

City of Cedar Park Public Works Department

Utility Policy and Standard Specifications Manual



October 11, 2022

V2.0

City of Cedar Park Public Works Utility Policy and Specification Manual

Adapted from City of Austin Utility Criteria Manual with changes.

Authorities:

City of Cedar Park Code of Ordinances, Chapter 12, Subdivision Regulation

City of Cedar Park Code of Ordinances, Chapter 14, Site Development

City of Cedar Park Code of Ordinances, Chapter 18, Utilities

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1.1 DEFINITIONS

CUSTOMER – The owner or operator of the property for which services are requested or an authorized representative (builder, engineer, contractor, plumber, etc.).

D.I. – Ductile iron pipe.

ENGINEER – A Professional Engineer currently licensed to practice engineering in the state of Texas is referred to as “Engineer”.

FISCAL REQUIREMENTS – The total fees and charges required by the City to compensate for all work and services provided to the customer including any charges for water and wastewater improvements included in the subdivision or other land use requirements.

I.D. – The inner diameter of a pipe.

LUE – Living unit equivalent; the typical flow produced by a single family residence.

O.D. – The outer diameter of a pipe.

SERVICE STUB – A branch pipe of the City Water or Wastewater System extending from the “main” line to the approximate location of the property line or easement line.

SPOT-IN-FIELD – The location of service not available at the time of tap sale. Customer to meet City inspector at site to verify location.

TCEQ – Texas Commission on Environmental Quality.

TXDOT – The State of Texas Department of Transportation.

WATER TAP – The connection between the customer’s water line and the City Water System.

WASTEWATER TAP – The connection between the customer’s wastewater drain line and the City Wastewater System.

1.2 GENERAL

1.2.1 INTRODUCTION

The following information is intended to assist engineers and the public in the design and construction of water, reclaimed water, and wastewater facilities within the right-of-way or public easements. Information herein is to provide the minimum City of Cedar Park requirements only. Sound engineering judgment shall be utilized to determine if these minimum requirements are suitable for each particular engineering design and project. Nothing in this document shall relieve the engineer, applicant, or owner from compliance with all codes, ordinances, statutes, or laws related to the operation of water or wastewater utilities. In writing this manual, and approving any drawings or specifications, the City must ultimately rely upon the adequacy of the designs and specifications of the drawings that are sealed by the Texas Professional Engineer.

1.2.1.1 PRIORITY OF INTERPRETATION

Utility systems are commonly complex systems, and occasionally conflicts may exist between rules, laws and codes. This document has endeavored to avoid conflicts, recognizing that Texas Administrative Code, and City Ordinance will from time-to-time conflict or be modified in ways that can cause a need for a Priority of Interpretation, and if necessary, an administrative variance to this manual.

The priority of interpretation is as follows, unless otherwise stipulated by law:

1. Laws of the State of Texas and the Texas Administrative Code
2. Texas Commission on Environmental Quality rules
3. City Ordinances
4. City of Cedar Park Utility Policy and Standard Specifications [this document]
5. American Water Works Association Specifications
6. City of Austin Standard Specifications (in the absence of any other applicable document)
7. Texas Department of Transportation Specifications
8. Texas Manual of Uniform Traffic Control Devices

1.2.1.2 EXPIRATION OF APPROVAL

Field conditions changes over time, such as new structures and new utilities, and survey, along with the design based on that survey, becomes outdated and inaccurate. City of Cedar Park Public Works Department plan approval shall expire six (6) months, or as dictated by the City of Cedar Park Code of Ordinances, from the date of current approval. If construction has not begun on the facility within six (6) months of the approval date, plans must be resubmitted for approval and must include all requirement criteria in effect at the time at the time of resubmittal.

1.2.2 SERVICE EXTENSION PROCEDURE

1.2.2.1 General

For information needed to obtain water and wastewater service extension approvals for future development, refer to City of Cedar Park Code of Ordinances for additional information.

Water and wastewater service shall only be provided to legal lots located within the City of Cedar Park city limits.

All properties not within the city limits of Cedar Park must request annexation per City of Cedar Park Code of Ordinances.

Legal lot status is determined by Cedar Park Code of Ordinances.

Connection to the City's water systems for water service requires connection to the wastewater collection system.

Connection to the City's wastewater collection systems for wastewater service requires connection to the water distribution system for domestic service.

One domestic water service connection and water meter shall be made per legal lot.

One wastewater connection is allowed per legal lot. All wastewater service connections shall be gravity flow. No private forcemains shall discharge to public manholes, or be placed in right-of-way, or across public water/wastewater easements.

If requested, only one Irrigation Meter is allowed per lot. In the case of Right-of-Way Use Agreements, only one irrigation Meter is allowed per Agreement.

No meter shall be in a "looped" condition with any other meter.

1.2.2.2 System Capacity Determination For Reviewing Service Extensions

The City of Cedar Park Public Works Department will determine what existing facilities are in place and if any remaining capacity is available after considering all existing services connected to the system. Planned Economic Development may be considered when evaluating available capacity. The Department may require an applicant for additional analysis when necessary.

1.2.3 CITY OF CEDAR PARK CROSS CONNECTION CONTROL AND BACKFLOW PREVENTION PROGRAM

- A. Refer to the City of Cedar Park Code of Ordinances.
- B. Design of fire lines, private fire hydrants, irrigation services, and domestic service requiring backflow protection shall minimize the volume of water in the service line before the backflow prevention device. Meters for irrigation and domestic water services shall be placed on the property line or easement line with the backflow prevention device immediately following. Backflow prevention devices on unmetered line, such as fire lines and private fire hydrants, shall be located at the property line or easement line. Refer to the City of Cedar Park Standard Water Service Connection detail and Double Check Back Flow Prevention Assembly In-Vault detail.

1.2.4 STANDARD PRODUCTS LIST PROCEDURES

1.2.4.1 Introduction

Regarding the City of Austin Standard Products List:

“Through previous investigation, testing and usage by Austin Water (AW), certain types, brands and models of some products have established a satisfactory record for certain services. These products have been tabulated by manufacturer’s names and identifying numbers on Standard Products Lists (SPL). Construction-related SPLs have been assembled into AW’s “Standard Products List”. The Standard Products List should not be interpreted as being pre-approved lists of products necessarily meeting the requirements for a given construction project and products included in the lists shall not be substituted unless they are approved by the Engineer and AW. Contractors electing to use products from the SPLs shall submit a list of products and the corresponding SPL number, together with the approvals for their use.

Products in use by AW are subject to ongoing consideration and evaluation by the Standards Committee. When changes, deletions or additions become necessary and are approved, the product list will be revised and included in updates to the Standard Products List.”

1.2.4.2 City of Cedar Park Standard Product List

The City of Cedar Park utilizes the City of Austin Standard Product List as guidance for products accepted for use in the City of Cedar Park water distribution system and wastewater collection system. Exceptions to the list are noted in various formats, including, but not limited to, the City of Cedar Park Standard Construction Notes and CIP Construction Notes. Vendors or manufacturers of products requesting approval for use in Cedar Park shall seek City of Austin approval first.

1.2.5 CONSTRUCTION PLAN INFORMATION-SUBMITTAL REQUIREMENTS

1.2.5.1 General

- A. Construction plans for water, reclaimed water, and wastewater service shall be submitted to the City of Cedar Park Development Services or the Engineering Department as outlined in the City of Cedar Park Code of Ordinances. Plans are reviewed for conformance to the City of Cedar Park Code of Ordinances, Standards, Specifications, and Policy.
- B. If the provider of service is a Municipal Utility District (MUD), Water Control and Improvement District (WCID), or private utility corporation, prior approval by the provider of service is also required.
- C. Plans submitted to City of Cedar Park must show approved easements and/or permits on highway and/or railroad crossings. A copy of the permit must be submitted prior to release by the Utility.
- D. All water, reclaimed water, and wastewater plans shall include the following items:
 1. Engineering Report with Engineer's dated signature and seal of a Professional Engineer licensed in the State of Texas shall be required by the City of Cedar Park's Public Works Department.
 2. Engineer's dated signature and seal of a Professional Engineer licensed in the State of Texas on each plan sheet. The design Engineer shall affixes an engineering seal to the details sheets and traffic control sheets as an acknowledgment of adequacy and applicability of the included details to the sealing Engineer's overall design; very similar to sealing the construction manual containing the front end documents, bid forms, and specifications.
 3. Date of plans and revisions. Plans and Revisions shall be the product of CAD (Computer Aided Drafting) and not hand drawn. Also refer to 1.2.5.1.D.19.
 4. North arrow and scale must be shown. The standard horizontal scale for plan and profile sheets shall be 1" = 40', 30' or 20' for the plan view. The vertical scale shall be 1" = 4', 3' or 2', respectively. The same scale shall be used on all plan and profile sheets. For sheets other than plan and profile, horizontal scales of 1" = 40', 30' or 20' may be used as appropriate. Where relevant and applicable, a scale of 1" = 10' for plan views and a scale of 1" = 1', 2', 3', 4', or 5', as needed to fit the area on the page and provide the most clarity for profiles, shall be used for detailed water, reclaimed water, and wastewater connections, designs, utility crossings, and/or special detail drawings. The minimum size for plan and profile sheets shall be 22" x 34". Plan view and associated profile shall appear on the same sheet with the plan view at the top half of the sheet. All utilities profiled shall be stationed in both the plan and profile view.
 5. A general location map.

6. Current standard City of Cedar Park construction notes.
7. Indicate on the cover sheet, the subdivision/site development permit number, and show all required permit numbers such as Texas Department of Transportation permit, railroad crossing permit, CTRMA, etc.
8. Volume and page number of approved and recorded easements and of any temporary working space.
9. Property lines and dimensions, legal description, lot and block numbers, right-of-way dimensions, and curb and sidewalk locations and street names. Property lines must be verifiable in the field through the use of survey monuments, set by a Texas RPLS. A description of the monuments shall be shown on the site plan and plat.
10. Location, size, and material of all existing and proposed water, reclaimed water, and wastewater mains, lines and services with respect to easements and rights-of-way. Existing and proposed mains 24" and larger shall be shown by double lines indicating pipe outside diameter. The direction of flow in the wastewater mains shall be indicated on the drawings. Because not all field changes or subsequent post-construction changes/repairs may be captured in record drawings, the Engineer is encouraged to collect subsurface utility data according to American Society of Civil Engineers (ASCE), Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data. SUE data is required for any project crossing or modifying a utility larger than 12" in diameter.
11. Location, size, and description of other existing and proposed utilities within the limits of construction.
12. Curve data for roads, property lines, water, and reclaimed water lines.
13. Final plat recording or land status report.
14. Street address and legal description for all existing structures and adjacent properties shall be shown on the lot(s) where the structures are located.
15. Pressure zone designation for subject tract and zone boundaries where applicable. Provide pressures and flow rates of conducted tests. Contact Public Works to request tests. At projects near pressure zone boundaries or high points, verify system pressures.
16. Where water, wastewater, and/or reclaimed water mains cross each other, details shall be shown to indicate compliance with TCEQ requirements.
17. Typical cross sections showing multiple utilities proposed to be within private streets or easements.
18. An index on the cover sheet.
19. All changes and revisions made to the design of utilities or impacts utilities shall use revision clouds to highlight all revisions or changes with each submittal. Revision triangles shall be used to mark revisions. All clouds and triangle markers

from previous revisions may be removed. Revision information shall be updated in the appropriate areas of the Title Block. Revisions shall propagate through all affected plan sheets.

20. Plans submitted with revisions to Public Works shall be submitted as a complete set including unaltered sheets.
 21. All utility design and revisions, including, but not limited to, additions, deletions, changes, and modification, shall occur on utility specific sheets to that type or class of utility and not depicted exclusively on an unrelated discipline sheet.
- E. Final plan approval may require additional authorizations such as:
1. Texas Department of Transportation permit.
 2. Railroad permit.
 3. Natural gas company permit.
 4. Easement acquisition (Vol. and Page or document number listed on plans).
 5. County approval.
 6. Water District approval.
 7. Municipal Utility District approval.
 8. CTRMA
 9. CapMetro
 10. Upper Brushy Creek WCID
 11. Texas Department of Health approval.
 12. Texas Commission on Environmental Quality approval.
 13. Non-occupancy letter.
 14. Service extension approval.
 15. City of Cedar Park Development Services approvals, including Sign Permits.

1.2.5.2 Water and/or Reclaimed Water System Plans

- A. All plan view drawings shall include all applicable items listed in the General Requirements above plus the following items:
1. Stations of all proposed connections to existing or proposed mains, if the service line is not perpendicular from the main to the property line.
 2. For proposed connections to mains or facilities to be constructed by others: identify the project by name, the design engineer, and site development/subdivision permit number.
 3. Station numbers for all wastewater mains and water mains shall be identified for beginning points, ending points, points of curvature, points of tangent, points of

reverse curve, points of intersection, valves, fire hydrants, other appurtenances, grade breaks, and regular intervals along the line.

4. Station numbers shall be identified for the mains where they cross any other utility.
 5. Details of appurtenances shall be shown.
 6. The location of all existing and proposed services, mains, valves, fire hydrants, water meters, and backflow preventers shall be identified, and show to be sufficiently clear of any traffic area, pedestrian area, or impervious improvement.
 7. All one hundred year flood plain limits shall be shown, including FEMA, Fully Developed, and Atlas -14. In addition, show the FEMA 500yr flood plain.
 8. Calculated design pressure at highest and lowest lot served shall be shown.
 9. Location (beginning and ending station numbers) and type of thrust restraint shall be shown on the plan view. Both Megalugs (or approved equal) and concrete thrust blocking shall be required.
 10. Retaining walls, including geogrid, straps, MSE walls, tiebacks and all other components shall be shown.
 11. Culverts, bridges, and other drainage structures shall be shown and sufficiently detailed to indicate the vertical and horizontal location.
 12. Fire hydrants shall be located so as not to conflict with ADA features, traffic signal foundations, sign supports, and other surface features, and be placed as close to the ROW line as possible and practical (see detail).
 13. Geotechnical borings data shall be shown if performed. This is required for City-funded projects.
 14. Auxiliary water sources, if any, shall be shown.
- B. A profile drawing shall be provided for all water mains 12 inch in diameter or larger. Show all applicable items listed in the General Requirements plus the following items:
1. The existing ground profile and proposed street finish grade or subgrade.
 2. Station numbers and elevations of all utility crossings.
 3. Station numbers and soil geology information at stream crossings to evaluate the need for special surface restoration.
 4. Identify pipe size, percent grade and pipe material to be used including ASTM and/or AWWA designation. If an alternate material is to be allowed, both should be listed (example "D.I. or DR14 PVC"). Lines must be included to indicate pipe flowline and crown.
 5. Station numbers and elevations for starting points, ending points, point of intersection, grade breaks, valves, fire hydrants, air release valves, pressure/flow regulating valves and at intermediate points every 100 feet.

6. Retaining walls, including geogrid, straps, tiebacks, and all other components.
7. Culverts, bridges and other drainage structures.
8. Curb elevations at fire hydrant locations.
9. Geotechnical boring graphic symbols, showing subsurface materials, if performed. This is required for City-funded projects.
10. Locations by station of restrained pipe, indicating type of restraint. Both Megalugs (or approved equal) and concrete trust blocking shall be required.
11. Beginning and ending stations for encasement.
12. Air valve vaults and piping from the main to the vault shall be included in the profile view. The rim elevation for the vault shall be shown along with the ground profile from the main to the vault.

1.2.5.3 Wastewater System Plans

- A. All plan view drawings shall include all applicable items listed in the General Requirements listed above plus the following items:
 1. Station numbers and GIS numbers at all proposed connections to existing or proposed wastewater mains if the service line is not perpendicular from the main to the property line.
 2. For proposed connections to wastewater mains or facilities to be constructed by others, identify the project name, the design engineer and site development/subdivision permit number.
 3. The location, alignment and structural features of the wastewater main, including manholes and concrete retards, if applicable, and show to be sufficiently clear of any traffic area, pedestrian area, or impervious improvement.
 4. Station numbers and GIS numbers for beginning points, ending points, manholes, clean-outs, other appurtenances, grade breaks, and regular intervals along the line.
 5. Details of all required appurtenances.
 6. Location of all existing and proposed wastewater services, mains, and manholes.
 7. All one hundred year flood plain limits shall be shown, including FEMA, Fully Developed, and Atlas -14. In addition, show the FEMA 500yr flood plain.
 8. A reference noting the field book notes for the original survey.
 9. Retaining walls, including geogrid, straps, tiebacks and all other components.
 10. Culverts, bridges and other drainage structures.
 11. Geotechnical borings shall be shown if performed. This is required for City-funded projects.
 12. Locations of bolted manhole covers.

13. A plan view detail of the invert of each manhole or junction box having three or more pipes connecting to it, regardless of the pipe sizes, or when two pipes connect to a manhole at an angle other than 180 degrees from each other.
 14. Station numbers shall be identified for the mains where they cross any other utility.
- B. A profile view shall be provided for all wastewater mains and shall include all applicable items listed in the general requirements listed above, plus the following items:
1. The existing ground profile and proposed street finish grade, subgrade, or finished grade if not under pavement.
 2. Station numbers and elevations of all utility crossings.
 3. Station numbers and soil geology information at stream crossings to evaluate the need for special surface restoration.
 4. Identify the pipe size, percent grade and pipe material to be used including ASTM and/or AWWA designation. If an alternate material is to be allowed, both should be listed (example "D.I. or PVC"). Lines must be included to indicate pipe flowline and crown.
 5. Station numbers and elevations for starting points, ending points, manholes, clean-outs and at intermediate points every 100 feet.
 6. Elevations shall be indicated on the profile showing the finish floor elevations of all existing structures. If the structure has an active septic tank or other disposal system, the flow line elevation of the plumbing where it exits from the structure is to be indicated. If a lot or tract is vacant, side shots may be required from the middle of each lot to ensure gravity service is possible from the lot to the main.
 7. Peak dry weather flow and peak wet weather flow, as well as the associated velocities in each pipe.
 8. Retaining walls, including geogrid, straps, tiebacks and all other components.
 9. Culverts, bridges and other drainage structures.
 10. Rim elevations for manholes.
 11. Flow line elevations for all pipe connections at manholes and junction boxes.
 12. Geotechnical boring graphic symbols, showing subsurface materials, if performed. This is required for City-funded projects.
 13. Beginning and ending stations for encasement.

1.2.6 CONSTRUCTION INSPECTION AND CITY ACCEPTANCE

1.2.6.1 Construction Inspection Procedure for all projects except CIPs

Inspections shall be performed by City staff or a Third-Party Construction Observer, as determined by the City of Cedar Park Public Works Department. Fee schedule for inspection of site development/subdivision improvements during the normal 8 a.m. to 5 p.m. workweek shall be assessed per the City of Cedar Park Code of Ordinances. Project shall be invoiced for overtime by the Third Party Construction Observer for authorized work requiring inspection outside of 8 a.m. to 5 p.m., in excess of eight (8) hours, on weekends, and on City holidays.

1.2.6.2 City Acceptance

To obtain final City acceptance of a project, refer to City of Cedar Park Code of Ordinances.

1.2.6.3 As-Built/Record Drawings and Engineer's Concurrence Letter

The project design engineer shall submit as-built/record drawings and intersection field sketches as required by City of Cedar Park Code of Ordinances, showing all accepted corrections and modifications to the originally approved drawings. As-built/record drawings for water, reclaimed water, and wastewater construction shall consist of a complete set of drawings. The Engineer of Record shall also submit a concurrence letter stating the project was constructed in accordance with the Approved plans and Record Drawings. Record Drawings and Concurrence Letter shall bear the seal of a Texas Professional Engineer.

1.2.7 PUBLIC LIFT STATION REVIEW, APPROVAL AND ACCEPTANCE

1.2.7.1 Engineering Report, Plans and Specifications Review and Approval

- A. Prior to design, four (4) copies of a detailed engineering report shall be submitted to Public Works for review and approval of the lift station and all related line work. The engineering report shall include the following:
1. Justification for the proposed lift station. The report must clearly show that gravity lines are not available and are not feasible, and that the number of lift stations has been minimized. This justification must include a cost benefit analysis of a gravity system compared to the lift station project, including 30 years of operation and maintenance cost estimates for the proposed system. All new public wastewater systems shall be designed and constructed to operate on a gravity flow basis, taking advantage of natural topographic conditions as necessary, and thereby reducing the need for lift stations and force mains per the City of Cedar Park Code of Ordinances.
 2. A master development plan for the service area of the proposed lift station shall be prepared. This plan shall include a map showing the location of the lift station, the service area, the boundaries of the drainage basin, and the location of the nearest existing wastewater interceptor within that basin.

3. Engineering calculations and data described in Sections 2.1.4.1 and 2.1.4.10 shall be contained in the engineering report.
 4. The Engineering Report shall be approved by the Public Works Department prior to beginning preparation of the plans and specifications.
 5. Refer to the *Cedar Park Lift Station Specifications and Maintenance* document for Cedar Park specific design criteria requirements in addition to TCEQ design criteria requirements.
 6. No private lift stations or private wastewater pump stations will be approved unless located inside a building foundation surrounded by the principal structure. Minimum size for a public lift station is average dry flow of 100 gpm, and a greater than 120 gpm peak flow. Only non-clog pumps with minimum 4" diameter force mains shall be approved.
 7. Individual private grinder pumps (not sewage pumps) shall be located inside of building per the Cedar Park Standard Wastewater Connection Detail. All flows from private development shall enter the City's collection systems as gravity flow. No private forcemains shall discharge to public manholes. No private force mains will cross W, WW or PUE's or placed in the ROW.
- B. Prior to construction, four (4) complete sets of the plans and specifications shall be submitted to the Public Works Department for review and approval. These plans and specifications shall be prepared, sealed, signed, and dated by a Professional Engineer currently licensed to practice in Texas, and shall be in compliance with the approved Engineering Report previously submitted as required by this Section. The plans and specifications for the lift station shall also include all related line work and a comprehensive site plan, including any required access road(s) and easement(s).
- C. All drawings and specifications for lift stations within the City of Cedar Park extra-territorial jurisdiction (ETJ), submitted for review and approval, must demonstrate compliance with the current City of Cedar Park Design Criteria and standard lift station specifications. Approval of the lift station plans and specification does not imply that the City of Cedar Park will accept the lift station for operation and maintenance (Refer to Section 1.2.7.3).
1. Within the Water and Wastewater Service Area the following types of lift stations may be submitted for review and approval:
 - a. Submersible or grinder pump facilities with rated horsepower no greater than 25 BHP for the largest pump.
 - b. For installation with a required rated horsepower motor greater than 25 BHP, the City prefers a wet-well/dry-well type of design. However, submersible non-clog pump facilities with a rated horsepower of between 25 BHP and 50 BHP may be considered on a case-by-case basis. The Engineer must submit cost comparisons for submersible versus wet-well/dry-well installations. The cost comparison should include initial lift station costs, pump replacement costs,

installation costs and all operational and maintenance costs, including energy cost over the life of the lift station. The comparison should assume a typical service life for submersible pumps.

2. Within the City of Cedar Park ETJ, but outside the Wastewater Service Area, submersible non-clog pump facilities with a rated horsepower of 25 to 50 BHP may be considered on a case-by-case basis.

1.2.7.2 Submittal and Shop Drawing Review

Once the engineering report, drawings, and specifications have been approved, at least four (4) complete sets of submittals and shop drawings shall be provided to the Public Works Department, with an electronic copy. These submittals shall contain complete detailed information and drawings for all lift station equipment and components, and shall be submitted 30 days prior to the delivery of materials to the site.

1.2.7.3 City Operation and Maintenance Acceptance

The City of Cedar Park may accept a lift station with a firm pumping capacity greater than 100 gpm for operation and maintenance provided the following conditions are met:

- A. The station is located within the City Limits.
- B. The City has inspected the lift station and determined that it is constructed in conformance to the City's requirements. Any lift station not conforming to City of Cedar Park Public Works Department standards shall be upgraded to the current standards before the City of Cedar Park will accept the lift stations for operation and maintenance.
- C. The owner or their representative has provided all information requested in Sections 1.2.7.1 and 1.2.7.2 above, five (5) complete sets of all Operations and Maintenance Manuals for all equipment installed, and has received the Public Works Department written approval.
- D. The owner has granted the City a wastewater easement for the lift station and access road, and the lift station and access road are constructed. A copy of the recorded easement plat, legal description and any other legal documents granting the easement shall be delivered to the Public Works Department. The easement shall extend to at least five (5) feet outside the lift station fence and shall include access road with turn-around areas that extend back to paved public right-of-way. This easement shall be separate and in addition to any necessary pipeline easement.
- E. A letter of assignment shall be written to the City from the owner transferring title of the lift station and related equipment to the City of Cedar Park. This letter shall be delivered to the Public Works Department before acceptance of the lift station for operation and maintenance.
- F. One (1) complete set of reproducible Mylar prints of the as-built drawings and a copy of the file in an electronic format as specified by the Public Works Department shall also be provided prior to acceptance of the lift station for operation and maintenance.

1.2.8 ABANDONMENT OF FACILITIES

If a new project will abandon existing facilities, the plans shall provide for the appropriate abandonment of these facilities. The plans shall include, at a minimum, the location, sequence, details, and methodology for abandoning the facility according to this section. All abandonment shall be considered permanent. When the installation of new utility lines requires a trench to be cut through existing stormlines, waterlines, reclaimed lines, gas lines (if approved by the gas company) or wastewater lines, and the existing lines are confirmed to be abandoned, the abandoned lines shall be cut flush with the sides of the trench and blocked with an SPL approved plug or cap, or void filled with non-shrink grout in a manner satisfactory to the Public Works Department. Abandonment of facilities may require approval from County and State agencies prior to approval by the Utility.

1.2.8.1 Wastewater Mains and Services

- A. Abandonment of wastewater mains shall consist of filling the main with a flowable grout or slurry and meeting requirements of the current specifications. Plans, drawings and specifications shall include method of abandoning or removing services and all other mains.
- B. If the existing wastewater service line and/or appurtenances are not to be used in the future, the plans shall call out and indicate the wastewater service line(s) to be abandoned and that they shall be cut and plugged at the main.
- C. Abandonment of wastewater force main valves shall be accomplished by removing the valve casing to the top of the subgrade or 24" below the surface, whichever is greater, and filling remaining casing with concrete such that the abandoned valve is not identifiable from the surface. The pavement repair shall follow the applicable Standard Detail.

1.2.8.2 Manholes

Abandoned manholes shall be removed to a level not less than four feet below grade, inlets and outlets securely plugged, inlet and outlet pipes cut and plugged outside the manhole, and the structure filled with stabilized sand. At the Utility's option, the entire manhole to be abandoned may be require removal.

1.2.8.3 Lift Stations

Abandonment of lift stations shall consist of removing all pumps, motors, couplings, valves, and controls from the dry well and all appurtenances above finished grade. Both the wet well and dry well shall be cut down five feet below grade, filled with cement stabilized sand, and covered with top soil to grade. The associated force main shall be properly abandoned. This includes cutting and plugging both ends and/or grouting gravity mains as appropriate.

Area shall be revegetated. Revegetation of disturbed areas shall be completed in compliance with the City of Cedar Park Code of Ordinances. The Public Works Department shall be notified prior to abandonment.

1.2.8.4 Water Mains and Services

- A. Abandonment of a water main shall be accomplished by disconnecting the pipe from intersecting pipes that are to remain in service and the installation of a plug on the tee and/or cross at the point of intersection. If the cross and/or tee cannot be securely plugged, the cross and/or tee shall be removed. Abandoned tapping saddles shall be removed and the main repaired with a DI pipe and sleeves. If a valve is located at the tee for the line being abandoned, it shall be removed. In no instance will mains be abandoned by valve closure. Abandonment of water valves located on abandoned mains shall be accomplished by removing the valve casing to the top of the subgrade or 24" below the surface, whichever is greater, and filling remaining casing with concrete such that the abandoned valve is not identifiable from the surface. The pavement repair shall follow the applicable Standard Detail.
- B. All water service lines (including fire lines) that are being abandoned and not transferred to a new distribution line shall be disconnected at the corporation stop at the main and all other valves and appurtenances, including the water meter, removed. When meters are to be abandoned, the Engineer shall call out the size, type, and use (domestic or irrigation) of all proposed water meters (to include existing water meters to be relocated and/or re-purposed).
- C. Blue Polybutylene – When a blue polybutylene water service line is uncovered, the water service line shall be replaced from the corporation stop to the meter.

1.2.8.5 Reclaimed Water Mains and Services

- A. Abandonment of a reclaimed water main shall be accomplished by disconnecting the main from intersecting pipes that are to remain in service and installing a plug on the tee and/or cross at the point of intersection. If the tee and/or cross cannot be securely plugged, the tee and/or cross shall be removed. In no instance will reclaimed water mains be abandoned by valve closure.
- B. Valves located on abandoned mains shall be abandoned by removing the valve casing to the top of the subgrade or 24" below the surface, whichever is greater. The remaining casing shall be filled with concrete such that the abandoned valve is not identifiable from the surface. The pavement repair shall follow the applicable Standard Detail.
- C. All reclaimed water service lines that are being abandoned and not transferred to a new main shall be disconnected at the corporation stop at the main. All other valves and appurtenances, including the meter, shall be removed. When meters are to be abandoned, the Engineer shall call out the size, type, and use (domestic or irrigation), including existing meters to be relocated and/or repurposed.

2.1 DESIGN REQUIREMENTS FOR WATER, RECLAIMED WATER, AND WASTEWATER SYSTEMS

2.1.1 Introduction

These guidelines are intended to establish the minimum basic design requirements for water, reclaimed water, and wastewater systems within City of Cedar Park and its Extra Territorial Jurisdiction (ETJ), but do not address major facilities such as water and wastewater treatment plants. Generally, these systems will be operated and maintained by the City of Cedar Park. Some systems, such as certain municipal utility districts, will not be operated by the City immediately upon completion, but it is likely that the City will take over operation and maintenance at some time in the future.

All project manuals shall include the appropriate City of Cedar Park Standard Specifications. All projects shall be designed and built in accordance with these City of Cedar Park Standard Specifications, which include other requirements not addressed here. All variations are subject to the approval of the City of Cedar Park Public Works Department. Additional requirements for specific projects may be established where the conditions of service to the tract and related system operation and maintenance needs warrant.

All drawings for the design and construction of water and wastewater facilities shall be sealed by a registered Professional Engineer, licensed in the State of Texas. It will be the responsibility of the engineer to ensure that the plans are in compliance with the latest versions of all applicable federal, state and local ordinances, rules, regulations, and policies.

These include, but are not limited to, the following:

- A. Design Criteria for Domestic Wastewater Systems – Texas Commission on Environmental Quality. (TCEQ)
- B. Rules and Regulations for Public Water Systems – TCEQ.
- C. City of Cedar Park Code of Ordinances.
- D. City of Cedar Park Standards and Standard Specifications.
- E. City of Cedar Park Public Works Department Utility Policy and Specifications.
- F. Use of Reclaimed Water – TCEQ.

2.1.2 Water Systems

2.1.2.1 Size/Capacity Determination

1. General
 - a. Hazen Williams Friction Coefficient $C = 100$, higher C coefficient may be used for new mains only upon approval by the Public Works Department with sufficient documentation to show effects of long-term use.

- b. Average day demand = 200 gal/person/day.
 - c. Peak day demand = 400 gal/person/day.
 - d. Peak hour demand = 800 gal/person/day.
 - e. Population density (unless otherwise directed by Public Works) = 3.5 people per lot with 3.25 lots per acre.
 - f. Pressure reducing valves (PRV), as required by the plumbing code, that are to be installed outside of the footprint of a building must be illustrated and identified on site utility plans and must be located on private property outside of any public utility easements.
2. Peak Hour Demand Requirements
- a. The maximum allowable velocity shall not exceed 5 feet per second (fps).
 - b. The minimum pressure at any point in the affected pressure zone must not be less than 35 psi. Pressure, with water meter loss, at the highest fixture in any structure, where appropriate, shall not be less than 35 psi.
3. Emergency Demand Requirements
- a. All water infrastructure, including, but limited to, pump stations, motorized control valves, SCADA, radio telemetry, etc., shall comply with Senate Bill 3; consult Public Works for diesel generator requirements and sizing.
 - b. Emergency demands are considered to be fire flow requirement plus peak day demands.
 - c. Fire flow requirements (flow rate and duration) will be determined by the City of Cedar Park Fire Department, applicable City of Cedar Park Code of Ordinance and adopted Fire Code.
 - d. The maximum allowable velocity shall not exceed 10 fps.
 - e. The minimum residual pressure at any point in the affected pressure zone at peak day plus fire flow must not be less than 20 psi.
 - f. Required fire pumps, as defined in the building code, shall be supplied by connections to a minimum of two water mains. Separate supply piping shall be provided between each connection to the water main and the pumps. Each connection and the supply piping between the connection and the pumps shall be sized to supply the flow and pressure required for the pumps to operate.
- Exception: Two connections to the same main shall be permitted provided the main is valved such that an interruption can be isolated so that the water supply will continue without interruption through at least one of the connections.

4. Sizing of Water Mains
 - a. Computer modeling is preferred for sizing water mains. However, for water mains less than 16 inches in diameter other engineering calculation methods may be accepted. The largest size, as determined by comparing the service area's peak hour demand and peak day plus fire flow demand, shall be used. The minimum size for any street type, however, will be governed by various factors which include fire protection requirements, high density land usage, and the designer's consideration of general system gridding, future transmission mains, neighboring developments and area configuration. Transmission line sizes will be determined on a case-by-case basis. Minimum main size shall be 8 inches with consideration for 6-inch pipe in cul-de-sacs less than 200 feet in length per City of Cedar Park Code of Ordinances.
 - b. For purposes of water main sizing the emergency demand shall be assumed at a single point on the existing or proposed water main at the subject tract or development phase, unless otherwise approved by the Public Works Department.
5. Storage Requirements – If it is determined by the Public Works Department that additional storage is required, the following criteria shall be used:

Effective Storage = 100 gal/connection

Emergency Storage = 100 gal/connection

TOTAL STORAGE = 200 gal/ connection

Effective Storage is defined as storage, which will provide a minimum of 35 psi of pressure at the highest service elevation in pressure zone.

The Owner's Consulting Engineer may be required to provide computer simulations as determined on a case-by-case basis, at the applicant's expense.

2.1.2.2 Mains

1. While looped systems are required, it is recognized that in certain situations installation of dead end pipe may be necessary. When a dead end section of water main is approved for installation, the following requirements must be met:
 - a. A gate valve shall be installed near the end of the main followed by an appropriate length of restrained pipe, minimum 40 feet, and a plug with a 1" or larger tap. Thrust blocking shall not be used as restraint at the end of the main. The engineer shall determine the necessary length of restraint on each side of the valve that will keep the main in place for future extension when the plug is removed. No services may be installed between the valve and the plug.
 - b. Adequate water circulation must be provided to achieve turn-over of water in the dead end main every 72 hours. Until such time as water demand from active services on the dead end section of main results in the 72-hour turn over,

an approved automatic flushing device must be installed and programmed such that the 72-hour criterion is met.

- c. An automatic flushing valve (Hydroguard) is required at the end of all dead end lines.
2. The separation between water, reclaimed water and wastewater mains must comply with the Texas Commission on Environmental Quality (TCEQ) rules. When a new waterline crosses under an existing wastewater main or lateral, the waterline shall be encased in steel encasement at least 18 feet in length centered on the wastewater main and the encasement shall contain full-circumferential welded joints. No other form of encasement will be allowed, including cement stabilized sand. A minimum vertical separation distance of 12" measured from O.D. of pipe to O.D. of pipe, shall be maintained between the existing wastewater main and steel encasement. A minimum horizontal separation distance of five (5) feet, measured from O.D. of pipe to O.D. of pipe, shall be maintained between existing or proposed infrastructure and all other non-City of Cedar Park utilities in order to maintain trench integrity. A minimum horizontal separation between water service lines and dry utility services shall be three (3) feet between O.D. to O.D.

Water mains should normally be located on the high side of the street in a standard assignment and shall not deviate midblock. However, mains shall be installed on both sides of all divided roads/highways. Roads/highways, where opposing lanes of traffic are separated by a vehicle obstruction, shall be considered a divided road/highway.

Mains should be located where maintenance can be accomplished with the least interference with traffic, structures, and other utilities. When mains must be located outside of the right-of-way, they shall be within a dedicated exclusive City of Cedar Park water and wastewater easement. Generic Public Utility Easements (PUEs) are discouraged. Main assignments in City streets must be coordinated with the Public Works Department and Engineering Department. Assignment for mains in county roads must also be approved by the County Engineer. Assignments for mains to be located within State or Federal Highway Right-of-Way shall also be approved and permitted by the Texas Department of Transportation (TxDOT).

3. Piping materials and appurtenances shall conform to the City of Cedar Park Standard Specifications and Standard Products List, as modified.
4. Minimum depth of cover over the uppermost projection of pipe shall be at least 48 inches below proposed ground elevation. If fill or embankment placed over existing water mains or services exceeds four (4) feet or results in a final depth exceeding two times the easement width if applicable, the Public Works Department review and approval is required. If a cut over the existing mains or services results in less than minimum cover, Public Works Department approval is required. If manholes, valves, hydrants, meters, cleanouts, etc. are located within the cut or fill area(s), adjustment must be made to match final grade and plans must be reviewed and

approved by the Public Works Department and the construction inspected by the City. If the fill is located on top of an existing easement, see Section 2.1.2.7.

5. For mains 12 inches in diameter and larger, and on smaller mains where appropriate, hydrants or drain valves shall be placed at low points and on the up-slope side of all valve locations.
6. All fire lines shall have a gate valve on the line at the connection to the main line and a backflow preventer just inside the property line, but accessible for inspection by City personnel. All unmetered fire lines shall have an approved flow detection device. This flow detection device shall be located such that no more than 100 gallons of water is contained between the device and the point where the fire line is connected to the City's main.
7. The Engineer is responsible for determining the size and type of air release valves necessary to assure the water system operates properly based upon the water system characteristics and shall provide calculations determining the size and type of valves for review by the Public Works Department when requested. Air release valves may be necessary on any size of main. Minimally, on water mains 12 inches in diameter and larger and on smaller mains where appropriate, combination air valves will be placed at all high points and air/vacuum valves shall be placed at the down-slope side of all gate valve locations. Air/vacuum and vacuum release valves shall be approved on a case-by-case basis. Proposed waterline connections to air release valve piping are prohibited.
8. Joint restraint for pipes larger than 24-inch diameter shall be by use of integral, factory joint restraint systems. External mechanical joint restraint devices are allowed at all sizes of valves and fittings. Joint restraint for ductile iron pipes 24 inches and smaller may be by joint restraint gaskets.
9. Joint restraint shall be provided for all pipe bends and where necessary when joint deflection is utilized. A minimum safety factor of 1.5 shall be used when calculating restrained water pipe length. When joint restraint is required in intersections, extend the joint restraint, at a minimum, to the point of curvature (PC) of the curb line. Notes shall be placed in both plan and profile views and shall include at a minimum the type of restraint to be utilized and the beginning and ending stations of the restraint. Cast iron and asbestos concrete pipes cannot be mechanically restrained and shall be removed and replaced with ductile iron pipe or C-900 PVC pipe to ensure adequate restraint. Concrete thrust blocking may be approved on a case-by-case basis. In cases where concrete thrust blocks are utilized, at a minimum the Engineer shall include block dimensions and locations on the plans. The proximity of other utilities and structures must be taken into account when specifying the use of thrust blocking. All pipes, valves, and fittings, greater than two (2) inches in size and installed in the TxDOT right-of-way (ROW) shall be restrained.
10. Allowable pipe sizes. The following sizes will be the only sizes allowed for new water mains: 6 inch (see Section 2.1.2.1.4.a), 6 inch (fire-hydrant DI leads and services

only), 8 inch, 12 inch, 16 inch, 24 inch, 30 inch, 36 inch, and 42 inch. Larger sizes may be approved on a case-by-case basis.

11. Connections larger than 2 inch and new mains to existing mains shall be made by cutting in a tee. Tapping sleeves may be used on a case-by-case basis as determined by the Public Works Department. Full-body tapping sleeves shall be used. A tapping sleeve will not be allowed if the materials and conditions of the existing main preclude tapping. "Size on size" taps will not be permitted.
12. Wyes are not allowed on waterlines.
13. The maximum bend for waterlines is 45 degrees.
14. All potable water mains shall be constructed of ductile iron or PVC pipe. For ductile iron pipes, Pressure Class 350 minimum for pipe 12-inch diameter and smaller and Pressure Class 250 for pipes greater than 12-inch diameter shall be used. For PVC pipe 12-inch diameter and smaller conforming to the requirements of AWWA C-900, DR 14 shall be acceptable. Alternative pipe materials may be considered on a project-by-project basis. Pipe larger than 12-inch diameter shall be a minimum class 250 ductile iron.
15. Waterline shall be designed with a non-deviating standard assignment, with a constant offset from the right-of-way in paved public roads, unpaved public right-of-way, and easements. Waterline shall be designed with a non-deviating standard assignment, with a constant offset from the right-of-way in paved public roads, unpaved public right-of-way, and easements. Preference is given to locating waterlines in paved public City roads. The waterline alignment shall facilitate ease of maintenance by avoiding structures, including but limited to parking lots, drive aisles, sidewalks, and driveways, traffic, detention and water quality ponds and associated outlet structures, and other utilities. Non-deviating alignments facilitate locating the pipe in the future, minimizing risk to the City of Cedar Park in the future from damaged utility infrastructure. Deviations from a constant offset will be reviewed on a case-by-case basis. All mains located outside of pavement shall have tracer wire per specifications.
16. Vertical design of waterlines shall minimize grade breaks, high points, low points, and any other condition that increases the number of joints in the overall pipe run. Designs with an excessive number of pipe joints increase operation and maintenance efforts and contribute to water loss. All profiled waterlines shall have a slope greater than zero (0) percent to facilitate the movement of air to allow removal from the system.
17. Changes in alignment in water lines, both horizontal and vertical, shall be achieved by deflection of joints or by use of fittings. Deflection of pipe joints at fittings is only allowed on ductile iron pipes. Longitudinal bending of pipe is not allowed.
18. Utility crossings constructed under water lines by trenchless methods are allowed only if the distance between the outside surface of the water line and the top,

crown, or roof of the excavation made for the crossing utility is at least two times the diameter or horizontal span of the trenchless excavation below the water line, or 36 inches, whichever is larger. The trenchless method shall support the advancing face and roof or crown of the excavation at all times when within a horizontal distance of ten feet of the water line.

19. Utility crossings constructed under water mains by open cut methods are not allowed if the water main consists of asbestos cement pipe or cast iron pipe with lead caulk joints. In those instances, the main must be removed and replaced to accommodate construction of the subject utility. Replacement will be with new pipe of the type currently used in the system for comparable size pipe. If the utility crossing under the water main is a water or wastewater service line, in lieu of replacing the main, the Engineer may provide a design detail showing how the main shall be supported during the open cut method.
20. Bedding and backfill for that portion of a utility installed by open cut construction under and within 5 feet horizontally of a water main shall be made using controlled low strength material from the bottom of the subject utility to the bottom of the bedding envelope of the water line even if that water line is removed and replaced as described above.
21. Alignments shall not deviate to accommodate existing trees. If tree preservation is required (due to protected or heritage status) or desired, as approved by the Public Works Department, utilities shall be installed by jack and bore under the tree. Cost for boring under trees shall be borne by the Developer.
22. New waterlines crossing existing roads with a classification of neighborhood collector or higher shall be jack and bored.

2.1.2.3 Valves

1. There shall be a valve on each fire hydrant lead restrained to the main. A valve on the mainline may be required to facilitate operation of the system. These and all valves twenty-four (24) inches and smaller shall be resilient seated gate valves.
2. Valves shall be located at the intersection of two or more mains and shall be spaced so that no more than thirty (30) customers will be without water during a shutout. For lines smaller than twenty-four (24) inches, typical spacing should be 500 feet in high-density areas and 1,200 feet in residential area. Mains twenty-four (24) inches and larger shall have valves at intervals not to exceed 2,000 feet.
3. For valves at the end of dead end mains, see Section 2.1.2.2.a.
4. Branch piping (both new and future branches) shall be separated from the main with gate valves.
5. For all mains, valves at intersections shall be placed on the tee. Place a minimum of 2 valves per tee, and on all legs of a cross. Crosses are strongly discouraged; utilize two tees.

6. Valves shall be located so that isolating any segment of water main requires closing of no more than three (3) valves.
7. The operating nut of any valve shall be between eighteen (18) inches and twenty-four (24) inches below finished grade. Valves shall not require extensions unless approved by the Public Works Department on a case-by-case basis.
8. Valves at pressure zone boundaries shall be equipped with a locking type debris cap.
9. All vertical gate valves larger than sixteen (16) inches shall have the bonnet located in a vault or manhole.
10. Valves having “push on” joints are not permitted for fire hydrant leads and laterals.
11. Butterfly valves shall not be allowed.
12. Water mains shall be designed so that valves can be installed vertically unless conditions dictate otherwise.
13. Valves or utility appurtenances shall not be located in sidewalks, driveways, traffic areas, pedestrian areas, or curb lines. A turning path analysis may be required.

2.1.2.4 Fire Hydrants

1. Follow applicable design standards dictated in the City of Cedar Park Code of Ordinances.
2. Hydrants shall be installed at the intersection of two (2) streets and between intersections where necessary, at distances not in excess of 300 feet between hydrants in commercial or other high-density areas and not more than 600 feet in residential areas.
3. Hydrants shall be installed on both sides of all divided road/highways to provide adequate firefighting coverage. Roads/highways where opposing lanes of traffic are separated by a vehicle obstruction shall be considered a divided road/highway.
4. Fire hydrants shall be placed per the Standard Detail at the right-of-way or easement line.
5. All public fire hydrants shall have class 350 ductile iron leads per Standard Detail.
6. The entire fire hydrant assembly shall have restrained joints.
7. Fire hydrants shall not be designed to be within nine feet in any direction of any wastewater main, lateral, or service regardless of material of construction.
8. Fire hydrants shall be designed so as not to interfere with sidewalk ramps, trash receptacles, and streetlight and signal pole foundations.
9. To avoid sidewalks, ramps, and other features, fire hydrants placed near a street corner should in general be located outside the curve radius and a minimum of 4 feet from ramps. Exceptions may apply in existing neighborhoods or long (>5 feet) radius curb return.

10. Placement of fire hydrants should take into consideration above ground improvements, landscaping, critical root zones, grades and other utilities.
11. In existing neighborhoods, new fire hydrants should be placed as close as possible to the existing fire hydrant locations with the exception of new hydrants needed to meet minimum spacing requirements.
12. Fire hydrants should be placed on the short side of the street where possible unless there are site constraints.
13. Fire hydrants shall be placed on both sides of the street in commercial and high-density areas.
14. When fire hydrants are subjected to pressures above 150 psi, they shall have an attached PRV installed and set to reduce the operating pressure of the fire hydrants below 150 psi.
15. When new water lines are installed along with new fire hydrant leads, the drawings shall indicate existing fire hydrants are to be replaced with a new one, if the existing fire hydrant is older than 10 years old.

2.1.2.5 Services

1. Water services shall be in accordance with City of Cedar Park Standard Details.
2. All non-single family residential lots, including, but not limited to, commercial, multifamily, detached condominiums, and amenity/pool lots, shall have separate domestic, irrigation, and fire service lines. The irrigation plans shall be included in the plan set. An engineering report signed and sealed by Licensed Texas Professional Engineer showing compliance with City Code of Ordinance shall be submitted for review to Public Works when requesting to omit the irrigation service.
3. Individual meter services and fire lines will not be taken from transmission lines. Transmission lines are generally considered to be 16 inches in diameter or larger.
4. Water meters shall be placed within the public right-of-way (ROW) or in an easement immediately adjacent to the ROW. Meters may not be located inside fences and must be accessible by vehicle. Service lines, water meter boxes, and their appurtenances are not allowed in sidewalks, paved areas, driveways or load bearing pavement.
5. Service taps to the main shall have a minimum separation distance of 3 feet.
6. Service taps, regardless of type, shall not be made in vaults.
7. Domestic and irrigation water services shall not be supplied from fire hydrant leads.
8. Domestic and irrigation water services shall not be supplied from private fire lines.
9. All domestic and irrigation water services shall be metered.
10. Water services, especially 8-inch water service stubs, shall be made at the common property line of adjacent lots or tracts.

11. Service lines, taps, valves, cleanouts, manholes, or fittings, shall not be located under driveways, curbs, or in sidewalks.

2.1.2.6 Water Meters

1. Residential properties with two individual dwelling units (attached only, duplex) shall have an individual water meter serving each dwelling unit.
2. Commercial and multi-family properties (detached two dwelling residential properties with two or more dwellings, attached or detached) shall install a single domestic water meter and single irrigation meter per legal lot.
3. Requirements for meters 3 inch and larger:
 - a. Bypasses shall be provided on all meters three (3) inches and larger except those used for irrigation only.
 - b. Pipe and meter size shall be determined by Owner based upon plumbing code and AWWA Water Meter Standards. Plans must be prepared by a licensed Engineer registered in the State of Texas.
4. Water meters shall not be located in driveways or sidewalks.
5. If requested, only one Irrigation Meter is allowed per lot. In the case of Right-of-Way Use Agreements, only one irrigation Meter is allowed per Agreement.
6. No meter (domestic or irrigation) shall be in a "looped" condition with any other meter (domestic or irrigation). An irrigation plan shall be submitted demonstrating multiple irrigation meters are not looped. Water service plan shall be submitted demonstrating multiple domestic meters are not looped

2.1.2.7 Easements

1. Easements for water mains shall be a minimum of 20 feet wide (15 feet directly adjacent right-of-way), or twice the depth of the main, measured from finished grade to pipe flowline, whichever is greater. Easement widths shall be such that waterlines can be maintained, repaired, and rehabilitated fully within the easement, without encroaching on private property. Mains shall be centered on the easement. Generally, easements are no less than 20' in width. More narrow easements will be considered where the Engineer provides evidence, to the satisfaction of the Public Works Department, that maintenance activities will not be hindered by the reduced width. If fill is placed over an existing easement, the easement width will need to be adjusted to meet the minimum width requirements. Easement width for large diameter waterlines, 16-inch in diameter and greater, will be evaluated by the Public Works Department on a case-by-case basis.
2. Easement documents and the metes and bounds shall be reviewed and approved by the Public Works Department and City of Cedar Park Legal Department prior to recordation in the real property records of the appropriate county. Easement

recordation in the real property records of the appropriate county is required prior to approval of construction plans.

3. No signs, buildings, fences, retaining walls, ponds, trees, parking lots, or other structures may be placed or constructed within the public easement.

2.1.2.8 Requirements for Existing and Proposed Water Infrastructure beneath Circular Intersections or Other Geometric Street Features

1. Installation of Circular Intersections or Other Geometric Street Features over existing water infrastructure.
 - a. Existing water infrastructure may be allowed to exist beneath circular intersections or other geometric street features such as, but not limited to, modern roundabouts, medians, bulb-outs, splitter islands, channelization islands, and other types of physical roadway features. These features may contain hardscaping, landscaping, water quality features, public art, permanent structures, street furniture, or other similar amenities, provided they have been authorized in a Right-of-Way Use Agreement, and do not interfere with the operation and maintenance of the utility.
 - b. The planning and design of these features and their amenities shall include consideration for access, maintenance, protection, testing, cleaning, and operations of the water infrastructure. Where existing water facilities are to remain, trees with root zones of 18 inches in depth or greater at maturity may be considered for inclusion provided the drip lines at maturity of the proposed trees are not located within a minimum horizontal separation of 7.5 feet from any water infrastructure. Public art, permanent structures, and other similar amenities may be considered for inclusion provided they are not located within a minimum horizontal separation of 7.5 feet from any water infrastructure. The drip lines at maturity of ornamental trees with root zones at maturity of less than 18 inches in depth, grasses, woody or herbaceous shrubs, and street furniture may be located within a minimum horizontal separation of 7.5 feet from any water infrastructure.
 - c. The need for relocating, replacing or protecting in place existing water infrastructure beneath these features and their amenities shall be determined on a case-by-case basis by the Public Works Department.
2. Installation of Circular Intersections or Other Geometric Street Features in new areas of development with no existing water infrastructure.
 - a. Proposed water infrastructure may be placed beneath proposed circular intersections or other geometric street features such as, but not limited to, modern roundabouts, medians, bulb-outs, splitter islands, channelization islands, and other types of physical roadway features. These features may contain hardscaping, landscaping, water quality features, public art, permanent structures, street furniture, or other similar amenities.

- b. The planning and design of these features and their amenities shall include consideration for access, maintenance, protection, testing, cleaning, and operations of AW infrastructures. Trees with root zones of 18 inches in depth or greater at maturity may be considered for inclusion provided the drip lines at maturity of the proposed trees are not located within a minimum horizontal separation of 7.5 feet from any water infrastructure. Public art, permanent structures, and other similar amenities may be considered for inclusion provided they are not located within a minimum horizontal separation of 7.5 feet from any water infrastructure. The drip lines at maturity of ornamental trees with root zones at maturity of less than 18 inches in depth, grasses, woody or herbaceous shrubs, and street furniture may be located within a minimum horizontal separation of 7.5 feet from any water infrastructure.
- c. The need for alternative alignments or the inclusion of protective systems for the proposed water infrastructure beneath these features and their amenities shall be determined on a case-by-case basis by the Public Works Department.

2.1.3 Reclaimed Water Systems

2.1.3.1 Size/Capacity Determination

- 1. General
 - a. Hazen Williams Friction Coefficient: $C = 100$ for ductile iron or 120 for plastic pipe.
 - b. Maximum static pressure = 120 psi.
- 2. Peak Demand Requirements
 - a. The maximum velocity shall not exceed 5 feet per second.
 - b. The minimum pressure at any point in a pressure zone shall not be less than 35 psi.
 - c. Mains shall be sized to accommodate max day flows of:
 - i. 8100 gallons per irrigated acre.
 - ii. 28 gallons per ton of cooling.
 - iii. Indoor use based on fixture units.
- 3. Emergency Demand (Fire Flow) Requirements

None – fire flows are not provided by the reclaimed water system.
- 4. Plans shall include a detail of a reclaimed water identification sign. Plans shall show the posting locations for the sign.

2.1.3.2 Mains

1. Sizing of Mains – Computer modeling is preferred for sizing reclaimed water mains. However, for mains less than 16 inches in diameter other engineering calculation methods may be accepted. Standard main sizes: 6, 8, 12, 16, 24, 30, 36, 42, and 48 inches.
2. All reclaimed water mains shall be constructed of ductile iron pipe, Pressure Class 350 minimum for pipe 12-inch diameter and smaller and Pressure Class 250 for pipe greater than 12-inch diameter. For mains 12-inch diameter and smaller, PVC pipe, conforming to the requirements of AWWA C-900, DR 14 shall be acceptable. Plans shall indicate that all mains and appurtenances shall be manufactured in purple, factory painted purple or bagged in purple. Color shall match Pantone 522.
3. Mains should be located where maintenance can be accomplished with the least interference with traffic, structures, and other utilities. Mains shall be designed with a non-deviating standard assignment with a constant offset from the right-of-way. When mains are located outside of the right-of-way, they shall be within a dedicated utility easement. Main assignments in city streets must be coordinated with the Public Works Department and Engineering Department. Assignments for lines in county roads must also be approved by the county engineer. A minimum horizontal separation distance of five (5) feet, measured from the outer diameter (OD) of pipe to OD of pipe, shall be maintained between existing or proposed reclaimed water mains and all other non-Cedar Park utilities in order to maintain trench integrity. A minimum horizontal separation between reclaimed water service lines and dry utility services shall be three (3) feet OD-OD.
4. The separation between water, reclaimed water and wastewater mains must comply with TCEQ rules.
5. Piping materials and appurtenances shall conform to City of Cedar Park Standard Specifications, Standard Details, and Standard Products List, as modified.
6. Minimum depth of cover over the uppermost projection of the pipe and all appurtenances shall comply with Standard Details. Maximum depth will be approved by Public Works for the specific materials, application and conditions. If fill or embankment placed over existing reclaimed water mains or services increases by more than 4 feet or results in a final depth exceeding two times the easement width if applicable, Public Works Department review and approval is required. If a cut over the existing reclaimed water mains or services results in less than the minimum cover required by Standard Details, Public Works Department approval is required.
7. For mains of 12 inches and larger, drain valves shall be placed at low points.
8. On mains 12 inches in diameter and larger, automatic air release valves will be placed at all high points. Mains larger than 16 inches shall have an automatic air release valve placed at the down-slope side of all valve locations. Air/vacuum and vacuum release valves shall be approved on a case-by-case basis. All reclaimed

mains twenty-four (24) inches and larger will include an 18 inch outlet with blind flange installation at high points where the installation of an ARV would be necessary.

9. Dead-end mains shall terminate with a flushing device and flushing devices shall be installed as necessary to facilitate flushing of the system.
10. Mains shall have an approved flushing device located at the high point between main intersections.
11. Joint restraint for pipes larger than 16-inch diameter shall be by use of integral, factory joint restraint systems, or by restraint gaskets.
12. Joint restraint shall be provided for all pipe bends, reducers, and tees. When joint restraints are required in intersections, the joint restraints shall extend, at a minimum, to the point of curvature (PC) of the curb line. Notes shall be placed in both plan and profile views and shall include at a minimum the type of restraint to be utilized and the beginning and ending stations of the restraint.
13. The proximity of other utilities and structures must be taken into account when specifying the use of thrust blocking.
14. Connections of new reclaimed mains to existing reclaimed mains shall be made by cutting in a tee only.
15. Alignments shall not deviate to accommodate existing trees. If tree preservation is required (due to protected or heritage status) or desired, as approved by the Public Works Department, utilities shall be installed by jack and bore under trees. Cost for boring under trees shall be borne by Developer.

2.1.3.3 Valves

1. All valves twenty-four (24) inches and smaller, shall be resilient seated gate valves.
2. Valves shall be located at the intersection of two or more mains. For lines smaller than twenty-four (24) inches, typical spacing should be 500 feet in high-density areas and 1,200 feet in residential area. Mains twenty-four (24) inches and larger shall have valves at approximate 2,000 foot intervals.
3. At dead ends, gate valves shall be located one (1) pipe length ten (10-ft. minimum) from the end points of the main. The Engineer shall provide – and show drawings – complete restraint for all such valves, pipe extensions and end caps.
4. Branch piping (both new and future branches) shall be separated from the main with gate valves.
5. For all reclaimed mains, valves at intersections shall be placed on the tee.
6. Valves shall be located so that isolating any main intersection requires closing of no more than three (3) valves.

7. The operating nut of any valve shall be between eighteen (18) inches and twenty-four (24) inches below finished grade.
8. Valves at pressure zone boundaries shall be equipped with a locking type debris cap.
9. All horizontal gate valves larger than sixteen (16) inches shall have the valve actuator (gearing) located in a vault or manhole.
10. Butterfly valves shall not be allowed.
11. Valve boxes and lids shall be square, with "Reclaimed Water" indicated on the lid.
12. Reclaimed water mains shall be designed so that valves can be installed vertically unless conditions dictate otherwise.

2.1.3.4 Services

1. Reclaimed water services shall be in accordance with Standard Details.
2. The plans shall show the locations of backflow prevention assemblies.
3. The plans shall show irrigation lines, sizes, and specify pipe color (purple). All sprinkler heads and sprinkler control box covers shall be purple.
4. The plans shall show reclaimed meter locations and specify a color (purple).
5. Services for cooling towers or interior building use shall have a separate meter.
6. Meter boxes and vaults shall be square or rectangular with "Reclaimed Water" cast into the lid.
7. Reclaimed water meters shall be placed within the public ROW or in an easement immediately adjacent to the ROW. Meters may not be located inside fences and must be accessible by vehicle. Reclaimed water meter boxes and its appurtenances are not allowed in sidewalks, paved areas, driveways, or load bearing pavement.
8. Service taps to reclaimed mains shall be separated from other taps and pipe joints by a minimum distance of 3 feet.
9. Service taps, regardless of type, shall not be made in vaults.

2.1.3.5 Easements

1. Easements for reclaimed water mains shall be a minimum of 20 feet wide (15 feet directly adjacent to the right-of-way), or twice the depth of the main, measured from finished grade to pipe flowline, whichever is greater. Mains shall be centered on the easement. Narrower easements may be considered where the Engineer provides evidence, that maintenance activities will not be hindered by the reduced width.
2. Easement documents and the metes and bounds shall be reviewed and approved by the Public Works Department and City of Cedar Park Legal Department prior to

recordation with the County. Easement recordation at the County is required prior to approval of construction plans.

3. No signs, buildings, fences, retaining walls, ponds, trees, parking lots, or other structures may be placed or constructed within the public easement.

2.1.3.6 Requirements for Existing and Proposed Reclaimed Water Infrastructure beneath Circular Intersections or Other Geometric Street Features

1. Installation of Circular Intersections or Other Geometric Street Features over existing reclaimed water infrastructure.
 - a. Existing reclaimed water infrastructure may be allowed to exist beneath circular intersections or other geometric street features such as, but not limited to, modern roundabouts, medians, bulb-outs, splitter islands, channelization islands, and other types of physical roadway features. These features may contain hardscaping, landscaping, water quality features, public art, permanent structures, street furniture, or other similar amenities.
 - b. The planning and design of these features and their amenities shall include consideration for access, maintenance, protection, testing, cleaning, and operations of the reclaimed water infrastructure. Where existing reclaimed water facilities are to remain, proposed trees may be considered for inclusion provided the tree is a utility compatible species and is not planted within 5 horizontal feet from any reclaimed water infrastructure. Public art, permanent structures, and other similar amenities may be considered for inclusion provided they are not located within a minimum horizontal separation of 5 feet from any reclaimed water infrastructure.
 - c. The need for relocating, replacing or protecting in-place reclaimed existing water infrastructure beneath these features and their amenities shall be determined on a case-by-case basis.
2. Installation of Circular Intersections or Other Geometric Street Features in new areas of development with no existing reclaimed water infrastructure.
 - a. Proposed reclaimed water infrastructure may be placed beneath proposed circular intersections or other geometric street features such as, but not limited to, modern roundabouts, medians, bulb-outs, splitter islands, channelization islands, and other types of physical roadway features. These features may contain hardscaping, landscaping, water quality features, public art, permanent structures, street furniture, or other similar amenities.
 - b. The planning and design of these features and their amenities shall include consideration for access, maintenance, protection, testing, cleaning, and operations of infrastructures. Trees may be considered for inclusion provided the tree is a utility compatible species and is not planted within 5 horizontal feet from any reclaimed water infrastructure. Public art, permanent structures,

and other similar amenities may be considered for inclusion provided they are not located within a minimum horizontal separation of 5 feet from any reclaimed water infrastructure.

- c. The need for alternative alignments or the inclusion of protective systems for the proposed reclaimed water infrastructure beneath these features and their amenities shall be determined on a case-by-case basis by the Public Works Department.

2.1.4 Wastewater Systems

2.1.4.1 Determination of Wastewater Flows

1. Residential single-family units shall be assumed to produce an average wastewater flow of 300 gallons/day per LUE. Residential population is assumed to be 3.5 people per lot with 3.25 lots per acre.
2. Non-single family residential, non-residential, multifamily, and large residential wastewater flows will be evaluated on a case-by-case basis. LUE assumptions per land use type will be reviewed and approved by Public Works on a case-by-case basis, subject to correlation with Cedar Park collection system empirical data. The table below is provided as guidance only and is not intended to be all-inclusive or definitive:

| Land Use | LUE Conversion |
|---|---|
| Residential | |
| One (1) Single Family Residence; Modular Home; Mobile Home; Detached Single Condo | 1 LUE |
| One (1) Duplex | 0.9 LUE/unit |
| One (1) Triplex, Fourplex; Condo Unit; P.U.D. Unit (6+ Units/Acre to 24 Units/Acre) | 0.7 LUE/Unit |
| One (1) apartment Unit (24+ Units/Acre) | 0.5 LUE/Unit |
| One (1) Hotel or Motel Room | 0.5 LUE/Unit |
| Commercial | |
| Office | 1 LUE/3,000 Sq Ft of gross area per Floor |
| Office Warehouse | 1 LUE/4,000 Sq Ft of gross area per Floor |
| Retail; Shopping Center | 1 LUE/1,600 Sq Ft of gross area per Floor |
| Restaurant; Cafeteria | 1 LUE/200 Sq Ft of gross area per Floor |
| Hospital | 1 LUE/bed |
| Rest Home | 1 LUE/2 beds |
| Church (Worship Services Only) | 1 LUE/70 Seats |
| High/Middle School (Includes Gym and Cafeteria) | 1 LUE/13 Students |

| | |
|--|-------------------|
| Elementary School (Includes Gym and Cafeteria) | 1 LUE/15 Students |
|--|-------------------|

3. Inflow/Infiltration.

In sizing sewers, external contributions are accounted for by including 800 gallons per day per acre served for inflow and infiltration. For sewers in the Edwards Aquifer Zone refer to the Texas Commission on Environmental Quality (TCEQ) requirements. Strict attention shall be given to minimizing inflow and infiltration.

4. Peak Dry Weather Flow (PDWF) .

The PDWF is derived from the formula:

$$Q_{pd} = [(18 + (0.0144 \times F)^{0.5}) / (4 + (0.0144 \times F)^{0.5})] \times F$$

where: F = 86 gal./person/day × population/1440 = average dry-weather flow gpm

5. Peak Wet Weather Flow (PWWF).

The PWWF is obtained by adding inflow and infiltration to the peak dry weather flow. In designing for an existing facility, flow measurement shall be used when available for the preexisting developed area if the reference indicates higher peak wet weather flows than the calculated method.

6. Minimum Flow.

The minimum flow is derived from the formula:

$$Q_{min.} = [0.2 \times (0.0144 \times F)^{0.198} \times F]$$

2.1.4.2 Determination of Pipe Size

1. Minimum Size.

The minimum diameter of all gravity sewer mains shall be eight (8) inches. For service line sizes, refer to the Standard Details.

2. Design Requirements.

For sewer mains, 15 inches in diameter or smaller, use the larger size as determined below:

a. Manning n = 0.013

b. The main shall be designed such that the PDWF shall not exceed 65% of the capacity of the pipe flowing full.

c. The main shall be designed such that the PWWF shall not exceed 85% of the capacity of the pipe flowing full.

- d. For sewer mains, 18 inches in diameter or larger, the main shall be designed such that the PWWF shall not exceed 80% of the capacity of the pipe flowing full.

3. Minimum Design Velocities.

The minimum design velocity calculated using the PDWF must be at least two (2) feet per second (fps). If a minimum velocity of two (2) fps cannot be achieved due to the low projected wastewater flows, velocities lower than two (2) fps at PDWF may be allowed provided that all of the following requirements are met:

- a. The Engineer substantiates in writing and to the satisfaction of Public Works that is not possible to meet the two (2) fps velocity at PDWF.
- b. A minimum of 0.01 ft./ft. (1.0 percent grade) is provided.

4. Maximum Design Velocities.

The maximum design velocity calculated using the PWWF should not exceed ten (10) fps. Velocities in excess of 10 fps may be considered under special conditions where no other options are available. In such cases, proper consideration shall be given to pipe material, abrasive characteristics of the wastewater flows, turbulence and displacement by erosion or shock.

5. Minimum Slope.

The minimum allowable slope for eight (8) inches mains within the service area of the City of Cedar Park shall be 0.005 ft./ft. (0.5 percent grade) unless otherwise required by 3.b of this section.

6. Allowable pipe sizes.

The following sizes will be the only sizes allowed for use in the gravity system: 6" (for services and cul-de-sacs only), 8", 12", 15", 18", 21", 24", 30", 36", 42". Larger sizes may be approved on a case-by-case basis. These pipe sizes do not apply to force mains.

2.1.4.3 Design Considerations

1. Materials and Standards.

All materials and appurtenances shall conform to the SPL as modified.

2. Protecting Public Water Supply.

No physical connection shall be made between a drinking water supply and a sewer or any appurtenance thereof. An air gap of a minimum of two inlet pipe diameters between the potable water supply and the overflow level connected to the sewer shall be provided.

3. Location.

The location of the wastewater main shall be in conformance with the City of Cedar Park Standard Details Manual as adopted by the City of Cedar Park Code of Ordinances. Alternative assignments must be approved by Public Works. Outside the City Limits, the design engineer shall coordinate utility assignments with both the Public Works Department and the appropriate authority.

4. Separation Distance.

The separation between water mains, reclaimed mains and wastewater mains must comply with TCEQ rules. A minimum horizontal separation distance of five (5) feet, measured from OD of pipe to OD of pipe, shall be maintained between existing or proposed City of Cedar Park infrastructure and all other non-city mains in order to maintain trench integrity. A minimum horizontal separation between wastewater service lines and dry utility services shall be three (3) feet O.D. to O.D.

5. Steep grades.

Where the pipe grade exceeds 12% and the construction is outside of any pavement, concrete retards conforming to the City standards will be required at intervals of no more than twenty-five (25) feet (preferably at joint locations).

6. Depth of Cover.

If fill or embankment placed over existing wastewater mains exceeds four (4) feet above the existing ground, Public Works approval is required. If cuts exceed the minimum depth of cover stated below, Public Works approval is required. The minimum depth of cover over the upper-most projection of the main shall be as follows:

- a. Wastewater piping installed in natural ground in easements or other undeveloped areas which are not within existing or planned streets, roads or other traffic areas, shall be laid at least 48 inches below ground elevation.
- b. Wastewater piping installed in proposed streets, existing streets, roads or other traffic areas shall be laid at least 36 inches below proposed ground elevation.

7. Turbulence.

Wastewater lines shall be designed to minimize turbulence to prevent release of sulfide gases and subsequent corrosion.

8. Wastewater lines are prohibited in a critical water quality zone, except for a necessary crossing.

9. Curved wastewater mains are matching horizontal curvature of road using joint deflection are allowed and preferred in accordance with City of Cedar Park Code of Ordinance and TCEQ design requirements. Manholes shall be placed at Point of

Curvature and Point of Termination of horizontal curve and manhole spacing shall not exceed 300 feet. Curved wastewater collection line alignments, utilizing the allowable deflection at joints per TCEQ and pipe manufacture criteria, maximizes the usable space within the Right of Way and facilitates future rehabilitation or replacement of the water and wastewater infrastructure.

10. Alignments shall not deviate to accommodate existing trees. If tree preservation is required (due to protected or heritage status) or desired, as approved by Public Works, utilities shall be jack and bored under tree. Cost for boring under trees shall be borne by Developer.
11. Wastewater lines shall be video inspected prior to acceptance in accordance with City of Cedar Park Video Inspection of Wastewater Lines specification attached as Appendix E.

2.1.4.4 Manholes

1. Location.

Manholes shall be located and spaced so as to facilitate inspection and maintenance of the wastewater main. All manholes must be accessible to maintenance equipment, including 2½ ton straight trucks, dump trucks, vacuum trucks, and standard (not compact) sizes of backhoes and loaders. In isolated cases, construction of all-weather access roads may be necessary for manhole and/or wastewater line access. If required, design guidance is provided in Section 2.1.4.4.12. Manholes shall be placed at the following locations:

- a. Intersections of mains.
- b. Horizontal alignment changes. For sewer mains 18-inch and larger in diameter the maximum horizontal change in the direction of the flow shall be 45 degrees in order to maintain laminar flow, and to minimize head losses, standing waves, and odors. In other words, the minimum angle between the two mains shall be 135 degrees. Where there is a side inlet, the angle between the two mains entering the manhole shall be 45 degrees or less. Sewers 27-inch in diameter and greater shall require special design for changes in direction to assure laminar flow. To maintain laminar flow and minimize head losses through the manhole, the maximum horizontal change in the direction of flow for sewer mains 15-inch or smaller shall be 90 degrees.
- c. Vertical grade changes.
- d. Change of pipe size.
- e. Change of pipe material.
- f. Point of Curvature of horizontal curve
- g. Point of Termination of horizontal curve

- h. The point of discharge of a force main into a gravity wastewater main. Polymer manhole is required as approved by Public Works.
 - i. For multi-family projects exceeding 15 dwelling units and for commercial developments containing more than 4,000 square feet of air conditioned space and requiring a water meter greater than two (2) inches, a manhole is required on the main at the point of connection to the wastewater service.
 - j. At the upstream end of mains.
 - k. At other locations as required TCEQ and City of Cedar Park Code of Ordinances.
2. Spacing.
- Manhole spacing for lines smaller than 24 inches should not exceed 500 ft (300ft on curves); for larger mains, spacing may be increased, subject to approval by the Public Works.
3. Covers.
- a. All manholes located in unpaved areas or in the TCEQ Edwards Aquifer Recharge Zone (EARZ) shall have bolted, watertight covers with Penta security bolt.
 - b. When existing manholes are adjusted in height to match finished surface elevations, the most current manhole ring and cover size shall be utilized. This may require removal and replacement of the existing manhole cone section to facilitate the above work.
4. Corrosion Prevention.
- Manholes shall be constructed of or lined with an organic corrosion resistant material. Where new construction ties into an existing manhole, the existing manholes must be lined, coated, or replaced with a corrosion resistant material. The Design Engineer shall provide a Manhole Inspection report for Wastewater Manhole replacement or rehabilitation for both CIP and non-CIP projects. Structurally rehabilitated manholes may be lined with a structural corrosion resistance cementitious material. All forcemains shall discharge to polymer concrete manholes.
5. All lines into manholes, including drop connections, shall match crown-to-crown.
6. Drop manholes are not allowed where the size of the incoming main requiring the drop exceeds 15 inches diameter. External drops will be limited to a depth of 15 feet from the lid of the manhole to the base. Drop manholes in excess of 15 feet deep must be designed with an internal drop and must be a minimum size of five (5) foot diameter.

7. Minimum inside manhole diameters shall be as indicated in the following table:

| Main Size | Depth | | |
|-------------|---------------|---------|------------------|
| | Less than 20' | 20'—30' | Greater than 30' |
| Up to 15" | 48" | 60" | 72" |
| 18"—24" | 60" | 60" | 72" |
| 30" and 36" | 72" | 72" | 72" |

Note 1: In the event a structure is utilized inside a manhole, the clear space between the structure and the manhole wall shall be a minimum of 48".

Note 2: If more than two mains connect to a manhole, or if two mains connect to a manhole at an angle other than 180 degrees from each other, a larger diameter manhole may be required in order to accommodate mandrel insertion and hydraulically efficient flow. A straight section of invert that is 4 inches to 6 inches in length is required to transition between the curved portion of the invert channel and the connecting pipes in order to accommodate the mandrel apparatus for up to 15 inch diameter pipes.

Note 3: New pipe connections to existing manholes shall provide a minimum of 12" inch clearance between the existing pipe O.D. and the new core hole I.D. measured on the inside surface of the manhole, regardless of the orientation of the pipes with respect to one another. New precast manholes and manholes with cast-in-place bases shall have holes for pipe penetrations in the manhole wall separated by a minimum of seven (7) inches, designed by the manhole manufacturer and as measured from the inside diameter of the cored holes on the inside wall of the manhole to ensure the structural integrity of the manhole wall.

Note 4: The vertical distance between the highest point of the invert shelf and the bottom of any horizontal or near-horizontal surface protruding into a manhole or junction box, shall be at least six (6) feet, when the depth of the main is sufficient.

8. Where a separation of nine (9) feet between an existing water main and a new manhole cannot be achieved during construction of a new wastewater main the joints in the wastewater manhole shall be made watertight using externally applied joint wraps. Where a separation of nine (9) feet between a water main and an existing manhole cannot be achieved during construction of a new water main, the

manhole shall be assessed as per Section 2.1.4.4.4 to determine if the manhole is watertight and if not, the manhole shall be made watertight.

9. Manholes constructed on existing wastewater mains may have a cast-in-place base. All other manholes shall have a precast base.
10. Manhole and junction box inverts shall have a minimum slope of 2.5% between the inlet and outlet pipe inverts.
11. Manholes and junction boxes located below ground water.
 - a. When the interior surface of a concrete manhole or junction box is coated with a urethane, polyurethane, or epoxy liner, the exterior surface of that portion of a manhole or junction box located below ground water level shall be water proofed using a flexible system applied to the exterior surface. The drawings shall indicate which structures must be water proofed and the elevation to which waterproofing must be applied (two (2) feet above ground water level).
 - b. Manhole joints below the ground water level and/or located in the 100-year floodplain shall be sealed by installing a joint wrap material over the joint on the manhole exterior.
 - c. Construction joints in cast-in-place junction boxes shall be water proofed using water stops.
12. All-weather access roads should be at least 12 feet wide and placed within a 20-foot wide (minimum) access easement. It is intended for emergency use by maintenance equipment. If the wastewater easement is wide enough to accommodate the access road, it may be used in lieu of an access easement. This 12 foot maintenance access road should be outside the toe of any fill slope and the top of any cut slope and shall not have a post construction longitudinal slope greater than 15% nor a post construction transverse slope greater than 5%, shall not have a vertical grade break of greater than 12%, should have an inside turning radius of no less than 28.3 feet, an outside turning radius of no less than 42 feet, shall be cleared of all vegetation and graded, and should maintain a horizontal and vertical clearance from existing and proposed vegetation and all other objects of no less than 14 feet.

The access road shall include a means for equipment to turn around when located more than 200 feet from a paved public roadway. Turn around shall meet the above listed design criteria. Access roads shall be cleared, graded and stabilized with stones in accordance with Standard Detail 662S-2, Pond Maintenance Road Typical Cross Section. Other materials and geometrics may be approved on a case-by-case basis by Public Works.

2.1.4.5 Ventilation

Ventilation shall be provided as required by TCEQ Rules and Regulations.

2.1.4.6 Inverted Siphons

The use of siphons is not allowed.

2.1.4.7 Service Lines

1. Wastewater service lines, between the main and property line, shall have an inside diameter not less than six (6) inches. The minimum grade allowed for service lines is one (1) percent. In all new systems, grade breaks exceeding allowable joint deflection must be made with approved fittings and shall not exceed a cumulative total of 45 degrees.
2. No service connections shall be made to mains larger than 15 inches in diameter.
3. Service connections to force mains that are two (2) inches in diameter and smaller may be allowed on a case by case basis. Service connections to force mains that are larger than two (2) inches in diameter shall not be allowed.
4. Wastewater services are placed along the common property line between two lots where there is no conflict with other utilities' services. All other Utility service is usually located at the other lot corner. Services to lots without a water/wastewater easement will terminate at the property line with a cleanout; service to lots having a five (5) foot by five (5) foot water/wastewater easement will terminate within the easement. For details, see the City of Cedar Park Standard Details. Where two of more non-residential, including multifamily, services connect to the City collection system a manhole shall be required.
5. Wastewater clean-outs and service lines are not allowed in sidewalks, paved areas, load bearing pavement, or driveways.
6. Inspection ports are required for all nonresidential service lines. They shall be located at the property line within the public right-of-way (ROW) or utility easement line to indicate the line of responsibility of the utility. They shall not be located in traffic areas, paved parking areas or sidewalks. Refer to Standard connection detail.
7. All service lines shall be gravity flow. No private force main connections to public manholes.

2.1.4.8 Easements

1. Easements for wastewater mains shall be a minimum of 20 feet wide (15 feet directly adjacent to the right-of-way), or twice the depth of the main, measured from finished grade to pipe flowline, whichever is greater. Mains shall be centered on the easement. Narrower easements will be considered where the Engineer provides evidence, to the satisfaction of Public Works, that maintenance activities will not be hindered by the reduced width. Easement widths shall be such that waterlines can be maintained, repaired, and rehabilitated fulling within the easement, without encroaching on private property.
2. Easement documents and the metes and bounds shall be reviewed and approved by Public Works and City of Cedar Park Legal Department prior to recordation in the

real property records of the appropriate county. Easement recordation in the real property records of the appropriate county is required prior to approval of construction plans.

3. No signs, buildings, fences, retaining walls, ponds, trees, parking lots, or other structures may be placed or constructed within the public easement.

2.1.4.9 Requirements for Existing and Proposed Wastewater Infrastructure beneath Circular Intersections or Other Geometric Street Features.

1. Installation of Circular Intersections or Other Geometric Street Features over existing wastewater infrastructure.
 - a. Existing wastewater infrastructure may be allowed to exist beneath circular intersections or other geometric street features such as, but not limited to, modern roundabouts, medians, bulb-outs, splitter islands, channelization islands, and other types of physical roadway features. These features may contain hardscaping, landscaping, water quality features, public art, permanent structures, street furniture, or other similar amenities.
 - b. The planning and design of these features and their amenities shall include consideration for access, maintenance, protection, testing, cleaning, and operations of the wastewater infrastructure. Where existing wastewater facilities are to remain, trees with root zones of 18 inches in depth or greater at maturity may be considered for inclusion provided the drip lines at maturity of the proposed trees are not located within a minimum horizontal separation of seven and one-half (7.5) feet from any wastewater infrastructure. Public art, permanent structures, and other similar amenities may be considered for inclusion provided they are not located within a minimum horizontal separation of seven and one-half (7.5) feet from any wastewater infrastructure. The drip lines at maturity of ornamental trees with root zones at maturity of less than 18 inches in depth, grasses, woody or herbaceous shrubs, and street furniture may be located within a minimum horizontal separation of seven and one-half (7.5) feet from any wastewater infrastructure.
 - c. The need for relocating, replacing or protecting in place existing wastewater infrastructure beneath these features and their amenities shall be determined on a case-by-case basis.
2. Installation of Circular Intersections or Other Geometric Street Features in new areas of development with no existing wastewater infrastructure.
 - a. Proposed wastewater infrastructure may be placed beneath proposed circular intersections or other geometric street features such as, but not limited to, modern roundabouts, medians, bulb-outs, splitter islands, channelization islands, and other types of physical roadway features. These features may contain hardscaping, landscaping, water quality features, public art, permanent structures, street furniture, or other similar amenities.

- b. The planning and design of these features and their amenities shall include consideration for access, maintenance, protection, testing, cleaning, and operations of utility infrastructures. Trees with root zones of 18 inches in depth or greater at maturity may be considered for inclusion provided the drip lines at maturity of the proposed trees are not located within a minimum horizontal separation of seven and one-half (7.5) feet from any wastewater infrastructure. Public art, permanent structures, and other similar amenities may be considered for inclusion provided they are not located within a minimum horizontal separation of seven and one-half (7.5) feet from any wastewater infrastructure. The drip lines at maturity of ornamental trees with root zones at maturity of less than 18 inches in depth, grasses, woody or herbaceous shrubs, and street furniture may be located within a minimum horizontal separation of seven and one-half (7.5) feet from any wastewater infrastructure.
- c. The need for alternative alignments or the inclusion of protective systems for the proposed wastewater infrastructure beneath these features and their amenities shall be determined on a case-by-case basis.

2.1.4.10 Lift Stations (excluding low-pressure systems)

All new public wastewater systems shall be designed and constructed to operate on a gravity flow basis, taking advantage of natural topographic conditions as necessary, and thereby reducing the need for lift stations and force mains per City of Cedar Park Code of Ordinances. Lift stations are discouraged and will be allowed only where conventional gravity service is not feasible. This subsection details the specific design criteria for wastewater lift stations proposed for immediate or future City operation and maintenance within the City of Cedar Park or its ETJ. Additional requirements for individual lift stations may be imposed by the Director of Public Works or designee as conditions warrant.

In addition to these criteria, all lift stations must meet TCEQ rules and the *Cedar Park Lift Station Specifications and Maintenance*.

1. Flow Development.

Calculation of wastewater flow shall be done in accordance with Section 1.9.4.A. The following calculations shall be included:

a. Peak Wet Weather Flow (Design Flow).

This flow is used to determine the lift station design capacity. All lift stations shall be designed to handle the peak wet weather flow for its service area.

Equation:

$$(\text{Population of service area} \times 86 \text{ gallons per capita per day (gpcd)} \times \text{maximum flow peaking factor}) + (800 \text{ gallons per acre served}).$$

b. Peak Dry Weather Flow.

This flow is used to determine pipe size in the collection system.

Equation:

$$(\text{Population of service area}) \times (86 \text{ gpcd}) \times (\text{maximum flow peaking factor})$$

c. Average Dry Weather Flow.

This is the flow developed without the maximum flow peaking factor. This flow is used to determine the average detention time in the wet well.

Equation:

$$(\text{Population of service area}) \times (86 \text{ gpcd})$$

d. Minimum Dry Weather Flow.

This is used to determine the maximum detention time in the wet well.

Equation:

$$(\text{Population of service area}) \times (86 \text{ gpcd}) \times (\text{minimum flow peaking factor})$$

e. A minimum of three (3) pumps, each capable of firm capacity, shall be required for all lift station. The capacity of the pumps shall be such that the maximum wet weather flow can be handled with the largest pump out of service. This requirement will be evaluated by Public Works on a case by case basis for low volume wet well to achieve adequate float separation; in those cases two pumps, each capable of firm capacity, shall be required with a third pump provided.

2. Wet Well Design.

a. The bottom of the wet well shall have a minimum slope to the intake of two (2) vertical to one (1) horizontal. There shall be no projections in the wet well, which would allow deposition of solids.

b. The wet well volume shall be sized to provide adequate storage volume at peak design flows and a pump cycle time of sufficient duration to prevent pump short cycling and consequential motor damage. Pump cycle time, defined as the sum of "pump off" time plus "pump on" time, shall be as follows:

| Motor H.P. | θ Min (Minimum Cycle Time in Minutes) |
|--------------|--|
| 2 to 50 | 10 |
| 51 to 75 | 15 |
| 76 to 250 | 30 |
| 251 to 1,500 | 45 |

Volume between “pump on” and “pump off” elevation (of the pump cycle) shall be determined by the following criteria:

$$V = \frac{\theta q}{4}$$

Where: q = pump capacity in gpm and θ is the minimum cycle time in minutes

- c. All “pump on” levels shall have a minimum separation of one (1) foot between levels. All “pump off” levels shall be at least six (6) inches above the top of the pump casing. For more than two (2) pumps, the “pump off” levels shall be staged with a minimum separation of one (1) foot between levels.
- d. An example of a two (2) pump, each capable of firm capacity, and standby third pump in wet well, staging sequence follows:

High-level alarm and all (3) pumps on

Lag pump on

Lead pump on

Lag pump off

Lead pump off

Low-level alarm

The high level alarm shall be at least one (1) foot above the last (highest) “pump on” level in the wet well and also at least one (1) foot below the flow line of the lowest influent line into the wet well.

- e. For high volume lift stations with three (3) pumps or more, where no more than two pumps are required for firm capacity, the following method for calculating the wet well volume may be used:

$$V = \frac{\theta \times q_1}{4}$$

$$\text{and } K = (q_1 - q_2) + q_1$$

$$V_2 = V' \times N \times V_1$$

Where:

V_1 = working volume for the first pump in gallons

θ = minimum cycle time in minutes

q_1 = capacity of the first pump in gpm

q_2 = capacity of the second pump in gpm

K = the ratio of the discharge increment to the discharge of the first pump, dimensionless

V_2 = working volume for the second pump gallons

V' = the ratio of additional draw down volume to the volume for one pump, dimensionless

N = number of pumps

1) Calculate V_1 and K ;

2) Locate K on Table 1 and read the corresponding value for V' ;

3) calculate V_2 .

- f. An example of a three (3) pump starting sequence, with a fourth standby pump in wet well, is as follows:

High-level alarm and all (more than 3) pumps on

Third pump on

Second pump on

First pump on

Third pump off

Second pump off

First pump off

Low Level alarm

For the location of the high-level alarm, refer to the example of a two-pump starting sequence.

TABLE 1: V' values Corresponding to various K Values

| K | V' | K | V' | K | V' |
|------|------|------|------|------|------|
| 0.00 | 0.00 | 2.10 | 1.36 | 3.49 | 2.63 |
| 0.33 | 0.00 | 2.13 | 1.39 | 3.53 | 2.67 |
| 0.44 | 0.01 | 2.17 | 1.42 | 3.57 | 2.70 |
| 0.53 | 0.04 | 2.20 | 1.45 | 3.61 | 2.74 |
| 0.62 | 0.08 | 2.23 | 1.49 | 3.65 | 2.77 |
| 0.70 | 0.12 | 2.27 | 1.52 | 3.69 | 2.81 |
| 0.77 | 0.16 | 2.30 | 1.55 | 3.73 | 2.85 |
| 0.84 | 0.21 | 2.34 | 1.58 | 3.77 | 2.88 |
| 0.90 | 0.25 | 2.37 | 1.62 | 3.81 | 2.92 |
| 0.96 | 0.29 | 2.41 | 1.65 | 3.85 | 2.96 |
| 1.02 | 0.34 | 2.45 | 1.68 | 3.89 | 3.00 |
| 1.07 | 0.38 | 2.48 | 1.71 | 3.93 | 3.03 |
| 1.12 | 0.42 | 2.52 | 1.75 | 3.97 | 3.07 |
| 1.17 | 0.46 | 2.55 | 1.78 | 4.01 | 3.11 |

| | | | | | |
|------|------|------|------|------|------|
| 1.22 | 0.51 | 2.59 | 1.81 | 4.05 | 3.15 |
| 1.26 | 0.55 | 2.62 | 1.84 | 4.09 | 3.18 |
| 1.30 | 0.59 | 2.66 | 1.88 | 4.13 | 3.22 |
| 1.34 | 0.63 | 2.70 | 1.91 | 4.17 | 3.26 |
| 1.38 | 0.66 | 2.73 | 1.94 | 4.21 | 3.30 |
| 1.42 | 0.70 | 2.77 | 1.97 | 4.25 | 3.34 |
| 1.46 | 0.74 | 2.81 | 2.01 | 4.29 | 3.38 |
| 1.50 | 0.78 | 2.84 | 2.04 | 4.33 | 3.42 |
| 1.54 | 0.81 | 2.88 | 2.07 | 4.38 | 3.45 |
| 1.57 | 0.85 | 2.92 | 2.11 | 4.42 | 3.49 |
| 1.61 | 0.89 | 2.95 | 2.14 | 4.46 | 3.53 |
| 1.65 | 0.92 | 2.99 | 2.18 | 4.50 | 3.57 |
| 1.68 | 0.96 | 3.03 | 2.21 | 4.54 | 3.61 |
| 1.72 | 0.99 | 3.07 | 2.24 | 4.58 | 3.65 |
| 1.75 | 1.03 | 3.10 | 2.28 | 4.63 | 3.69 |
| 1.79 | 1.06 | 3.14 | 2.31 | 4.67 | 3.73 |
| 1.82 | 1.09 | 3.18 | 2.35 | 4.71 | 3.77 |
| 1.86 | 1.13 | 3.22 | 2.38 | 4.75 | 3.81 |
| 1.89 | 1.16 | 3.26 | 2.42 | 4.79 | 3.85 |

| | | | | | |
|------|------|------|------|------|------|
| 1.92 | 1.19 | 3.29 | 2.45 | 4.84 | 3.89 |
| 1.96 | 1.23 | 3.33 | 2.49 | 4.88 | 3.93 |
| 1.99 | 1.26 | 3.37 | 2.52 | 4.92 | 3.97 |
| 2.03 | 1.29 | 3.41 | 2.56 | 4.96 | 4.01 |
| 2.06 | 1.33 | 3.45 | 2.59 | 5.01 | 4.05 |

K = Pump discharge (Dimensionless) V' = Volume (Dimensionless) Source: ALBERT PINCINE

3. Wet Well Detention Time

- a. Calculate the detention time (Td) in the wet well for the maximum wet weather flow, maximum dry weather flow and average dry weather flow using the following equation:

$$T_d = t_f + t_e$$

Where:

$$T_f = (v) \div (i) = \text{time to fill the wet well in minutes}$$

$$T_e = (v) \div (q - i) = \text{time to empty the wet well in minutes}$$

v = Volume of wet well between “pump on” and “pump off” elevations in gallons

q = Pump capacity in gpm

i = flow into the station corresponding to the maximum wet weather flow, maximum dry weather flow or average dry weather flow in gpm.

- b. Maximum detention time shall be calculated with i = minimum dry weather flow.
 - c. Odor control shall be provided for the wet well if the total detention time in the wet well and force main system exceeds 180 minutes.
- ### 4. Static Head.

The static head shall be calculated for “pump on” and “pump off” elevations in the wet well.

5. Net Positive Suction Head.

The net positive suction head (NPSH) required by the pump selected shall be compared with the NPSH available in the system at the eye of the impeller. The engineer shall consult the pump manufacturer for the NPSH required values for that pump and compare them with calculated values for the NPSH available. The NPSH available should be greater than the NPSH required for a flooded suction pump. The following equation may be used for calculating the NPSH available:

$$\text{NPSH}_A = P_B + H_s - P_v - H_{f_s}$$

Where:

P_B = barometric pressure in feet absolute,

H_s = minimum static suction head in feet,

P_v = vapor pressure of liquid in feet absolute,

H_{f_s} = friction loss in suction in feet.

For lift stations in Cedar Park's service area a barometric pressure of 33.4 feet may be used and a vapor pressure of one and four-tenths (1.4) feet may be used. These values are based on the following assumptions: an altitude of 500 feet above sea level, a water temperature of 85°F and a specific gravity of water of 0.996 at 85°F.

6. Suction Piping Design.

- a. All suction piping shall be flanged ductile iron and have a minimum diameter of four (4) inches. Each pump shall have a separate suction pipe.
- b. Suction piping shall have a velocity of three (3) to five (5) fps.
- c. All suction pipes inside the wet well shall be equipped with a flare type, down-turned intake. The distance between the bottom of the flare and the floor of the wet well shall be between $D/3$ and $D/2$ where D is the diameter of the flare inlet.

7. Force Main Design.

- a. All force mains shall be ductile iron with non-corrosive lining or an approved HDPE in steel casing with a minimum diameter of four (4) inches. Force main pipe within the station shall be flanged. Flexible fittings shall be provided at the exit wall.
- b. Force mains shall be sized so that the flow velocity is between three (3.0) and six (6.0) feet per second at initial and ultimate development. During initial development phases for lift stations with three (3) or more pumps and fourth

standby in wet well, flow velocities may be as low as two and one-half (2.5) feet per second with one pump running.

- c. The maximum time required to flush the force main shall be calculated on the basis of average dry weather flow. Flush time shall be calculated for average dry weather flow using the following equations:

$$T_{\text{flush}} = (t_f + t_e) \times \frac{(\text{Force Main Length})}{(\theta/2) (V_{\text{fm}}) (60 \text{ sec/min})}$$

Where:

t_e = Time to empty wet well in minutes

t_f = Time to fill wet well in minutes

V_{fm} = Flow velocity in the force main in feet per second

θ = Pump cycle time in minutes

* $t_e = v/(q-i)$

* $t_f = v/i$

i = average dry weather flow in gpm

*See Section 1.9.4.J.3.a, "Wet Well Detention Time", for an explanation of v and q .

- d. Odor and corrosion control shall be provided for the force main if the force main detention time exceeds 30 minutes if dual force mains are not feasible.
- e. Location and size of all air release valves shall be evaluated for odor or nuisance potential to adjacent property by the design engineer.

The use of air release valves shall be restricted to installations where there are not possible alternatives.

- f. Sulfide Generation Potential.

Lift station/force main systems shall be evaluated for their sulfide generation potential and their ability to achieve scouring velocities during average dry weather flow periods. If the evaluation indicates that sulfide concentration of greater than two (2) ppm and solids deposition are likely, the design shall:

- 1) Define a workable sulfide control technique that will minimize sulfide formation in the force main,
- 2) Include "pig" launching stations and recovery points to allow cleaning of the force main, and

- 3) Protect the gravity main and manholes downstream of the force main from corrosion. The length of pipe to be protected shall be determined on a case-by-case basis.
 - g. The force main shall discharge into its own distinct manhole. (i.e. multiple force mains shall not discharge into a single manhole.)
 - h. Thrust restraint when required shall be shown on the plan view.
8. Head Loss Curves.
- a. Data points for the system capacity curve shall be provided in tabular form and graphed with pump head capacity curve on the same graph. Two system capacity curves shall be plotted using the Hazen Williams coefficient values of C = 100 and C= 140.
 - b. Pump output in gpm at maximum and minimum head shall be clearly shown on the system curve for each pump and combination of pumps.
 - c. For stations with two (2) or more pumps operating in parallel, multiple and single operation points shall be plotted on the system curve.
 - d. Pumps with the highest efficiencies at all operating points shall be used.
 - e. If pumps are equipped with smaller impellers during start up to handle lower than design flows, impellers sized to handle the design flow shall also be provided.

9. Buoyancy Calculations.

The lift station design shall include a complete analysis of buoyant forces on the entire lift station structure.

10. Water Hammer.

- a. Calculations for water hammer showing maximum pressures, which would occur upon total power failure while pumping, shall be provided using the following equations.

$$p = \frac{(a)(V)}{(2.31)(g)} + \text{operating pressure of pipe (psi)}$$

$$a = 12 \div \left\{ \frac{w}{g} \left[\frac{1}{k} + \frac{d}{Et} \right] \right\}^{0.5}$$

Where:

p = water hammer pressure (psi)

a = pressure wave velocity (ft/s)

w = specific weight of water (62.4 lb/ft³)

g = acceleration of gravity (32.2 ft/s²)

k = bulk modulus of water (300,000 psi)

d = inside diameter of pipe (in)

E = Young's modulus of pipe (psi)

t = pipe wall thickness (in)

v = flow velocity in pipe (ft/s)

Surge control measures shall be provided when pressures, including those due to water hammer, exceed the pressure rating of the pipe.

11. Suction Specific Speed.

Suction specific speed of the pumps shall be calculated using the following formula:

$$SSS = \Omega(Q)^{-.5} / (H)^{-.75}$$

Where:

SSS = suction specific speed (rpm)

Q = flow at the best efficiency point, gallons per minute (gpm)

H = net positive suction head required at maximum impeller speed (feet)

Ω = speed of pump and motor in rpm

Suction specific speed should be below 9,000 rpm to ensure that the pump will not cavitate because of internal recirculation.

12. Stiffness Ratio.

In order to ensure that the pump shaft does not bend an excessive amount, the engineer shall calculate the stiffness ratio of the shaft using the following equation:

$$\text{Stiffness Ratio} = L^3 / D^4$$

where:

L = distance from impeller centerline to the centerline of the inboard bearing (inches)

D = diameter of shaft (inches)

The stiffness ratio shall not exceed 60.

13. Energy Calculations.

For lift stations with flows exceeding 75 gpm but less than 1,000 gpm, and if the engineer is considering a submersible type lift station as an option then the engineer shall submit cost comparisons for submersible stations versus wet well/dry well stations. These cost comparisons should include the initial station costs, installation costs and power costs for the life of the station.

Energy costs for each type station shall be calculated using the following equations:

- a. Calculate the water horsepower required.

$$P = \frac{(Q)(h)(8.34 \text{ lb/gal})}{33,000 \text{ ft-lb min/hp}}$$

where:

P = water horsepower (hp)

Q = flow, gallons per minute (gpm)

h = head, feet (ft)

- b. Calculate the brake horsepower required.

$$\text{Bhp} = \frac{P}{\text{pump efficiency}^*}$$

where:

Bhp = brake horsepower (hp)

P = water horsepower (hp)

* Use the most efficient pumps for the application.

- c. Calculate the electrical horsepower required.

$$\text{Ehp} = \frac{\text{Bhp}}{\text{motor efficiency}}$$

where:

Ehp = electrical horsepower (hp)

Bhp = brake horsepower (hp)

* Use the most efficient motors for the application.

- d. Calculate the power required in kilowatts.

$$\text{EkW} = (\text{Ehp})(0.746 \text{ Kw/hp})$$

- e. Calculate daily power consumption in kilowatt-hours.

$$E = [(EKW_1)(t_1) + (EKW_2)(t_2) + (EKW_3)(t_3)...]$$

where: E = total power consumption, kilowatt hours (kWh) per day

EkWⁿ = power required, kilowatts for pumps 1,2,...,n

tⁿ = estimated pump run time in hours per day for pumps 1,2,...,n

- f. Calculate the estimated cost for power consumption over the life of the station.

$$C = I(\$0.06/kWh)(T)$$

where:

C = cost of power over the life of the station (dollars)

E = power consumption (kilowatt-hour per day – kWh/day)

T = time the station is expected to be in service (days)

- g. Stress and thrust calculations for internal station piping and bends shall be provided for stations with flows over 1,000 gpm.

14. Sump Design.

The following items apply for lift station dry well sump pumps:

- a. Dual submersible sump pumps, each with a minimum capacity of 1,000 gallons per hour (gph), shall be provided.
- b. The design head of the sump pumps should be the static head from the sump to one foot above the hundred-year flood level plus allowances for pipe friction both inside and outside the pump chamber.
- c. Sump piping shall be galvanized steel with a minimum diameter of two (2) inches.
- d. Sump discharge from the dry well shall be installed through the wall of the wet well at a point not less than 12 inches above the top of the influent pipe and grouted in place with a water tight seal.
- e. The dry well floor shall slope toward the sump pit.

15. Specific Station Requirements.

- a. All stations will be required to have an equipment-lifting device.
- b. Engineering calculations are required showing that temperatures inside the dry well do not exceed 85°F, while the pumps are operating.
- c. Stations with motors greater than 100 hp shall use a horizontal pump/motor configuration.

- d. Stations with motors 75 hp and larger shall have reduced voltage starters of the auto transformer or solid-state soft start type. Part winding starters and motors are not acceptable. Motors larger than 75 hp shall be designed with a maximum temperature rise not to exceed 80°C over a 40°C ambient temperature. Motors larger than 300 hp may require a higher temperature rise and may be specifically approved with such.
 - e. Motors 75 hp and smaller shall be provided with high efficiency frames. Maximum temperature rise shall not exceed 90°C over a 40°C ambient temperature.
 - f. Stations deeper than 30 feet, measured from the finished floor to the top of the entrance tube, shall require an electrically powered personnel lift.
 - g. Entrance hatches larger than 40 inches in diameter shall be spring loaded.
 - h. Valves higher than six (6) feet above the floor shall have chain operators.
 - i. Any potable water supply below the overflow elevation of the wet well shall be protected by an air gap.
 - j. All lift stations must have a back-up power source. Provide a pad mounted diesel generator located on the lift station. Generator shall be equipped with noise and air pollution control devices. Generator shall have a sized to start all pumps, including stand-by and spare, not just firm requirement. Looped service from two (2) different substations may be considered adequate backup power provide the electric power provider guarantees operation of the Automatic Transfer Switch during an ERCOT required load shedding event.
 - k. Flow monitoring shall be provided for all lift stations, with integration to the City's SCADA system (per the City's SCADA standards).
16. All-weather access roadway.
- a. General.
 - 1) An access road shall be designed and constructed within an established access easement that connects a lift station facility to a paved public roadway.
 - 2) Roadways shall have a concrete or asphalt concrete pavement as the roadway's surface.
 - b. Design.
 - 1) Roadway shall have a longitudinal slope not to exceed 15%, a minimum transverse slope of 2%, no vertical grade break greater than 12%, no vertical curve greater than 1% per horizontal foot, a centerline radius of no less than 50 feet, a minimum width of 12 feet.
 - 2) Road base material and sub-base material as recommended by Geotechnical Report for the site specific soil and load conditions.

- 3) Roadway shall include a means for equipment to turn around.
- 4) Culverts, where required, shall be minimum of 12 inches in diameter. Culvert lengths shall reach to the toe of the fill without changing the side slope of the fill.

c. Easements.

- 1) Easements for access roadways shall be a minimum of 25 feet wide with the roadway centered on the easement. Narrower easements will be considered where the Engineer provides evidence, to the satisfaction of AW, that maintenance activities will not be hindered by the reduced width.
- 2) Easement documents and the metes and bounds shall be reviewed and approved by AW UDS – Pipeline Engineering prior to recordation in the real property records of the appropriate county. Easement recordation in the real property records of the appropriate county is required prior to AW approval of construction plans.

17. Wastewater Lift Station Specifications.

In addition to the design criteria presented in this document, Cedar Park has the *Cedar Park Lift Station Specifications and Maintenance*. This document details minimum City requirements as they relate to the construction and installation of wastewater lift stations. Copies of these documents are available and can be obtained from Public Works.

18. Alternate Wastewater Systems.

a. General.

Public low-pressure wastewater systems are not allowed. Wastewater service shall convert to gravity flow at or prior to the property line and connection to the City's collection system.

3.1 DESIGN REQUIREMENTS FOR DRY UTILITY INSTALLATIONS

3.1.1 INTRODUCTION

These guidelines are intended to establish the minimum basic design requirements for the installation of dry utility infrastructure within the City of Cedar Park. All projects shall be designed and installed in accordance with City of Cedar Park Standard Specifications and requirements. All variations are subject to the approval of the City of Cedar Park Public Works Department. It will be the responsibility of the designer to ensure that the plans are in compliance with the latest versions of all applicable federal, state, and local ordinances, rules, regulations, and policies. Additional requirements for specific projects may be established as warranted.

3.1.2 CONSTRUCTION PLAN INFORMATION & APPLICATION SUBMITTAL REQUIREMENTS

1. Construction plans for the installation of dry utility infrastructure shall be submitted to the City of Cedar Park through the “MyGovernmentOnline” permitting program, as a Right-Of-Way (ROW) use permit. Plans are reviewed for conformance to the City of Cedar Park Code of Ordinances, Standards, Specifications, and Policy.
2. All supplemental documentation on the City’s ROW permit application checklist shall be provided prior to approval.
3. Any necessary permits/approval from other entities whose ROW and/or easements will be utilized for the installation of dry utility infrastructure shall be provided prior to approval of a City of Cedar Park permit. Including, but not limited to TxDOT, CTRMA (Central Texas Regional Mobility Authority), and Capital Metro.
4. ROW permit application fee will be charged unless either of the following criteria applies.
 - a. Applicant has paid a yearly franchise fee that includes the cost of using a City street.
 - b. Applicant is applying for a permit to conduct an emergency operation is not required to pay the permit fee.
5. All dry utility infrastructure construction plans shall include the following items:
 - a. Cover sheet with overview map of the projects proposed location, title, contact information, and the City of Cedar Park general notes for ROW permits (See below).
 - 1) All existing utility lines (water, wastewater, and storm sewer) must be field verified, located, and potholed via SUE Level A prior to construction with a City of Cedar Park employee present.
 - 2) All disturbed areas must be re-vegetated to meet the requirements of the City of Cedar Park Code of Ordinances.

- 3) Proposed dry utility infrastructure must be installed under all existing utility lines unless approved otherwise by the City of Cedar Park Public Works Department.
- b. City of Cedar Park general construction notes from the City website.
- c. Detailed plan overview showing the proposed path and/or location of dry utility infrastructure. All existing roads, easements, ROW, and City utility lines shall be clearly shown and called out (Existing City infrastructure and as-built plans can be viewed online in “Cedar Park Atlas”).
- d. North arrow, scale, legend, and table of contents.
- e. Profile shall be provided with the following information:
 - 1) Existing grade elevation.
 - 2) Station numbers and elevations.
 - 3) Utility crossings with correct elevation of existing lines where they will be crossed.
 - 4) Vertical separation distances between proposed dry utility infrastructure and existing utility lines that are crossed. Minimum vertical separation shall be two feet (2’).
 - 5) Dry utility infrastructure installation method (bore or open trench shall be clearly called out).
- f. Traffic control plan that complies with the City of Austin Transportation Criteria Manual and TxDOT standards.
- g. Any necessary details that pertain to the dry utility installation project.
6. Once permit is approved by City of Cedar Park staff, applicant must schedule a pre-construction meeting with City of Cedar Park inspector prior to the commencement of permitted work.
7. City of Cedar Park ROW permits may not be effective for more than 180 days from the date of approval. Extensions can be requested if necessary.
8. All plan revisions, including, but not limited to, additions, deletions, changes, and modifications, shall be submitted to the City of Cedar Park through “MyGovernmentOnline” under the original ROW permit. Revisions must be approved prior to commencement of work on revised section.

3.1.3 INSTALLATION OF DRY UTILITY INFRASTRUCTURE

3.1.3.1 General

1. No individual franchised utility, City-licensed facility operator, special utility district, or other non-City-owned utility shall perform work affecting the Public Rights-of-Way without first obtaining the appropriate permits required by the City of Cedar Park.

2. Scope of Permit - As used herein, "work affecting the Public Rights-of-Way" includes, but is not limited to, installation, or construction of any structure, pipe, pole, conduit, culvert, or facility, including a telecommunications, cable service, or video service facility, in or on a public way, and any construction, reconstruction, grading, oiling, repair, maintenance, opening, or excavation of a Public Right-of-Way for any purpose, but does not include the construction of public improvements performed by City of Cedar Park employees.
3. All proposed dry utility infrastructure shall be installed with a minimum horizontal separation of five feet (5') from any existing City of Cedar Park utility lines (Water, Wastewater, and Storm Sewer) that the dry utility infrastructure will run parallel with.
4. All proposed dry utility infrastructure must be installed under any existing water, wastewater, or storm sewer line unless approved otherwise by the City of Cedar Park Public Works Department.
5. If a proposed dry utility facility is approved to be installed crossing over existing City of Cedar Park utility lines, that dry utility facility shall have a steel sleeve around the crossing section to prevent any potential damage in the case of future excavation for the maintenance of City lines.
6. All proposed dry utilities facilities shall maintain a minimum vertical separation of two feet (2') from all existing water, wastewater, and storm sewer lines.
7. All disturbed areas must be re-vegetated to meet the requirements of the City of Cedar Park Code of Ordinances.
8. All existing utility lines shall be located/field verified and potholed utilizing SUE Level A prior to construction with a City of Cedar Park employee present.
9. All dry utilities shall be installed in accordance with the City of Cedar Park Code of Ordinances and this manual.
10. All new construction within the public street rights-of-way shall be located underground.

All new residential and nonresidential dry utility installations, including, but not limited to, electrical, gas, television and telephone/telecommunication, shall be placed underground where service is provided adjacent to public street or right-of-way.
11. Proper traffic control shall be implemented following the details provided in permit plans.
12. Proper trench safety protocols shall be followed as necessary.
13. Hours of work shall follow the requirements outlined in note #27 and #28 of the City of Cedar Park Standard Construction Notes (General Construction Notes).
14. Approved City of Cedar Park ROW permits and other necessary permits or approval documentation shall be on site throughout installation/construction of dry utility infrastructure.

3.1.3.2 Boring, Opening Cutting, and Excavation

1. Only dry boring techniques may be used within Public ROW in the City of Cedar Park. Further, dry bores under any existing City street shall be cased. Jetting types of boring equipment are not allowed.
2. The location of the boring pits shall be a minimum of five feet from the roadway to prevent undermining of the curb, gutter, or shoulder section. The pits or trenches excavated to facilitate this operation shall be backfilled and compacted immediately after work is completed.
3. Backfill of all trenches and bore pits shall begin immediately following installation of the new facility in accordance with City of Cedar Park standards.
4. Restoration work must be performed to the satisfaction of the City of Cedar Park. All disturbed areas shall be re-vegetated to meet the requirements of the City Code of Ordinances.

3.1.3.3 Notification of Damages

1. Damage to Private Facilities - The City Inspector and the owner of any damaged private facility must be immediately notified of damage to private facilities caused or found by the Permittee. Required repairs shall meet the current adopted City of Cedar Park Codes and be inspected by the Building Inspector.
2. Damage to City Facilities - When a City facility is damaged the Permittee shall immediately notify the City Inspector and the Public Works Department at (512) 401-5550. The Inspector will coordinate with appropriate City departments responsible for infrastructure that was damaged to determine repair strategy.

3.1.3.4 Non-compliance.

Work commenced prior to obtaining an approved permit may result in workers being removed from the Public Rights-of-Way and a stop work order being issued to the responsible party to prevent any further work in the Public Rights-of-Way until an approved permit is obtained and application fees are paid in full. Additionally, failure to comply with permit conditions may result in workers being removed from the Public Rights-of-Way and a stop work order being issued to the responsible party to prevent any further work until a resolution acceptable to the City is reached.

3.1.3.5 Inspection of Dry Utility Installations

1. Work performed under the ROW permit is subject to City inspection before, during, and after completion of the work. A copy of the approved permit and plans or drawings must be on the work site at all times.
2. Inspections of the Permittee's work by the Inspector shall in no way relieve the Permittee from the obligation of performing all work within the Public ROW in strict accordance with

the requirements of the City of Cedar Park Standard Specifications, provisions of this manual, the City Code, recognized national standards, related administrative rules, and specific permit conditions. Nor shall this inspection relieve the Permittee of the Permittee's responsibility to perform any required corrections in case the work is later found deficient.61

3. The Inspector will periodically monitor operations performed by the contractor to see that work is performed according to the permit conditions. Work must strictly conform to the approved plans. Any changes in the proposed facility from that shown on the approved permit must have the prior consent of the Inspector. If a field change is approved by the Inspector, the Permittee shall submit modified/revised permit drawings which document the change.
4. The Inspector may require changes in construction technique or workmanship if hazardous conditions are present and may halt construction if it does not conform to the approved permit and plans or drawings.

4.1 Requirements for Geotechnical Investigations for Pipeline Projects

4.1.1 General

1. This section applies only to water, wastewater, and reclaimed water pipeline projects with construction funded by the City of Cedar Park and private developer projects that include utility bores, unusually deep utilities, and wet wells. These include Capital Improvement Program projects, Service Extension Request projects, and other cost-participation/developer-agreement projects
2. Investigate subsurface materials and conditions according to these requirements, which represent the minimum acceptable level of care. Higher levels of care, which would involve more extensive sampling, testing, analyses, and reporting, may be required for certain projects.
3. Investigate subsurface materials and conditions on all pipeline projects except those involving “small” repairs, pipe replacement along the exact same alignment as the existing pipe, in-place lining of existing pipe, or pipe bursting where the proposed pipe will not be more than one to two standard pipe sizes larger than the existing pipe. The projects to which these requirements apply include tunneling, guided boring, directional drilling, pipe bursting, pipe jacking, and auger boring. These methods are defined herein as “tunneling and trenchless methods.”
4. Perform investigations that are appropriate for the project. The requirements given herein address a broad category of projects. It is not possible in these requirements to identify all possible geotechnical issues that may arise or that may be unique to a particular project.

4.1.2 Planning the Investigation

1. Tailor the investigation to the type of construction, the anticipated geology, the landforms and topography, and the project schedule and budget.
2. Involve professionals who are experts in the particular type of underground construction. For pipelines constructed by tunneling and trenchless methods, the site exploration, laboratory testing, geotechnical analyses, and reporting shall be planned and implemented in conjunction with engineers whose expertise is tunneling and trenchless construction methods and with geologists or engineering geologists experienced in civil engineering construction.

4.1.3 Site Exploration

1. Locate geotechnical borings by taking into account topography and landforms, expected subsurface materials and conditions, and proposed type of construction. Borings for tunnels and trenchless methods must be located in conjunction with engineers and engineering geologists who are experts in those types of construction.

2. Use typical borehole spacing of from 500 to 750 feet, except in urban areas and in areas of complex or changing geology where closer spacing may be needed (See Section 1.9.5.E.1.). Where truck-mounted drill rigs cannot access critical boring locations, obtain the necessary specialized drilling equipment.
3. Locate geotechnical borings, including piezometers, that are part of investigations for tunnels and trenchless methods far enough off of the proposed pipe alignment so that they do not impact construction.
4. Reference the location of each boring to the Texas State Plane Coordinate System and the ground surface elevation to USGS MSL with horizontal and vertical positional tolerances of +/- one foot.
5. Extend borings a minimum of five (5) feet below the profile grade line of proposed utility lines and a sufficient depth below foundations for structures to characterize the affected materials.
6. Advance borings in soil or soil-like materials using continuous flight auger, hollow stem auger with drag bit, or thin-walled tube. Obtain samples using thin-walled tube or split spoon. In general, reserve split-spoon sampling for cohesionless materials.
7. Advance borings and obtain samples in rock or rock-like material using double-tube core barrel.
8. Conduct in situ tests, such as Standard Penetration Tests and packer tests, as needed to characterize the subsurface materials and conditions.
9. Conduct geophysical tests (resistivity, ground penetrating radar, seismic, and very low frequency) as needed to locate the soil/rock interface, cavities, porous rock, and faults.
10. Locate geotechnical borings at all proposed work and access shafts and pits for tunnels and trenchless methods.
11. Install and abandon piezometers and ground water monitor wells in compliance with State law.
12. Backfill and plug boreholes in pavement according to Public Works Department requirements. Backfill boreholes outside pavement using non-shrink grout from the bottom of the borehole to within three feet of the ground surface. Plug the upper three feet with cuttings from the borehole.
13. Obtain street cut permit and approved traffic control plan for work in public right-of-way.

4.1.4 Laboratory Testing

1. Conduct the following tests:
 - a. For soil and soft rock, including some shale, mudstone, clay shale, and claystone

- i. Unconfined compressive strength
 - ii. Atterberg limits
 - iii. Moisture content
 - iv. Grain size analyses, as needed
 - v. Percent finer than 74 micron
 - vi. Special testing as required to characterize collapsible soils, soils susceptible to particle migration, etc.
 - b. For rock
 - Unconfined compressive strength
2. For projects involving tunneling and trenchless methods, conduct the following additional tests, as needed:
 - a. For soil and soft rock, including some shale, mudstone, clay shale, claystone
 - i. Slake durability
 - ii. Swell pressure
 - iii. Grain size analyses
 - b. For rock
 - i. Cerchar abrasivity
 - ii. Point load
 - iii. Brazilian tensile
 - iv. Punch penetration
 3. Conduct tests for resistivity, pH, chlorides and sulfates, as needed, for corrosion studies.

4.1.5 Geotechnical Analyses

1. Check for, identify, and reconcile inconsistencies in subsurface information or subsurface materials and conditions that may impact design or construction. Compare the boring logs to one another, compare the logs to mapped stratigraphy as contained in Environmental Geology of the Austin Area: An Aid to Urban Planning (Garner and Young, 1976), Geologic Quadrangle Map No. 38, Austin West, Travis County, Texas (Rodda, Garner and Dawe, 1970), and Geologic Atlas of Texas, Austin Sheet (Barnes, 1974), and compare the logs to personal experience in the same area. Assess the potential for “differing site condition” claims based on these comparisons and undertake additional investigations, as needed, to resolve such inconsistencies.

2. Provide geotechnical parameters and construction recommendations appropriate for the type of construction and covering the topics requested. In all cases, provide project-specific recommendations. Avoid generalized discussions and detailed explanations of theory or phenomena.
 - a. Open Cut (Trench) Construction :
 - i. Provide bearing capacity for thrust blocking.
 - ii. Provide maximum lift thickness for backfill.
 - iii. Identify need for and specify method of bedding / backfill particle migration mitigation.
 - iv. Identify need for excavation retention system to protect surrounding utilities, pavement and property.
 - v. Identify aspects of the behavior of the in situ subsurface materials that could affect design (for example, highly plastic soils and extremely flat pipeline grades are incompatible for gravity line construction if water can enter the trench during construction).
 - vi. Provide lateral earth pressures for underground structures (do not provide lateral earth pressures for excavation safety systems).
 - vii. Provide pavement thickness or repair recommendations, if requested.
 - b. Trenchless Construction:

Provide soil and rock properties and characteristics and geotechnical parameters required by the tunneling and trenchless construction engineers.

4.1.6 Reports

1. Use only 8½" by 11" and 11" by 17" sheets. Prepare black and white Illustrations, maps, drawings, photographs, and other graphics: Use color prints only if necessary to adequately convey the information. Do not use tabbed dividers.
2. Submit preliminary reports for review with the 60 and 90 percent submittal of design documents or at the frequency specified for the design documents.
3. Submit final reports with the 100 percent submittal of design documents.
4. Submit one unbound copy of the final report for insertion in the master Project Manual. Bind all other copies.
5. Characterize rock by reporting, at a minimum, the geologic material, color, degree of weathering, relative hardness, RQD, percent recovery, unconfined compressive strength, unit weight, and relative frequency and infilling of discontinuities. Where appropriate, report SPT results.
6. Characterize soil by reporting, at a minimum, the engineering classification (group name and symbol), color, relative stiffness, shrink / swell potential, unconfined compressive strength, unit weight, moisture content, liquid limit, particle size

distribution, and plasticity index. Where appropriate, report SPT results and collapse potential.

7. Characterize groundwater by reporting observations and expected occurrence.
8. Prepare two separate reports for pipelines constructed by open cut excavation or by auger boring that is small diameter, short length, and not under major facilities such as multi-lane highways: Prepare a Geotechnical Data Report that the project design engineer / project manager will include in Section 00220 of the Project Manual, and a Geotechnical Design Memorandum that will be included in the project files but not in the Project Manual.
 - a. Geotechnical Data Report:
 - i. Include the boring location map, boring logs, and text describing the investigation and the subsurface materials and conditions that were encountered, but no geotechnical recommendations. Do not include references to agronomic soil units or engineering parameters reported in County Soil Surveys. (If soil hydraulic conductivity, corrosivity, or other parameters commonly reported in the Soil Survey are of interest, perform the appropriate tests or investigations.)
 - ii. In the text portion of the Geotechnical Data Report, describe the geologic setting, stratigraphy, and structure. Use commonly accepted geologic names such as Buda Formation, Georgetown Formation, Capital Terrace Deposits as contained in Environmental Geology of the Austin Area: An Aid to Urban Planning (Garner and Young, 1976), Geologic Quadrangle Map No. 38, Austin West, Travis County, Texas (Rodda, Garner and Dawe, 1970), and Geologic Atlas of Texas, Austin Sheet (Barnes, 1974).
 - iii. Include the State Plane coordinate and USGS ground surface elevation for each boring on the boring log.
 - iv. Identify geologic units on the boring logs, using commonly accepted geologic symbols such as Kbu, Kdr, Qca as contained in Environmental Geology of the Austin Area: An Aid to Urban Planning (Garner and Young, 1976), Geologic Quadrangle Map No. 38, Austin West, Travis County, Texas (Rodda, Garner and Dawe, 1970), and Geologic Atlas of Texas, Austin Sheet (Barnes, 1974).
 - b. Geotechnical Design Memorandum:
 - i. Reference the Geotechnical Data Report in the Geotechnical Design Memorandum; do not gratuitously repeat its contents.
 - ii. Provide geotechnical recommendations specific to the project and only for items or issues requested. For instance, do not make pavement thickness or repair recommendations unless requested to do so. (See Section 1.9.5.E.2.).

9. Prepare three separate reports for pipelines constructed by tunneling and trenchless methods that are large diameter, long length, or under major facilities such as multi-lane highways: Prepare a Geotechnical Baseline Report that the project design engineer / project manager will include in Section 00220A of the Project Manual, a Geotechnical Data Report that the project design engineer / project manager will include in Section 00220B of the Project Manual, and a Geotechnical Design Memorandum that will be included in the project files but not in the Project Manual.
 - a. Geotechnical Data Report
See Section 1.9.5.F.8.a.
 - b. Geotechnical Baseline Report
 - i. Provide baseline geotechnical information to establish what constitutes “anticipated site conditions for the project.” The experts in underground construction must author or co-author the GBR because it is a contractual document that allocates risk associated with construction.
 - ii. Use clear, concise prose organized in parallel structure. Provide specific, quantifiable, and measurable baselines, not subjective, vague descriptors. Reference the GDR in the GBR; do not gratuitously repeat its contents.
 - iii. Follow ASCE’s Geotechnical Baseline Reports for Construction, Suggested Guidelines (Essex, 2007). However, do not use the checklist in that publication as the outline for the GBR. Instead, describe baseline conditions reach by reach, sequentially along the project alignment. (A reach is defined as a segment having consistent ground conditions and excavation methods.) Address all baseline conditions and design and construction considerations for each reach in a single section of the GBR. Write the GBR using parallel structure to present information reach by reach in the same repetitive manner. Discuss distinctly different elements of work separately. For instance, discuss tunnels separately from shafts. Minimize the presentation of information not related to baseline conditions. As an example, do not include lengthy discussions about geologic setting or project background information, both of which should be adequately discussed in the GDR.
 - c. Geotechnical Design Memorandum
See Section 1.9.5.F.8.b.
10. Prepare reports as directed by the Public Works for projects that are a combination of open cut excavation and tunneling or trenchless methods.

4.1.7 References

Barnes, V. E., Geologic Atlas of Texas, Austin Sheet, The University of Texas at Austin, Bureau of Economic Geology, 1974.

Essex, R. J. ed., Geotechnical Baseline Reports for Construction, Suggested Guidelines, American Society of Civil Engineers, 2007.

Garner, L. E., and K. P. Young, Environmental Geology of the Austin Area: An Aid to Urban Planning, The University of Texas at Austin, Bureau of Economic Geology, 1976.

Rodda, P. U., L. E. Garner, and G. L. Dawe, Geologic Quadrangle Map No. 38, Austin West, Travis County, Texas, The University of Texas at Austin, Bureau of Economic Geology, 1970.

5.1 Exceptions

Exceptions to these design criteria must be requested in writing. Written approval from the Director of the Public Works or a designee must be obtained before any exceptions will be allowed.

Appendix A: Construction Notes for Subdivisions and Site Plans

Construction Notes for Subdivisions & Site Plans City of Cedar Park Revised October 11, 2022

General Notes:

1. General Contractor shall call for all utility locates prior to any construction. Contractor shall delineate areas of excavation using white paint (white lining) in accordance with 16 TAC 18.3. Water & wastewater owned by the City of Cedar Park can be located by calling Texas 811 at 1- 800-344-8377. Allow three business days for utility locates by the City of Cedar Park.
2. All construction shall be in accordance with the latest City of Austin Standard Specifications. City of Austin standards shall be used unless otherwise noted.
3. Design procedures shall be in general compliance with the City of Austin Drainage Criteria Manual. All variances to the manual are listed below: **<enter here>**
4. Benchmarks should be tied to the City of Cedar Park benchmarks and be correctly "geo-referenced" to state plane coordinates. A list of the City's benchmarks can be found at: <http://www.cedarparktexas.gov/index.aspx?page=793>.
5. Prior to issuance of a certificate of occupancy for a site development permit, the right of way between the property line and edge of pavement / back of curb shall be revegetated according to COA specification 602S and 606S. Prior to City acceptance of subdivision improvements all graded and disturbed areas shall be re-vegetated in accordance with the City of Austin Specification Item #604 native seeding unless non-native is specifically approved.
6. The Contractor shall provide the City of Cedar Park copies of all test results prior to acceptance of subdivision improvements.
7. City, owner, engineer, contractor, representatives of all utility companies, and a representative from the testing lab shall attend pre-construction conference prior to start of construction. The contractor shall schedule the meeting with the City of Cedar Park Engineering Department a minimum of 48 hours prior to this pre-construction meeting (512-401-5000). Final construction plans shall be delivered to Engineering a minimum of seven business days prior to requesting a pre-construction meeting.
8. Excess soil shall be removed at the contractor's expense. Notify the City of Cedar Park if the disposal site is inside the City's jurisdictional boundaries.
9. Burning is prohibited.
10. Any changes or revisions to these plans must first be submitted to the City by the design engineer for review and written approval prior to construction of the revision. All changes and revisions made to the design of utilities or impacts utilities shall use revision clouds to highlight all revisions or changes with each submittal. Revision triangles shall be used to mark revisions. All clouds and triangle markers from previous revisions may be removed. Revision information shall be updated in the appropriate areas of the Title Block.
11. Minimum setback requirements for existing and newly planted trees from the edge of pavement to conform to the requirements as shown in Table 6-1 of the City of Austin's Transportation Criteria Manual.
12. The Contractor will reimburse the City for all cost incurred as a result of any damage to any City utility or any infrastructure within the Right-of-Way by the Contractor,

regardless of these plans.

13. An engineer's concurrence letter and electronic 22"x34" record drawings shall be submitted to the Engineering Department prior to the issuance of certificate of occupancy or subdivision acceptance. The Engineer and Contractor shall verify that all final revisions and changes have been made to record drawings prior to City submittal. Record construction drawings, including roadway and all utilities, shall be provided to the City in AutoCad ". dwg" files and ".PDF" format on a CD or DVD. Line weights, line types and text size shall be such that if half-size prints (11"x 17") were produced, the plans would still be legible. All required digital files shall contain a minimum of two (2) control points referenced to the State Plane Grid Coordinate System – Texas Central Zone (4203), in US feet and shall include rotation information and scale factor required to reduce surface coordinates to grid coordinates in US feet.
14. The City of Cedar Park has not reviewed these plans for compliance with the Americans With Disabilities Act. It is the responsibility of the owner to provide compliance with all legislation related to accessibility within the limits of construction shown in these plans.
15. ALL RESPONSIBILITY FOR THE ADEQUACY OF THESE PLANS REMAINS WITH THE ENGINEER WHO PREPARED THEM. IN REVIEWING THESE PLANS, THE CITY OF CEDAR PARK MUST RELY ON THE ADEQUACY OF THE WORK OF THE DESIGN ENGINEER.
16. No blasting is allowed on this project.
17. A traffic control plan, in accordance with the Texas Manual on Uniform Traffic Control Devices, shall be submitted to the City for review and approval prior to any partial or complete roadway closures. Traffic control plans shall be site specific and seal by a registered professional engineer.
18. The contractor shall keep the site clean and maintained at all times, to the satisfaction of the City. The subdivision will not be accepted (or Certificate of Occupancy issued) until the site has been cleaned to the satisfaction of the City.
19. Signs are not permitted in Public Utility Easements, Set Backs or Drainage Easements.
20. It shall be the responsibility of the Contractor to inspect temporary erosion controls on a daily basis. Adjust the controls and/or remove any sediment buildup as necessary. A stop work order and/or fine may be imposed if the erosion controls are not maintained.
21. A final certificate of occupancy will not be issued on commercial sites until all disturbed areas have been re-vegetated. Substantial grass cover, as determined by Engineering Department, must be achieved prior to the issuance of a final certificate of occupancy. All erosion controls must remain in place and maintained until all disturbed areas have been re-vegetated to the acceptance of the City of Cedar Park Engineering Department. Prior to issuance of a certificate of occupancy for a site development permit, the right of way between the property line and edge of pavement / back of curb shall be revegetated according to COA specification 602S and 606S.
22. Contractor will be responsible for keeping roads and drives adjacent to and near the site free from soil, sediment and debris. Contractor will not remove soil, sediment or debris from any area or vehicle by means of water, only shoveling and sweeping will be allowed. Contractor will be responsible for dust control from the site. Failure to comply with this requirement may result in a stop work order or a fine.
23. All wet utilities shall be installed and all densities must have passed inspection(s) prior to the installation of dry utilities.
24. A minimum of seven days of cure time is required for HMAC prior to the introduction of vehicular traffic to any streets.
25. Prior to plan approval, the Engineer shall submit to the Engineering Department

- documentation of subdivision/site registration with the Texas Department of Licensing and Regulations (TDLR) and provide documentation of review and compliance of the subdivision/site construction plans with Texas Architectural Barriers Act (TABAA).
26. Prior to subdivision/site acceptance, the engineer/developer-owner shall submit to the Engineering Department documentation that the subdivision/site was inspected by TDLR or a registered accessibility specialist (RAS) and the subdivision/site is in compliance with the requirements of the TABAA.
 27. All construction and construction related activities shall be performed Monday thru Friday from 7:00 A.M. to 6:00 P.M. However, construction activities within one hundred feet (100') of a dwelling or dwelling unit shall be performed between the hours of 8:00 a.m. and 6:00 p.m. Otherwise all construction and construction related activities shall conform to City of Cedar Park Code of Ordinances, specifically ARTICLE 8.08.
 28. Approval for construction activities performed on Owner's Holidays, and/or Saturdays, outside of Monday through Friday 8 am to 5 pm, or in excess of 8 hours per day shall be obtained in writing 48 hours in advance, and inspection fees at 1.5 times the hourly inspection rate shall be billed directly to the contractor. There shall be no construction or construction related activities performed on Sunday. The City reserves the right to require the contractor to uncover all work performed without City inspection.
 29. All poles to be approved by City and PEC, no conduit shall be installed down lot lines / between homes. All conduit shall be located in the public ROW or in an easement adjacent to and parallel to the public ROW.
 30. Dry utilities shall be installed after subgrade is cut and before first course base. No trenching of compacted base. If necessary dry utilities installed after first course base shall be bored across the full width of the ROW.
 31. No ponding of water shall be allowed to collect on or near the intersection of private driveway(s) and a public street. Reconstruction of the driveway approach shall be at the Contractor's expense.
 32. All driveway approaches shall have a uniform two percent slope within the ROW unless approved in writing by the Engineering Department.
 33. Contractors on site shall have an approved set of plans at all times. Failure to have an approved set may result in a stop work order.
 34. Contractor to clear five feet beyond all right of way to prevent future vegetative growth into the sidewalk areas.
 35. There shall be no water or wastewater appurtenances, including but not limited to, valves, fittings, meters, clean-outs, manholes, or vaults in any driveway, sidewalk, traffic or pedestrian area.
 36. Sidewalks shall not use curb inlets as a partial walking surface. Sidewalks shall not use traffic control boxes, meter or check valve vaults, communication vaults, or other buried or partially buried infrastructure as a vehicular or pedestrian surface.

Street Notes:

1. No trenching of compacted base will be allowed. A penalty and/or fine may be imposed to the general contractor if trenching of compacted base occurs without City approval, regardless of who performed the trenching.
2. All sidewalks shall comply with the Americans With Disabilities Act. The City of Cedar Park has NOT reviewed these plans for compliance with the Americans With Disabilities Act, or any other accessibility legislation, and does not warranty or approve these plans for any accessibility standards.

3. Street barricades shall be installed on all dead end streets and as necessary during construction to maintain job safety.
4. Any damage caused to existing pavement, curbs, sidewalks, ramps, etc., shall be repaired by the contractor to the satisfaction of the City prior to acceptance of the subdivision.
5. At intersections, which have valley drainage, the crown to the intersecting street will be culminated at a distance of 40 ft. from the intersecting curb line unless otherwise noted.
6. The subgrade material was tested by **(Name, Address & Phone Numbers)** on **(Date)** the pavement sections were designed accordingly. The pavement sections are to be constructed as follows: **<enter here>**
7. Density testing of compacted subgrade material, first course and second course compacted base, shall be made at 500 foot intervals.
8. All density testing is the responsibility of the owner or contractor and shall be witnessed by the City of Cedar Park's project representative. The contractor is to notify the City 48 hours prior to scheduled density testing.
9. Traffic control signs and pavement markings shall be in accordance with the Texas Manual on Uniform Traffic Control Devices and installed as directed by the City of Cedar Park prior to City acceptance of the Subdivision.
10. Slope of natural ground adjacent to the right-of-way shall not exceed 3:1. If a 3:1 slope is not possible, a retaining wall or some other form of slope protection approved by the City shall be placed in a location acceptable to the City.
11. The City, engineer, contractor, and a representative from the asphalt testing lab shall attend a pre-paving conference prior to the start of HMAC paving. The contractor shall give the City a minimum of 48 hours notice prior to this meeting (512-401-5000).
12. The Contractor or owner is responsible for conducting tests on asphalt pavement in accordance with the requirements set forth in the City of Austin Standard Specification No. 340. Any re-testing of the asphalt pavement shall be conducted under the supervision of the engineer and the City of Cedar Park. Re-testing of the asphalt pavement shall be limited to one retest per project.
13. All pavement markings and signage shall comply with MUTCD standards. Street name letter sizing shall be in accordance with MUTCD Table 2D-2. Pavement markings shall be thermoplastic unless otherwise noted.
14. All street name signs shall be high intensity retro grade.
15. No Fencing or Wall is allowed to be constructed so that it obstructs the sight lines of drivers from an intersecting public roadway or from an intersecting private driveway. Sight lines are to be maintained as described in City Code Section 14.05.007. Installing a fence or wall which does not comply with the City's Sight Distance Requirements or Fencing Regulations is a violation of the City's Ordinance and may be punishable pursuant to Section 1.01.009 of City Code.
16. Temporary rock crushing operations are not allowed. All sources for flexible base material are required to be approved by the City. Prior to base placement all current triaxial test reports for the proposed stockpiles are to be submitted to the City's project representative for review and approval.
17. Utility service boxes or other utility facilities shall not be installed within areas determined to be required sight lines of two intersecting public streets or within sight lines of a private driveway. Sight lines are to be maintained compliant with Table 1-1 of the Austin Transportation Criteria Manual. Utilities determined by the Director of Engineering to be placed within required sight lines may be required to be relocated at

the expense of the contractor prior to the City issuing a Certificate of Occupancy or prior to the City's Acceptance of the Project Improvements.

18. All lane closures shall occur only between the hours of 9 AM and 4 PM. Any night time lane closures require approval by the Director of Engineering and shall occur between the hours of 8 PM and 6 AM. Lane closures observed by City during the peak hours of 6 AM to 9 AM, or 4 PM to 8 PM will be subject to fine per Chapter 1 of City Ordinance, and/or subsequent issuance of Work Stoppage.
19. Improvements that include reconstruction of an existing Type II driveway shall be done in a manner which retains operations of not less than half of the driveway at all times. Full closure of such driveway can be considered with written authorization retained by the Contractor from the property owner(s) or access easement right holder(s) of the driveway allowing full closure of the driveway.
20. Trees must not overhang within 10' vertically of a sidewalk, or 18' vertically of a roadway or driveway.

Wastewater Notes:

1. Refer to the City of Cedar Park Public Works Utility Policy and Specifications manual.
2. Manhole frames and covers and water valve boxes shall be raised to finished pavement grade at the owner's expense by the contractor with the City approval. All utility adjustments shall be completed prior to final paving construction.
3. The location of any existing utility lines shown on these plans may not be accurate. Any damage to existing utility lines, both known and unknown, shall be repaired at the expense of the contractor. The contractor shall locate all utilities prior to bidding the project.
4. All iron pipe and fittings shall be wrapped with at least 8 mil. Polyethylene wrap.
5. All water mains, wastewater mains and service lines shall meet City of Austin minimum cover specifications. All streets are to be cut to subgrade prior to installation of water mains or cuts will be issued by the engineer.
6. Where 48-inches of cover below subgrade cannot be achieved for wastewater service lines alternate materials may be used. A minimum of 36-inches of cover below subgrade shall be achieved. Any wastewater service line with cover between 36-inch and 48-inches shall be SDR-26 PVC pressure pipe.
7. Gasketed PVC sewer main fittings shall be used to connect SDR-35 PVC to SDR-26 PVC pressure pipe or C-900.
8. Pipe materials to be used for construction of utility lines:
 - Wastewater- **<enter here>**
 - Force Main- **<enter here>**
 - (Note: If using PVC, SDR-26 is required, SDR-35 WW is not allowed.
 - Forcemains shall be epoxy lined ductile iron)
9. All sanitary sewers, excluding service lines, shall be mandrel tested per TCEQ (Texas Commission on Environmental Quality) criteria. A mandrel test will not be performed until backfill has been in place for a minimum of 30 days.
10. All wastewater lines 10" and larger shall be video inspected in accordance with City of Cedar Park Public Works Department Utility Policy and Standard Specifications Manual Appendix E: Requirements for Video Inspection of Wastewater Lines at the Contractor's expense. No separate pay unless noted on the bid form.
11. All sanitary sewers, including service lines, shall be air tested per City of Austin Standard Specifications.

12. Density testing of compacted backfill shall be made at a rate of one test per two foot lifts per 500 feet of installed pipe.
13. City shall be given 48 hours notice prior to all testing of water and wastewater lines. City inspection is required for all testing of water and wastewater lines.
14. Where a water or wastewater line crosses above (or below) a storm sewer structure and the bottom (or top) of the pipe is within 18 inches of the top (or bottom) of the utility structure, the pipe shall be encased with concrete for a distance of at least 1 ft. on either side of the ditch line of the utility structure or the storm sewer. Concrete encasement will not be required for ductile iron (thickness Class 50), AWWA C-900 (SDR-18) 150 psi rated PVC in sizes to 12 inches or AWWA C-905 (SDR-25) 165 psi rated PVC in sizes larger than 12 inches. Concrete encasement shall conform to C.O.A. standard detail 505-1.
15. The allowable (maximum) adjustment for a manhole shall be 12" (inches) or less.
16. Where a sewer line crosses a water line, the sewer line shall be one 20 ft. joint of 150 psi rated PVC centered on crossing.
17. All manhole and inlet covers shall read "City of Cedar Park".
18. Contractor to notify, and obtain approval from, the City of Cedar Park 48 hours prior to connecting to existing City utilities.
19. All pipe bedding material shall conform to City of Austin Standard Specifications.
20. Unless otherwise specified by the Engineer all concrete is to be Class "A" (5 sack, 3000 psi ~ 28-days), and all reinforcing steel to be ASTM A615 60.
21. All wastewater manholes to be coated with organic materials and procedures listed in City of Austin Qualified Products List No. WW-511 (WW-511A and WW-511B are not allowed unless manhole is being structurally rehabilitated with approval by Public Works). All manholes will be pre-coated or coated AFTER testing.
22. Polybrid Coatings on wastewater manholes will not be allowed. Any other product appearing on the COA SPL WW-511 is acceptable.
23. All penetrations of existing wastewater manholes are required to be re-coated in accordance with the specifications listed in Note 20.
24. All manholes will be vacuum tested only.
25. Tracer tape AND marking tape shall be installed on all water and wastewater mains in accordance with City of Austin Standards, regardless of the type of pipe.
26. All pressure pipe shall have mechanical restraint and concrete thrust blocking at all valves, bends, tees, plugs, and other fittings.

Water Notes:

1. Refer to the City of Cedar Park Public Works Utility Policy and Specifications manual.
2. The top of valve stems shall be at least 18", and no more than 36", below finished grade. Valve stem risers shall be welded on each end to the City's satisfaction.
3. Fire hydrant leads to be ductile iron, Class 350, and installed per City of Austin standard specifications and detail.
4. Prior to installation of fire hydrants, the engineer will provide the Contractor one (1) cut from a hub pin, establishing the elevation of the bury line.
5. The engineer shall provide cuts for all water lines at all storm sewer crossings to the City of Cedar Park.
6. Pipe materials to be used for construction of utility lines:
 - Water - *<enter here>*
Copper pipe and fittings are not permitted within the Right-of-Way.

Minimum DR-14 12" dia and smaller. Minimum class 250 DI larger than 12" dia.

7. Approved 5 1/4" fire hydrants:
 - American Flow Control, B84B
 - Mueller Company, Super Centurion 250
 - Clow Medallion Hydrant
 - American AVK Company, Series 27 (Model 2780)
 - All fire hydrants must meet City of Cedar Park thread specifications (National Thread)
 - Blue reflector markers shall be located on the centerline of the pavement across from all fire hydrants. Pavement markers at intersections shall be four-sided.
8. Should a Tapping Saddle be approved by Public Works, the saddle shall be Smith-Blair 662 Stainless Steel Tapping Sleeves with all stainless hardware, or approved equal. Requests for alternate providers shall be made to the City of Cedar Park Public Works. No tap exceeding 2" in diameter will be approved.
9. All water lines, including service lines, shall be pressure and leak tested per City of Austin Standard Specifications and witnessed by the City of Cedar Park representative. All testing is to be the responsibility of the contractor, and the contractor may be required to re-test lines if the testing is not witnessed by the City. Contractor must notify the City of Cedar Park 48 hours prior to any testing.
10. All water lines shall be sterilized and bacteriologically tested in accordance with City of Austin Standards. The contractor is responsible for sterilization and the City of Cedar Park is responsible for submitting bacteriological samples to the State. Public Works will require a contractor specialized in disinfection for large diameter lines or critical infrastructure, subsidiary to pipe installation.
11. Density testing of compacted backfill shall be made at a rate of one test per two foot lifts per 500 feet of installed pipe.
12. Contractor to obtain a water meter from the City of Cedar Park for any water that may be required during construction. (512-401-5000)
13. ALL WATER METER BOXES SHALL BE FORD GULF METER BOX WITH LOCKING LID.
 - SINGLE G-148-233
 - DUAL DG-148-243
 - 1" METER YL111 - 444
 - 1 1/2" – 2" METER 1730-R (LID) & 1730-12 (BOX)/ACCEPTABLE BOXES FOR THIS SIZE OF METER
14. Manhole frames and covers and water valve boxes shall be raised to finished pavement grade, when in public streets, at the owner's expense by the contractor with City inspection. All utility adjustments shall be completed prior to final paving construction.
15. The location of any existing utility lines shown on these plans is the best available and may not be accurate. Any damage to existing utility lines, both known and unknown, shall be repaired at the expense of the contractor.
16. All iron pipe and fittings shall be wrapped with at least 8 mil. Polyethylene wrap.
17. All water mains, wastewater mains and service lines shall meet City of Austin Specifications for minimum cover requirements. All streets are to be cut to subgrade prior to installation of water mains or cuts will be issued by the engineer.
18. City to be given 48 hours notice prior to all testing of water and wastewater lines. City inspection is required for all testing of water and wastewater lines.
19. Where a water or wastewater line crosses above (or below) a storm sewer structure and the bottom (or top) of the pipe is within 18 inches of the top (or bottom) of the utility

structure, the pipe shall be encased with concrete for a distance of at least 1 ft. on either side of the ditch line of the utility structure or the storm sewer. Concrete encasement will not be required for ductile iron (thickness Class 50), AWWA C-900 (SDR-18) 150 psi rated PVC in sizes to 12 inches or AWWA C-905 (SDR-25) 165 psi rated PVC in sizes larger than 12 inches. Concrete encasement shall conform to C.O.A. standard detail 505-1.

20. Contractor to notify the City of Cedar Park 48 hours prior to connecting to existing utilities.
21. All pipe bedding material shall conform to City of Austin Standard Specifications.
22. Tracer tape shall be installed on all water and wastewater mains regardless of the type of pipe or depth of pipe installed.
23. Unless otherwise specified by the Engineer all concrete is to be Class "A" (5 sack, 3000 psi ~ 28-days), and all reinforcing steel to be ASTM A615 60.
24. The City considers protection of its water system paramount to construction activities. City personnel will operate, or authorize the contractor to operate, all water valves that will pass through the City's potable water. The contractor may not operate any water valve, existing or proposed, that will allow water from the City's water system to flow to a proposed or existing water system without the express consent of the City. Notify the City two business days in advance of any request to operate a water valve. The general contractor may be fined \$500 or more, including additional theft of water fines, if a water valve is operated in an unauthorized manner, regardless of who operated the valve.
25. All water valves over 24" in size shall have a by-pass line and valve installed. By-pass valves and lines are subsidiary to the cost of the valve unless specifically identified on the bid form.
26. All water valves, including those over 12" in size, shall be gate valves.
27. A double check backflow device in a vault shall be installed at the property line on all private fire lines. A detector water meter will be installed on this backflow device, and it must be a Sensus SR11 3/4" meter with AMI radio read capability. The City will provide this meter. Please reference the City of Cedar Park Double Check Backflow Prevention Assembly Detail.
28. All potable water system components installed after January 4, 2014, shall be "lead free" according to the United States Safe Drinking Water Act. The only components exempt from this requirement are fire hydrants. Components that are not clearly identified by the manufacturer as meeting this requirement by marking, or on the product packaging, or by pre-approved submittal, will be rejected for use. A NSF certification will be adequate if the certification has not expired as of January 4, 2014 and remains unexpired at the time of construction.
29. All pressure pipe shall have mechanical restraint and concrete thrust blocking at all valves, bends, tees, plugs, and other fittings.

Storm Sewer Notes:

1. Manhole frames and covers and water valve boxes shall be raised to finished pavement grade at the owner's expense by the contractor with City inspection. All utility adjustments shall be completed prior to final paving construction. Contractor shall backfill around manholes and junction boxes with Class A concrete.
2. All manhole lids shall be 32" or larger, unless expressly approved in writing by the Engineering Department.

3. The location of any existing utility lines shown on these plans is the best available and may not be accurate. Any damage to existing utility lines, both known and unknown, shall be repaired at the expense of the contractor.
4. Pipe materials to be used for construction of utility lines: Unless otherwise specified by the Engineer, all storm sewer RCP shall be Class III. Corrugated Metal Pipe is not permitted.
5. All manhole and inlet covers shall read "City of Cedar Park".
6. Contractor to notify the City of Cedar Park 48 hours prior to connecting to existing utilities.
7. All pipe bedding material shall conform to City of Austin Standard Specifications.
8. Unless otherwise specified by the Engineer all concrete is to be Class "A" (5 sack, 3000 psi ~ 28-days), and all reinforcing steel to be ASTM A615 60.
9. Contractor to install and maintain geo-textile fabric barrier (inlet protection) around storm sewer leads and inlets to prevent silt and other material from entering the storm sewer collection system.
10. Install concrete safety end treatments to all culverts and ends of drainage pipe.
11. All curb inlets shall have an Almetek 4" Disc "No Dumping Drains to Waterway" marker.

Sequence of Construction Notes:

The following sequence of construction shall be used for all development. The applicant is encouraged to provide any additional details appropriate for the particular development.

1. Temporary erosion and sedimentation controls are to be installed as indicated on the approved site plan or subdivision construction plan and in accordance with the Erosion Sedimentation Control Plan (ESC) and Stormwater Pollution Prevention Plan (SWPPP) that is required to be posted on the site. Install tree protection and initiate tree mitigation measures.
2. The General Contractor must contact the City Inspector at 512-401-5000, 72 hours prior to the scheduled date of the required on-site preconstruction meeting.
3. The General Contractor will follow the Erosion Sedimentation Control Plan (ESC) and Storm Water Pollution Prevention Plan (SWPPP) posted on the site. Temporary erosion and sedimentation controls will be revised, if needed, to comply with City Inspectors' directives, and revised construction schedule relative to the water quality plan requirements and the erosion plan.
4. Rough grade the pond(s) at 100% proposed capacity. Either the permanent outlet structure or a temporary outlet must be constructed prior to development of embankment or excavation that leads to ponding conditions. The outlet system must consist of a sump pit outlet and an emergency spillway meeting the requirements of the City of Austin Drainage Criteria Manual, as required. The outlet system shall be protected from erosion and shall be maintained throughout the course of construction until installation of the permanent water quality pond(s).
5. Temporary erosion and sedimentation controls will be inspected and maintained in accordance with the Erosion Sedimentation Control Plan (ESC) and Storm Water Pollution Prevention Plan (SWPPP) posted on the site.
6. Begin site clearing/construction (or demolition) activities.
7. Underground utilities will be installed, including fire hydrants.

8. Fire Department access will be installed where required by approved site plan.
9. Vertical construction may occur after the Pre-vertical Inspection has been cleared by the Fire Marshal.
10. Permanent water quality ponds or controls will be cleaned out and filter media will be installed prior to/concurrently with revegetation of site.
11. Complete construction and start revegetation of the site and installation of landscaping.
12. Upon completion of the site construction and revegetation of a project site, the design engineer shall submit an engineer's letter of concurrence bearing the engineer's seal, signature, and date to the City indicating that construction, including revegetation, is complete and in substantial compliance with the approved plans. After receiving this letter, a final inspection will be scheduled by the City Inspector.
13. Upon completion of landscape installation of a project site, the Landscape Architect shall submit a letter of concurrence to the City indicating that the required landscaping is complete and in substantial conformity with the approved plans. After receiving this letter, a final inspection will be scheduled by the City Inspector.
14. After a final inspection has been conducted by the City Inspector and with approval from the City Inspector, remove the temporary erosion and sedimentation controls and complete any necessary final revegetation resulting from removal of the controls. Conduct any maintenance and rehabilitation of the water quality ponds or controls.

Appendix B: Capital Improvement Project General Construction Notes

Capital Improvement Project General Construction Notes Revised October 11, 2022

General Notes:

1. General Contractor shall call for all utility locates prior to any construction. Contractor shall delineate areas of excavation using white paint (white lining) in accordance with 16 TAC 18.3. Water & wastewater owned by the City of Cedar Park can be located by calling Texas 811 at 1-800-344-8377. Allow three business days for utility locates by the City of Cedar Park.
2. All construction shall be in accordance with the latest City of Austin Standard Specifications. City of Austin standards shall be used unless otherwise noted.
3. Prior to City acceptance of all improvements, all graded and disturbed areas inside the right of way between the property line and edge of pavement / back of curb shall be revegetated according to COA specification 602S and 606S; all graded and disturbed areas outside of the right of way shall be re-vegetated in accordance with the City of Austin Specification Item #604 native mix unless another re-vegetation specification is specifically identified in the plans and/or bid form.
4. The Contractor shall provide the City of Cedar Park copies of all test results prior to acceptance of this project.
5. City, owner, engineer, contractor, representatives of all utility companies, and a representative from the testing lab shall attend pre-construction conference prior to start of construction. The contractor shall schedule the meeting with the City of Cedar Park Engineering Department 48 hours prior to this pre-construction meeting (512-401-5000).
6. Excess soil shall be removed at the contractor's expense. Notify the City of Cedar Park for approval if the disposal site is inside the City's jurisdictional boundaries.
7. Burning is prohibited.
8. No blasting is allowed on this project.
9. Any changes or revisions to these plans must first be submitted to the City by the design engineer for review and written approval. All changes and revisions made to the design of utilities or impacts utilities shall use revision clouds to highlight all revisions or changes with each submittal. Revision triangles shall be used to mark revisions. All clouds and triangle markers from previous revisions may be removed. Revision information shall be updated in the appropriate areas of the Title Block.
10. The Contractor will reimburse the City for all cost incurred as a result of any damage to any City utility by the Contractor, regardless of these plans.
11. An engineer's concurrence letter and electronic 22"x34" record drawings shall be submitted to the Engineering Department prior to the issuance of final acceptance. The Engineer and Contractor shall verify that all final revisions and changes have been made to record drawings prior to City submittal. Record construction drawings, including roadway and all utilities, shall be provided to the City in AutoCad ".dwg" files and ".PDF" format on a CD, DVD, or USB Flash Drive. Line weights, line types and text size shall be such that if half-size prints (11"x 17") were produced, the plans would still be legible. All required digital files shall contain a minimum of two (2) control points referenced to the State Plane Grid Coordinate System – Texas Central Zone (4203), in US feet and shall include rotation information and scale factor required to reduce surface coordinates to grid coordinates in US feet.

12. ALL RESPONSIBILITY FOR THE ADEQUACY OF THESE PLANS REMAINS WITH THE ENGINEER WHO PREPARED THEM. IN REVIEWING THESE PLANS, THE CITY OF CEDAR PARK MUST RELY ON THE ADEQUACY OF THE WORK OF THE DESIGN ENGINEER.
13. A traffic control plan sign and sealed by a Licensed Texas Professional Engineer, in accordance with the Texas Manual on Uniform Traffic Control Devices, shall be submitted to the City for review and approval prior to any partial or complete roadway closures.
14. The contractor shall keep the site clean and maintained at all times, to the satisfaction of the City. This project will not be accepted until the site has been cleaned and re-vegetated to the satisfaction of the City.
15. Signs are not permitted in Public Utility Easements, Set Backs or Drainage Easements.
16. Inspect temporary erosion controls on a daily basis. Adjust the controls and/or remove any sediment buildup as necessary.
17. Contractor will be responsible for keeping roads and drives adjacent to and near the site free from soil, sediment and debris. Contractor will not remove soil, sediment or debris from any area or vehicle by means of water, only shoveling and sweeping will be allowed. Contractor will be responsible for dust control from the site.
18. The Contractor shall be responsible for all damage to private property, which occurred as a result of any portion of this project. Any damage to private property shall be repaired to equal or better condition. The Contractor shall coordinate all repairs to private property with the property owner. Contractor shall pay and/or settle with private property owner for all costs related to any damage. The City will not provide separate pay for repair of any damages, reimbursements or settlements.
19. Contractor shall provide the services of the City's approved SCADA consultant and controls instrumentation consultant. (When applicable to SCADA) The cost of the consultant and/or any equipment shall be subsidiary to the cost of the project (no separate pay) unless specifically identified on the bid form.
20. The contractor shall make applications to Pedernales Electric Cooperative for electric service if new service is required. The City will assume the service upon acceptance of the project (if required). The contractor will pay for electric power until the meter is transferred to the City of Cedar Park. Impact fees and Application Fees required by PEC will be the responsibility of the Contractor unless specifically identified in the contract.
21. The contractor shall provide combination locks for all gates, hatches, vaults, and MCC boxes. Each lock shall be pre-approved and set to the City's requirements. (No separate pay)
22. All work on these plans shall be performed. Pay for work shown on these plans, which are not identified in the contract, shall be considered incidental to the items specifically identified for payment.
23. The contractor shall provide a competent and qualified superintendent to supervise all work. The superintendent shall be present during all construction activities.
24. Any survey monuments damaged or moved as a result of this project shall be replaced to equal or better condition. A Texas Registered Professional Land Surveyor shall oversee the replacement and certify the replacement for its intended use. No separate pay will be provided.
25. Adequate drainage conditions, in accordance with the City of Austin Drainage Criteria Manual, shall be maintained at all times.
26. Any tree removed or damaged by this project, which is not specifically identified to be removed by the plans, will be replaced according to the requirements of the City of Cedar Park Code of Ordinances. No separate pay will be provided.
27. The contractor shall uncover all utilities within the limits of construction and verify their horizontal and vertical location prior to any construction activities. The contractor shall notify

the City and the Engineer, IN WRITING, of any conflicts prior to any other construction including but not limited to exact locations of conflicts with proposed or existing utilities. No additional pay unless specifically identified for payment in the contract documents. The contractor shall also make his own sub-surface investigation prior to bid.

28. Only stainless steel casing spacers are allowed in encasement pipe(s).
29. No separate pay will be given to de-water trenches or other excavated areas.
30. Soil material, of sufficient organic content, imported for re-vegetation of disturbed areas shall be approved by the Engineering Department prior to placement. A sample (submittal) is required. Sandy-loam and/or soils with high clay content will not be accepted.
31. The contractor shall perform pumping stations and/or lift station start-up independently: prior to requesting witness or acceptance by the City. When a final start-up fails to be complete and acceptable and when City personnel are present at start-up, each additional start-up will be charged to the contractor, as liquidated damages, \$500.00 per additional meeting.
32. Shutout of any customers of the City's utility due to tie-ins shall only be scheduled for nighttime work unless approved by the Public Works Department. The City's field representative shall coordinate and inspect all nighttime shutouts and tie-ins. The contractor shall request shutouts two weeks in advance. Shutouts will only be allowed in the following times and are subject to approval by the City: 10 PM - 6 AM; beginning on Tuesday, Wednesday or Thursday night(s). No extra time will be granted to the contract for unscheduled work in the time period allowed or due to requests outside the approved time periods.
33. All construction and construction related activities shall be performed Monday thru Friday from 7:00 A.M. to 6:00 P.M. However, construction activities within five hundred feet (500') of a dwelling or dwelling unit shall be performed between the hours of 8:00 a.m. and 6:00 p.m. Otherwise all construction and construction related activities shall conform to City of Cedar Park Code of Ordinances, specifically ARTICLE 8.08.
34. Approval for construction activities performed on Owner's Holidays, and/or Saturdays, outside of Monday through Friday 8 am to 5 pm, or in excess of 8 hours per day shall be obtained in writing 48 hours in advance, and inspection fees at 1.5 times the hourly inspection rate shall be billed directly to the contractor. There shall be no construction or construction related activities performed on Sunday. The City reserves the right to require the contractor to uncover all work performed without City inspection.
35. Temporary rock crushing operations are not allowed. All sources for flexible base material are required to be approved by the City. Prior to base placement all current triaxial test reports for the proposed stockpiles are to be submitted to the City's project representative for review and approval.
36. There shall be no water or wastewater appurtenances, including but not limited to, valves, fittings, meters, clean-outs, manholes, or vaults in any driveway, sidewalk, traffic or pedestrian area.
37. Sidewalks shall not use curb inlets as a partial walking surface. Sidewalks shall not use traffic control boxes, meter or check valve vaults, communication vaults, or other buried or partially buried infrastructure as a vehicular or pedestrian surface.

Street Notes:

1. No trenching of compacted base will be allowed. A penalty and/or fine may be imposed to the general contractor if trenching of compacted base occurs without City approval, regardless of who performed the trenching.
2. All sidewalks shall comply with the Americans With Disabilities Act and the Texas Architectural Barriers Act. The City of Cedar Park has NOT reviewed these plans for compliance with the

Americans With Disabilities Act, Texas Architectural Barriers Act, or any other accessibility legislation, and does not warranty or approve these plans for any accessibility standards. However, prior to project acceptance, the Contractor shall submit to the COCP documentation that the project was inspected by the Texas Department of Licensing and Regulation or a Registered Accessibility Specialist and the project is in compliance with the requirements of the Texas Architectural Barriers Act.

3. Street barricades shall be installed on all dead end streets and as necessary during construction to maintain job safety.
4. Any damage caused to existing pavement, curbs, sidewalks, ramps, etc., shall be repaired by the contractor to the satisfaction of the City prior to acceptance of this project.
5. Density testing of compacted subgrade material, first course and second course compacted base, shall be made at 500 foot intervals. Any failed tests will be re-tested at the expense of the contractor.
6. The contractor shall coordinate with the City's field representative 48 hours prior to scheduled density testing. The City's field representative shall witness all testing.
7. The City will notify the contractor of the name, contact and phone number of the testing laboratory for this job. The City will pay for all tests that pass the specifications the first time. The CONTRACTOR shall schedule the testing with the laboratory and notify the City's field representative of the time and location of all tests.
8. Traffic control signs and pavement markings in accordance with the Texas Manual on Uniform Traffic Control Devices to be installed as directed by the City of Cedar Park prior to City acceptance of this project.
9. Slope of natural ground adjacent to the right-of-way shall not exceed 3:1. If a 3:1 slope is not possible, a retaining wall or some other form of slope protection approved by the City shall be placed in a location acceptable to the City.
10. The City, engineer, contractor, and a representative from the asphalt-testing lab shall attend a pre-paving conference prior to the start of HMAC paving. The contractor shall give the City's field representative 48 hours notice prior to this meeting.
11. Re-testing of the asphalt pavement shall be limited to one retest per project. Failed tests shall be the financial responsibility of the contractor.
12. All pavement markings and signage shall comply with MUTCD standards.
13. Pavement markings shall be thermoplastic unless otherwise noted.
14. Street name signs shall be provided and installed in accordance with Street Name Sign Pole detail provided by the City of Cedar Park.
15. All street name signs shall be high intensity retro grade.
16. A minimum of seven days of cure time is required for HMAC prior to the introduction of vehicular traffic to any streets.
17. No Fencing or Wall is allowed to be constructed so that it obstructs the sight lines of drivers from an intersecting public roadway or from an intersecting private driveway. Sight lines are to be maintained as described in City Code Section 14.05.007. Installing a fence or wall which does not comply with the City's Sight Distance Requirements or Fencing Regulations is a violation of the City's Ordinance and may be punishable pursuant to Section 1.01.009 of City Code.
18. Utility service boxes or other utility facilities shall not be installed within areas determined to be required sight lines of two intersecting public streets or within sight lines of a private driveway. Sight lines are to be maintained compliant with Table 1-1 of the Austin Transportation Criteria Manual. Utilities determined by the Director of Engineering to be placed within required sight lines may be required to be relocated at the expense of the contractor prior to the City issuing a Certificate of Occupancy or prior to the City's Acceptance of the Project Improvements.

19. All lane closures shall occur only between the hours of 9 AM and 4 PM. Any night time lane closures require approval by the Director of Engineering and shall occur between the hours of 8 PM and 6 AM. Lane closures observed by City during the peak hours of 6 AM to 9 AM, or 4 PM to 8 PM will be subject to fine per Chapter 1 of City Ordinance, and/or subsequent issuance of Work Stoppage.
20. Improvements that include reconstruction of an existing Type II driveway shall be done in a manner which retains operations of not less than half of the driveway at all times. Full closure of such driveway can be considered with written authorization retained by the Contractor from the property owner(s) or access easement right holder(s) of the driveway allowing full closure of the driveway.
21. Trees must not overhang within 10' vertically of a sidewalk, or 18' vertically of a roadway or driveway.

Wastewater Notes:

1. Refer to the City of Cedar Park Public Works Utility Policy and Specifications manual.
2. The contractor, with City approval, shall raise manhole frames and covers and water valve boxes to finished pavement grade at the contractor's expense. All utility adjustments shall be completed prior to final paving construction.
3. The location of any existing utility lines shown on these plans may not be accurate. Any damage to existing utility lines, both known and unknown, shall be repaired at the expense of the contractor. The contractor shall make his own sub-surface investigation prior to bid. The contractor shall uncover all utilities within the limits of construction and verify their horizontal and vertical location prior to any construction activities.
4. All iron pipe and fittings shall be wrapped with at least 8-mil polyethylene wrap, according to the COA Specification. All metallic pipe shall be cathodically protected.
5. All water mains, wastewater mains and service lines shall meet City of Austin minimum cover specifications. All streets are to be cut to subgrade prior to installation of water mains.
6. Where 48-inches of cover below subgrade cannot be achieved for wastewater service lines alternate materials shall be used. A minimum of 36-inches of cover below subgrade shall be achieved. Any wastewater service line with cover between 36-inch and 48-inches shall be SDR-26 PVC pressure pipe.
7. Gasketed PVC sewer main fittings shall be used to connect SDR-35 PVC to SDR-26 PVC pressure pipe or C-900.
8. SDR-35 WW is not allowed.
9. Force mains shall be epoxy lined ductile iron.
10. All sanitary sewers, excluding service lines, shall be mandrel tested per TCEQ (Texas Commission on Environmental Quality) criteria. A mandrel test will not be performed until backfill has been in place for a minimum of 30 days.
11. All sanitary sewers, including service lines, shall be air tested per City of Austin Standard Specifications.
12. Density testing of compacted backfill shall be made at a rate of one test per two foot lifts per 500 feet of installed pipe, unless specified otherwise by the City.
13. City to be given 48 hours notice prior to all testing of water and wastewater lines. City inspection is required for all testing of water and wastewater lines.
14. Where a water or wastewater line crosses above (or below) a storm sewer structure and the bottom (or top) of the pipe is within 18 inches of the top (or bottom) of the utility structure, the pipe shall be encased with concrete for a distance of at least 1 ft. on either side of the ditch line of the utility structure or the storm sewer. Concrete encasement will not be required for ductile

iron (thickness Class 50), AWWA C-900 (SDR-14) 200 psi rated PVC in sizes to 12 inches or AWWA C-905 (SDR-25) 165 psi rated PVC in sizes larger than 12 inches. Concrete encasement shall conform to C.O.A. standard detail 505-1.

15. The allowable (maximum) adjustment for a manhole shall be 12" (inches) or less.
16. Where a sewer line crosses a water line, the sewer line shall be one 20 ft. joint of 150 psi (or greater if specified in the plans) rated PVC centered on crossing.
17. All manhole and inlet covers shall read "City of Cedar Park".
18. All manhole lids outside the pavement shall be bolted. Security bolts per City specifications shall be used.
19. Contractor to notify City of Cedar Park 48 hours prior to connecting to existing utilities. Inspection of connections to existing utilities is required.
20. All pipe bedding material shall conform to City of Austin Standard Specifications.
21. Unless otherwise specified by the Engineer all concrete is to be Class "A" (5 sack, 3000 psi ~ 28-days), and all reinforcing steel to be ASTM A615 60.
22. All wastewater manholes to be coated with organic materials and procedures listed in City of Austin Qualified Products List No. WW-511 (WW-511A and WW-511B are not allowed unless manhole is being structurally rehabilitated with approval by Public Works). All manholes will be pre-coated or coated AFTER testing.
23. Polybrid Coatings on wastewater manholes will not be allowed without pre-approval from the project manager. Any other manhole coating product appearing on the CoA SPL WW-511 is acceptable and required.
24. All manholes will be vacuum tested only.
25. Tracer tape shall be installed on all water and wastewater mains in accordance with City of Austin Standards regardless of the type of pipe or depth of pipe.
26. Piping in and around lift station valve vaults will be painted and/or coated to the City's specifications.
27. MCC's, junction boxes or any housing for electrical components shall be NEMA 4X stainless steel. Painted metal or any other type of box will not be accepted unless specifically identified in the plans.
28. All wastewater lines 10" and larger shall be video inspected in accordance with City of Cedar Park Public Works Department Utility Policy and Standard Specifications Manual Appendix E: Requirements for Video Inspection of Wastewater Lines at the Contractor's expense. No separate pay unless noted on the bid form.
29. Calcutta MH rings are not allowed in the TX DOT ROW.
30. All pressure pipe shall have mechanical restraint and concrete thrust blocking at all valves, bends, tees, plugs, and other fittings.

Water Notes:

1. Refer to the City of Cedar Park Public Works Utility Policy and Specifications manual.
2. The top of valve stems shall be at least 18", and no more than 36", below finished grade. Valve stem risers shall be welded on each end to the City's satisfaction.
3. Fire hydrant leads to be ductile iron, Class 350, and installed per City of Austin standard specifications and City of Cedar Park detail.
4. The contractor shall provide cuts for all water lines and fire hydrant bury lines in accordance with the contract.
5. Approved 5 ¼" fire hydrants:
 - American Flow Control, B84B
 - Mueller Company, Super Centurion 250

- Clow Medallion Hydrant
 - American AVK Company, Series 27 (Model 2780)
 - All fire hydrants must meet City of Cedar Park thread specifications (National Thread)
 - Blue reflector markers shall be located on the centerline of the pavement across from all fire hydrants. Pavement markers at intersections shall be four-sided.
6. Should a Tapping Saddle be approved by Public Works, the saddle shall be Smith-Blair 662 Stainless Steel Tapping Sleeves with all stainless hardware, or approved equal. Requests for alternate providers shall be made to the City of Cedar Park Public Works. No tap exceeding 2" in diameter will be approved.
 7. All water lines, including service lines, shall be pressure and leak tested per City of Austin Standard Specifications and witnessed by the City of Cedar Park representative. All failed tests shall be the fiscal responsibility of the contractor, and the contractor may be required to re-test lines if the testing is not witnessed by the City. Contractor must notify the City of Cedar Park 48 hours prior to any testing.
 8. All water lines shall be sterilized and bacteriologically tested in accordance with City of Austin Standards. The contractor is responsible for sterilization and the City of Cedar Park is responsible for submitting bacteriological samples to the State unless otherwise approved by the Public Works department. Public Works will require a contractor specialized in disinfection for large diameter lines or critical infrastructure, subsidiary to pipe installation.
 9. All water valve risers not in pavement shall be set in concrete in accordance with the City's specifications and details. The standard detail is available on the City's web site.
 10. Density testing of compacted backfill shall be made at a rate of one test per two foot lifts per 500 feet of installed pipe unless otherwise approved by the Engineering Department.
 11. Contractor to obtain a water meter from the City of Cedar Park for any water that may be required during construction. (512-401-5000)
 12. All water meter boxes shall be Ford Gulf Meter Box with locking lid.
 - SINGLE G-148-233
 - DUAL DG-148-243
 - 1" METER YL111 - 444
 - 1 ½" – 2" METER 1730-R (LID) & 1730-12 (BOX)/ACCEPTABLE BOXES FOR THIS SIZE OF METER
 13. Manhole frames and covers and water valve boxes shall be raised to finished pavement grade at the contractor's expense with City inspection. All utility adjustments shall be completed prior to final paving construction.
 14. The location of any existing utility lines shown on these plans is the best available and may not be totally accurate. Any damage to existing utility lines, both known and unknown shall be repaired at the expense of the contractor. The Engineer and/or the City make no guarantee or warranty to the accuracy of these plans. The contractor shall make his own sub-surface investigation prior to bid. The contractor shall uncover all utilities within the limits of construction and verify their horizontal and vertical location prior to any construction activities.
 15. All iron pipe and fittings shall be wrapped with at least 8-mil polyethylene wrap in accordance with the COA specification. All metallic pipe shall be cathodically protected.
 16. All water mains, wastewater mains and service lines shall meet City of Austin Specifications for minimum cover requirements. All streets are to be cut to subgrade prior to installation of water mains.
 17. City to be given 48 hours notice prior to all testing of water and wastewater lines. City inspection is required for all testing of water and wastewater lines.

18. Where a water or wastewater line crosses above (or below) a storm sewer structure and the bottom (or top) of the pipe is within 18 inches of the top (or bottom) of the utility structure, the pipe shall be encased with concrete for a distance of at least 1 ft. on either side of the ditch line of the utility structure or the storm sewer. Concrete encasement may not be required for ductile iron (thickness Class 50), AWWA C-900 (SDR-14) 200 psi rated PVC in sizes to 12 inches or AWWA C-905 (SDR-25) 165 psi rated PVC in sizes larger than 12 inches. Concrete encasement shall conform to C.O.A. standard detail 505-1. This note does not allow for pipe that would otherwise have a higher maximum operating pressure.
19. Contractor to notify City of Cedar Park 48 hours prior to connecting to existing utilities. Inspection is required.
20. All pipe bedding material shall conform to City of Austin Standard Specifications.
21. Tracer tape shall be installed on all water and wastewater mains regardless of the type of pipe or depth of pipe installed.
22. Unless otherwise specified by the Engineer all concrete is to be Class "A" (5 sack, 3000 psi ~ 28-days), and all reinforcing steel to be ASTM A615 60.
23. The City considers protection of its water system paramount to construction activities. City personnel will operate, or authorize the contractor to operate, all water valves that will pass through the City's potable water. The contractor may not operate any water valve, existing or proposed, that will allow water from the City's water system to flow to a proposed or existing water system without the express consent of the City. Notify the City two business days in advance of any request to operate a water valve. The general contractor may be fined \$500 or more, including additional theft of water fines, if a water valve is operated in an unauthorized manner, regardless of who operated the valve.
24. All water valves over 24" in size shall have a by-pass line and valve installed. By-pass valves and lines are subsidiary to the cost of the valve unless specifically identified on the bid form.
25. All water pipe and appurtenances larger than 12" shall have a maximum operating pressure greater than 250 psi unless specifically identified on the bid form.
26. A.Y. McDonald "T" series compression fittings will not be accepted by the City of Cedar Park. Mac-Pak compression fittings, or another type listed on the COA SPL is acceptable.
27. All potable water system components installed after January 4, 2014, shall be "lead free" according to the United States Safe Drinking Water Act. The only components exempt from this requirement are fire hydrants. Components that are not clearly identified by the manufacturer as meeting this requirement by marking, or on the product packaging, or by pre-approved submittal, will be rejected for use. A NSF certification will be adequate if the certification has not expired as of January 4, 2014 and remains unexpired at the time of construction.
28. All pressure pipe shall have mechanical restraint and concrete thrust blocking at all valves, bends, tees, plugs, and other fittings.

Storm Sewer Notes:

1. The contractor with City inspection shall raise manhole frames and covers and water valve boxes to finished pavement grade at the contractor's expense. All utility adjustments shall be completed prior to final paving construction. The contractor shall backfill around manholes and junction boxes with Class A concrete. All utility adjustments shall be completed prior to final paving construction.
2. All manhole lids shall be 32" or larger, unless expressly approved in writing by the Public Works Department. All lids outside the pavement will be bolted.

3. The location of any existing utility lines shown on these plans is the best available and may not be totally accurate. Any damage to existing utility lines, both known and unknown, shall be repaired at the expense of the contractor.
4. Corrugated Metal Pipe is not permitted.
5. All manhole and inlet covers shall read "City of Cedar Park".
6. Contractor to notify City of Cedar Park 48 hours prior to connecting to existing utilities.
7. All pipe bedding material shall conform to City of Austin Standard Specifications.
8. Unless otherwise specified by the Engineer all concrete is to be Class "A" (5 sack, 3000 psi ~ 28-days), and all reinforcing steel to be ASTM A615 60.
9. Contractor to install and maintain geo-textile fabric barrier (inlet protection) around storm sewer leads and inlets to prevent silt and other material from entering the storm sewer collection system.
10. All curb inlets shall have an Almetek 4" Disc "No Dumping Drains to Waterway" marker.

Appendix C: Cedar Park Lift Station Specifications and Maintenance

Version: 3/10/2022

Maintenance, control and alarms at all lift stations, Public and Private:

- Inspections are performed during workdays at all lift stations. A visual inspection is made. Pump run hours, and generator hours are recorded.
- Thermal scan of all electrical panels is performed quarterly. Hot spots must be addressed and contacts cleaned.
- The wet well is checked weekly and cleaned if needed. Solids are removed, walls are washed down and a visual inspection of the pumps and floats are made.
- Floats are manually tested quarterly to verify operation.
- The generator is run under load weekly either by automatic control or manually where needed. If present, the automatic transfer switch is tested.
- The grounds are mowed, trimmed and any repair work is done to the facility as needed.
- Every lift station shall have primary and secondary control for the pump operation. They operate independently, but when the secondary control is activated, operation remains under secondary control until manually switched back to primary. The primary control consists of a Siemens Hydromaster 200 with a pressure transducer to read level. Secondary control is by floats. The station will switch to secondary when the Hydromaster shows high level, the high-level float is activated, or there is a power loss.
- Separate high/high level float set below lowest collection system manhole top of rim triggers an alarm and immediate all pump run independent both primary and secondary systems.
- The stations have a sufficient battery backup for 24 hours of the level, alarm, and radio operation.
- Electrical enclosures shall be unpainted NEMA 4X.
- The stations have a SCADA communication link using a MDS 900 mhz Ethernet radios or as specified by Public Works Operations Engineer. The monitoring is conducted in the operator station control room at the Water Reclamation Facility.
- The Water Reclamation Facility operators monitor the stations 24 hours a day for high level, low level or any anomaly.
- Alarms are generated and reported to SCADA by: primary control high level, secondary control high level, SCADA actuated low level and SCADA no level change.
- Backup generator sized to account for inrush current for the actual pump electrical load for starting and running all pumps (lead, lag, firm, spare, and/or all stand-bys), not firm pump electrical load.
- Non-clog Triplex Pump System is required.
- Pump rails and all lift station hardware shall be 316 stainless steel

- Forcemain material: Epoxy lined Ductile Iron (smaller than 4" may be welded HDPE).
- Pump rehabilitation program based upon run-time.
- Pump hours and SCADA flow trends are monitored for reduced flow due to clog pumps.
- Compliance with TCEQ Chapter 217
- Compliance with City of Cedar Park Public Works Department Utility Policy and Standard Specifications Manual
- General guidance from City of Austin Utility Design Criteria and Standard Lift Station Specifications.
- Sign and sealed Engineering report by Texas professional engineer shall be provided.
- Maximum RPM for lift station pumps motors shall be 1800 RPM
- Hydrogen Peroxide or Activated Carbon Odor Control
- Appropriately sized jib-crane.
- ARV shall be Vent-o-mat RGX sewage AARV
- Wets wells shall be polymer concrete (submit manufacturer) or coated with approved organic lining per materials and procedures listed in City of Austin Qualified Products List No. WW-511 (WW-511A and WW-511B are not allowed).
- All manholes will be pre-coated or coated AFTER testing. Per TCEQ chapter 217, wet wells shall be water tight with zero leakage.
- Force main discharge manhole shall be polymer concrete. Please submit manufacturer.

Appendix D: Requirements for Bypass Pumping

03/10/2022

PART 1 – G E N E R A L

1.1 WORK INCLUDED

A. This item shall govern the management of all wastewater flows under all flow conditions encountered during performance of the Work. The Contractor shall prevent sewage overflows and provide reliable sewer service at all times. The Contractor shall manage and maintain sewage flow in the construction area, where indicated on the plans, in order to prevent backup and/or overflow into upstream pipe segments and laterals, adjacent ditches, storm sewer, and waterways.

B. Measurement and Payment shall be in accordance with SPECIAL PROVISION SP-001, GENERAL PROVISION REGARDING PAY ITEMS.

1.2 MATERIALS

A. The Contractor shall provide and maintain adequate flow diversion systems, pumping equipment, force mains and/or other necessary appurtenances in order to maintain reliable wastewater service in all wastewater lines as required for construction. The Contractor shall have backup pump(s), force main(s), and/or other necessary appurtenances ready to deploy immediately. Intake and discharge points shall be submitted as part of the flow bypass plan.

B. Remediation of any spillage, backups and/or overflows, etc. is the sole responsibility of the Contractor.

C. The Contractor shall demonstrate that the diversion or pumping system is in good working order and is sufficiently sized to successfully handle all wastewater flows by performing a test run for a period of 24 hours prior to beginning the Work.

D. The Contractor shall be required to have all materials, equipment and labor necessary to complete the repair or replacement on the job site prior to isolating the sewer manhole or line segment and beginning flow diversion or pumping operations.

1.3 SUBMITTALS

A. The Contractor shall submit a wastewater Flow Management Plan. Plan shall define CONTRACTOR'S intended methods, techniques, equipment, down-hole tools, procedures and

incidentals required to safely and effectively manage the wastewater flows under all flow conditions. The plan shall also include a list of personnel and their qualifications and experience (including back-up personnel in the event that an individual is unavailable), list of subcontractors, a schedule of work activity, a safety plan (including MSDS of any potentially hazardous substances to be used), traffic control plan (if applicable), all excavation locations, interfering utilities, and flow bypass plan, an erosion and sedimentation control plan and contingency plans for possible problems. Work plan should be comprehensive, realistic and based on actual working conditions for the project.

B. Where flow diversion and/or pumping will be performed by a Subcontractor, the Flow Management Plan shall identify that subcontractor including qualifications and similar experience

C. The Flow Management Plan will be reviewed for compliance with the specification by OWNER and ENGINEER.

PART 2 – PRODUCTS – [NOT USED]

PART 3 – EXECUTION

A. Construction Methods

1. The Contractor shall provide flow management of sewage and wet weather flows around each Work area requiring flow management. The Contractor shall be responsible for all required bulkheads, flow plugs, pumping equipment, piping, etc. to accomplish the flow management.

2. All piping, joints and accessories shall be designed to withstand at least twice the maximum system pressure, or a minimum of 50 psi, whichever is greater. During flow diversion and/or pumping, no sewerage shall be leaked, dumped, or spilled in or onto, any area outside of the existing wastewater system. When flow diversion and/or pumping operations are complete, all pumping shall be drained into the wastewater prior to disassembly and all flow management components shall be removed from the site.

3. The pump and bypass lines shall be of adequate capacity and size to handle the flow. Take all necessary steps to prevent flooding of any residence or business. Contractor shall be liable for any damages incurred as a result of this work.

4. The Contractor shall provide an automatic controlled duplex pumping system with one (1) pump on stand-by. Stand-by pump shall be plumbed in parallel with primary

pump.

5. Begin the flow diversion at an upstream manhole. Divert flow to the downstream manhole of the line section being worked. The bypass system must have sufficient capacity to handle peak flow during a rainstorm. The Contractor is responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing. Caution shall be used when using inflatable plugs in the downstream outlet of a manhole to prevent constriction or pinching of the airline upon deflation. Although it may extend length of the forcemain piping, it is encouraged to plug and brace, as necessary, an upstream inlet in a downstream pipe segment.

6. The Contractor shall provide continuous 24 hour monitoring of all by-pass pumping activities.

7. The contractor is responsible for any construction activities related to the pumping of existing wastewater flow. The Contractor shall repair any damage resulting from wastewater flow backing up in the wastewater system.

END OF SECTION

Appendix E: Requirements for Video Inspection of Wastewater Lines

7/11/2022

Video Inspection of Wastewater Lines

1. General

- A. All wastewater lines shall be inspected for conformance to the requirements of this specification. The contractor shall provide video in complete segments (manhole to manhole).
- B. Video inspection are also subject to the following constraints:
 - a. All video work shall be conducted under the direct full-time supervision of a NASSCO-PACP certified operator certified for a minimum of 3 years.
 - b. The Contractor will be required to inspect, assess, and record the condition of the wastewater line using National Association of Sewer Service Companies (NASSCOs) Pipeline Assessment Certification Program (PACP) coding standards.

2. Pipe Cleaning Of In-Service Lines

- A. Contractor shall clean sewers by removing grit, loose solids, grease, and any construction debris that are present.
- B. Cleaning shall be completed by the Contractor within 72 hours and no less than one hour prior to inspection to reduce the impact of the natural flow within the pipeline during inspection.
- C. The Contractor shall trap all debris at the end manhole and properly dispose and haul away debris when cleaning pipe segments.
- D. Contracts for video inspection of existing wastewater lines, not new construction, may indicate in the Bid/Proposal Documents if the City will clean the wastewater lines prior to inspection.

3. Video Inspection of Installed Wastewater Lines

- A. Contractor shall provide all labor, equipment, material and supplies and perform all operations required to conduct internal closed-circuit television and video recording of all wastewater lines. The video recording shall be provided to the Owner for review. Should Bid/Proposal Documents for the video inspection services of existing wastewater lines require correction defects revealed by the video inspection, a new re-inspection video meeting the requirements of this specification shall be submitted to the Owner of the complete pipe segment (manhole to manhole), versus specific deficiency locations, showing that all revealed deficiencies have been satisfactorily corrected.
- B. The inspection camera shall have the capability of panning plus/minus 275 degrees and rotating 360 degrees. The camera shall be specifically designed and constructed for such use. The camera shall be operative in 100% humidity conditions. Camera shall have an accurate footage counter that displays on the monitor the exact distance of the camera (to the nearest tenth of a foot) from the centerline of the starting manhole or access point. Camera shall have height adjustment so that the camera lens is always centered within

plus/minus 10% of the center axis of the pipe being videoed. Camera shall provide a 1080p resolution at 60 frames per second. Camera shall be equipped with a remote iris to control the illumination range for an acceptable picture. Geometrical distortion of the image shall not exceed one percent (1%). The video image produced by each camera shall be calibrated using a Marconi Resolution Chart No. 1 or equivalent.

- C. Lighting for the camera shall be sufficient to allow a clear picture of the entire periphery of the pipe without loss of contrast, flare out of picture or shadowing. A reflector in front of the camera may be required to enhance lighting in dark or large sized pipe. The video camera shall be capable of showing on the digital display the Owner's name, Project name, Contractor name, date, line size and material, wastewater line segment identification, and ongoing footage counter. The camera, television monitor, and other components of the video system shall be capable of producing a picture quality satisfactory to the satisfaction of the Owner. The camera lens shall be kept clear of condensation and debris during the video inspection. The recording of the internal condition of the wastewater line shall be clear, accurate, focused and in color. If the recording fails to meet these requirements, the equipment shall be removed and replaced with equipment that is suitable. No payment will be made for an unsatisfactory recording.
- D. If during video inspection of an existing pipe segment, water is encountered inside the pipe segment that prohibit the assessment and evaluation of the pipe segment, the wastewater line shall be dewatered by the Contractor at the Contractor's expense. Maximum depth of flow for video inspections shall be 25 percent of the pipe diameter. If the depth of flow is greater, then the video inspection shall be performed during the low flow periods. If the flow is still above 25 percent during low flow period, then the Contractor shall contact Public Works. The Contractor shall include the original inspection in the final submittal even with high flow conditions. If the Contractor encounters a surcharging manhole (whereas the flow at the manhole is at least 50 percent of the sewer pipe diameter), then the Contractor shall immediately notify the Public Works. Video recording conducted while the camera is floating is not acceptable unless approved in writing by the Owner.
- E. The camera shall be moved through the wastewater line in the downstream direction at a moderate rate, stopping and slowly panning when necessary to permit proper documentation of the pipe condition at each pipe connection, joint, and defect. In no case shall the camera be pulled at a speed greater than 30 feet per minute. The Contractor shall pause the digital recording at any time there is a delay in the inspection and restart the digital video recording in the same digital file. The pause shall in no way affect, freeze, or interrupt the replay of the video and shall not close the video file during the inspection. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the pipe conditions shall be used to move the camera through the wastewater line. When manually operated winches are used to pull the camera through the wastewater line segment, radios, telephones or other suitable means of communication shall be set up between the two access points or manholes of the pipe segment being videoed to insure good communication between members of the video crew.
- F. Distance measurements shall be provided to an accuracy of one tenth of a foot.
- G. If during video inspection, debris is encountered that prohibits a proper inspection of the segment, the Contractor shall remove the debris before proceeding. The Contractor shall trap all debris at the end manhole and properly dispose and haul away debris when cleaning pipe segments. Refer to 'Section Pipe Cleaning Of In-Service Lines'.

- H. All video shall be documented using a data logger and reporting system that are PACP compliant and which use codes as established by the National Association of Sewer Service Companies (NASSCO)s - Pipeline Assessment and Certification Program (PACP).
- I. Computer printed location records shall be kept by the Contractor and shall clearly show the location and orientation of all points of significance such as joints, service connections, connections at manholes, and defects. Copy of all records shall be supplied to the Owner as part of the Submittal Requirements. During the video inspection, the camera shall stop at all defects and significant observations to ensure a clear and focused view of the pipe condition and shall rotate the camera head at the defect to allow for adequate evaluation at a later time. All defects and significant observations shall include a text overlay of the recorded observation. The video recording shall include on-screen observation text for every observation recorded in the database, including manholes.
- J. The video recording shall supply a visual record of the wastewater lines that may be replayed. Video format shall be MPEG 4 or other approved format at a resolution of 1080p and 60 frames per second. In addition to video recordings, the contractor shall include an audio track recorded by the video technician during the actual video work describing the parameters of the wastewater line being videoed (i.e. location, depth, diameter, pipe material), as well as describing connections, defects and unusual conditions observed during the video work. Video recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. Rectangular shaped external hard drive with USB 2.0 connection shall be used to store recorded video. Once videoed, the USB Flash Drives shall be labeled and become the property of the Owner. The Contractor shall have all video and necessary playback equipment readily accessible for review by the Owner while the video inspection service is being performed.
- K. Video shall be continuous for each wastewater line segment. Do not show a single segment as more than one file.
- L. Each pipe segment (manhole to manhole) shall be identified with an initial text screen and completed in accordance with PACP's video inspection form header Instructions and shall be as follows:

Line Number & Description

- Line 1: Surveyed By
- Line 2: City
- Line 3: Street
- Line 4: Location Code*
- Line 5: Weather*
- Line 6: Direction of Survey
- Line 7: Use of sewer*
- Line 8: Pipe Material
- Line 9: Pipe Diameter/Height
- Line 10: Pipe Length (on plans)
- Line 11: Start Manhole Number
- Line 12: End Manhole Number
- Line 13: Pipe Segment ID
- Line 14: Inspection Time/Date

Line items noted with an asterisk (*) are optional depending on the line capacity of the text overlay equipment

4. Submittal Requirements

Contractor shall submit to Owner the following:

- A. National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) certification of operators who will be performing video work.
- B. Bid/Proposal Documents may indicate removal of portions of required submittals listed in C.d.iii and D. below. USB Flash Drives containing video files of specified format and resolution meeting C.a-d.i. shall always be required and provided.
- C. USB Flash Drives of recording of wastewater lines segments and manholes.
 - a. Rectangular shaped external hard drive with USB 2.0 connection shall be used to store recorded video. Once videoed, the USB Flash Drives shall be labeled and become the property of the Owner.
 - b. The color USB Flash Drives shall include a digital color key map in a format acceptable to the Owner with each segment of wastewater line labeled with the appropriate inspection ID on the map.
 - c. Video shall be continuous for each wastewater line segment. Do not show a single segment as more than one file.
 - d. The file folder for each segment of the wastewater line shall have a unique name based on the Owner's approved inspection naming convention and shall contain the following:
 - i. Video files
 - ii. Video inspection logs with information coded in accordance with the PACP
 - iii. Photo logs - Digital photographs in JPEG format shall be made of all recorded defect observations. These photographs will be computer generated with the use of the inspection reporting system software. JPEG images shall be captured at a minimum resolution of 2 megapixel. At a minimum, all photographs shall be named consisting of the following descriptions: "FROM MANHOLE STATION NUMBER", "TO MANHOLE STATION NUMBER", eight digit inspection date, and the defect 'station' location along the pipe. It is in the Contractor's discretion as to additional data information that may be needed in the naming of the files to make each file unique within the file naming constraints of their inspection software.

0+00_3+45_20050101_125_A.jpg
(FromMHStation_ToMHStation_YYYYMMDD_Defect Position_UniqueData)

Any additional information shall be included after the mandatory info specified above. The naming convention shall be consistent throughout the project. A minimum of TWO photographs of each defect shall be taken, one with a perspective view and one with a close-up view. ONE photograph is required for each lateral connection looking directly at the connection and each AMH observation from the bottom of the manhole looking up.

D. Report summarizing the results of the video inspection:

Printed Report in a hardcover white clear view 3-ring binder, containing the following information:

- i. Footage calibration report for each camera used.
- ii. PACP Certificate copies of all operators.
- iii. Summary table of all pipeline segments inspected with the following fields in the order listed:

Column 1: Date of Inspection
Column 2: Start Manhole
Column 3: Stop Manhole
Column 4: Total Pipe Length (per as-built plan)
Column 5: Televised Length
Column 6: Quick Maintenance Rating (per PACP)
Column 7: Quick Structure Rating (per PACP)
Column 8: Section Number
(*NOTE: The table shall be sorted by StartManhole)

An observation table of all pipeline segments inspected with the following fields in the order listed:

Column 1: Section Number
Column 2: Position of Defect
Column 3: Observation Code (per PACP)
Column 4: Observation Description (per PACP)
Column 5: Structural Grade (per PACP)
Column 6: O&M Grade (per PACP)
(*NOTE: The table shall be sorted by Section Number)

- iv. Color hard copy print-outs of digital photos of noted defects and service lateral as specified for digital files shall be included. Photo logs shall accompany each photo submitted.
- v. Proposed method of repair for any defects discovered.

5. Traffic Control

- A. Video Inspection of wastewater lines staged in an active right-of-way or roadway shall require traffic control in accordance with City of Cedar Park standards and Texas Manual on Uniform Traffic Control Devices (TMUTCD) provided by the Contractor. All temporary lane and roadway closures shall be approved in advanced by the City of Cedar Park; all closures shall be limited to 9am to 4pm, Monday through Friday and may require public notice.
- B. Contracts for video inspection of existing wastewater lines, not new construction, may indicate in the Bid/Proposal Documents if the City will provide traffic control for video inspection operations.

6. Additional Responsibilities Of The Contractor

- A. In the event of any Contractor-related overflow or interruption/backup of customer service, the Contractor shall immediately notify the Public Works immediately and shall contain and eliminate the overflow.
- B. Contractor shall be responsible for any fines levied by others, reimbursement of any agency incurred costs, damage, cleanup, restoration of flow, and any disruption of service costs to customers as a result of the Contractor's work. This is in addition to any and all costs incurred by the customer.
- C. Contractor shall respect the rights of property owners, and not enter upon private property without obtaining permission from the owner of the property.
- D. For manholes located in easements of private property, the Contractor shall provide the resident with 24-hour advanced notice for easement access prior to entering the property,

7. Specific Requirements For Video Inspection of New Installed Wastewater Lines

A. General

All wastewater lines shall be inspected for conformance to the requirements of this specification.

B. Period for Video Inspection

Contractor shall provide all labor, equipment, material and supplies and perform all operations required to conduct internal closed-circuit television and video recording of all wastewater lines. Post-installation video work shall be completed by the Contractor in the presence of the Owner and video recording, meeting Submittal Requirements, shall be provided to the Owner for review. Post-installation video shall not be completed until all work is completed on a section of wastewater line. Manhole and service line work shall be complete prior to post-installation video work. Video recording of each wastewater line segment shall be conducted after the trench has been backfilled, after the 30-day mandrel test is passed, and prior to placement of permanent pavement repairs or permanent pavement reconstruction. Contractor shall not place permanent pavement repairs or permanent pavement reconstruction over the wastewater lines until Owner has reviewed the video and agrees that there are no defects in the wastewater line installation shown in the video submitted by the Contractor or shown in any video acquired by the Owner through other means. Placement of permanent pavement repair or permanent pavement reconstruction over the installed wastewater line before the Owner acknowledges no defects shall be at the Contractor's risk. Any defects revealed by the video inspection shall be corrected at the Contractor's expense and a new video submitted to the Owner for review prior to acceptance of the wastewater line.

C. Wastewater Segment Dewatering

If during video inspection for new construction acceptance, water is encountered inside the pipe segment; the wastewater line shall be dewatered by the Contractor at the Contractor's expense. The wastewater line must be dry. Video recording conducted while the camera is floating is not acceptable unless approved by the Owner in writing.

D. Pipeline Settlement Test

Pipe Settlement Test shall be performed independent of video inspection for pipe deficiencies as water may obscure deficiencies and shall require separate videos files

meeting same specifications for video inspection. During the infiltration test or after the exfiltration test, the pipe will be video inspected for possible settlement. When air testing has been used, water shall be flowed into the pipe to permit meaningful observations. Any pipe settlement which causes excessive ponding of water in the pipe shall be cause for rejection. Excessive ponding shall be defined as a golf ball (1 $\frac{3}{4}$ " dia.) submerged at any point along the line.

E. Defect Correction

All deficiencies revealed by inspection shall be corrected. Video re-inspection meeting the requirements of this specification shall be provided at the Contractor's expense to show that deficiencies have been corrected satisfactorily. Further, the contractor shall provide video in complete segments (manhole to manhole) versus specific deficiency locations. The post-defect correction inspection video, electronic files, and hard-copy documents, meeting the Submittal Requirements, shall be completed and submitted to confirm that the wastewater lines segments are free of defects.

END OF SECTION

VERSION CONTROL

| Modifier | Date | Reason For Change | Version Number |
|--------------------------|-----------|--|----------------|
| Thomas J. Dawkins, P.E. | 5/15/2020 | Initial Release | V1.0 |
| Michael A. Huber, P.E. | 5/20/2020 | Formatting | V1.1 |
| Kenneth A. Wheeler, P.E. | 5/21/2020 | Minor wording revisions | V1.2 |
| Eric S Rauschuber, P.E. | 5/27/2020 | Minor wording revisions | V1.3 |
| Michael A. Huber, P.E. | 5/29/2020 | Formatting | V1.4 |
| Thomas J. Dawkins, P.E. | 6/3/2020 | Clarified 1.2.5.1.D.3; Added 1.2.5.1.D.19; Added 2.1.2.5.2 and renumbered; Clarified 2.1.2.6.6 | V1.5 |
| Thomas J. Dawkins, P.E. | 7/7/2020 | Clarified 1.2.5.1.D.3 and 1.2.5.1.D.19; Added 1.2.5.1.D.20; Added 1.2.5.1.D.21; Update Appendices for latest version of notes and specifications | V1.6 |
| Thomas J. Dawkins, P.E. | 7/13/2020 | Clarified and 2.1.4.1.2 | V1.7 |
| Adam Thane | 8/30/2021 | Clarified 2.1.4.8, 2.1.3.5, and 2.1.2.7 | V1.8 |
| Thomas J. Dawkins, P.E. | 3/10/2022 | Clarified and Updated 1.2.2.1; 1.2.2.2; 1.2.5.1.D.2; 1.2.6.3; 1.2.7.1.A.3; 2.1.2.1.1e; 2.2.1.1.1f; 2.1.2.1.2b; 2.1.4.1.1_ ; 2.1.4.1.1; 2.1.4.1.2; 2.1.4.3.9; 2.1.4.4.4; 2.12.1.3a-f; 2.1.4.10.15j; Appendix A: Construction Notes for Subdivisions and Site Plans; Appendix C: Cedar Park Lift Station Specifications and Maintenance; and Appendix D: Requirements for Bypass Pumping | V1.9 |

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| Thomas J. Dawkins, P.E. | 4/22/2022 | Added Table to 2.1.4.1.2, Added/clarified 2.1.4.2.2a-d; and corrected formatting Appendix D: Requirements for Bypass Pumping | V1.10 |
| Thomas J. Dawkins, P.E. | 7/11/2022 | Added 2.1.2.2.16; Renumbered 2.1.2.2.17-22; Added 2.1.4.3.11 and Appendix E: Requirements for Video Inspection of Wastewater Lines; Updated Appendix A: Construction Notes for Subdivisions and Site Plan and Appendix B: Capital Improvement Project General Construction Notes; Revised 2.1.2.3.3, 2.1.3.2.6, 2.1.4.4.1, 2.1.4.4.8 | V1.11 |
| Thomas J. Dawkins, P.E. | 10/11/2022 | Renumber 3.1 and 4.1; Add new Section 3.1 Design Requirements For Dry Utility Installations; formatting; Updated Appendix A: Construction Notes for Subdivisions and Site Plan and Appendix B: Capital Improvement Project General Construction Notes | V2.0 |