainage ways and floodplain shall be dedicated in drainage and floodway easements of such width as to encompass the 100-year storm event plus a minimum ten feet for maintenance purposes or as determined by the Deputy Director of Engineering Services.

(1) All erosion hazard setbacks shall be dedicated within the same drainage and floodway easement for floodplains of such width as determined by design standards and specification.

(2) The outer limits of a drainage and floodway easement shall be such that it encompasses both 100-year floodplain and the erosion hazard setback plus the additional width for maintenance purposes as outlined in the design standards and specifications.

(e) Studies to be provided when requested. At the request of the town, the property owner shall submit the following documents with the final plat that includes property along creeks, drainage ways and floodplains in addition to studies required for development along major creeks:

(1) Floodplain studies;

(2) Reclamation studies; and

(3) Creek stabilization.

Providence Village

Code of Ordinances; Ch. 6 Health and Sanitation; Article 6.04 Post-Construction Stormwater Control; § 6.04.001 Stormwater control permit.

https://ecode360.com/39736120

(a) Purpose. The purpose of these post-construction controls is to protect, maintain and enhance the public health, safety, environment and general welfare by establishing minimum requirements and procedures to control the adverse effects of increased post-construction stormwater runoff and non-point source pollution associated with new development and redevelopment. It has been determined that development and redevelopment alter the hydrologic response of local watersheds and increase stormwater runoff rates and volumes, flooding, soil erosion, stream channel erosion, non-point source pollution, and sediment transport and deposition, as well as reduce groundwater recharge. These changes in stormwater runoff contribute to increased quantities of waterborne pollutants and alterations in hydrology which may be harmful to public health and safety as well as to the natural environment. These effects can be managed and minimized by applying proper design and well-planned controls to manage stormwater runoff from development sites. This article seeks to meet its general purpose through the following specific objectives and means:

(1) Establishing decision-making processes for development that protect the integrity of watersheds and preserves the health of water resources;

(2) Minimizing changes to the pre-development hydrologic response for new development and redevelopment in their post-construction state in accordance with the requirements of this article for the applicable design storm in order to reduce flooding, stream bank erosion, and non-point and point source pollution, as well as to maintain the integrity of stream channels, aquatic habitats and healthy stream temperatures;

(3) Establishing minimum post-construction stormwater management standards and design criteria for the regulation and control of stormwater runoff quantity and quality;

(4) Establishing design and review criteria for the construction, function, and use of structural stormwater best management practices (BMPs) that may be used to meet the minimum post-development stormwater management standards;

(5) Encouraging the use of better management and site design practices, such as the use of vegetated conveyances for stormwater and preservation of green space, buffers and other conservation areas to the maximum extent practicable;

(6) Establishing provisions for the long-term responsibility for and maintenance of structural and nonstructural stormwater BMPs to ensure that they continue to function as designed, are maintained appropriately, and pose minimum risk to public safety; and

(7) Establishing administrative procedures for the submission, review, approval and disapproval of stormwater management plans, for the inspection of approved projects, and to assure appropriate long-term maintenance.

§ 6.04.002 Standards for stormwater controls.

https://ecode360.com/39736149

(a) Development standards.

(1) Development standards for low density projects. Any drainage area within a project is considered low density when said drainage area has less than thirty percent (30%) built-upon area. Such low-density projects shall comply with each of the following standards:

(A) Vegetated conveyances. Stormwater runoff from the development shall be transported from the development by vegetated conveyances to the maximum extent practicable.

(B) Stream buffers. All built-upon area shall be at a minimum of thirty (30) feet landward of all perennial and intermittent streams. Perennial streams shall have an 80-foot undisturbed buffer (total buffer both sides of stream) and intermittent streams shall have a 40-foot undisturbed buffer. Buffer widths shall be measured horizontally on a line perpendicular to the surface water, landward from the top of the bank on each side of the stream. Allowable stream buffer uses include the following: road crossings, driveway crossings, greenway/hiking trails, bike trails, fences, utility line crossings, parallel or near parallel utility lines, flood control structures, stream and bank stabilization/restoration projects, grading and revegetation, stormwater BMPs, temporary sediment and erosion control devices, animal trails, and activities permitted under section 404 of the Clean Water Act.

(2) Development standards for high-density projects. Any drainage area within a project is considered high density when said drainage area has greater than or equal to thirty percent (30%) built-upon area. Such high-density projects shall implement stormwater treatment systems that comply with each of the following standards:

(A) Stormwater quality treatment volume. Stormwater quality treatment systems shall treat the difference in the stormwater runoff from the pre-development and post-development conditions for the 1-year, 24-hour storm.

(B) Stormwater treatment system design. General engineering design criteria for all projects shall be in accordance with the town's engineering design and standard details and shall also consider North Central Texas Council of Governments Integrated Storm Water Management Design Standards.

(C) Stream buffers. Perennial streams shall have a 120-foot undisturbed buffer (total buffer both sides of stream) and intermittent streams shall have a 60-foot undisturbed buffer. Buffer widths shall be measured horizontally on a line perpendicular to the surface water, landward from the top of the bank on each side of the stream. Allowable stream buffer uses include the following: road crossings, driveway crossings, greenway/hiking trails, bike trails, fences, utility line crossings, parallel or near parallel utility lines, flood control structures, stream and bank stabilization/restoration projects, grading and revegetation, stormwater BMPs, temporary sediment and erosion control devices, animal trails, and activities permitted under section 404 of the Clean Water Act.

(D) Stormwater volume control. Stormwater treatment systems shall be installed to control the difference in the stormwater runoff from the pre-development and post-development conditions for the 1-year, 24-hour storm. Runoff volume drawdown time shall be a minimum of 24 hours, but not more than 120 hours.

(E) Stormwater peak control. For developments greater than or equal to 24% built-upon area, peak control shall be installed for the 10-year and 25-year, 6-hour storms. Controlling the 1-year, 24-hour volume achieves peak control for the 2-year, 6-hour storm. The emergency overflow and outlet works for any pond or wetland constructed as a stormwater BMP shall be capable of safely passing a discharge with a minimum recurrence frequency as specified in the engineering design manual. For detention basins, the temporary storage capacity shall be restored within 72 hours. Requirements of the Dam Safety Act shall be met when applicable.

(b) Stream buffer delineation.

(1) Determination of streams to be buffered. The stream buffer requirements of this article shall apply if a stream is shown on either the most recent version of the soil survey map prepared by the Natural Resources Conservation Service of the United States Department of Agriculture (USDA) or the most recent version of the 1:24,000 scale (7.5 minute) quadrangle topographic maps prepared by the United States Geologic Survey (USGS). Streams that do not appear on either of the aforementioned maps shall not be subject to the aforementioned buffer requirements of this article. Streams that appear on either of the aforementioned maps shall be subject to this article unless one of the following applies:

(A) Exemption when an on-site determination shows that streams are not present. When a landowner or other affected party believes that the USDA or USGS stream buffer delineation maps described in this section inaccurately depict streams, he or she shall consult with the town manager or his designee. Upon request, the town manager or his designee shall make on-site determinations. Such determinations can also be made at the discretion of the town manager or his designee in the absence of a request from a landowner or other concerned party. The buffer requirements of this article shall apply based on these determinations. Surface waters that appear on the maps shall not be

subject to this article if an on-site determination by the town manager or his designee shows that they fall into one of the following categories:

(i) Ditches and man-made conveyances other than modified natural streams.

(ii) Man-made ponds and lakes that are not intersected by a buffered stream segment and that are located outside natural drainageways.

(B) Exemption when existing uses are present and ongoing. This article shall not apply to portions of buffers where a use is existing and ongoing according to the following:

(i) A use shall be considered existing if it was present within the buffer as of the effective date of this article. Existing uses shall include, but not be limited to, agriculture, buildings, industrial facilities, commercial areas, transportation facilities, maintained lawns, utility lines and on-site sanitary sewage systems. Only the portion of the buffer that contains the footprint of the existing use is exempt from this article. Activities necessary to maintain uses are allowed provided that no additional vegetation [is removed] except that grazed or trampled by livestock and existing diffuse flow is maintained.

(ii) At the time the existing use is proposed to be converted to another use, this article shall apply. An existing use shall be considered converted to another use if any of the following applies:

a. Impervious surface is added to the buffer in locations where it did not exist previously.

b. An agricultural operation within the buffer is converted to a non-agricultural use.

c. Vegetation within the buffer ceases to be maintained.

(2) Stream buffer identification. The following buffer identifications are required:

(A) Streams and buffer boundaries must be clearly identified on all construction plans, including grading and clearing plans, erosion, drainage and sediment control plans and site plans.

(B) Outside buffer boundaries must be clearly marked on-site prior to any land disturbing activities.

(C) The outside boundary of the buffer must be permanently marked at highway stream crossings.

(D) Streams and buffer boundaries must be specified on all surveys and record plats.

(E) Buffer boundaries as well as all buffer requirements must be specified on all surveys and record plats, on individual deeds and in property association documents for lands held in common.

(c) Lakes and ponds. Lakes and ponds which intersect the stream channel shall have the same buffers as the original stream measured from the top of the bank of the lake or pond.

(d) Standards for control measures.

(1) Evaluation according to contents of engineering design manual. All stormwater control measures and stormwater treatment practices (also referred to as best management practices, or BMPs) required under this article shall be evaluated according to the policies, criteria, and information, including technical specifications, standards and the specific design criteria for each stormwater best management practice, and should also consider North Central Texas Council of Governments Integrated Storm Water Management Design Standards.

'Green infrastructure' discussed on page 44 of the Town's Comprehensive Land Use Plan which can be found at https://pvtx.gov/DocumentCenter/View/286/Adopted-Providence-Village-2040-Comprehensive-Plan-PDF

Sanger

Parks, Open Space and Green Infrastructure are discussed in the Comprehensive Plan starting on page 136 at https://ecode360.com/documents/SA6473/public/714723837.pdf

Zoning Ordinance; Article III Established Zoning Districts and Uses; Section 19 "FP" – Floodplain District

https://ecode360.com/46843562

§ 29.0 FLOOD PLAIN PREFIX TO DISTRICT DESIGNATION

General Purpose and Description: To provide for the appropriate use of land which has a history of inundation or is determined to be subject to flood hazard, and to promote the general welfare and provide protection from flooding portions of certain districts are designated with a Flood Plain Prefix, FP. Areas designated on the Zoning District Map by an FP Prefix shall be subject to the following provisions:

(Ordinance 015-87 adopted 8/3/87)

§ 29.1 Permitted Uses.

The permitted uses in that portion of any district having a Flood Plain (FP) prefix shall be limited to the following:

1. Agricultural activities including the ordinary cultivation or grazing of land and legal types of animal husbandry but excluding construction of barns or other outbuildings.

2. Off-street parking incidental to any adjacent main use permitted in the district.

3. Electrical substation.

4. All types of local utilities including those requiring specific use permits.

5. Parks, community centers, playgrounds, public golf courses (no structures), and other recreational areas.

6. Private open space as part of a Planned Residential Development.

7. Heliport when approved by specific use permit as provided in Section 31.

8. Structures, installations and facilities installed, operated and maintained by public agencies for flood control purposes.

9. Bridle trail, bicycle or nature trail.

(Ordinance 015-87 adopted 8/3/87)

§ 29.2

No building or structure shall be erected in that portion of any district designated with a Flood Plain, FP, prefix until and unless such building or structure has been approved by the City Council after engineering studies have been made, and it is ascertained that such building or structure is not subject to damage by flooding and would not constitute an encroachment, hazard, or obstacle to the movement of flood waters and that such construction would not endanger the value and safety of other property or the public health and welfare.

Southlake

Requirements for "**Streamway Buffers**", defined as 25 feet from the top of bank on either side (page 1) start on page 3 of 'Zoning – Section 42 – Bufferyards' found at

https://ecode360.com/46843562

Rural Conservation Subdivision Zoning Districts combine conservation easements and cluster development to protect open space in the northern part of the City.

https://library.municode.com/tx/southlake/codes/development_ordinances?nodeId=Section%2048%20-%20RCS%20Rural%20Conservation%20Subdivision%20Zoning%20District

Trophy Club

Code of Ordinances; Ch. 3 Building Regulations; Article 3.14 Runoff Control, Erosion Control and Discharges to Storm Drainage System; § 3.14.008 Stormwater Pollution Prevention and Erosion Control; (c) Stormwater Pollution Prevention and Erosion Control Plan

https://ecode360.com/40207468

(10) Waterway and watercourse protection requirements shall include:

(A) A temporary stream crossing installed and approved by the town if a wet watercourse will be crossed regularly during construction.

(B) Stabilization of the watercourse channel before, during, and after any in-channel work.

(C) Stabilization adequate to prevent erosion located at the outlets of all pipes and paved channels.

(D) Restrict clearing within twenty-five (25) feet of waterways.

(11) Construction site access requirements shall include:

(A) A temporary access road provided at all sites.

(B) Other measures required by the town in order to ensure that construction vehicles do not track sediment onto public streets or washed into storm drains.

(12) Erosion hazard setbacks. Erosion hazard setback determinations will be made for every stream in which natural channels are to be preserved. Natural channel banks will be protected by use of the determined setbacks unless a plan to stabilize and protect stream banks is approved by the designated official.

Ch. 10 Subdivision Regulations; Article 10.03 Parkland Dedication and Open Space

https://ecode360.com/40209304

§ 10.03.005 Credit for conveyance of floodplains.

In cases where floodplain land or property is proposed for conveyance to satisfy the parkland requirements, a credit will be given upon the following criteria:

Three (3) acres of floodplain shall be equal to one (1) acre of non-floodplain.

Westlake

Ch. 36 Engineering Standards; Article XI Stormwater Design Manual; Section 4.4.3.1 General Criteria

https://library.municode.com/tx/westlake/codes/code_of_ordinances?nodeId=COOR_CH36ENST_ARTXISTDEMA

8. The following guidelines shall be considered for buffer areas or zones along natural or constructed earthen channels:

a. A minimum Erosion Control Setback on each side of natural channels based on a 4:1 (H:V) slope from the bottom of the bank to the natural ground adjacent to the bank plus an additional 15 feet. See Figure 4.4.3-1.

b. Include adjacent delineated wetlands or critical habitats.

c. Other buffer widths shall be considered if supported by specific engineering and environmental studies.

Ch. 102 Zoning; Article IV District Development Standards; Section 102-121 Generally

https://library.municode.com/tx/westlake/codes/code_of_ordinances?nodeId=COOR_CH102ZO_ARTIVDIDEST_S102-121GE

(c) Open space.

(1) Applicability. This subsection applies to all development in the town.

(2) Purpose. The town is planned to be a rural and recreationally oriented community with opportunities for both residents and workers, and it is intended to tie into a regional framework of open space trails and corridors. Open space corridors link all major areas of the town using primarily floodplain areas and drainage areas. Because of the importance of open space and recreational amenities to commercial and residential vitality of the town, all projects must contribute to the open space system as established in the town's Comprehensive Plan, Open Space Plan and Thoroughfare Plan.

(3) Requirement. All projects in the town must reserve, dedicate and/or develop public open space consistent with the Open Space Plan, subdivision standards and development agreements.

Comprehensive Plan-

Page 183 - 204 – Mention of preserving open space, trees, natural stream corridors and implementing low impact development practices. https://www.westlake-tx.org/DocumentCenter/View/824/Comprehensive-Plan-Full?bidId=

ADDITIONAL ORDINANCES (in Texas, beyond NCTCOG region):

San Antonio

Unified Development Code; Article V – Development Standards; Division 5 – Natural Resource Protection; Sec. 35-523
https://library.municode.com/tx/san_antonio/codes/unified_development_code?nodeId=ARTVDEST_DIV5NAREPR_S35-523TRPR

(h) **100-Year Floodplain(s) and Environmentally Sensitive Areas.** Significant trees shall be preserved at eighty (80) percent preservation within both the 100-year floodplains and environmentally sensitive areas. Heritage trees shall be preserved at one hundred (100) percent preservation within both the 100-year floodplains and environmentally sensitive areas. The 100-year floodplain shall be determined by the floodplain administrator. Mitigation shall be prohibited in floodplains and environmentally sensitive areas except when a variance is granted by the planning commission. If trees are required to be removed by a governmental entity due to existing off-site conditions, then mitigation shall not be required by the applicant. The city arborist, the director of public works, the director of development services, the Bexar County flood control division manager and one (1) representative from the Cibolo Creek Watershed, the Leon Creek Coalition, the Salado Creek Foundation, the San Antonio River Oversight Committee, and the Land Heritage Institute (for the Medina River) shall recommend a standard for treatment of drainageways, which standard shall be approved by the city council. Subsection (h) titled "100-year Floodplain(s) and Environmentally Sensitive Areas" shall not apply to properties located entirely within the boundaries of the RIO-2 and RIO-3 overlay zoning districts, provided however all other subsections of 35-523 shall apply in the RIO-2 and RIO-3 districts.

(i) **Tree Preservation Incentives**. An individual may apply for, and subject to verification, shall receive incentives for tree preservation as follows:

(1) **Parking Space Reduction.** Upon application and verification by the city arborist, an individual shall be entitled to a reduction in the minimum parking requirements of section 35-526 of this chapter to help meet the minimum tree preservation requirements. For the purpose of providing an incentive, the said minimum parking requirements of section 35-526 of this chapter may be reduced by one (1) parking space for every four (4) diameter inches of trees that have been protected or mitigated on a site. The city arborist shall issue a certificate to the appropriate city department(s) confirming that a reduction has been earned under this section. Up to fifteen (15) percent of the required spaces may be waived, however, a waiver in excess of fifteen (15)

percent of the required spaces must be approved by the director of planning and development services or his designee, and no waiver may exceed thirty (30) percent of the required spaces. A waiver of up to fifty (50) percent of the minimum parking spaces required by table 526-3 may be granted if the plan will result in the preservation of woodlands or significant stands of trees in a natural state as in section 35-526. If used, the incentive provided by this subsection shall control over any other conflicting provision of this chapter.

(2) **Sidewalks.** Where the director of planning and development services determines that preservation of trees warrants the elimination, reduction in width, or modification to the sidewalk and curb requirements in accordance with the tree preservation standards, a waiver may be granted.

(3) **Tree Cluster(s).** In order to emphasize the importance of preserving trees in a cluster during development, additional tree preservation credit will be given as follows:

A. Cluster(s) of three (3) or more trees less than ten (10) feet apart without existing understory will be calculated at one hundred five (105) percent for each tree within the cluster with a minimum DBH size of two and one-half (2½) inches.

B. Cluster(s) of three (3) or more trees less than ten (10) feet apart with existing understory will be calculated at one hundred fifteen (115) percent for each tree within the cluster with a minimum DBH size of two and one-half (2½) inches.

(4) **Landscape Credits.** Landscape credits may be awarded as provided in section 35-511, above. Trees installed to meet the requirements of the landscape buffer section 35-510 and/or landscape ordinance section 35-511 may be used to meet the requirements of the final tree canopy section 35-523.

(5) **Understory.** The city arborist, may determine that the preservation of existing predevelopment native understory plants together with trees grouped in significant stands or native "natural" areas may result in a reduction of new tree plantings needed to meet the requirements of tree canopy in subsection (e). Such areas may receive up to one and one-half (1.5) tree canopy credit. In addition, such areas can be used to meet the landscape requirements and/or an increase of credit given for elective points and/or the elimination of an irrigation system requirement of section 35-511.

(6) **Minimum Lot Size and Setbacks.** The board of adjustment may waive the minimum lot size and setback requirements of the applicable zoning district for an individual lot or lots where the applicant demonstrates the following:

A. Compliance with the minimum lot size or setback requirement is needed to preserve a significant tree or heritage tree; and

B. If the tree permit application is pursuant to a proposed subdivision plat, the average lot size of the proposed subdivision will equal or exceed that of the applicable zoning district; and

C. The public purpose involved in protecting the tree exceeds the public purpose of complying with minimum lot size or setback requirements; and

D. The resulting lot sizes or setbacks do not violate the master plan or the applicable neighborhood, community, perimeter, sector, or sub-area plan.

(7) **State Certification in Lieu of Compliance.** The city arborist shall assist those who wish to have a site certified under the Texas Parks and Wildlife, Texas Wildscape Program in lieu of meeting city requirements in this division as long as twenty (20) percent of existing trees on-site are preserved.

(8) **Energy Conservation Credit.** Planted or preserved large canopy shade trees (medium to large designated in Appendix E) located on the western or southern exposures of a habitable building may receive additional tree canopy credit for final tree canopy cover requirements. The trees must be located a minimum of ten (10) feet but a maximum of thirty (30) feet in distance from the building. Tree canopy cover may be credited at one and one-half (1.5) times the existing or newly planted trees meeting the aforementioned specifications.

(9) **Woodland Canopy Cover Credit.** Woodlands, as defined excluding regulatory floodplains, that are preserved beyond the minimum preservation requirements shall receive a tree canopy cover credit of one and one-half (1.5) times the area and two (2) times if the area joins with an abutting contiguous tree canopy area on the adjacent property. To receive credit, the adjoining properties must indicate tree save areas in perpetuity through subdivision platting or a dedicated conservation easement.

(10) **Significant Tree Canopy Credit.** A canopy cover credit of one and one-half (1.5) times the tree canopy area of a significant tree preserved beyond the minimum preservation requirements may be counted toward meeting the final canopy coverage using the tree survey method only.

(11) **Heritage Tree Canopy Credit.** A canopy cover credit of two (2) times the tree canopy area of a heritage tree preserved beyond the minimum preservation requirements may be counted toward meeting the final tree canopy coverage using the tree survey or tree stand delineation method. To use this credit when using the tree stand delineation method a heritage tree survey is required. The minimum root protection zone requirements shall be met to receive this credit. A heritage tree with a tree warranty does not receive two (2) times the tree canopy area credit.

(12) **Athletic Fields.** Athletic fields shall be deleted from the gross area for the final tree canopy cover requirements, however the tree preservation requirements shall remain at twenty-five (25) percent for both methods tree survey or tree stand delineation.

(13) **Use of Landscaped Low Impact Development (LID) Practices.** A canopy cover credit of one and one-half (1.5) times the existing canopy cover of trees shall be provided for areas where tree preservation is maintained in conjunction with LID practices such as the use of structured soils including infiltration trenches, bioswales, micro-bioretention areas and where such

locations receive appropriate amounts of stormwater runoff. To receive one and one-half (1.5) times credit, the landscaped LID must be approved by application of the standards in section 35-210 and Appendix H of this chapter.

Such LID areas may also be used to comply with the buffer and/or landscape requirements of section 35-510 and section 35-511.

Summary of Tree Canopy Credit Options:

	Credit Amount (counted by multiplying the existing canopy cover of trees)
Understory Preservation	1.0 to 1.5
Energy Conservation	1.5
Woodland Canopy	1.5 (on property) 2.0 (with abutting property)
Significant Tree Canopy	1.5
Heritage Tree Canopy	2.0
Low Impact Development	1.5

Sec. 35-210. - Low Impact Development and Natural Channel Design Protocol (LID/NCDP).
https://library.municode.com/tx/san_antonio/codes/unified_development_code?nodeId=ARTIIUSPA_S35-210LOIMDENACHDEPRLINC

STATEMENT OF PURPOSE

The purpose of this voluntary section is to provide site design flexibility, development incentives, and strategies to implement low impact development and natural channel design protocols. This section reduces the need for variances that would otherwise be required for applicants that voluntarily desire to implement LID/NCDP approaches within their site. This section also implements existing city policies which call for the use of LID/NCDP techniques, including but not limited to SA2020, Master Plan, and Complete Streets policies.

The LID/NCDP use pattern implements the following policies of the master plan:

Natural Resource Goals

Goal 1 Preserve the unique, rare, and significant features of San Antonio's natural environment

• Sub-Policy 1.a.2. Water. Encourage the conservation of the City's surface and ground water resources through public education programs and information programs and protective regulations.

• Policy 1.b. Develop and implement a management plan for land use activities which include the best management practices, based on scientific study that will protect the recharge and drainage zones of the Edwards Aquifer from pollution.

• Sub-Policy 1.b.3. Support new development designs that incorporate street, drainage and lot layouts which reduce storm runoff, pollutant loading, and the need for landscape irrigation.

• Sub-Policy 1.b.4. Adopt urban drainage standards which reduce nonpoint source pollution and minimize downstream flooding.

• Sub-Policy 1.b.10. Establish standards for vegetation clearing and maintenance.

• Sub-Policy 1.b.11. Maximize open space and minimize impervious cover through all available means.

• Policy 1.c. Work with elected representatives, other governing bodies, and public interest groups to develop a comprehensive management plan for water resources including the development of additional sources of clean water for the San Antonio area.

• Policy 1.d. Encourage retention of the 100-year floodplains as natural drainage ways without permanent construction, unnecessary straightening, bank clearing or channeling.

• Sub-policy 1.d.1. Encourage the ecological management of floodplains and promote their use as open space, such as greenways, parks, wildlife habitat, and pedestrian-friendly linkage corridors.

• Sub-policy 1.d.2. Adopt strong stormwater management practices throughout the drainage area which include site specific measures such as:

- on-site stormwater retention and detention;

- reduction in impervious cover;

- natural bank contouring;

- floodplain preservation and buffering;

- preservation of riparian habitat;

- stormwater harvesting sites for reuse purposes.

Goal 2 Integrate environmental quality protection into all phases of local planning and policy implementation

• Policy 2.a. Establish a strong natural resources protection policy for San Antonio.

• Sub-policy 2.a.1. Support the preservation and improvement of the current quality of San Antonio's air, land, and water resources and revise current City codes, regulations and practices to reflect this policy.

• Policy 2.d. Develop ordinances which preserve integrity of the natural settings of neighborhoods, communities, open spaces and parks, and develop clear procedures for their enforcement.

Goal 3 Achieve a sustainable balance between the conservation, use and development of San Antonio's natural resources.

• Policy 3.a. Develop programs to attract environmentally sensitive industry to San Antonio and to encourage local industry to adopt water conserving and minimal impact technologies in their operations.

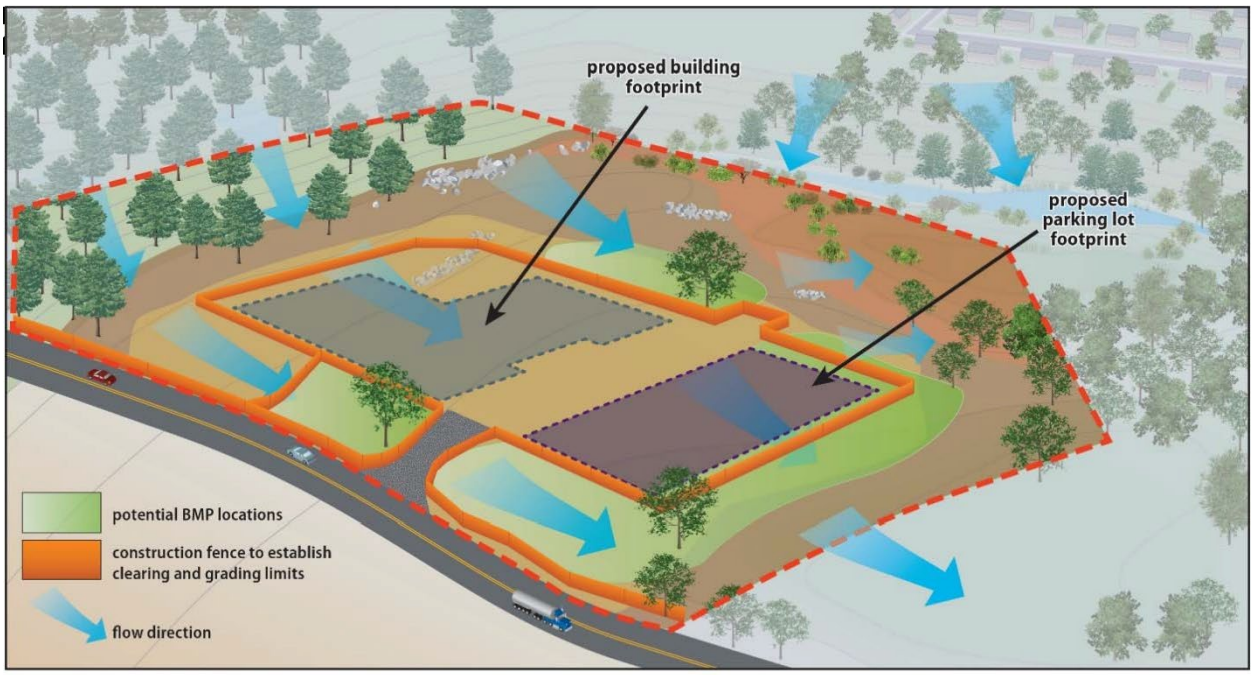
• Sub-policy 3.a.4. Provide incentives for companies to reduce water and energy consumption, and to reuse or recycle water.

• Policy 3.c. Develop incentive programs to reduce energy and water consumption.

• Sub-policy 3.c.6. Expand programs to encourage individuals and businesses to replace high water-using vegetation with water saving landscapes.

PREAMBLE

LID/NCDP is a site assessment, site planning, and structural BMP design process that reduces impervious area and its effects. The process works to first identify then protect and preserve environmentally sensitive features; and uses both natural areas and engineered stormwater controls that mimic natural functions, with a goal of replicating the predevelopment hydrology.



Graphic from the San Antonio River Basin LID Manual (2013)

The San Antonio River Basin LID Technical Guidance Manual provides site design principles to identify protected areas and minimize impacts to existing vegetation, high value soils, geology, and habitat. For LID/NCDP planning, the team (owner, architect, engineer, etc.) begins the process with a site analysis to determine which protected features exist on the site and the optimal preservation or enhancement.

To encourage the use of LID/NCDP, this section provides a number of bonus credits toward meeting requirements of this chapter, including but not limited to landscaping, parkland, tree canopy, buffering, street trees, density, and stormwater fee credit.

(a) **Applicability.** The provisions of this section shall apply to any voluntary application meeting the requirements of subsections (b) through (o) of this section and which is designated as a "Low Impact Development and Natural Channel Design Protocol (LID/NCDP) Plan" by the applicant.

Within the city of San Antonio and its extraterritorial jurisdiction (ETJ), the LID/NCDP plan shall be based on the San Antonio River Basin LID Technical Guidance Manual and/or the Natural Channel Design Protocol - San Antonio, Texas Region as amended.

The Unified Development Code continues to be applicable to issues not covered in this section, except where these would conflict with the LID/NCDP use pattern, in which case the conflict shall be resolved in favor of the LID/NCDP use pattern as long as the LID/NCDP does not create an adverse impact to adjacent property owners or drainage structures or interfere with public safety and emergency response.

(b) **Processing Procedures.**

(1) **Generally.** A low impact development and natural channel design protocol plan is a voluntary use pattern application and may be processed as part of a plat, tree affidavit, tree permit, building permit, master development plan, or other development review applications.

(2) **Incentives.** An LID/NCDP plan shall be eligible for two (2) types of incentives as approved by the director of the development services department for credit/offset incentives or the director of transportation and capital improvements or their respective designee for fee based incentives.

A. **Credit and Offset Incentives.** The applicant managing a minimum of sixty (60) percent of the water quality volume shall receive credit and offset incentives for LID/NCDP according to table 210-1.

Applicants using LID and NCDP practices and managing less than sixty (60) percent of the site water quality volume shall be eligible to receive bonus credits/offsets 1 through 4 for individual BMPs.

Table 210-1

Credit/Offset	**Multiplier**
1. Stream Buffer or Stream Restoration to Parkland Acre	1.5
2. Stream Restoration to Tree Canopy	1.25
3. Linear Park to Parkland Acre	1.5
4. LID BMP to Tree Canopy	1.5
5. LID BMP to Streetscape Tree	1
6. LID BMP Landscape Elective Credit	Up to 25 points
7. LID BMP Drainage Area to Parkland Acre	1.5
8. Density Bonus	10%

1. **Stream Buffer to Parkland Acre.** The applicant shall receive 1.5 parkland area credit acres for meeting the stream network buffering requirement in subsection 35-210(i)(1)A.3., below as long as the buffer area contains trail access; this credit may meet up to fifty (50) percent of the site's parkland requirements. Any stream network buffering area on the site which overlaps with a linear trail area shall receive 1.5 parkland area credit acres (i.e., there shall be no double counting of credits for overlapping areas).

2. **Stream Restoration to Tree Canopy.** Streams that are restored and that establish a minimum twenty-five (25) foot riparian vegetated buffer will be credited at 1.25 times the tree canopy and will receive 1.5 credit acres for parkland, up to fifty (50) percent of the site's parkland requirements.

3. **Linear Park to Parkland Acre.** LID practices meeting a minimum of sixty (60) percent of the performance standard in subsection 35-210(g)(2) below will receive 1.5 credit acres towards parkland requirements up to twenty (20) percent of the site's parkland requirements.

The parkland dimensional requirements in Table 503-2 of this chapter may be reduced up to ten (10) percent to accommodate use of LID BMPs.

Linear trails may receive 1.5 parkland credit acres up to fifty (50) percent of site's required parkland area, if such trails are connected to a portion of the development's remaining parkland area via a pedestrian way. Such linear trails may deviate up to ten (10) percent from dimension requirements in Table 503-2 of this chapter.

4. **LID BMP to Tree Canopy.** A canopy cover offset of 1.5 times the area of the vegetated LID BMP treatment area shall be provided where tree preservation is used in conjunction with LID practices. To receive 1.5 times credit, the landscape LID practice must be approved based on the standards of this section and appendix H of this chapter and must meet a minimum of sixty (60) percent of the performance standard in subsection 35-210(g)(2) below.

5. **LID BMP to Streetscape Tree.** Tree preservation in the right-of-way area is encouraged in LID/NCDP developments. As an alternative to the streetscaping requirements for new landscape trees in the right-of-way, up to twenty (20) percent of the new required streetscaping trees may be offset by installing a vegetated LID stormwater BMP if part of an approved LID/NCDP integrated stormwater management plan, except in areas zoned as a corridor overlay district or form-based zoning district. A maintenance plan must be approved for the LID BMPs in the right-of-way.

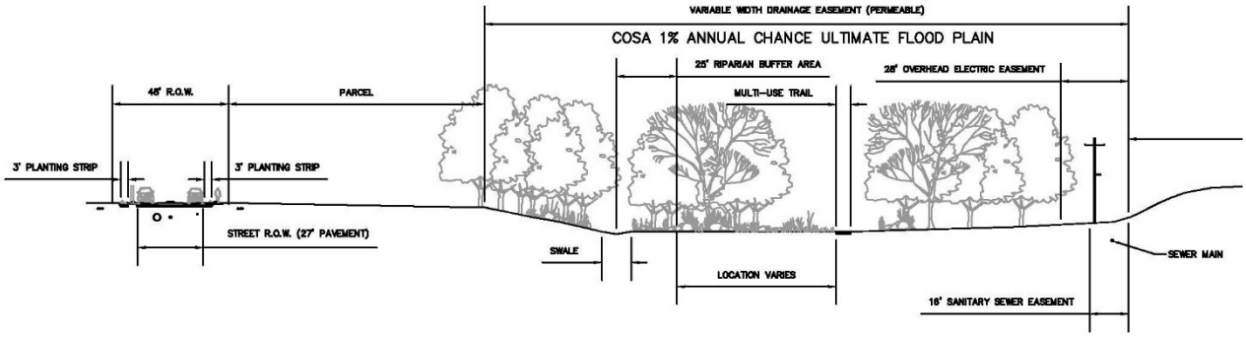
6. **LID BMP Landscape Elective Credit.** For an LID/NCDP plan meeting a minimum of sixty (60) percent of performance standards in subsection 35-210(g)(2) below, areas with LID BMPs will receive up to twenty-five (25) points for elective landscaping criteria of this chapter. Credit will be allocated according to the proportion of trees, small trees, large shrubs, and small to medium shrubs and native grass cover in the LID BMPs.

7. **LID BMP Drainage Area to Parkland Acre.** Where LID practices such as bioretention areas, rain gardens, and swales are part of an approved LID/NCDP integrated stormwater plan, the preserved pervious areas which drain to these practices and which serve multiple uses such as trails, open space, and recreation, shall be counted toward the site's required parkland requirements of this section and may be constructed in designated parkland area. This may meet up to sixty (60) percent of the site's parkland requirements.

8. **Density Bonus.** For an LID/NCDP plan meeting a minimum of sixty (60) percent of performance standards in subsection 35-210(g)(2) below, the applicant may increase by ten (10) percent the density allowed in Table 310-1 of this chapter.

9. **Allowance for LID BMPs in Table 510-2 Bufferyards.** For LID/NCDP vegetated LID BMPs in bufferyard types A, B, and C shall be allowed. In bufferyard types D, E, and F, LID BMPs shall be allowed in the first ten (10) feet as measured from the interior of the site. The minimum plant materials required for each specific bufferyard type as described in Table 510-2 of this chapter shall be installed within the respective bufferyard area.

10. **Allowance for LID BMPs in Public Right-of-Way.** For an LID/NCDP plan meeting a minimum of sixty (60) percent of performance standards in subsection 35-210(g)(2), LID/NCDP vegetated LID stormwater management features may be located within the right-of-way medians, planting strips, curb extensions, or other permeable surface within the street right-of-way; permeable pavement may be used for sidewalks per subsection 35-210(f)(6) below. The applicant may construct vegetated LID BMPs in the privately maintained area of the street right-of-way and receive LID performance standards and detention credits for such BMPs. For the latter, a sliding scale based on the cumulative reduction in flow for the water quality storm, 2-year storm, 5-year storm, 25-year storm and 100-year storms will be applied. To receive a credit, the BMPs must be adjacent to the applicant's development property, must be privately maintained, and must have a long-term maintenance agreement.



11. **Irrigation of LID BMPs.** Elimination of permanent irrigation systems is a cost-saving incentive available to property owners. LID BMPs that use native plants and meet a minimum of sixty (60) percent of the performance standard in subsection 35-210(g)(2) for the managed drainage area are not required to install a permanent irrigation system; however, an LID/NCDP BMP that does not install a permanent irrigation system shall provide a detailed alternative irrigation plan and schedule for the establishment and maintenance of the BMP vegetation. LID BMPs, with or without permanent irrigation systems, are subject to the general maintenance requirements of subsection 35-511(c)(4) of this chapter. It is recommended that commercial properties direct air conditioning condensate into BMPs for irrigation as needed and to meet the requirements in City Code, chapter 34, section 34-274.

B. **Fee Based Incentives.** The applicant managing a minimum of sixty (60) percent of the water quality volume for the project site shall receive credit and offset incentives for LID/NCDP according to Table 210-2.

Future modification or dissolution of an approved LID/NCDP integrated stormwater plan or its associated operation and maintenance schedule may require reimbursement of any fee based incentives provided, and discontinuance of any ongoing fee based incentives per subsection 35-210(l)(2).

1. **Stormwater Fee Discount.** The stormwater fee discount available for incorporating the use of LID/NCDP is specified in City Code, chapter 34, section 34-7.07.

2. **Stormwater Fee in Lieu of (FILO) Discount.** Per Table 210-2 below, a minimum credit of five (5) percent of the required FILO payment, based on section 35-C109 of this chapter, may be designated for parcels that manage sixty (60) percent of the water quality volume or greater.

3. **Permeable Pavement Impervious Cover Credit.** Permeable pavement shall not be counted as impervious cover if designed to store the 2-year, 24-hour storm event as specified by appendix H of this chapter.

Table 210-2

Credit/Offset	**Percent of Water Quality Volume Managed**				
	60%	70%	80%	90%	100%
FILO Reduction	5%	10%	20%	25%	30%
Storm Water Utility Fee (SWUF) Reduction	30%				
Note: LID designed to manage runoff above the required WQV, or Natural Channel Design (NCDP) that increases channel storage to the point of decreasing runoff may result in further reduction or elimination of FILO and SWUF. Reference 210(i)(1)(B).					

(3) **Variances.** Within the incorporated areas of the city and the ETJ, variances shall be processed in accordance with section 35-483 of this chapter.

(4) **Application Requirements.**

A. **Minimum Water Quality Volume Requirements.** In order to be considered an LID/NCDP plan and be eligible for incentives in Table 210-2 above, a minimum of sixty (60) percent of the required water quality volume resulting from the increase in impervious area for the entire site,

including all of the parking and street areas, must be managed to meet the performance standards in subsection 35-210(g)(2) below.

Individual BMPs may receive credit according to Table 210-1 as approved by the director of development services or their designee.

B. **Preliminary Site Design Review Meeting.** The San Antonio River Authority is available free of charge to meet with owners or their design team including engineer, architect and landscape architect before, during or after the development services department's preliminary plan review meeting or as needed any time during the development design process. The preliminary LID/NCDP site design review meeting may be conducted with or without City of San Antonio staff.

C. **Requirements of an LID/NCDP Integrated Stormwater Plan.** The LID/NCDP integrated stormwater plan required by this section shall contain architectural, landscape architecture and engineering drawings, maps, assumptions, calculations and narrative statements as needed to adequately describe the proposed development or redevelopment of the tract and the measures planned to comply with the LID/NCDP performance standards in subsection 35-210(g)(2) below. Plan content may vary to meet the needs of specific site requirements.

The plan must also meet the requirements of the current stormwater engineering review team checklist.

Guidelines for the LID/NCDP integrated stormwater plan preparation may be obtained from the director of the transportation and capital improvements department or designee or on the transportation and capital improvements department website. One (1) copy of the approved LID/NCDP integrated stormwater plan shall be kept on file at the jobsite.

D. **Construction Standards.** All construction of LID and NCDP stormwater management measures addressed by this section should conform to applicable best management practices outlined in two (2) guidance documents: San Antonio River Basin LID Technical Guidance Manual and Natural Channel Design Protocol, San Antonio, Texas Region.

These guidance documents may be updated or revised periodically based on new information and new approved technologies. These sources are recommended for guidance for LID/NCDP applicants. Choice of specific LID and NCDP measures is at the option of the applicant.

E. **Single-Family Lots.** A single-family residential lot, not part of a larger development, is eligible to submit a simplified stormwater management plan. The simplified plan must include the following:

1. A brief project summary including the location, description of existing property, and the proposed development;

2. Calculations that show the development adheres to the LID performance standards in subsection 35-210(g)(2).

3. An exhibit showing the site boundary, proposed locations of building, driveway, parking and other impervious area footprints.

4. The plan must show the proposed locations of stormwater BMPs and the positive overflow pathways for storms exceeding the flow rate and volume managed by the BMPs.

F. **Plat Note.** Developments with LID/NCDP shall have the following note placed on the plat (minor variations of this note may be accepted as approved by the director of TCI:

The property owner has elected to provide low impact development (LID) and/or natural channel design (NCD) on lot(s) XX, block XX, NCB XXXXX. Building permits for this property shall be issued only in conjunction with necessary LID/NCDP approved by the City of San Antonio. The property may be eligible for credit and offset incentives and/or fee incentives when approved by the City of San Antonio. If the property owner elects not to provide LID and/or NCDP, the incentives may not be granted and the property shall conform to all applicable development standards of chapter 35, the Unified Development Code.

G. **Restrictions on Property Usage.** Conservation areas and open space (floodplains, buffer zones, greenbelts, open space, park dedication, tree save areas, etc.) if applicable to a site, shall be provided according to platting and development requirements and procedures of this chapter. The location of all such designated natural areas, parkland, open space, etc. shall be described and delineated in the integrated stormwater plan. Revisions to these areas after an LID/NCDP plan is approved will be subject to city review. Revisions may increase or decrease incentives, and the property shall conform to all applicable development standards of this chapter.

Land within the rights-of-way of below and above-ground utilities or roads shall not count toward the site's buffer zone, open space, parkland or other conservation area requirements.

H. **Deed Recordation Affidavit.** A deed recordation affidavit shall be required when LID/NCDP is proposed with a building or site work permit and the associated plat does not include the plat note from subsection 35-210(b)(4)F. Once an LID/NCDP integrated stormwater plan has been approved for the site, within sixty (60) days the applicant shall submit a deed recordation affidavit referencing the LID/NCDP integrated stormwater plan, including a description of LID/NCDP components and the stormwater plan's operation and maintenance agreement. Building permit approval may be withheld until the affidavit is reviewed and approved by the City of San Antonio. Certificate of occupancy may be withheld until proof of recordation of the affidavit is submitted to and accepted by the City of San Antonio.

The affidavit may be drafted such that modifications or removal of LID/NCDP components does not require revoking or vacating the deed recordation affidavit. However, those modifications to the LID/NCDP integrated stormwater plan must be submitted to the city for review and approval,

and may result in nullification or reimbursement of credits and/or incentives. The property shall conform to all applicable development standards of the Unified Development Code.

I. **Improvement Security.** LID/NCDP stormwater control measures shall be recognized similar to other site improvements (e.g., drainage infrastructure, streets, etc.). As such, a performance agreement, in the form of a financial security, shall be required and adhere to the procedures and the guarantees of performance specified in section 35-437 of this chapter.

J. **Record Drawings and Final Approval.** Upon completion of an LID/NCDP BMP project, and before a temporary certificate of occupancy or field acceptance of public or private infrastructure improvements that are part of LID/NCDP integrated stormwater plan shall be granted, the applicant shall conduct a post-construction site inspection and verify that the completed project is in accordance with the approved stormwater plan and designs. Before a final certificate of occupancy, or release of the performance bond for construction of public or private infrastructure improvements, the designer of record shall submit actual record drawings for all structural stormwater management facilities and flow paths after final construction is completed. See subsection 35-210(k)(1) below, for detailed requirements of the record drawings.

(c) **Density.** Except for the density bonus allowed in subsection 35-210(b)(2)A., a LID/NCDP shall comply with the density standards of this chapter.

(d) **Traffic Impact Analysis.** An LID/NCDP shall comply with the traffic impact analysis standards of this chapter.

(e) **Lot Layout.** An LID/NCDP shall comply with the lot layout standards of this chapter except as follows:

(1) **Setback, Side Yard, and Rear Yard Incentives.** In order to accommodate LID BMPs and optimize LID/NCDP site design, required setback, side yards, and rear yards in Table 310-1 of this chapter may be reduced as long as such reductions meet fire code standards. The reductions may not compromise public safety such as the sight distance triangles defined in subsection 35-506(d)(5) of this chapter.

(f) **Transportation.**A LID/NCDP shall comply with the transportation standards of this chapter except as follows:

(1) **Minimum Pavement Width and Street Design.** Applicants shall adhere to the traditional street design standards in section 35-506, Tables 506-4 and 506-4A of this chapter.

(2) **Credit for LID Practices in the Street Right-of-Way.** See credit allowed in subsection 35-210(b)(2)A. Use of swales with curb is allowed by right in the following zoning districts RP, RE, RD, and FR, and allowed with conditional approval in zoning districts R-20, O-1, MI-1, and MI-2.

(3) **Curb and Edge Treatment.** Where a portion of a project or public improvement has been designed specifically as a LID stormwater management feature, saw tooth curb edge treatment is encouraged as part of LID/NCDP.

(4) **Separation of LID Practices and Utilities.** For LID BMPs installed in the right-of-way, care must be taken to allow the co-placement and separation of utilities in such a way as to avoid utility damage during construction. The applicant may reference the street cross sections in the San Antonio River Basin LID Technical Guidance Manual for appropriate placement and installation of BMPs in the street right-of-way.

(5) **Use of Permeable Pavement for On-Street Parking.** The applicant may reference the approved list of permeable pavement materials for on-street parking areas in the San Antonio River Basin LID Technical Guidance Manual, as may be updated periodically. Permeable pavement must meet the requirements of subsection 35-210(b)(2)B.3. above to receive FILO credit.

(6) **Sidewalks.** In order to reduce effective impervious area, an approved permeable pavement may be used for sidewalks as long as the materials meet ADA requirements. The applicant shall adhere to the approved list of permeable pavement materials that may be used for sidewalk areas in the San Antonio River Basin LID Technical Guidance Manual as may be updated periodically.

(7) **Special Purpose Medians.** Designers may incorporate BMPs into dividers constructed for aesthetic purposes such as at entrances for subdivisions and landscaping features. LID stormwater BMPs shall be designed according to specifications in the San Antonio River Basin LID Guidance Manual. The minimum width for such special purpose dividers with LID BMPs shall be in accordance with subsection 35-506(n)(2) of this chapter. No vegetation shall be placed in the median that will obstruct the drivers' sight distance defined in subsection 35-506(d)(5) of this chapter.

(8) **Traffic Calming Devices.** Traffic calming devices approved for use in LID/NCDP developments include curb bump outs with LID/BMPs or curb extensions with LID/BMPs as illustrated in the San Antonio River Basin LID Guidance Manual.

(g) **Stormwater Management.** An LID/NCDP application shall comply with the stormwater management standards of appendix H of this chapter, except as follows:

(1) **Integrated Stormwater Management.** After accounting for stormwater quality and volume credits from environmentally sensitive site design per subsection (i), natural resource protection and tree preservation, applicants shall use LID structural BMPs or a combination of LID and conventional BMPs to meet the balance of LID performance standards required in subsection 35-210(g)(2) below.

The applicant may choose the appropriate combination of environmentally sensitive site design techniques and LID structural BMPs to meet the LID performance standards. Approved LID

structural BMPs, as well as design and maintenance guidance for each BMP, may be found in the San Antonio River Basin LID Technical Guidance Manual.

LID Performance Standards.

A. **On-site Stormwater Management Framework.** Per subsection 35-210(b)(4)A., a minimum of sixty (60) percent of the water quality volume must be managed to be considered an LID/NCDP development. If less than one hundred (100) percent of the water quality volume will be managed, the designer will give first priority to managing the runoff volume from all of the parking and street areas within the development limits. The water quality, volume, and flow rate LID performance standards below are presumed to be met if the stormwater management system is sized and designed to manage a minimum of sixty (60) percent of the WQV using the guidance in the San Antonio River Basin LID Technical Guidance Manual.

B. **On-site Stormwater Management Criteria.** For new development, a stormwater management system with LID shall treat the water quality volume (WQV) resulting from the first 1.5 inches (equivalent to the ninetieth (90th) percentile storm calculated using the methodology developed by the EPA in report 841-B-09-001. The daily rainfall total for the period of record at the San Antonio International Airport was used to calculate the ninetieth (90th) and eighty-fifth (85th) percentile storms referenced in this section.) of rainfall falling on the developed portions of the site in a twenty-four (24) hour period.

Compliance with this WQV performance standard through a combination of infiltration, filtering, and settling is presumed to meet the following treatment levels:

1. Removal of eighty (80) percent of the average annual post development total suspended solids (TSS) load; and

2. Removal of sixty (60) percent of the annual bacteria load. The applicant shall be eligible for incentives to treat stormwater from the new development according to Tables 210-1 and 210-2.

C. **Definitions.** For the purposes of this section, development and redevelopment are as defined in appendix H of this chapter.

D. **Redevelopment Standards.** A redevelopment site shall be subject to a reduced LID performance standard: the stormwater management system will be sized and designed based on the runoff volume resulting from the first 1.18 inches (equivalent to the ninetieth (90th) percentile storm calculated using the methodology developed by the EPA in report 841-B-09-001. The daily rainfall total for the period of record at the San Antonio International Airport was used to calculate the ninetieth (90th) and eighty-fifth (85th) percentile storms referenced in this section.) of rainfall in twenty-four (24) hours from rebuilt areas and newly developed areas on the site. The applicant shall be eligible for incentives to treat stormwater from the redevelopment site according to Tables 210-1 and 210-2.

Water Quality Volume (WQV) for redevelopment projects shall be calculated based on the total post-project impervious cover within the limits of construction.

1. Examples of construction or reconstruction that are generally considered redevelopment for the purposes of determining WQV include, but may not be limited to:

a. New buildings, parking lots, hardscape, or other impervious cover constructed on an already developed lot;

b. Additions to or expansion of existing buildings, parking lots, hardscape, or other impervious cover;

c. Demolition and reconstruction of an existing building or construction of a new building in its place;

d. Reconstruction of a paved surface (involves regrading or reconstruction of base material);

e. Removal of a paved surface to build a new structure or other impervious cover in its place; and

f. Removal of a building to construct new pavement or an otherwise impervious surface.

2. These types of construction are generally not considered redevelopment in terms of determining WQV:

a. Construction staging or lay down areas that are not within the limits of new or reconstructed impervious cover;

b. Temporary increases in impervious cover due to phasing (at the discretion of Public Works);

c. Renovation of an existing building without an addition;

d. Repairing pavement (i.e., mill and overlay, but not reconstruction of base);

e. Repair or replacement of canopies; and

f. Untouched impervious areas on a site that is being redeveloped (i.e., existing impervious cover outside the limits of construction).

E. **Treatment of Offsite Runoff.** Runoff from the developed or redeveloped site should generally be given preference for treatment. However, the director of Public Works or designee may, on a case by case basis, approve treatment of offsite runoff instead of or in combination with onsite runoff. In this case, the design rainfall depth is increased by ten (10) percent for all offsite runoff. Public Works may require that some onsite runoff is treated, especially if there are potentially acute sources of pollutants (i.e., dog parks, dumpster pads, and oil/grease containers).

(3) **Special LID Requirements for Karst Areas Outside the Edwards Aquifer Recharge Zone.** If applicable, the applicant shall identify and locate karst features and submit a map with the concept plan and stormwater management plan for the proposed development project. The

map shall display, according to the best information available, topographic and geologic information and features (including, but not limited to, faults and fractures along waterways and sinkholes), and proposed and existing stream buffer preservation areas.

Any existing karst swales, sinkholes, or solution features should be surveyed and indicated in the integrated stormwater plan. Buffers or reserves for features collecting drainage for watersheds should be set aside as defined by RG-348A (Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer (Revised)) in the integrated stormwater plan so that all future landowners are aware of the presence of solution features or sinkholes on their property.

(4) **Special LID BMP Requirements/Considerations for Historic Areas.**

A. **Landscaping.** Removal of existing landscaping or sod areas and replacing them with vegetated LID BMPs is allowed where not removing character defining landscaping elements and with historic design review commission approval and a certificate of appropriateness.

B. **Hardscaping.** Removal of existing hardscaping and replacing it with pervious pavement treatments is allowed where not removing character defining hardscaping elements.

(5) **Manufactured Products for Stormwater Management.** In addition to the BMPs included in the San Antonio River Basin LID Technical Guidance Manual, several proprietary manufactured products have been adopted by the Texas Commission on Environmental Quality (TCEQ) to meet a minimum of eighty (80) percent TSS removal. These devices shall not be accepted to meet the volume reduction requirement of subsection 35-210(g)(2), but will be allowed for pre-treatment, filtering, trash removal and oil and grease removal as the first structural BMP in a treatment train. Devices that have not been approved by TCEQ may be acceptable to the Director of the transportation and capital improvements department or designee only if they meet the Technology Assessment Protocol - Ecology (TAPE) guidelines.

A. **Pre-Treatment and Trash Removal Applications.**

B. **Hydrodynamic Separators.** Hydrodynamic separators utilize cyclonic motion of stormwater to physically remove sediments and floatable materials. They do not provide volume or rate reduction; therefore, their most appropriate application is upstream of BMP practices that can provide these functions. Hydrodynamic separators are particularly well suited for providing pretreatment in areas of high sediment loading for BMPs whose primary function is filtration or infiltration, as they can reduce maintenance frequency and extend the life of the downstream BMP.

C. **Screens and Trash Racks.** Screening devices that capture large floatable debris are recommended for all inlets that drain into preserved/restored streams or BMPs. These devices provide a single point for collection and disposal of trash that would otherwise be dispersed into natural areas.

D. **Enhanced Filtration.**

1. **Cartridge Filters.** Cartridge filters that rely on structurally enclosed media to filter stormwater and remove pollutants may be used in applications where LID structural BMPs described in the LID Design Manual are determined to be infeasible or not in the best interest of the city according to the director of transportation and capital improvements or designee. Cartridge filters shall not be used in areas with high sediment loading unless hydrodynamic separator pretreatment is installed. Cartridge filters may be used as part of a treatment train but do not retain the volume defined as the performance standard in subsection 35-210(g)(2).

2. **High Rate Filter Media.** Customized high rate filter media may be utilized to meet partial water quality performance goals if LID BMPs designed using the San Antonio River Basin LID Technical Guidance Manual are infeasible or not in the best interest of the city according to the director of transportation and capital improvements or designee. High rate filter media applications may include tree boxes, tree filters, or any filter system that treats but does not retain the volume defined as the performance standard in subsection 35-210(g)(2). The WQV defined in subsection 35-210(g)(2) must pass through the high rate filter media and achieve the pollutant removal targets. Treating the WQV using high rate media does not equate to meeting the volume reduction requirement in subsection 35-210(g)(2).

E. **Automated Drainage System Components.** BMPs may include drainage system components with digital or automated controls. Provide sufficient manufacturer's documentation to show how the components function and how the system is programmed for specific site. Maintenance plans shall include all pertinent information to ensure future owners or operators can maintain the automated system (see also Section 35-210 (l)(1) & (2). Applicant is responsible for all permitting associated with these systems (plumbing, electrical, SAWS, etc.).

(h) **Utilities.** See utilities standards, section 35-507, of this chapter. Also see subsections 35-210(b)(4)D., restrictions on property usage, and 35-210(f)(4), separation of LID practices and utilities, above.

(i) **Natural Resource Protection and Tree Preservation.**

(1) **Environmentally Sensitive Site Design.**

A. **Site Analysis.** For LID/NCDP, the design process begins with a site analysis to determine the degree to which the following features exist on the site and the feasibility of their preservation or enhancement:

1. **High Value Soils.** Preservation of high infiltration soils is encouraged. For the purposes of this section, high infiltration soils are defined as all soils with infiltration rates greater than one (1) inch per hour.

2. **Geomorphic Assessment.** The applicant shall perform a NCDP geomorphic assessment according to subsection 35-210(i)(2) below.

3. **Stream Network Buffering.** The stream buffer to parkland credit incentive is applicable to LID/NCDP plans that preserve the habitat and watershed management functions of riparian buffers. To the extent that any of the following stream network elements exist on a site, at a minimum, the LID/NCDP shall preserve:

i. A riparian buffer with a minimum average width of twenty-five (25) feet from the top of bank for all Jurisdictional Waters of the U.S. and;

ii. All of the floodway and flood fringe within the regulatory 100-year floodplain, as shown on official FEMA maps, and any letter of map revision (LOMR);

iii. A riparian buffer with minimum average width of fifty (50) feet from the edge of the regulatory 100-year floodplain as delineated on the official FEMA maps and any letter of map revision (LOMR). To reduce fragmentation, no more than ten (10) percent of the buffer can be less than thirty-three (33) feet wide;

iv. A riparian buffer with a minimum average width measured from the top of the bank and determined based on the slope of the streamside area in accordance with the table methodology found in City Code, chapter 34, section 34-913 for all perennial streams or intermittent streams with a drainage area of greater than one hundred (100) acres. In all cases, a twenty-five (25) foot-wide riparian buffer zone must be preserved. To reduce fragmentation, no more than ten (10) percent of the buffer can be less than thirty-three (33) feet wide;

v. A riparian buffer with minimum average width of fifty (50) feet from the top of bank of any perennial, intermittent streams with a drainage area of less than one hundred (100) acres or ephemeral streams draining more than forty (40) acres. In all cases, a twenty-five (25) foot-wide riparian buffer zone must be preserved. To reduce fragmentation, no more than ten (10) percent of the buffer can be less than thirty-three (33) feet wide;

vi. All areas within twenty-five (25) feet of the top of bank of any ephemeral stream draining less than forty (40) acres; and

vii. The applicable stream buffer requirements of this chapter's tree preservation and floodplain requirements, or applicable recharge protection provisions in City Code, chapter 34, section 34-920, recharge feature protection and buffer zone, whichever is most stringent.

4. **Slopes.** Slopes greater than fifteen (15) percent should be evaluated for erodibility using the natural resources conservation service erodibility index.

B. **Offsetting Stormwater Detention, Water Quality, and Volume Requirements.** Environmentally sensitive site design practices that manage the increased runoff due to development may be evaluated using standard hydrologic approaches required for the LID/NCDP integrated stormwater plan. Environmentally sensitive design site practices shall also be credited toward meeting the site's LID performance standard.

C. **Establish Clearing, Grading and Stockpiling Limits.** Grading plans shall clearly identify limits of construction areas and include a ten (10) foot buffer between areas of disturbance and protected areas, BMPs or buildings and any environmentally sensitive area. Allowable stockpile areas shall be identified in areas that will be paved or disturbed during subsequent construction.

(2) **Natural Channel Design Protocol.**

A. **Restorative Practices for Natural Channels.** All channels draining more than twenty (20) acres within an environmentally sensitive site design plan should be evaluated for:

1. Protection if the channel is stable and functioning properly, or

2. Restoration if the channel is unstable.

For the purposes of this section, channels should be evaluated using a geomorphic assessment as defined in the Natural Channel Design Protocol, San Antonio, Texas Region, as amended, to determine the degree of instability. See subsection 35-210(b)(2)A. for bonus tree canopy and parkland credits for stream restoration.

B. **Earthen Engineered Channel Design to Reduce Erosion and Maintenance.** Engineered channels that are necessary to convey local and/or off-site flows shall be designed either as vegetated swales or as multi-stage flood control channels (see Natural Channel Design Protocol, San Antonio, Texas Region as amended).

C. **Restoration Credit for Existing Engineered Channels.** Existing engineered channels that are armored using either concrete or rock rubble may be redesigned using NCDP. As part of an LID/NCDP integrated stormwater plan, channels will be credited as flow reduction and water quality features based on scientifically based benefits. Such benefits shall be documented in the LID/NCDP integrated stormwater plan.

D. **Design Protocols.** Recommended natural channel design protocols may be found in Natural Channel Design Protocol, San Antonio, Texas Region (2013), which may be updated from time to time.

(j) **Parking.** An LID/NCDP shall comply with the parking standards of this chapter except as follows:

(1) **Parking Space.** To minimize impervious area, use of minimum vehicle spaces allowed in Tables 526-3a and 526-3b of this chapter is encouraged except where preservation of woodlands or significant stands of trees is desired; in such cases, per subsection 35-526(b)(6) of this chapter, the director of the transportation and capital improvements department or designee may waive up to fifty (50) percent of the minimum parking spaces required by Table 526-3. Permeable pavement is encouraged for vehicle spaces above the minimum requirement, and as stipulated in subsection 35-210(l)(3) below. Use of shared off-street parking facilities is encouraged, as practicable, according to subsection 35-526(g) of this chapter.

(2) **Dimensions.** To reduce impervious area, an LID/NCDP may reduce parking dimensions using one (1) of the following options.

A. **Alternative Parking Dimensions.** Use of the parking space dimensions in Table 210-3 below is allowed as an alternative to the requirements of Table 526-1 of this chapter.

Table 210-3

Angle	Width	Curb Length	1-way aisle	2-way aisle	Stall Depth
30 degrees	8'-6"	17'	12'	NA	15'
45 degrees	8'-6"	12'	12'	NA	17'
60 degrees	8'-6"	9'-9"	16'	20'	17'-6"
90 degrees	8'-6"	8'-6"	25'	25'	18'

B. **Compact Parking Allowance.** Up to forty (40) percent of the required parking spaces may be designated for use by compact vehicles with minimum dimensions of eight (8) feet in width and sixteen (16) feet in length. Compact vehicle parking shall be identified by individually marking each parking space surface with lettering a minimum of six (6) inches in size.

(3) **Use of Permeable Pavement.** Permeable pavements may be used in low-traffic portions of the off-street parking area, including all marked parking stalls and infrequently used fringe parking areas. The applicant may reference the approved list of permeable pavement materials that may be used for off-street parking areas in the San Antonio River Basin LID Technical Guidance Manual. Permeable pavement must meet the requirements of subsection 35-210(b)(2)B.3. above to receive FILO credit.

(4) **Parking Area Landscaping, Buffering, and Shading.** To encourage multifunctional LID BMPs and provide incentives for their use, bioretention areas, vegetated swales, planter boxes, rainwater harvesting systems, NCDP, and other vegetated BMPs may be used to meet parking area landscaping requirements in this chapter and may be constructed in designated landscape areas as part of an approved LID/NCDP integrated stormwater management plan for the site. See subsection 35-210(b)(2) above for allowable credits.

(k) **Construction Activities and Reporting Requirements.** A registered design professional in responsible charge (RDPiRC) or certified inspector, retained by the owner of the land, shall provide oversight of construction activities. An inspector (other than the RDPiRC) must be certified through the San Antonio River Basin Construction Inspector Certification program. The

inspector and contractor shall work to avoid damage or alterations of the existing site conditions that could deteriorate or compromise the structural and non-structural LID BMPs.

The inspector may reference guidance and checklists from the BRWM Design and Construction Inspection of LID BMPs registration course. The LID/NCDP plan shall adhere to City Code, chapter 34 stormwater compliance for construction activity and reference the San Antonio River Basin LID Technical Guidance Manual for construction practices, including environmentally sensitive construction, construction sequencing, and inspections.

Inspections may also be conducted by city staff. However, those inspections will not waive any owner, contractor, or RDPiRC requirements or responsibilities.

(1) **Record Drawings and Final Agency Acceptance.** Upon completion of a project, the applicant shall conduct a post-construction site inspection and verify that the completed project is in accordance with the approved stormwater plan and designs. Before a final certificate of occupancy is issued, the designer of record shall submit the following items to the transportation and capital improvements department for review and acceptance:

A. Record (as-built) drawings; and

B. Post-construction inspections certification form which can be obtained from the director of the transportation and capital improvements department or designee or on the transportation and capital improvements department website.

(l) **Maintenance.**

(1) **Maintenance Required.** Structural stormwater management practices must be privately owned and shall be maintained by the property owner, unless the practices are part of a capital improvement project managed by a public agency. An operation and maintenance schedule shall be submitted to the director of Public Works or designee prior to approval of construction plans. Maintenance of potentially acute sources of pollution (i.e., dog parks, dumpster pads, and oil/grease containers) and the associated BMPs must be specifically included in the maintenance and operation plan

(2) **Annual Maintenance Inspection Report.** The person responsible for maintenance of any structural stormwater management practice installed pursuant to this section shall submit to the director of the transportation and capital improvements department or designee an annual inspection report from a registered design professional licensed by the State of Texas or a certified inspector. A single-family residential lot, not in a subdivision, is not required to submit annual inspection reports.

(3) **Operation and Maintenance Compliance.**

A. **LID/NCDP Plan Three-Year Establishment Period.** The standard establishment period for an LID/NCDP integrated stormwater plan shall be three (3) years. It is recommended that the owner obtain a registered design professional licensed in the State of Texas or a certified inspector to perform at least quarterly inspections of the structural stormwater management practices during the first year after construction of the LID/NCDP improvements to promote proper establishment.

B. **Dissolution of an LID/NCDP Plan.** If the applicant or owner wishes to dissolve the LID/NCDP integrated stormwater plan or operation and maintenance schedule within the establishment period, the following conditions apply:

1. The applicant or owner must notify the director of transportation and capital improvements department or designee.

2. The applicant or owner must meet the requirements of appendix H of this chapter.

3. The applicant or owner must meet the parkland, landscaping, and tree preservation requirements of the ordinance in effect on the date when the city was notified of the desire to dissolve the plan and/or schedule.

4. The applicant or owner forfeits all ongoing fee-based incentives.

5. The applicant or owner must reimburse to the city all fee-based incentives accrued to date within thirty (30) days of receiving the assessment of incentives. If such assessment is not paid within thirty (30) days, the matter will be referred to the city attorney's office to enforce compliance.

If the owner fails to provide annual inspection reports during the establishment period, the city may elect to inspect the structural stormwater management practices for proper maintenance and functionality. Failure to provide annual inspection reports and to maintain structural stormwater management practices within the establishment period may result in forfeiture and/or reimbursement of incentives.

C. **Modification of a LID/NCDP Plan.** If the owner proposes to modify the LID/NCDP integrated stormwater plan and/or maintenance agreement during or after the establishment period, the revised integrated stormwater plan shall be submitted to and reviewed by the City of San Antonio Transportation and Capital Improvements Department. The revised plan and any associated incentives shall be subject to the requirements of section 35-210, appendix H of this chapter, and other pertinent sections of this chapter.

(m) **Compliance.** Compliance with the requirements of this section shall be enforced through sections 35-490 through 35-492 of this chapter.