

CHAPTER 5.2

**RECLAIMED WATER**

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## 5.2 Reclaimed Water System Design

### 5.2.1 General Information

#### A. Introduction

This document provides guidance and minimum design criteria for the modification and construction of reclaimed water systems within the City of Goodyear. It is intended for use in the planning, design, plan preparation, and construction processes.

Wherever the language of this document refers to equipment or material to be used or the language of a standard refers to an Approved Materials List, the “Reclaimed Water System Approved Materials List” shall be used. The “Flushing and Disinfection Meter Program” and “Water Line Flushing Procedures” documents shall be followed when installing new reclaimed water infrastructure. These documents can be obtained from the City’s Engineering Department or from the City’s website, [www.goodyearaz.gov](http://www.goodyearaz.gov).

#### B. Abbreviations

1. ADEQ - Arizona Department of Environmental Quality
2. ADHS - Arizona Department of Health Services
3. ADWR - Arizona Department of Water Resources
4. ARS - Arizona Revised Statutes
5. ARV - Air Relief Valve
6. MAG - Maricopa Association of Governments
7. PRV - Pressure Relief Valve
8. PVC - Poly Vinyl Chloride
9. RPP - Reduced Pressure Principle
10. USC - University of Southern California
11. VFD - Variable Frequency Drive
12. WPA - Water Planning Area (See City Master Plan)

#### C. City Policies

Proposed developments determined by the City Engineering Department to have a significant impact on the City Reclaimed Water System model shall be analyzed on the City’s computer model and shall amend the City approved Reclaimed Water Master Plan at the Developer’s expense. The effects of peak demand from these developments will be reviewed by the City Engineering Department to verify the sizing and layout of the proposed reclaimed water system elements. This information will also be used to assist the City in planning for current and future developments.

Reclaimed water or, irrigation water (from RID, BID, or private wells) shall be used for dust suppression and control for all construction related uses. Potable water shall not be used for dust suppression and control for construction related uses.

## 5.2.2 Plan Preparation

### A. Reports

#### 1. Preliminary Reclaimed Water Information

- a. Preliminary information regarding the reclaimed water system for a development shall be provided with all General Plan Amendment, Rezone, and PAD applications. The preliminary information provided with these documents shall at a minimum show the location and dimensions of existing and proposed reclaimed water infrastructure including distribution and transmission mains, City reclaimed water zones, reclaimed water storage facilities, etc. Text shall be provided with these documents to provide background to support the proposed infrastructure. When a site is planned to be constructed in phases, a Master Reclaimed Water Report shall be provided with the Rezone or PAD application.

#### 2. Master Reclaimed Water Report

The master reclaimed water report will provide a governing design plan by which all Preliminary and Final Reclaimed Water Reports are supported for each phase of development. The Master Reclaimed Water Report shall be prepared, as directed by the City Engineering Department, in accordance with this manual, and shall be sealed by a Professional Engineer registered in and licensed to practice in the State of Arizona.

The Master Reclaimed Water Report shall present relevant project information concerning development of the reclaimed water system for the project.

The objective of the report is to provide sufficient information to adequately review the use of a reclaimed water system at a proposed development.

At a minimum the Master Reclaimed Water Report shall address the following:

- a. Design assumptions and computations, demands, pressures and flows, reclaimed water production requirements, cathodic protection requirements, storage facilities serving the site and the adequacy of said storage, connections to the existing system, and rights-of-way or easements that exist or are being proposed.
  - (1). A development's reclaimed water demand requirements shall be calculated according to information shown in Table 5.2-1, Reclaimed Water Average Day Demands.
- b. The Master Reclaimed Water Report will become the basis for a Water, Reclaimed Water and Wastewater Service Agreement between the Developer and the City when such agreement is required by the City. The agreement will specify terms and requirements for water, wastewater, and reclaimed water service to the development. This shall be stated in the introduction to the report.
- c. All development projects shall be responsible for determining their specific reclaimed water system needs. The Master Reclaimed Water Report shall verify that service for proposed developments shall not be provided at the expense of existing customers.
- d. Computer Reclaimed Water Models
  - (1). A reclaimed water model demonstrating that system pressures do not exceed the maximum nor fall below the minimum operating levels, as identified in this chapter, will be required in each reclaimed water report.
  - (2). The reclaimed water model shall verify that minimum pressures are available within the development during the Maximum Day demand scenario.
  - (3). The reclaimed water model shall be provided to the City electronically for purposes of updating the City's Water Model.

- (4). If the proposed development will significantly change the land use identified in the City's Reclaimed Water Master Plan or proposes a reclaimed water system that differs from the City's requirements, then the developer shall be financially responsible to have the City's Reclaimed Water Master Plan updated to address the changes.
- (5). All model data shall include the following:
  - i. Average Day Demand scenario - based on information in Table 5.2-1.
  - ii. Maximum Day Demand scenario – 1.8 times the Average Day Demand
  - iii. See the pressure requirements section of this chapter for minimum pressure design requirements.
  - iv. Pipeline calculations verifying that head loss per 1,000 feet of any pipe is no greater than 10 feet/feet during peak period demand conditions and not more than 8 feet/feet under any maximum day condition.
  - v. A data CD containing all electronic calculations shall be submitted along with the master reclaimed water report.
- e. Each Master Reclaimed Water Plan shall show the following information:
  - (1). All existing and proposed on-site and off-site facilities including, but not limited to transmission and distribution mains, storage facilities, and booster pumps.
  - (2). Proposed street locations, parcel boundaries, and proposed lots within each parcel.
  - (3). Contour lines showing the elevation of the land surface shall be at 5 or 10 foot intervals. Sufficient information shall be provided to allow the evaluation of network node elevations.
  - (4). All reclaimed water pressure zone boundaries.

- (5). The scale of all maps shall be sufficient to show all required information clearly.
  - f. The Master Reclaimed Water Report shall comply with all other requirements identified as being necessary for the functioning of the City's reclaimed water system in the area as determined by the City Engineering and Public Works & Water Resources Departments.
  - g. More specific information regarding master reclaimed water report requirements and the City's requirements for a specific area can be obtained by contacting the City's Engineering Department.
3. Preliminary Reclaimed Water Reports
  - a. Preliminary Reclaimed Water Reports shall be provided along with all site plans, preliminary plats or other applications which do not require a Master Reclaimed Water Report.
  - b. When a Master Reclaimed Water Report has previously been approved by the City for a master planned development and a phase of the master development is submitted for Site Plan or Preliminary Plat Approval, a Preliminary Reclaimed Water Report specific to that phase shall be provided to the City.
    - (1). The Preliminary Reclaimed Water Report shall be created using the same criteria as identified for a master reclaimed water report.
4. Final Reclaimed Water Reports
  - a. Either a Master Reclaimed Water Report or a Preliminary Reclaimed Water Report shall be used as the basis for a Final Reclaimed Water Report.
  - b. The Final Reclaimed Water Report shall finalize all calculations and modeling information provided in the Master or Preliminary Reclaimed Water Report.
  - c. The Design Engineer shall have a flow test performed by a private company who will certify the results in writing to the City. The pressures determined in the Master or Preliminary Reclaimed Water Report shall be revised per this flow test information and shown in the Final

Reclaimed Water Report. A copy of the flow test shall be provided to the City Engineering Department and Environmental Services division for their records.

- d. If a certified flow test(s) performed on the existing system to which the project will be connected does not confirm that sufficient capacity exists, the final report's reclaimed water model shall be used to determine the required on-site and off-site facilities such as pump stations and pipeline diameters necessary to serve the project.

#### B. Site Plan and Preliminary Plat Requirements

All site plans and preliminary plats shall show and label the following:

1. All existing improvements shall be shown in dashed and screened back line types. Existing improvements such as reclaimed water lines (with line size and line material type clearly labeled), storage reservoirs, booster pump station sites, and associated transmission mains shall be shown and labeled. It is encouraged that a separate plan sheet be provided to show all of the public wet utilities.
2. All proposed improvements such as reclaimed water lines, storage reservoirs, well sites, and booster pump stations shall be shown in dark lines.
3. The service provider for the area shall be labeled.
4. All existing and proposed reclaimed water line easements shall be shown, labeled, and dimensioned.

#### C. Construction Plan Requirements

1. Reviews and Approvals
  - a. All improvement plans which include work within the City shall be submitted for review and approval by City Staff. Plan review submittals are made to the Engineering Department.
  - b. Maricopa County Department of Environmental Services approval is required prior to City approval.

## 2. Review Guidelines

No permits for public reclaimed water installation will be issued until the Owner/Developer has provided the necessary easements and rights-of-way. The instruments of dedication must be approved by the City and recorded at the Maricopa County Recorder's Office.

The following paragraphs highlight construction plan requirements pertaining to the preparation of reclaimed water improvement plans which are to be submitted to the City for approval.

- a. Plans shall be prepared per the guidelines in Chapter 2 of this manual.
  - b. General Construction Notes and Reclaimed Water Construction Notes which apply to construction of the City of Goodyear's sewer system are required on each set of construction plans which include work on the City's reclaimed water system or a reclaimed water system which is to be dedicated to the City. These notes are provided in the Administrative Chapter of this manual.
3. Reclaimed water line stationing shall be along the center line of the pipe.
  4. Concrete encasement shall be shown in both plan and profile. The beginning and ending stations of the encasement shall be called out.
  5. If a line is to be connected to an existing system, the following note shall be placed on the plans: "Contractor shall verify the location of the existing reclaimed water line before proceeding with trenching."
  6. The end invert elevation shall be shown on all proposed reclaimed water main stubs (profile required for lines larger than 12 inches).
  7. Where reclaimed water lines cross sewer lines, storm drains, water lines or drainage culverts, the relationship shall be shown in both plan and profile and actual separations shall be called out.
  8. Quantities for all items of work within public rights-of-way and public easements shall be included on the cover sheet of the plans.

9. The drawings shall show all utility locations, sizes, material types, easements, rights-of-way, and other structural features of the reclaimed water for current and future building construction.
10. Private reclaimed water lines shall be noted as such on plans. The responsibility for operation and maintenance should also be called out.
11. Easements of record shall be noted and shown in plan view including docket and page numbers and / or the Maricopa County Recorder’s number.
12. There are additional requirements for the preparation of improvement plans in the City. The additional requirements are presented in Chapter 2 of this manual.
13. A separate construction schedule in table format shall be provided to the City for all reclaimed water related construction required to serve a development, prior to issuance of the reclaimed water construction permit.

D. As-Built Drawings

A City approved set of As-Built Drawings are required for all reclaimed water system improvements constructed in the City prior to approval of the construction and start of the 2 year warranty period. As-built plans shall be signed and sealed by a qualified professional registered in the State of Arizona. See Chapter 10 of this manual for applicable As-Built standards.

TABLE 5.2-1 – Reclaimed Water Average Day Demands

USE	Average Day (gpd/ac)	Maximum Day Multiplier
Parks & Schools	4,500	1.8
Golf Courses	6,000	
Lakes	5,800	
Low Water Use Irrigation	1,700	

### 5.2.3 Reclaimed Water Production System

#### A. Construction of Reclaimed Water Production Facilities

Facilities constructed for reclaimed water production and treatment that are to be dedicated to the City shall be designed and built as approved by the City Engineering department and Environmental Services division.

##### 1. Reclaimed Water Production Facilities

All reclaimed water facilities must include the following:

- a. All electrical equipment must be air conditioned.
- b. A security system in place which includes video surveillance.
- c. Security at the facility shall be provided by constructing a minimum eight foot block fence with two feet of wrought iron picket extension located at the top of the wall.
- d. The facility shall have an automatic rolling entry gate and an access door with automated key pad for access into the facility. A knock box is required for Fire Department access per City Standard Details.
- e. Valves eight inches in diameter and greater shall have a motorized operator device to open and close and shall interface with SCADA.
- f. Security cameras and an alarm system shall be provided to monitor all access areas in and around the storage tanks or booster pump station. These include, but are not limited to the following: the reservoir tank area, reservoir top hatch tank entry, wellhead area, well master control cabinets and booster pumps. They also must interface with SCADA.
- g. All valves shall be epoxy coated valves.
- h. Gate valves shall be resilient wedge valves

#### B. Reservoirs

1. Reservoirs shall provide storage for developments in which the pressure in the reclaimed water system is not sufficient to serve a development.

2. The developer shall be responsible for upgrading the City's reclaimed water reservoir system to provide for demands of development.
3. The capacity of new reservoirs shall be rounded up to the nearest 0.25 million gallons when being designed.
4. All tanks and reservoirs shall have level indicators that are clearly visible 24 hours a day from the outside. Level indicators shall read in feet and tenths of foot increments.
5. Retention basins around reservoirs shall be large enough to accept 1-1/2 times the maximum storage capacity.
6. Reservoirs shall be installed on a minimum 3.5-acre parcel. Parcel sizes will be reviewed and approved by the Public Works and Engineering departments. The dedicated land shall be accessible from a public street right-of-way or through a dedicated access easement of 23 foot minimum width.
7. All reservoirs shall be constructed with a concrete base ring.
8. Reservoir tank levels shall interface with SCADA.
9. The tops of all reservoirs shall have a safety railing installed three feet in height surrounding the entire radius of the tank.
10. Reservoir vent structures shall be double contained; disassembly of the vent cover must be possible from the interior of the reservoir only.
11. All reservoirs shall have a dedicated inlet and outlet piping structure.
12. Reservoirs shall be constructed of either steel welded, or pre-stressed concrete (DYK) and shall follow American Water Works Association standards.
13. The height of the tank shall not exceed 12 feet from the street final grade in residential and commercial areas unless otherwise approved by the City Engineer.
14. All steel welded constructed reservoirs shall include a cathodic protection system in order to protect the interior floor and tank walls coating. The cathodic system shall be installed from the roof structure.

15. Reservoir interior tank coating shall be a two part epoxy process. Prime and finished coat shall have a minimum of 16 mils and must comply with SSPC-SP No. 10. All work must be inspected by a NACE certified inspector.
16. Reservoir exterior finish shall be Devoe 6579 Gloss DTM buff finish, consisting of two coats application and meet the SSPC-SP2, SP3 cleaning methods. All work must be inspected by a NACE certified inspector.
17. All above ground piping and reservoir appurtenances shall have a purple exterior finish.
18. A 48" diameter manhole entry way shall be provided at opposite sides of the reservoir.
19. A reservoir tank draining system shall be provided for the purpose of draining and cleaning of the interior. This draining system shall consist of a center floor drain located in the interior of the tank. The tank floor shall be sloped in a direction that allows the water within the tank to flow downward and outward to a collection basin that contains additional piping to remove the flow away from the reservoir to the retention area.
20. Valves eight-inches and larger shall have a motorized operator to open and close the valve. The actuator shall interface with SCADA.
21. All tanks and reservoirs shall be subject to an inspection of the interior at the 11 month warranty inspection. The expense of this inspection shall be included in the construction cost for the tank or reservoir.

#### C. On-site Storage Facilities

1. Where on-site storage facilities such as lakes and ponds are approved for storage of reclaimed water within a development, the home owners association (HOA) or property owners association (POA) shall retain ownership, care, and maintenance responsibilities for the facility, associated pumping equipment, on-site irrigation system, control of insects, signage, maintenance of pedestrian areas, and all other associated improvements.
2. Side slopes of all lake or pond storage facilities that store reclaimed water shall be a maximum of 10:1 for 20 feet beyond

the proposed high water elevation along areas where pedestrian access is encouraged. All other side slopes within 20 feet of the proposed high water elevation shall be a maximum of 6:1. All other slopes within the on-site storage facility shall be no greater than 4:1. A maximum 1.5 foot vertical drop may be constructed at the proposed high water elevation if desired. Side slopes beyond the 1.5 foot drop will adhere to the above mentioned standards. Reclaimed water on-site storage facilities shall have depths no greater than 18 feet unless otherwise approved by the City Engineering Department.

3. The City of Goodyear will maintain responsibility for maintenance of reclaimed water pipes and associated equipment up to the meter located within an easement typically adjacent to the right-of-way. All lines and equipment beyond the City meter shall be the responsibility of the property owner to maintain.
4. The City of Goodyear will not accept ownership or maintain on-site storage facilities.

#### D. Booster Pump Stations

1. A “Preliminary” or “Basis of Design” report shall be prepared and submitted to the City Engineering department for approval prior to submission of a reclaimed water pump station or upgrade to an existing reclaimed water pump station final design. This report shall outline the type of equipment and controls proposed for the station. A final design report prepared by a Registered Professional Engineer licensed in Arizona shall accompany the pump station design drawings.
2. Reclaimed water booster pumps shall be designed to maintain adequate pressure for reclaimed water supply.
3. Engineers shall coordinate their pump station design with the City Engineering department and Environmental Services division prior to final plan preparation.
4. All pumps shall be designed such that the pumping mechanism is a centrifugal horizontal type pump that is located above ground.
5. All pump station control panels shall be designed and constructed with SCADA.

6. All booster pump station equipment shall conform to the City's current SCADA standards.
7. An hour meter shall be provided for each reclaimed water pump.
8. Reclaimed water pumping stations shall be equipped with water meters which register and totalize in US gallons.

#### 5.2.4 Reclaimed Water Lines

##### A. General Information

The City reclaimed water delivery system has three basic classifications of reclaimed water lines which are determined by use. These classifications are distribution, transmission, and service.

1. All developments shall design and construct reclaimed water transmission lines, distribution lines, services, and associated equipment of appropriate size, material, and location.
  - a. Refer to the City's approved Master Reclaimed Water Plan for the backbone layout of reclaimed water distribution mains. Developments that have frontages along City streets that are designated as having a transmission main shall be responsible for the construction or a financial contribution for future construction of those facilities.
  - b. The use of reclaimed water on all open space areas, rights-of-way, and parks is required by the City of Goodyear. All developments shall design and install infrastructure to accommodate watering vegetation in these areas with a reclaimed water system, where applicable.
  - c. Temporary connections between a newly installed and isolated reclaimed water system and an approved alternate water system may be permitted on a case by case basis as approved by the City Engineering department. At a minimum the following conditions shall be met prior to acceptance of this connection:
    - (1). Existing charged reclaimed water lines are not located nearer than one mile from the nearest main in the proposed reclaimed water system.

- (2). Only one point of connection is proposed.
  - (3). The proposed single point of connection includes a reduced pressure principle backflow prevention device that is painted purple and signed appropriately.
  - (4). The Developer shall provide the City with an in-lieu payment for future abandonment of the connection and the future connection to a City reclaimed water line.
2. The City Engineering Construction Inspector shall be contacted two working days prior to all reclaimed water system shut downs. City approval is required prior to shut downs. The Contractor shall have all materials and equipment necessary to do the work at the job site prior to shutdown. It shall be the Contractor's responsibility to provide all affected reclaimed water customers with a written notice of the proposed shutdown. Such notice shall be given a minimum of one working day in advance.

#### B. Transmission Lines

Transmission lines are located in arterial or collector streets and have line sizes of 12 inches and larger. Transmission mains are typically used to convey reclaimed water between two City reservoirs and generally do not maintain a constant pressure required of the distribution system. Transmission mains shall be located as identified in the City's Reclaimed Water Master Plan.

1. When existing reclaimed water demands or proposed reclaimed water demands are shown to be insufficient to support a development such that in the opinion of the City Engineering department a transmission reclaimed water line is required, a transmission reclaimed water line of a size approved by the City Engineering department and designed by a professional engineer shall be constructed by the developer in conjunction with the construction of the development project.
2. Long, straight reaches of transmission mains shall be marked every 440 feet with a programmable electronic marker ball. . See the Approved Materials List for marker ball models, which are to be programmed by the Contractor. Installation of an electronic marker may be omitted when valve locations permit identification of pipeline location.

3. Design flows for transmission mains shall be based on the current City Reclaimed Water Master Plan or a reclaimed water report approved by the City Engineering Department.
4. All transmission lines shall be C-900 purple PVC pipe. Where ductile iron pipe is required for fittings, crossings, etc. the pipe shall be wrapped in purple poly wrap with the words “Reclaimed Water Line” written on the poly wrapping.
5. Transmission mains shall not have service connections.

#### C. Distribution Lines

Distribution lines are typically 4 inches to 12 inches in size and can be located in arterial, collector, or local streets. However, all lines in an arterial, collector, or local street shall be designed and constructed with the sizes identified in the Reclaimed Water Master Plan or to a diameter sufficient to accommodate the extension of reclaimed water services to areas of development beyond the project as identified by the City’s Reclaimed Water Master Plan.

1. Eight inch diameter pipe shall be the minimum size installed in any arterial street.
2. Distribution mains in arterial street alignments shall be installed as identified in the City’s Reclaimed Water Master Plan or City approved reclaimed water report.
3. All service lines shall be connected to a distribution main
4. See the City’s “Approved Materials List” for materials that have been approved to be installed within the City.
5. Distribution mains shall be constructed in all arterial streets.
6. The flow to a new development shall be calculated to confirm that existing supply is sufficient to meet the proposed development’s need. When additional improvements are required to increase the flow to a development, all improvements necessary, including but not limited to pumping stations, storage facilities, transmission and distribution lines, and appurtenances necessary to provide the flow shall be a part of the design.
7. Four inch diameter pipe shall be the minimum size installed in any collector, residential, or private street or public easement.

8. These are minimum guidelines. The City may require larger sizes, different materials, and varying locations depending on circumstances.
9. All distribution mains shall be C-900 purple PVC pipe.

#### D. Service Connections

A Service connection includes the reclaimed water line from the distribution main to the meter and includes the meter and all connections.

1. Reclaimed Water Services to Commercial and Residential Developments
  - a. All reclaimed water service lines shall be of a material as listed in the Approved Materials List.
  - b. The Developer shall install all 1-inch and 2-inch reclaimed water services in new developments. The minimum service line size shall be 1 inch.
  - c. The Developer is responsible for application and payment of all applicable fees.
  - d. Reclaimed water services maintained by the City shall be installed within a public right-of-way, PUE, or a 20-foot minimum width dedicated reclaimed water line easement.
  - e. All reclaimed water service lines constructed under existing pavement shall be installed by underground boring.
  - f. Reclaimed water service lines maintained by the City shall not be located in parking spaces, driveways, washes, manmade or natural drainage channels, or retention / detention basins.
  - g. Construction plans shall indicate the location of reclaimed water service lines, water services, and sewer taps referenced with stations and dimensions from the street center line or monument line. Location of sewer service and water service relative to the reclaimed water service shall also be shown.
  - h. Reclaimed water services 2 inches or smaller shall be of a material as identified in the City Approved Materials List. Service lines shall have a purple polymer wrapping

with the words “Reclaimed Water” in white letters printed every foot.

- i. All service lines for reclaimed water use shall be a separate dedicated line that is tapped off the reclaimed water main within a public right-of-way, PUE, or reclaimed water line easement.
- j. Branched reclaimed water service line tees are not allowed.
- k. Newly installed reclaimed water services shall not have a compression coupling installed unless the length of the service is a distance longer than that of a full roll of copper.
- l. Services damaged after installation are required to be replaced back to the corporation stop.
- m. The corporation and curb stops shall be of a type and manufacture as identified in the City’s Approved Materials List.

## 2. Reclaimed Water Meters

### a. General Information

Reclaimed water meters to be used shall conform to City Standard Specifications for reclaimed water meters. Information regarding reclaimed water meters may be obtained from the City Environmental Services division. Types of approved reclaimed water meters include:

- (1). Positive Displacement
  - (2). Compound - This unit is designed for uses where most of the flow is low, some intermittent and no more than occasionally high.
  - (3). Turbo - This shall be used where a wide variety of flows can be expected but most are at the high end.
- b. Each building or area requiring a separate reclaimed water bill shall have a separate reclaimed water meter installed.
  - c. There shall only be one reclaimed water meter per service line.

- d. Manifolding, combining, or connecting several smaller reclaimed meters to meet a flow demand that could be provided by a single larger meter is not permitted.
- e. Reclaimed water meters shall be sized and designed in accordance with the requirements of all applicable plumbing code as adopted by the City.
- f. Reclaimed Water Meter Installation

All reclaimed water meters shall be supplied by the City, after all prevailing fees have been paid, all applicable permits have been obtained (federal, state, and local), and all required signage has been posted.

- (1). All  $\frac{3}{4}$ -inch to 2-inch reclaimed water meters shall be installed by City personnel.
- (2). Reclaimed water meters 3 inches to 6 inches shall be installed by the Developer in accordance with City Standard Details and MAG Standard Specification, Section 631. After installation, City personnel will inspect and accept the work if all requirements for installation are met.

- g. Reclaimed Water Meter Locating

- (1). Reclaimed water meters shall be located outside of street improvements but within the right-of-way or adjacent PUE.
- (2). Reclaimed water meters shall not be located in parking lots, driveways, sidewalks, washes, manmade or natural drainage channels, or retention / detention basins.
- (3). Reclaimed water meters shall not be fenced in or enclosed and must be accessible by City personnel at all times.
- (4). If an existing reclaimed water service/meter must be relocated, a contractor may relocate the service a maximum of 10 feet. If the desired relocation is greater than 10 feet, the old service must be severed and shut off at the corporation stop on the main; a new service shall be installed by the contractor. Relocation of reclaimed water service lines shall be

done so by shutting off and severing the line at the corporation stop, and making a new tap at the proper location. Both services shall be noted on the As-Built Drawings.

3. Reclaimed Water Meter Boxes and Vaults
  - a. Irrigation Reclaimed Water Meter Boxes
    - (1). Reclaimed water meter boxes shall be installed within the right-of-way or PUE at a distance of no less than 1 foot back of curb for detached sidewalks and no less than 1 foot back of sidewalk for attached sidewalks and at an elevation of 0.2 feet above the adjacent sidewalk or curb. See City Standard Details and Approved Materials List.
    - (2). All other locations shall be approved by the City Engineering department.
    - (3). Reclaimed water meter boxes shall be of a type and manufacture as identified in the Reclaimed Water Approved Materials List.
  - b. Reclaimed Water Meter Vaults 3 to 6 inches and Larger
    - (1). Reclaimed water meter vaults for sizes 3 to 6 inches shall be installed as a water meter vault as shown in the City Standard Details with the exception that the inside of the vault lid be painted purple.
    - (2). Vaults for reclaimed water meters larger than 6 inches shall be reviewed and approved by the City Engineering department on a case by case basis.
    - (3). All valves shall be of a type and manufacture as identified in the Approved Materials List.
4. Taps
  - a. Installation of tapping sleeves and tapping an energized reclaimed water main shall be performed by the Developer after approval is received by the City Engineering department.
  - b. A 3 foot minimum separation is required between service taps on a reclaimed water main.

- c. Saddles that meet the specifications of the Approved Materials List shall be installed on all new reclaimed water service taps.
- d. The Contractor shall make all taps from the City's operational reclaimed water system unless otherwise directed by the City Engineering department or Environmental Services division. The Developer is responsible for preparing application and payment of all applicable fees prior to taps being made.

#### E. Water Quality

1. Reclaimed water lines that are temporarily connected to the City's potable water system shall be disinfected in conformance with MAG Standard Specifications for water lines, Section 611.9 and the City's Flushing and Disinfection Meter and Water Line Flushing Procedures
  - a. Dry powdered calcium-hypochlorite compounds shall not be placed within pipelines during construction.
  - b. Notify the City Engineering Construction Inspector when samples are ready to be taken to verify disinfection of reclaimed water lines. The Construction Inspector must be present and samples shall be collected in strict conformance with MAG Standard Specification, Section 611.15. The Contracting Agency is the City of Goodyear, and it is the responsibility of the Developer to hire a lab to process the samples.

#### F. Pipe Materials

1. Standard material for reclaimed water lines larger than 8" located within a City right-of-way or PUE shall be purple PVC C-900 class 200. Mains 8" and smaller shall be class 150.
2. All PVC C-900 reclaimed water pipe shall be purple in color. The words "Reclaimed Water Do Not Drink" shall be stenciled with not more than 12" separating the repetitions of words.
3. For all ductile iron pipe/fittings, or other metallic pipe installations, soil corrosivity tests shall be conducted and reported in accordance with the American Ductile Iron Pipe Research Association. Reports shall be filed with the City Engineering Department.

4. All fittings shall be ductile iron (D.I.P.) with restrained joints, and shall be wrapped in purple polyethylene wrap with the words "Reclaimed Water" written on the poly wrap. A programmable marker ball programmed by the Contractor, shall be installed at each fitting.

G. Locating Reclaimed Water Lines

1. Where conditions prevent adequate horizontal and vertical separation between a reclaimed water line and a water and/or sewer line, each line shall be constructed of DIP (minimum Class 150) with mechanical or flanged joints.
2. Separation of reclaimed water and electrical or gas lines shall conform to City Standard Details.
3. Locating Reclaimed Water Lines within Rights-of-Way
  - a. Rights-of-way and/or utility easements shall be dedicated prior to the issuance of construction permits.
  - b. Reclaimed water line location in rights-of-way shall be in accordance with City Standard Details.
4. Cut stakes shall be set for all trenching of reclaimed waterlines 12-inches or greater in diameter.
5. Locating Reclaimed Water Lines within Easements
  - a. All reclaimed water lines which cross golf courses, open areas, or any area outside a dedicated right-of-way shall be located within a minimum 20 foot wide PUE or reclaimed water line easement that is dedicated to the City.
  - b. Easements larger than 20 feet in width will be required if multiple utilities are co-located or if additional area is required for maintenance equipment access due to the size and/or depth of the lines.
  - c. No structures of any kind shall be constructed or placed within or over a utility easement except: utilities, wire (or removable section-type) fencing, decomposed granite and/or wood, asphalt paving, or grass. Masonry fencing that crosses easement in a perpendicular alignment shall be permitted.

- d. Easements shall at all times be accessible to City service equipment such as trucks, backhoes, etc. Easements shall be accessible from City rights-of-way or other public easements.
  - e. Easements shall be dedicated prior to the commencement of construction activities.
6. Locating Reclaimed Water Lines in Areas not Accessible by Normal Excavation Methods
    - a. All pipe in these areas must be restrained through the inaccessible area extending one full joint before and after the section.
    - b. All reclaimed water pipe within the inaccessible area shall be sleeved using C900 PVC class 200 pipe.

#### H. Cover Requirements

1. Reclaimed water mains in arterial and major collector streets shall have a minimum cover of 48 inches over the top of the pipe. Reclaimed water mains in other locations shall have a minimum cover over the top of the pipe as follows:
  - a. 48 inches for reclaimed water mains 12 inches and larger
  - b. 48 inches for reclaimed water mains in industrial areas
  - c. 36 inches for reclaimed water mains smaller than 12 inches, and all lines in minor collector streets, residential streets, and in utility easements.
2. Cover for reclaimed water mains shall be measured from finished grade of pavement or natural ground, whichever is lower, to the top of pipe. Greater depths may be required to ensure adequate pipe protection during construction.
3. The proposed depth shall be clearly noted in each plan sheet. Any changes in depth required to avoid conflicting utilities, etc., shall be noted.

#### I. Pressure Requirements

Pressure extremes in reclaimed water systems result in potential for contamination to enter the network. Low pressures in the reclaimed water system may allow polluted fluids to be forced into the system. High pressures may cause ruptures or breaks in some elements of the network.

1. Where reclaimed water lines are located adjacent to potable water lines, engineers shall design the system such that pressures in reclaimed water lines are at least 20 psi lower than the pressure in the adjacent potable water line. Operating reclaimed water system pressures shall be a minimum of 20 psi and not to exceed a 60 psi. Ultimate pressure requirements shall be approved by the City Engineering.
2. All reclaimed water mains and service lines shall be designed for a minimum normal internal working pressure of 150 psi plus appropriate allowances for water hammer.
3. Water hammer may produce momentary pressures greatly in excess of normal static pressures, thus increasing the probability of reclaimed water main failure.
  - a. Suitable provisions shall be made to protect the system from water hammer.
4. In cases where greater than the above noted maximum pressures are required for effective operation, all elements of the system shall be designed accordingly. Pressure information for existing reclaimed water lines may be obtained by having a flow test performed on the existing system.
  - a. A Right-of-Way Permit issued by the City Engineering Department is necessary to perform the flow test.
  - b. These tests may be performed by a private fire protection company who must certify the results of the tests and submit them to the City Engineering department and Environmental Services division for approval.
  - c. Flow testing shall be arranged through the City's Environmental Services division. A minimum of two working days notice shall be given prior to testing.

#### J. Miscellaneous Requirements and Specifications

1. Trenching, backfilling, and compacting shall be in accordance with MAG Standard Specifications.
2. Reclaimed water lines that have one-ended connections (dead-end lines) shall have a hydrant at the non-connected end. In no case shall a hydrant be located in a wash, natural or manmade drainage way, detention or retention basin, sidewalk, or driveway. All reclaimed water hydrants shall be painted purple in color.
3. No reclaimed water line shall be deflected or swept, either vertically or horizontally, in excess of the maximum recommended deflection specified by the manufacturer of the pipe or coupling. The appropriate use of bends or offsets shall be used where the maximum deflection is exceeded. Fittings may be required where more than two pipe lengths are deflected.
4. The minimum clearance under major washes, culverts, storm drain lines, manmade and natural drainage ways, canals, railroads, highways, bridges, airports, etc shall be 2 feet. Greater clearance requirements may be required by other conditions such as scour depth, traffic loading, etc.
5. All changes in direction in reclaimed water lines shall be marked with a programmable electronic marker. Valve locations permit adequate identification of pipeline location (typically at crosses and tees). Electronic markers ball manufacturers and models shall comply with the City Approved Materials List.
6. Reclaimed water lines to be abandoned shall be approved by the City Engineering department.

### 5.2.5 Valves and Zone Splits

#### A. General Valve Requirements

1. Valve Specifications
  - a. Gate valves are required in all reclaimed water lines smaller than 16 inches and shall be resilient seated, solid wedge gate, and shall open left.
  - b. Butterfly valves shall be required on reclaimed water mains larger than 16 inches.

- c. At selected locations between the City's reclaimed water zones special reclaimed water zone valves shall be installed if not previously existing.
  - d. Per City Standard Details, valved bypass lines shall be required on valves larger than 16 inches in diameter.
  - e. Manholes shall be provided for all Butterfly valves as identified in the City Standard Details.
  - f. Valve box installation and grade adjustments shall be performed per MAG Standard Detail, No. 391-1 Type "A" and 391-2.
  - g. Debris caps shall be included along with all valve box installations. Debris caps shall conform to City Standard Details.
  - h. When encountered during construction, existing valve boxes shall be replaced to meet MAG Standard Detail, No. 391-1 Type "A" and 391-2 with associated debris cap.
  - i. Valve box equipment shall be of a type and manufacture as identified in the Reclaimed Water Approved Materials List.
2. Spacing
- a. Valve spacing for transmission mains with no branches shall be no less than 1/4-mile and no more than 1/2-mile.
  - b. The maximum spacing of valves on distribution mains shall be 1/4-mile for all types of developments.
  - c. Valves shall be spaced and located such that they are beneficial to the operation and maintenance of the system. The City Engineering department shall approve all valve locations.
  - d. Where valves are to be located off of a tee or cross, the valves shall be flanged to the tee or cross.
  - e. Valves shall be provided to allow for the isolation of lines crossing major washes, culverts, storm drain lines, manmade and natural drainage ways, canals, railroads,

highways, bridges, airports, etc. as directed by the City Engineering department.

- f. All mains branching from feeder mains or loops shall be valved adjacent to the feeders so that the branch mains can be taken out of service without interrupting the supply to other locations.
- g. Any reclaimed water line that will be extended in the future shall have a valve, along with a 13-foot minimum stub and a blind flange in a Number 4 box with a marker ball at the non-connected end.

### 3. Operation

- a. Only City personnel are authorized to open and close all existing reclaimed water valves at all times and in all circumstances including but not limited to flushing, pressure testing, chlorinating, etc.
- b. Valves that control the Reclaimed Water System Zone Split shall be designated by permanently imprinting the letters “RZS” on the lid.
- c. Valves intended to remain closed shall be designated by painting those valve covers white.

### 4. Backfilling and Compaction

- a. The area immediately surrounding any City valve shall be compacted. A test(s) verifying the compaction of the soil around the valve shall be provided to the City for each 3-foot depth of trench backfill and prior to placement of any portion of pavement section materials (ABC or asphaltic concrete).
- b. Compaction testing around valves shall be performed as follows:
  - (1). A minimum one test per valve per 3-foot depth of trench backfill shall be performed. The test(s) shall be performed within 2 horizontal feet of the valve and directly over the reclaimed water main. Care shall be taken to prevent damage to the pipe and valve during compaction and testing.

- (2). Additional compaction tests may be required as determined on a case-by-case basis. The need for additional tests will be identified by City Engineering Department representatives.

#### B. Air Release Valves

Air release valves shall be installed as follows:

1. When the slope of a reclaimed water line changes from a positive slope to a zero slope in primary direction of flow.
2. When reclaimed water line changes from a positive slope to a negative slope in primary direction of flow.
3. When reclaimed water line changes from a zero slope to a negative slope in primary direction of flow.
4. When vertical alignment changes to undercross or overcross another facility (i.e. utility, drainage wash, etc.), air release valves shall be installed on both sides of the crossing where conditions identified in standards 1 through 3 above exist. In cases where a positive slope is maintained across the vertical alignment, an air release valve is required on the upstream side only. Isolation valves shall also be constructed on either side of a vertical alignment.
5. NOTE: Slopes less than or equal to 0.002 feet/feet shall be treated as zero slopes.
6. All air release valves shall be a combination air/vacuum release type per the Approved Materials List.

#### C. Pressure Reducing Valves

1. Transmission and Distribution Lines
  - a. PRV's on reclaimed water lines shall be rated to maintain pressures between 20 and 80 psi within the distribution system.
  - b. PRV's shall be designed in accordance with the criteria shown in City Standard Details and as outlined in the City's Reclaimed Water Master Plan.
  - c. A vault shall be provided for each PRV as shown in the City Standard Details.

- d. A minimum 6 feet of ductile iron pipe shall extend out from the PRV on either side before transitioning to PVC pipe.

#### D. Zone Splits

The City's reclaimed water distribution system is divided into various reclaimed water zones as outlined in the City Reclaimed Water Master Plan . Each zone shall operate as an independent reclaimed water system. Cross-connections between zones are prohibited.

1. Valves

See the valve section of this chapter.

2. Special Requirements for Developments Bordering Zone Splits

If a proposed development is located adjacent to a zone split boundary, the Developer shall extend, as necessary, redundant reclaimed water mains within the development's side of the zone split boundary to close the zone loop.

3. Plans

Plans for reclaimed water distribution mains adjacent to a zone split boundary shall clearly indicate the different zones involved and the location of the zone split boundary.

#### E. Reclaimed Water Hydrants

1. General Requirements

- a. All reclaimed water hydrants shall be painted per the color indicated in the Approved Materials List.
- b. All hydrants shall have signage that indicates "Reclaimed Water Do Not Drink" as identified in the Approved Materials List.
- c. The Developer shall provide the hydrant, materials, and all labor required for installation.
- d. All new hydrant installations will be installed per manufacturer's specifications. Extensions shall not be used to reach finished grade.

- e. Where the finished grade around existing hydrants is changed, an extension kit, installed per manufacturer's specifications, may be used.
  - f. One valve shall be placed between each hydrant and the reclaimed water main.
  - g. Valves for hydrant connections shall be flanged to the tee.
  - h. All hydrants shall have a locking device installed as a part of the development costs and of a type and manufacture as identified in the Approved Materials List.
2. Spacing and Locating
- a. Reclaimed water hydrants shall be installed as directed by the City Engineering department.
  - b. Where hydrants are required they shall be located outside of street improvements but within the right-of-way or public utility easement.
3. Locations
- a. The location of a hydrant shall be such that the pipe leading to the hydrant will be under the least amount of pavement.
  - b. A 3-foot minimum clearance shall be maintained around the hydrant.
  - c. Hydrant protection is required where no curb is present.
4. Backfilling and Compaction
- a. The area immediately surrounding any City hydrant shall be compacted per MAG Standards. Test(s) verifying the compaction of the ABC around the hydrant shall be provided to the City for each 3-foot depth of trench backfill and prior to placement of any portion of pavement section materials (ABC or asphaltic concrete).
  - b. Compaction testing around hydrants shall be performed as follows:
    - (1). A minimum one test per hydrant per 3-foot depth of trench backfill shall be performed. The test(s) shall

be performed within 2 horizontal feet of the hydrant. Care shall be taken to prevent damage to the hydrant, valve, or reclaimed water main during compaction and testing.

- (2). Additional compaction tests may be required as determined on a case-by-case basis. The need for additional tests will be identified by City Engineering department representatives.

#### 5.2.6 Cross-Connection Control

The program shall consist of inspection by the City Environmental Services division and implementation of a backflow prevention and maintenance program, as outlined in the "Manual of Cross-Connection Control" published by USC.

##### A. Implementation

1. Air-gap separation shall be required for developments where entry is or will be restricted and cross-connection inspections can not be made with sufficient frequency or on short notice. Air-gap separation shall be required in, but not limited to, areas where the following high-hazard conditions exist:
  - a. Public water system is used to supplement reclaimed water.
  - b. Wastewater is pumped and/or treated.
  - c. Hazardous substances are handled or stored.
  - d. Irrigation systems exist into which fertilizers, herbicides or pesticides could be injected.
  - e. As required by ADEQ, or the City Public Works and Engineering departments.
2. RPP backflow prevention devices painted purple shall be required in all locations where air-gap is not required or where entry is not restricted and cross-connection inspection can be made with sufficient frequency.

##### B. Installation

The owner, at his or her own expense, shall purchase, install, operate and maintain any approved backflow prevention device required by

the City. Approved cross-connection equipment manufactures and models are identified in the City's Approved Materials List. Installation of approved backflow prevention devices shall be as follows:

1. All backflow prevention devices shall be constructed with a security enclosure as shown on the City Standard Details.
2. An air-gap separation shall be located as close as practical to the user's connection at the meter. The piping between the user's connection and the receiving tank shall be entirely visible. The air-gap separation shall be at least twice the diameter of the supply pipe, measured vertically from the flood rim of the receiving vessel to the supply pipe. In no case shall this separation be less than 1 inch. See the City Standard Details for approved air-gap separation methods for portable tanks.
3. RPP backflow prevention devices and detection assemblies shall be located outside of the right-of-way or PUE and shall be installed as close as practical to the user's reclaimed water meter. See the City Standard Details for backflow prevention methods on portable tanks.
  - a. RPP Assembly backflow prevention devices and assemblies shall be installed a minimum of 12 inches above grade and not more than 36 inches above grade with 12 inch clearance on both sides, and in a manner where it is accessible for testing.
    - (1). For RPP backflow prevention device installation information see the City Standard Details.

#### C. Maintenance

Maintenance of backflow prevention devices shall be as follows:

1. Maintenance of backflow prevention devices shall be tested immediately after installation, relocation, or repair. Devices shall not be placed in service unless they are functioning as required.
2. Devices shall be tested on an annual basis or more frequently if determined to be necessary. When devices are found to be defective they shall be repaired or replaced.

3. Backflow prevention devices shall be tested by persons certified as a General Tester or Specialist by USC or ASETT.
4. Accurate records of these tests shall be maintained by the City for a minimum of 5 years. Copies of these records shall be submitted to the City Environmental Services division.