SECTION 2 - WATER, RECLAIMED WATER, AND WASTEWATER CRITERIA

2.1.0. GENERAL

The following information is intended to assist engineers and the general public in the design and construction of water, reclaimed water, and wastewater facilities. Information herein is to provide minimum City of Austin requirements only. Sound engineering judgment shall be utilized to determine if these minimum requirements are suitable for each particular engineering design.

2.2.0. SERVICE EXTENSION PROCEDURE

2.2.1. General Information

This section is intended to provide information needed to obtain water and wastewater service extension approvals for future development. Refer to The Code of the City of Austin, Chapter 25-9 Article 1 Utility Service for additional information.

The service extension is not to be interpreted as a vehicle solely for the purpose of securing a utility commitment, but rather a procurement of rights to install utility mains, associated facilities and off-site improvements within the City of Austin's Adopted Water and Wastewater Service Area. These water and wastewater facilities are not extended through capital improvement programs or other City initiated projects.

The Water and Wastewater Service Area is the Impact Fee Boundary for the Austin Water Utility. It is a set of geographic boundaries within which water or wastewater service may be provided. Properties must be completely within the service area before a service extension application can be submitted.

A legal lot is an entire lot as shown in a recorded subdivision; a legal tract is a parcel of land, created by warranty deed prior to being subject to the subdivision regulations of the City of Austin that has remained in the same configuration through current ownership. Utility service cannot be provided without a land status determination.

Refer to the Code of the City of Austin Section 25-4-195 (Request for Utility Service) for detailed information regarding service extensions.

2.2.2. Service Extension Application Requirements

Service Extension Request Forms are utilized when requesting a service extension. Other forms may apply. Information on obtaining Service Extension Request forms is provided in Appendix A.

2.2.3. Service Extension Guidelines for Processing

A. All properties not within the full-purpose city limits of Austin that are not within the City of Austin Certificate of Convenience and Necessity (CCN) area must request annexation. An annexation request is submitted with the service extension application.

B. All extension requests within the full purpose City Limits not requiring City cost participation or reimbursement may be approved by the Director of Austin Water Utility without any further action.

C. All extension requests within the Extra Territorial Jurisdiction and the Desired Development Zone not requiring City cost participation or reimbursement may be approved by the Director of Austin Water Utility without any further action.

D. All service extensions requesting City cost participation or reimbursement must be submitted to the Water and Wastewater Commission for consideration and must be approved by the Austin City Council.

E. Approved applications are not a reservation of capacity in the system but are an acknowledgment of the intent to serve.

2.2.4. System Capacity Determination Procedure for Reviewing Service Extensions by the Austin Water Utility

A. The Utility will determine what existing facilities are in place and any remaining capacity after considering all existing services connected to the system.

B. The Utility will determine the length of time after all funded projects have been constructed, based on present conditions until additional system improvements are needed.

C. A service extension may or may not be approved depending on the time frame of approval, funding and construction of additional system improvements and related agreements and conditions.

2.2.5. Expiration of Service Extension Approvals

A. Expired service extensions may be re filed upon, the expriation date, not pior.

B. A new application packet will be required upon refiling.

C. A new number will be assigned and new fees will be required.

D. In cases where approvals are contingent upon developer contracts and/or C.I.P.s, the timing for expiration begins upon completion and City acceptance of those projects, not the approval date of application.

2.3.0. PRIVATE PLUMBING (this section only applies to private plumbing)

2.3.1. Plumbing Inspections Outside the City's Zoning Jurisdiction

Within the zoning jurisdiction of the City of Austin (City) and within the boundaries of other jurisdictions as specified by contract, private plumbing installations shall be inspected by the Planning and Development Review Department (PDR). New private plumbing installations on properties located outside of the zoning jurisdiction of the City for which the City provides direct retail water or wastewater service (outside-city installations) shall be inspected by the Planning and Development Review Department.

2.3.2. Adherence to Federal, State, and Local Responsibilities, Rules, and Regulations Relating to Backflow Prevention and Cross Connection Control

A. Backflow prevention assemblies that are installed in private plumbing systems, fire protection systems, process water systems, and/or other private water distribution systems that are directly or indirectly connected to or on properties serviced by the City of Austin’s potable water distribution system shall obtain laboratory and field testing approval and listing as backflow prevention devices and assemblies from the University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USC FCCC & HR) or other approved agency with field and laboratory testing to American Water Works Association (AWWA) standards and shall be installed in accordance with American Water Works Association manual M-14 and the USC FCCC & HR Manual of Cross Connection Control, Ninth Edition, as amended. It shall be the responsibility of the property owner or the representative of the property owner to provide verification of the required approvals upon request.

B. The installation, maintenance, repair, replacement and operational testing shall strictly conform to the requirements of Chapter 15-1 of the Austin City Code (Cross Connection Control Regulations).

C. To prevent contamination of the potable water system from stagnant water in dead end potable water service lines (e.g., private fire systems, private fire mains, sections for future use, etc.), the installation of an approved backflow prevention assembly is required immediately downstream of the City water meter.

If the dead end potable water service line is unmetered, then an approved detector backflow prevention assembly is required at a point on the dead end potable water service line where no more than 100 gallons of water volume in the service line is reached. The 100 gallon threshold is determined by calculating the volume of water that would be contained in the service line as measured from the connection to the City’s water main and the location of the approved backflow prevention assembly.

2.3.3. Backflow Installation Standards

Water customers directly connected to or serviced by the City of Austin’s potable water or reclaimed water distribution systems will install backflow prevention assemblies to the following minimum standards.

A. Standards common to various backflow prevention assemblies:

1. All vacuum breakers, pressure vacuum breaker assemblies, double check valve assemblies, and reduced pressure backflow assemblies shall be installed in the vertical or horizontal upright position only and rotated on their axis only as listed by approval agencies identified in Chapter 15-1 of the Austin City Code

2. All pressure vacuum breaker assemblies, double check valve assemblies, reduced pressure backflow assemblies, and spill resistant vacuum breaker assemblies shall be installed only as an assembly. These assemblies shall not be modified to allow fittings, strainers, or other devices to be installed between the shutoff valves.

3. Assemblies installed over five (5) feet above finished floor or grade shall have a platform for maintenance, testing and repair. Platform designs shall be designed to sound engineering practices and the design sealed by a registered Professional Engineer.

4. Protection from freezing shall be provided if installed in areas subjected to freezing temperatures or conditions.

5. Containment backflow preventers, backflow preventers installed at water meter, and those installed in supply to water heaters and boilers require compliance with Austin Plumbing Code 608.3 as amended, to prevent explosions.

6. Atmospheric vacuum breaker, pressure vacuum breaker, spill proof vacuum breaker, hose bibb vacuum breaker, and reduced pressure backflow assembly installations shall not be in an area where corrosive fumes or gasses could possibly render the assembly inoperative, corroded, or deteriorate the exterior of the assembly, (fume hoods, car washes, chemical storage rooms, etc.).

B. Atmospheric vacuum breakers (AVB) and hose bibb vacuum breakers (HBVB) shall be installed to the following minimum standards:

1. Atmospheric vacuum breakers and hose bibb vacuum breakers shall be installed a minimum of six inches above all downstream piping and the highest point of discharge.

2. Atmospheric vacuum breaker and hose bibb vacuum breaker installations or applications shall not be subjected to back-pressure.

3. Shutoff valves shall not be installed downstream of the device.

4. Atmospheric vacuum breakers and hose bibb vacuum breakers shall be installed as a unit and shall not be modified.

5. Atmospheric vacuum breakers and hose bibb vacuum breakers shall not be subjected to operating pressure for more than twelve (12) hours out of a 24-hour period.

6. Hose bibb vacuum breakers shall be a non-removable type.

C. Double Check Valve Assemblies (DCVA) and Double Check Detector Assemblies (DCDA) shall be installed to the following minimum standards:

1. Above Grade or Floor Installations

a. Installations shall provide a minimum of twelve (12) inches to a maximum of sixty (60) inches clearance between finished grade or finished floor and bottom of the assembly.

b. A minimum of twenty-four (24) inches unobstructed clearance and access shall be provided on the service side of the assembly to permit access for testing, service, repairs, and replacement.

c. A threaded assembly, not installed between unions and isolation valves for removal, shall be installed with a minimum six (6) inch clearance from its outermost dimension to a wall or other obstruction on the non-service side of the assembly.

d. A flanged assembly shall be installed with a minimum of twelve (12) inches clearance from its outermost dimension to a wall or other obstruction on the non-service side of the assembly.

2. Below Grade Installations

a. Test cocks shall be plugged or capped with non-ferrous plugs or caps.

b. Test cocks shall discharge vertically upward.

Note: Fittings may be installed in the test cocks to redirect the discharge vertically upward.

c. A minimum of twenty-four (24) inches unobstructed clearance and access shall be maintained on the service side of the flanged assembly to permit access for testing, service, repairs, and replacement.

d. Double check valve assemblies installed in vaults shall have a minimum of twelve (12) inches clearance to a wall or other obstruction on the non-service side of the assembly.

e. Double check valve assemblies installed in vaults shall maintain twelve (12) inches minimum to a thirty six (36) inches maximum clearance from the lowermost point of the backflow prevention assembly to the vault flooring.

f. Double check valve assemblies installed in vaults shall maintain a minimum of six (6) inches to a of thirty six (36) inches maximum clearance from the uppermost portion of the assembly to the underside of a vault lid, with the shutoff valves in the open position.

g. Backflow prevention assembly vaults shall not be installed in roadways driveways or parking lots or areas requiring traffic bearing lids. Vault access openings for flanged assemblies shall not be less than thirty (30) inches in the least dimension. The vault access door shall be hinged and shall be spring assisted as necessary to allow hand opening by a single individual.

h. Threaded Assemblies installed in vaults less than eighteen (18) inches deep shall have a minimum of four (4) inches clearance from the shutoff valves to the inside walls of the vault.

1) A minimum of four (4) inches clearance shall be maintained from the uppermost part of the threaded Double Check Valve Assembly to the underside of the vault box lid.

2) A minimum of six (6) inches clearance shall be maintained from the lowermost point of the threaded double check valve backflow prevention assembly to the flooring in the vault.

3) Vault access openings shall not be less than sixteen (16) inches long and ten and three-fourths (10 ¾) inches wide.

4) Installations deeper than eighteen (18) inches below finished grade shall be installed in accordance with the requirements of this section for flanged double check valve assemblies.

Note: The opening on any vault or box used to house a backflow prevention assembly shall be large enough to permit access for testing, service, repairs, and replacement of the assembly.

D. Reduced Pressure Backflow Assemblies (RPZ) and Reduced Pressure Detector Assemblies (RPDA) shall be installed to the following minimum standards:

1. A minimum of twenty-four (24) inches unobstructed clearance and access shall be maintained on the service side of the assembly to permit access for testing, service, repairs, and replacement.

2. Installations shall provide a minimum of twelve (12) inches to a maximum of sixty (60) inches clearance between finished grade or finished floor and bottom of reduced pressure backflow assembly.

3. Twelve (12) inches minimum clearance shall be maintained above the assembly.

4 Above ceiling installations are not permitted.

5. Installations in a pit or below finished grade are not permitted.

6. Threaded Reduced Pressure Backflow Assemblies, not installed between unions and isolation valves for removal, shall be installed with a minimum six (6) inches clearance from their outermost dimension to a wall or other obstruction on the non-service side of the assembly.

7. Flanged Reduced Pressure Backflow Assemblies: shall be installed with a minimum of twelve (12) inches clearance from their outermost dimension to a wall or other obstruction on the non-service side of the assembly.

E. Pressure Vacuum Breaker Assemblies (PVB) shall be installed to the following minimum standards:

1. Installations shall not be less than twelve (12) inches above all downstream piping and the highest point of discharge.

2. Installations or applications will not be subjected to back pressure.

3. Shutoff valves may be installed downstream of the assembly.

4. Installations above ceilings are not permitted.

5. Installations where structural damage may occur are not permitted.

F. Spill Resistant Vacuum Breaker Assemblies (SVB) shall be installed to the same minimum standards listed above for the Pressure Vacuum Breaker Assemblies. The SVB is an improved PVB with features intended to limit water loss during start up and operation, but care should be exercised in selection to minimize potential water damage.

2.3.4. Backflow Prevention Rules and Regulations Pertaining to Sites With Both City Potable Water and Auxiliary Water

A. Auxiliary Water means a water from a source other than the City's potable water supply, or mixture of water and anything else, from any source, which is pressurized for any purpose, use, treatment, or disposal on or available to a site served by the City's potable water system.

The presence of auxiliary water on a site also served by the City's potable water system requires that a backflow prevention assembly be installed at all City water service connections to the site in order to prevent the auxiliary water from contaminating the City's potable water system.

Table 2.3.4. A. includes a partial list of common auxiliary water sources that may be found on sites also serviced by the City's potable water system, the containment backflow protection required at the service points, and the isolation backflow protection required at the point of supply where the City's potable water is used as a backup to an auxiliary water source. The table describes the minimum approved backflow protection required at sites using auxillary water. These requirements apply to all Austin Water customers. Note that backflow preventers approved for higher levels of protection may be used in place of the minimum required backflow preventer described below:

AG = Air Gap. Approved for all hazards, but its use is not always practical. AG's are the best, or highest level of backflow protection.

RP = Reduced Pressure Zone Backflow Prevention Assembly (also known as RPZ). Approved for all hazards where an air gap would be impractical (exception: sewer). An RP is the best level of approved protection after an Air Gap.

DC = Double Check Backflow Prevention Assembly (also known as DCVB or DCVA). Aproved for low hazards only. A DC provides the lowest level of approved protection.

Table 2.3.4. A.

		Containment Backflow Protection Required At			Isolation Backflow Protection Required at Point of Supply
List of Pressurized Auxiliary Water Sources and Uses (1)		Domestic Water Meter (2), (3)	Irrigation Water Meter (3)	City Service to Private Fire Mains (4), (5), (6)	Where Austin is used as Back-up to Auxiliary Water Source
Lake/River Water		RP	RP	RP	RP
Well Water		RP	RP	RP	RP
Rainwater Harvesting		RP	RP	RP	RP
Reclaim Water	used on property	RP	RP	DC	AG
	used in building	RP	RP	RP	AG
Gray Water, Re-Irrigation, Disposal		RP	RP	RP	AG
Other Water Supply (7)		RP	RP	RP	AG

Table Notes:

(1) All auxiliary water use sites are required to have a Customer Service Inspection performed in addition to the annual operational test of the backflow assemblies.

(2) Backflow prevention assemblies installed at potable water meters require attention to thermal expansion.

(3) Backflow prevention assemblies installed at potable and irrigation water meters in conjunction with an auxiliary water source are required to have an annual backflow assembly operational test.

(4) New backflow prevention assemblies installed in existing fire systems may result in the need to re-calculate fire system design specifications due to backflow preventer pressure losses.

(5) Backflow prevention assemblies installed in un-metered fire systems are required to be detector assemblies.

(6) DCs installed on fire systems at reclaimed water use sites are required to have a semiannual operational test

(7) Other includes any and all other defined auxiliary waters not listed in this chart and/or any combination of 2 or more auxiliary waters.

B. Reclaimed Water means reclaimed municipal wastewater that is under the direct control of the City treatment plants, satellite facilities, or a treatment plant with which the City contracts, and that has been treated to a quality that meets or exceeds 30 Texas Administrative Code, Chapter 210 requirements. Reclaimed Water is water which, as a result of treatment of wastewater by a public agency, is suitable for a direct beneficial use or a controlled use that would not otherwise occur.

Because reclaimed water is the product of a final stage of a wastewater treatment process, it is prohibited by the plumbing code from connection or contact at any time for any reason with potable water.

The following rules are intended to insure the prevention of cross contamination of potable water with reclaimed water and other auxiliary waters. All measurements shall be made from the pipe's outside diameter.

1. Pressurized auxiliary water piping shall be separated from potable water piping by a horizontal distance of at least ten (10) feet or any piping within ten (10) feet shall be sleeved.

2. Auxiliary water pipes shall not be run or laid in the same trench as potable water pipes. A ten (10) foot horizontal separation shall be maintained between buried pressurized reclaimed and potable water piping.

3. Buried potable water pipes crossing auxiliary water pipes shall be laid a minimum of twelve (12) inches above the auxiliary water pipes and the auxiliary water piping shall have a minimum twenty (20) foot sleeve centered on the potable water pipe.

4. Auxiliary water irrigation (the edge of the soaking of the applied reclaim water) shall stop ten 10 feet from potable water irrigation heads.

5. Operational or tailwater controls shall be provided to preclude discharge of auxiliary water from irrigation sites.

6. Auxiliary systems shall be designed so that the irrigation spray does not reach any privately owned premises outside the designated irrigation area or reach public drinking fountains.

7. A forty (40) foot protected zone shall be established around a drinking fountain installed in an open field of auxiliary water irrigation. A twenty (20) foot radius of drip irrigation around the drinking fountain surrounded by a twenty (20) foot radius of shrub bubblers shall establish the forty (40) foot protected zone. Pop-up spray heads and rotary heads on auxiliary water systems cannot be installed closer than their radius to any potable water outlet and/or protected zones.

8. Hose bibs on reclaimed water systems and hose connections to reclaimed water systems are not permitted

9. Water for housekeeping in areas served with auxiliary water shall be provided from the city potable water source protected by an RPZ at the water meter and/or at the branch off the private potable drinking water system. The line shall be sleeved from the RPZ to an in-ground lockable service box labeled "NON-POTABLE CITY WATER - DO NOT DRINK." The hose connection in the box shall be a unique connection such as a bayonet stab/twist style with the hose permanently connected to the bayonet without use of garden hose threads. The water valve shall require a special key for valve operation.

10. Hose bibs through and outside the walls of buildings on sites using auxiliary water shall have RPZ water protection on the lines serving the hose bibs. All the hose bibs shall be in a locked boxes, and may be supplied from a single RPZ, and the piping and locked boxes themselves shall be labeled "NON-POTABLE CITY WATER - DO NOT DRINK." All hose bib boxes and the water valves themselves shall require a special key for access and operation.

2.3.5. Cross Connection Inspections and Testing Requirements for Sites With Both City Potable Water and Auxiliary Water

The inspections and testing required to confirm the separation of or discover the cross connection between an auxiliary water system and the City's potable water system shall be conducted by City potable water customers upon installation of reclaimed water or other auxiliary water sources used to supply private pressurized water systems inside or outside buildings on sites where City potable water is used for any purpose.

These inspections and tests shall be conducted as follows:

A. Reclaimed and other auxiliary water piping shall be tested as outlined in this manual.

B. Inspecting and testing systems. An initial inspection prior to receiving reclaimed water service or the start-up of any auxiliary water system and subsequent periodic cross connection inspections and tests shall be performed in addition to a Customer Service Inspection as prescribed by the Texas Commission on

Environmental Quality (TCEQ) in TAC 30 Chapter 290 Subchapter D §290.46(j).

The City water customer requesting to use or continue to use reclaimed or any auxiliary water system in addition to City potable water on a site shall employ, at their own expense, a licensed Water Supply Protection Specialist (WSPS) or Customer Service Inspector (CSI) registered with the Austin Water Utility to schedule and perform the customer service inspection prescribed on both the potable and reclaimed and/or auxiliary water systems as follows:

1. Visual System Inspection. Prior to commencing the cross-connection testing, a dual system inspection shall be conducted by the WSPS or CSI, (terms hereafter to mean the same as "customer" or "applicant") with direction and oversight of the Authority Having Jurisdiction (as defined in the 2009 Uniform Plumbing Code section 203.0) and other Authorities Having Jurisdiction.

a. Source locations of the auxiliary water lines and meter locations of the reclaimed water and potable water lines shall be checked to verify that no modifications were made, or cross-connections are visible.

b. All pumps and equipment, equipment room signs, and exposed piping in equipment room shall be checked.

c. All valves shall be checked to ensure that valve lock seals are still in place and intact. All valve control door signs shall be checked to verity that no signs have been removed.

2. Cross-Connection Test. After all on-site piping has been completed and pressure and flow-tested, the following procedure shall be followed by the applicant with direction and oversight of the Authority Having Jurisdiction and other Authorities Having Jurisdiction to determine if a cross-connection occurred.

a. All water systems shall be activated and pressurized as follows:

i. For the initial charging and testing, reclaimed and auxiliary water systems shall not be connected to the auxiliary source until the initial cross connection test has been successfully performed, (i.e., proof there is no cross connection). Water source for testing auxiliary water piping shall be from a potable water supply protected with an installed, tested and reported reduced pressure zone (RPZ) backflow prevention assembly. Since all the piping downstream of the potable water containment backflow preventer will be subjected to this test, the source of potable water must be taken either from the section between the potable water meter and the containment backflow preventer or from a totally separate source such as a temporary fire hydrant meter and in every case these sources must be backflow protected with an RPZ.

ii. For both initial and periodic testing, the auxiliary water system shall be shut down at the property owner's system supply cutoff (POSSCO) valve and, in the case of reclaimed water, at the property owner's cut off (RWPOCO) valve. A tee (line size up to 2") shall be provided downstream of the containment backflow preventers in the case of reclaimed water, and the POSSCO valves in the case of all other auxiliary waters (AWFPBV) with a line size (up to 2") full port ball valve for flushing, sampling, and troubleshooting. All water systems' sectional, isolation, and automated control valves shall be in the fully open position throughout this test.

b. The potable water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the auxiliary water systems are down being examined. The minimum period the auxiliary water system is to remain under test shall be determined on a case-by-case basis, taking into account the size and complexity of the potable and auxiliary water distribution systems, but in no case shall that period be less than one hour.

c. At this time, the AWFPBV and other auxiliary water system drain valves shall be fully opened in order to drain the auxiliary water systems.

d. All potable fixtures and outlets shall be tested and inspected for flow and the time and location of each test shall be logged. Low or no flow from a potable water outlet would indicate that fixture or outlet may be connected to an auxiliary water system.

e. All auxiliary water fixtures, irrigation sprinkler zones, etc. shall be tested and inspected for flow. Flow from any auxiliary water system outlet shall indicate a cross connection.

f. While the procedures in Section 2.3.5.B.2.d. above are being performed, periodic checks of all auxiliary water drain openings shall be made looking for the appearance of water. This section of the test is completed and passed if, after completion of the required test period, no unexpected appearance of water is found at the auxiliary water service points (points of use) or at any drains,

g. For initial tests, secure all drains and refill the auxiliary water systems using the temporary water source established for this purpose in Section 2.3.5.B.2.a.i. above and then purging the air while leaving all (POSSCO) and (RWPOCO) valves shut. For periodic tests, open these valves and start up the auxiliary water systems.

h. The potable water system shall then be shut down at the #1 Shut-off Valve of the containment backflow preventer. A tee shall be provided downstream of the containment backflow preventer with a line size (up to 2") full port ball valve (PWFPBV) for flushing, sampling, and troubleshooting. All water meters should be read and the readings and times recorded.

i. At this time, the PWFPBV and other potable water system drain valves shall be fully opened in order to drain the potable water system.

j. The auxiliary water systems shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction. The minimum period the potable water system is to remain depressurized shall be determined on a case-by-case basis, but in no case shall that period be less than one hour.

k. All auxiliary water fixtures, irrigation sprinkler zones, etc. shall be tested and inspected for flow. No flow from an auxiliary water outlet would indicate the auxiliary water system may be connected to the potable water system. Likewise, test all potable water outlets to confirm no flow and no appearance of water at the potable water PWFPBV and other drains.

l. If unexpected flows or no-flows are detected, resolve cause.

m. This cross connection test is considered complete and passing if there is no unexpected flow detected in any of the fixtures or water at the drains, which would have indicated a cross connection. The potable water system may now be repressurized and the system returned to normal.

n. If this was an initial test, the site is now approved for setting reclaimed meter and/or connection to, and startup of, the auxiliary water systems.

3. In the event that a cross connection is discovered, the following procedure shall be activated immediately in the presence of the Authority Having Jurisdiction:

a. Reclaimed water piping shall be shut down at the reclaimed RWPOCO valve at the meter, or auxiliary water at the POSSCO valve, and riser shall be drained.

b. All potable water sources to the building shall be shut down at the meter/service connection

c. The cross connection shall be uncovered and disconnected.

d. The site water piping shall be retested following procedures listed in subsections 2.3.5. B.1. and 2.3.5. B.2. above.

e. The potable water system shall be chlorinated with at least fifty (50) ppm chlorine for twenty-four (24) hours.

f. The potable water system shall be flushed after twenty-four hours and a standard bacteriological test shall be performed. If test results are acceptable, the potable water system may be recharged.

C. An annual inspection of the reclaimed water system following the procedures listed in Sections 2.3.5.B.1. and 2.3.5.B.2. shall be required by the Authority Having Jurisdiction.

D. A periodic (other than annual) inspection of auxiliary water systems other than reclaimed water following the procedures listed in Sections 2.3.5.B.1. and 2.3.5.B.2. may be approved by the Authority Having Jurisdiction. The frequency shall be determined and may be changed based on system complexity, exposure for modifications, hidden or visible piping, hazardous materials used or stored, history of compliance, etc.

E. Drawings and Specifications. The Authority Having Jurisdiction may require any or all of the following information to be included with or in the plot plan before a permit is issued for installation and/or operation of a reclaimed or auxiliary water system and for the planning and execution of the periodic inspection and testing of systems.

1. A plot plan drawn to scale and completely dimensioned, showing lot lines and structures, location of all present and proposed potable water supplies and meters, water wells, streams, auxiliary water supply and systems, reclaimed water supply and meters, drain lines, and locations of private sewage disposal systems and one hundred percent expansion areas or building sewer connected to the public sewer.

2. Details of construction including riser diagrams or isometrics and a full description of the complete installation, including installation methods, construction, and materials as required by the Authority Having Jurisdiction. To the extent permitted by structural conditions, all reclaimed and auxiliary water risers within the toilet room, including appurtenances such as air/vacuum relief valves, pressure reducing valves, etc. shall be installed in the opposite end of the room containing the served fixtures from the potable water risers or opposite walls, as applicable. To the extent permitted by structural conditions, reclaimed and auxiliary water headers and branches off risers shall not be run in the same wall or ceiling cavity of the toilet room where potable water piping is run.

F. Periodic inspections shall recur from the month of the auxiliary water system startup. Requests for changes to this schedule must be in writing. At no time may a change of schedule be used to avoid a scheduled Customer Service Inspection.

G. Alternate methods for inspection and testing which will confirm separation of, or discover the cross connection between, auxiliary water systems and City potable water supplied systems may be submitted to the Authority Having Jurisdiction and must comply with the requirements set forth in Chapter 301.2 of the Austin Plumbing Code.

H. The performance, witnessing and certification of the inspection and test of Austin Water sites utilizing reclaimed and/or auxiliary water systems shall be treated as Customer Service Inspections as described in the Rules and Regulations for Public Water Systems, 30 TAC Chapter 290 Subchapter D § 290.46(j).

1. A customer service inspection certificate as described and found in the Rules and Regulations for Public Water Systems, 30 TAC Chapter 290 Subchapter D § 290.47(b) shall be completed and delivered to the Austin Water Utility. Additional report on the cross connection inspection and test containing site specific documentation, test data, gauge and meter readings, test preparations and results, etc. may be required.

2. Individuals with the following credentials shall be recognized as capable of conducting a customer service inspection certification.

a. Plumbing Inspectors and Water Supply Protection Specialists licensed by the Texas State Board of Plumbing Examiners.

b. Customer Service Inspectors who have completed a Texas Commission on Environmental Quality (TCEQ) approved course, passed an examination administered by TCEQ, and hold current professional certification or endorsement as a Customer Service Inspector.

c. Persons wishing to perform Customer Service Inspections for City water customers must first meet with the Austin Water Utility to register, and learn the process, procedures, reporting expectations, and other requirements.

2.4.0. STANDARD PRODUCTS LIST PROCEDURES

2.4.1. Introduction

Through previous investigation, testing and usage by the Utility, 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 the Utility'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 the Austin Water Utility. 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 the Utility 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.

Questions concerning the Utility's Standard Products List may be addressed to the Standards Committee Chairperson at 625 East 10th Street, Austin, Texas 78701 or call (512) 972-0204.

2.4.2. Austin Water Utility Standard Product Approval Process

A. Product and equipment manufacturers shall submit a written request for consideration to the Austin Water Utility Standards Committee chairperson. This request shall comprise a complete submittal, in a single package for each product, and include the following:

1. Product description, technical specifications and catalog information.

2. All applicable product standards (AWWA, ASTM, ANSI, NFPA and others) and related manufacturer's certifications.

3. Test results showing compliance with applicable standards, including independent laboratory test results, if necessary and which contain the name, address and telephone number of the laboratory and indicate who authorized or ordered the tests.

4. Manufacturer's installation procedures for the particular product.

5. Product availability and restrictions, if any, delivery time and manufacturer's location.

6. Maintenance requirements, special equipment and procedures and recommended maintenance schedules.

7. Product references (municipal or public users) shall include users name, address and telephone number, product application and number of years in use, and name and telephone number of a contact person having knowledge of the particular usage.

8. Material safety data sheet (MSDS); if applicable.

9. Recent product revisions or improvements.

10. Explanation of how the product benefits the Utility in terms of prolonged service life, reduced maintenance, reduced life-cycle cost and other relevant aspects.

11. Quality control program covering manufacturing or fabricating of the product.

B. If the submittal is acceptable, the chairperson shall submit it for consideration to the committee. Products may be requested for testing or field evaluation. Field evaluation for up to one (1) year may be required to assess performance.

C. Following review of the submittals the committee may request a presentation by the manufacturer at a regularly scheduled or special committee meeting to demonstrate the product or provide additional information.

D. Procedures for testing or evaluation shall be as agreed upon between the supplier and the Standards Committee. Results will become a part of the product file and will be made available to the supplier upon request.

E. When products are evaluated in a construction or CIP project, the location and installation details shall be recorded in the inspection record and filed with the Utility. In addition, the installation shall be cross-referenced on all as-built plans, profiles, quad maps and other Utility maintained maps.

F. A database listing all testing locations, time of test and results shall be compiled and periodically updated. From this information, the Standards Committee will recommend approval or disapproval of the products.

G. A majority vote is required to accept any new product. The Utility will advise the applicant of the Standards Committee's decision regarding the product.

H. The newly accepted product will be added to the appropriate Standard Products List (SPL).

I. Problems regarding accepted products shall be submitted to the standards committee for review. Such review may lead to a recommendation to rescind approval. The Utility shall inform the product manufacturer of the reasons for removal from the SPL.

2.4.3. Product Review

Each SPL will be reviewed at least every five (5) years (Every two (2) years for new or unproven products). Products will be under constant evaluation as they are used in the water, reclaimed water, and wastewater systems.

2.5.0. CONSTRUCTION PLAN INFORMATION AND SUBMITTAL REQUIREMENTS

2.5.1. General

A. Construction plans for water, reclaimed water, and wastewater service shall be submitted to the Austin Water Utility's Pipeline Engineering Division for verification of conformance to the City of Austin Standards and Specifications. The Pre-Construction Meeting must occur within two (2) years of the date of AWU plan approval, otherwise they must be resubmitted to the Austin Water Utility review team to ensure compliance with any changes in requirements related to health and safety.

B. If the provider of service is a Municipal Utility District (MUD), Water Control and Improvement District (WCID) or private utility corporation, then prior approval by the provider of service is also required.

C. Plans submitted to the Austin Water Utility must show approved easements and/or permits on highway and/or railroad crossings.

D. A Development Permit must be obtained from the Planning and Development Review Department prior to final plan approval.

E. Plans that include fire lines must have approval by the City of Austin Fire Department and the Planning and Development Review Department.

F. All water, reclaimed water, and wastewater plans will include the following items:

1. Engineer's dated signature and seal of a Professional Engineer licensed in the State of Texas on each plan sheet.

2. Date of Plans and revisions.

3. 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'. 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. The minimum size for plan and profile sheets shall be 22" x 34".

4. A general location map, showing MAPSCO and grid numbers.

5. Current standard City of Austin Water and Wastewater construction notes.

6. Indicate on the cover sheet, the subdivision file number, include a copy of the service extension form, and show all required permit numbers such as development permit, Texas Department of Transportation permit, railroad crossing permit, etc.

7. Volume and page number of recorded easement and of any temporary working space.

8. For sites and subdivisions, show GIS numbers of all existing mains and appurtences. For City-funded, City-reimbursed, and City-cost-participation projects, show GIS numbers for all existing and proposed mains and appurtenances.

9. Size, pipe material, and location of main with respect to easements and rights-of way. Mains 24 inches and larger shall be shown by double lines indicating pipe outside diameter.

10. Property lines and dimensions, legal description, lot and block numbers, right-of-way dimensions, and curb and sidewalk locations and street names.

11. Location, size, and material of all existing water, reclaimed water, and wastewater mains, lines and services. The direction of flow in the wastewater mains shall be indicated on the drawings.

12. Location, size, and description of other existing and proposed utilities within the limits of construction.

13. Curve data for roads, property lines, water, and reclaimed water lines.

14. Final plat recording or land status report.

15. Street address for all existing structures shall be shown on the lot(s) where the structures are located.

16. Pressure zone designation for subject tract and zone boundaries where applicable.

17. Where water, wastewater, and/or reclaimed water mains cross each other, details shall be shown to indicate compliance with TCEQ requirements.

G. Final plan approval may require additional authorizations such as:

1. Texas Department of Transportation permit.

2. Railroad permit.

3. 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. Texas Department of Health approval.

9. Texas Commission on Environmental Quality.

10. Non-occupancy letter.

11. Service Extension approval.

12. Planning and Development Review Department approvals.

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 service extension number.

3. Station numbers for 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 and grade breaks.

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, and backflow preventers shall be identified.

7. One hundred year flood plain limits shall be shown.

8. A reference noting the field book notes for the original survey shall be shown.

9. Proposed and affected existing mains shall be labeled with design velocities at maximum day plus fire flow and at peak hour flow.

10. Calculated design pressure at highest and lowest lot served shall be shown.

11. Location (beginning and ending station numbers) and type of thrust restraint shall be shown on the plan view.

12. Retaining walls, including geogrid, straps, tiebacks and all other components shall be shown.

13. Culverts, bridges, and other drainage structures shall be shown.

14. Fire hydrants, located so as not to conflict with ADA features, traffic signal foundations, sign supports, and other surface features.

15. Geotechnical borings shall be shown. (required for City funded projects only)

16. Auxillary water sources, if any, shall be shown.

B. A profile drawing shall be provided for all water mains twelve (12) inches in diameter and larger showing 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 “Dl. 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. (required for City funded projects only)

10. Locations by station of restrained pipe, indicating type of restraint.

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.

2.5.3. Wastewater System Plans

A. All plan view drawings shall include all applicable items listed in the General Requirements mentioned 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 the service extension number.

3. The location, alignment and structural features of the wastewater main, including manholes and concrete retards, if applicable.

4. Station numbers and GIS numbers for beginning points, ending points, manholes, clean-outs and other appurtenances.

5. Details of all required appurtenances.

6. Location of all existing and proposed wastewater services, mains and manholes.

7. One hundred year flood plain limits.

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. Locations of geotechnical borings. (required for City funded projects only)

12. Locations of bolted manhole covers.

B. A profile view shall be provided for all wastewater mains and shall include all applicable items listed in the general requirements above plus the following items:

1. The existing ground profile and proposed street finish grade or 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 “Dl 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. (required for City funded projects only)

13. Beginning and ending stations for encasement.

(NOTE: AWU plan Approval shall expire three years from the date of current approval. If construction has not begun on the facility within three years of the approval date, Plans must be resubmitted for approval and must include all criteria in effect at the time resubmitted.)

2.6.0. CONSTRUCTION INSPECTION AND CITY ACCEPTANCE

2.6.1. Construction Inspection Procedure for all projects except CIPs.

To have a City of Austin inspector assigned to a project, the following items must be submitted to the appropriate inspection office. The appropriate contact person will be able to answer any questions regarding the following information:

A. Ten (10) sets of signed Plans are required. Also required are two (2) copies of signed contracts (lump sum contracts should include water and wastewater quantities on a developer's or consulting engineer's letterhead), four (4) sets of cut sheets with one (1) copy of field notes and two (2) copies of any permits listed on the front of the plans. The engineering review and inspection fees, if applicable, will be determined at that time and payment must be made prior to beginning of construction.

B. One (1) copy of the bid tabulation (if the project is bid out) will be required with the above listed items for all service extensions submitted for construction. All of these required items must be submitted at the same time. For reviews occurring during the construction phase, seven (7) copies of the revised plans are required.

C. To set up a Pre-Construction Conference, contact the Planning and Development Review Department (PDR) (Inspection Office) or the Austin Water Utility (Taps Office), at the phone number indicated on the plans.

D. Five copies of the signed plans and a contract must be submitted to the appropriate office at least three (3) working days before the Pre-Construction Conference. Please include the name and phone number of the contact person listed above.

E. The contractor shall call the One Call Center for information on existing buried utilities.

2.6.2. City Acceptance

To obtain final City acceptance of a project, final quantities, as-constructed drawings, construction summary form, required maintenance bonds, and cost information, along with the consulting engineer's concurrence for acceptance form, must be submitted. By ordinance all subdivisions and site plans receiving approval by the Planning Commission after January 20, 1991 are charged an engineering review and construction inspection fee. Any outstanding fees, based on final cost figures, must be paid prior to final acceptance.

If landscaping and vegetation items are outstanding, a conditional acceptance letter may be issued. This allows for the release of letter of credit requirement for the majority of the water and wastewater related work that has been satisfactorily completed. When all work is completed and all necessary information is provided, a final acceptance letter will be issued.

If the project includes a lift station, the lift station will be considered separately for operation and maintenance acceptance. (Refer to Section 2.7.3)

2.6.3 As-constructed Drawings

The project design engineer shall submit as-constructed drawings to the AWU showing all corrections and modifications to the originally approved drawings. As-constructed drawings for water, reclaimed water, and wastewater construction shall consist of a complete set of drawings.

2.7.0. LIFT STATION REVIEW, APPROVAL AND ACCEPTANCE

2.7.1. Engineering Report, Plans and Specifications Review and Approval

(NOTE: Lift station plan Approval shall expire one (1) year from the date of approval. If construction has not begun on the facility within one year of the approval date, plans must be resubmitted for approval and must include all criteria in effect at the time resubmitted.)

A. Prior to design, four (4) copies of a detailed engineering report shall be submitted to the Austin Water Utility 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 economically feasible and that the number of lift stations has been minimized. This justification must include a cost benefit analysis of gravity versus lift station project including 30 years of operation and maintenance of the proposed system.

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 it is in and the location of the nearest existing wastewater interceptor within that basin.

3. Engineering calculations and data described in Sections 2.9.3.A and 2.9.3.H shall be contained in the engineering report.

4. The Engineering Report shall be approved by the Utility prior to beginning preparation of the plans and specifications.

B. Prior to construction, four (4) complete sets of the plans and specifications shall be submitted to the Austin Water Utility for review and approval. These plans and specifications shall be prepared, sealed, signed and dated by a Registered Professional Engineer licensed to practice in Texas and shall be in compliance with the approved Engineering Report. 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 Austin extra territorial jurisdiction (ETJ), submitted for review and approval, must demonstrate compliance with current Austin Water Utility Design Criteria and standard lift station specifications. Approval of the lift station plans and specification does not imply the Austin Water Utility will accept the lift station for operation and maintenance (Refer to 2.7.3).

1. Within the Water and Wastewater Impact Fee Service Area the following type 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 Utility prefers wet/dry well type installation. 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/dry well installations. The cost comparison should include initial station costs, pump replacement costs, installation costs and all operational and maintenance cost including energy costs over the life of the station. The comparison should assume a typical service life for submersible pumps.

2. Within the City of Austin extra territorial jurisdiction (ETJ) but outside the Austin Water Utility Impact Fee 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.

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 Facility Engineering Division of the Utility. These submittals shall contain complete detailed information and drawings for all lift station equipment and components.

2.7.3. City Operation and Maintenance Acceptance

The City of Austin may accept a lift station with a firm pumping capacity greater than 25 gpm for operation and maintenance provided the following conditions are met:

A. The station is located within the City's approved wastewater service area and impact fee area.

B. The Austin Water Utility has inspected the lift station and determined that it is constructed in conformance to the City's requirements. Any lift station not conforming to Utility standards shall be upgraded to Utility standards before the City of Austin will accept the lift stations for operation and maintenance.

C. The owner or his representative has provided all information requested in Sections 2.7.1 and 2.7.2 above, five (5) complete sets of all Operations and Maintenance Manuals for all equipment installed, and has received the Utility's approval.

D. The owner has granted the City a wastewater easement for the lift station and access road. A copy of the recorded easement plat, legal description and any other legal documents granting the easement shall be delivered to the Austin Water Utility. 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.

If the lift station is to become a permanent installation, transfer of ownership and title to the land may be required by the Director of the Austin Water Utility prior to acceptance of the station for operation and maintenance.

E. A letter of assignment has been written to the City from the owner transferring title of the lift station and

related equipment to the City of Austin. This letter shall be delivered to the Austin Water Utility before acceptance of the lift station for operation and maintenance. The original owner may regain title to a temporary lift station that was designed and constructed entirely at his expense and for which no refund was made by the City. After written notification by the City that the lift station has been abandoned, the original owner has one (1) month to notify the City in writing of his intent to regain title to the lift station.

F. One (1) complete set of reproducible Mylar of the as-built drawings and a copy of the file on disk(s) in electronic format as specified by Facility Engineering shall also be provided to the Austin Water Utility prior to acceptance of the lift station for operation and maintenance.

2.8.0. 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 applicable AWU requirements. Abandonment shall be considered permanent. Temporary abandonment must be approved on a case-by-case basis.

2.8.1. Wastewater Mains and Services

Abandonment of wastewater mains in private easements shall consist of filling the main with a pumpable 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.

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.

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 re-vegetated. The Lift Station Maintenance Group shall be notified prior to abandonment.

2.8.4. Water Mains and Services

All water service lines (including fire lines) that are being abandoned and not transferred to a new distribution line should be disconnected at the corporation stop and all other valves and appurtenances, including the water meter, removed. The drawings shall include a note requiring notification of AWU for meter removal.

2.8.5. Reclaimed Water Mains and Services

All reclaimed water service lines that are being abandoned and not transferred to a new distribution main shall be disconnected at the corporation stop. All other valves and appurtenances, including the water meter, shall be removed. The drawings shall include a note requiring notification of AWU for meter removal.

2.9.0. DESIGN REQUIREMENTS FOR WATER, RECLAIMED WATER, AND WASTEWATER SYSTEMS

2.9.1. Introduction

These guidelines are intended to establish the minimum basic design requirements for water, reclaimed water, and wastewater systems within the Full Purpose and Limited Purpose Jurisdiction of the City of Austin 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 Austin. 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 Austin Standard Specifications. All projects are required to be built in accordance with these City of Austin Standard Specifications, which include other requirements not

addressed here. All variations are subject to the approval of the Austin Water Utility. Additional requirements for specific projects may be established where the conditions of service to the tract and related system operation and maintenance needs warrant.

The following information is provided to assist engineers and the general public in the design and construction of water and wastewater facilities within the City of Austin Extra Territorial Jurisdiction. All drawings for such facilities shall be prepared by or under the supervision of 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 and regulations.

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

A. Design Criteria for Domestic Wastwater Systems - Texas Commission on Environmental Quality. (TCEQ)

B. Rules and Regulations for Public Water Systems - TCEQ.

C. The Code of the City of Austin.

D. City of Austin Standard Specifications.

E. The Austin Utility Location and Coordination Committee Policies.

F. The City of Austin Water, Reclaimed Water, and Wastewater Criteria.

G. Use of Reclaimed Water – TCEQ.

2.9.2. Water Systems

A. Size/Capacity Determination

1. General

a. Hazen Williams Friction Coefficient C = 80, higher C coefficient may be used for new mains only upon approval by the City with sufficient documentation to show effects of long-term use.

b. Average day demand = 200 gal/person/day.

c. Peak day demand = 530 gal/person/day.

d. Peak hour demand = 900 gal/person/day.

e. Maximum static pressure - 110 psi (fire hydrants will have attached PRV where pressure exceeds 150 psi).

f. If the maximum static pressure exceeds 80 psi, a pressure-reducing valve (PRV) will be required on the property owner's side of the water meter and should be shown on the plan view.

g. Minimum operating pressure is 50 psi at the highest elevation meter location using average day demand.

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.

3. Emergency Demand (Fire Flow) Requirements

a. The maximum allowable velocity shall not exceed 10 fps.

b. Fire flow (reference City of Austin Fire Protection Manual) requirements will be determined in accordance with the City of Austin Fire Code and associated rules.

c. 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.

4. Sizing of Water Mains - 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.

5. Storage Requirements - If it is determined by the Austin Water Utility that additional storage is required, the following criteria shall be used:

Effective Storage = 100 gal/person

Emergency Storage	=	100 gal/person
TOTAL STORAGE	=	200 gal/person

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 Engineer may be required to provide computer simulations as determined on a case-by-case basis.

B. Mains

1. Minimum main size shall be 8 inches with consideration for 4-inch pipe in cul-de-sacs less than 200 feet in length. Provision must be made in these cases for a flush valve at the end of the 4" line. 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. Looped systems are required for service reliability. Transmission line sizes will be determined on a case-by-case basis.

2. Water mains should be located, where maintenance can be accomplished with the least interference with traffic, structures, and other utilities.

The separation between water and wastewater mains must comply with TCEQ rules or have a variance approved by TCEQ before submittal to the City.

Mains should normally be located on the high side of the street. However, mains shall be installed on both sides of all divided road/highways. Roads/highways, where opposing lanes of traffic are separated by a vehicle obstruction, shall be considered a divided road/highway. The following locations may be considered as standard assignments:

Right -of-Way	Assignment
50 to 60 feet	14.5 feet from ROW
70 to 80 feet	17.5 feet from ROW
90 to 120 feet	22.5 feet from ROW

In major collector and arterial roadways, mains should be located outside the pavement, curbs, etc., wherever feasible. When mains are located outside of the right-of-way, they shall be within a dedicated utility easement. Main assignments in such city streets must be approved by the Austin Utility Location and Coordination Committee assignments for lines in such county roads must also be approved by the county engineer.

3. Piping materials and appurtenances shall conform to City of Austin Standard Specifications and the Utility's Standard Products List (SPL).

4. Minimum depth of cover over the uppermost projection of the pipe and all appurtenances shall be as follows:

a. Water piping installed in undisturbed ground in easements of undeveloped areas, which are not within existing or planned streets, roads, or other traffic areas, shall be laid with at least 36 inches of cover.

b. Water piping installed in existing streets, roads, or other traffic areas shall be laid with at least 48 inches of cover below finished grade.

c. Unless approved by the Austin Water Utility, installation of water piping in proposed new streets will not be permitted until paving and drainage plans have been approved and the roadway traffic areas excavated to the specified or standard paving subgrade, with all parkways and sidewalk areas graded according to any applicable provisions of the drainage plans or sloped upward from the curb line to the right of way at minimum slope of ¼ inch per foot. Piping and appurtenances installed in such proposed streets shall be laid with at least 36 inches of cover below the actual subgrade. The maximum depth will be as approved by the Utility for the specific materials, application, and conditions.

5. For mains 16 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 inside the property line, but accessible for inspection by City personnel. All unmetered fire lines shall have a Utility approved flow detection device. This flow detection service 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. On water mains 16 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 valve locations. Air/vacuum and vacuum release valves shall be approved on a case-by-case basis.

8. Joint restraint for pipes larger than 16 inch diameter shall be by use of integral, factory joint restraint systems, or by restraint gaskets.

9. Joint restraint shall be provided for all pipe bends and where necessary when joint deflection is utilized. 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. Concrete thrust blocking may be approved on a case by case basis. The proximity of other utilities and structures must be taken into account when specifying the use of thrust blocking. The use of thrust blocks will be prohibited in the downtown area (Loop 1 to I35 and Lady Bird Lake to 30th Street) due to the congestion of utilities, structures and excavations in the right of way.

10. Allowable pipe sizes.

The following sizes will be the only sizes allowed for use in the system: (4"see item 1. above), (6" fire-hydrant leads and services only), 8", 12", 16", 24", 30", 36", and 42". Larger sizes may be approved on a case by case basis.

C. Valves

1. There shall be a valve on each fire hydrant lead restrained to the main. 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 be valved at intervals not to exceed 2,000 ft.

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 mains twelve (12) and smaller, valves at intersections shall be placed at point of curvature (p.c.) of the curb line.

6. Valves shall be located so that isolating any segment of water main requires closing of no more than three (3) valves.

7. Double disc gate valves may be used at other locations where, in the judgment of the Design Engineer, complete shut out is critical.

8. The operating nut or extension of any valve shall be between eighteen (18) inches and twenty-four (24) inches below finished grade.

9. Valves with valve extensions and those at pressure zone boundaries shall be equipped with a locking type debris cap.

10. All horizontal gate valves larger than sixteen (16) inches shall have the operating bonnet located in a vault.

11. Valves having "push on" joints are not permitted for fire hydrant leads and laterals.

12. Butterfly valves shall not be allowed.

13. Water mains shall be designed so that valves can be installed vertically.

D. Fire Hydrants

1. 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.

2. Hydrants shall be installed on both sides of all divided road/highways. Roads/highways where opposing lanes of traffic are separated by a vehicle obstruction shall be considered a divided road/highway.

3. For dead-end mains with no fire hydrant, an acceptable flushing device shall be required.

4. The entire fire hydrant assembly shall have restrained joints.

5. 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.

6. Fire hydrants shall be designed so as not to interfere with sidewalk ramps, trash receptacles, and

street light and signal pole foundations.

E. Services

1. Water services shall be in accordance with City of Austin Standard Details. More than two meters on a single service line will be considered on a case-by-case basis.

2. Individual meter services will not be taken from transmission lines. Transmission lines are generally considered to be 24 inches in diameter or larger. Exceptions must be approved by Pipeline Engineering at time of plan submittal. The Engineer shall submit a letter with this request.

3. Water meter boxes are not allowed in sidewalks or driveways.

F. Water Meters for Multi-Family and Commercial Customers

1. Each unit in a duplex, triplex, or four-plex, shall be provided with an individual water meter.

2. Separate meters shall be used for all irrigation, swimming pools, common laundry areas, and all other common areas of each multi-family facility.

3. All commercial or multi-family building of any type that has a site plan area of over 10,000 square feet will purchase and install a separate meter or meters for all irrigation, fountain, swimming pool, and any other outdoor use of water.

4. For all building permits issued on or after January 1, 2003, all multi-family, manufactured home rental community, or multiple-use facility shall provide for the measurement of the quantity of water, if any, consumed by the occupants of each unit through the installation of:

a. Submeters, owned by the property owner or manager, for each dwelling unit or rental unit.

b. Individual meters for each dwelling unit or rental unit.

G. Easements

Easements for water mains shall be a minimum of 15 feet wide, 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 AWU, that maintenance activities will not be hindered by the reduced width.

2.9.3. Reclaimed Water Systems

A. 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 the affected pressure zone must 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 provided by the water system.

4. Plans shall include a detail of a reclaimed water identification sign. Plans shall show the posting locations for the sign.

B. 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 are: 6, 8, 12, 16, 24, 30, 36, 42, and 48 inches. A 4 inch pipe size shall be considered for mains less than 200 feet in length.

2. 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.

4. The separation of reclaimed mains from water and wastewater mains must comply with TCEQ rules. In major collector and arterial roadways, mains should be located outside the pavement, curbs, etc., wherever feasible. When mains are located outside of the right-of-way, they shall be within a dedicated utility easement. Main assignments in such city streets must be approved by the Utility Location and Coordination Committee assignments for lines in such county roads must also be approved by the county engineer.

5. Piping materials and appurtenances shall conform to City of Austin Standard Specifications, Standard Details, and the Utility's Standard Products List (SPL).

6. Minimum depth of cover over the uppermost projection of the pipe and all appurtenances shall comply with City of Austin Standard Details; maximum depth will be as approved by the Utility for the specific materials, application and conditions.

7. For mains of 16 inches and larger, drain valves shall be placed at low points.

8. On water mains 16 inches in diameter and larger, automatic air release valves will be placed at all high points and at the down-slope side of all valve locations. Air/vacuum and vacuum release valves shall be approved on a case-by-case basis.

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.

C. 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 be valved at intervals not to exceed 2,000 ft.

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 mains twelve (12) and smaller, valves at intersections shall be placed at point of curvature (p.c.) of the curb line.

6. Valves shall be located so that isolating any main intersection requires closing of no more than three (3) valves.

7. Double disc gate valves may be used at other locations where, in the judgment of the Design Engineer, complete shut out is critical.

8. The operating nut or extension of any valve shall be between eighteen (18) inches and twenty-four (24) inches below finished grade.

9. Valves with valve extensions and those at pressure zone boundaries shall be equipped with a locking type debris cap.

10. All horizontal gate valves larger than sixteen (16) inches shall have the operating bonnet located in a vault.

11. Butterfly valves shall not be allowed.

12. Valve boxes and lids shall be square, with “Reclaimed Water” indicated on the lid.

D. Services

1. Reclaimed water services shall be in accordance with City of Austin 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 meter boxes are not allowed in sidewalks or driveways.

E. Easements

Easements for reclaimed water mains shall be a minimum of 15 feet wide, 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 AWU, that maintenance activities will not be hindered by the reduced width.

2.9.4. Wastewater Systems

A. Determination of Wastewater Flow

1. Residential single-family units shall be assumed to produce an average wastewater flow of 245 gallons/day.

2. Industrial wastewater flows will be evaluated on a case-by-case basis.

3. Inflow/Infiltration.

In sizing sewers, external contributions are accounted for by including 750 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.

The peak dry weather flow is derived from the formula:

$Qpd = [(18+(0.0206 \times F)^{0.5}) / (4+(0.0206 \times F)^{0.5})] \times F$

where: F = 70 gal./person/day x population/1440

= average dry-weather flow in gpm

5. Peak Wet Weather Flow.

The peak wet weather flow is obtained by adding inflow and infiltration to the peak dry weather flow. In designing for an existing facility, flow measurement shall be used in lieu of calculations for the preexisting developed area.

B. 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 City of Austin Standard Details.

2. Design Requirements.

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

a. The main shall be designed such that the Peak Dry Weather Flow shall not exceed 65% of the capacity of the pipe flowing full.

b. The main shall be designed such that the Peak Wet Weather Flow shall not exceed 85% of the capacity of the pipe flowing full.

c. For sewer mains, eighteen (18) inches in diameter or larger, the main shall be designed such that the peak Wet Weather Flow shall not exceed 80% of the capacity of the pipe flowing full.

3. Design Velocities.

The minimum design velocity calculated using the Peak Dry Weather Flow shall not be less than two (2) feet per second (fps). The maximum design velocity calculated using the Peak Wet Weather Flow 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.

4. Minimum Slope.

The minimum allowable slope for eight (8) inches mains within the service area of the City of Austin shall be 0.005 ft./ft (0.5 percent grade).

5. Allowable pipe sizes.

The following sizes will be the only sizes allowed for use in the gravity system: 6” (for services only), 8”, 12”, 15”, 18”, 21”, 24”, 30” 36”, 42”. Larger sizes may be approved on a case by case basis.

C. Design Considerations

1. Materials and Standards.

All materials and appurtenances shall conform to the City of Austin Standard Products List.

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 Austin Standard Details Manual. Alternative assignments must be approved by Pipeline Engineering. Outside the City Limits, the design engineer shall coordinate utility assignments with both the Austin WaterUtility and the appropriate county authority.

4. Separation Distance.

The separation between wastewater mains and other utilities shall be in accordance with the Rules adopted by the Texas Commission on Environmental Quality.

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.

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 with at least 42 inches of cover.

b. Wastewater piping installed in existing streets, roads or other traffic areas shall be laid with at least 66 inches of cover.

c. Wastewater piping installed in proposed streets shall be laid with at least 48 inches of cover below the actual subgrade. The maximum depth shall be as approved by the Utility for the specific material, application, and conditions.

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. (see the Code of the City of Austin, 25-8-361).

D. 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. Manholes shall be placed at the following locations:

a. Intersections of mains.

b. Horizontal alignment changes.

c. Vertical grade changes.

d. Change of pipe size.

e. Change of pipe material.

f. The point of discharge of a force main into a gravity wastewater main.

g. Intersection of service lines to main lines 24 inches and larger.

h. A manhole is required at the point of connection of a building service line to the public wastewater service stub for multi-family projects exceeding fifteen (15) dwelling units and for commercial developments {containing more than 4,000 square feet} requiring a water meter greater than 2".

i. At the upstream end of mains.

j. At other locations as required by Chapter 15-10 (Wastewater Regulations) of the Austin City Code.

2. Spacing.

Manhole spacing for lines smaller than 24 inches should not exceed 500 ft.; for larger mains, spacing may be increased, subject to approval by the Utility.

3. Covers.

All manholes not located in paved areas shall have bolted, watertight covers.

4. Corrosion Prevention.

Manholes shall be constructed of or lined with a 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.

5. All lines into manholes, including drop connections, shall match crown-to-crown where feasible. Any deviation must be approved in advance by Pipeline Engineering.

6. Drop manholes will have a maximum of 8 foot of drop and are not allowed where the main size exceeds 15 inches.

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

	Depth		
Main Size	Less than 20’	20’ – 30’	Greater than 30’
Up to 15”	48”	60”	72”
18”-24”	60”	60”	72”
30” & 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 pipes connect to a manhole, or if two pipes connect to a manhole at an angle other than 180 degrees from each other, larger diameters may be required in order to accommodate mandrel insertion and hydraulically efficient flow.

Note 3: Access to mains 48” and larger shall be by junction boxes designed by a structural engineer.

8. Where a separation of nine feet between a water main and a manhole cannot be achieved, as approved by the Austin Water Utility, the joints in the wastewater manhole shall be made watertight using externally applied joint wraps.

E. Ventilation

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

F. Inverted Siphons

Siphons shall have a minimum of two barrels. The minimum pipe size shall be six (6) inches with a minimum flow velocity of 3.0 fps at peak dry weather flow. The minimum dry weather flow shall be used to size the smallest barrel. Three-barrel siphons shall be designed to carry the capacity of the incoming gravity wastewater mains(s) with one barrel out of service.

An additional corrosion resistant pipe shall be designed to allow for the free flow of air between the inlet and outlet siphon boxes. The diameter of this air jumper shall not be smaller than one-half the diameter of the upstream sewer. Air jumper pipe design shall provide for removal of condensate water that will collect in the pipe.

Siphon inlet and outlet structures shall be manufactured with approved corrosion resistant material and shall

provide for siphon cleaning and maintenance requirements.

G. Service Lines

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. No service connections shall be made to mains larger than 15 inches in diameter.

Usually 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. Wastewater service should be placed four (4) feet on the low (or right, if on a level ground) side of the lot, nine (9) feet from the water service (located on the other side of the lot line). 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 Austin Standard Details.

Wastewater clean-outs are not allowed in sidewalks or driveways.

H. Easements

Easements for wastewater mains shall be a minimum of 15 feet wide, 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 AWU, that maintenance activities will not be hindered by the reduced width.

I. Lift Stations (Excluding low pressure systems)

Lift stations are discouraged and will be allowed only where conventional gravity service is not feasible (Lift Station installation cost plus 30 years O&M expense is less than installation cost for gravity system). This subsection details the specific design criteria for wastewater lift stations proposed for immediate or future City operation and maintenance within the City of Austin or its ETJ. Additional requirements for individual lift stations may be imposed by the Director of the Austin Water Utility or his designee as conditions warrant.

In addition to these criteria, all lift stations must meet the Texas Commission on Environmental Quality Chapter 317.3 rules and the Austin Water Utility Submersible Wastewater Lift Station General Specifications.

1. Flow Development

Calculation of wastewater flow shall be done in accordance with Section 2.9.3.A. The following calculations shall be included.

a. Maximum 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 maximum wet weather flow for its service area

Equation:

(Population of service area x 70 gallons per capita per day (gpcd) x maximum flow peaking factor) + (750 gallons per acre served).

b. Maximum Dry Weather Flow

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

Equation:

(Population of service area) x (70 gpcd) x (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:

(Population of service area) x (70 gpcd)

d. Minimum Dry Weather Flow

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

Equation:

(Population of service area) x (70 gpcd) x (minimum flow peaking factor)

e. A minimum of two (2) pumps 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.

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.	› Min (Minimum Cycle Time in Minutes)
2 to 50	10
51 to 75	15
76 to 250	30
251 to 1500	45

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

$$V = \frac{\text{›q}}{4}$$

Where: q = pump capacity in gpm and ? 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 staging sequence follows:

High-level alarm

Lag pump on

Lead pump on

Lag pump off

Lead pump off

Low-level alarm

The high level alarm shall be at least one 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 lift stations with three pumps or more, the following method for calculating the wet well volume may be used:

$$V = \frac{\theta \times q_1}{4} \quad \text{and} \quad K = (q_1 - q_2) + q_1$$

$$V2 = V' \times N \times V_1$$

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) then calculate V_2.

f. An example of a three (3) pump starting sequence is as follows:

High-level alarm
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 (T_d) 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) ÷ (i) = time to fill the wet well in minutes

t_e = (v) ÷ (q - i) = 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:

$$NPSH_A = P_B + H_s - P_v - H_{fs}$$

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_{fs} = friction loss in suction in feet.

For lift stations in Austin'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 value are based on the following assumptions: an altitude of 500 feet above sea level, a water temperature of 85ºF and a specific gravity of water of 0.996 at 85ºF.

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 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 ultimate development. During initial development phases, flow velocities may be as low as two and one-half (2.5) feet per second.

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:

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

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

› = Pump cycle time in minutes

$*t_e = \frac{V}{q - i}$

$*t_f = \frac{V}{i}$

i = average dry weather flow in gpm.

*See Section 2.9.3.H.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 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 it's 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.

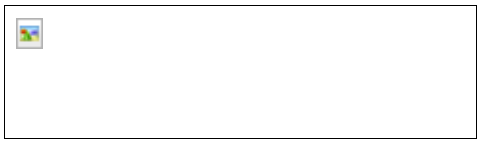
9. Buoyancy Calculations

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.

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



Where:

p = water hammer pressure (psi)

a = pressure wave velocity (ft/s)

w = specific weight of water (62.4 lb/ft^3)

g = acceleration of gravity (32.2 ft/s^2)

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:

$SSS = S\,(Q)^{.5} / (H)^{.75}$

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.

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

where: Bhp = brake horsepower (hp)

P = water horsepower (hp)

* Use the most efficient pumps for the application.

c. Calculate the electrical horsepower required

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

where: Ehp = electrical horsepower (hp)

Bhp = brake horsepower (hp)

Use the most efficient motors for the application

d. Calculate the power required in kilowatts.

EkW=(Ehp)(0.746 Kw/hp)

e. Calculate daily power consumption in kilowatt-hours.

$E = [(EKW_1)(t_1) + (EKW_2)(t_2) + (E\,KW_3)(t_3)...]$

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

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

t_n = 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.

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

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 1000 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 1000 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. Looped service from two (2) different substations is adequate backup power. If a back-up electric system is not feasible, a diesel generator may be located on the lift station site instead. Generator shall be equipped with noise and air pollution control devices.

k. Flow monitoring will be provided for all lift stations.

16. Wastewater Lift Station Specifications

In addition to the design criteria presented in this document, the Austin Water Utility has "Wastewater Lift Station General Specifications and Drawings". These documents delineate 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 the Austin Water Utility.

17. Alternate Wastewater Systems

a. General

Low-pressure wastewater systems are discouraged and will be allowed only where conventional gravity service is not possible. For the purpose of these criteria, low-pressure sewer service is defined as private grinder pump facilities or private septic tank effluent pump facilities that do not convert to gravity flow at or prior to the property line. There shall be no more than one grinder pump facility per single family or duplex residential lot. Each grinder pump shall discharge to a gravity flow system. Grinder pump facilities for commercial establishments, Public Utility Districts (PUD) or condominiums will be considered on a case-by-case basis.

The distance for each grinder pump from the property line to the gravity main shall not exceed 200 feet.

Flows may be calculated using the Lift Station Design Criteria disregarding the Infiltration/Inflow flow component.

If the above criteria are applicable and a low-pressure wastewater service is necessary, the Austin Water Utility will be responsible for maintaining the portion within the right-of-way only.

Design and installation of the property owner's pumping system, as well as all associated plumbing shall be reviewed, approved and inspected by the City of Austin. The system shall be designed as a complete system including all connections, pumps, etc. for lots being served by the system. If the above criteria are not applicable, refer to Lift Station design criteria.

b. Connection to Gravity Main.

Each grinder pump facility shall be individually tied into a manhole on an existing gravity main. If a manhole does not exist, one shall be constructed. Construction costs and all other associated costs shall be the responsibility of the property owner.

The connection to the gravity main shall be designed to minimize turbulence and the release of hydrogen sulfide. The discharge point shall be at or below the springline of the gravity main.

c. Cleanout and Valve Assemblies.

A cleanout and corrosion resistant eccentric plug valve shall be placed just inside of the right-of-way where City maintenance begins and private maintenance ends. This cleanout will allow the property owner's system to be isolated and the City's portion of the system to be pressurized, flushed or rodded.

Cleanouts and corrosion resistant eccentric plug valves shall also be installed at bends of 45 degrees and greater.

Refer to applicable standard Detail(s) in the City of Austin Standards Manual.

d. Separation Requirements.

The separation between low-pressure sewer lines and waterlines shall comply with City of Austin Standard Specifications and all other applicable rules and regulations.

e. Grinder Pump System General Specifications and Drawings.

In addition to the design criteria presented in this document, the Austin Water Utility maintains 'Grinder Pump System General Specifications and Drawings." These documents delineate minimum City requirements as they relate to the construction and installation of grinder pump systems. Copies of these documents are available and can be obtained from Austin Water Utility.

2.9.5. Requirements for Geotechnical Investigations for Pipeline Projects

A. General

1. This section applies only to water, wastewater, and reclaimed water pipeline projects with construction funded by the City of Austin. 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.

B. 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.

C. 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 2.9.5.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 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.

D. 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.

E. 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.

F. 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 K_{bu}, K_{dr}, Q_{ca} 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 2.9.5.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 2.9.5.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 2.9.5.F.8.b.

10. Prepare reports as directed by the Water Utility for projects that are a combination of open cut excavation and tunneling or trenchless methods.

G. 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.

2.9.6. Exceptions.

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