ORDINANCE NO. O-09-11

AN ORDINANCE OF THE CITY OF GLENN HEIGHTS, TEXAS, ADOPTING A POST-CONSTRUCTION STORM WATER ORDINANCE; AUTHORIZING CITY MANAGER TO IMPLEMENT ORDINANCE; ESTABLISHING DECISION-MAKING PROCESSES FOR DEVELOPMENT THAT PROTECT THE INTEGRITY OF WATERSHEDS AND PRESERVE THE HEALTH OF WATER RESOURCES; 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 ORDINANCE 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; ESTABLISHING MINIMUM POST-CONSTRUCTION STORM WATER MANAGEMENT STANDARDS AND DESIGN CRITERIA FOR THE REGULATION AND CONTROL OF STORM WATER RUNOFF QUANTITY AND QUALITY; ESTABLISH A PERMIT FEE, DESIGN AND REVIEW CRITERIA FOR THE CONSTRUCTION, FUNCTION, AND USE OF STRUCTURAL STORM WATER BEST MANAGEMENT PRACTICES (BMPS) THAT MAY BE USED TO MEET THE MINIMUM POST-DEVELOPMENT STORM WATER MANAGEMENT STANDARDS; ENCOURAGING THE USE OF BETTER MANAGEMENT AND SITE DESIGN PRACTICES, SUCH AS THE USE OF VEGETATED CONVEYANCES FOR STORM WATER AND PRESERVATION OF GREEN SPACE, BUFFERS AND OTHER CONSERVATION AREAS TO THE MAXIMUM EXTENT PRACTICABLE; ESTABLISHING PROVISIONS FOR THE LONG-TERM RESPONSIBILITY FOR AND MAINTENANCE OF STRUCTURAL AND NONSTRUCTURAL STORM WATER BMP'S TO ENSURE THAT THEY CONTINUE TO FUNCTION AS DESIGNED, ARE MAINTAINED APPROPRIATELY, AND POSE MINIMUM RISK TO PUBLIC SAFETY; AND ESTABLISHING ADMINISTRATIVE PROCEDURES FOR THE SUBMISSION, REVIEW, APPROVAL AND DISAPPROVAL OF STORM WATER MANAGEMENT PLANS, FOR THE INSPECTION OF APPROVED PROJECTS, AND TO ASSURE APPROPRIATE LONG-TERM MAINTENANCE; PROVIDING A PENALTY OF FINE NOT TO EXCEED THE SUM OF TWO THOUSAND DOLLARS ($2,000.00) FOR EACH OFFENSE AND PROVIDING THAT SEPARATE OFFENSE SHALL BE DEEMED COMMITTED EACH DAY

DURING OR ON WHICH A VIOLATION OCCURS OR CONTINUES; ESTABLISHING PROCEDURES FOR GRANTING VARIANCES; AND PROVIDING SEVERABILITY AND AN EFFECTIVE DATE.

WHEREAS, the U. S. Environmental Protection Agency (EPA) issued regulations in 1999 to protect storm water quality in small cities and urbanized areas. In Texas, the Texas Commission on Environmental Quality (TCEQ) was delegated the responsibility for implementing the regulations, commonly called Phase II Storm Water Program. The City of Glenn Heights is one of several hundred cities, counties, and other public entities required to develop a program to protect storm water quality under Phase II regulations; and

WHEREAS, the State of Texas ("State") required the City of Glenn Heights, Texas ("City") to obtain a permit with TCEQ for the discharge of storm water from within the City; and

WHEREAS, the City has prepared and adopted a Storm Water Management Program (SWMP) that was approved by the Texas Commission of Environmental Quality (TCEQ) and the City was issued a General Permit Number TXR040038, effective December 10, 2008. As part of this approved SWMP, the City is required to adopt the Best Management Practices (BMP's) to assist in improving storm water quality; and

WHEREAS, as part of the Best Management Practices (BMP's), the City of Glenn Heights is required to implement and adopt a Post-Construction Storm Water Ordinance in compliance with the National Pollutant Discharge Elimination System (NPDES) Phase II regulations and the Texas Pollutant Discharge Elimination System (TPDES).

NOW, THEREFORE, BE IT ORDAINED by the City Council of the City of Glenn Heights, Texas:

SECTION 1: PURPOSE

The purpose of this ordinance 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 storm water 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 storm water 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 storm water runoff contribute to increased quantities of water-borne

pollutants and alterations in hydrology which are 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 storm water runoff from development sites. It has been determined by the City that proper management of construction-related and post-construction storm water runoff will minimize damage to public and private property and infrastructure, safeguard the public health, safety, and general welfare, and protect water and aquatic resources. This ordinance seeks to meet its general purpose through the following specific objectives and means:

a) Establishing decision-making processes for development that protect the integrity of watersheds and preserve the health of water resources;
b) 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 ordinance 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;
c) Establishing minimum post-construction storm water management standards and design criteria for the regulation and control of storm water runoff quantity and quality;
d) Establishing design and review criteria for the construction, function, and use of structural storm water Best Management Practices (BMP's) that may be used to meet the minimum post-development storm water management standards;
e) Encouraging the use of better management and site design practices, such as the use of vegetated conveyances for storm water and preservation of green space, buffers and other conservation areas to the maximum extent practicable;
f) Establishing provisions for the long-term responsibility for and maintenance of structural and nonstructural storm water BMP's to ensure that they continue to function as designed, are maintained appropriately, and pose minimum risk to public safety; and
g) Establishing administrative procedures for the submission, review, approval and disapproval of storm water management plans, for the inspection of approved projects, and to assure appropriate long-term maintenance.

SECTION 2: DEFINITIONS

When used in this ordinance, the following words and terms shall have the meaning set forth in this Section, unless other provisions of this ordinance specifically indicate otherwise.

1. Best Management Practices (BMP's) – A structural management facility used singularly or in combination for storm water quality and quantity treatment to achieve water quality protection goals.

2. Buffer – A natural or vegetated area through which storm water runoff flows in a diffuse manner so that the runoff does not become channelized and which provides for infiltration of the runoff and filtering of pollutants.

3. Buffer Widths – Viewed aerially, the stream buffer width is measured horizontally on a line perpendicular to the surface water, landward from the top of the bank on each side of the stream.

4. Built-Upon Area (BUA) – That portion of a development project that is covered by impervious or partially impervious surface including, but not limited to, buildings; such as tennis courts. "Built-upon area" does not include wooden slatted deck or the water area of a swimming pool.

5. City Manager – City of Glenn Heights City Manager or the designee of the City to act as the representative in such capacity.

6. Development – New development created the addition of built-upon area to land void of built-upon area as of the effective date of this ordinance.

7. Disturbance – Any use of the land by any person or entity which results in a change in the natural cover or topography of the land.

8. Drainage Area – That area of land that drains to a common point on a project site.

9. Storm Water Management Design Criteria – The Storm Water Management Design Criteria (Exhibit "A") for the City of Glenn Heights approved for use for the proper implementation of the design requirements for the City. All references herein to the Storm Water Management Design Criteria are the latest published edition or revision.

10. Larger Common Plan of Development Or Sale – Any contiguous area where multiple separate and distinct construction or land disturbing activities will occur under one plan. A plan is any announcement or piece of documentation (including but not limited to public notice or hearing, drawing, permit application, zoning request, or site design) or physical demarcation (including but not limited to boundary signs, lot stakes, or surveyor markings) indicating that construction activities may occur on a specific plot.

11. Non-Point Source (NPS) Pollution – Forms of pollution caused by sediment, nutrients, organic and toxic substances originating from land use activities and carried to lakes and streams by surface runoff.

12. Owner – The legal or beneficial owner of land, including but not limited to a fee owner, mortgagee or vendee in possession, receiver, executor, trustee, or long-term or commercial lessee, or any other person or entity holding proprietary rights in the property or having legal power of management and control of the property. A secured lender not in possession of the property does not constitute and owner, unless the secured lender is included within the meaning of "owner" under another description in this definition, such as management entity.

13. Person(s) – Any individual, partnership, firm, association, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, interstate body, or other legal entity.

14. Redevelopment – Rebuilding activities on land containing built-upon area as of the effective date of this ordinance.

15. Storm Water Management Permit – A permit required for all development and redevelopment unless exempt pursuant to this ordinance, which demonstrates compliance with this ordinance.

16. Top of Bank – The landward edge of the stream channel during high water or bank full conditions at the point where the water begins to overflow onto the floodplain.

17. Total Suspended Solids (TSS) – Total suspended matter in water which includes particles collected on a filter with a pore size of 2 microns as measured by Standard Method 2540-D, which is commonly expressed as a concentration in terms of milligrams per liter (mg/1) or parts per million (ppm).

SECTION 3: REQUIREMENTS

A. APPLICABILITY AND JURISDICTION

1. General

The requirements of this ordinance shall apply to all developments of the City of Glenn Heights and redevelopments within the corporate limits or in the extraterritorial jurisdiction, unless one of the following exceptions applies to the development or redevelopment as of the effective date of this ordinance:

a) Preliminary subdivision plan application or in the case of minor subdivisions, construction plan for required improvements, submitted and accepted for review;
b) Zoning use application submitted and accepted for review for uses that do not require a building permit;
c) Valid building permit issued, so long as the permit remains valid, unexpired, and unrevoked: and/or
d) Common law vested right established (e.g., the substantial expenditure of resources (time, labor, money) based on a good faith reliance upon having received a valid governmental approval to proceed with a project).

2. Exemptions

a) Development that cumulatively disturbs less than one (1) acre and is not part of a larger common plan of development or sale is exempt from the provisions of this ordinance.
b) Redevelopment or expansion that cumulatively disturbs less than one (1) acre and is not part of a larger common plan of development or sale is exempt from the provisions of this ordinance.
c) Redevelopment or expansion that results in no net increase in built-upon area and provides equal or greater storm water control that the pervious development is exempt from the requirements of this ordinance
d) Development and redevelopment that disturb less than one (1) acre are not exempt if such activities are part of a larger common plan of development or sale, even though multiple, separate or distinct activities take place at different times on different schedules.
e) Activities exempt from permit requirements of Section 404 of the Federal Clean Water Act, as specified in 40 CFR 232 (primarily, ongoing farming and forestry activities).

3. No Development or Redevelopment until Permit is Issued

No development or redevelopment shall occur except in compliance with the provisions of this ordinance or unless exempted. No development for which a permit is required pursuant to this ordinance shall occur except in compliance with the provisions, conditions, and limitations of the permit.

B. INTERPRETATION

1. Meaning and Intent

   All provision, terms, phrases, and expressions contained in this ordinance shall be construed according to the general and specific purposes set forth in Section 104, Purpose. If a different or more specific meaning is given for a

   term defined elsewhere in the Code of Ordinances for the City of Glenn Heights, the meaning and application of the term in this ordinance shall control for purposes of application of this ordinance.

2. Interpretation Authority

   The City Manager or designee has authority to interpret this ordinance. Any person may request an interpretation by submitting a written request to the City Manager or designee who shall respond in writing within thirty (30) days. The City Manager or designee shall keep on file a record of all written interpretations of this ordinance.

3. References to Statutes, Regulations and Documents

   Whenever reference is made to a resolution, ordinance, statute, regulation, manual, or document, it shall be construed as a reference to the most recent edition of such that has been finalized and published with the due provision for notice and comment, unless otherwise specifically stated.

4. Computation of Time

   The time in which an act is to be done shall be computed by excluding the first day and including the last day. If a deadline or required date of action falls on a Saturday, Sunday or holiday observed by the City of Glenn Heights, the deadline or required date of action shall be the next day that is not a Saturday, Sunday or holiday observed by the City of Glenn Heights. References to days are calendar days unless otherwise stated.

5. Delegation of Authority

   Any act authorized by this Ordinance to be carried out by the City Manager or the designee of the City of Glenn Heights.

6. Usage

   a) Mandatory and Discretionary Terms

The words “shall,” “must,” and “will” are mandatory in nature, establishing an obligation or duty to comply with the particular provision. The words “may” and “should” are permissive in nature.

b) Conjunctions

Unless the context clearly indicates the contrary, conjunctions shall be interpreted as follows: The word “and” indicates that all connected items, conditions, provisions or events apply. The word “or” indicates that one or more of the connected items, conditions, provisions, or events apply.

c) Tense, Plurals, and Gender

Words are used in the present tense include the future tense. Words used in the singular number include the plural number and the plural number includes the singular number, unless the context of the particular usage clearly indicates otherwise. Words used in the masculine gender include the feminine gender, and vice versa.

7. Measurement and Computation

Disturbed area refers to the amount of horizontal land area contained inside the limits of the land disturbance. Lot area refers to the amount of horizontal land area contained inside the limits of the lot lines of a lot or site.

C. STORM WATER MANAGEMENT DESIGN CRITERIA

1. Reference to Storm Water Management Design Criteria

The City Manager or designee shall use the policy, criteria, and information, including technical specifications and standards, in the Storm Water Management Design Criteria as the basis for decisions about Storm Water Management Permit and about the design, implementations and performance of structural and non-structural storm water BMP’s.

The Storm Water Management Design Criteria includes a list of acceptable storm water treatment practices, including the specific design criteria for each storm water practice. Storm water treatment practices that are designed and constructed in accordance with these design and sizing criteria will be presumed to meet the minimum water quality performance standards of this ordinance and the Federal Phase II Storm Water Rules. Failure to construct storm water treatment practices in accordance with these criteria may subject the violator to a civil penalty as described in Section 8, Violations and Enforcement of this ordinance.

2. Relationship of Storm Water Management Design Criteria to Other Law and Regulations

   If the specifications or guidelines of the Storm Water Management Design Criteria are more restrictive or apply a higher standard than other laws or regulations, that fact shall not prevent application of the specifications or guidelines in the Storm Water Management Design Criteria.

3. Changes to Standards and Specifications

   Standards, specifications, guidelines, policies, criteria, or other information in the Storm Water Management Design Criteria in affect at the time of acceptance of a complete application shall control and shall be utilized in reviewing the application and in implementing this ordinance with regard to the application.

4. Amendments to Storm Water Management Design Criteria

   The Storm Water Management Design Criteria may be updated and expanded from time to time, based on advancements in technology and engineering, improved knowledge of local conditions, or local monitoring or maintenance experience.

D. RELATIONSHIP TO OTHER LAWS, REGULATIONS AND PRIVATE AGREEMENTS

1. Conflict of Laws

   This ordinance is not intended to modify or repeal any other ordinance, rule, regulation or other provision of law. The requirements of this ordinance are in addition to the requirements of any other ordinance, rule, regulation or other provision of law, and have any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule, regulation or other provision of law, whichever provision is more restrictive or imposes higher protective standards for human or environmental health, safety, and welfare, shall control.

2. Private Agreements

   This ordinance is not intended to revoke or repeal any easement, covenant, or other private agreement. However, where the regulations of this ordinance are more restrictive or impose higher standards or requirements than such easement, covenant, or other private agreement, then the requirements of this ordinance shall govern. Nothing in this ordinance shall modify or repeal any private covenant or deed restriction, but such covenant or restriction shall not legitimize any failure to comply with this ordinance. In no case shall the

City of Glenn Heights be obligated to enforce the provisions of any easements, covenants, or agreements between private parties.

E. SEVERABILITY

If the provisions of any section, subsection, paragraph, subdivision or clause of this ordinance shall be adjudged invalid by a court of competent jurisdiction, such judgment shall not affect or invalidate the remainder of any section, subsection, paragraph, subdivision or clause of this ordinance.

F. EFFECTIVE DATE AND TRANSITIONAL PROVISIONS

1. Effective Date

This ordinance shall take effect upon adoption.

2. Final Approvals, Complete Applications

All development and redevelopment projects for which complete and full applications were submitted to the City of Glenn Heights prior to the effective date of this ordinance shall be exempt from complying with the provisions of this ordinance.

3. Violations Continue

Any violation of the provisions of this ordinance existing as of the effective date of this ordinance shall continue to be a violation under this ordinance and be subject to penalties and enforcement unless the use, development, construction, or other activity complies with the provisions of this ordinance.

SECTION 4: ADMINISTRATION AND PROCEDURES

A. REVIEW AND DECISION MAKING ENTITIES

1. Designation

A City Manager or designee shall be designated by the City of Glenn Heights for the purpose of administering and enforcing this ordinance.

2. Powers and Duties

In addition to the powers and duties that may be conferred by other provisions of the City of Glenn Heights Zoning Ordinance and other laws, the City Manager or designee shall have the following powers and duties under this ordinance:

a) To review and approve or disapprove applications submitted pursuant to this ordinance.
b) To make determinations and render interpretations of this ordinance.
c) To establish application requirements and schedules for submittal and review of applications and appeals.
d) To enforce this ordinance in accordance with its enforcement provisions.
e) To maintain records, maps, and official materials as relate to the adoption, amendment, enforcement, or administration of this ordinance.
f) To provide expertise and technical assistance upon request to the City of Glenn Heights and its Board of Adjustment.
g) To designate appropriate other person(s) who shall carry out the powers and duties of the City Manager.
h) To provide information and recommendations relative to variances and information as requested by the Board of Adjustment in response to appeals.
i) To take any other action necessary to administer the provisions of this ordinance.

B. REVIEW PROCEDURES

1. Permit Required – Must Apply for Permit

A Storm Water Management Permit is required for all development and redevelopment unless exempt pursuant to this ordinance. A permit may only be issued subsequent to a properly submitted, reviewed and approved permit application, pursuant to this Section.

2. Effect of Permit

A Storm Water Management Permit shall govern the design, installation and construction of storm water management and control practices on the site, including structural BMP's and elements of site design for storm water management other than structural BMP's.

The permit is intended to provide a mechanism for the review, approval and inspection of the approach to be used for the management and control of storm water for the development or redevelopment site consistent with the requirements of this ordinance, whether the approach consists of structural BMP's or other techniques such as low-impact or low-density design. Compliance after project construction is assured by the maintenance provision of this ordinance.

3. Authority to File Applications

All applications required pursuant to this ordinance shall be submitted to the City Manager or designee by the land owner or the land owner's duly

authorized agent or anyone having interest in the property by reason of a written contract with the owner.

4. Establishment of Application Requirements, Schedule and Fees

   a) Application Contents and Form

      The City Manager or designee shall establish requirements for the content and form of all applications and shall amend and update those requirements from time to time. At a minimum, the Storm Water Management Permit Application shall describe in detail how post-construction storm water runoff will be controlled and managed, the design of all storm water facilities and practices, and how the proposed project will meet the requirements of this ordinance.

   b) Submission Schedule

      The City Manager or designee shall establish a submission schedule for applications. The schedule shall establish deadlines by which complete applications must be submitted for the purpose of ensuring that there is adequate time to review applications, and that the various stages in the review process are accommodated.

   c) Permit Review Fees

      The City of Glenn Heights establishes a permit fees in the amount of $250 plus all actual costs associated with the professional review of the plans. If an application is withdrawn prior to review and inspection the City may refund this fee minus reasonable administrative costs. This fee may be amended and updated as deemed necessary from time to time.

5. Submittal of Complete Application

   Applications shall be submitted to the City Manager or designee pursuant to the application submittal schedule in the form established by the City Manager or designee, along with the appropriate fee established pursuant to this Section. An application shall be considered as timely submitted only when it contains all elements of a complete application pursuant to this ordinance, along with the appropriate fee. If the City Manager finds that an application is incomplete, the applicant shall be notified of the deficient elements and shall be provided with an opportunity to submit a complete application. However, the submittal of an incomplete application shall not suffice to a deadline contained in the submission schedule established above.

6. Review

Within three (3) weeks after a complete application is submitted, the City Manager or designee shall review the application and determine whether the application complies with the standards of this ordinance. On projects which will require a Floodplain Development Permit, the review time will be extended to four (4) weeks. The following guidelines will be considered:

a) Approval

If the City Manager or designee finds that the application complies with the standards of the ordinance, the City Manager shall approve the application and issue a Storm Water Management Permit to the applicant. The City Manager may impose conditions of approval as needed to ensure compliance with this ordinance. The conditions shall be included in the permit as part of the approval.

b) Failure to Comply

If the City Manager or designee finds that the application fails to comply with the standards of this ordinance, the City Manager shall notify the applicant and shall indicate how the application fails to comply. The applicant shall have an opportunity to submit a revised application.

c) Revision and Subsequent Review

A complete revised application shall be reviewed by the City Manager or designee within 15 working days after its re-submittal and shall be approved, approved with conditions or disapproved. If a revised application is not re-submitted within sixty (60) calendar days from the date the applicant was notified, the application shall be considered withdrawn, and a new submittal for the same or substantially the same project shall be required along with the appropriate fee.

C. APPLICATIONS FOR APPROVAL

1. Concept Plan and Consultation Meeting

Before a storm water management permit application is submitted, the City Manager or land owner or the land owner's duly authorized agent or anyone having interest in the property by reason of a written contract with the owner may request consultation(s) on a concept plan for the post-construction storm water management system to be utilized in the proposed development project. This consultation meeting(s) should take place at the time of the preliminary plan of the subdivision or other early step in the development process. The purpose of this meeting(s) is to discuss the post-construction storm water management measures necessary for the proposed project, as well as to discuss and assess constraints, opportunities and potential

approaches to storm water management designs before formal site design engineering is commenced. Local watershed plans and other relevant resource protection plans may be consulted in the discussion of the concept plan. At the time of concept plan submittal, the following information should be included in the concept plan:

a) Existing Condition/Proposed Site Plans

Existing conditions and proposed site layout sketch plans, which illustrate at a minimum: existing and proposed topography; perennial and intermittent streams; mapping of predominant soils from soil surveys; boundaries of existing predominant vegetation and proposed limits of clearing and grading; and location of existing and proposed roads, buildings, parking areas and other impervious surfaces.

b) Natural Resource Inventory

A written or graphic inventory of the natural resources at the site and surrounding area as it exists prior to the commencement of the project. This description should include a discussion of soil conditions, forest cover, geologic features, topography, wetlands, and native vegetative areas on the site, as well as the location and boundaries of other natural feature protection and conservation areas such as lakes, ponds, floodplains, stream buffers and other setbacks (e.g., drinking water well setbacks, septic systems setbacks, etc.). Particular attention should be paid to environmentally sensitive features that provide particular opportunities or constraints for development.

c) Storm Water Management System Concept Plan

A written or graphic concept plan of the proposed post-construction storm water management system including: preliminary selection and location of proposed structural storm water controls; low impact design elements; location of existing and proposed conveyance systems such as grass channels, swales, and storm drains; flow paths; location of all floodplain/floodway limits; relationship of site to upstream and downstream properties and drainages; and preliminary location of proposed stream channel modifications, such as bridge or culvert crossings.

2. Storm Water Management Permit Application

The Storm Water Management Permit Application shall detail how post-construction storm water runoff will be controlled and managed and how the proposed project will meet the requirements of this ordinance, including Section 3, Standards. All such plans submitted with the application shall be prepared by a registered Texas professional engineer or landscape architect.

The engineer or landscape architect shall perform services only in their area of competence, and shall verify that the design of all storm water management facilities and practices meets the submittal requirements for complete applications, that the designs and plans are sufficient to comply with applicable standards and policies found in the Storm Water Management Design Criteria, and that the designs and plans ensure compliance with this ordinance. The submittal shall include all of the information required in the submittal checklist established by the City Manager or designee. Incomplete submittals shall be treated pursuant to Section 202(E).

3. As-Built Plans and Final Approval

The applicant shall certify that the completed project is in accordance with the approved storm water management plans and designs, and shall submit actual "as-built" plans for all storm water management facilities or practices after final construction is completed. Failure to provide approved as-built plans within the frame specified by the City Manager may result in assessment of penalties as specified in Section 8, Violations and Enforcement. At the discretion of the City Manager, performance securities or bonds may be required for storm water management facilities or practices until as-built plans are approved. As-built plans shall show the final design specifications for all storm water management facilities and practices and the filed location, size, depth, and planted vegetation of measures, controls and devices, as installed. The designer of the management measures and plans shall certify, under seal, that the as-built storm water management plans and designs and with the requirements of this ordinance. Final as-built plans and a final inspection and approval by the City Manager are required before a project is determined to be in compliance with this ordinance. At the discretion of the City Manager, certificates of occupancy may be withheld pending receipt of as-built plans and the completion of a final inspection and approval of a project.

D. APPROVALS

1. Effect of Approval

Approval authorizes the applicant to go forward with only the specific plans and activity authorized in the permit. The approval shall not be construed to exempt the applicant from obtaining other applicable approvals from local, State, and federal authorities.

2. Time Limit/Expiration

A Storm Water Management Permit and accompanying plan approved under the provisions of this ordinance shall remain valid for a period of three (3) years from the date of approval. If no work on the site in furtherance of the

plan has commenced within the three-year period, the permit and plan approval will become null and void and a new application will be required to develop the site. If work on the site in furtherance of the plan has commenced that involves any utility installations or street improvements except grading, the permit and plan shall remain valid and in force and the project may be completed in accordance with the approved plan. Any permit granted under the Subchapter/section shall expire and be subject to renewal requirements twelve (12) months from the date of issuance. A thirty- (30) day grace period shall be granted after permit expiration before the permitee is considered in violation of city ordinance.

E. APPEALS

1. Right of Appeal

   Any aggrieved person affected by any decision, order, requirement, or determination relating to the interpretation or application of this ordinance may file an appeal to the City Manager first. The City Manager will have two (2) weeks to review and render a decision. If the aggrieved person is not satisfied with the City Manager's decision, order, requirement, or determination, they may file an appeal to the Board of Adjustment for the City of Glenn Heights within thirty (30) days.

2. Filing of Appeal and Procedures

   Appeals shall be taken within the specified time period by filing a notice of appeal and specifying the grounds for appeal on forms provided by the City of Glenn Heights. The City Manager shall forthwith transmit to the Board of Adjustment all documents constituting the record on which the decision appealed was taken. The hearing conducted by the Board of Adjustment shall be conducted in the nature of a quasi-judicial proceeding in accordance with the City of Glenn Heights Zoning Ordinance.

3. Statutory Exceptions

   a) The City Manager Engineering may grant exceptions from the buffer requirements of this ordinance as well as the deed restrictions and protective covenant requirements as follows:

      (1) Unnecessary hardships would result from strict application of the ordinance.
      (2) The hardships result from conditions that are peculiar to the property, such as location, size, or topography of the property.
      (3) The hardships did not result from action taken by the petitioner.
      (4) The requested exception is consistent with the spirit, purpose, and intent of the act; will protect water quality; will secure public safety and

(5) welfare; and will preserve substantial justice. Merely proving that the exception would permit a greater profit from the property shall not be considered adequate justification for the exception.

b) Notwithstanding subdivision (1) of this Section, exceptions shall be granted in any of the following instances:

(1) When there is a lack of practical alternatives for a road crossing, railroad crossing, bridge, airport facility, or utility crossing as long as it is locate, designed, constructed, and maintained to minimize disturbance, provide maximum nutrient removal, protect against erosion and sedimentation, have the least adverse effects on aquatic life and habitat, and protect water quality to the maximum extent practicable through the use of BMPs.

(2) When there is a lack of practical alternatives for a storm water management facility; a storm water management pond; or a utility, including, but not limited to, water, sewer, or gas construction and maintenance corridor, as long as it is located fifteen (15) feet landward of all perennial and intermittent surface waters and as long as it is located, designed, constructed, and maintained to minimize disturbance, provide maximum nutrient removal, protect against erosion and sedimentation, have the least adverse effects on aquatic life and habitat, and protect water quality to the maximum extent practicable through the use of BMPs.

(3) A lack of practical alternatives may be shown by demonstrating that, considering the potential for a reduction in size, configuration, or density of the proposed activity and all alternatives designs, the basic project purpose cannot be practically accomplished in a manner which would avoid or result in less adverse impact to surface waters.

SECTION 6: STANDARDS

A. GENERAL STANDARDS

All development and redevelopment to which this ordinance applies shall comply with the standards of this Section.

B. 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 twenty-four percent (24%) built-upon area. Such low-density projects shall comply with each of the following standards:

a) Vegetated Conveyances

Storm water 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 a two hundred- (200) foot undisturbed buffer and intermittent streams shall have a one hundred- (100) 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 re-vegetation, storm water best management practices, 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 twenty-four percent (24%) built-upon area. Such high-density projects shall implement storm water treatment systems that comply with each of the following standards:

a) Storm Water Quality Treatment Volume

Storm water quality treatment systems shall treat the difference in the storm water runoff from the pre-development and post-development conditions for the one (1) year, twenty-four- (24) hour storm.

b) Storm Water Quality Treatment

All structural storm water treatment systems used to meet these requirements shall be designed to have a minimum of eighty-five percent (85%) average annual removal for Total Suspended Solids.

c) Storm Water Management Design

General engineering design criteria for all projects shall be in accordance with the City's Storm Water Management Design Criteria and shall also

consider North Central Texas Council of Governments *Integrated* Storm Water Management Design Standards.

d) Stream Buffers

Perennial streams shall have a two hundred (200) foot undisturbed buffer and intermittent streams shall have a one hundred (100) 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 re-vegetation, storm water best management practices, temporary sediment and erosion control devices, animal trails, and activities permitted under Section 404 of the Clean Water Act.

e) Storm Water Volume Control

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

f) Storm Water Peak Control

For developments greater than or equal to twenty-four percent (24%) built-upon area, peak control shall be installed for the ten- (10) year and twenty-five- (25) year, six (6) hour storms. Controlling the one (1) year, twenty-four (24) hour volume achieves peak control for the two (2) year, six (6) hour storm. The emergency overflow and outlet works for any pond or wetland constructed as storm water BMP shall be capable of safely passing a discharge with a minimum recurrence frequency as specified in the Storm Water Management Design Criteria. For detention basins, the temporary storage capacity shall be restored within seventy-two (72) hours. Requirements of the Dam Safety Act shall be met when applicable.

C. STREAM BUFFER DELINEATION

1. Determination of Streams to be Buffered

The stream buffer requirements of this ordinance 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 Geological Survey (USGS). Streams that do not appear on either of the aforementioned maps shall not be subject to the aforementioned buffer requirements of this ordinance. Streams that appear on either of the aforementioned maps shall be subject to this ordinance unless one of the following applies:

a) Exemption when an on-site determination shows that streams are not present. When a land owner 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 City Manager. Upon request, the City Manager shall make on-site determinations. Such determinations can also be made at the discretion of the City Manager in the absence of a request from a land owner or other concerned party. The buffer requirements of this ordinance shall apply based on these determinations. Surface waters that appear on the maps shall not be subject to this ordinance if an on-site determination by the City Manager shows that they fall into one of the following categories:
   (1) Ditches and manmade conveyances other than modified natural streams.
   (2) Manmade ponds and lakes that are not intersected by a buffered stream segment and that are located outside natural drainage ways.

b) Exemption when existing uses are present and ongoing. This ordinance shall not apply to portions of buffers where a use is existing and ongoing according to the following:
   (1) A use shall be considered existing if it was present within the buffer as of the effective date of this ordinance. Existing uses shall include, but not be limited to, agriculture, buildings, industrial facilities, commercial areas, transportation facilities, maintained lawns, utility lines, and onsite sanitary sewage systems. Only the portion of the buffer that contains the footprint of the existing use is exempt from this ordinance. Activities necessary to maintain uses are allowed provided that no additional vegetation except that grazed or trampled by livestock and existing diffuse flow is maintained.

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

      - Impervious surface is added to the buffer in locations where it did not exist previously.
      - An agricultural operation within the buffer is converted to a non-agricultural use.
      - A lawn 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.

D. PONDS

Ponds which intersect the stream channel shall have the same buffers as the original stream measured from the top of the bank of the pond.

STANDARDS FOR STORM WATER CONTROL MEASURES

1. Evaluation According to Contents of Storm Water Management Design Criteria

   All storm water control measures and storm water treatment practices (also referred to as Best Management Practices, or BMP's) required under this ordinance shall be evaluated by the City Manager according to the policies, criteria, and information, including technical specifications, standards and the specific design criteria for each storm water best management practice contained in the City's Storm Water Management Design Criteria and should also consider North Central Texas Council of Governments *Integrated* Storm Water Management Design Standards. The City Manager shall determine whether these measures will be adequate to meet the requirements of this ordinance.

2. Determination of Adequacy; Presumptions and Alternatives

   Storm water treatment practices that are designed, constructed, and maintained in accordance with the criteria and specifications in the Storm Water Management Design Criteria will be presumed to meet the minimum water quality and quantity performance standards of this ordinance. Whenever an applicant proposes to utilize a practice or practices not designed and constructed in accordance with the criteria and specifications in

the Storm Water Management Design Criteria, the applicant shall have the burden of demonstrating that the practice(s) will satisfy the minimum water quality and quantity performance standards of this ordinance before it can be approved for use. The City Manager may require the applicant to provide such documentation, calculations, and examples as necessary for the City Manager to determine whether such an affirmative showing is made.

E. DEED RECORDATION AND INDICATIONS ON PLAT

The approval of the Storm Water Management Permit shall require an enforceable restriction on property usage that runs with the land, such as plat, recorded deed restrictions or protective covenants, to ensure that future development and redevelopment maintains the site consistent with the approved project plans. Streams and buffers boundaries must be specified on all surveys and record plats. The applicable operations and maintenance agreement with the Dallas or Ellis County Register of Deeds Office so as to appear in the chain of title of all subsequent purchasers under generally accepted searching principles. A copy of the recorded maintenance agreement shall be provided to the City Manager within fourteen (14) days following receipt of the recorded document. A maintenance easement shall be recorded for every structural BMP to allow sufficient access for adequate maintenance. The specific recordation and deed restriction requirements as well as notes to be displayed on final plats and deeds shall be contained in the City Record File at City Hall.

SECTION 7: MAINTENANCE

A. GENERAL STANDARDS FOR MAINTENANCE

1. Function of BMP's as Intended

The owner of a structural BMP installed pursuant to this ordinance shall maintain and operate the BMP so as to preserve and continue its function in controlling storm water quality and quantity at the degree or amount of function for which the structural BMP was designed.

2. Single Family Residential BMP's Accepted for Maintenance

The City of Glenn Heights may, upon specific official City Council action, accept maintenance responsibility of structural BMPs that are installed pursuant to this ordinance following a warranty period of two (2) years from the date of as-built certification described in Section 203(C), provided by the BMP:

a) Only serves a single family detached residential development or townhomes all of which have public street frontage;

b) Is satisfactorily maintained during the two (2) year warranty period by the owners or designee;
c) Meets all the requirements of this ordinance and the Storm Water Management Design Criteria; and
d) Includes adequate and perpetual access and sufficient area, by easement or otherwise, for inspection, maintenance, repair or reconstruction.
The City Manager must receive an application for transfer of maintenance responsibilities for the structural BMP along with the storm water management permit application.

3. Annual Maintenance Inspection and Report

The person responsible for maintenance of any BMP installed pursuant to this ordinance above shall submit to the City Manager an inspection report from a qualified registered Texas professional engineer or landscape architect performing services only in their area competence. The inspection report shall contain all of the following;

a) The name of address of the land owner; and
b) The recorded book and page number of the lot of each structural BMP; and
c) A statement that an inspection was made of all structural BMP's; and
d) The date the inspection was made; and
e) A statement that all inspected structural BMP's are performing properly and are in compliance with the terms and conditions of the approved maintenance agreement required by this ordinance; and
f) The original signature and seal of the engineer, surveyor, or landscape architect.

All inspection reports shall be on forms supplied by the City Manager that are contained in the City Record File at City Hall. An original inspection report shall be provided to the City Manager beginning one year from the date of as-built certification and each year thereafter on or before the anniversary date of the as-built certification.

B. OPERATION AND MAINTENANCE AGREEMENT

1. General

At the time that as-built plans are provided to the City Manager as described in Section 203(C) and prior to final approval of a project for compliance with this ordinance, but in all cases prior to placing the BMP's in service, the applicant or owner of the site must execute an operation and maintenance agreement that shall be binding on all current and subsequent owners of the site, portions of the site, and lots or parcels served by the structural BMP. Failure to execute an operation and maintenance agreement within the time

frame specified in Section 8, Violations and Enforcement. Until the transference of all property, sites, or lots served by the structural BMP, the original owner or applicant shall have primary responsibility for carrying out the provisions of the maintenance agreement. At the discretion of the City Engineer, certificates of occupancy may be withheld pending receipt of an operation and maintenance agreement. The operation and maintenance agreement shall require the owner or owners to maintain, repair and, if necessary, reconstruct the structural BMP, and shall state the terms, conditions, and schedule of maintenance for the structural BMP. In addition, it shall grant to the City of Glenn Heights a right of entry in the event that the City Manager has reason to believe it has become necessary to inspect, monitor, maintain, repair, or reconstruct the structural BMP; however, in no case shall the right of entry, of itself, confer an obligation on the City of Glenn Heights to assume responsibility for the structural BMP. Standard operation and maintenance agreements for BMPs shall be developed by the City Manager. The operation and maintenance agreement must be approved by the City Manager prior to plan approval, and it shall be referenced on the final plat and shall be recorded by the applicant or owner with the Dallas County Registrar of Deeds upon final plat approval as described in Section 309. A copy of the recorded maintenance agreement shall be given to the City Manager within fourteen (14) days following its recordation.

2. Special Requirement for Homeowners' and Other Associations

   For all structural BMPs required pursuant to this ordinance and that are to be or are owned and maintained by a homeowners' association, property owners' association, or similar entity, the required operation and maintenance agreement shall include all such maintenance provisions and responsible parties.

C. INSPECTION PROGRAM

Inspections and inspection programs by the City of Glenn Heights may be conducted or established on any reasonable basis, including but not limited to routine inspections; random inspections; inspections based upon complaints or other notice of possible violations; and joint inspections with other agencies inspecting under environmental of safety laws. Inspections may include, but are not limited to, reviewing maintenance and repair records; sampling discharges; surface water, groundwater; and material or water in BMPs; and evaluating the condition of BMPs.

If the owner or occupant of any property refuses to permit such inspection, the City Manager shall proceed to obtain an administrative search warrant. No person shall obstruct, hamper or interfere with the City Manager while carrying out his or her official duties.

D. PERFORMANCE SECURITY FOR INSTALLATION AND MAINTENANCE

The City of Glenn Heights may require the submittal of a performance security or bond with surety, cash escrow, letter of credit or other acceptable legal arrangement prior to issuance of a permit.

E. RECORDS OF INSTALLATION AND MAINTENANCE ACTIVITIES

The owner of each structural BMP shall keep records of inspections, maintenance, and repairs for at least five years from the date of creation of the record and shall submit the same upon reasonable request to the City Manager.

F. NUISANCE

The owner of each BMP, whether structural or non-structural, shall maintain it so as not to create a nuisance condition.

G. MAINTENANCE EASEMENT

Every structural BMP installed pursuant to this ordinance shall be made accessible for adequate inspection, maintenance, reconstruction and repair by a maintenance easement. The easement shall be recorded as described in Section 311 and its terms shall specify who may make use of the easement and for what purposes.

H. RENEWALS

Permit renewal requirements, and conditions of renewal are as follows:

1. The Post Construction Storm Water permit shall be renewed biannually and certified by a Professional Engineer.

2. The owner/developer shall submit a Post Construction Storm Water permit renewal packet within thirty (30) days of expiration of the permit. The renewal packet shall include:

   a) A completed renewal form;
   b) A completed certificate of proper operation; and
   c) An As-built certification by a professional engineer.

3. The city shall conduct, at its discretion, an inspection of the structural storm water quality control prior to approval of the renewal request. Inspection results shall be used as part of the evaluation process for the renewal request.

I. EXEMPTIONS

Any new development or redevelopment project that has or will have permit coverage under the Texas Pollutant Discharge Elimination System Industrial Storm Water Permit issued by the Texas Commission on Environmental Quality (TCEQ). In lieu of the Post Construction Storm Water permit, the owner/developer/operator shall submit an Industrial Activity Certification (to be provided by the City Manager) and any one of the following:

1. A copy of the application for an individual permit from the TCEQ or the U. S. Environmental Protection Agency (EPA) for Storm Water Discharges Associated with Industrial activity at the facility.
2. A copy of the permit issued by the TCEQ or EPA for Storm Water Associated Industrial Activity at the facility.
3. A statement of commitment to file an application for an individual permit from the TCEQ for Storm Water Discharges Associated with Industrial Activity at the facility.
4. A statement of commitment to file an NOI for coverage under a general permit for Storm Water Discharges Associated with Industrial Activity issued by the TCEQ.

SECTION 8: VIOLATIONS AND ENFORCEMENT

A. GENERAL

1. Authority to Enforce

   The provisions of this ordinance shall be enforced by the City Manager, his or her designee or any authorized agent of the City of Glenn Heights. Whenever this Section refers to the City Manager, it includes his or her designee as well as any authorized agent of the City of Glenn Heights.

2. Violation Unlawful

   Any failure to comply with an applicable requirement, prohibition, standard, or limitation imposed by this ordinance, or the terms or conditions of any permit or other development or redevelopment approval or authorization granted pursuant to this ordinance, is unlawful and shall constitute a violation of this ordinance.

3. Each Day a Separate Offense

   Each day that a violation continues shall constitute a separate and distinct violation or offense.

4. Responsible Persons/Entities

Any person who erects, constructs, reconstructs, alters (whether actively or passively), or fails to erect, construct, reconstruct, alter, repair or maintain any structure, BMP, practice, or condition is violation of this ordinance, as well as any person who participates in, assists, directs, creates, causes, or maintains a condition that results in or constitutes a violation of this ordinance, or fails to take appropriate action, so that a violation of this ordinance results or persists; or any other person, who has control over, or responsibility for, the use or development of the property on which the violation occurs shall be subject to the remedies, penalties, and/or enforcement actions in accordance with this Section. For the purposes of this article, responsible person(s) shall include but not be limited to:

a) Person Maintaining Condition Resulting In or Constituting Violation
Any person who participates in, assists, directs, creates, causes, or maintains a condition that constitutes a violation of this ordinance, or fails to take appropriate action, so that a violation of this ordinance results or persists.

b) Responsibility for Land or Use of Land
The owner of the land on which the violation occurs, any tenant or occupant of the property, any person who is responsible for storm water controls or practices pursuant to a private agreement or public document, or any person, who has control over, or responsibility for, the use, development or redevelopment of the property.

B. INSPECTIONS AND INVESTIGATIONS

1. Authority to Inspect

The City Manager shall have the authority, upon presentation of proper credentials, to enter and inspect any land, building, structure, or premises to ensure compliance with this ordinance, or rules or orders adopted or issued pursuant to this ordinance, and to determine whether the activity is being conducted in accordance with this ordinance and the approved storm water management plan, Storm Water Management Design Criteria and whether the measures required in the plan are effective. No person shall willfully resist, delay, or obstruct the City Manager while the City Manager is inspecting or attempting to inspect an activity under this ordinance.

2. Notice of Violation and Order to Correct

When the City Manager finds that any building, structure, or land is in violation of this ordinance, the City Manager shall notify in writing the responsible person/entity. The notification shall indicate the nature of the violation, contain the address or other description of the site upon which the violation occurred or is occurring, or the necessary action to abate the

violation, and give a deadline for correcting the violation. The notice shall, if required, specify a date by which the responsible person/entity must comply with this ordinance, and advise that the responsible person/entity is subject to remedies and/or penalties or that failure to correct the violation within the time specified will subject the responsible person/entity to remedies and/or penalties as described in Section 503 of this ordinance. In determining the measures required and the time for achieving compliance, the City Manager shall take into consideration the technology and quantity of work required, and shall set reasonable and attainable time limits. The City Manager may deliver the notice of violation and correction order personally, by certified mail or registered mail, return receipt requested, or by any means authorized for the service of documents. If a violation is not corrected within a reasonable period of time, as provided in the notification, the City Manager may take appropriate action, as provided in Section 503, Remedies and Penalties, to correct and abate the violation and to ensure compliance with this ordinance.

3. Extension of Time

A responsible person/entity who receives a notice of violation and correction order, or the owner of the land on which the violation occurs, may submit to the City Manager a written request for an extension of time for correction of the violation. On determining that the request included enough information to show that the violation cannot be corrected within the specified time limit for reasons beyond the control of the responsible person/entity requesting the extension, the City Manager may extend the time limit as is reasonably necessary to allow timely correction of the violation, up to, but not exceeding sixty (60) days. The City Manager may grant thirty (30) day extensions in addition to the foregoing extension if the violation cannot be corrected within the permitted time due to circumstances beyond the control of the responsible person/entity violating this ordinance. The City Manager may grant an extension only by written notice of extension. The notice of extension shall state the date prior to which correction must be made, after which the violator will be subject to the penalties described in the notice of violation and correction order.

4. Penalties Assessed Concurrent with Notice of Violation

Penalties may be assessed concurrently with a notice of violation for any of the following in which case the notice of violation shall also contain a statement of the civil penalties to be assessed, the time of their accrual, and the time within which they must be paid or be subject to collection as debt:

a) Failure to submit a storm water management plan.
b) Performing activities without an approved storm water management plan.
c) Obstructing, hampering or interfering with an authorized representative who is in the process of carrying out official duties.

d) A repeated violation for which a notice was previously given on the same project and to the same responsible person/entity responsible for the violation.
e) Willful violation of this ordinance.
f) Failure to install or maintain best management practices per the approved plan.

5. Authority to Investigate

The City Manager shall have the authority to conduct such investigations as it may reasonably deem necessary to carry out its duties as prescribed in this ordinance, and for this purpose to enter at reasonable times upon any property, public or private, for the purpose of investigating and inspecting. No person shall refuse entry or access to the City Manager who requests entry for purpose of inspection or investigation, and who presents appropriate credentials, nor shall any person obstruct, hamper or interfere with the City Manager while in the process of carrying out official duties. The City Manager shall also have the power to require written statements, or the filing of reports under oath as part of an investigation.

6. Enforcement after Time to Correct

After the time has expired to correct a violation, including any extension(s) if authorized by the City Manager, the City Manager shall determine if the violation is corrected. If the violation is not corrected, the City Manager may act to impose one or more of the remedies and penalties authorized by Section 503.

7. Emergency Enforcement

If delay in correcting a violation would seriously threaten the effective enforcement of this ordinance or pose an immediate danger to the public health, safety, or welfare, then the City Manager may order the immediate cessation of a violation. Any person so ordered shall cease any violation immediately. The City Manager may seek immediate enforcement, without prior written notice, through any remedy or penalty specified in Section 503.

C. REMEDIES AND PENALTIES

The remedies and penalties provided for violations of this ordinance, whether civil or criminal, shall be cumulative and in addition to any other remedy provided by law, and may be exercised in any order.

1. Remedies

a) Withholding of Certificate of Occupancy

The City Manager or other authorized agent may refuse to issue a certificate of occupancy for the building or other improvements constructed or being constructed on the site and served by the storm water practices in question until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein.

b) Disapproval of Subsequent Permits and Development Approvals

As long as a violation of this ordinance continues and remains uncorrected, the City Manager or other authorized agent may withhold, and the City of Glenn Heights my disapprove, any request for permit or development approval or authorization provided for by this ordinance or the zoning, subdivision, and/or building regulations, as appropriate for the land on which the violation occurs.

c) Injunction, Abatements, etc.

The City Manager, with the written authorization of the City Manager may institute an action in a court of competent jurisdiction for a mandatory or prohibitory injunction and order of abatement to correct a violation of this ordinance. Any person violating this ordinance shall be subject to the full range of equitable remedies provided in the General Statutes or at common law.

d) Correction as Public Health Nuisance, Costs as Lien, etc.

If the violation is deemed dangerous or prejudicial to the public health or public safety, the City Manager, with the written authorization of the City Manager, may cause the violation to be corrected and the costs to be assessed as a lien against the property.

e) Stop Work Order

The City Manager may issue a stop work order to the person(s) violating this ordinance. The stop work order shall remain in effect until the person has taken the remedial measures set forth in the notice of violation or has otherwise corrected the violation or violations described therein. The stop work order may be withdrawn or modified to enable the person to take the necessary remedial measures to correct such violation or violations.

f) Restoration of Areas Affected by Failure to Comply

By issuance of an order of restoration, the City Manager may require a person(s) who engaged in a land development activity and failed to comply

with this ordinance to restore the waters and land affected by such failure so as to minimize the detrimental effects of the resulting pollution. This authority is in addition to any other civil penalty or injunctive relief authorized under this ordinance.

2. Civil Penalties

a) Violation of Ordinance

A violation of any of the provisions of this ordinance or rules or other orders adopted or issued pursuant to this ordinance may subject the violator to a civil penalty. A civil penalty may be assessed from the date the violation occurs. No penalty shall be assessed until the person alleged to be in violation has been notified of the violation except as provided in Section 502(D) of this ordinance in which case the penalty is assessed concurrently with a notice of violation. Refusal to accept the notice or failure to notify the City Manager of a change of address shall not relieve the violator's obligation to comply with this ordinance or to pay such a penalty.

b) Amount of Penalty

The maximum civil penalty for each violation of this ordinance is **two thousand dollars ($2,000.00)**. Each day of continuing violation shall constitute a separate violation. In determining the amount of the civil penalty, the City Manager shall consider any relevant mitigating and aggravating factors including, but not limited to, the effect, if any, of the violation; the degree and extent of harm caused by the violation; the cost of rectifying the damage; whether the violator saved money through noncompliance; whether the violator took reasonable measures to comply with this ordinance; whether the violation was committed willfully; whether the violator reported the violation to the City Manager; and the prior record of the violator in complying or failing to comply with this ordinance or any other post-construction ordinance or law. The City Manager is authorized to vary the amount of the per diem penalty based on relevant mitigating factors. Civil penalties collected pursuant to this ordinance shall be credited to the City of Glenn Heights general fund as nontax revenue.

c) Notice of Assessment of Civil Penalty

The City Manager shall determine the amount of the civil penalty and shall notify the violator of the amount of the penalty and the reason for assessing the penalty. This notice of assessment of civil penalty shall be served to violator and shall direct the violator to either pay the assessment or file an appeal within thirty (30) days of receipt of the notice as specified in Section 503(C) below.

d) Failure to Pay Civil Penalty Assessment

If a violator does not pay a civil penalty assessed by the City Manager within thirty (30) days after it is due, or does not request a hearing as provided in Section 503(C), the City Manager shall request initiation of a civil action to recover the amount of the assessment. The civil action shall be brought in Dallas or Ellis County Superior Court or in any other court of competent jurisdiction. A civil action must be filed within three (3) years of the date the assessment was due. An assessment that is appealed is due at the conclusion of the administrative and judicial review of the assessment.

e) Appeal and Remedy or Penalty

The issuance of an order of restoration and/or notice of assessment of a civil penalty by the City Manager shall entitle the responsible party or entity to an appeal before the Board of Adjustment for the City of Glenn Heights if such person submits written demand for an appeal hearing within thirty (30) days of the receipt of an order of restoration and/or notice of assessment of a civil penalty. The appeal of an order of restoration and/or notice of assessment of a civil penalty shall be conducted as described in Section 205 of this ordinance.

3. Criminal Penalties

Violation of this ordinance may be enforced as a misdemeanor subject to the maximum fine permissible under Texas law.

SECTION 9: SEVERABILTIY

If any section, article, paragraph, sentence, clause, provision, phrase, word or portion in this ordinance or application thereof to any person or circumstance, is held invalid or unconstitutional by a court of competent jurisdiction, such holdings shall not affect the validity of the remaining portions of the ordinance, and the City Council hereby declares it would have passed such remaining portions of the ordinance despite such invalidity, which remaining portions shall remain in full force and effect.

SECTION 10: EFFECTIVE DATE

The ordinance shall take effect on August 1, 2011 and after publication according to statute.

PASSED AND ADOPTED by the City Council of the City of Glenn Heights, Texas this the 18th day of July, 2011.

Victor Pereira

Victor Pereira, Mayor
City of Glenn Heights, Texas

ATTEST:

Othel Murphree

Othel Murphree, City Secretary

EXHIBIT "A"
Storm Water Management Design Criteria

Exhibit A
Storm Water Management Design Criteria

3.1 STORM DRAINAGE SYSTEM

The City of Glenn Heights is participating with NCTCOG in preparation of an integrated approach to the design and construction of drainage facilities resulting from land development projects. When fully implemented in the future, the integrated Storm Water Management (iSWM) design and construction methods will result in reduced impact on property up and downstream of individual projects. At the current time, the iSWM available for use is the iSWM Design Manual for Construction dated December 2003. All construction projects in the City of Glenn Heights shall be designed and constructed in accordance with this manual. When the future design procedures for determination of storm water runoff quantities are implemented by iSWM, those design procedures shall replace the procedures described below.

Drainage facilities shall be designed and constructed at such locations and of such size and dimensions to adequately serve the development and the fully developed contributing drainage area above the development. The developer shall provide all the necessary easements and right-of-ways required for drainage structures including storm drains and open channels, lined or unlined. Easement widths for storm drain pipelines shall not be less than twenty (20) feet. Easement widths for open channels less than ten (10) feet from top of bank to top of bank shall be at least twenty-five (25) feet wide with a fifteen (15) foot access easement on one side. For open channels wider than ten (10) feet from top of bank to top of bank, a minimum fifteen (15) foot wide access easement shall be provided on both sides of the channel. In all cases, easements shall be of an adequate size to allow proper maintenance.

The design flows for the drainage system shall be calculated by the Rational Method in accordance with standard engineering practice and in accordance with the requirements set forth in this document. Curbs, inlets, manholes, etc., shall be designed and constructed in accordance with the Standard Details. Materials and construction procedures shall conform to the requirements of the Standard Specifications for Construction.

A lot grading plan shall be provided for all development work. No lot-to-lot drainage will be allowed unless specific and private drainage easements are shown on the plat and provisions are made to prevent blocking the easements with fences or other appurtenances. The easements shall not be to the City of Glenn Heights and will not be maintained by the City of Glenn Heights and shall be specified as such on the Final Plat.

The developer shall comply with all requirements of the Environmental Protection Agency, the U.S. Army Corps of Engineers, and the Texas Commission on Environmental Quality (TCEQ) and shall obtain all permits required by these agencies.

The developer shall provide plans and specifications and design calculations for all drainage structures. The drainage facility requirements will depend on the type of street used within the subdivision as follows:

A. Subdivisions Utilizing Rural Residential and Parkways

1. Storm water may be carried in drainage ditches located adjacent to and parallel to the roadway.

2. Ditch slopes shall not be steeper than 5:1 on the front slope and 4:1 on the back slope. Slopes steeper than 6:1 shall be solid block sodded with Bermuda grass sod.

3. For clay (CL, CH, and SC classified) soils, the velocity of the storm water in the drainage way shall not exceed six (6) fps at a ten-year frequency storm event unless

erosion control devices meeting the approval of the City Engineer are used. For sandy soil conditions, the velocity of the storm water in the drainage way shall not exceed three (3) fps at a ten-year frequency storm event without approved erosion control devices.

4. Ditch flow line slopes shall not be less than 0.75%.

5. Ditch depth shall not be less than 1.5 feet measured from the edge of pavement.

6. If any of the above criteria cannot be met, the storm water shall be carried in an enclosed pipe system.

B. Subdivision Utilizing Curbed Streets

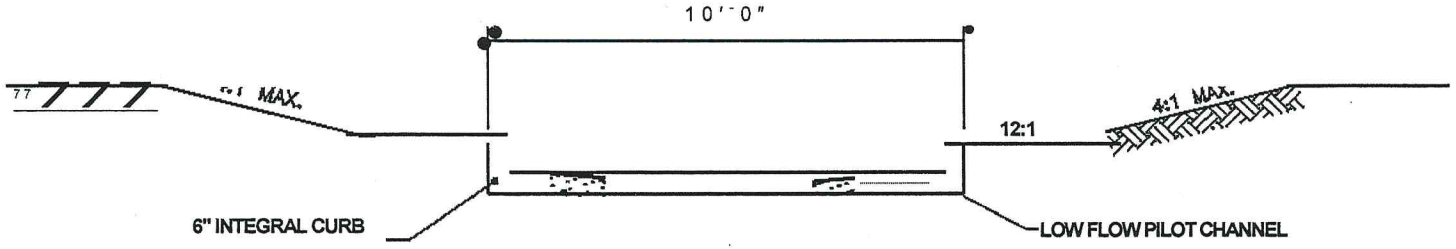
All storm water shall be carried within the paved street surface or in an enclosed pipe system or both.

For flows that exceed the capacity of an equivalent 84-inch pipe, an unlined open channel with a concrete pilot channel constructed in accordance with Figure 3-1 may be used.

The design, size, type, and location of all storm drainage facilities shall be subject to the approval of the City Engineer. The requirements set forth herein are considered minimum requirements. The developer and his engineer shall bear the total responsibility for the adequacy of design. The approval of the facilities by the City Engineer in no way relieves the developer of this responsibility.

The developer shall be responsible for the necessary facilities to provide drainage patterns and drainage controls such that properties within the drainage area, whether upstream or downstream of the development, are not adversely affected by storm drainage from facilities on the development.

Storm drainage released from the site will be discharged to a natural water course of an adequate size to control the peak runoff expected after development.



6". 3000 P.S.I. CONCRETE
W/ #3 0 24" E.W. REINF.

TYPICAL EARTHEN CHANNEL SECTION
W/CONCRETE PILOT CHANNEL

SECTION LOOKING SOUTH OR WEST

FIGURE 3-1

SCALED: NONE

DATE: MAY 2010

SHEET

DESIGN STANDARDS

TYPICAL CHANNEL SECTION

CITY OF GLENN HEIGHTS

DALLAS/ELLIS COUNTY, TEXAS

3.2 HYDROLOGY

A. Design Criteria

The Rational Method for computing storm water runoff is to be used for the hydraulic design of facilities serving a drainage area of less than six-hundred (600) acres. For drainage areas six-hundred (600) acres to twelve-hundred (1,200) acres, the runoff is to be calculated by both the Rational Method and the Unit Hydrograph Method with the larger of the two (2) values being used for hydraulic design. For drainage areas of twelve-hundred (1,200) acres and larger, the Unit Hydrograph or the U.S. Army Corps of Engineers HEC-1 Computer program shall be used. For developments which impact designated Federal Emergency Management Agency (FEMA) flood plains, HEC-1 or other methods designated by FEMA shall be used.

B. Rainfall Intensities

When calculating the quantity of storm runoff, rainfall intensity will be determined from the U.S. Department of Commerce Technical Paper No. 40, "Rainfall Frequency Atlas of the United States." For design of hydraulic facilities in the City of Glenn Heights, the applicable formulas are as follows:

$$I100 \quad \frac{103.645}{(t_c + 14.0)_{0.75823}}$$

$$I10 \quad \frac{78.197}{(t_c + 13.0)_{0.78786}}$$

Where: t_c = Time of concentration in minutes.
Rainfall intensity for a 10 year and 100 year storm.

The above equations are represented graphically in Figure 3-2.

The storm frequency used for this determination will be according to the facility to be designed as listed in Table 3-1. Emergency overflows where used are to be located at sags and T-intersections of streets and designed to prevent erosion and surface water damage.

RAINFALL INTENSITY CURVES
CITY OF GLENN HEIGHTS

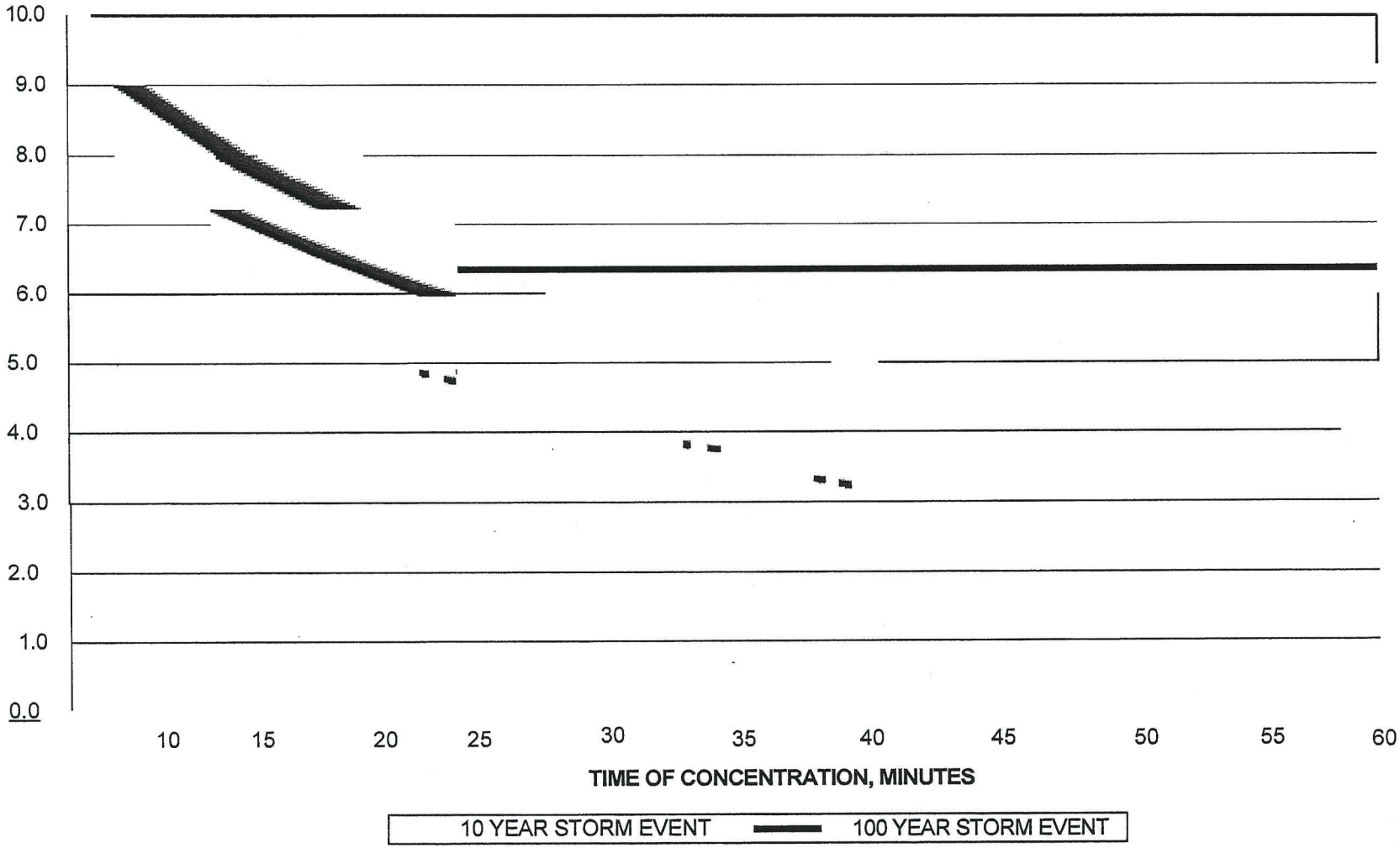


FIGURE 3-2

TABLE 3-1
DESIGN STORM FREQUENCY

Drainage Facility	Storm Frequency
Drainage ditches located in street right-of-way used in conjunction with Rural Residential and Parkway street construction with no freeboard	100 years
Pipe storm sewers with emergency overflow to give a combined capacity of 100-year frequency	10 years
Pipe storm sewer with no emergency overflow	100 years
All open channels with a minimum of 2 feet freeboard above to the top of the bank.	100 years
Culverts (pipe or concrete box)	100 years
Bridges, low point of bridge beams or similar bridge deck supporting structure to be two (2) feet above 100-year storm or highest flood recorded whichever is greater.	100 years

C. Rational Method

The rational method as described in Chapter 5 of the Texas Departments of Transportation "Hydraulic Manual" shall be used to calculate runoff. The storm frequency used for this determination will be according to the facility to be designed as listed in Table 3-1. Emergency overflows, where used, are to be located at sags and T-intersection of streets and designed to prevent erosion and surface water damage.

The time of concentration to any inlet shall be determined from finished grade slopes but in no case may be more than listed in Table 3-2.

D. Unit Hydrograph Method

For watersheds sized between six-hundred (600) and twelve-hundred (1,200) acres, the unit hydrograph method shall be compared to the Rational Method results and the higher of the two used for design purposes. The unit hydrograph method described in the TxDOT Hydraulic Design Manual, latest edition, shall be used.

E. Design According to FEMA-FIA Requirements

All streams having floodway or flood plain designation by FEMA-FIA must be designed to meet the requirements of these agencies.

3.3 RUNOFF COEFFICIENTS AND TIME OF CONCENTRATION

Runoff coefficients, as shown in Table 3-2, shall be the maximum used, based on total development under existing land zoning regulations. Where land uses other than those listed in Table 3-2 are planned, a coefficient shall be developed utilizing values comparable to those shown. Larger coefficients may be used if considered appropriate to the project by the City Engineer.

TABLE 3-2
RUNOFF COEFFICIENTS AND MAXIMUM INLET TIMES

Zone	Zoning District Name	Run-off Coefficient "C" for Sandy Soil	Run-off Coefficient "C" for Clay Soil	Max Inlet Time in Minutes
AR	Agricultural Residential	0.30	0.40	20
F-1	Single Family Residential	0.40	0.50	15
1F-2	Single Family Residential	0.50	0.60	15
2F	Two Family Residential	0.55	0.65	15
GR	General Residential	0.55	0.65	15
MF	Multi-Family	0.70	0.80	10
R	Retail District	0.85	0.85	10
CA	Central Area District	0.90	0.90	10
CA	Commercial District	0.90	0.90	10
LI	Light Industrial	0.70 to 0.90	0.70 to 0.90	10
HI	Heavy Industrial	0.70 to 0.90	0.70 to 0.95	10
PD	Planned Development	0.55	0.65	20
NON-ZONED LAND USES				
Church		0.70	0.90	10
School		0.50	0.90	10
Park		0.30	0.70	10
Cemetery		0.30	0.50	15
Street & Highway ROW		0.95	0.95	10

Time of concentration shall be computed as shown in Chapter 2, HYDROLOGY, of the Texas Department of Transportation, "Hydraulic Manual," latest edition.

3.4 DESIGN OF DRAINAGE FACILITIES

A. Storm drain conduits shall begin at the point where the depth of flow based on the 100-year storm frequency reaches a point not greater than one (1) inch over the top of curb. For pavement sections that do not have curbs, including alleys, the 100-year storm shall be contained within the right-of-way. Inlets are then located as necessary to remove the flow based on a 10-year storm frequency. If, in the judgment of the Engineer, the flow in the gutter would be excessive under either of these conditions, then consideration should be given to extending the storm sewer to a point where the gutter flow can be intercepted by more reasonable inlet locations. Multiple inlets at a single location are permitted in extenuating circumstances. Where possible, inlets should be placed upstream from an intersection to prevent large amounts of water from running through intersections. Inlets should also be located on the approach street to an intersection and in alleys where necessary to prevent water from entering these intersections in amounts that would cause the allowed street capacity to be exceeded.

The use of the street for carrying storm water shall be limited to the following:

SPREAD OF WATER – 10-YEAR STORM FREQUENCY

Type AA, A, B, or C Streets – One traffic lane on each side to remain clear.

Type D or E Streets – One traffic land to remain clear.

Type F Streets – Six (6) inch depth of flow at curb or no lanes completely

Alleys – Contained within the paved surface.

For Rural Residential (Type G) and Parkway thoroughfares, the spread of water shall be based on a 100-year storm frequency. All storm water must be contained within the right-of-way. The depth of flow shall not exceed the roadway crown elevation.

SPREAD OF WATER – 100-YEAR STORM FREQUENCY

Notwithstanding the requirements above, all storm water in the 100-year storm frequency shall be contained within the street or alley right-of-way or within the drainage easement. The water depth shall not be greater than one (1) inch over any curb.

B. Capacity of Streets and Alleys

Figure 3-3 includes a nomograph for flow in triangular channels that may be used for computing the capacity of streets and alleys having a straight cross slope. All street and alley capacities shall be calculated using a roughness coefficient of n = 0.0175.

C. Capacity of Swales

The capacity of swales shall be calculated according to the Manning Equation as given in Chapter 3 of the Texas Department of Transportation "Hydraulic Manual. All calculations shall be made using a roughness coefficient based on Table 3-5.

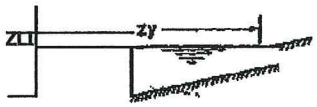
D. Valley Gutters

The use of valley gutters to convey storm water across a street intersection is subject to the following criteria:

1. A Type AA or A street shall not be crossed with a valley gutter.
2. Wherever feasible, a Type B, C, or D street shall not be crossed with a valley gutter.
3. At any intersection, perpendicular valley gutters will not be permitted and parallel valley gutters should cross only the lower classified street.

E. Alley Capacities

In residential areas where the standard alley section capacity is exceeded, curbs may be used to provide needed capacity. However, all storm drainage shall be contained in the alley right-of-way and may not encroach on to private property, especially at connecting driveways.

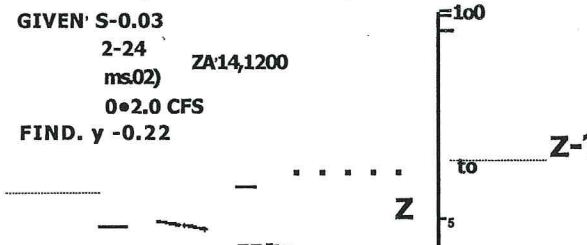


EQUATION' Ow 0.56 (k) V^g Y^h

Z•RECIPROCAL OF TRANSVERSE SLOPE
n•COEFFICIENT OF ROUGHNESS IN MANNING'S FORMULA
S•GRADE OF CHANNEL IN FT./FT.
y -DEPTH AT CURB OR DEEPEST POINT IN FT.

EXAMPLE (SEE DASHED LINES)

GIVEN' S-0.03
2-24
ms.02) ZA14,1200
0•2.0 CFS
FIND. y -0.22



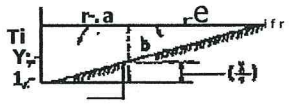
INSTRUCTIONS

L CONNECT 2/n RATIO WITH SLOPE (9) AND CONNECT DISCHARGE KB WITH DEPTH (y). THESE TWO LINES MUST INTERSECT AT "TURNING LINE FOR COMPLETE SOLUTION.

2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH TO DETERMINE DISCHARGE IN SECTIONS o AND b SEPARATELY.
THEN Cy' Qii0_b

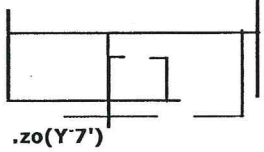
o : b

3. TO DETERMINE DISCHARGE (T IN PORTION OF CHANNEL HAVING WIDTH X.
DETERMINE DEPTH y FOR TOTAL DISCHARGE IN EN
THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTI(



Y'

4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION,- FOLLOW INSTRUCTION 3 TO OBTAIN DISCHARGE IN SECTION * AT ASSUMED DEPTH y ; OBTAIN SLOPE RATIO Z_b AND D



EPTH y. THEN Q_y • 0_4+0b

ty/t: 10000, 9000, 8000, 7000, 6000, 5000, 4000, 3000, 2000, 1000, 900, 800, 700, 600, 500, 400, 300, 200, 100, 90, 80, 70, 60, 50, 40, 30, 20, 10

.10 (In GRADE), .08, .07, .06, .05, .04, .03, .02, .01, .008, .007, .006, .005, .004, .002, .001(0.1x GRADE)

M V o

2.0, 1.0, .80, .70, .60, .50, .40, .30, .20, .10, -0.8, .06, .05, .04, .03, .02, L01

FIGURE 3-3

ADAPTED FROM FIGURE 6-20, THIRD EDITION
BRIDGE DIVISION HYDRAULIC MANUAL,
STATE DEPARTMENT OF HIGHWAYS AND PUBLIC
TRANSPORTATION OF TEXAS, DECEMBER 1985.

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

F. Sizing and Location of Inlets

For determining the size and locations of inlets, the following shall be used as a minimum:

TABLE 3-3
INLET OPENING REQUIREMENTS

Street Grade	Length of Inlet Opening for Each CFS of Gutter Flow
Sags	0.6 Feet
Less than 2%	1.0 Feet
Greater than 3.5%	2.0 Feet

Inlets shall be spaced no closer than three-hundred (300) feet apart without special permission from the City. The maximum length of an inlet at one location shall be twenty (20) feet on each side of the street.

No more than five (5) cfs can cross intersections in residential areas and no bypass of storm water across major intersections shall be allowed.

G. Hydraulic Gradient of Conduits

After the computation of the quantity of storm runoff entering each inlet, the size and gradient of pipe required to carry off the design storm are to be determined. All hydraulic gradient calculations shall begin at the outfall of the system. The following are the criteria for the starting elevation of the hydraulic gradient:

1. The 100-year water surface elevation in a creek, stream, or other open channel is to be calculated for the time of peak pipe discharge in the same storm and that elevation used for beginning the hydraulic gradient.

2. When a proposed storm sewer is to be connected to an existing storm sewer system that has a design flow less than the proposed, the hydraulic gradient for the proposed storm sewer should start at the elevation of the existing storm sewers hydraulics gradient based on the proposed design year of the upstream system.

H. Hydraulic Design of Closed Conduits

All closed conduits shall be hydraulically designed for full flow as shown in STORM DRAINS, of the Texas Department of Transportation, "Hydraulic Manual."

The crown of the pipe should be near the elevation of the hydraulic gradient, in most cases, to eliminate excessive excavation. The hydraulic gradient shall not be designed above the top of any inlet. The permissible difference between the hydraulic gradient and top of curb is normally two (2) feet or 1.5 $V^2 2g$ where V is the velocity in fps and g is 32.2 fps. The hydraulic gradient in the inlet shall not be higher than one (1) foot below the top of the inlet.

I. Velocity in Closed Conduits

Pipe grade shall be set to produce a velocity of not less than three (3) fps (fps) when flowing full. Grades producing velocities of less than three (3) fps will not be allowed. All storm sewer pipe and driveway culverts shall be a minimum of eighteen (18) inches in diameter. Discharge velocity shall be calculated with a tailwater depth not greater than the lesser of the top of the pipe at the pipe outlet or the actual 100-year water surface elevation in the channel.

Table 3-4 shows the maximum allowable velocities in closed conduits:

TABLE 3-4
RECOMMENDED MAXIMUM VELOCITY

Type of Conduit	Maximum Velocity
Culverts	15.0 fps
Inlet Laterals	15.0 fps
Storm Sewers	12.5 fps

Discharge velocities cannot exceed the permitted velocity of the channel or conduit at the outfall.

J. Roughness Coefficients for Conduits

The recommended value for the roughness coefficient "n" for concrete conduits with smooth joints and good alignment is 0.013. Where engineering judgment indicates a value other than 0.013 be used, the appropriate adjustments should be made in the calculations and the variance noted.

K. Head Losses

1. Head losses and gains for wyes and pipe size changes will be calculated by the formulas:

Where: $V_1<V_2$

$$Hl = \frac{V_{22}}{2g} - \frac{V_1^2}{2g}$$

Where: $V_1>V_2$

$$Hl = \frac{V_{22}}{4g} - \frac{V_1^2}{4g}$$

Where:

- Hl the head loss in feet measured at the point of wye or pipe size change.
- V_1 upstream velocity
- V_2 downstream velocity

2. Head losses and gains for manholes and junction boxes will be calculated by the formula:

$$Hl = V2\ 2 - KV1^2$$

Where:

- Hl the head loss in feet measured from the downstream water surface elevation.
- V_1 upstream velocity or velocity in the lateral
- V_2 the downstream velocity
- K 0.35 for 90° Lateral

K 0.43 for 60° Lateral
K 0.50 for 45° Lateral
K 0.25 for Thru Line

3. Head losses for pipe bends will be calculated by the formula:

$$HI = K \frac{V^2}{2g}$$

Where:

HI the head loss in feet measured at the upstream end of the bend the pipe velocity
V 0.50 for 90°Bend
K 0.43 for 60°Bend
K 0.35 for 45°Bend
K 0.20 for 22.5°Bend

The use of pipe bends is discouraged and will be allowed only in special situations with the permission of the City Engineer.

4. In the case where the inlet is at the very beginning of a line, the equation becomes the following without any velocity of approach:

$$HI \quad KI\frac{V^2}{2g}$$

Where:

KI 1.75

5. If the head loss calculated is less than 0.1 foot, the minimum head loss to be used at wyes, junctions, manholes, and pipe size changes for design of storm drainage system is 0.10 foot.

L. Open Channels

A wide variety of lined, partially lined or unlined channels are permitted except that lined channels may not be constructed in single family, multi-family or townhouse residential developments. All lined channels must be screened by continuous adjacent landscaping of at least four (4) feet in height. In general, the use of existing channels in their natural condition is encouraged. Low flow pilot channel lining of earthen channels will be required for any earthen channel carrying more than the capacity of an equivalent eighty-four (84)-inch diameter pipe. The design of the low flow pilot channel shall be as shown in Figure 3-1.

For residential developments, no more than two (2) barrel box culverts will be permitted for stream crossings, except in unusual conditions. For unlined channel sections, the maximum side slopes are 4:1 and the maximum permitted mean velocity in the channel is six (6) fps. Hydraulic mulching shall be applied to channel side slopes that are steeper than 5:1 in accordance with Section 202.6.4.4 of the NCTCOG Specifications and addenda. Temporary erosion control per Section 201 of the NCTCOG specifications is required for all channels.

Paved and rip-rapped slopes are to have a side slope of 2:1 maximum. Permitted velocities in totally lined channels are fifteen (15) fps for finished concrete and ten (10) fps for rock rip-rap. Discharge velocities from lined channels may not exceed six (6) fps for clay soils and 3 fps for sandy soils. The minimum velocity in any channel shall be greater the two (2) fps, including roadway ditches.

M. Hydraulic Design of Open Channels

The water surface as designed in an open channel is to be a minimum of 1 foot below the top of the channel section for concrete lined channels and two (2) feet below the top of the channel section for rock rip-rap and earthen channels to provide a margin of safety for channel obstructions and for flows that exceed the design storm frequency.

The design engineer must provide sufficient depth in the channel at entrances to closed conduits and culverts to provide for the headwater requirements. The downstream depth of flow in the proposed ditch shall be used as the tailwater condition. Exit velocity for the 10-year storm event shall be checked as well as the 100-year storm event.

On all channels the water surface elevation, which is coincident with the hydraulic gradient, shall be calculated, and shown on the construction plans.

Maximum allowable velocities and roughness coefficients for open channels are shown in Table 3-5. When the normal available grade would cause velocities in excess of the maximums, it may be necessary to design special drops or channel retards.

N. Hydraulic Design of Culverts

In the design of culverts, the Engineer shall keep head losses and velocities within reasonable limits while selecting the most economical structure. This normally requires selecting a structure that creates a head water condition and has a velocity of flow safely below the allowed maximum.

The vertical distance between the upstream design water surface and the roadway or bridge" The dimension is included as a safety factor to protect elevation is termed "freeboard, against unusual clogging of the culvert and to provide a margin for future modifications in surrounding physical conditions. Normally, a minimum of two (2) feet shall be considered a reasonable freeboard when the structure is designed to pass a design storm frequency of 100 years. Unusual surrounding physical conditions may be cause for a change in this requirement. Hydraulic design of culverts shall be in accordance with CULVERTS, of the Texas Department of Transportation, "Hydraulic Manual."

TABLE 3-5
OPEN CHANNEL DESIGN PARAMETERS

Description	Minimum Roughness Coefficient	Maximum Channel, Velocity, fps Clayey Soil/Sandy
NATURAL STREAMS		
Moderately Well-defined Channel		
Grass & Weeds, Little Brush	0.030	6/3
Dense Weeds, Little Brush	0.040	6/3
Weeds, Light Brush on Banks	0.045	6/3
Weeds, Heavy Brush on Banks	0.060	6/3
Weeds, Dense Willows on Banks	0.080	6/3
Irregular Channel With Pools and Meanders		
Grass & Weeds, Little Brush	0.045	6/3
Dense Weeds, Little Brush	0.050	6/3
Weeds, Light Brush on Banks	0.060	6/3
Weeds, Heavy Brush on Banks	0.070	6/3
Weeds, Dense Willows on Banks	0.100	6/3
Flood Plain, Pasture		
Short Grass, No Brush	0.035	6/3
Tall Grass, No Brush	0.050	6/3
Flood Plain, Cultivated		
No Grass	0.035	6/3
Mature Crops	0.050	6/3
Flood Plain, Uncleared		
Heavy Weeds, Light Brush	0.070	6/3
Medium to Dense Brush	0.160	6/3
Trees With Flood Stage Below Branches	0.120	6/3
UNLINED VEGETATED CHANNELS		
Mowed Grass, Clay Soil	0.030	6/3
LINED CHANNELS		
Smooth Finished Concrete	0.015	15/15
Rip-Rap, Rubble or Gabions	0.040	10/10

O. Headwalls

Headwalls are to be used to protect the embankment from erosion and the culvert from displacement. Sloped headwalls on a 4H:1V slope shall be constructed at the end of all pipe drainage facilities and vertical headwalls with wingwalls and aprons shall be constructed for all rectangular shaped hydraulic structures. Standard TxDOT details shall be used as the basis for design of headwalls.

Special headwalls and wingwalls may be required at the entrance of all hydraulic structures where approach velocities are in excess of eight (8) fps. Culvert exit and headwall shall be designed such as the flow line of the culvert is coincident with the flow line of the stream or channel into which the culvert discharges.

The culvert exit and headwall shall be designed such that the flow line of the culvert is coincident with the flow line of the stream or channel into which the culvert discharges. The maximum exit velocity from the culvert is limited to the maximum velocity allowed in the stream or channel.

Due to the geometry of the culvert-stream intersection, turbulence or other conditions may tend to produce erosion. Concrete rip-rap will be used to protect the stream bed from scour and erosion. The rip-rap shall be reinforced and have toe walls to prevent undermining.

The maximum exit velocity from the culvert is limited to the maximum velocity allowed in the stream or channel depending on channel geometry and soil type. Concrete rip-rap and energy dissipaters are required to protect the stream bed from scour and erosion when velocities exceed the capacity of grass lining to protect the underlying soil. The rip-rap shall be reinforced and have toe walls to prevent undermining.

P. Bridge Design Hydraulics

Once a design discharge and a downstream depth of flow have been determined, the size of the bridge opening can be determined. Determination of head losses through bridge structures shall be calculated.

The City of Glenn Heights has the following policy with regard to the hydraulic design of bridge structures:

1. Minor head loss due to the structure is allowed. Normal losses due to channel cross sections are allowable.

2. Excavation of the natural channel is not normally allowed as compensation for loss of cross sectional area.

3. Channelization upstream or downstream of the proposed bridge will normally not be permitted.

4. Hydraulic design for bridges shall conform to the requirements of BRIDGES, of the Texas Department of Transportation, "Hydraulic Manual."

5. A two (2)-foot freeboard is required between the designed water surface and the bottom of the lowest beam.

6. Bridge design shall meet all FEMA requirements when a designated floodway is crossed.

3.5 CONSTRUCTION PLANS PREPARATION

A. Drainage Area Map

The site drainage area map shall have a minimum scale of 1' = 200', and show the street right-of-way. For large drainage areas, including off-site drainage, a map having a larger scale may be used. The following items/information shall be included:

1. Acres, coefficient, and intensity for each drainage sub-area;
2. Inlets, their size and location, the flow bypass for each, the direction of flow as indicated by flow arrows, the station for the centerline of the line;
3. A chart including data shown shall be submitted with the first review, and included on the map with the final review;
4. Existing and proposed storm sewers;
5. Sub-areas for alleys, streets, and off-site areas;
6. Points of concentration;
7. Runoff to all inlets, dead-end streets, and alleys or to adjacent additions and/or lots;
8. A table for runoff computations;
9. Flow arrows to indicate all crests, sags and street and alley intersections;
10. North arrow;
11. Any off-site drainage shall be included;
12. Street names shall be indicated; and,
13. 100-year floodplain shall be indicated on the drainage area map.

When calculating runoff, the drainage area map shall show the boundary of the drainage area contributing runoff into the proposed system. This boundary should be determined from a map having a maximum contour interval of two (2) feet. The area shall be further divided into subareas to determine flow concentration points or inlet locations. The centerline of all streets will normally be a boundary of a drainage area, to ensure that inlets are sized and positioned to fill the need without depending on storm water crossing over the street crown for proper drainage.

In residential areas, the centerline of the street will only be used as a drainage area boundary if the flow in either gutter has not exceeded the street crown elevation.

Direction of flow within streets, alleys, natural and man-made drainage ways, and at all system intersections, shall be clearly shown on the drainage area map and/or paving plans. Existing and proposed drainage inlets, storm sewer pipe systems and drainage channels shall also be clearly shown and identified on the drainage area map. Storm sewer plans shall show and mark station ticmarks at 100-foot intervals. Plan-profile storm sewer or drainage improvement sheet limits and match lines shall be shown with pipes and channels identified.

The drainage area map should show enough topography to easily determine its location within the City.

B. Plan-profile Sheets

1. Inlets

Inlets shall be given the same number designation as the area or sub-area contributing runoff to the inlet. The inlet number designation shall be shown opposite the inlet. Inlets shall be located at or immediately downstream of drainage concentration points. At intersections, where possible, the end of the inlet shall be ten feet from the curb return P.T., and the inlet location shall also provide minimum interference with the use of adjacent property. Inlets in residential areas should be located in streets and alleys so the driveway access is not prohibited to the lots. Inlets located directly above storm sewer lines, as well as laterals passing through an inlet, shall be avoided. Drainage from abutting properties shall not be impaired, and shall be designed into the storm drainage system.

Data opposite each inlet shall include paving or storm sewer stationing at centerline of inlet, size and type of inlet number or designation, top of curb elevation and flow line of inlet as shown on construction plans.

2. Laterals

Inlet laterals leading to storm sewers, where possible, shall enter the inlet and the storm drain main at a 60-degree (60 angle from the street side. Laterals shall be four feet from top of curb to flow line of inlet, unless utilities or storm sewer depth requires otherwise. Laterals shall not enter the corners or bottoms of inlets. Lateral profiles shall be drawn showing appropriate information including the hydraulic gradient and utility crossings. Short laterals (30 feet or less) crossing utility lines will be profiled.

3. Storm Sewer

In the plan view, the storm sewer designations, size of pipe, and length of each size pipe shall be shown adjacent to the storm sewer. The sewer plan shall be stationed at one hundred (100)-foot intervals, and each sheet shall begin and end with even or fifty (50)-foot stationing. All storm sewer components shall be stationed.

The profile portion of the storm sewer plan-profile sheet shall show the existing and proposed ground profile along the centerline of the proposed sewer, the hydraulic gradient of the sewer, the proposed storm sewer, and utilities that intersect the alignment of the proposed storm sewer. Also, shown shall be the diameter of the proposed pipe in inches, and the physical grade in percent. Hydraulic data for each length of storm sewer between interception points shall be shown on the profile. This data shall consist of pipe diameter in inches, the 100-year design storm discharge in cubic fps, slope of hydraulic gradient in percent, Manning capacity of the pipe flowing full in cubic fps, velocity in fps, and $V^2 2g$. Also, the head loss at each interception point shall be shown.

Elevations of the flow line of the proposed storm sewer shall be shown at one hundred (100)-foot intervals on the profile. Stationing and flow line elevations shall also be shown at all pipe grade changes, pipe size changes, lateral connections, manholes and wye connections. All soffits shall be connected.

4. Creek Cross-Sections

The plan view of creek crossing shall include topographic information for the creek channel at least two hundred (200) feet up and downstream of the crossing and shall include the location and type of trees in excess of three (3)-inch caliper. Sufficient information shall be provided to determine accurate cross-sections of the natural creek and creek bank. The profile shall include the depth of flow and velocities in the existing creek channel for the 100-year storm event. This depth of flow shall be used as the tailwater when analyzing the hydraulic impacts of the proposed crossing. The resulting headwater and exit velocity from the proposed crossing shall be included on the profile.

All plan sheets shall be drawn in AutoCAD® format on 24" x 36" sheets, to a standard engineering scale, and shall be clearly legible when sheets are reduced to half scale. Each plan-profile sheet shall have a benchmark shown. Review plan markups shall be returned with each subsequent submittal of revised plans.

3.6 CHECK LIST FOR STORM DRAINAGE PLANS

A. Drainage Area Map

1. Normally, use 1" = 200' scale for on-site, and 1" 400" for off-site. Show match lines between any two (2) or more maps.
2. Show existing and proposed storm drains and inlets with designations.
3. Indicate sub-areas for alley, street, and off-site areas.
4. Indicate existing and proposed contours on map for on and off-site.
5. Use design criteria as shown in design manual.
6. Indicate zoning on drainage area map.
7. Show points of concentration and their designations.
8. Indicate runoff at all inlets, dead-end streets and alleys, or to and from adjacent additions or acreage.
9. Provide runoff calculations for all areas showing acreage, runoff coefficient, and inlet time. (Q = CIA table).
10. For cumulative runoff, show calculations.
11. Indicate all crests, sags, and street and alley intersections with flow arrows.
12. Identify direction of north to top page or to the left.
13. Show limits of 100-year fully developed flood plain on drainage area map.

B. Storm Sewers

1. Diversion of flow from one natural drainage area to another will not be allowed.
2. Show plan and profile of all storm sewers.

3. Specify Class III reinforced concrete pipe, unless otherwise noted.

4. Use heavier than Class III reinforced concrete pipes where crossing railroads, areas of deep fill and areas subjected to heavy loads.

5. Specify concrete strength for all structures. The minimum allowable is 3,600 psi.

6. Provide inlets where street capacity is exceeded. Provide inlets where alley runoff exceeds intersecting street capacity.

7. Do not allow storm water flow from streets into alleys.

8. Do not use high velocities in storm sewer design. A maximum discharge velocity of six (6) fps for clay soil and 3 fps for sandy soils is required at the location where grass lined ditches begin. Velocity dissipation may be necessary to reduce erosion.

9. Flumes may not be allowed unless specifically designated, and will not be allowed on AA, A, B, C, or D thoroughfares.

10. Provide headwalls and aprons for all storm sewer outfalls. Provide rip-rap around headwalls where slopes exceed 4:1.

11. Discharge flow lines of storm sewers to be two (2) feet above the flow line of creeks and channels (where topography allows), unless channel lining is present. Energy dissipation shall be provided when specified by the City Engineer.

12. Where fill is proposed for trench cut in creeks or outfall ditches, compaction shall be 95% of the maximum density as determined by ASTM D 698.

13. Investigations shall be made by the engineer to validate the adequacy of the storm sewer outfall to a major stream.

14. Outfall area must have adequate capacity to carry the discharge. Provide Erosion control facilities with hydraulic data.

15. Any off-site drainage work or discharge to downstream property will require an easement. Easements shall be sized such that the developed flows can be conveyed within the easement. The easement shall also be large enough to provide access along the top bank for maintenance and access from public right-of-way. Submit field notes for off-site easement that may be required.

16. For 24" and smaller storm sewer, manholes shall be spaced at junctions and at a maximum of 500-foot centers. For storm sewer larger than 24", manholes shall be placed at junctions and a maximum of 80-foot' centers.

C. Plan and Profile

1. Indicate proper ty lines and lot lines along storm sewers, and show easements with dimensions.

2. If necessary, provide separate plan and profile of storm sewers. The storm drain pipes should also be shown on paving plans with a dashed line, and on sanitary sewer profiles showing the full pipe section.

3. Tie storm sewer system stationing with paving stations.

4. Show pipe sizes in plan and profile.

5. Show hydraulics on each segment of pipe profile to include: Q10Q100C flow capacity; S, V, $V^2$2g.

6. Show curve data for all storm sewer system.

7. Show all existing utilities in plan and profile. On storm sewer profiles, as a minimum, the sanitary sewer profile will be shown.

8. Indicate existing and proposed ground line and improvements on all street, alley, and storm sewer profiles.

9. Show future streets and grades where applicable.

10. Where connections are made to existing storm sewer show computations on existing system when available. HGL will be calculated from the outfall to the connection point including the designed flows of the added on systems.

11. Indicate flow line elevations of storm sewers on profile, show pipe slope (percent grade). Match top inside of pipe where adjacent to other size pipe.

12. Intersect laterals at sixty (60) degrees with trunk line.

13. Show details of all junction boxes, headwalls, storm sewers, flumes, and manholes, when more than one pipe intersects the drainage facility or any other item is not a standard detail.

14. Pipe direction changes will be curves using radius pipe unless approved by the City Engineer.

15. Bends in pipe may be used in unusual circumstances with approval of the City Engineer. No bend at one location may exceed thirty (30) degrees.

16. Do not use ninety (90)-degree turns on storm sewers or outfalls. Provide good alignment with junction structures or manholes (for small systems).

17. Profile outfall with typical flat bottom section.

18. Show all hydraulics, velocity head changes, gradients, and computations.

19. Show water surface at outfall or storm drain.

20. On all dead-end streets and alleys, show grade out to "daylight" for drainage on the profiles and provide erosion control. Show typical section and slope of "daylight" drainage. Side slopes shall not exceed 4:1.

21. At sags in pavement, provide a positive overflow (paved sidewalk in a swale) to act as a safety path for failure of the storm drain system. Minimum finished floor elevations will be shown on the plat to protect building against flooding should the positive overflow be used.

22. Where quantities of runoff are shown on plans or profiles, indicate storm frequency design.

23. Provide sections for road, railroad and other ditches with profiles and hydraulic computations. Show design water surface on profile.

24. For drainage ditches located in street right-of-way running parallel to street paving, show the size of each driveway culvert on the ditch profile. Assume the maximum number and width of driveways allowed for each lot. Show the hydraulic grade lines as required herein.

D. Laterals

1. Show laterals on trunk profile with stations.

2. Provide lateral profiles for laterals exceeding thirty (30) feet in length.

3. Where laterals tie into trunk lines, place at sixty (60) degree angles with centerlines. Connect them so that the longitudinal centers intersect.

4. Calculate hydraulic grade line for laterals and inlets to ensure collection of storm water. Check $1.5\ V^2 2g$, using trunk line velocity on laterals less than 80-feet long. Final the H.G. at the gutter or inlet lip by adding the $1.5\ V^2 2g$ to the hydraulic gradient of the trunk line at the lateral connection. For all inlets, provide HGL. and hydraulic data on profile for all profiled laterals. Laterals longer than eighty (80) feet require special analysis.

5. All inlets shall have minimum eighteen (18)-inch laterals.

E. Inlets and Intakes

1. Provide inlets where street capacity is exceeded. Provide inlets where runoff from alley causes the capacity of the intersecting street to be exceeded.

2. Indicate runoff concentrating at all inlets and direction of flow. Show runoff for all stub outs, pipes and intakes.

3. On plan view, indicate size of inlet, lateral size, flow line, top-of-curb elevations, paving station, and inlet designation number.

4. Use standard curb inlets in streets. Use recessed inlets in divided streets. Use combination inlets in alleys when on a straight run. Do not use grate or combination inlet unless other solution is not available (special situation).

5. Use type "Y" or special "Y" inlets in ditches or swales. No "Glory Holes" allowed as intake for a storm sewer or at a culvert. A three (3)-foot concrete apron shall be constructed around "Y" inlets.

F. Paving

1. Provide six (6)-inch curb on alleys parallel to creek or channel on creek side of alley.

2. For a proposed driveway turnout, curb return P.T. must be ten (10)-feet upstream from any existing or proposed inlet, or five (5)-feet downstream of a standard inlet.

3. Check the need for curbing at all alley turns and "T" intersections. Flatten grades ahead of turns and intersections.

4. Where inlets are placed in an alley, provide curbing for ten (10)-feet on each side of combination inlets.

G. Detention Basins

1. Provide drainage area map and show all computations for runoff affecting the detention basin.

2. Provide a plot plan with existing and proposed contours for the detention basin and plan for structural components. Determine if TCEQ permit is required for a small dam.

3. Where earthen embankment is proposed for impoundment, furnish a geotechnical report, typical embankment section and specifications for fill including a profile for the outflow structure.

4. Provide structural details and calculations for any item not a standard detail.

5. Provide detention basin volume calculations and elevation versus storage curve.

6. Provide hydraulic calculations for outflow structure and elevation versus discharge curve.

7. Provide routings or modified rational determination of storage requirements, demonstrating that critical duration is used (for areas of 600 acres or less).

8. Provide a ramp into the pond for maintenance. A pilot channel (minimum grade 0.5%) will be required for all ponds with a bottom grade sloping less than one percent (1%).

H. Bridges

1. Clear the lowest member of the bridge by two (2)-feet above the design water surface, unless otherwise directed by the City Engineer.

2. Show geotechnical soil boring information on plan.

3. Show bridge sections upstream and downstream.

4. Provide structural details and calculations with dead load deflection diagram.

5. Provide vertical and horizontal alignment.

6. Show soil erosion protection measures and concrete rip-rap.