CHAPTER 16.20
ENGINEERING PLANS AND STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

16.20.005 CONCEPTUAL ISWM SITE PLAN

The conceptual iSWM site plan shall be submitted at the time of Sketch Plat submittal at the same scale as the Sketch Plat (preferably 1" = 50') and shall include:

A. Project Description

1. Address and legal description of site
2. Vicinity map
3. Land use

B. Existing conditions:

1. Copy of applicable digital orthophotos showing the proposed project boundaries
2. A topographic map of existing site conditions (no greater than 2-foot contour interval) with drainage basin boundaries indicated and project boundaries shown
3. Total area size of development (in acres)
4. Total impervious area as a percentage (%) of total area
5. Benchmarks used for site control
6. Perennial and intermittent streams
7. Map of predominant soils from USDA soil surveys
8. Boundaries of existing predominant vegetation
9. Location and boundaries of other natural feature protection and conservation areas, such as wetlands, lakes, ponds, floodplains, stream buffers and other setbacks (e.g. drinking water well setbacks, septic setbacks, etc.)
10. Location of existing roads, buildings, parking areas and other impervious surfaces
11. Existing utilities (e.g. water, sewer, gas, electric) and easements
12. Location of existing drainage conveyance systems such as grass channels, swales, and storm drains
13. Flow paths
14. Location of floodplain/floodway limits and relationship of site to upstream and downstream properties and drainage systems
15. Location and dimensions of existing channels, bridges or culvert crossings.

C. Conceptual Site Layout

1. Completed iSWM Conceptual Plan Worksheet
2. Hydrologic analysis to determine conceptual runoff rates, volumes, and velocities to support selection of Storm Water Controls.
3. Conceptual site design identifying integrated site design practices used
4. Identification of storm water site design credits
5. Identification and calculation of water quality volume reduction, if applicable
6. Conceptual estimates of the three (3) storm design approach requirements (i.e. 2-year, 25-year and 100-year 24-hour storms)
7. Conceptual selection, location and size of proposed structural storm water controls
8. Conceptual limits of proposed grading and clearing
9. Total proposed impervious area, as a percentage of total area.

16.20.007 Preliminary iSWM Site Plan

For a Standard Plat, this sheet shall be submitted with the Preliminary Plat and shall be at the same scale as the Preliminary Plat. For a Minor Plat, this sheet shall be submitted with the Final Plat. The Preliminary iSWM Site Plan should consist of maps, narrative, and supporting design calculations (hydrologic and hydraulic) for the proposed storm water management system, and shall include the following sections:

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

1. Existing conditions data developed in the Conceptual iSWM Site Plan
2. All existing storm water conveyances and structural control facilities
3. Direction of flow and exits from the site
4. Analysis of runoff provided by off-site areas upstream of the project site
5. Methodologies, assumptions, site parameters and supporting design calculations used in analyzing the existing conditions site hydrology

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

1. A description of the overall project and the site plan showing facility locations, roadways, etc.
2. A discussion of the applicable local criteria and how it will be integrated into the design of the project
3. Evaluate the integrated site design practices and their applicability to this site
4. A discussion of any credits for integrated site design being requested
5. A discussion of the water quality treatment techniques (pollution prevention practices) that are to be utilized on this site, if applicable
6. A determination of groundwater recharge considerations, if applicable, for this site,
7. Identify hotspot land uses, if applicable, and how runoff will be addressed

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

1. A topographic map of developed site conditions (minimum 2-foot contour interval recommended) with post development basin boundaries indicated
2. Total area of post development impervious surfaces and other land cover areas for each subbasin affected by the project
3. Runoff calculation for flood control and streambank protection for each subbasin, as well as any applicable water quality calculations

4. Location and boundaries of proposed natural feature protection and conservation areas
5. Documentation and calculations for any applicable site design credits or water quality volume reduction methods being used
6. Methodologies, assumptions, site parameters and supporting design calculations used in analyzing the post-development conditions site hydrology
7. Supporting documentation that there is existing streambank protection/reinforcement or that the planned development will provide streambank protection downstream
8. Supporting calculations for a downstream peak flow analysis to show safe passage of post-development design flows downstream. Document point downstream at which analysis ends, and how it was determined.

In calculating runoff volumes and discharge rates, consideration may need to be given to any planned future upstream land use changes. Depending on the site characteristics and given local design criteria, upstream lands may need to be modeled as "existing conditions" of "projected buildout/future condition" when sizing and designing on-site conveyances and stormwater controls.

D. Storm Water Management System Design: Provide drawings and design calculations for the proposed storm water management system, including:

1. A drawing or sketch of the storm water management system including the location of non-structural site design features and the placement of existing and proposed structural storm water controls. This drawing should show design water surface elevations, storage volumes available from zero to maximum head, location of inlets and outlets, location of bypass and discharge systems, and all orifice/restrictor sizes.
2. Narrative describing that appropriate and effective structural storm water controls have been selected
3. Cross-section and profile drawings and design details for each of the structural storm water controls in the system. This should include supporting calculations to show that the facility is designed to the applicable design criteria.
4. Hydrologic and hydraulic analysis of the storm water management system for all applicable design storms (should include stage-storage or outlet rating curves, and inflow and outflow hydrographs)
5. Documentation and supporting calculations to show that the storm water management system adequately meets the integrated design approach (see Section 1.2 of the iSWM Design Manual)
6. Drawings, design calculations and elevations for all existing and proposed storm water conveyance elements including storm water drains, pipes, culverts, catch basins, channels, swales and areas of overland flow.

16.20.010 PRELIMINARY WATER AND SEWER PLAN

This sheet shall be submitted with the Preliminary Plat for Standard Plats in a form acceptable to the Benbrook Water Authority. It shall be prepared from the Preliminary Plat, but shall also

include topographical contours at the intervals specified for Preliminary Drainage Plan, and show the following:

A. Existing sewers, water mains, gas mains, electric and telephone lines, culverts, or other underground structures or utilities within the tract and immediately adjacent thereto with pipe sizes, grades, and locations indicated.

B. Indicate the direction and distance to, and size of the nearest water mains and sewers in the event they are not on or adjacent to the tract, showing invert elevation of sewers, if any.

C. The size and location of all proposed sewer mains and proposed easements, if required, including manholes. Preliminary sewer plans are required to determine location of easements.

D. The size and location of all proposed water distribution mains including valves and fire hydrants.

E. The size of water mains according to requirements of the Benbrook Water Authority.

In the event water mains and sewers are not on or adjacent to the tract, indicate the direction and distance to, and size of the nearest ones, showing invert elevation of sewers.

16.20.015 PRELIMINARY STREET PLAN

This sheet shall be submitted with the Preliminary Plat for Standard Plats and shall be prepared from the Preliminary Plat, showing topographical contours as applicable, and showing the following:

A. Type of street to be constructed (i.e. concrete).

B. Classification (i.e. arterial, collector, local).

C. Additional easement or right-of-way requirements.

D. Design Standards used.

E. Relationship of existing and planned streets, to topographical conditions, if applicable.

16.20.017 PRELIMINARY LOT GRADING PLAN

This sheet shall be submitted with the Preliminary Plat for Standard Plats and shall be prepared from the Preliminary Plat, showing topographical contours as applicable, and showing the following:

A. Planned grading contours, elevations, earth works, slopes, retaining walls, or other grading information if required by the City Engineer.

16.20.020 CONSTRUCTION PLANS FOR PUBLIC IMPROVEMENTS

These plans shall be submitted with the Final Plat for Standard Plats, and for Minor Plats with infrastructure when required.

A. GENERAL REQUIREMENTS

Prior to the commencement of any construction of public works improvements, the developer or person who intends to construct such projects shall present plans, specifications, and projections of probable cost setting forth in detail all elements of construction to the City for approval. In the case of public improvements associated with subdivision development, the engineering plans (including descriptions of all necessary off-site easements) must be approved in accordance with all requirements of the Subdivision Ordinance prior to approval of the Final Plat.

1. Four (4) copies of complete plans, specifications, engineering calculations, and detailed cost estimates for streets, drainage, sanitary sewers, water distribution, and any other improvements to be performed, with the Engineer's seal affixed, are required for submission at Final Plat approval. Upon approval, two (2) full size and two (2) half-size copies of the construction plans shall be submitted.

2. Final iSWM Site Plan, including the construction Storm Water Pollution Prevention Plan (SWPPP), landscaping plan, operations and maintenance plan, and evidence of acquisition of applicable federal, state and local permits.

3. These plans shall be submitted on standard 22 by 34 inch or 24 x 36 inch sheets for full size sheets and 11 by 17 inch for half-size sheets, and shall include the information required herein. Plan and profile sheets shall be oriented with the plan view at the top portion of the sheet.

4. Each plan shall show the seal and signature of the registered professional Engineer who prepared the plan. The subdivider shall retain a registered civil Engineer, licensed to practice in the State of Texas, for all design in new subdivisions or developments, including streets, storm drains, water and sanitary sewers.

5. Upon approval of the plans, the Developer shall furnish two (2) full-size and two (2) half-size sets of final approved plans to the City Planner or designee for the Developer's Agreement.

B. CONTENT OF PLANS, SPECIFICATIONS AND COST ESTIMATES

1. The plans shall include plan view, profile and section views of the proposed improvements. Construction details of all structures and appurtenances including dimensions, reinforcing, and components such as grate and manhole covers shall be shown. The proposed curb and gutter type and location in relation to the center line and right-of-way, the proposed sidewalk dimension and the proposed parkway grading shall be shown on street plans. This information shall be given for each of the different types of streets and alleys in the subdivision. Soils test by an approved soil testing laboratory shall be submitted with the plans to determine the limits and amount of lime or cement stabilization required.

2. The plans shall include the alignment of each street, alley, crosswalk and drainage and any other easement, and a beginning and end station of the point of intersection of each curve. The station and angle of each intersection with another street, alley, or drainage easement, the station and radius of each curb return, the location of all monuments and the length, width, thickness of base, subgrade and surface material of each street.

3. The plans shall also include the location, description and elevation of all benchmarks, the direction of storm drainage flow at each intersection, the flow line elevation of each drainage structure, the flow line elevation of each storm

sewer at each point of change of grade and each end and the intervening gradient, the profiles of streets, alleys, and drainage structures shall show the natural ground at adjacent property lines and the proposed center line.

4. The plans and profiles should be drawn at a scale of one inch (1") to forty feet (40') horizontal and one inch (1") to four feet (4') vertical on sheets no larger than twenty-four inches by thirty-six inches (24" x 36") in size. North arrow and date of preparation must be shown on each sheet. All public work improvement plans shall bear the seal and signature of a professional engineer registered in the State of Texas.

5. The applicant shall include on the plans all calculations and assumptions used in the design of the proposed improvements. Calculations shown on the Plans will not have to be repeated in a report.

6. Cost projections shall be prepared using quantities shown on the construction plans and recent unit prices from bids on similar projects. Reasonable contingencies should be included to cover uncertainty in the projection. Actual bids supported by bid and performance bonds may be used in lieu of projections of probable cost.

7. Upon approval of the construction plans, specifications and projections of probable cost by the City Engineer; approval of the contract documents, bonds and financial assurance; acquisition of all necessary off-site easements, and upon receipt of the inspection fees, Notice of Intent (NOI), Storm Water Pollution Prevention Plan and Erosion Control Deposit, and conformance with all requirements of and approval by the Benbrook Water Authority, the City shall schedule a pre-construction conference and issue a permit for the construction of public works improvements.

C. FINAL DRAINAGE PLANS

Upon approval of the preliminary drainage study, the Developer shall submit detailed plans, specifications and cost projections prepared by a registered Professional Engineer registered in the State of Texas and experienced in municipal drainage work. Existing and proposed flow lines of all improvements shall be shown. Unless otherwise specified herein, drainage requirements shall be based on the ISWM Design Manual for Site Development. The Hydraulic Manual prepared and compiled by the Texas Department of Transportation Bridge Division, with current revisions, may be used in cases not covered by the iSWM Design Manual for Site Development. The following shall be included in the Plans:

1. Final iSWM Site Plan, which includes all of the revised elements included in the Preliminary iSWM Site Plan, plus a Construction Storm Water Pollution Prevention Plan (SWPPP), a Landscaping Plan, Operations and Maintenance Plan, evidence of acquisition of Applicable Federal and State permits, and any waiver requests.

2. Final grading and drainage construction plans, indicating two foot (2') contours. All street width and grades shall be indicated on the plan, and run-off figures shall be indicated on the outlet and inlet side of all drainage ditches and storm sewers, and at all points in the street at changes of grade or where the water enters another street or storm sewer or drainage ditch. Drainage easements shall be indicated.

3. When a drainage channel or storm sewer is proposed, complete plans, profiles and specifications shall be submitted showing complete construction details. Scales shall be one inch equal to 40 or 50 feet horizontally and one inch equal 4 or 5 feet vertically.

4. Two (2) copies of detailed cost estimates.

5. A plan of the development shall be submitted depicting the final grading contours and elevations, earthwork, slopes, retaining walls, minimum finished floor elevations of all affected structures, and any other information considered necessary by the City Engineer at a scale of 1" = 100' minimum.

6. Complete detention pond plans and calculations meeting the requirements of paragraph 16.28.035(C).

D. FINAL WATER AND SEWER PLANS

1. The Final Water and Sewer Plans shall be submitted to the Benbrook Water Authority in accordance with the Policies and Procedures of the Benbrook Water Authority. In addition, three copies shall be submitted to the City. These plans shall be submitted with the Final Plat for Standard Plats and shall be prepared from the Preliminary Plat, but shall also include topographical contours and shall show the following:

   a) Existing sewers, water mains, gas mains, electric and telephone lines, culverts, or other underground structures or utilities within the tract and immediately adjacent thereto with pipe sizes, grades, and locations indicated.

   b) A plan and profile of proposed sanitary sewers, with grades and pipe sizes indicated and showing locations of manholes, cleanouts, etc. and a plan of the proposed water distribution system showing pipe sizes and location of valves, fire hydrants, and fittings, etc., in conformance with the criteria as shown in the part of the Ordinance listed as "Design Provisions". Each plan shall show the seal and signature of the registered professional civil engineer who prepared the plans. Each sheet shall include north point, scale, date, and benchmark description to sea level datum. If the applicant does not propose to install a sewage collection system, a preliminary sewage collection plan may be required, suitable for determination of easement requirements.

   c) Indicate the direction and distance to, and size of the nearest water mains and sewers in the event they are not on or adjacent to the tract, showing invert elevation of sewers, if any.

   d) A plan and profile of the proposed water distribution system showing pipe sizes and location of valves, fire hydrants, and fittings and other facilities. A profile is required for all water lines 12 inches in diameter and larger. Each sheet shall include north point, scale, date, and benchmark description to sea level datum.

   e) The size and location of all proposed water distribution mains including valves and fire hydrants.

   f) The size of water mains according to requirements of the Benbrook Water Authority.

g) Scales shall be one inch equal to 40 or 50 feet horizontally and one inch equal 4,5, or 10 feet vertically.

2. A copy of the executed Developer-Authority Agreement, in accordance with the Policies and Procedures of the Benbrook Water Authority.

E. FINAL STREET PAVING PLANS

Final Street Paving Plans shall include:

1. A plan and profile of each street with centerline and top curb grades, existing and proposed ground line shown. Each sheet shall include north point, scale, date, and a minimum of two benchmark descriptions to sea level datum. The plans shall include:

   a) Type of street to be constructed (i.e. Portland cement).

   b) Classification (i.e. arterial, collector, residential).

   c) Additional easement or right-of-way requirements.

   d) Design Standards used.

   e) Relationship of existing and planned streets, to topographical conditions, if applicable.

   f) Planned grading contours, elevations, earth works, slopes, retaining walls, flow arrows or other grading information required by the City Engineer.

2. Scales shall be one inch equal to 40 or 50 feet horizontally and one inch equal 4 or 5 feet vertically.

3. The typical cross-section of proposed streets showing the width of roadways and type of surface, reinforcing, subgrade, sidewalks, curb height, crown height and cut/fill slopes shall be shown.

4. All other requirements of the current street standards shall be included in the plans.

5. The plans shall contain a statement of “Released for Construction” for signature of the City Engineer.

6. Two (2) copies of detailed cost estimates.

16.20.025 OTHER UTILITIES

The Subdivider must furnish a written statement to the City designating how the subdivision will be served by electrical, natural gas, telephone and cable television. Utility construction shall be coordinated with street construction to avoid unnecessary pavement cuts.

16.20.030 DESIGN SUMMARY

The City Engineer may require a separate document or report entitled "Engineering Report" that shall be submitted with final plans and specifications. This report shall summarize calculations and other Engineering information pertaining to the major items of design significance as may be necessary in the City's review of the plans and specifications to determine whether the facilities proposed for construction have been designed in accordance with the intent of the Design Standards contained or referenced herein. Calculations should include drainage facilities, water demand, sewage flows, and any others that are considered necessary by the City.

16.20.035 STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

The City of Benbrook, Texas, herein has adopted the Standard Specifications for Public Works Construction (2002, as amended) as published by the North Central Texas Council of Governments (NCTCOG), plus any local amendments adopted by the City of Benbrook, for use in public works or facilities construction within the City of Benbrook and its extraterritorial jurisdiction. These specifications are adopted in their entirety except as may be amended in the local amendments that are included in the Benbrook Design Standards and Criteria. All builders, developers, and contractors are to utilize said specifications in the construction of any public facilities or projects which are anticipated to be dedicated to, accepted by, or utilized by the public within the City of Benbrook and its extraterritorial jurisdiction. To the extent that any of the provisions of these standard specifications are in conflict with any other City ordinances, the most restrictive or exacting standard shall apply.

16.20.040 MONUMENTATION AND BENCHMARKS

The boundaries of any subdivision presented for review and recording shall be monumented and such monuments shall be duly noted on said plat and within the accompanying dedication instrument according to Rule 663.11 of the Texas Board of Land Surveying (Certification and Monumentation of Surveys). In no case shall a boundary course of said subdivision be monumented in intervals greater than 1300 feet.

Subsequent to installation of utilities and pavements, all lot corners, curve points, and changes in course in any line with the subdivision shall be monumented in accordance with said Board of Land Surveying Rule 663.11 by the platting surveyor under the sponsorship of the developer.

A. All monuments shall be of materials recognizable as being those of property boundary monuments by professional surveying standards, and shall be of sufficient length and girth and placed in locations sufficiently stable to withstand abuse of normal conditions with significant movement.

    1. Under most circumstances no steel rods smaller than two inches (2") in diameter and shorter than 13 inches in length should be used nor should pipes smaller than two inches (2") inside diameter and shorter than 13 inches in length be used.

    2. No monument made of a wood material shall be used.

B. A minimum of three (3) elevation benchmarks shall be installed in all Standard Plats reflecting elevation using North American Datum of 1983 (in feet). The City may require the installation of fewer benchmarks in small projects or additional benchmarks in unusually large or complex sites.

16.20.040 EROSION AND SEDIMENTATION CONTROL

All construction projects shall conform to the City's Erosion and Sediment Control Ordinance (codified as Chapter 15.42 of the Benbrook Municipal Code) and shall include temporary erosion and sedimentation controls in accordance with Item 201 of the Standard Specifications and Integrated Storm Water Management Design Manual for Construction (2003) published by the North Central Texas Council of Governments. Storm Water Pollution Prevention Plans shall be submitted for review by the City Engineer prior to release of construction projects. The Developer and his engineer shall be responsible for preparation of a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the Texas Commission on Environmental Quality (TCEQ) and U.S. Environmental Protection Agency (EPA) requirements. TCEQ and EPA permitting shall also be the responsibility of the developer and his engineer.