Washington City
Where Dixie Begins

SUNRISE ENGINEERING

WASHINGTON CITY WASTEWATER MASTER PLAN UPDATE, 2009

SUNRISE ENGINEERING, INC.

September 2009

WASHINGTON CITY
WASTEWATER MASTER PLAN
SEPTEMBER 2009

INCLUDES:

WASTEWATER FLOW PROJECTIONS,
RECOMMENDED WASTEWATER SYSTEM CONFIGURATION,
IMPACT FEE AND USER RATE ANALYSIS,
CASH FLOW PROJECTIONS, AND
WRITTEN SUMMARY

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SECTION 1

SECTION 1 – INTRODUCTION

A. PURPOSE AND SCOPE

In October 2004, Washington City commissioned Sunrise Engineering, Inc. to conduct a wastewater master plan study. As directed by the City, the specific objectives of the November 2005 Washington City Wastewater Master Plan study was to analyze the capacity of the existing wastewater system with respect to predicted future land use projections and population densities, to recommend a system configuration for undeveloped areas of Washington City, to consider how new technologies can be implemented to maximize efficiency and resource utilization, to forecast utility cash flow, and to update utility impact fees.

In February 2009, Washington City asked Sunrise Engineering, Inc. to update the Washington City Wastewater Master Plan. The scope of work for the Washington City Master Plan Update is to analyze and update connections and growth rates, update the land use map with corresponding flows, and update the pipe model with the option of dual lines, and remove the alternative of water resource recovery facilities. This plan will also include evaluating alternatives to the canal trunk line route, and updating the engineer's opinion of probable cost, impact fees, user rates, and cash flow to reflect the current condition of Washington City. This will also serve as a Capital Facilities Plan for the wastewater system.

B. BACKGROUND INFORMATION

Washington City, Utah located east of St. George City along I-15, has experienced moderate to high growth rates over the past 20 years. As with any other community, growth and development in the area have resulted in the need for the wastewater system to be improved and enlarged to support the population increases. Washington City is wise to undertake early planning projects to ensure that a regional system can be constructed which will effectively and efficiently route wastewater flows from the City.

In 2005, Sunrise Engineering completed the Wastewater Master Plan for Washington City which included a user rate analysis, a connection fee analysis, an impact fee analysis, recommendations for system improvements and a written explanation of the methodologies and calculations used to create the plan. Since that time a number of conditions have experienced significant change, requiring modifications to the master plan. Among these changes are the rate of growth this City is experiencing, the City's participation in the Washington County Water Conservancy District's (WCWCD)

pooling agreement for water resources, and the desire of the City to consider the use of parallel wastewater lines as opposed to large scale upsizing. Sunrise Engineering has again been contracted to update the wastewater plan and to develop conceptual scenarios of how the wastewater system should be constructed to support growth in various areas of the community.

Conceptual design of the master planned wastewater system presented in this study has been completed under the design criteria issued by Washington City in the Washington City Construction Design Standards and Washington City Construction Design Details booklets. In addition, wastewater industry standards and engineering judgement were applied where necessary. Preliminary sizing and alignment of a conceptual system was completed based on a 10-yr analysis, 20-yr analysis, and buildout conditions within the study area. Additionally, financial analyses and a proposed implementation of the recommended master plan improvements have been completed for the appropriate planning periods.

C. PROJECT STUDY AREA

Figure A.1 in Appendix A shows the study area boundary in relation to the existing Washington City boundary and local geographical features. Generally speaking, the study area expands the existing city boundaries considerably on the north and northwest and extensively on the east and southeast. The northern annexation is almost entirely comprised of the Desert Tortoise Habitat Conservation Plan (HCP) areas; no development is expected in the region. The eastern annexation includes all of Warner Valley and several smaller valleys south of Purgatory Flat in Hurricane City. A significant portion of the eastern annexation will be developed and is expected to produce wastewater flows. Table 1.A summarizes how the proposed annexations will increase the area within the Washington City boundaries.

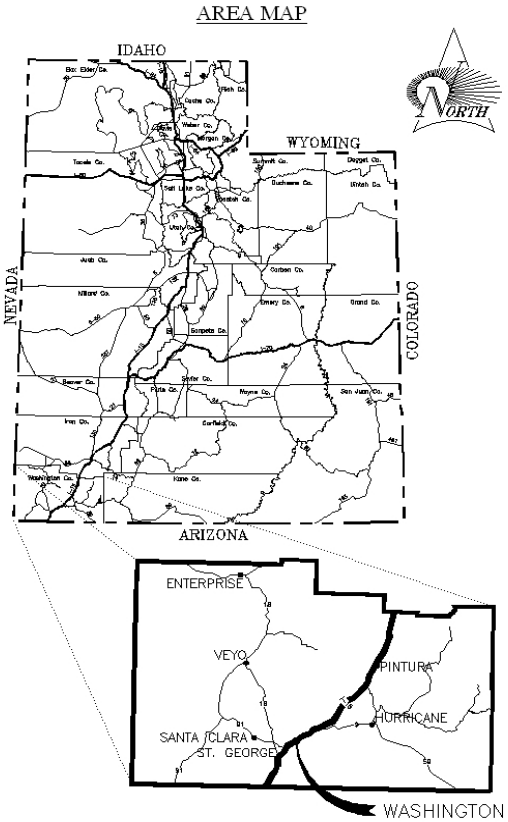


Table 1.A

Area Within Existing Washington City Boundaries	20,090	acres
Area Within Study Area Boundaries	51,909	acres
Percent Increase in Area	158%	

SECTION 2

SECTION 2 – LAND USE DATA

A. PREFACE

Design of any wastewater pipe system requires that the amount of wastewater flows entering the system are known. Wastewater flow quantities can usually be derived based on population densities existing or predicted within a wastewater collection area. Standard design practices and calculations are applied to the population numbers to predict average and peak wastewater flows that will be generated in the area and introduced into the wastewater system. This section seeks to summarize how design wastewater flows were calculated for the Washington City study area.

B. WINSTON ASSOCIATES LAND USE (BUILDOUT)

At the direction of Washington City in 2004, Winston Associates of Boulder Colorado prepared a Washington General Plan Update that identifies land use designations for the project study area. Figure A.1 in Appendix A is a reproduction of the Winston Associates land use plan. Land use designations specifically identified in the plan include civic, industrial, business, community commercial, downtown commercial, neighborhood commercial, regional commercial, high density residential, medium high density residential, medium density residential, low density residential, very low density residential, estate, agricultural, park, open space, and habitat conservation plan areas. The legend provided on Figure A.1 identifies how these specific land use designations lie within the study area boundaries.

Included with the Washington General Plan Update is a table prepared by Winston Associates which compares land use designations to zoning categories in Washington City. The table is included as Table B.1 in Appendix B. Items identified in the table include zoning categories applicable to the land use categories, various lot sizes for each zone, efficiency of land use within the zone, the expected gross density for each land use given as a numerical density per unit acre (du/ac), the net density and the existing density.

The gross density units per acre taken from Table B.1 can be applied to the respective land use areas to determine the number of units of a particular type within a given area. For example, if the commercial gross density units value is applied to a commercial tract, the total number of commercial units can be predicted. The

following equation illustrates the example.

$$\left(\frac{7du}{ac}\right)(100ac) = 700du$$

In the equation, 7 density units per acre applied to a 100 acre commercial tract would result in 700 commercial units being built on the tract. This method can be followed for each development type to determine the number of units that can be built per acre of development.

The number of equivalent residential units (ERUs) for each acre of a particular development type can be determined in the same way. For example, if it is known that each commercial unit is equivalent to 2.53 residential units, the number of ERUs for the commercial tract can be determined. The following equation illustrates this example.

$$(700du)\left(\frac{2.53ERUs}{unit}\right) = 1{,}771ERUs$$

The example shows that 1,771 equivalent residential units will be present in the 700 commercial units developed on the 100 acre tract.

In a similar process, the gross unit density and the ERU rate per unit can be combined to calculate an ERU rate per acre for each development type. If the gross unit density for a commercial development is 7 density units per acre and the ERU rate per unit is 2.53 ERUs per unit, the resulting ERU rate is 17.71 ERUs per acre. The following equation illustrates the example.

$$\left(\frac{7du}{ac}\right)\left(\frac{2.53ERUs}{du}\right) = \frac{17.71ERUs}{ac}$$

Applying the ERU rate per acre to the areas of each land use type results in the total ERUs produced in a given land use area.

Table B.2 in Appendix B condenses and summarizes the land use data provided by Winston Associates and includes some data derived based on local observations. For example, the land use category shown as "exmd" is the category for the existing medium density use typical of historically developed areas of Washington City. Unit density values for the "exmd" land use were taken from aerial photographs of the historic Washington City. The land use category shown as "ccrd" is the Coral Canyon residential density land use. Unit density values for that land use were derived from the development's community master plan. Business, industrial and civic land uses identified separately by Winston Associates were lumped into one category and a unit density was derived from aerial photographs of business, industrial and civic developments in Washington City and St. George City. Similarly, HCP, open space and park land uses were lumped into a separate category; the unit density for these areas is zero. Average ERU rates per unit for commercial and business units were calculated by reducing customer billing data provided by Washington City.

Generally speaking, the Winston Associates land use plan was assumed to be applicable throughout the study area. Several exceptions exist. The first two were mentioned in the preceding paragraph. As the data was being reviewed, it appeared that the Winston Associates land use plan specified higher buildout densities for areas within historic Washington City than are probable. As a result, the land use category "exmd" was derived and overlaid on applicable areas in the City. It also appeared that the densities prescribed by

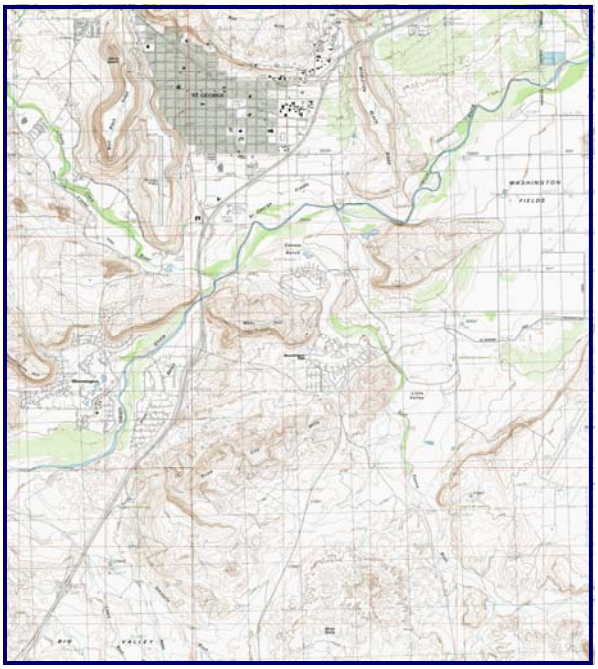
Winston Associates for the Coral Canyon development were slightly higher than those actually predicted by the Coral Canyon community development master plan. In order to correct this discrepancy, a digital copy of the master plan land uses from Coral Canyon was obtained and overlaid on the Winston Associates land use plan.

In addition to including the existing medium residential densities and the Coral Canyon densities, Sunrise Engineering contacted the Bureau of Land Management (BLM) to determine how much of the land in the outlying regions of the study area would become available for development in the future. Information from the BLM was overlaid on the Winston Associates land use plan. It was assumed that those areas already held by private owners and those areas scheduled to be released to the State School and Institutional Trust Lands would be developed according to the Winston Associates land use designations. It was also assumed that those areas which would be perpetually held by the BLM and those areas designated as areas of critical environmental concern (ACEC) would never be developed and could thus be included with the open space land use category. Figure A.2 in Appendix A illustrates how the exceptional land uses were applied to the Winston Associates map.

In updating the Washington City Wastewater Master Plan from 2005, the only area affected by a change in land use was the SITLA Green Springs area. This land use map was generated by Alliance Consulting dated the 11th of November, 2007. Figure A.3 of Appendix A shows the overlay of this most recent land use change applied to the Winston Associates map.

C. UNIFORM GRID SYSTEM & LAND USE SPREADSHEET

In order to make the land use information provided by Winston Associates and described in the preceding subsection manageable in a digital format, a grid system and spreadsheet were created that would take the visible data shown on the land use map and convert it into future wastewater ERUs. The ERUs could then be used to determine projected wastewater flows from specific regions of the study area and could also be used to conceptually design the master plan system improvements for Washington City.



The process was begun by creating a grid which was overlaid on the Winston Associates land use plan using AutoCAD. Figure A.4 in Appendix A shows the grid overlaid on the Winston Associates land use map. Each cell in the grid was assigned an alphanumeric ID number; letters were assigned to the columns in the grid while numbers were assigned to the rows. The grid was established so that individual cells would cover approximately 100 acres of the study area. Examination of each cell was done to determine the various land use designations

present in the cell and the respective areas covered by each land use. ERU densities per acre for each land use within the cell were combined to generate a weighted ERU density per acre for the cell. The total ERUs per cell were then calculated for each cell in the grid system. The following equation illustrates how projected wastewater flows for Cell 11H were calculated. The method is applicable for all cells in the grid.

$$(675\,ERUs)\left(\frac{2.88\,capita}{ERU}\right)\left(\frac{250\,gal}{capita\cdot day}\right)\left(\frac{day}{1{,}440\,\text{min}}\right)=338\,gpm$$

It should be noted that 2.88 capita (people) per ERU is the population density specified by Winston Associates as the projected density in the study area. 250 gallons per capita per day is the peak design flow typically used to design wastewater systems and is the value specified by the Washington City Construction Design Standards as the peak design value. The denominator 1,440 in the equation converts the time unit from days to minutes. Appendix C contains a printout of the entire updated land use spreadsheet. The method of calculation from the individual cell ID number to the final wastewater design flow for each cell in the study area can be seen in the table.

D. SECTION SUMMARY

LAND USE ASSUMPTIONS BASED ON WASHINGTON GENERAL PLAN
* AVERAGE POPULATION PER RESIDENTIAL UNIT: - 2.88 *(capita/ERU)* * DESIGN FLOW: - 250 *(gal/capita/day)* - 0.5 *(gpm/ERU)* * RESIDENTIAL UNIT PER CONNECTION: - 1.248 *(ERU/connection)*

SECTION 3

SECTION 3 – SYSTEM MODEL

A. PREFACE

Converting the data provided by Winston Associates into a digital format using the grid system and land use spreadsheet discussed in the previous section and converting the data into wastewater flows expected from each cell was preparatory to applying the flow data to conceptual wastewater pipe systems in the study area, and thereby determining the size, location, and quantity of proposed master plan facilities. This section seeks to explain the methodology for bringing the flow data derived for each cell to a condition where it could be introduced into conceptual pipe systems. This section also discusses the computer model created to simulate the proposed master plan system and the design criteria applied to the model.

B. BASIN DELINEATION

The first step in applying the derived flow data was breaking the study area into wastewater collection basins. Each collection basin is an area defined by topographic or other features that govern or influence how wastewater is most efficiently routed from an area. In most cases, collection basins are determined by considering how a gravity sewer system could be constructed and which direction the proposed pipes must be aligned to maintain downhill slopes to receiving treatment facility. In many cases, the end of a collection basin is the junction with a regional trunk line. In all cases, the collection basin is a tributary area from which wastewater flows are concentrated at a single point.

Using digital surface contours, aerial photographs, global information system (GIS) data and the previously delineated collection boundaries as given in the 1997 Wastewater Collection System Master Plan and the 2005 Wastewater Master Plan, the Washington City study area was divided into 23 individual collection basins. Each of the collection basins was determined by controlling topographical or structural features. Figure A.5 in Appendix A illustrates the division of the study area into wastewater collection basins and names each basin with an alpha-numeric identifier.

Total wastewater flows generated by each of the wastewater collection basins were determined by applying the basin boundaries to the grid system and land use spreadsheet discussed previously in Section 2. The boundaries of the collection basins were superimposed upon the grid cells to determine which portions of the individual cells fell within the separate collection basins. In many cases, an entire grid cell fell within one of the defined collection basins. In these cases, the entire wastewater flow calculated for the grid cell was assigned to the

collection basin. In other cases, it was found that the collection basin boundaries divided individual grid cells. In these cases, the total grid cell wastewater flow was divided between the collection basins according to the percentage of grid cell area that fell in either basin. Summing all of the flows from the grid cells in each basin provided a calculation of total flows generated in the collection basins. Appendix D contains spreadsheet printouts showing total flows in the 23 wastewater collection basins. Also shown in the printouts are the ERUs, population, and wastewater flow contributions of each grid cell or portion thereof falling within the individual basins.

C. SUB-BASIN DELINEATION

Determining the boundaries of each wastewater collection basin and identifying the grid cells or portions thereof contributing to the wastewater flows in each basin was preparatory to further dividing the collection basins into collection sub-basins for the purpose of isolating individual portions of the conceptual wastewater system and for determining actual design wastewater flow rates that could be applied to the computer model to calculate recommended system pipe sizes.

Wastewater collection sub-basins were delineated in a manner similar to the delineation of the collection basins. The difference is that when sub-basins are defined, the controlling topographic or structural features are minor compared to the controlling features of the larger basins. Nevertheless, the effect of the minor controlling features on the sub-basins is the same as the effect of the major controlling features on the larger basins. Particularly notable is the fact that the end points of the collection sub-basins are the points at which concentrated wastewater flows are assumed to enter the conceptual wastewater pipe system.

D. POPULATION PROJECTIONS

After determining the wastewater collection basins and sub-basins, the City emphasized their interest in providing a 5-yr, 10-yr, and 20-yr flow analysis, along with buildout conditions. The initial step was to obtain the most recent active wastewater connections for 2008 and then distribute these connections according to the GIS data provided by the City to accurately represent the number of connections per sub-basin. Once the number of connections per sub-basin were calculated, a growth rate was applied for the appropriate time period (5-yr, 10-yr, 20-yr) based upon the demand and capacity for development in the sub-basin.

For example, a higher growth rate was used for the 10-yr analysis in the Green Springs area and north of I-15 because of the potential for growth within 10 years. That same growth rate was then lowered for the 20-yr analysis for the Green Springs area, while the areas in south Washington received a higher growth rate because of potential growth with the airport and Southern Parkway construction. A summary of the population projections, growth rates, and estimated connections for each individual sub-basin based upon a 5-yr, 10-yr, 20-yr, and buildout analysis is shown in Table B.3 of Appendix B.

Calculation of wastewater flows for each of the sub-basins was completed for the individual analyses following the same procedure as that used to determine the total flows for each collection basins. The wastewater flow contributions of each grid cell or portion of grid cell falling within the individual collection sub-basin were totaled to determine wastewater flow from each sub-basin. Figure A.6 in Appendix A illustrates the delineation of the wastewater collection sub-basins and identifies each with an alpha-numeric indicator. Table B.4

in Appendix B summarizes the wastewater flows calculated for each wastewater collection basin and sub-basin for each individual analysis.

E. COMPUTER MODEL

After determining the wastewater flows generated by each collection sub-basin, AutoDesk Land Desktop Design was used to create a computer model of the conceptual master plan pipe network. The determined wastewater flows were applied to the network at the appropriate nodes and the model was run. A spreadsheet was also created to verify the results of the computer model. The printed results of the modeling effort are provided in Appendix E. It should be noted that design of the conceptual wastewater system was completed at a master planning level only. A thorough design analysis should be completed for each segment of the system prior to actual construction.

Design criteria entered into the computer model assume that the pipe system will flow at 2/3 full capacity, the Manning's roughness was set at 0.012, the minimum flow velocity was set at 2.0 fps, and the maximum flow velocity was set at 15.0 fps. The pipe flow line for each segment was set 10 feet below ground elevation, but was adjusted slightly at some nodes to ensure that minimum flow velocities would be maintained. Reports generated during the process indicated that nearly all of the pipe segments functioned within the set parameters when completed. Those segments that didn't quite meet the design criteria were close and were not changed in the model.

F. SYSTEM LAYOUT

After calculations were completed for each analysis, the 5-yr analysis was considered insignificant because of its minimal impact on the system compared to that of the 10-yr analysis. For this study, the 10-yr, 20-yr and buildout scenarios will be analyzed and appropriate recommendations will be made for each of them.

The final layout of the master plan pipe system, together with any lift stations according to the appropriate analysis is given in this report. A discussion of each of the components in the master plan system and a discussion of the proposed improvements for each analysis are presented in Section 4 and Section 5 of this study.

G. SECTION SUMMARY

WASHINGTON CITY WASTEWATER SYSTEM MODEL
* DELINEATION OF BASIN & SUB-BASINS * GROWTH RATE PROJECTIONS FOR INDIVIDUAL SUB-BASINS: - 5.44% *(5-yr overall)* - 6.90% *(10-yr overall)* - 6.85% *(20-yr overall)* * APPLICATION OF COMPUTER MODEL BASED ON STANDARD DESIGN CRITERIA: - Pipe 2/3 Full - Manning's "n" value of 0.012 - 2.0 fps Minimum Flow Velocity - 15.0 fps Maximum Flow Velocity - Pipe Flow Line 10' Below Ground Elevation

SECTION 4

SECTION 4 – WASTEWATER SYSTEM FACILITIES

A. PREFACE

The total master planned wastewater system recommended for implementation in Washington City consists of both existing and proposed facilities which operate together to convey wastewater effluent. These facilities include gravity pipe networks, lift stations and force mains, a wastewater utility yard, and a regional trunk line system to carry effluent to the regional treatment plant. The discussion presented in this section seeks to briefly highlight important details pertaining to each of the major system components.

B. GRAVITY PIPE NETWORKS

Wastewater collection systems are generally made up of a network of discharge and flow lines, drains, inlets, valve works and connections for transporting domestic and industrial wastewater flows to regional treatment facilities. Generally speaking, the most obvious component of any wastewater system is the gravity collection pipe network. Flow through gradually sloping gravity wastewater pipes is the most desirable means of moving wastewater effluent since pumping energy is not required.

Most of the wastewater pipe system existing in Washington City and recommended as part of the master planned system improvements are gravity lines. Section 5 of this study provides recommendations for a 10-yr, 20-yr, and buildout scenario of the wastewater collection system and illustrates the layout of each of the existing and proposed gravity trunk lines according to the projected analyses as well as the general location of each line in the wastewater collection basins and their relationship to other major system facilities. An explanation and description of each basin has been included in Appendix F. It should be noted that the location shown for each of the proposed facilities is conceptual and general. Actual development and real site conditions may require that improvements are constructed in alternative locations.

C. LIFT STATIONS & FORCE MAINS

In locations where topography, density of existing utilities, lack of adequate right-of-way or other circumstances limit the continuation of a gravity wastewater system, it becomes necessary to construct pressurized force mains to route wastewater over or around the existing obstacles. Force mains are associated with wastewater lift stations; the two are normally designed in conjunction with one another. Because of the perpetual pumping energy required to operate lift stations, these facilities are normally avoided if possible.

Three lift stations currently operate in Washington City. The Coral Canyon lift station, with its corresponding 10-inch force main, lifts wastewater effluent produced in Coral Canyon area (collection basin R-6) over the Washington Black Ridge to the gravity system on Telegraph Road in collection sub-basin R-5-9. The second existing lift station is the Ridge Pointe station which forces wastewater flows from lower areas of collection sub-basin R-5-10 to the existing gravity line in Telegraph Road. The third station, called the Sienna Hills lift station, is near the Grapevine Wash in collection sub-basin R-5-8. This station boosts water from the low point in the wash (sub-basin R-5-8) to the existing wastewater line in Telegraph Road.

If proposed portions of the total wastewater system are constructed as shown in this master plan study, three additional lift stations may be built. Two of these facilities would be constructed in the wash southeast of the Coral Canyon area (collection sub-basin R-6-5) and the East Washington Dam area (collection sub-basins R-11-2) for the 10-yr analysis. The other lift station would be constructed in the 20-yr analysis further east in the Washington dam area in the wastewater collection sub-basin R-10-2.

The lift station that would be constructed in sub-basin R-6-5 would inject wastewater effluent from development on the Washington Black Ridge into the existing 10-inch force main in Telegraph Road on the Black Ridge.

The lift station in sub-basin R-11-2 would boost effluent from low-lying areas south of the Virgin River in collection basins R-10 and R-11 to the existing 8-inch gravity line in Washington Dam Road. This scenario would be temporary due to potential growth in that area, higher flows, and undersized line in Washington Dam Road.

The lift station that would be constructed in the 20-yr analysis in sub-basin R-10-2 would provide the relief needed in combination with the lift station in sub-basin R-11-2. Between these two lift stations the effluent from the low-lying areas south of the Virgin River in collection basins R-10 and R-11, and the wastewater flows from basin R-9 would combine and the lift station would boost effluent to the proposed 15-inch gravity line shown in the illustrations.

It should be noted that each of the lift stations identified in the preceding paragraphs serves a local rather than regional purpose. As a result, recovery of operation and maintenance costs for each of the facilities is a local rather than regional issue. System users who depend upon the existing Coral Canyon, Ridge Pointe, and Sienna Hills lift stations are assessed additional user fees above the standard fees.

These additional fees cover the operation and maintenance costs of the facilities. It is recommended that this method be employed to recover the operation and maintenance costs of the proposed lift stations that may be constructed in the future.

D. WASTEWATER DEPARTMENT FACILITY

It is expected that as growth continues in Washington City, the existing department facility will become inadequate and obsolete. In order to meet the needs of the growing City, an updated and larger facility has been specified as a master plan facility. It is the recommendation of this study that the yard be constructed in the east Washington Dam area in wastewater collection basin R-11 or R-16. This location is a site that provides convenient access to all areas within the study area boundaries and was recommended by City staff.

E. SMALL COMMUNITY WASTEWATER TREATMENT SYSTEMS

A small community (cluster) has many alternatives to choose from for its wastewater collection and treatment system. The choices range from the use of individual septic tanks for each home or business to gravity sewer systems and treatment plants that are miniatures of those used by larger communities. Small communities can also utilize combinations of more than one wastewater treatment method. Developments in areas that are topographically isolated from regional treatment facilities can be modeled as small communities. The developments planned in wastewater collection basins R-7 and R-8 in Washington City are examples of small communities needing specialized wastewater treatment facilities.

All small community wastewater treatment options have their advantages and disadvantages. When selecting the right treatment system, the community must have clear goals and specific criteria to use in making the decision. Selection considerations include how the wastewater will be discharged to the environment, the type of collection system that will be installed, estimated total influent flow, site characteristics such as soil type, water table elevations, land slope and available space, system reliability and monitoring, system maintenance and personnel requirements, and adaptability to changes in system operation. Whatever wastewater treatment method chosen, the system must provide the community with effective and manageable wastewater treatment at a reasonable cost.

Choices of treatment methods for small, isolated communities include adaptations of conventional single-service septic systems for clusters, lagoons, alternative treatment methods such as constructed wetlands, sand filters and aeration systems and package plants including sequencing batch reactors, membrane bioreactors, biological contactors, and other systems. The following sub-sections discuss in more depth several of the small community wastewater treatment options that may be considered for use in Washington City.

F. SAND FILTERS

There are two types of sand filters, intermittent and recirculating. In an intermittent sand filter, wastewater passes down through the sand bed once before going to an absorption field or discharge. Intermittent sand filters are further subdivided into buried and open types. As a rule, intermittent sand filters for single homes or small clusters are buried and large sand filters are open.

In a recirculating sand filter, part of the effluent from the filter goes to the absorption field or discharge and part is sent back to a recirculation

tank ahead of the filter where it is mixed with septic tank or primary treatment effluent before being passed through the filter again. A recirculating sand filter is more expensive and complex than an intermittent unit. However, it can treat the wastewater more completely, and it can be designed to reduce total nitrogen and nitrates in the effluent. This is especially important for systems that discharge to a water-quality-limited stream.

One of the most critical factors in good sand filter performance is the quality of the sand. It must be clean and sized to specific standards. Other key factors are how often and how much wastewater is applied at a time. Sand filters require dosing which is applying wastewater during several short periods of time rather than continuously. This requires a pump and a timer.

Maintenance requirements for sand filters consist of caring for the pumps and other mechanical equipment. Filters that have exposed sand surfaces may have to be raked periodically to keep the surface smooth and to remove surface clogging. Over the long term, some or all of the sand may have to be replaced. In addition, orifices in the distribution lines need to be checked to make sure none are plugged. If necessary, they must be cleaned. In extreme cases, sand filters may be restored by injecting air through the sand from the bottom of the filter.

G. CONSTRUCTED WETLANDS

Constructed wetlands treat wastewater by bacterial decomposition, settling, and filtering. As in tank designs, bacteria break down organic matter in the wastewater under both aerobic and anaerobic conditions. Oxygen for aerobic decomposition is supplied by the plants growing in the wetlands. Solids are filtered and finally settle out of the wastewater within the wetland. After a certain time in the wetland, effluent is usually discharged by gravity to an unlined wetland bed. If these systems discharge effluent to surface ditches, they require a National Pollutant Discharge Elimination System (NPDES) permit.

In many cases, constructed wetlands in small community systems are used for polishing processes after other treatment procedures have been employed. Unless gravity flow is not sufficient and pumps are needed, constructed wetlands filters do not have mechanical parts except perhaps a simple manual device used to control the water level. Maintenance is composed of keeping the plants in good condition and maintaining the water level at an adequate level. Dead plant material should be removed regularly so that it does not add to the organic load in the system.

H. LAGOONS

Wastewater lagoons can provide both aerobic and anaerobic treatment zones of suspended bacteria. Two or more lagoons or cells are used for community systems. With three or more cells, wastewater can flow from one cell to the next in series or in parallel. Wastewater lagoons must be fenced. Lagoons require comparatively little maintenance which includes keeping weeds out, keeping berms mowed and in good condition and maintaining mechanical equipment, pipes and valves. Lagoons should be inspected every few days to ensure that nothing has upset the biological processes occurring in the lagoon and to ensure that all of the mechanical equipment is in good working condition. Quick action to restore proper conditions is critical to prevent more maintenance problems, difficulties in restoring operations, and odors.

I. MOUNDS

Mounds are similar to sand filters in that they utilize dosed distribution onto a bed of sand. However, a mound has a self-contained water dispersal system because the base of the mound is in contact with the soil that accepts the treated wastewater. Mounds are alternative treatment systems suitable for areas with high bedrock or water tables. Mounds can be used for small community systems. Because of size and construction costs, they are normally cost effective only for individual homes or facilities within a larger management district or for small clusters of homes.

J. LAND APPLICATION

Application of wastewater effluent to a land area is normally done as a final treatment process. Multiple application techniques are used for both surface and subsurface dispersal. They include gravel infiltration trenches, gravel infiltration fields, drip irrigation, recharge wells, spray irrigation, flood irrigation and other variations of these basic application types. As wastewater percolates down through the soil column, remaining nitrogen, BOD, TSS, phosphorus, coliforms, pathogens, metals and other priority pollutants are chemically metabolized.

K. PACKAGE PLANTS

Small community wastewater treatment facilities that do not employ some type of single-service on-site technology (i.e. septic tanks) or the alternative methods described above normally use a method that separates the solids from the liquids and treats them in a manner similar to that used by a regional treatment facility. These processes include activated sludge, extended aeration, contact stabilization, oxidation ditches, sequencing batch reactors, membrane bioreactors, rotating biological contactors and trickling filters. Package plants are commercially available in scales suitable for small, isolated communities.

Sequencing batch reactors use aeration and an activated sludge process to treat wastewater. A specific volume of wastewater, called a batch, is first screened to remove larger particles within the water. It then may undergo primary treatment in a septic tank before being delivered to the reactor. The reactor is a tank into which air is pumped to ensure that a sufficient supply of oxygen is present for aerobic biochemical processes to occur. The addition of oxygen allows microorganisms to consume dissolved organic matter in the wastewater that was not previously removed by a screening or settling process. After a specified period of aeration, wastewater in the reactor is allowed to settle. The sludge that settles on the bottom now

consists primarily of the microorganisms that have fed on the organics in the wastewater. After the treated effluent is discharged, all but a small portion of the sludge, which is rich in microorganisms, is removed from the reactor. This helps quickly reestablish a population of microorganisms within the next batch of wastewater delivered to the reactor, reducing the amount of time necessary for treating each batch. Usually more than one reactor is needed so that while one batch of wastewater is being treated, additional flow can be directed elsewhere. The number of reactors ultimately depends on the expected volume of wastewater flow and the amount of time for treatment of each basin in the reactor. A longer retention period produces less sludge and cleaner effluent.

Membrane bioreactors (MBRs) are increasingly being used to treat domestic waste for small communities. Effluent can be treated to either discharge or reuse standards. The MBR replaces secondary clarification in a conventional wastewater treatment plant. MBRs separate biologically treated effluent from the mixed liquor utilizing membranes to perform the separation. The membranes allow the purified water to pass through the pores while creating a complete barrier to the passage of any solid greater than 0.4 microns. This prohibits passage of almost all bacteria and suspended solids. In an MBR, the membranes create a solids barrier and therefore the process is not subject to gravity settling solids limitations as in conventional clarifiers. MBRs are instead limited by the flow dynamics of high solids mixed liquor and the effect on oxygen transfer.

MBR systems are relatively simple to operate, with few pumps and controls; the systems therefore require minimal operator attention. Typical operator requirements for an MBR for a small community would average less than one hour per day. Typical daily maintenance includes monitoring of performance parameters. On approximately a weekly basis, waste from the pre-screens would be disposed of, and sludge would be pumped from the aeration tank to a sludge holding tank. Typical in-situ cleanings take place approximately four times a year. For a small community, these low maintenance requirements can be performed by on-site maintenance personnel in addition to other duties, or as an external service by personnel who visit the plant on an as-needed basis. However, initial capital costs for MBR systems and filter replacement costs can make the facilities more expensive to construct and operate than other treatment options.

L. SECTION SUMMARY

WASHINGTON CITY WASTEWATER SYSTEM FACILITIES

* GRAVITY WASTEWATER SYSTEM MOST DESIREABLE MEANS OF MOVING WASTEWATER
* EXISTING LIFT STATIONS:
  - Coral Canyon Lift Station
  - Ridge Pointe Lift Station
  - Sienna Hills Lift Station
* ADDITIONAL PROPOSED LIFT STATIONS
* WASTEWATER DEPARTMENT FACILITY
* COMMUNITY WASTEWATER TREATMENT SYSTEMS
  - Necessary in Development Southeast of Coral Canyon *(Basins R-7, R-8)*
  - All Washington City Wastewater Currently Going to Regional Treatment Plant

SECTION 5

SECTION 5 – RECOMMENDED SYSTEM IMPROVEMENTS

A. PREFACE

Application of the land use data described in Section 2 and creation of the computer model described in Section 3 allowed for three wastewater system scenarios to be generated for the Washington City study area. They include a 10-yr scenario, 20-yr scenario and a buildout scenario. Various alternative system scenarios were considered during the study; the final scenarios presented in this master plan are those deemed optimal based on current developmental expectations. This section seeks to present thoughts, theories, descriptions, considerations and methodologies particular to each master plan facility and wastewater collection basin. The reader is referred to Appendix F for a description, brief explanation, and buildout analysis of each individual basin and its corresponding master planned systems.

The decision was made with City Staff to analyze the system using a dual line scenario. The idea of dual lines is to install parallel lines rather than a single larger line. This allows the capacity of the existing lines to be fully used and mitigates the cost of the larger single line. In some cases, when examining the basins and sub-basins, there were areas in which it was not feasible to install dual lines when one sewer line, sized a little bigger, would carry the full capacity. The criteria used for this transition between dual lines and a single line was a 15-inch pipe or in other words, if a 15-inch pipe could handle the capacity of the flows then it was to be considered as a single pipe. Anything bigger was considered for the dual pipe scenario. Also note that any recommended improvements on an existing line was modeled and shown on the maps as a dual line, with the future capacity requirement being met by a parallel line.

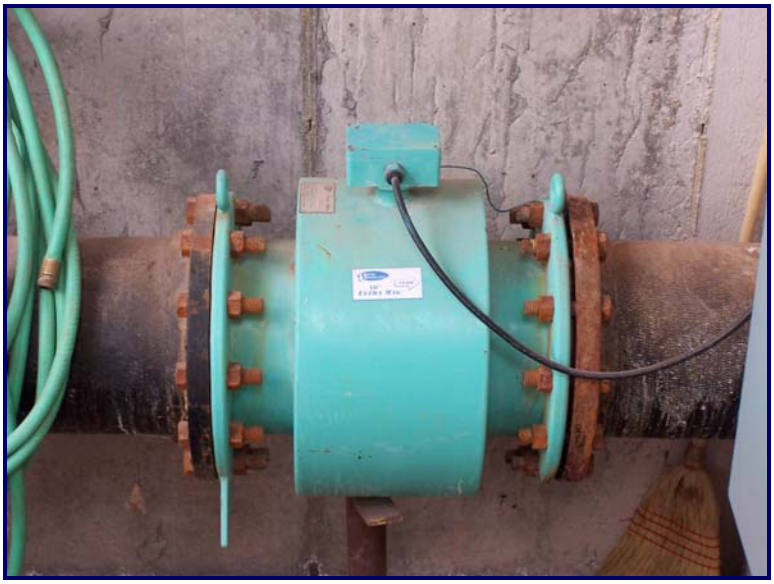
In order to recommend the best possible solutions to an ever-growing wastewater system, it is necessary to make logical decisions when updating the master plan on a case–by-case scenario.

Most of the existing wastewater pipes and those recommended as part of the Washington City master plan pipe improvements are gravity lines. The following sub-sections illustrate the proposed layout of gravity wastewater lines, their location in each of the wastewater collection basins, and their relationship to other master plan facilities such as lift stations and force mains for each scenario. These sub-sections provide a more detailed explanation of each of the scenarios. Included with the discussion for each scenario is a system map and Engineer's Estimate. This system map is divided into three areas: A North Area, a South (A) Area, and a South (B) Area. The North Section covers all existing and new development north of the Virgin River. The South (A) Section contains much of the Washington Fields area and east. Last of all, South Section (B) includes mostly new and developable areas in the southern edge of the study area boundary.

It should be noted that the shown location of each line or facility is conceptual and general only. Actual development and real site conditions may require improvements to be constructed in alternative locations.

B. 10-YR ANALYSIS AND RECOMMENDATIONS

A 10-yr analysis was completed within the study area for all of Washington City. This study area includes all basins and sub-basins shown in Figure A.6 of Appendix A, and applies the growth projections for 10 years.



The computer model that was developed to analyze the hydraulic capacity of the existing wastewater system indicates that most of the existing system is sized adequately to convey projected wastewater flows in ten years. The exceptions occur in Basins R-3 and R-4 along 100 East and 300 East. Maps of the existing wastewater system in these locations indicate a 12-inch pipe in both streets. The computer models show that in order to convey 10-yr flows, a 15-inch pipe will need to be added to the 100 East portion at Millcreek crossing, and an additional 10-inch will need to be installed in 300 East. If upstream land uses (R-6, R-5, R-4, R-3, R-2) reach the densities predicted by Winston Associates, it is recommended that the existing 18-inch line in basin R-4 near the industrial park be coupled with a 21-inch line.

It should be noted that upstream development may not reach the densities predicted by Winston Associates land use plan. It is therefore suggested that Washington City observe development in the upper areas of collection basin R-3 and R-4 before expending resources on the pipe replacement effort. Reality may be such that development in the upper portions of these basins occurs at a density less that that predicted by Winston Associates.

Along with the existing system, the computer model shows any necessary pipes required for new development based upon the growth rate and population projections explained in Section 3. These proposed improvements are shown in the attached figures.

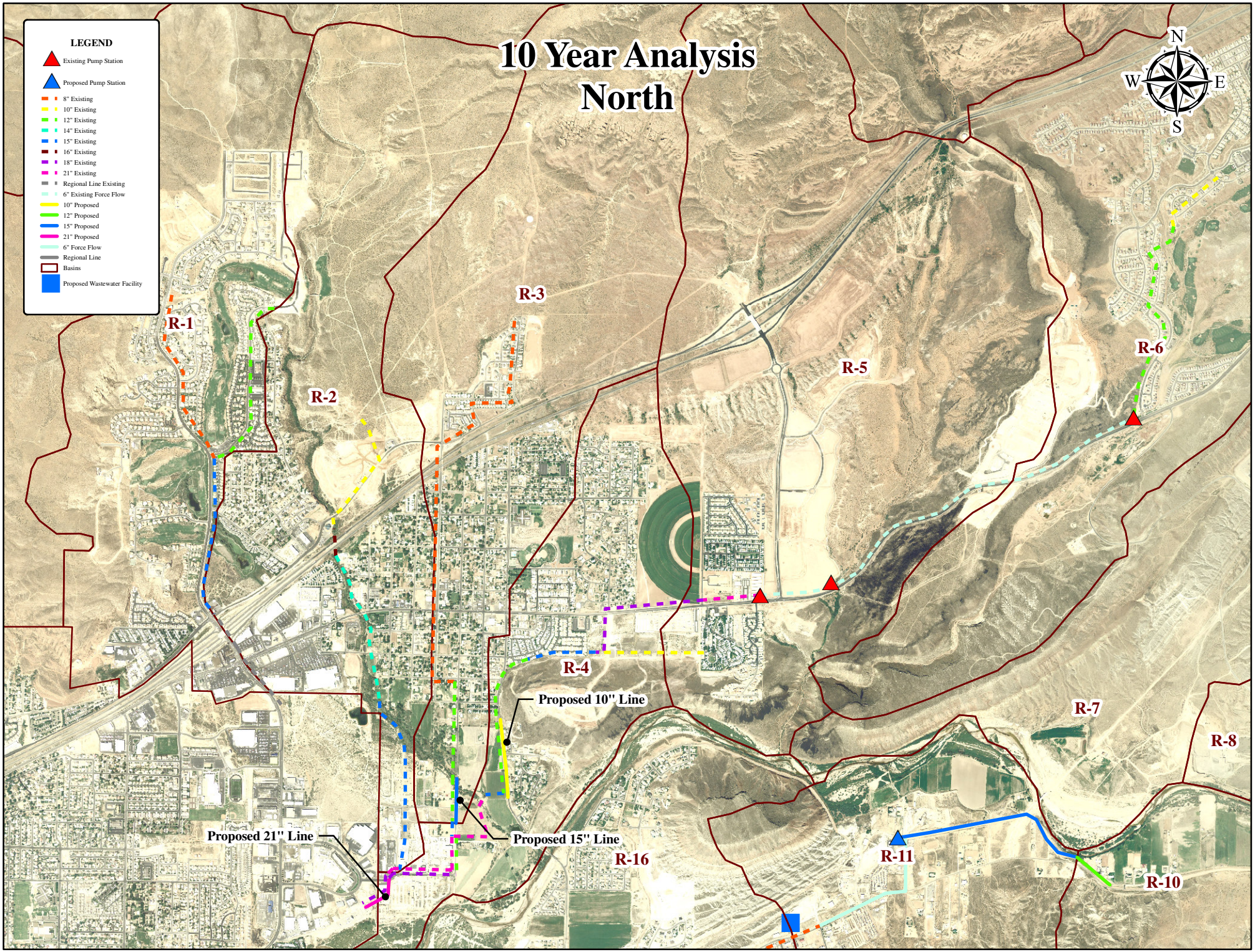
The accounting of master plan facility costs for the 10-yr analysis includes the cost of the necessary improvements to meet the 10-yr projected wastewater design flows. These include adding a 10-inch, 15-inch, and 21-inch dual wastewater pipe, a sewer pump station, a wastewater department facility, and additional construction items. The opinion of probable cost for the 10-yr analysis is shown on the attached figures. It also includes the cost of upsizing a developers wastewater line, when that line is considered a trunk line using wastewater impact fee funds. This study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that

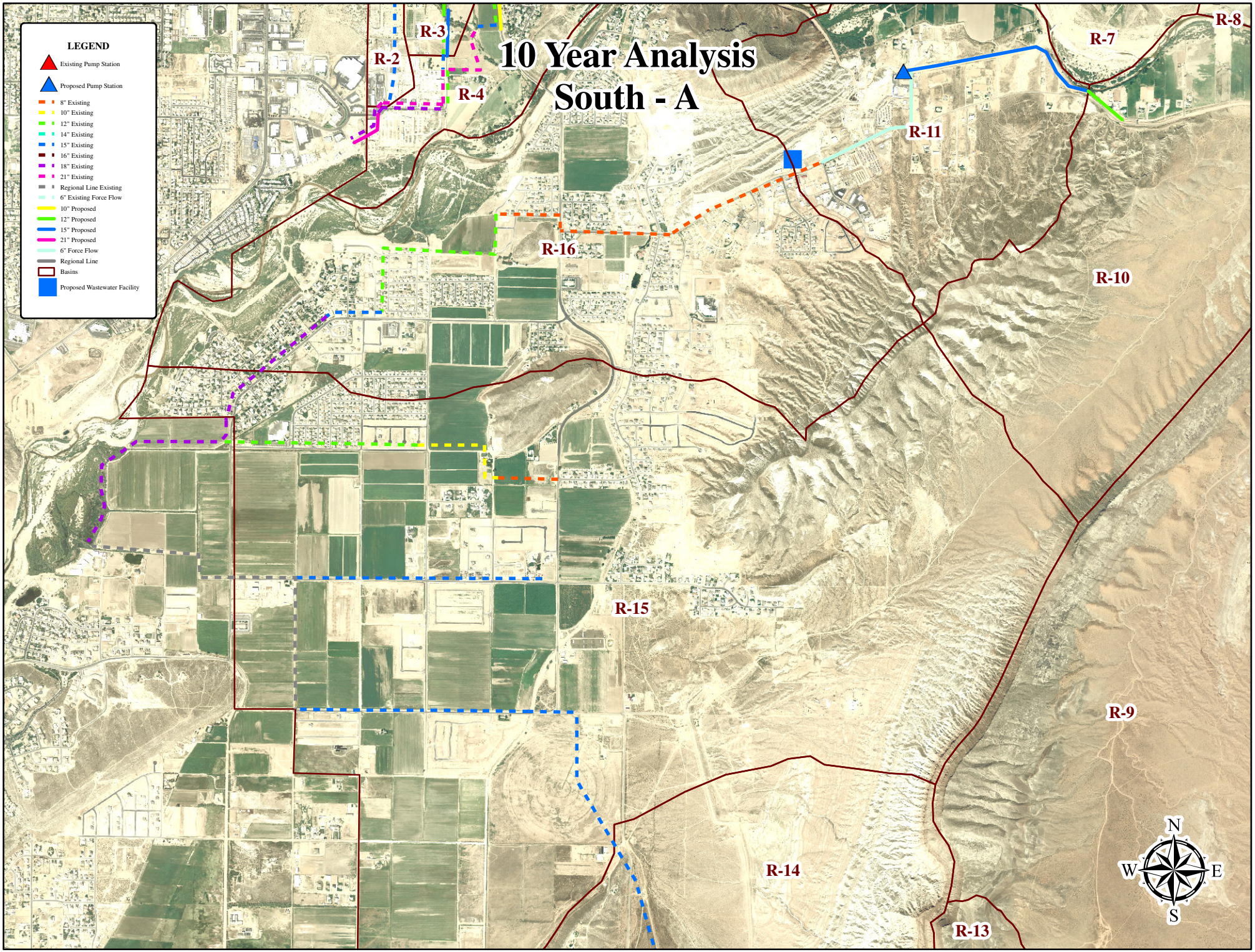
an 8-inch line is sufficient for this purpose.

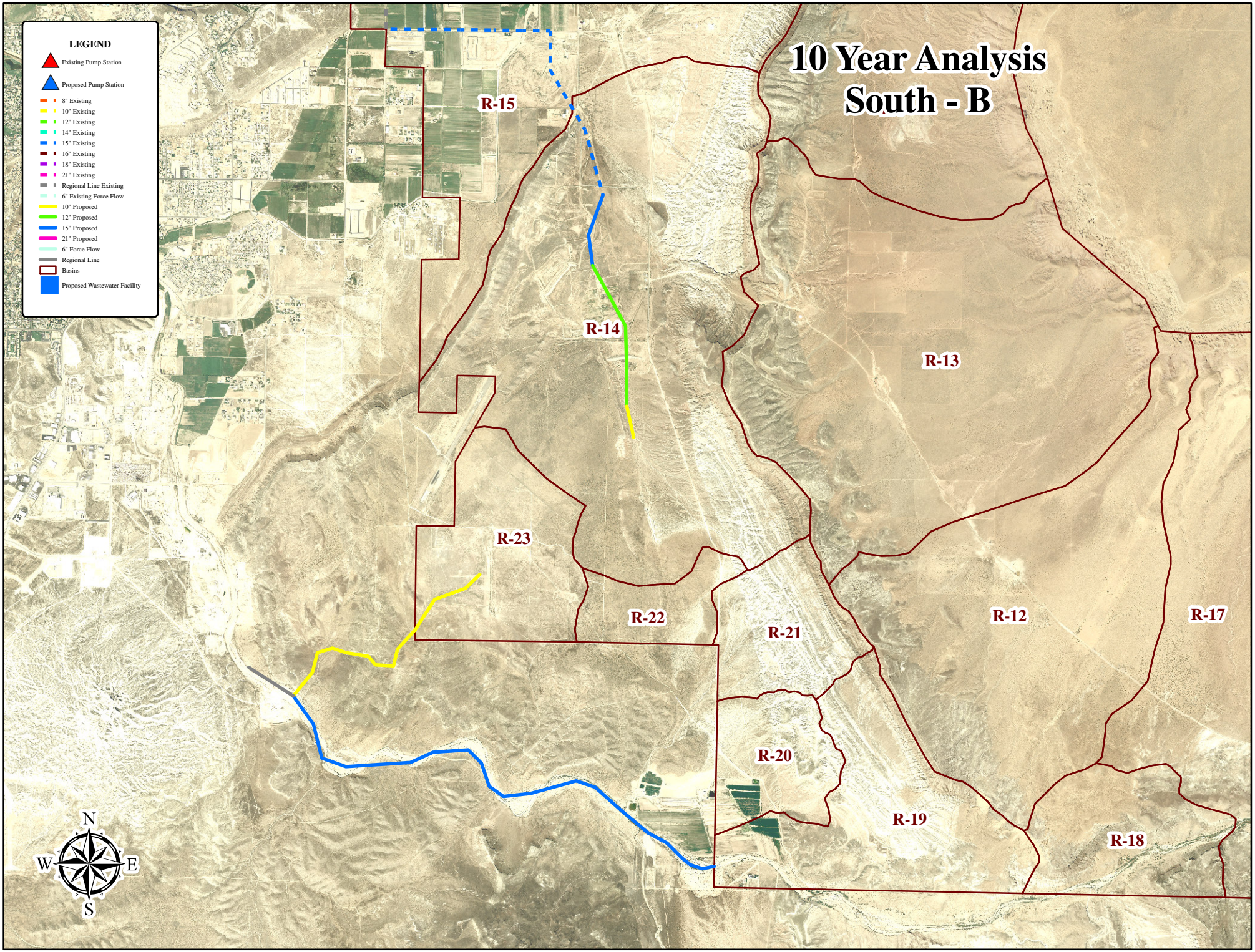
It should be noted that the Washington City Construction Design Standards manual specifies that sanitary sewer mains, trunks and outfalls shall be designed to carry not less than 250 gallons per capita per day when running 2/3 full with a manufacturers recommended Manning's n value. Planning of the proposed system improvements in this study generally follows that guideline. A Manning's n value of 0.012 was used throughout the study. However, in some sections of the system, it is acceptable to allow a Manning's n value less than that of 0.012 (0.012 is more conservative than the manufacturer's recommendation of 0.010) to support a smaller pipeline for that area. Certain sections throughout this analysis are examples of this allowance. The model spreadsheet printout, given in Appendix E, shows which pipes were allowed the lower manning's n value.

It is recommended that the Washington City Wastewater Master Plan be reviewed and updated regularly and such reviews are reflected in the Opinion of Probable Cost and Impact Fee Analysis.

RECOMMENDED SYSTEM IMPROVEMENTS 10-YR ANALYSIS
*** RECOMMENDED IMPROVEMENTS TO EXISTING SYSTEM:**
VIRGIN RIVER NORTH
- 300 East: New 10" Parallel Line
- 100 East (Millcreek X-ing): New 15" Parallel Line
- Industrial Road: New 21" Parallel Line
*** RECOMMENDED IMPROVEMENTS DUE TO NEW DEVELOPMENT:**
WASHINGTON DAM AREA (SOUTH A)
- New Sewer Pump Station w/ 6" Force Flow
- New 15" Single Line
- New 12" Single Line
- New Wastewater Department Facility
WASHINGTON FIELDS SOUTH (SOUTH B)
- New 10" Single Line
- New 12" Single Line
- New 15" Single Line
WASHINGTON FT. PIERCE/AIRPORT (SOUTH B)
- New 15" Single Line
- New 10" Single Line


10 Year Analysis
North
LEGEND
Existing Pump Station
Proposed Pump Station
8" Existing
10" Existing
12" Existing
14" Existing
15" Existing
16" Existing
18" Existing
21" Existing
Regional Line Existing
6" Existing Force Flow
10" Proposed
12" Proposed
15" Proposed
21" Proposed
6" Force Flow
Regional Line
Basins
Proposed Wastewater Facility
N
W
E
S
R-1
R-2
R-3
R-4
R-5
R-6
R-7
R-8
R-10
R-11
R-16
Proposed 10" Line
Proposed 15" Line
Proposed 21" Line


10 Year Analysis
South - A
LEGEND
Existing Pump Station
Proposed Pump Station
8" Existing
10" Existing
12" Existing
14" Existing
15" Existing
16" Existing
18" Existing
21" Existing
Regional Line Existing
6" Existing Force Flow
10" Proposed
12" Proposed
15" Proposed
21" Proposed
6" Force Flow
Regional Line
Basins
Proposed Wastewater Facility
R-2
R-3
R-4
R-7
R-8
R-9
R-10
R-11
R-13
R-14
R-15
R-16
N
W
E
S


10 Year Analysis
South - B
LEGEND
Existing Pump Station
Proposed Pump Station
8" Existing
10" Existing
12" Existing
14" Existing
15" Existing
16" Existing
18" Existing
21" Existing
Regional Line Existing
6" Existing Force Flow
10" Proposed
12" Proposed
15" Proposed
21" Proposed
6" Force Flow
Regional Line
Basins
Proposed Wastewater Facility
R-15
R-14
R-13
R-23
R-22
R-21
R-12
R-17
R-20
R-19
R-18
N
W
E
S

C. 20-YR ANALYSIS AND RECOMMENDATIONS

A 20-yr analysis was completed within the study area for all of Washington City. This study area includes all basins and sub-basins shown in Figure A.6 of Appendix A and applies the growth rates specified for 20 years.

The computer model that was developed to analyze the hydraulic capacity of the existing wastewater system indicates that most of the existing system is sized adequately to convey projected wastewater flows at 20 years. The exceptions occur along Main Street and 300 South in Basins R-3 and R-4 and along the industrial road in the southwestern parts of basin R-4. Maps of the wastewater system on Main Street and 300 South indicate an existing 8-inch pipe. The computer models show that in order to convey 20-yr flows, a 10-inch pipe will need to be added to the Main Street and a 12-inch pipe to 300 South. If upstream land uses (R-6, R-5, R-4, R-3, R-2) reach the densities predicted by Winston Associates, it is recommended that the existing 18-inch line in basin R-4 near the industrial park be coupled with a 24-inch line. All other wastewater improvements, shown in the figures, are due to projected growth in the area. This study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. It should be noted that any wastewater improvements made in the 10-yr analysis under the 15-inch criteria will be shown on the figures as existing features.

It should be noted that upstream development may not reach the densities predicted by Winston Associates land use plan. It is therefore suggested that Washington City observe development in the upper areas of collection basin R-3 and R-4 before expending resources on the pipe replacement effort. Reality may be such that development in the upper portions of these basins occurs at a density less that that predicted by Winston Associates.

Along with the existing system, the computer model shows any necessary pipes required for new development based upon the growth rate and population projections explained in Section 3. These proposed improvements are shown in the attached figures.

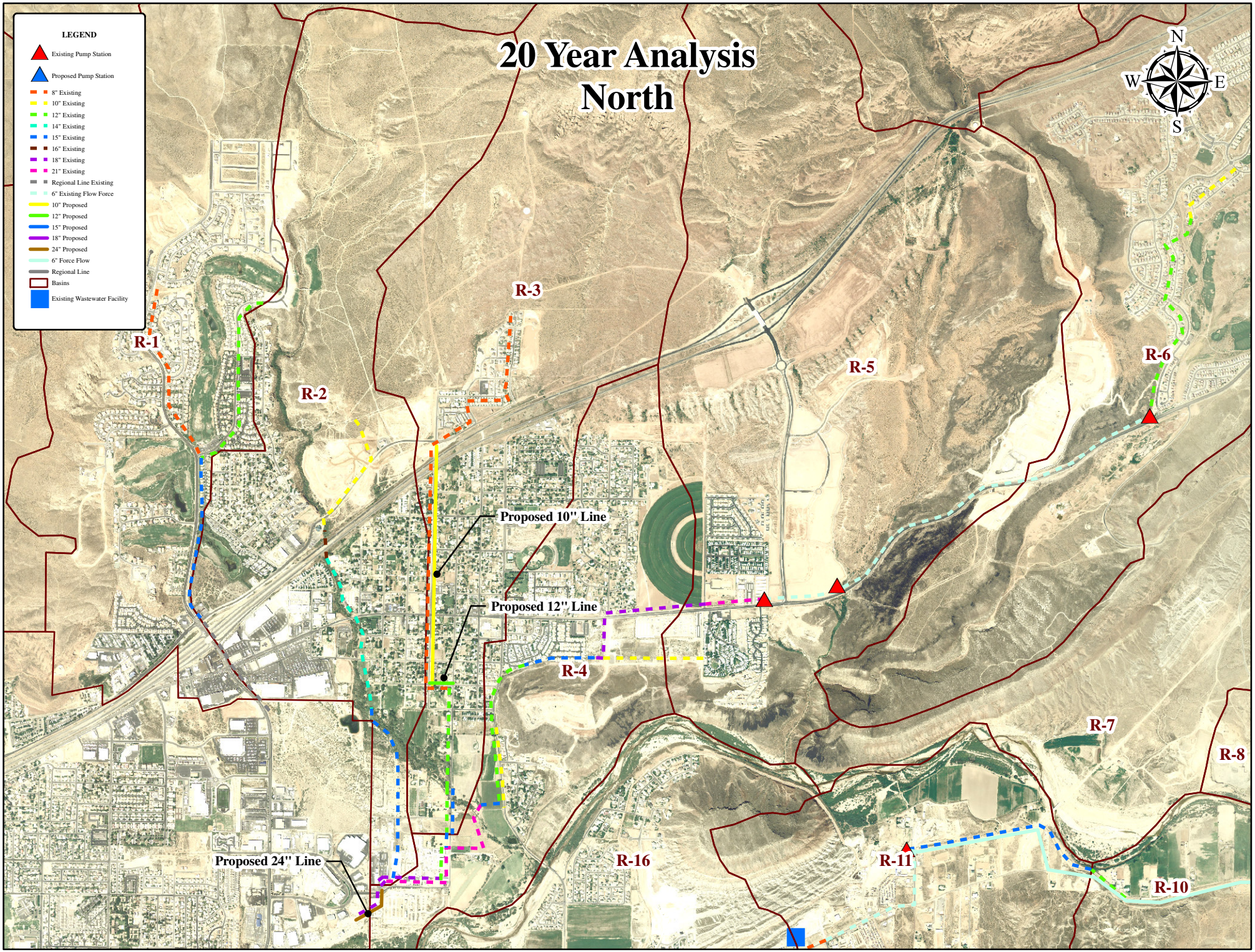
The accounting of master plan facility costs for the 20-yr analysis is not included in this report because the impact fees and user rates are solely

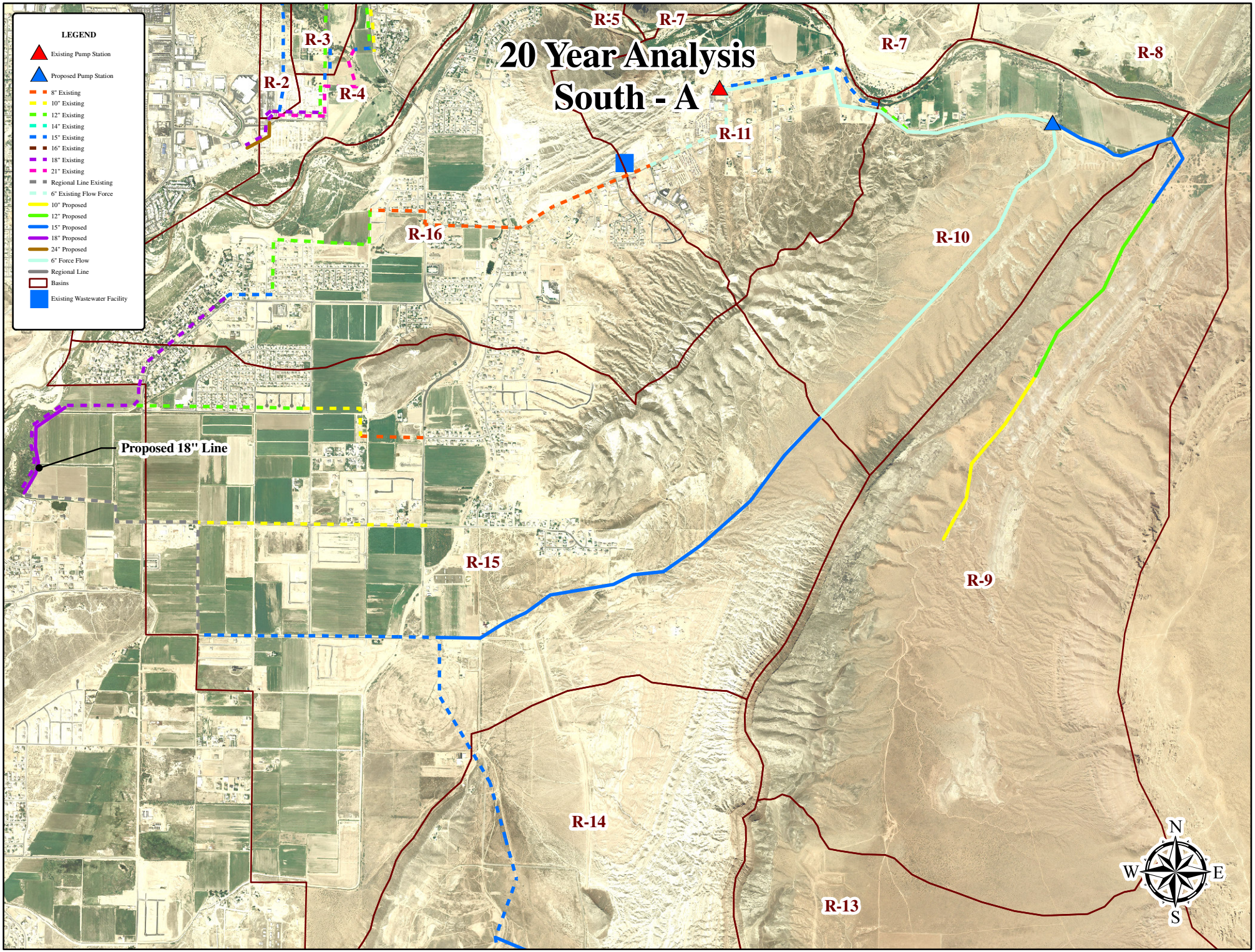
based upon the 10-yr analysis. In the 10-year cost estimate, a master planning fee is included to provide an update of the wastewater master plan and provide new cost estimates based upon the current economic conditions and sewer flows. It also includes the cost of upsizing a developers wastewater line, when that line is considered a trunk line using wastewater impact fee funds.

As per the 10-yr analysis, it should be noted that the all design standards specified were used throughout each scenario. This includes a design flow of not less that 250 gallons per capita per day, pipes running 2/3 full, and a Manning's n value of 0.012. However, in some sections of the system, it is acceptable to allow a Manning's n value less than that of 0.012. Certain sections throughout this analysis are examples of this allowance. The model spreadsheet printout, given in Appendix E, shows which pipes were allowed the lower Manning's n value.

It is recommended that the Washington City Wastewater Master Plan be reviewed and updated regularly and such reviews are reflected in the Opinion of Probable Cost and Impact Fee Analysis.

RECOMMENDED SYSTEM IMPROVEMENTS 20-YR ANALYSIS
*** RECOMMENDED IMPROVEMENTS TO EXISTING SYSTEM:**
VIRGIN RIVER NORTH
- Main Street: New 10" Parallel Line
- 300 South: New 12" Parallel Line
- Industrial Road: New 24" Parallel Line
VIRGIN RIVER SOUTH
- Regional Pipe: New 18" Parallel Line
*** RECOMMENDED IMPROVEMENTS DUE TO NEW DEVELOPMENT:**
WASHINGTON DAM AREA (SOUTH A)
- New Sewer Pump Station
- New 6" Force Flow from Proposed 10-Year Pump Station to Proposed 20-Year Pump Station
- New 6" Force Flow through Long Valley w/ 15" Gravity Flow
- New 15" Single Line
- New 12" Single Line
- New 10" Single Line
WASHINGTON FIELDS SOUTH (SOUTH B)
- New 10" Single Line
- New 12" Single Line
- New 15" Single Line
WASHINGTON FT. PIERCE/AIRPORT (SOUTH B)
- New 10" Single Line
- New 12" Single Line


20 Year Analysis
North
LEGEND
Existing Pump Station
Proposed Pump Station
8" Existing
10" Existing
12" Existing
14" Existing
15" Existing
16" Existing
18" Existing
21" Existing
Regional Line Existing
6" Existing Flow Force
10" Proposed
12" Proposed
15" Proposed
18" Proposed
24" Proposed
6" Force Flow
Regional Line
Basins
Existing Wastewater Facility
N
W
E
S
R-1
R-2
R-3
R-4
R-5
R-6
R-7
R-8
R-10
R-11
R-16
Proposed 10" Line
Proposed 12" Line
Proposed 24" Line

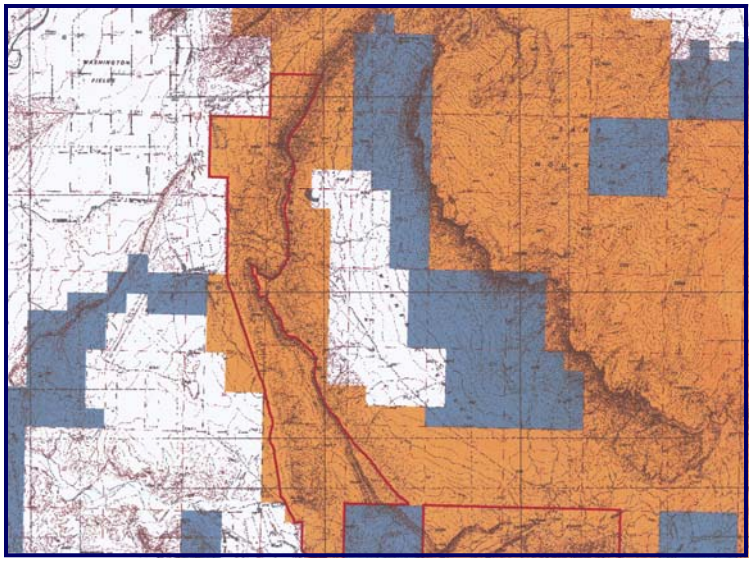

20 Year Analysis
South - A
LEGEND
Existing Pump Station
Proposed Pump Station
8" Existing
10" Existing
12" Existing
14" Existing
15" Existing
16" Existing
18" Existing
21" Existing
Regional Line Existing
6" Existing Flow Force
10" Proposed
12" Proposed
15" Proposed
18" Proposed
24" Proposed
6" Force Flow
Regional Line
Basins
Existing Wastewater Facility
R-2
R-3
R-4
R-5
R-7
R-7
R-8
R-9
R-10
R-11
R-13
R-14
R-15
R-16
Proposed 18" Line
N
W
E
S

20 Year Analysis
South - B
LEGEND
Existing Pump Station
Proposed Pump Station
8" Existing
10" Existing
12" Existing
14" Existing
15" Existing
16" Existing
18" Existing
21" Existing
Regional Line Existing
6" Existing Flow Force
10" Proposed
12" Proposed
15" Proposed
18" Proposed
24" Proposed
6" Force Flow
Regional Line
Basins
Existing Wastewater Facility
N
W
E
S
R-9
R-15
R-14
R-13
R-23
R-22
R-21
R-12
R-17
R-20
R-19
R-18

D. BUILDOUT ANALYSIS AND RECOMMENDATIONS

A buildout analysis was previously completed in the November 2005 Washington City Wastewater Master Plan for all of Washington City. This study includes a buildout analysis based upon adding dual lines only to existing pipes instead of replacing them. Areas with no exiting pipe are treated as a single pipe flow. The study area includes all basins and sub-basins shown in Figure A.6 of Appendix A. It is expected that future development in Washington City will generally follow the land use patterns specified by Winston Associates. Discussion on how wastewater flows are calculated from the land use plan is presented in Section 2 of this study.

The computer model that was developed to analyze the hydraulic capacity of the existing wastewater system indicates that there are many areas that need added sewer pipe within the existing system. It should be noted the existing system is sized adequately to convey project wastewater flows at 10 to 20 years. The following figures show the necessary pipe sizes to meet the buildout wastewater collection design flows.



This study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose.

It should be noted that development may not reach the densities predicted by Winston Associates land use plan. Reality may be such that development in portions of these basins occurs at a density less that that predicted by Winston Associates. It is therefore suggested that Washington City observe development and refer to the 10-yr and 20-yr analysis in determining problem areas. This buildout analysis is mainly to assist in determining wastewater collection pipe sizes for the 10-yr and 20-yr analyses. It is suggested that the master plan and its recommendations be updated regularly.

The accounting of master plan facility costs for the buildout analysis is not included in this report because of the long term nature of the projections. Also, the impact fees and user rates are solely based upon the 10-yr analysis. In the 10-year opinion of probable cost, a master planning fee is included to provide an update of the wastewater master plan and provide new cost estimates based upon the current economic conditions and sewer flows.

It is recommended that the Washington City Wastewater Master Plan be reviewed and updated regularly and such reviews are reflected in the Opinion of Probable Cost and Impact Fee Analysis.

RECOMMENDED SYSTEM IMPROVEMENTS
BUILDOUT ANALYSIS

These buildout recommendations are for informational purposes and do not include any 10-yr or 20-yr proposed improvements. Please refer to previous sub-sections B & C for 10-yr and 20-yr recommendations

*** RECOMMENDED IMPROVEMENTS TO EXISTING SYSTEM:**

VIRGIN RIVER NORTH

- Basin R-2: New 10" & 12" Parallel Lines
- Basin R-3: New 8", 10", 12" & 18" Parallel Lines
- Basin R-4: New 21", 18", 15", 27", 24", & 36" Parallel Lines
- Basin R-6: New 10" Parallel Line

VIRGIN RIVER SOUTH

- Basin R-16: New 8" Parallel Line
- Basin R-15: New 18" Parallel Line
- Basin R-14: New 18" Parallel Line

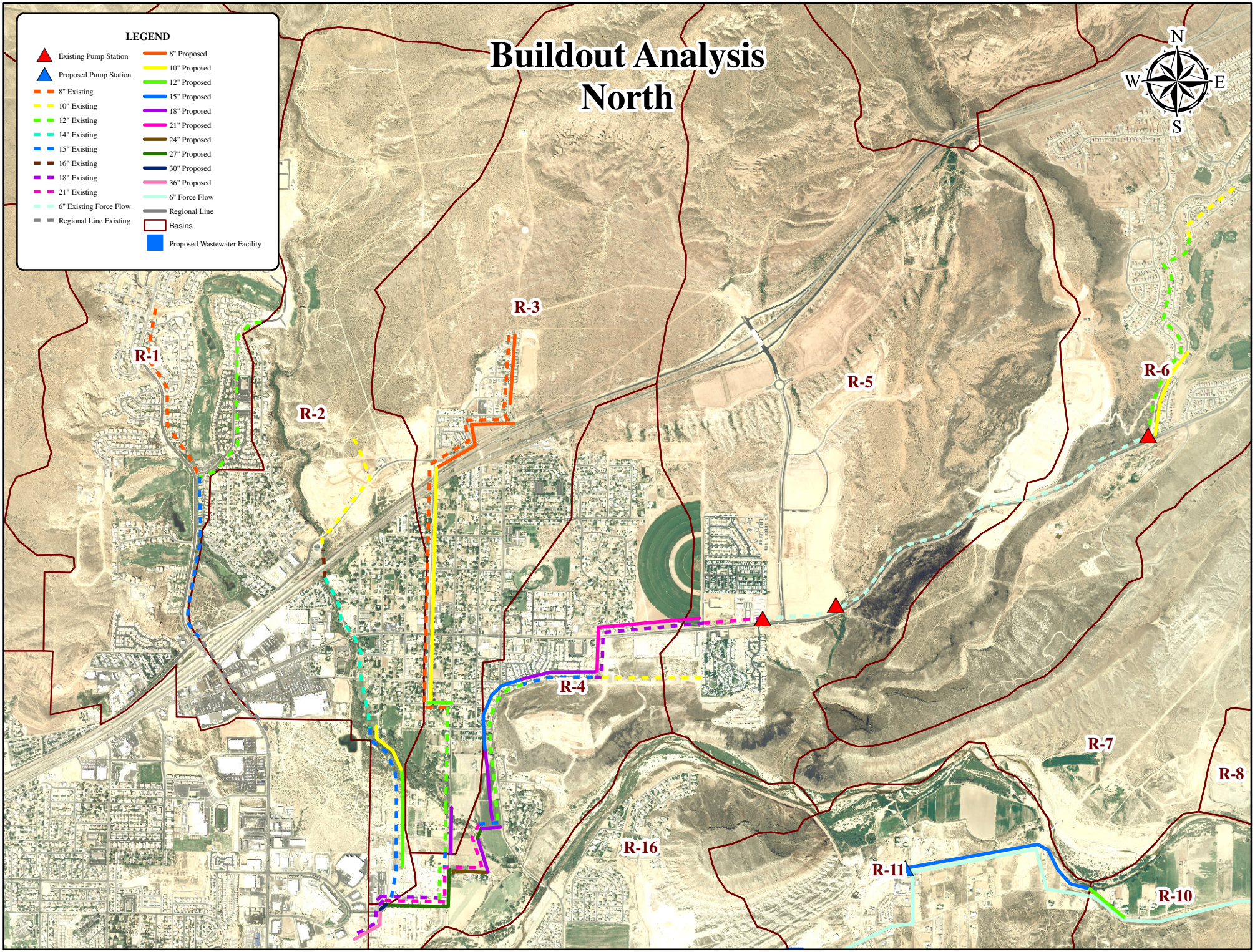
*** RECOMMENDED IMPROVEMENTS DUE TO NEW DEVELOPMENT:**

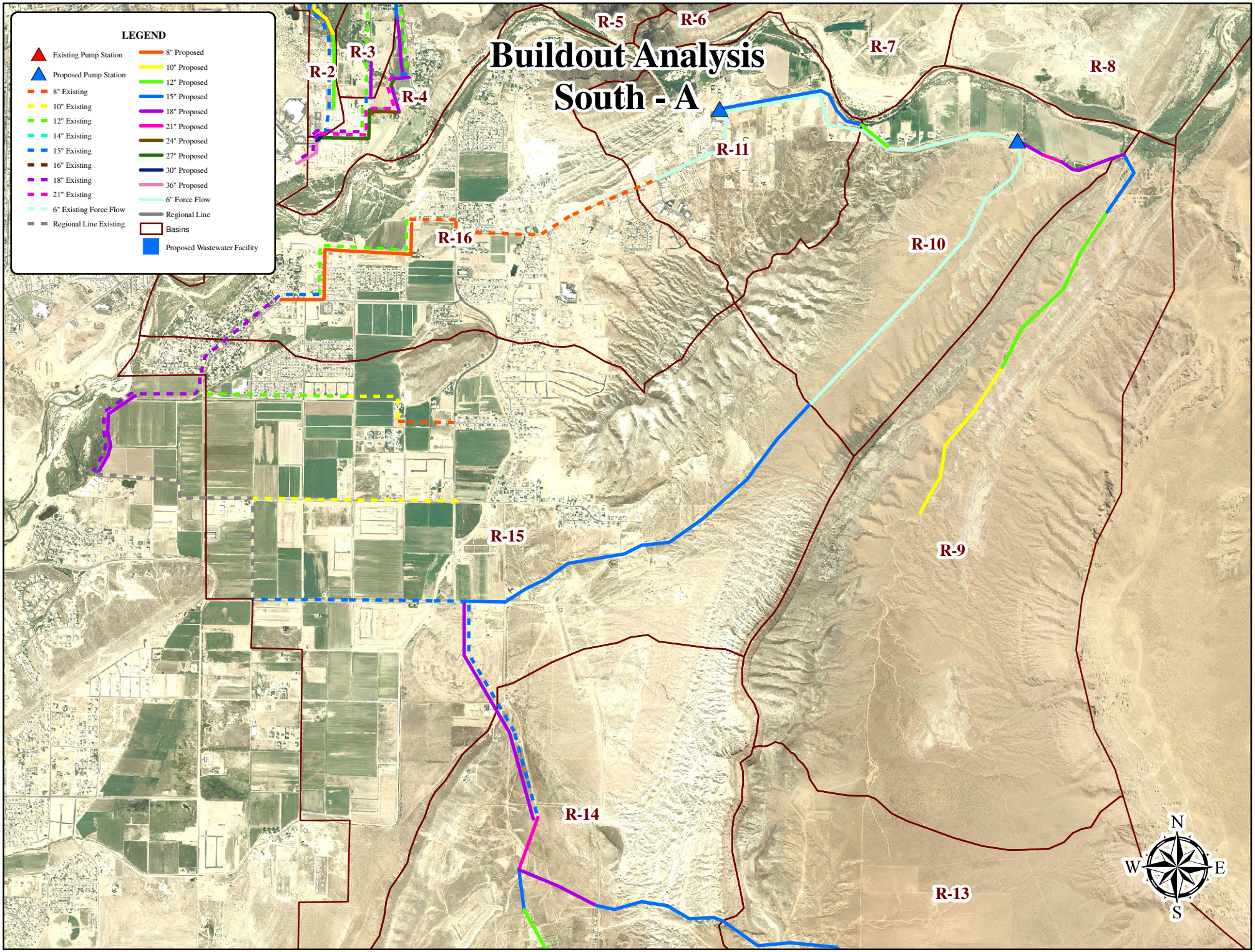
VIRGIN RIVER SOUTH - A

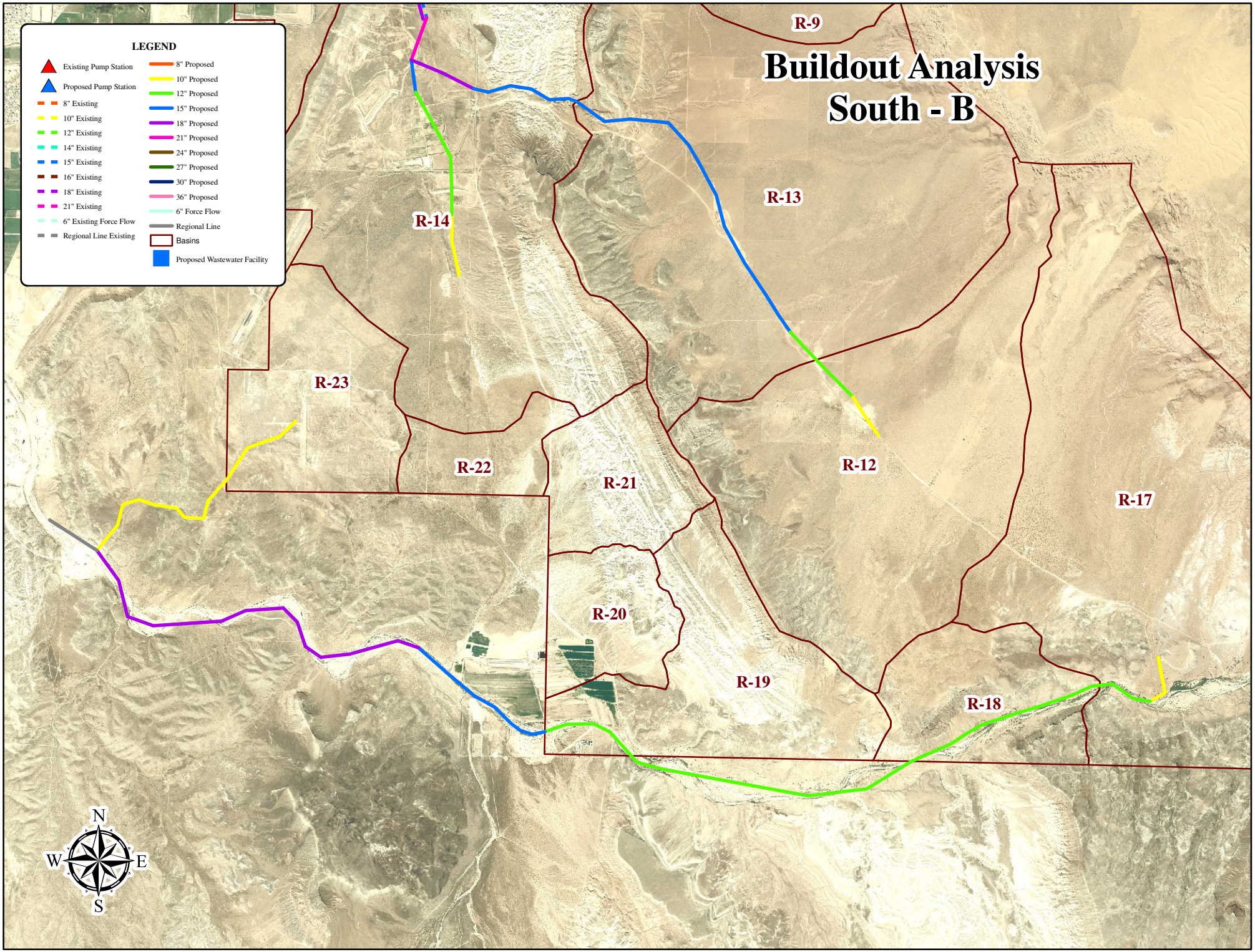
- Basin R-9: New 10", 12" & 15" Single Lines
- Basin R-10: New Sewer Pump Station w/ 6" Force Flow
- Basin R-10: New 12", 18" & 21" Single Lines
- Basin R-11: New Sewer Pump Station w/ 6" Force Flow
- Basin R-11: New 15" Single Line
- Basin R-15: New 15" Single Line
- Basin R-14: New 10", 12", 15", 18" & 21" Single Lines

VIRGIN RIVER SOUTH - B

- Basin R-13: New 12" & 15" Single Lines
- Basin R-12: New 10" & 12" Single Lines
- Basin R-17: New 10" & 12" Single Lines
- Basin R-18: New 12" Single Line
- Basin R-19,20,21,22: New 12",15" & 18" Single Lines
- Basin R-23: New 10" Single Line


Buildout Analysis
North
LEGEND
Existing Pump Station
Proposed Pump Station
8" Existing
10" Existing
12" Existing
14" Existing
15" Existing
16" Existing
18" Existing
21" Existing
6" Existing Force Flow
Regional Line Existing
8" Proposed
10" Proposed
12" Proposed
15" Proposed
18" Proposed
21" Proposed
24" Proposed
27" Proposed
30" Proposed
36" Proposed
6" Force Flow
Regional Line
Basins
Proposed Wastewater Facility
N
W
E
S
R-1
R-2
R-3
R-4
R-5
R-6
R-7
R-8
R-10
R-11
R-16


Buildout Analysis
South - A
LEGEND
Existing Pump Station
Proposed Pump Station
8" Existing
10" Existing
12" Existing
14" Existing
15" Existing
16" Existing
18" Existing
21" Existing
6" Existing Force Flow
Regional Line Existing
8" Proposed
10" Proposed
12" Proposed
15" Proposed
18" Proposed
21" Proposed
24" Proposed
27" Proposed
30" Proposed
36" Proposed
6" Force Flow
Regional Line
Basins
Proposed Wastewater Facility
R-2
R-3
R-4
R-5
R-6
R-7
R-8
R-9
R-10
R-11
R-13
R-14
R-15
R-16
N
W
E
S


Buildout Analysis
South - B
LEGEND
Existing Pump Station
Proposed Pump Station
8" Existing
10" Existing
12" Existing
14" Existing
15" Existing
16" Existing
18" Existing
21" Existing
6" Existing Force Flow
Regional Line Existing
8" Proposed
10" Proposed
12" Proposed
15" Proposed
18" Proposed
21" Proposed
24" Proposed
27" Proposed
30" Proposed
36" Proposed
6" Force Flow
Regional Line
Basins
Proposed Wastewater Facility
R-9
R-13
R-14
R-23
R-22
R-21
R-12
R-17
R-20
R-19
R-18
N
W
E
S

SECTION 6

SECTION 6 – SYSTEM FINANCIALS

A. PREFACE

A feasibility analysis of any type of wastewater system requires that a financial analysis be done to determine if the fees and rates are legitimate. This section seeks to explain how recommended improvements are applied to a system's financials by utilizing a cash flow spreadsheet to determine the user rates and impact fees for a specific time period. This section also discusses the methodology in providing opinions of cost for the construction of recommended improvements.

B. SYSTEM COST ESTIMATES

The opinion of probable cost calculated for the recommended system improvements specified by this study was formulated by analyzing only the 10-yr analysis. Unit price estimates for each component of the total system were obtained from recent applicable bid tabulations and materials suppliers. The unit prices used are for constructed and/or installed facilities and include costs for materials, labor, equipment and incidentals, based on current construction prices. Material quantities in each of the wastewater collection basins were itemized and the unit costs were applied to the quantities to generate an overall estimate. The 10-yr opinion of probable cost showing the unit costs and material quantities for the improvements is provided in Section 5 of this study.

In determining the material quantities for the 10-yr analysis, pipe segment lengths were taken from the AutoCAD drawings for the designated improvement areas. It was assumed that manholes would be spaced 400 feet apart. The estimates assume 48-inch manholes for 8-inch and 10-inch pipe sizes, 60-inch manholes for 12-inch through 30-inch pipe sizes and 72-inch manholes for 36-inch and greater pipe sizes. It was also assumed that 33% of the total pipe length would require imported pipe bedding and imported trench backfill. Additional miscellaneous items that are common to wastewater pipe construction projects were taken as 15% of the total pipe and manhole installation cost and added to the system estimate. In locations where groundwater or existing pavement was expected to be encountered, an allowance was given for the extra costs incurred by these construction obstacles. Standard allowances for construction contingency, quality control and expenses, survey, legal and fiscal expenses, engineering design expenses, GIS system mapping, and future master planning were also included in the opinion of probable cost.

Where the physical facilities of a sewer pump station and wastewater department facility are specified, the accounting of master plan costs includes the estimated price of said facilities. The Washington Dam area includes the anticipated cost of constructing a wastewater department facility and sewer pump station within the next ten years. Procurement of the land upon which the physical facilities would be constructed has also been included in the accounting of master plan facility costs.

C. PROJECT PHASING

Master plan improvements recommended by this study were determined by the 10-yr analysis and broken into a percentage of the overall cost. These costs are shown in Table 6.A and are considered Phase 1. It was assumed that those improvements expected to provide immediate returns or facilitate imminent growth were assigned to an earlier priority. Those improvements within 20 years that could be allowed to come gradually with development were assigned in Phase 2 to a later date. Phase 2 costs are not based on unit pricing but simply demonstrate that there will be additional projects required. Specific timing and cost should be considered as a part of routine updates of the master plan.

Scheduling of master plan 10-yr improvements in the cash flow analysis was done according to the growth projections given in Section 3 of this report. In all cases, the improvements are planned to support continuing growth within the next ten years and are planned for implementation at times when the growing population base can theoretically generate enough revenue to fund the projects. It should be noted that growth in the study area may occur at a rate faster or slower than that predicted in the cash flow analysis. If growth occurs at a faster rate, more funds will be available to construct the projects at an earlier schedule than that specified by the phasing projections. On the other hand, if growth slows more than expected, implementation of the projects should be delayed until the population base can fund the improvements.

Table 6.A Master Plan Improvements 20-Year Phasing

Phase	Priority	Const. Year	Total Cost	
1	A	2010	$2,589,750	*(50% of 10-Yr Cost)*
1	B	2014	$1,294,875	*(25% of 10-Yr Cost)*
1	C	2016	$1,294,875	*(25% of 10-Yr Cost)*
2	A	2020	$2,000,000	*(Estimated)*
2	B	2024	$2,000,000	*(Estimated)*
2	C	2028	$2,000,000	*(Estimated)*

D. WASTEWATER IMPACT FEES

As previously discussed in the system cost estimates subsection, unit prices for each of the master plan facilities were established and applied to material quantities throughout the study area to calculate the engineer's opinion of

probable cost for a 10-yr projection. Because Washington City staff have indicated that the existing wastewater system functions adequately under current development conditions, it was assumed that the purpose of all the improvements recommended by this study is to facilitate new growth in the City; all the recommended improvements are therefore eligible for funding through impact fee collection.

As requested by Washington City staff, a 10-year impact fee was calculated to better enable the City to provide the services necessary for growth which is expected to occur within the next 10 years.

Application of the Winston Associates land use map, along with other modified land use maps, to the study area and reduction of the data (described in Section 2 of this study) estimates that the total number of Equivalent Residential Units (ERUs) at buildout in the study area will be 64,352 ERUs. Eliminating the ERUs in wastewater collection basins R-7 and R-8 (southeast of Coral Canyon area) because it is anticipated that these basins will discharge wastewater to an isolated system and apply no burden to the Washington City wastewater system, the total number of ERUs discharging to the municipal system at buildout is estimated at 56,305. The number of existing ERUs within Washington City was obtained from current utility records and City audits and falls at 7,989 ERUs. According to the growth projections included in the cash flow analysis, the total number of ERUs estimated in the study area in 10 years is 14,007. Table 6.B illustrates the projections.

Table 6.B - ERU Projection Summary

ERU Data Type	ERU's	% of Total
Existing Wastewater ERU's	7,989	14%
5-yr Wastewater ERU's	10,032	18%
10-yr Wastewater ERU's	14,007	25%
20-yr Wastewater ERU's	27,180	48%
Buildout Wastewater ERU's	56,305	100%

The current Washington City ordinance for assessing wastewater impact fees is such that one fee is charged to development north of the Virgin River and a different fee is charged to development south of the Virgin River. During the process of this study, continuation of this methodology was not investigated. As can be seen, recommended improvements are relevant throughout the City and without unreasonable analysis on a neighborhood by neighborhood basis it is not feasible to assign impact fees based on geographic location. It is recommended the City adopt a single impact fee that will be uniform throughout the community.

The investigation of a unified impact fee was completed by totaling the 10-yr engineer's opinion of probable cost with

the portion of the existing debt service that would be due and paid within the 10 year analysis period, and dividing it by the respective net projected ERU increases to determine the impact fee that should be charged. It is recommended that the City adopt a unified impact fee system which would be applied throughout the City. The recommended maximum unified impact fee is $1,159. Table 6.C illustrates the results.

Table 6.C Unified Impact Fee Analysis

EXISTING DEBT SERVICE			**% Eligible**	**Eligible**	
Sewer Bonds (1999) (only portion due between 2008-2018)	2.00%	$1,883,000	95.2%	$ 1,793,181	
		Existing Impact Fee Eligible Cost:		$ 1,793,181	
PROPOSED 10 YEAR IMPROVEMENT PROJECTS			**% Eligible**	**Eligible**	
Total Estimated New Project Cost		$5,179,500	100.0%	$ 5,179,500	
		Impact Fee Eligible Cost:		$ 5,179,500	
Total Impact Fee Eligible Cost				$ 6,972,681	
No. of ERUs (2008 Est.)				7,989	
No. of ERUs (2018 Est.)				14,007	
No. of New ERU's Due to Growth				6,018	
Maximum Impact Fee = Total Eligible Cost / New ERU's				$ 1,159	/ERU
Proposed Impact Fee for Washington City (FY 2009-2010) =				**$ 1,159**	/ERU

The impact fee collected will go towards projects within the 6 Year period as required by the State of Utah.

The impact fee charged by the City of St. George to all new residential equivalent users of the regional wastewater treatment facility is $948. Any future alterations to the existing fee will be determined by administrators of the regional facilities. As the accounting system currently operates, impact fees assessed for use of regional facilities collected by Washington City are passed directly to the City of St. George. This fee should continue to be assessed independently of the Washington City fees as has been done in the past.

Regarding the inspection fee, Washington City has an ordinance that the City will not provide a wastewater connection; the developer or property owner has the responsibility to bring a lateral to the lot from the wastewater main. This, however, does not eliminate the cost to the City to provide the connection inspection or clerical work to set up the required bookkeeping reports. The 2005 Wastewater Collection System Master Plan prepared by Sunrise Engineering, Inc. specifies $150 per connection as the recommended inspection fee and the City has enacted an ordinance enabling them to charge that fee. No effort has been made by this study to re-evaluate the fee. It should be noted that by law the inspection fee is entirely independent from the wastewater system impact fee. It is recommended that the City continue charging the inspection fee as has been done heretofore.

E. SYSTEM USER RATES

The current Washington City ordinance for assessing wastewater system user rates is such that a Washington City base fee is charged to development north of the Virgin River and a different base fee is charged to development south of the Virgin River. This base fee includes sewer service for all connections. A surcharge is

then added for the City of St. George for transport and treatment of all wastewater from Washington City. A pumping surcharge is also added for areas requiring a lift station as is currently being done for the Coral Canyon, Ridge Pointe, and Sienna Hills developments. These rates and surcharges are summarized in the following Table 6.D.

Table 6.D Existing Monthly System User Rates

Area	Washington City Rate	Surcharge		Total
		St. George	Pump Station	
Virgin River - North	$ 11.20	$ 14.30	$ -	$ 25.50
Virgin River - South	$ 13.20	$ 14.30	$ -	$ 27.50
Coral Canyon	$ 11.20	$ 14.30	$ 4.60	$ 30.10
Ridge Pointe	$ 11.20	$ 14.30	$ 10.68	$ 36.18
Sienna Hills	$ 11.20	$ 14.30	$ 4.60	$ 30.10

During the process of this study, continuation of this methodology was not investigated. As requested by Washington City staff, the establishment of one unified Washington City rate was investigated.

By using the audits from 2007 and 2008 along with projections for the year 2009, the operating expenses for the Washington Wastewater Utility were analyzed.

In this review, the operating budget was projected using an average of the data from the previous three years. The projected operating expenses for the year 2009-2010 were used along with any existing debt service eligible to obtain a expense total for the year 2010. This expense total was then divided among the projected number of ERU's to obtain the average monthly wastewater user rate per ERU for the next fiscal year. This figure was calculated to be $12.65 per ERU. Table 6.E shows the calculations and results from this analysis.

Table 6.E Unified User Rate Analysis & Recommendations

OPERATING EXPENSES	TOTAL
Salaries	$403,119
Employee Benefits	$214,471
Utilities	$29,400
Professional Services	$14,581
Repairs and Maintenance	$3,150
Miscellaneous	$8,017
Supplies	$62,894
Bad Debt Expense	$7,875
Funded Depreciation/Renewal Replacement	$339,951
Transfer to General Fund	$157,500
Total	**$1,240,958**
EXISTING DEBT SERVICE	**TOTAL**
Sewer Revenue Bond (1999; $3,356,000; 2.0%)	$180,680
Reserve for 1999 Sewer Bond	$0
Estimated Percentage Not Impact Fee Eligible	4.77%
Total	**$8,618**
NEW DEBT SERVICE	**TOTAL**
Bond A	$0
Reserve for Bond A	$0
Estimated Percentage Not Impact Fee Eligible	0%
Total	**$0**
GRAND TOTAL EXPENSES	**$1,249,577**
ANNUAL INCOME	**TOTAL**
Total Number of ERUs (2010)	**8,229**
Average Monthly Wastewater User Rate/ERU	**$12.65**

RECOMMENDED MONTHLY SYSTEM USER RATES

Area	Base Rate	Surcharge		Total
		St. George	Pump Sta.	
Washington City	$12.65	$ 14.30	$ -	$26.95
Coral Canyon	$12.65	$ 14.30	$ 4.60	$31.55
Ridge Pointe	$12.65	$ 14.30	$ 10.68	$37.63
Sienna Hills	$12.65	$ 14.30	$ 4.60	$31.55

It should also be noted as additional lift stations are incorporated into the wastewater system, additional user fees will need to be charged for the individual lift station service areas as is currently being done for the Coral Canyon, Ridge Pointe, and Sienna Hills developments. This will ensure that operating costs for the new lift stations do not cause a deficit in the utility operating and maintenance budget.

F. CASH FLOW ANALYSIS

A wastewater utility cash flow analysis for a 20 year projection was completed to ensure that impact fee calculations were accurate, to show how the 10-yr improvements projects could be implemented, to analyze the continued viability of adopted user rates and to show possible trends in impact fee and cash fund balances. Initial data for the cash flow analysis was taken from fiscal year 2006 and 2007 Washington City audits as well as budget outlines provided by City staff. Values projected through the analysis are based on growth, interest and inflation trends determined during the process of the study. It should be noted that the analysis is a general forecast only and will vary with the speed and pattern of development in the City. The entire cash flow analysis printout is given as Table B.5 in Appendix B.

The upper section of the cash flow printout, entitled Wastewater System Data, contains the basic data upon which many of the values in the cash flow spreadsheet are generated. Of particular note are the projected population growth trends, the assumed inflation rates, user rates, impact fees and inspection fees, and the projected ERU quantities for the coming fiscal years. Most of the revenue and expense increases in later parts of the cash flow spreadsheet are generated from the initial fees, rates and ERU values based on the assumed growth and inflation rates.

The next section of the cash flow spreadsheet is the utilities revenues section. This section seeks to quantify all revenues generated by the utility, whether through impact fees, user rate assessments, interest earned on deposited funds, etc. The next section is the utility expenses section which seeks to quantify all the expenses incurred by the wastewater utility. Included in the expenses section are the operation and maintenance costs, existing debt service costs and new debt service costs. The difference between the total revenues and total expenses is the net cash flow for the utility.

Total revenues and total expenses are then broken down into impact fee and cash fund categories. This was done to help the City review how the two funds would behave over the course of the projection period.

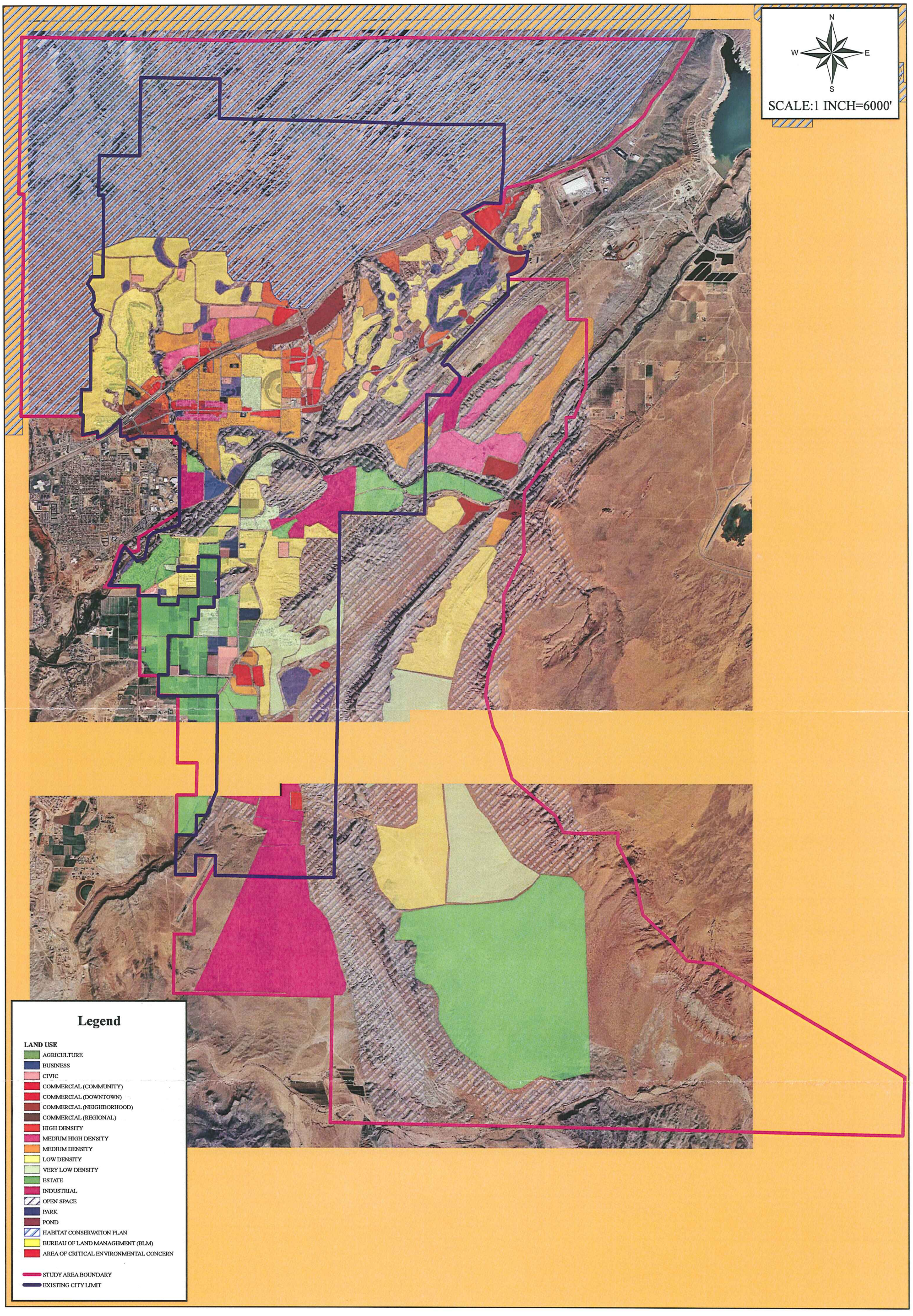
Included at the end of the cash flow analysis is a system improvement implementation schedule for the next twenty years which shows how the master plan improvements projects were incorporated into the cash flow analysis.

It is also notable that an accounting for funded depreciation has been included in the cash flow analysis. In addition to these real expenses, growth of the cash fund total is continuous through the end of the projection period. It is expected that all of these items will be used for the replacement of the wastewater system as it degenerates over its expected 40-50 year life. It is recommended that, wherever possible, the City invest excess cash funds in accounts that return dividends greater than the ongoing inflation rate.

G. SECTION SUMMARY

WASHINGTON CITY WASTEWATER SYSTEM FINANCIALS
*** OPINION OF PROBABLE COST FOR RECOMMENDED IMPROVEMENTS**
- TOTAL 10-YR PROJECT COST - $5,179,500
*** 10-YR PROJECT PHASING W/ ESTIMATED 20-YR PROJECTS**
*** WASTEWATER IMPACT FEE ANALYSIS**
EXISTING DEBT SERVICE
- $1,883,000 = 95% Impact Fee Eligible *(1999 Sewer Bond)*
PROPOSED 10-YR IMPROVEMENT PROJECTS
- $5,179,500 = 100% Impact Fee Eligible
TOTAL IMPACT FEE ELIGIBLE COST
- $6,972,681
NO. OF NEW ERUs DUE TO 10-YR GROWTH
- 6,018 ERUs
PROPOSED UNIFIED MAXIMUM IMPACT FEE FOR WASHINGTON CITY
- **$1,159** per ERU
*** SYSTEM USER RATES ANALYSIS**
EXISTING USER RATES
- $11.20 /ERU/Month: North of River
- $13.20 /ERU/Month: South of River
RECOMMENDED UNIFIED USER RATE
- **$12.65** /ERU/Month: Washington City
SURCHARGE
- $14.30 /ERU/Month: St. George Treatment
- $4.60 /ERU/Month: Coral Canyon
- $10.68 /ERU/Month: Ridge Point
- $4.60 /ERU/Month: Sienna Hills
*** CASH FLOW ANALYSIS**

APPENDIX A
MISCELLANEOUS FIGURES

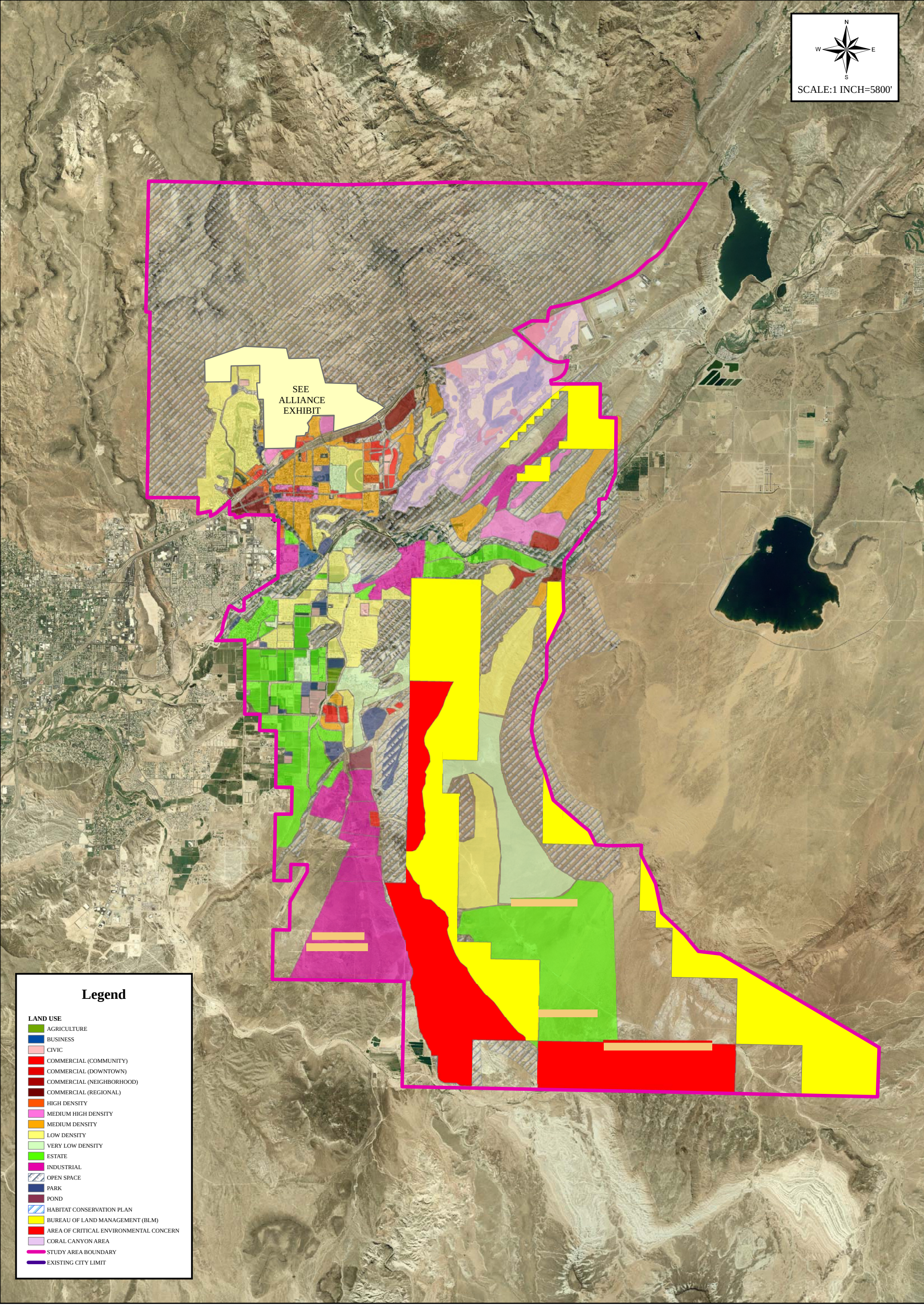


WASHINGTON CITY

SUNRISE ENGINEERING

WINSTON ASSOCIATES LAND USE MAP

FIGURE A.1



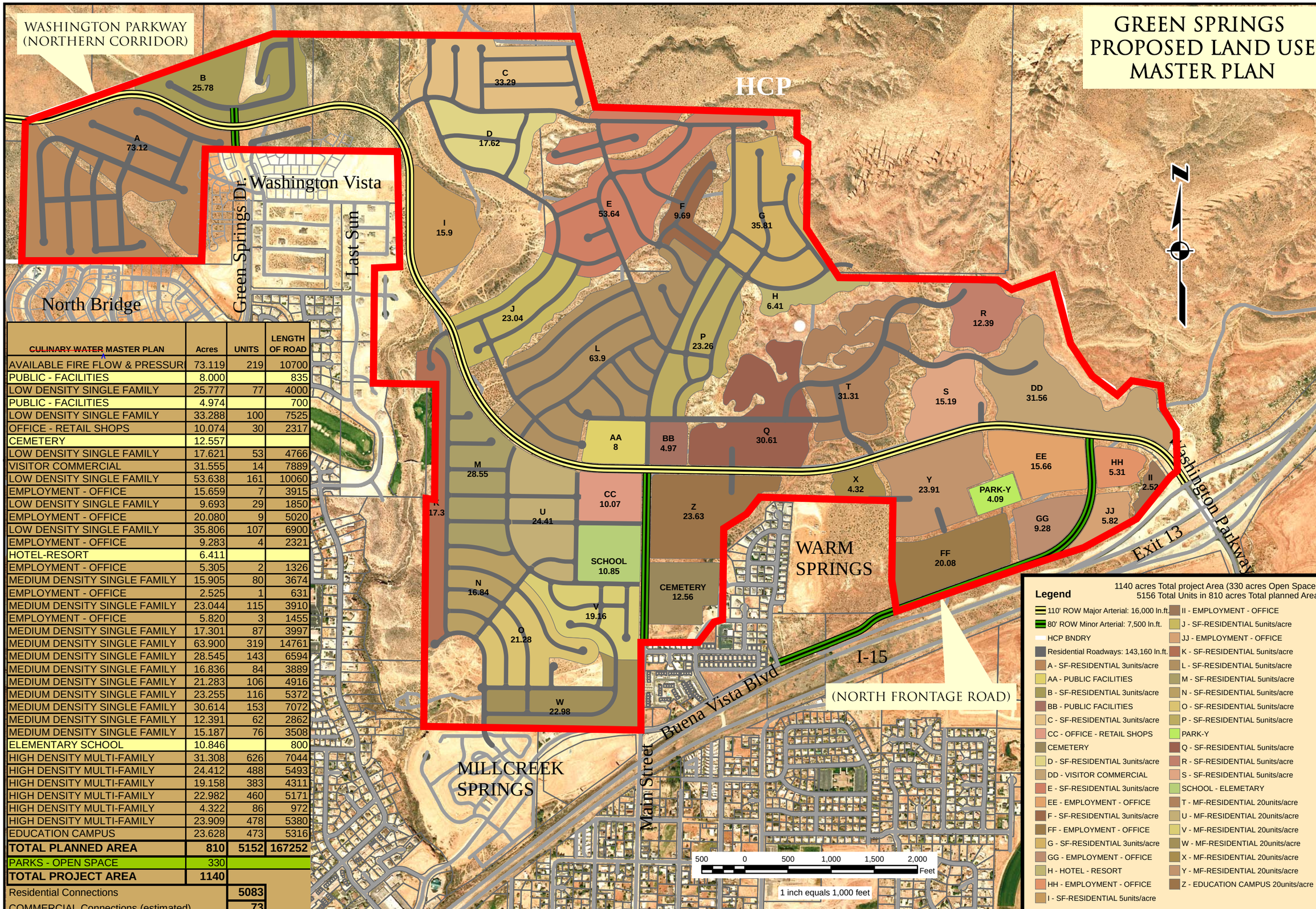
WASHINGTON CITY

MODIFIED WINSTON ASSOCIATES LAND USE MAP

FIGURE A.2

SUNRISE ENGINEERING

GREEN SPRINGS PROPOSED LAND USE MASTER PLAN

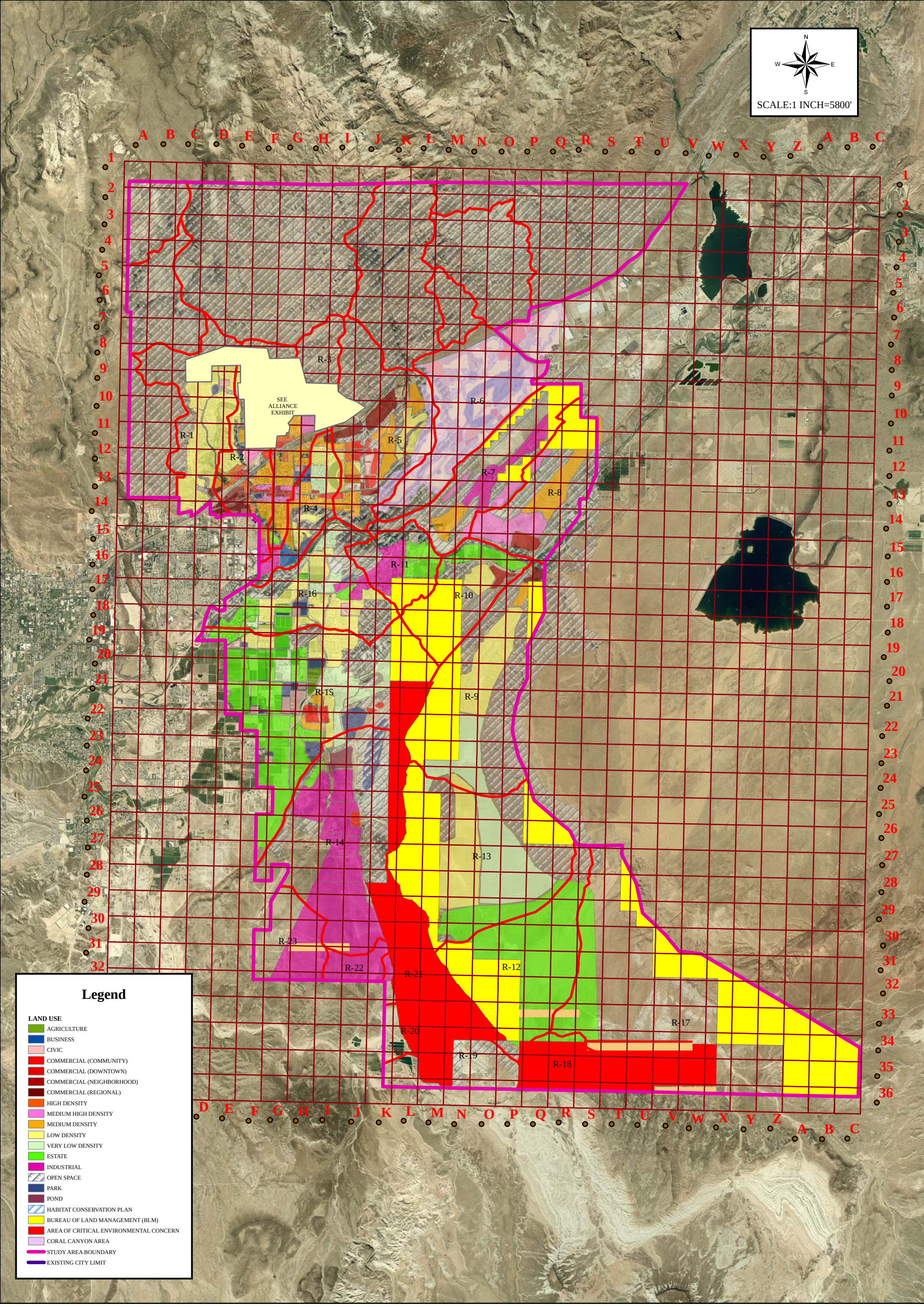


~~CULINARY WATER~~ MASTER PLAN	Acres	UNITS	LENGTH OF ROAD
AVAILABLE FIRE FLOW & PRESSUR	73.119	219	10700
PUBLIC - FACILITIES	8.000		835
LOW DENSITY SINGLE FAMILY	25.777	77	4000
PUBLIC - FACILITIES	4.974		700
LOW DENSITY SINGLE FAMILY	33.288	100	7525
OFFICE - RETAIL SHOPS	10.074	30	2317
CEMETERY	12.557		
LOW DENSITY SINGLE FAMILY	17.621	53	4766
VISITOR COMMERCIAL	31.555	14	7889
LOW DENSITY SINGLE FAMILY	53.638	161	10060
EMPLOYMENT - OFFICE	15.659	7	3915
LOW DENSITY SINGLE FAMILY	9.693	29	1850
EMPLOYMENT - OFFICE	20.080	9	5020
LOW DENSITY SINGLE FAMILY	35.806	107	6900
EMPLOYMENT - OFFICE	9.283	4	2321
HOTEL-RESORT	6.411		
EMPLOYMENT - OFFICE	5.305	2	1326
MEDIUM DENSITY SINGLE FAMILY	15.905	80	3674
EMPLOYMENT - OFFICE	2.525	1	631
MEDIUM DENSITY SINGLE FAMILY	23.044	115	3910
EMPLOYMENT - OFFICE	5.820	3	1455
MEDIUM DENSITY SINGLE FAMILY	17.301	87	3997
MEDIUM DENSITY SINGLE FAMILY	63.900	319	14761
MEDIUM DENSITY SINGLE FAMILY	28.545	143	6594
MEDIUM DENSITY SINGLE FAMILY	16.836	84	3889
MEDIUM DENSITY SINGLE FAMILY	21.283	106	4916
MEDIUM DENSITY SINGLE FAMILY	23.255	116	5372
MEDIUM DENSITY SINGLE FAMILY	30.614	153	7072
MEDIUM DENSITY SINGLE FAMILY	12.391	62	2862
MEDIUM DENSITY SINGLE FAMILY	15.187	76	3508
ELEMENTARY SCHOOL	10.846		800
HIGH DENSITY MULTI-FAMILY	31.308	626	7044
HIGH DENSITY MULTI-FAMILY	24.412	488	5493
HIGH DENSITY MULTI-FAMILY	19.158	383	4311
HIGH DENSITY MULTI-FAMILY	22.982	460	5171
HIGH DENSITY MULTI-FAMILY	4.322	86	972
HIGH DENSITY MULTI-FAMILY	23.909	478	5380
EDUCATION CAMPUS	23.628	473	5316
TOTAL PLANNED AREA	**810**	**5152**	**167252**
PARKS - OPEN SPACE	330		
TOTAL PROJECT AREA	**1140**		
Residential Connections		**5083**	
COMMERCIAL Connections (estimated)		**73**	

DATE: 11-30-07
JOB NUMBER: 4181
DRAWN BY: JAW
SCALE: 1" = 1000'

FIGURE A.3 — SITLA — GREEN SPRINGS

ALLIANCE CONSULTING
A Planning and Engineering Firm
2303 N Coral Canyon Blvd Suite 201 Washington, Utah 84780-0577 Tel (435) 673-8060 Fax (435) 673-8065

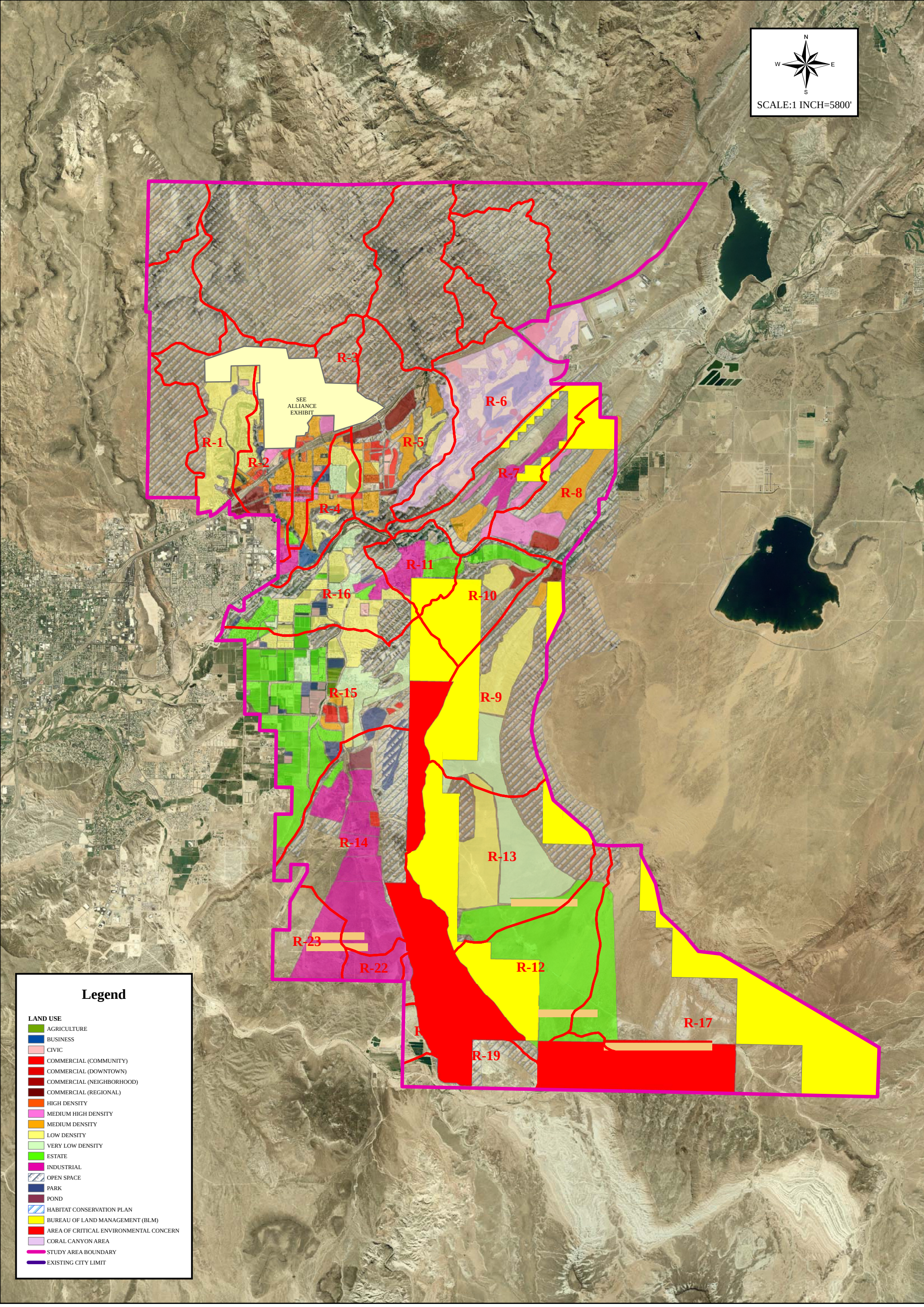


WASHINGTON CITY

WASTEWATER PRODUCTION GRID

FIGURE A.4

SUNRISE ENGINEERING

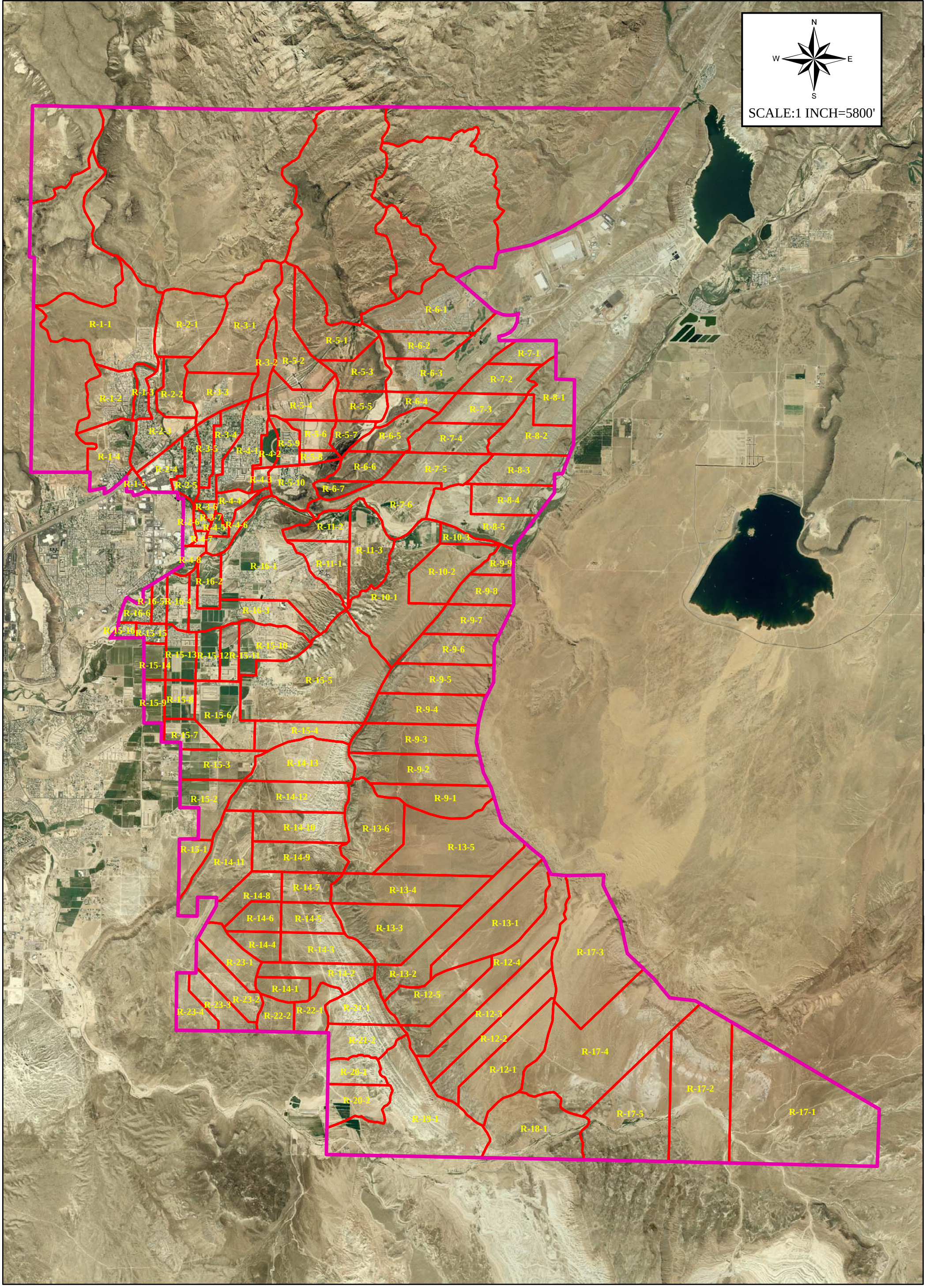


WASHINGTON CITY

WASTEWATER COLLECTION BASINS & LAND USES

FIGURE A.5

SUNRISE ENGINEERING



WASHINGTON CITY

WASTEWATER COLLECTION SUB-BASINS

FIGURE A.6

SUNRISE ENGINEERING

APPENDIX B
MISCELLANEOUS TABLES

Table B.1 Residential Land Use Designations Compared to Zoning Categories (Winston Associates)

Land Use Category	Applicable Zoning	Lot Sizes	Efficiency	Gross Density Range/Average	Net Density	Existing Density
Agriculture	A-20 A-10 A-5 RA-5	20 acres 10 acres 5 acres 5 acres	100%	.05 to .2 du/ac **Use: 0.1 du/ac**	1 unit/20 ac 1 unit/10 ac 1 unit/5 ac 1 unit/5 ac	
Estate	RA-2 RA-1 R-1-40 R-1-30	2 acres 1 acre 40,000 s.f. 30,000 s.f.	90% 85% 85% 85%	.45 to 1.16 du/ac **Use: 0.75 du/ac**	.45 units/ac .8 units/ac .9 units/ac 1.16 units/ac	
Very Low Density (VLD)	RA-1/2 R-1-15	21,780 s.f. 15,000 s.f.	85% 85%	1.5 to 2.5 du/ac **Use: 2 du/ac**	1.7 units/ac 2.4 units/ac	.57 units/ac 1.6 units/ac
Low Density (LD)	R-1-12 R-1-10 R-1-8	12,000 s.f. 10,000 s.f. 8,000 s.f.	80% 80% 80%	3 to 4.5 du/ac **Use: 3.75 du/ac**	2.9 units/ac 3.5 units/ac 4.3 units/ac	 2.4 units/ac 3.2 units/ac
Medium Density (MD)	R-1-6 R-2	6,000 s.f. 6,000 s.f.	75% 75%	**Use: 5.5 du/ac**	5.5 units/ac 5.5 units/ac	2.7 units/ac
Medium-High Density (M-H)	New			7-12 du/ac **Use: 10 du/ac**	7 units ac	8 units/ac
High Density (HD)	R-3	6,000 s.f.+ 2,000 s.f. each add.	75%	14 to 16 du/ac **Use: 15 du/ac**	14 du/ac 15.8 du/ac	4.3 units/ac
Commercial (COM)	C-2 C-3			For mixed use Use: 7 du/ac		1.4 units/ac 3.8 units/ac
	R-1-20					1.9 units/ac
	A-P					.56 units/ac
Planned Unit Development	PUD					3.4 units/ac

Table B.2 Land Use Categories and ERU Densities

Land Use Categories	Unit Density *(units/ac)*	ERU Rate *(ERU's/unit)*	ERU Density *(ERU's/ac)*
agr = Agriculture	0.10	1.00	**0.10**
est = Estate	0.75	1.00	**0.75**
vld = Very Low Density	2.00	1.00	**2.00**
exmd = Existing Medium Density	3.10	1.00	**3.10**
ccrd = Coral Canyon Residential Density	3.57	1.00	**3.57**
ld = Low Density	3.75	1.00	**3.75**
md = Medium Density	5.50	1.00	**5.50**
mhd = Medium High Density	10.00	1.00	**10.00**
hd = High Density	15.00	1.00	**15.00**
com = Commercial	7.00	2.53	**17.71**
bic = Business/Industrial/Civic	1.00	2.44	**2.44**
hop = HCP/Open Space/Park/Federal/State	0.00	0.00	**0.00**

Table B.3 Summary of Collection Basin and Sub-Basin Growth Rates and Estimated Connections

BASIN	SUB-BASIN	2008	5-YEAR		10-YEAR		20-YEAR		BUILDOUT
		EXIST CON.	GRO RATE	EST. CON	GRO RATE	EST. CON	GRO RATE	EST. CON	EST. CON
		(Active)	*(%)*	*(2013)*	*(%)*	*(2018)*	*(%)*	*(2028)*	
R-1	R-1-1	261	8%	383	7%	537	5%	875	905
	R-1-2	234	4%	285	3%	330	5%	538	547
	R-1-3	172	2%	190	1%	200	2%	244	245
	R-1-4	142	8%	208	10%	335	10%	870	895
	R-1-5	23	8%	33	15%	67	15%	271	319
	TOTAL	832	6%	1,100	6%	1,470	7%	2,798	2,910
R-2	R-2-1	23	30%	87	10%	140	15%	568	784
	R-2-2	36	30%	135	7%	190	12%	589	816
	R-2-3	506	2%	559	4%	680	3%	914	1,352
	R-2-4	103	6%	138	7%	193	6%	346	1,523
	R-2-5	164	6%	220	6%	294	6%	527	654
	R-2-6	2	10%	3	20%	6	25%	60	159
	TOTAL	835	6%	1,141	6%	1,504	7%	3,004	5,288
R-3	R-3-1	0	0%	75	10%	121	15%	489	1,200
	R-3-2	0	0%	10	10%	16	25%	150	363
	R-3-3	180	8%	264	16%	555	8%	1,198	1,322
	R-3-4	281	5%	359	5%	458	2%	558	662
	R-3-5	172	5%	220	7%	309	3%	415	506
	R-3-6	1	40%	4	35%	20	10%	51	71
	R-3-7	2	20%	6	15%	12	10%	32	78
	TOTAL	636	8%	938	10%	1,490	7%	2,891	4,202
R-4	R-4-1	485	5%	619	3%	718	2%	875	1,008
	R-4-2	0	0%	20	20%	50	20%	308	329
	R-4-3	0	0%	20	15%	40	8%	87	103
	R-4-4	111	0%	111	0%	111	0%	111	102
	R-4-5	36	5%	45	4%	55	3%	74	80
	R-4-6	4	10%	7	20%	16	20%	100	103
	R-4-7	5	10%	8	20%	19	5%	32	32
	R-4-8	9	10%	14	20%	36	5%	58	69
	TOTAL	649	5%	844	4%	1,045	5%	1,645	1,827
R-5	R-5-1	0	0%	20	30%	74	8%	160	529
	R-5-2	0	0%	40	20%	100	8%	215	881
	R-5-3	2	50%	18	20%	46	8%	99	710
	R-5-4	78	5%	99	6%	133	3%	178	1,523
	R-5-5	108	5%	137	5%	175	2%	214	345
	R-5-6	102	5%	130	5%	166	3%	223	597
	R-5-7	37	5%	48	6%	64	3%	85	209
	R-5-8	0	0%	5	6%	7	3%	9	212
	R-5-9	235	3%	272	3%	316	3%	424	584
	R-5-10	107	6%	143	6%	191	3%	257	561
	TOTAL	669	6%	913	7%	1,271	4%	1,866	6,150
R-6	R-6-1	451	3%	523	3%	606	2%	739	1,176
	R-6-2	105	3%	122	3%	141	2%	172	303
	R-6-3	206	2%	228	2%	252	2%	307	1,247
	R-6-4	145	1%	152	1%	160	1%	177	199
	R-6-5	11	5%	14	3%	17	5%	27	296
	R-6-6	0	0%	5	3%	6	2%	7	350
	R-6-7	0	0%	0	0%	0	0%	0	3
	TOTAL	919	3%	1,045	3%	1,182	2%	1,429	3,573
R-7	R-7-1	0	0%	0	0%	0	0%	20	30
	R-7-2	0	0%	0	0%	0	0%	50	103
	R-7-3	0	0%	0	0%	0	0%	80	167
	R-7-4	0	0%	0	0%	0	0%	150	208
	R-7-5	0	0%	0	0%	0	0%	350	610
	R-7-6	0	0%	0	0%	0	0%	350	678
	TOTAL	0	0%	0	0%	0	0%	1,000	1,795
R-8	R-8-1	0	0%	0	0%	0	0%	75	94
	R-8-2	0	0%	0	0%	0	0%	125	513
	R-8-3	0	0%	0	0%	0	0%	300	614
	R-8-4	0	0%	0	0%	0	0%	200	1,023
	R-8-5	0	0%	0	0%	0	0%	300	1,616
	TOTAL	0	0%	0	0%	0	0%	1,000	3,860
R-9	R-9-1	0	0%	0	0%	0	0%	83	297
	R-9-2	0	0%	0	0%	0	0%	83	196
	R-9-3	0	0%	0	0%	0	0%	83	154
	R-9-4	0	0%	0	0%	0	0%	83	347
	R-9-5	0	0%	0	0%	0	0%	83	394
	R-9-6	0	0%	0	0%	0	0%	83	380
	R-9-7	0	0%	0	0%	0	0%	83	246
	R-9-8	0	0%	0	0%	0	0%	83	188
	R-9-9	0	0%	0	0%	0	0%	83	383
	TOTAL	0	0%	0	0%	0	0%	747	2,586
R-10	R-10-1	0	0%	0	0%	25	10%	65	219
	R-10-2	0	0%	0	0%	50	10%	130	737
	R-10-3	0	0%	0	0%	25	10%	65	248
	TOTAL	0	0%	0	0%	100	10%	259	1,205
R-11	R-11-1	34	8%	50	8%	73	8%	159	278
	R-11-2	5	15%	10	10%	16	8%	34	86
	R-11-3	13	12%	23	15%	46	12%	143	234
	TOTAL	52	10%	83	10%	135	10%	335	597

BASIN	SUB-BASIN	2008	5-YEAR		10-YEAR		20-YEAR		BUILDOUT
		EXIST CON.	GRO RATE	EST. CON	GRO RATE	EST. CON	GRO RATE	EST. CON	EST. CON
		(Active)	*(%)*	*(2013)*	*(%)*	*(2018)*	*(%)*	*(2028)*	
R-12	R-12-1	0	0%	0	0%	0	0%	40	212
	R-12-2	0	0%	0	0%	0	0%	40	136
	R-12-3	0	0%	0	0%	0	0%	40	140
	R-12-4	0	0%	0	0%	0	0%	40	189
	R-12-5	0	0%	0	0%	0	0%	40	119
	TOTAL	0	0%	0	0%	0	0%	200	795
R-13	R-13-1	0	0%	0	0%	0	0%	41	409
	R-13-2	0	0%	0	0%	0	0%	43	437
	R-13-3	0	0%	0	0%	0	0%	64	638
	R-13-4	0	0%	0	0%	0	0%	68	682
	R-13-5	0	0%	0	0%	0	0%	91	913
	R-13-6	0	0%	0	0%	0	0%	7	63
	TOTAL	0	0%	0	0%	0	0%	314	3,142
R-14	R-14-1	0	0%	1	15%	2	20%	12	247
	R-14-2	0	0%	2	15%	4	20%	25	261
	R-14-3	0	0%	3	15%	6	20%	37	218
	R-14-4	0	0%	3	15%	6	20%	37	222
	R-14-5	0	0%	4	15%	8	20%	50	152
	R-14-6	0	0%	4	15%	8	20%	50	203
	R-14-7	0	0%	4	15%	8	20%	50	127
	R-14-8	0	0%	4	15%	8	20%	50	190
	R-14-9	0	0%	5	15%	10	20%	62	722
	R-14-10	0	0%	10	35%	45	8%	97	505
	R-14-11	0	0%	15	35%	67	8%	145	274
	R-14-12	0	0%	20	35%	90	8%	194	302
	R-14-13	0	0%	25	35%	112	5%	183	233
	TOTAL	0	0%	100	30%	374	10%	992	3,657
R-15	R-15-1	0	0%	5	10%	8	10%	21	61
	R-15-2	0	0%	10	20%	25	10%	65	171
	R-15-3	0	0%	10	20%	25	10%	65	302
	R-15-4	1	50%	6	30%	23	10%	59	221
	R-15-5	118	2%	131	10%	210	10%	545	765
	R-15-6	88	2%	97	10%	157	12%	487	686
	R-15-7	69	2%	76	2%	84	1%	93	99
	R-15-8	57	3%	67	2%	74	1%	81	83
	R-15-9	3	50%	25	20%	61	12%	190	247
	R-15-10	228	2%	252	2%	278	4%	412	469
	R-15-11	37	2%	41	6%	55	8%	119	161
	R-15-12	46	2%	51	6%	68	7%	134	166
	R-15-13	155	2%	171	2%	189	1%	208	224
	R-15-14	5	30%	18	12%	32	7%	63	87
	R-15-15	69	2%	76	2%	84	1%	93	117
	R-15-16	33	1%	35	1%	37	0%	37	39
	TOTAL	910	3%	1,070	6%	1,409	7%	2,671	3,896
R-16	R-16-1	446	3%	517	6%	692	4%	1,025	1,194
	R-16-2	107	3%	124	3%	144	3%	193	209
	R-16-3	288	3%	334	4%	407	3%	546	632
	R-16-4	160	3%	185	2%	204	2%	249	275
	R-16-5	35	3%	40	5%	52	5%	84	100
	R-16-6	28	3%	32	8%	47	6%	84	100
	TOTAL	1063	3%	1,232	5%	1,545	4%	2,181	2,510
R-17	R-17-1	0	0%	0	0%	0	0%	40	227
	R-17-2	0	0%	0	0%	0	0%	40	135
	R-17-3	0	0%	0	0%	0	0%	40	278
	R-17-4	0	0%	0	0%	0	0%	40	509
	R-17-5	0	0%	0	0%	0	0%	40	163
	TOTAL	0	0%	0	0%	0	0%	200	1,312
R-18	R18-1	0	0%	0	0%	0	0%	25	55
	TOTAL	0	0%	0	0%	0	0%	25	55
R-19	R-19-1	0	0%	10	30%	37	20%	230	445
	TOTAL	0	0%	10	30%	37	20%	230	445
R-20	R-20-1	0	0%	10	12%	18	15%	71	83
	R-20-2	0	0%	10	12%	18	15%	71	209
	TOTAL	0	0%	20	12%	35	15%	143	292
R-21	R-21-1	0	0%	5	20%	12	10%	32	55
	R-21-2	0	0%	5	20%	12	10%	32	80
	TOTAL	0	0%	10	20%	25	10%	65	135
R-22	R-22-1	0	0%	15	40%	81	8%	174	255
	R-22-2	0	0%	10	40%	54	8%	116	240
	TOTAL	0	0%	25	40%	134	8%	290	495
R-23	R-23-1	0	0%	10	50%	76	8%	125	249
	R-23-2	0	0%	5	50%	38	8%	125	269
	R-23-3	0	0%	5	50%	38	8%	125	219
	R-23-4	0	0%	5	50%	38	8%	60	85
	TOTAL	0	0%	25	50%	190	9%	435	822
TOTAL		**6565**	**5.44%**	**8,556**	**6.90%**	**11,946**	**6.85%**	**24,719**	**51,549**

Table B.4 Summary of Collection Basin and Sub-Basin Wastewater Flows

BASIN	SUB-BASIN	WASTEWATER DESIGN FLOWS				
		EXISTING	5-YEAR ANALYSI	10-YEAR ANALYSI	20-YEAR ANALYSI	BUILDOUT CONDITION
		(cfs)	*(cfs)*	*(cfs)*	*(cfs)*	*(cfs)*
R-1	R-1-1	0.36	0.53	0.75	1.22	1.26
	R-1-2	0.33	0.40	0.46	0.75	0.76
	R-1-3	0.24	0.26	0.28	0.34	0.34
	R-1-4	0.20	0.29	0.47	1.21	1.24
	R-1-5	0.03	0.05	0.09	0.38	0.44
	TOTAL	**1.16**	**1.53**	**2.04**	**3.89**	**4.05**
R-2	R-2-1	0.03	0.12	0.20	0.79	1.09
	R-2-2	0.05	0.19	0.26	0.82	1.13
	R-2-3	0.70	0.78	0.95	1.27	1.88
	R-2-4	0.14	0.19	0.27	0.48	2.12
	R-2-5	0.23	0.31	0.41	0.73	0.91
	R-2-6	0.00	0.00	0.01	0.08	0.22
	TOTAL	**1.16**	**1.59**	**2.09**	**4.18**	**7.35**
R-3	R-3-1	0.00	0.10	0.17	0.68	1.67
	R-3-2	0.00	0.01	0.02	0.21	0.51
	R-3-3	0.25	0.37	0.77	1.67	1.84
	R-3-4	0.39	0.50	0.64	0.78	0.92
	R-3-5	0.24	0.31	0.43	0.58	0.70
	R-3-6	0.00	0.01	0.03	0.07	0.10
	R-3-7	0.00	0.01	0.02	0.04	0.11
	TOTAL	**0.89**	**1.30**	**2.07**	**4.02**	**5.84**
R-4	R-4-1	0.67	0.86	1.00	1.22	1.40
	R-4-2	0.00	0.03	0.07	0.43	0.46
	R-4-3	0.00	0.03	0.06	0.12	0.14
	R-4-4	0.15	0.15	0.15	0.15	0.14
	R-4-5	0.05	0.06	0.08	0.10	0.11
	R-4-6	0.01	0.01	0.02	0.14	0.14
	R-4-7	0.01	0.01	0.03	0.04	0.04
	R-4-8	0.01	0.02	0.05	0.08	0.10
	TOTAL	**0.90**	**1.17**	**1.45**	**2.29**	**2.54**
R-5	R-5-1	0.00	0.03	0.10	0.22	0.74
	R-5-2	0.00	0.06	0.14	0.30	1.23
	R-5-3	0.00	0.03	0.06	0.14	0.99
	R-5-4	0.11	0.14	0.18	0.25	2.12
	R-5-5	0.15	0.19	0.24	0.30	0.48
	R-5-6	0.14	0.18	0.23	0.31	0.83
	R-5-7	0.05	0.07	0.09	0.12	0.29
	R-5-8	0.00	0.01	0.01	0.01	0.29
	R-5-9	0.33	0.38	0.44	0.59	0.81
	R-5-10	0.15	0.20	0.27	0.36	0.78
	TOTAL	**0.93**	**1.27**	**1.77**	**2.59**	**8.55**
R-6	R-6-1	0.63	0.73	0.84	1.03	1.64
	R-6-2	0.15	0.17	0.20	0.24	0.42
	R-6-3	0.29	0.32	0.35	0.43	1.73
	R-6-4	0.20	0.21	0.22	0.25	0.28
	R-6-5	0.02	0.02	0.02	0.04	0.41
	R-6-6	0.00	0.01	0.01	0.01	0.49
	R-6-7	0.00	0.00	0.00	0.00	0.00
	TOTAL	**1.28**	**1.45**	**1.64**	**1.99**	**4.97**
R-7	R-7-1	0.00	0.00	0.00	0.03	0.04
	R-7-2	0.00	0.00	0.00	0.07	0.14
	R-7-3	0.00	0.00	0.00	0.11	0.23
	R-7-4	0.00	0.00	0.00	0.21	0.29
	R-7-5	0.00	0.00	0.00	0.49	0.85
	R-7-6	0.00	0.00	0.00	0.49	0.94
	TOTAL	**0.00**	**0.00**	**0.00**	**1.39**	**2.50**
R-8	R-8-1	0.00	0.00	0.00	0.10	0.13
	R-8-2	0.00	0.00	0.00	0.17	0.71
	R-8-3	0.00	0.00	0.00	0.42	0.85
	R-8-4	0.00	0.00	0.00	0.28	1.42
	R-8-5	0.00	0.00	0.00	0.42	2.25
	TOTAL	**0.00**	**0.00**	**0.00**	**1.39**	**5.37**
R-9	R-9-1	0.00	0.00	0.00	0.12	0.41
	R-9-2	0.00	0.00	0.00	0.12	0.27
	R-9-3	0.00	0.00	0.00	0.12	0.21
	R-9-4	0.00	0.00	0.00	0.12	0.48
	R-9-5	0.00	0.00	0.00	0.12	0.55
	R-9-6	0.00	0.00	0.00	0.12	0.53
	R-9-7	0.00	0.00	0.00	0.12	0.34
	R-9-8	0.00	0.00	0.00	0.12	0.26
	R-9-9	0.00	0.00	0.00	0.12	0.53
	TOTAL	**0.00**	**0.00**	**0.00**	**1.04**	**3.60**
R-10	R-10-1	0.00	0.00	0.03	0.09	0.30
	R-10-2	0.00	0.00	0.07	0.18	1.03
	R-10-3	0.00	0.00	0.03	0.09	0.35
	TOTAL	**0.00**	**0.00**	**0.14**	**0.36**	**1.68**
R-11	R-11-1	0.05	0.07	0.10	0.22	0.39
	R-11-2	0.01	0.01	0.02	0.05	0.12
	R-11-3	0.02	0.03	0.06	0.20	0.33
	TOTAL	**0.07**	**0.11**	**0.19**	**0.47**	**0.83**

BASIN	SUB-BASIN	WASTEWATER DESIGN FLOWS				
		EXISTING	5-YEAR ANALYSI	10-YEAR ANALYSI	20-YEAR ANALYSI	BUILDOUT CONDITION
		(cfs)	*(cfs)*	*(cfs)*	*(cfs)*	*(cfs)*
R-12	R-12-1	0.00	0.00	0.00	0.06	0.29
	R-12-2	0.00	0.00	0.00	0.06	0.19
	R-12-3	0.00	0.00	0.00	0.06	0.20
	R-12-4	0.00	0.00	0.00	0.06	0.26
	R-12-5	0.00	0.00	0.00	0.06	0.16
	TOTAL	**0.00**	**0.00**	**0.00**	**0.28**	**1.11**
R-13	R-13-1	0.00	0.00	0.00	0.06	0.57
	R-13-2	0.00	0.00	0.00	0.06	0.61
	R-13-3	0.00	0.00	0.00	0.09	0.89
	R-13-4	0.00	0.00	0.00	0.09	0.95
	R-13-5	0.00	0.00	0.00	0.13	1.27
	R-13-6	0.00	0.00	0.00	0.01	0.09
	TOTAL	**0.00**	**0.00**	**0.00**	**0.44**	**4.37**
R-14	R-14-1	0.00	0.00	0.00	0.02	0.34
	R-14-2	0.00	0.00	0.01	0.03	0.36
	R-14-3	0.00	0.00	0.01	0.05	0.30
	R-14-4	0.00	0.00	0.01	0.05	0.31
	R-14-5	0.00	0.01	0.01	0.07	0.21
	R-14-6	0.00	0.01	0.01	0.07	0.28
	R-14-7	0.00	0.01	0.01	0.07	0.18
	R-14-8	0.00	0.01	0.01	0.07	0.26
	R-14-9	0.00	0.01	0.01	0.09	1.00
	R-14-10	0.00	0.01	0.06	0.13	0.70
	R-14-11	0.00	0.02	0.09	0.20	0.38
	R-14-12	0.00	0.03	0.12	0.27	0.42
	R-14-13	0.00	0.03	0.16	0.25	0.32
	TOTAL	**0.00**	**0.14**	**0.52**	**1.38**	**5.09**
R-15	R-15-1	0.00	0.01	0.01	0.03	0.08
	R-15-2	0.00	0.01	0.03	0.09	0.24
	R-15-3	0.00	0.01	0.03	0.09	0.42
	R-15-4	0.00	0.01	0.03	0.08	0.31
	R-15-5	0.16	0.18	0.29	0.76	1.06
	R-15-6	0.12	0.14	0.22	0.68	0.95
	R-15-7	0.10	0.11	0.12	0.13	0.14
	R-15-8	0.08	0.09	0.10	0.11	0.12
	R-15-9	0.00	0.03	0.09	0.26	0.34
	R-15-10	0.32	0.35	0.39	0.57	0.65
	R-15-11	0.05	0.06	0.08	0.17	0.22
	R-15-12	0.06	0.07	0.09	0.19	0.23
	R-15-13	0.22	0.24	0.26	0.29	0.31
	R-15-14	0.01	0.03	0.04	0.09	0.12
	R-15-15	0.10	0.11	0.12	0.13	0.16
	R-15-16	0.05	0.05	0.05	0.05	0.05
	TOTAL	**1.27**	**1.49**	**1.96**	**3.71**	**5.42**
R-16	R-16-1	0.62	0.72	0.96	1.42	1.66
	R-16-2	0.15	0.17	0.20	0.27	0.29
	R-16-3	0.40	0.46	0.57	0.76	0.88
	R-16-4	0.22	0.26	0.28	0.35	0.38
	R-16-5	0.05	0.06	0.07	0.12	0.14
	R-16-6	0.04	0.04	0.07	0.12	0.14
	TOTAL	**1.48**	**1.71**	**2.15**	**3.03**	**3.49**
R-17	R-17-1	0.00	0.00	0.00	0.06	0.32
	R-17-2	0.00	0.00	0.00	0.06	0.19
	R-17-3	0.00	0.00	0.00	0.06	0.39
	R-17-4	0.00	0.00	0.00	0.06	0.71
	R-17-5	0.00	0.00	0.00	0.06	0.23
	TOTAL	**0.00**	**0.00**	**0.00**	**0.28**	**1.82**
R-18	R18-1	0.00	0.00	0.00	0.03	0.08
	TOTAL	**0.00**	**0.00**	**0.00**	**0.03**	**0.08**
R-19	R-19-1	0.00	0.01	0.05	0.32	0.62
	TOTAL	**0.00**	**0.01**	**0.05**	**0.32**	**0.62**
R-20	R-20-1	0.00	0.01	0.02	0.10	0.12
	R-20-2	0.00	0.01	0.02	0.10	0.29
	TOTAL	**0.00**	**0.03**	**0.05**	**0.20**	**0.41**
R-21	R-21-1	0.00	0.01	0.02	0.04	0.08
	R-21-2	0.00	0.01	0.02	0.04	0.11
	TOTAL	**0.00**	**0.01**	**0.03**	**0.09**	**0.19**
R-22	R-22-1	0.00	0.02	0.11	0.24	0.35
	R-22-2	0.00	0.01	0.07	0.16	0.33
	TOTAL	**0.00**	**0.03**	**0.19**	**0.40**	**0.69**
R-23	R-23-1	0.00	0.01	0.11	0.17	0.35
	R-23-2	0.00	0.01	0.05	0.17	0.37
	R-23-3	0.00	0.01	0.05	0.17	0.30
	R-23-4	0.00	0.01	0.05	0.08	0.12
	TOTAL	**0.00**	**0.03**	**0.26**	**0.60**	**1.14**

Table B.5 Cash Flow Analysis

Fiscal Year (July 1 through June 30)	2006 2007	2007 2008	2008 2009	2009 2010	2010 2011	2011 2012	2012 2013	2013 2014	2014 2015	2015 2016	2016 2017	2017 2018	2018 2019
WASTEWATER SYSTEM DATA													
Annual Population Growth Rate		3.8%	2.1%	3.0%	4.0%	5.4%	5.4%	5.4%	6.9%	6.9%	6.9%	6.9%	6.9%
Annual Inflation Rate	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
User Rate / ERU / Month (North of River)	$11.20	$11.20	$11.20										
User Rate / ERU / Month (South of River)	$13.20	$13.20	$13.20										
User Rate / ERU / Month (Ridge Pointe)	$21.88	$21.88	$21.88	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33
User Rate / ERU / Month (Coral Canyon)	$15.80	$15.80	$15.80	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25
Average User Rate / ERU / Month (Washington City)	$12.00	$12.00	$12.00	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65
Impact Fee / ERU (North of River)	$650	$650	$650										
Impact Fee / ERU (South of River)	$2,150	$2,150	$2,150										
Average Impact Fee / ERU (Washington City)	$1,032	$1,032	$1,185	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227
Inspection Fee / ERU	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
Regional Facility Impact Fee / ERU	$900	$900	$900	$948	$948	$948	$948	$948	$948	$948	$948	$948	$948
Existing ERU's at Year End (North of River)	5653	5867	5993										
Existing ERU's at Year End (South of River)	1883	1954	1996										
Total ERU's at Year End	7535	7821	7989	8229	8558	9023	9514	10032	10725	11465	12256	13102	14007
New ERU's per Year		286	168	240	329	466	491	518	693	740	791	846	904
WASTEWATER SYSTEM REVENUES													
OPERATING													
Charges for Services	$1,015,025	$1,087,871	$1,187,925	$1,230,921	$1,274,094	$1,334,419	$1,407,027	$1,483,586	$1,575,442	$1,684,195	$1,800,456	$1,924,742	$2,057,608
Solid Waste Collection	$667,414	$728,597	$704,900	$765,027	$807,103	$857,310	$910,640	$967,287	$1,034,528	$1,106,443	$1,183,358	$1,265,619	$1,353,599
Inspection Fees	$63,900	$34,950	$30,000	$36,698	$38,716	$41,124	$43,682	$46,400	$49,625	$53,075	$56,764	$60,710	$64,931
Miscellaneous	$32,089	$4,913	$2,813	$5,159	$5,442	$5,781	$6,141	$6,523	$6,976	$7,461	$7,979	$8,534	$9,127
NON-OPERATING													
Interest Earnings	$271,633	$231,452	$130,000	$243,025	$256,391	$272,340	$289,281	$307,276	$328,636	$351,482	$375,915	$402,047	$429,995
Impact Fees	$506,402	$295,080	$199,000	$294,075	$403,863	$571,347	$602,435	$635,214	$849,726	$908,383	$971,089	$1,038,124	$1,109,786
Gain (Loss) on sale of assets	($34,773)	$12,425	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Interest & Fiscal Charges	($53,920)	($49,024)	($55,807)	($51,475)	($53,277)	($55,142)	($57,071)	($59,069)	($61,136)	($63,276)	($65,491)	($67,783)	($70,155)
TOTAL OPERATING REVENUES:	**$2,467,770**	**$2,346,264**	**$2,198,831**	**$2,523,429**	**$2,732,333**	**$3,027,179**	**$3,202,134**	**$3,387,216**	**$3,783,797**	**$4,047,763**	**$4,330,071**	**$4,631,994**	**$4,954,891**
WASTEWATER SYSTEM OPERATING EXPENSES													
Salaries	$293,201	$335,194	$383,923	$403,119	$425,291	$451,746	$479,848	$509,697	$545,129	$583,023	$623,552	$666,899	$713,258
Employee Benefits	$155,795	$171,390	$204,258	$214,471	$226,267	$240,342	$255,293	$271,173	$290,024	$310,185	$331,748	$354,809	$379,474
Utilites	$18,584	$21,681	$28,000	$29,400	$31,017	$32,946	$34,996	$37,173	$39,757	$42,521	$45,476	$48,638	$52,019
Professional Services	$5,627	$13,887	$35,000	$14,581	$15,383	$16,340	$17,357	$18,436	$19,718	$21,089	$22,555	$24,123	$25,799
Repairs and Maintenance	$2,275	$9,542	$3,000	$3,150	$3,323	$3,530	$3,750	$3,983	$4,260	$4,556	$4,872	$5,211	$5,573
Solid Waste Service Fee	$637,733	$675,616	$704,900	$740,145	$780,853	$829,427	$881,022	$935,826	$1,000,881	$1,070,457	$1,144,870	$1,224,456	$1,309,575
Miscellaneous	$3,456	$40,541	$7,635	$8,017	$8,458	$8,984	$9,543	$10,136	$10,841	$11,594	$12,400	$13,262	$14,184
Supplies	$50,226	$23,958	$59,899	$62,894	$66,353	$70,481	$74,865	$79,522	$85,050	$90,962	$97,286	$104,048	$111,281
Bad Debt Expense	$1,511	$11,160	$7,500	$7,875	$8,308	$8,825	$9,374	$9,957	$10,649	$11,389	$12,181	$13,028	$13,934
Funded Depreciation/Renewal Replacement	$268,100	$323,763	$470,000	$339,951	$358,648	$380,958	$404,656	$429,828	$459,708	$491,665	$525,843	$562,397	$601,492
Transfer to General Fund	$205,000	$177,500	$150,000	$157,500	$166,163	$176,499	$187,478	$199,140	$212,984	$227,789	$243,624	$260,560	$278,672
TOTAL OPERATINGEXPENSES:	**$1,641,508**	**$1,804,232**	**$2,054,115**	**$1,981,103**	**$2,090,064**	**$2,220,078**	**$2,358,180**	**$2,504,873**	**$2,678,999**	**$2,865,231**	**$3,064,408**	**$3,277,431**	**$3,505,262**
WASTEWATER SYSTEM EXISTING DEBT SERVICE													
Sewer Revenue Bond (1999; $3,356,000; 2.0%)	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680
Reserve for 1999 Sewer Bond	$18,068	$18,068	$18,068	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL EXISTING DEBT SERVICE:	**$198,748**	**$198,748**	**$198,748**	**$180,680**	**$180,680**	**$180,680**	**$180,680**	**$180,680**	**$180,680**	**$180,680**	**$180,680**	**$180,680**	**$180,680**
WASTEWATER SYSTEM NEW DEBT SERVICE													
Bond A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Reserve for Bond A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Bond B	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Reserve for Bond B	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Bond C	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Reserve for Bond C	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL NEW DEBT SERVICE:	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
WASTEWATER SYSTEM EXPENSES SUMMARY													
Wastewater System O&M Expenses	$1,641,508	$1,804,232	$2,054,115	$1,981,103	$2,090,064	$2,220,078	$2,358,180	$2,504,873	$2,678,999	$2,865,231	$3,064,408	$3,277,431	$3,505,262
Wastewater System Existing Debt Service	$198,748	$198,748	$198,748	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680	$180,680
Wastewater System New Debt Service	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL EXPENSES:	**$1,840,256**	**$2,002,980**	**$2,252,863**	**$2,161,783**	**$2,270,744**	**$2,400,758**	**$2,538,860**	**$2,685,553**	**$2,859,679**	**$3,045,911**	**$3,245,088**	**$3,458,111**	**$3,685,942**
WASTEWATER SYSTEM CASH FLOW													
NET CASH FLOW:	**$627,514**	**$343,284**	**($54,032)**	**$361,645**	**$461,589**	**$626,421**	**$663,274**	**$701,664**	**$924,117**	**$1,001,852**	**$1,084,983**	**$1,173,883**	**$1,268,949**
WASTEWATER SYSTEM IMPACT FEE FUND													
Total Impact Fee Revenue	$506,402	$295,080	$199,000	$294,075	$403,863	$571,347	$602,435	$635,214	$849,726	$908,383	$971,089	$1,038,124	$1,109,786
Impact Fees Covering Sewer Revenue Bond 1999	($198,748)	($198,748)	($198,748)	($180,680)	($180,680)	($180,680)	($180,680)	($180,680)	($180,680)	($180,680)	($180,680)	($180,680)	($180,680)
Impact Fees Covering Bond A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Impact Fees Covering Bond B	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Impact Fees Covering Bond C	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Impact Fees Spent for Single Payment Projects or Self Help	$0	$0	($400,000)	($2,589,750)	$0	$0	$0	($1,294,875)	$0	($1,294,875)	$0	$0	$0
Bond Reserve Payments	($18,068)	($18,068)	($18,068)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
IMPACT FEE FUND TOTAL:	**$4,005,219**	**$3,523,992**	**$3,123,992**	**$647,637**	**$870,820**	**$1,261,487**	**$1,683,242**	**$842,901**	**$1,511,948**	**$944,776**	**$1,735,185**	**$2,592,629**	**$3,521,736**
WASTEWATER SYSTEM CASH FUND													
Total Cash Revenue	$1,961,368	$2,051,184	$1,999,831	$2,229,354	$2,328,470	$2,455,833	$2,599,699	$2,752,002	$2,934,071	$3,139,380	$3,358,982	$3,593,870	$3,845,105
Total Cash Expenses	($1,840,256)	($2,002,980)	($2,252,863)	($2,161,783)	($2,270,744)	($2,400,758)	($2,538,860)	($2,685,553)	($2,859,679)	($3,045,911)	($3,245,088)	($3,458,111)	($3,685,942)
Cash Spent for Single Payment Projects or Self Help	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
CASH FUND TOTAL:	**$1,516,319**	**$2,108,179**	**$960,250**	**$1,027,820**	**$1,085,546**	**$1,140,621**	**$1,201,460**	**$1,267,909**	**$1,342,300**	**$1,435,769**	**$1,549,663**	**$1,685,422**	**$1,844,585**
SYSTEM IMPROVEMENT IMPLEMENTATION SCHEDULE													
Improvement Project ID # (see Phasing Table)				1A				1B		1C			
2009-2018 Improvement Cost				$2,589,750				$1,294,875		$1,294,875			

Table B.5 Cash Flow Analysis

Fiscal Year (July 1 through June 30)	2019 2020	2020 2021	2021 2022	2022 2023	2023 2024	2024 2025	2025 2026	2026 2027	2027 2028	2028 2029	2029 2030	2030 2031
WASTEWATER SYSTEM DATA												
Annual Population Growth Rate	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%
Annual Inflation Rate	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
User Rate / ERU / Month (North of River)												
User Rate / ERU / Month (South of River)												
User Rate / ERU / Month (Ridge Pointe)	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33	$23.33
User Rate / ERU / Month (Coral Canyon)	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25
Average User Rate / ERU / Month (Washington City)	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65	$12.65
Impact Fee / ERU (North of River)												
Impact Fee / ERU (South of River)												
Average Impact Fee / ERU (Washington City)	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227	$1,227
Inspection Fee / ERU	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
Regional Facility Impact Fee / ERU	$948	$948	$948	$948	$948	$948	$948	$948	$948	$948	$948	$948
Existing ERU's at Year End (North of River)												
Existing ERU's at Year End (South of River)												
Total ERU's at Year End	14967	15993	17089	18260	19512	20849	22278	23805	25436	27180	29043	31033
New ERU's per Year	960	1026	1096	1171	1252	1337	1429	1527	1632	1743	1863	1991
WASTEWATER SYSTEM REVENUES												
OPERATING												
Charges for Services	$2,199,123	$2,349,848	$2,510,903	$2,682,997	$2,866,886	$3,063,378	$3,273,338	$3,497,688	$3,737,415	$3,993,572	$4,267,286	$4,559,760
Solid Waste Collection	$1,447,362	$1,547,620	$1,654,822	$1,769,451	$1,892,019	$2,023,078	$2,163,216	$2,313,060	$2,473,284	$2,644,607	$2,827,797	$3,023,677
Inspection Fees	$69,428	$74,238	$79,380	$84,879	$90,758	$97,045	$103,767	$110,955	$118,641	$126,859	$135,646	$145,042
Miscellaneous	$9,760	$10,436	$11,159	$11,932	$12,758	$13,642	$14,587	$15,597	$16,678	$17,833	$19,068	$20,389
NON-OPERATING												
Interest Earnings	$459,781	$491,629	$525,684	$562,098	$601,034	$642,667	$687,185	$734,785	$785,683	$840,107	$898,301	$960,526
Impact Fees	$1,177,942	$1,258,677	$1,344,945	$1,437,126	$1,535,624	$1,640,874	$1,753,337	$1,873,509	$2,001,916	$2,139,125	$2,285,738	$2,442,399
Gain (Loss) on sale of assets	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Interest & Fiscal Charges	($72,611)	($75,152)	($77,783)	($80,505)	($83,323)	($86,239)	($89,257)	($92,381)	($95,615)	($98,961)	($102,425)	($106,010)
TOTAL OPERATING REVENUES:	**$5,290,785**	**$5,657,295**	**$6,049,111**	**$6,467,977**	**$6,915,757**	**$7,394,446**	**$7,906,172**	**$8,453,213**	**$9,038,002**	**$9,663,142**	**$10,331,411**	**$11,045,783**
WASTEWATER SYSTEM OPERATING EXPENSES												
Salaries	$762,665	$815,495	$871,983	$932,385	$996,971	$1,066,030	$1,139,873	$1,218,832	$1,303,259	$1,393,535	$1,490,064	$1,593,280
Employee Benefits	$405,760	$433,866	$463,920	$496,055	$530,417	$567,158	$606,445	$648,453	$693,371	$741,400	$792,757	$847,670
Utilites	$55,622	$59,475	$63,595	$68,000	$72,710	$77,747	$83,132	$88,891	$95,048	$101,632	$108,672	$116,200
Professional Services	$27,587	$29,498	$31,541	$33,726	$36,062	$38,560	$41,231	$44,087	$47,141	$50,406	$53,898	$57,631
Repairs and Maintenance	$5,960	$6,372	$6,814	$7,286	$7,790	$8,330	$8,907	$9,524	$10,184	$10,889	$11,643	$12,450
Solid Waste Service Fee	$1,400,288	$1,497,285	$1,601,001	$1,711,901	$1,830,483	$1,957,279	$2,092,859	$2,237,830	$2,392,843	$2,558,593	$2,735,825	$2,925,334
Miscellaneous	$15,167	$16,218	$17,341	$18,542	$19,827	$21,200	$22,668	$24,239	$25,918	$27,713	$29,633	$31,685
Supplies	$118,990	$127,232	$136,045	$145,469	$155,546	$166,320	$177,841	$190,160	$203,332	$217,417	$232,477	$248,581
Bad Debt Expense	$14,899	$15,931	$17,034	$18,214	$19,476	$20,825	$22,268	$23,810	$25,459	$27,223	$29,109	$31,125
Funded Depreciation/Renewal Replacement	$643,157	$687,708	$735,345	$786,282	$840,747	$898,985	$961,257	$1,027,843	$1,099,041	$1,175,171	$1,256,574	$1,343,616
Transfer to General Fund	$297,976	$318,616	$340,687	$364,286	$389,520	$416,502	$445,352	$476,202	$509,188	$544,459	$582,173	$622,500
TOTAL OPERATINGEXPENSES:	**$3,748,069**	**$4,007,696**	**$4,285,306**	**$4,582,146**	**$4,899,548**	**$5,238,937**	**$5,601,834**	**$5,989,869**	**$6,404,784**	**$6,848,439**	**$7,322,825**	**$7,830,072**
WASTEWATER SYSTEM EXISTING DEBT SERVICE												
Sewer Revenue Bond (1999; $3,356,000; 2.0%)	$180,680	$180,680	$180,680	$180,680	$0	$0	$0	$0	$0	$0	$0	$0
Reserve for 1999 Sewer Bond	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL EXISTING DEBT SERVICE:	**$180,680**	**$180,680**	**$180,680**	**$180,680**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
WASTEWATER SYSTEM NEW DEBT SERVICE												
Bond A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Reserve for Bond A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Bond B	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Reserve for Bond B	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Bond C	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Reserve for Bond C	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL NEW DEBT SERVICE:	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
WASTEWATER SYSTEM EXPENSES SUMMARY												
Wastewater System O&M Expenses	$3,748,069	$4,007,696	$4,285,306	$4,582,146	$4,899,548	$5,238,937	$5,601,834	$5,989,869	$6,404,784	$6,848,439	$7,322,825	$7,830,072
Wastewater System Existing Debt Service	$180,680	$180,680	$180,680	$180,680	$0	$0	$0	$0	$0	$0	$0	$0
Wastewater System New Debt Service	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL EXPENSES:	**$3,928,749**	**$4,188,376**	**$4,465,986**	**$4,762,826**	**$4,899,548**	**$5,238,937**	**$5,601,834**	**$5,989,869**	**$6,404,784**	**$6,848,439**	**$7,322,825**	**$7,830,072**
WASTEWATER SYSTEM CASH FLOW												
NET CASH FLOW:	**$1,362,036**	**$1,468,919**	**$1,583,125**	**$1,705,150**	**$2,016,209**	**$2,155,509**	**$2,304,338**	**$2,463,343**	**$2,633,219**	**$2,814,703**	**$3,008,586**	**$3,215,710**
WASTEWATER SYSTEM IMPACT FEE FUND												
Total Impact Fee Revenue	$1,177,942	$1,258,677	$1,344,945	$1,437,126	$1,535,624	$1,640,874	$1,753,337	$1,873,509	$2,001,916	$2,139,125	$2,285,738	$2,442,399
Impact Fees Covering Sewer Revenue Bond 1999	($180,680)	($180,680)	($180,680)	($180,680)	$0	$0	$0	$0	$0	$0	$0	$0
Impact Fees Covering Bond A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Impact Fees Covering Bond B	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Impact Fees Covering Bond C	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Impact Fees Spent for Single Payment Projects or Self Help	($2,000,000)	$0	$0	$0	($2,000,000)	$0	$0	$0	($2,000,000)	$0	$0	$0
Bond Reserve Payments	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
IMPACT FEE FUND TOTAL:	**$2,518,998**	**$3,596,995**	**$4,761,260**	**$6,017,706**	**$5,553,330**	**$7,194,204**	**$8,947,541**	**$10,821,050**	**$10,822,966**	**$12,962,091**	**$15,247,828**	**$17,690,227**
WASTEWATER SYSTEM CASH FUND												
Total Cash Revenue	$4,112,843	$4,398,618	$4,704,166	$5,030,851	$5,380,133	$5,753,572	$6,152,835	$6,579,704	$7,036,086	$7,524,017	$8,045,674	$8,603,384
Total Cash Expenses	($3,928,749)	($4,188,376)	($4,465,986)	($4,762,826)	($4,899,548)	($5,238,937)	($5,601,834)	($5,989,869)	($6,404,784)	($6,848,439)	($7,322,825)	($7,830,072)
Cash Spent for Single Payment Projects or Self Help	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
CASH FUND TOTAL:	**$2,028,679**	**$2,238,921**	**$2,477,101**	**$2,745,126**	**$3,225,710**	**$3,740,345**	**$4,291,346**	**$4,881,181**	**$5,512,484**	**$6,188,062**	**$6,910,910**	**$7,684,222**
SYSTEM IMPROVEMENT IMPLEMENTATION SCHEI												
Improvement Project ID # (see Phasing Table)	2A				2B				2C			
2009-2018 Improvement Cost	$2,000,000				$2,000,000				$2,000,000			

APPENDIX C
ERU DENSITY, POPULATION AND WASTEWATER DESIGN FLOWS BY CELL

ERU Density, Population, and Design Flow by Cell

Cell ID	Cell Area w/in Study Area *(ac)*	% of Cell w/in Study Area	Land Use Categories	Category ERU Density *(ERU's/ac)*	Category Land Use Area *(sf)*	Average ERU Density *(ERU's/ac)*	**Cell ERU's *(ERU's/cell)***	Category Population *(residents)*	**Cell Population *(residents/cell)***	**Cell Wastewater Design Flow *(gpm)***
1A	20.05	20.1%	hop	0.00	873236	0.00	**0**	0	**0**	**0**
1B	25.42	25.4%	hop	0.00	1107231	0.00	**0**	0	**0**	**0**
1C	25.72	25.7%	hop	0.00	1120352	0.00	**0**	0	**0**	**0**
1D	26.02	26.0%	hop	0.00	1133473	0.00	**0**	0	**0**	**0**
1E	26.32	26.3%	hop	0.00	1146594	0.00	**0**	0	**0**	**0**
1F	26.62	26.6%	hop	0.00	1159715	0.00	**0**	0	**0**	**0**
1G	26.92	26.9%	hop	0.00	1172836	0.00	**0**	0	**0**	**0**
1H	27.20	27.2%	hop	0.00	1184925	0.00	**0**	0	**0**	**0**
1I	30.02	30.0%	hop	0.00	1307457	0.00	**0**	0	**0**	**0**
1J	33.75	33.8%	hop	0.00	1470270	0.00	**0**	0	**0**	**0**
1K	37.86	37.9%	hop	0.00	1648986	0.00	**0**	0	**0**	**0**
1L	42.25	42.3%	hop	0.00	1840234	0.00	**0**	0	**0**	**0**
1M	44.69	44.7%	hop	0.00	1946577	0.00	**0**	0	**0**	**0**
1N	45.72	45.7%	hop	0.00	1991550	0.00	**0**	0	**0**	**0**
1O	46.79	46.8%	hop	0.00	2038113	0.00	**0**	0	**0**	**0**
1P	48.61	48.6%	hop	0.00	2117432	0.00	**0**	0	**0**	**0**
1Q	50.73	50.8%	hop	0.00	2209742	0.00	**0**	0	**0**	**0**
1R	52.76	52.8%	hop	0.00	2298135	0.00	**0**	0	**0**	**0**
1S	53.54	53.6%	hop	0.00	2332261	0.00	**0**	0	**0**	**0**
1T	55.83	55.9%	hop	0.00	2431810	0.00	**0**	0	**0**	**0**
1U	57.11	57.1%	hop	0.00	2487626	0.00	**0**	0	**0**	**0**
1V	24.69	24.7%	hop	0.00	1075280	0.00	**0**	0	**0**	**0**
2A	79.70	79.7%	hop	0.00	3471642	0.00	**0**	0	**0**	**0**
2B	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2C	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2D	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2E	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2F	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2G	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2H	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2I	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2J	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2N	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2O	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2P	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2Q	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2R	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2S	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2T	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
2U	91.60	91.6%	hop	0.00	3989945	0.00	**0**	0	**0**	**0**
2V	6.29	6.3%	hop	0.00	273915	0.00	**0**	0	**0**	**0**
3A	79.73	79.8%	hop	0.00	3472916	0.00	**0**	0	**0**	**0**
3B	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3C	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3D	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3E	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3F	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3G	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3H	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3I	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3J	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**

ERU Density, Population, and Design Flow by Cell

Cell ID	Cell Area w/in Study Area *(ac)*	% of Cell w/in Study Area	Land Use Categories	Category ERU Density *(ERU's/ac)*	Category Land Use Area *(sf)*	Average ERU Density *(ERU's/ac)*	**Cell ERU's *(ERU's/cell)***	Category Population *(residents)*	**Cell Population *(residents/cell)***	**Cell Wastewater Design Flow *(gpm)***
3N	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3O	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3P	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3Q	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3R	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3S	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
3T	99.76	99.8%	hop	0.00	4345553	0.00	**0**	0	**0**	**0**
3U	28.65	28.7%	hop	0.00	1248178	0.00	**0**	0	**0**	**0**
4A	79.73	79.8%	hop	0.00	3472860	0.00	**0**	0	**0**	**0**
4B	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4C	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4D	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4E	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4F	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4G	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4H	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4I	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4J	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4N	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4O	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4P	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4Q	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4R	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
4S	98.86	98.9%	hop	0.00	4306342	0.00	**0**	0	**0**	**0**
4T	39.31	39.3%	hop	0.00	1712275	0.00	**0**	0	**0**	**0**
5A	79.65	79.7%	hop	0.00	3469704	0.00	**0**	0	**0**	**0**
5B	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5C	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5D	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5E	99.01	99.1%	hop	0.00	4312904	0.00	**0**	0	**0**	**0**
5F	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5G	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5H	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5I	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5J	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5N	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5O	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5P	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
5Q	99.68	99.7%	hop	0.00	4342242	0.00	**0**	0	**0**	**0**
5R	72.59	72.6%	hop	0.00	3162125	0.00	**0**	0	**0**	**0**
5S	20.29	20.3%	hop	0.00	883745	0.00	**0**	0	**0**	**0**
6A	75.85	75.9%	hop	0.00	3304086	0.00	**0**	0	**0**	**0**
6B	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6C	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6D	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6E	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6F	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6G	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6H	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6I	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6J	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**

ERU Density, Population, and Design Flow by Cell

Cell ID	Cell Area w/in Study Area *(ac)*	% of Cell w/in Study Area	Land Use Categories	Category ERU Density *(ERU's/ac)*	Category Land Use Area *(sf)*	Average ERU Density *(ERU's/ac)*	**Cell ERU's *(ERU's/cell)***	Category Population *(residents)*	**Cell Population *(residents/cell)***	**Cell Wastewater Design Flow *(gpm)***
6K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6N	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
6O	96.77	96.8%	hop	0.00	4215290	0.00	**0**	0	**0**	**0**
6P	61.21	61.2%	hop	0.00	2586416	0.53	**32**	0	**0**	**16**
			com	17.71	79735			0		
6Q	6.60	6.6%	hop	0.00	287415	0.00	**0**	0	**0**	**0**
7A	63.22	63.3%	hop	0.00	2754034	0.00	**0**	0	**0**	**0**
7B	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
7C	10.91	10.9%	hop	0.00	475360	0.00	**0**	0	**0**	**0**
7D	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
7E	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
7F	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
7G	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
7H	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
7I	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
7J	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
7K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
7L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
7M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
7N	99.96	100.0%	hop	0.00	3878516	0.39	**39**	0	**0**	**19**
			ccrd	3.57	462668			0		
			bic	2.44	12859			0		
7O	73.21	73.2%	hop	0.00	1874361	3.60	**264**	0	**0**	**132**
			com	17.71	489498			0		
			ccrd	3.57	710270			0		
			bic	2.44	114702			0		
7P	4.48	4.5%	com	17.71	195050	17.71	**79**	0	**0**	**40**
8A	62.45	62.5%	hop	0.00	2720433	0.00	**0**	0	**0**	**0**
8B	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
8C	99.96	100.0%	hop	0.00	3868528	0.42	**42**	0	**120**	**21**
			ld	3.75	485516			120		
8D	99.96	100.0%	hop	0.00	1751664	2.24	**224**	0	**645**	**112**
			ld	3.75	2602379			645		
8E	99.96	100.0%	hop	0.00	3692317	0.57	**57**	0	**164**	**28**
			ld	3.75	661726			164		
8F	99.96	100.0%	hop	0.00	1585365	2.38	**238**	0	**686**	**119**
			ld	3.75	2768678			686		
8G	99.96	100.0%	hop	0.00	2907603	1.25	**125**	0	**359**	**62**
			ld	3.75	1446440			359		
8H	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
8I	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
8J	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
8K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
8L	99.96	100.0%	ccrd	3.57	398730	0.33	**33**	0	**0**	**16**
			hop	0.00	3955313			0		
8M	99.96	100.0%	hop	0.00	2003830	1.93	**193**	0	**0**	**96**
			ccrd	3.57	2350214			0		
8N	99.96	100.0%	hop	0.00	2400656	1.58	**158**	0	**0**	**79**
			bic	2.44	97012			0		
			ccrd	3.57	1856375			0		
8O	99.96	100.0%	hop	0.00	1483753	4.48	**447**	0	**0**	**224**
			com	17.71	678493			0		
			ccrd	3.57	1882120			0		
			bic	2.44	309677			0		

ERU Density, Population, and Design Flow by Cell

Cell ID	Cell Area w/in Study Area *(ac)*	% of Cell w/in Study Area	Land Use Categories	Category ERU Density *(ERU's/ac)*	Category Land Use Area *(sf)*	Average ERU Density *(ERU's/ac)*	**Cell ERU's *(ERU's/cell)***	Category Population *(residents)*	**Cell Population *(residents/cell)***	**Cell Wastewater Design Flow *(gpm)***
8P	84.02	84.1%	com	17.71	1539784	7.75	**651**	0	**0**	**326**
			hop	0.00	1814461			0		
			ccrd	3.57	305858			0		
8Q	19.54	19.6%	com	17.71	623377	12.97	**253**	0	**0**	**127**
			hop	0.00	227925			0		
9A	61.98	62.0%	hop	0.00	2699845	0.00	**0**	0	**0**	**0**
9B	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
9C	99.96	100.0%	ld	3.75	1724706	1.49	**148**	428	**428**	**74**
			hop	0.00	2629337			0		
9D	99.96	100.0%	ld	3.75	3822644	3.40	**340**	948	**948**	**170**
			hop	0.00	333493			0		
			bic	2.44	197906			0		
9E	99.96	100.0%	ld	3.75	2245883	3.40	**340**	557	**940**	**170**
			bic	2.44	249280			0		
			hop	0.00	805707			0		
			md	5.50	1053173			383		
9F	99.96	100.0%	hop	0.00	1133894	3.75	**375**	0	**1080**	**187**
			ld	3.75	788024			195		
			md	5.50	2432126			884		
9G	99.96	100.0%	hop	0.00	907432	4.44	**443**	0	**1007**	**222**
			ld	3.75	1402641			348		
			md	5.50	1813313			659		
			com	17.71	230657			0		
9H	99.96	100.0%	hop	0.00	2731479	3.18	**318**	0	**788**	**159**
			mhd	10.00	796815			527		
			md	5.50	717389			261		
			com	17.71	108360			0		
9I	99.96	100.0%	com	17.71	519567	2.11	**211**	0	**0**	**106**
			hop	0.00	3834476			0		
9J	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
9K	99.96	100.0%	com	17.71	1365873	5.56	**555**	0	**0**	**278**
			hop	0.00	2988170			0		
9L	99.96	100.0%	hop	0.00	2397833	2.11	**211**	0	**419**	**106**
			md	5.50	1151286			419		
			ccrd	3.57	804924			0		
9M	99.96	100.0%	bic	2.44	139653	1.81	**181**	0	**0**	**90**
			hop	0.00	2104055			0		
			ccrd	3.57	2110335			0		
9N	99.96	100.0%	bic	2.44	35595	1.45	**144**	0	**0**	**72**
			hop	0.00	2579578			0		
			ccrd	3.57	1738870			0		
9O	99.96	100.0%	hop	0.00	3189679	1.68	**168**	0	**0**	**84**
			com	17.71	223758			0		
			ccrd	3.57	940607			0		
9P	97.20	97.2%	com	17.71	216333	1.78	**173**	0	**0**	**87**
			hop	0.00	2978916			0		
			ccrd	3.57	1038908			0		
9Q	80.02	80.1%	hop	0.00	3360661	0.13	**10**	0	**0**	**5**
			ccrd	3.57	124902			0		
9R	56.97	57.0%	hop	0.00	2481757	0.00	**0**	0	**0**	**0**
10A	61.11	61.1%	hop	0.00	2662118	0.00	**0**	0	**0**	**0**
10B	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
10C	99.96	100.0%	ld	3.75	1210471	1.04	**104**	300	**300**	**52**
			hop	0.00	3143572			0		
10D	99.96	100.0%	ld	3.75	4354043	3.75	**375**	1080	**1080**	**187**
10E	99.96	100.0%	hop	0.00	719493	3.13	**313**	0	**901**	**156**
			ld	3.75	3634550			901		

ERU Density, Population, and Design Flow by Cell

Cell ID	Cell Area w/in Study Area *(ac)*	% of Cell w/in Study Area	Land Use Categories	Category ERU Density *(ERU's/ac)*	Category Land Use Area *(sf)*	Average ERU Density *(ERU's/ac)*	**Cell ERU's *(ERU's/cell)***	Category Population *(residents)*	**Cell Population *(residents/cell)***	**Cell Wastewater Design Flow *(gpm)***
10F	99.96	100.0%	md	5.50	2214513	8.43	**842**	805	**1414**	**421**
			mhd	10.00	919970			608		
			bic	2.44	412168			0		
			com	17.71	807392			0		
10G	99.96	100.0%	md	5.50	1516242	6.71	**671**	551	**1886**	**336**
			mhd	10.00	2019250			1335		
			bic	2.44	288426			0		
			hop	0.00	530125			0		
10H	99.96	100.0%	md	5.50	430777	5.51	**550**	157	**1495**	**275**
			mhd	10.00	2024623			1339		
			bic	2.44	558166			0		
			hop	0.00	1340477			0		
10I	99.96	100.0%	com	17.71	829727	4.57	**457**	0	**0**	**228**
			bic	2.44	2134422			0		
			hop	0.00	1389894			0		
10J	99.96	100.0%	com	17.71	1623461	6.60	**660**	0	**0**	**330**
			hop	0.00	2730582			0		
10K	99.96	100.0%	com	17.71	1546117	6.98	**698**	0	**199**	**349**
			hop	0.00	2194416			0		
			md	5.50	404868			147		
			ld	3.75	208643			52		
10L	99.96	100.0%	md	5.50	972390	2.87	**287**	354	**811**	**144**
			ld	3.75	1843502			457		
			ccrd	3.57	68265			0		
			hop	0.00	1469886			0		
10M	99.96	100.0%	hop	0.00	2329089	1.66	**166**	0	**0**	**83**
			ccrd	3.57	2024954			0		
10N	99.96	100.0%	com	17.71	62241	1.89	**189**	0	**0**	**95**
			ccrd	3.57	2000515			0		
			hop	0.00	2291287			0		
10O	99.96	100.0%	com	17.71	797342	4.28	**428**	0	**0**	**214**
			hop	0.00	2291930			0		
			ccrd	3.57	1264771			0		
10P	99.96	100.0%	hop	0.00	4202080	0.12	**12**	0	**0**	**6**
			bic	2.44	28626			0		
			ccrd	3.57	123337			0		
10Q	99.96	100.0%	hop	0.00	3500244	0.48	**48**	0	**0**	**24**
			bic	2.44	853799			0		
10R	86.43	86.5%	hop	0.00	3764699	0.00	**0**	0	**0**	**0**
10S	17.66	17.7%	hop	0.00	769281	0.00	**0**	0	**0**	**0**
11A	60.72	60.7%	hop	0.00	2645081	0.00	**0**	0	**0**	**0**
11B	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
11C	99.96	100.0%	hop	0.00	2836335	1.31	**131**	0	**376**	**65**
			ld	3.75	1517708			376		
11D	99.96	100.0%	ld	3.75	4354043	3.75	**375**	1080	**1080**	**187**
11E	99.96	100.0%	ld	3.75	2099482	3.05	**305**	521	**877**	**152**
			md	5.50	935950			340		
			mhd	10.00	24721			16		
			hop	0.00	1293891			0		
11F	99.96	100.0%	md	5.50	1475875	6.36	**636**	537	**1803**	**318**
			mhd	10.00	1914831			1266		
			bic	2.44	174089			0		
			hop	0.00	789248			0		
11G	99.96	100.0%	md	5.50	1095453	4.83	**482**	398	**925**	**241**
			hd	15.00	531271			527		
			hop	0.00	2330775			0		
			com	17.71	396544			0		

ERU Density, Population, and Design Flow by Cell

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11H	99.96	100.0%	ld	3.75	356065	6.75	**675**	88	**1796**	**338**
			md	5.50	182483			66		
			mhd	10.00	937271			620		
			hd	15.00	1029763			1021		
			hop	0.00	1721454			0		
			com	17.71	127008			0		
11I	99.96	100.0%	com	17.71	1542939	10.69	**1068**	0	**1270**	**534**
			hop	0.00	1530019			0		
			hd	15.00	1281085			1270		
11J	99.96	100.0%	com	17.71	1622343	7.03	**703**	0	**124**	**351**
			md	5.50	341472			124		
			hop	0.00	2390228			0		
11K	99.96	100.0%	ld	3.75	925610	3.69	**369**	229	**1063**	**185**
			md	5.50	2291556			833		
			hop	0.00	1136878			0		
11L	99.96	100.0%	ld	3.75	1280287	2.09	**209**	317	**317**	**105**
			hop	0.00	1866918			0		
			ccrd	3.57	1206839			0		
11M	99.96	100.0%	hop	0.00	3088191	1.04	**104**	0	**0**	**52**
			ccrd	3.57	1265852			0		
11N	99.96	100.0%	hop	0.00	2320466	2.74	**274**	0	**0**	**137**
			ccrd	3.57	1702242			0		
			com	17.71	331335			0		
11O	99.96	100.0%	ccrd	3.57	182259	0.15	**15**	0	**0**	**7**
			hop	0.00	4171784			0		
11P	99.96	100.0%	bic	2.44	1838339	1.03	**103**	0	**0**	**51**
			hop	0.00	2515704			0		
11Q	99.96	100.0%	bic	2.44	894810	1.32	**132**	0	**236**	**66**
			mhd	10.00	356202			236		
			hop	0.00	3459233			0		
11R	99.96	100.0%	hop	0.00	3612578	0.94	**94**	0	**270**	**47**
			md	5.50	741465			270		
11S	34.12	34.1%	hop	0.00	1325097	0.60	**20**	0	**59**	**10**
			md	5.50	161122			59		
12A	60.44	60.5%	hop	0.00	2632902	0.00	**0**	0	**0**	**0**
12B	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
12C	99.96	100.0%	ld	3.75	1788163	1.54	**154**	443	**443**	**77**
			hop	0.00	2565880			0		
12D	99.96	100.0%	ld	3.75	4003676	3.73	**373**	993	**1075**	**187**
			md	5.50	225407			82		
			hop	0.00	124959			0		
12E	99.96	100.0%	ld	3.75	2153435	6.34	**634**	534	**1403**	**317**
			md	5.50	115637			42		
			mhd	10.00	275894			182		
			hd	15.00	649696			644		
			com	17.71	360518			0		
			hop	0.00	798863			0		
12F	99.96	100.0%	exmd	3.10	1336725	4.97	**497**	0	**578**	**248**
			mhd	10.00	874169			578		
			com	17.71	494060			0		
			hop	0.00	1649089			0		
12G	99.96	100.0%	exmd	3.10	3008038	3.69	**369**	0	**405**	**185**
			hd	15.00	408847			405		
			bic	2.44	257555			0		
			hop	0.00	679604			0		

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12H	99.96	100.0%	exmd	3.10	659098	1.72	**172**	0	**349**	**86**
			vld	2.00	2636592			349		
			bic	2.44	78109			0		
			hop	0.00	980243			0		
12I	99.96	100.0%	ld	3.75	3013433	5.44	**544**	747	**1163**	**272**
			exmd	3.10	699697			0		
			hd	15.00	419067			416		
			com	17.71	221846			0		
12J	99.96	100.0%	ld	3.75	376404	7.92	**792**	93	**273**	**396**
			exmd	3.10	262940			0		
			hd	15.00	180887			179		
			bic	2.44	825896			0		
			com	17.71	1554457			0		
			hop	0.00	1153460			0		
12K	99.96	100.0%	ld	3.75	274300	2.36	**236**	68	**665**	**118**
			md	5.50	1643033			597		
			hop	0.00	2382249			0		
			ccrd	3.57	54460			0		
12L	99.96	100.0%	ld	3.75	80629	2.65	**265**	20	**20**	**133**
			com	17.71	303911			0		
			hop	0.00	2325941			0		
			ccrd	3.57	1643562			0		
12M	99.96	100.0%	ccrd	3.57	1498473	1.23	**123**	0	**0**	**61**
			hop	0.00	2855570			0		
12N	99.96	100.0%	mhd	10.00	262543	0.71	**71**	174	**174**	**35**
			hop	0.00	3904475			0		
			bic	2.44	187025			0		
12O	99.96	100.0%	bic	2.44	1939984	1.09	**109**	0	**0**	**54**
			hop	0.00	2414059			0		
12P	99.96	100.0%	bic	2.44	456845	1.18	**118**	0	**265**	**59**
			mhd	10.00	400617			265		
			hop	0.00	3496581			0		
12Q	99.96	100.0%	md	5.50	654536	2.21	**221**	238	**636**	**110**
			mhd	10.00	602501			398		
			hop	0.00	3097006			0		
12R	99.96	100.0%	md	5.50	2445583	3.09	**309**	889	**889**	**154**
			hop	0.00	1908460			0		
12S	32.16	32.2%	hop	0.00	1400926	0.00	**0**	0	**0**	**0**
13A	54.01	54.0%	hop	0.00	2352515	0.00	**0**	0	**0**	**0**
13B	88.67	88.7%	hop	0.00	3862515	0.00	**0**	0	**0**	**0**
13C	95.27	95.3%	ld	3.75	2962832	2.68	**255**	735	**735**	**128**
			hop	0.00	1187133			0		
13D	99.96	100.0%	ld	3.75	1961613	4.75	**475**	486	**654**	**237**
			md	5.50	461136			168		
			com	17.71	608887			0		
			hop	0.00	1322407			0		
13E	99.96	100.0%	md	5.50	167504	11.77	**1176**	61	**1069**	**588**
			hd	15.00	1016345			1008		
			com	17.71	1980188			0		
			hop	0.00	1190006			0		
13F	99.96	100.0%	exmd	3.10	1367882	8.18	**818**	0	**1071**	**409**
			mhd	10.00	1135928			751		
			hd	15.00	322598			320		
			com	17.71	857863			0		
			hop	0.00	669772			0		

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13G	99.96	100.0%	exmd	3.10	1313501	8.37	**836**	0	**1112**	**418**
			mhd	10.00	1682133			1112		
			com	17.71	867965			0		
			bic	2.44	69657			0		
			hop	0.00	420787			0		
13H	99.96	100.0%	vld	2.00	1386813	4.45	**445**	183	**183**	**222**
			exmd	3.10	2077590			0		
			com	17.71	573341			0		
			hop	0.00	316299			0		
13I	99.96	100.0%	ld	3.75	2219943	6.30	**630**	550	**778**	**315**
			exmd	3.10	1235555			0		
			hd	15.00	229361			227		
			com	17.71	669185			0		
13J	99.96	100.0%	exmd	3.10	1122019	7.46	**746**	0	**205**	**373**
			hd	15.00	207106			205		
			com	17.71	1463450			0		
			hop	0.00	1561468			0		
13K	99.96	100.0%	ccrd	3.57	1328657	1.12	**112**	0	**9**	**56**
			md	5.50	25629			9		
			hop	0.00	2999757			0		
13L	99.96	100.0%	ccrd	3.57	3731733	3.06	**306**	0	**0**	**153**
			hop	0.00	622310			0		
13M	99.96	100.0%	md	5.50	8333	2.31	**231**	3	**472**	**115**
			mhd	10.00	709783			469		
			ccrd	3.57	813326			0		
			hop	0.00	2822602			0		
13N	99.96	100.0%	md	5.50	109011	1.88	**188**	40	**266**	**94**
			mhd	10.00	341902			226		
			bic	2.44	1708408			0		
			hop	0.00	2194721			0		
13O	99.96	100.0%	mhd	10.00	1216018	3.65	**365**	804	**804**	**183**
			bic	2.44	1533832			0		
			hop	0.00	1604193			0		
13P	99.96	100.0%	md	5.50	389678	2.44	**244**	142	**702**	**122**
			mhd	10.00	847649			560		
			hop	0.00	3116716			0		
13Q	99.96	100.0%	md	5.50	3756314	4.74	**474**	1366	**1366**	**237**
			hop	0.00	597729			0		
13R	89.75	89.8%	md	5.50	861853	1.21	**109**	313	**313**	**54**
			hop	0.00	3047792			0		
13S	6.20	6.2%	hop	0.00	270123	0.00	**0**	0	**0**	**0**
14C	28.85	28.9%	ld	3.75	1256658	3.75	**108**	312	**312**	**54**
14D	36.90	36.9%	ld	3.75	611399	9.60	**354**	152	**152**	**177**
			com	17.71	741573			0		
			hop	0.00	254183			0		
14E	48.78	48.8%	com	17.71	2125073	17.71	**864**	0	**0**	**432**
14F	78.89	78.9%	exmd	3.10	1947581	4.89	**386**	0	**466**	**193**
			hd	15.00	470196			466		
			com	17.71	210012			0		
			hop	0.00	808726			0		
14G	99.96	100.0%	exmd	3.10	3245852	2.51	**250**	0	**56**	**125**
			ld	3.75	226509			56		
			hop	0.00	881682			0		
14H	99.96	100.0%	exmd	3.10	438158	0.31	**31**	0	**0**	**16**
			hop	0.00	3915886			0		

ERU Density, Population, and Design Flow by Cell

Cell ID	Cell Area w/in Study Area *(ac)*	% of Cell w/in Study Area	Land Use Categories	Category ERU Density *(ERU's/ac)*	Category Land Use Area *(sf)*	Average ERU Density *(ERU's/ac)*	**Cell ERU's *(ERU's/cell)***	Category Population *(residents)*	**Cell Population *(residents/cell)***	**Cell Wastewater Design Flow *(gpm)***
14I	99.96	100.0%	vld	2.00	132002	0.89	**89**	17	**17**	**45**
			exmd	3.10	1169141			0		
			hop	0.00	3052900			0		
14J	99.96	100.0%	exmd	3.10	654488	0.47	**47**	0	**0**	**23**
			hop	0.00	3699555			0		
14K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
14L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
14M	99.96	100.0%	md	5.50	2703899	3.42	**341**	983	**983**	**171**
			hop	0.00	1650144			0		
14N	99.96	100.0%	md	5.50	987691	4.98	**498**	359	**1414**	**249**
			mhd	10.00	1595795			1055		
			bic	2.44	117679			0		
			hop	0.00	1652878			0		
14O	99.96	100.0%	mhd	10.00	2984531	6.89	**689**	1973	**1973**	**344**
			bic	2.44	60739			0		
			hop	0.00	1308773			0		
14P	99.96	100.0%	md	5.50	388558	7.94	**793**	141	**2139**	**397**
			mhd	10.00	3020899			1997		
			com	17.71	124616			0		
			hop	0.00	819970			0		
14Q	99.96	100.0%	md	5.50	874545	4.84	**484**	318	**1393**	**242**
			mhd	10.00	1626122			1075		
			hop	0.00	1853376			0		
14R	53.69	53.7%	hop	0.00	2338952	0.00	**0**	0	**0**	**0**
15F	52.20	52.2%	hd	15.00	266739	3.22	**168**	265	**311**	**84**
			est	0.75	932571			46		
			bic	2.44	1074347			0		
15G	99.96	100.0%	est	0.75	456318	2.71	**271**	23	**190**	**135**
			exmd	3.10	1617788			0		
			bic	2.44	1606859			0		
			ld	3.75	673078			167		
15H	99.96	100.0%	vld	2.00	742232	1.23	**123**	98	**355**	**62**
			ld	3.75	1037272			257		
			hop	0.00	2574540			0		
15I	99.96	100.0%	vld	2.00	1701989	0.81	**81**	225	**233**	**40**
			ld	3.75	32929			8		
			hop	0.00	2619125			0		
15J	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
15K	99.96	100.0%	hop	0.00	2514431	1.03	**103**	0	**0**	**52**
			bic	2.44	1839612			0		
15L	99.96	100.0%	hop	0.00	1757496	0.60	**60**	0	**110**	**30**
			bic	2.44	385624			0		
			est	0.75	2210922			110		
15M	99.96	100.0%	md	5.50	540392	0.81	**81**	197	**232**	**40**
			est	0.75	722902			36		
			hop	0.00	3090749			0		
15N	99.96	100.0%	mhd	10.00	559562	1.64	**164**	370	**471**	**82**
			est	0.75	2037700			101		
			hop	0.00	1756781			0		
15O	99.96	100.0%	mhd	10.00	1362469	3.41	**340**	901	**981**	**170**
			est	0.75	1609100			80		
			hop	0.00	1382474			0		
15P	99.96	100.0%	est	0.75	149730	9.40	**939**	7	**229**	**470**
			mhd	10.00	334468			221		
			com	17.71	2115474			0		
			hop	0.00	1754371			0		

ERU Density, Population, and Design Flow by Cell

Cell ID	Cell Area w/in Study Area *(ac)*	% of Cell w/in Study Area	Land Use Categories	Category ERU Density *(ERU's/ac)*	Category Land Use Area *(sf)*	Average ERU Density *(ERU's/ac)*	**Cell ERU's *(ERU's/cell)***	Category Population *(residents)*	**Cell Population *(residents/cell)***	**Cell Wastewater Design Flow *(gpm)***
15Q	80.79	80.8%	mhd	10.00	142569	3.11	**251**	94	**94**	**125**
			com	17.71	536760			0		
			hop	0.00	2840080			0		
15R	2.66	2.7%	hop	0.00	115918	0.00	**0**	0	**0**	**0**
16F	52.26	52.3%	bic	2.44	1519179	1.63	**85**	0	**0**	**43**
			hop	0.00	757412			0		
16G	99.96	100.0%	ld	3.75	145531	1.17	**117**	36	**36**	**59**
			bic	2.44	1868603			0		
			hop	0.00	2339909			0		
16H	99.96	100.0%	ld	3.75	3605316	3.11	**311**	894	**894**	**155**
			est	0.75	8276			0		
			hop	0.00	740452			0		
16I	99.96	100.0%	vld	2.00	788554	0.96	**96**	104	**276**	**48**
			ld	3.75	682427			169		
			est	0.75	52895			3		
			hop	0.00	2830167			0		
16J	99.96	100.0%	bic	2.44	1278145	0.72	**72**	0	**0**	**36**
			hop	0.00	3075899			0		
16K	99.96	100.0%	bic	2.44	3822139	2.14	**214**	0	**0**	**107**
			hop	0.00	531904			0		
16L	99.96	100.0%	est	0.75	279287	1.84	**184**	14	**14**	**92**
			bic	2.44	3201073			0		
			hop	0.00	873683			0		
16M	99.96	100.0%	est	0.75	199547	1.03	**103**	10	**10**	**52**
			bic	2.44	1778078			0		
			hop	0.00	2376417			0		
16N	99.96	100.0%	hop	0.00	2295975	1.43	**143**	0	**412**	**72**
			ld	3.75	1565058			388		
			est	0.75	493009			24		
16O	99.96	100.0%	ld	3.75	1666883	6.06	**606**	413	**438**	**303**
			est	0.75	507060			25		
			com	17.71	1114992			0		
			hop	0.00	1065108			0		
16P	99.96	100.0%	hop	0.00	2737904	2.49	**249**	0	**95**	**124**
			est	0.75	954429			47		
			md	5.50	130924			48		
			com	17.71	530786			0		
16Q	44.62	44.6%	hop	0.00	982724	8.75	**391**	0	**0**	**195**
			com	17.71	960741			0		
17E	42.59	42.6%	ld	3.75	134813	0.27	**12**	33	**33**	**6**
			hop	0.00	1720517			0		
17F	96.78	96.8%	ld	3.75	1449167	1.29	**125**	359	**359**	**62**
			hop	0.00	2766743			0		
17G	99.96	100.0%	ld	3.75	2675297	2.31	**231**	663	**664**	**115**
			hop	0.00	1504017			0		
			agr	0.10	174729			1		
17H	99.96	100.0%	vld	2.00	945182	2.44	**243**	125	**701**	**122**
			ld	3.75	2287904			567		
			est	0.75	113055			6		
			agr	0.10	510160			3		
			hop	0.00	497742			0		
17I	99.96	100.0%	vld	2.00	497012	2.40	**240**	66	**536**	**120**
			ld	3.75	1660825			412		
			bic	2.44	951315			0		
			hop	0.00	57130			0		
			est	0.75	1187761			59		

ERU Density, Population, and Design Flow by Cell

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17J	99.96	100.0%	ld	3.75	1768573	2.53	**253**	438	**448**	**127**
			est	0.75	185340			9		
			bic	2.44	1744554			0		
			hop	0.00	655576			0		
17K	99.96	100.0%	ld	3.75	788976	1.20	**120**	196	**196**	**60**
			bic	2.44	929336			0		
			hop	0.00	2635730			0		
17L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
17M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
17N	99.96	100.0%	hop	0.00	3773188	0.50	**50**	0	**144**	**25**
			ld	3.75	580856			144		
17O	99.96	100.0%	ld	3.75	439696	0.98	**98**	109	**109**	**49**
			com	17.71	147568			0		
			hop	0.00	3766779			0		
17P	99.96	100.0%	ld	3.75	473380	1.96	**196**	117	**563**	**98**
			md	5.50	1226332			446		
			hop	0.00	2654332			0		
17Q	46.13	46.2%	hop	0.00	2009539	0.00	**0**	0	**0**	**0**
18D	47.98	48.0%	ld	3.75	241957	0.43	**21**	60	**60**	**10**
			hop	0.00	1848267			0		
18E	96.45	96.5%	ld	3.75	3043716	2.72	**262**	755	**755**	**131**
			hop	0.00	1157573			0		
18F	99.96	100.0%	ld	3.75	4354043	3.75	**375**	1080	**1080**	**187**
18G	99.96	100.0%	ld	3.75	2080000	1.84	**184**	516	**530**	**92**
			agr	0.10	2173591			14		
			hop	0.00	100453			0		
18H	99.96	100.0%	ld	3.75	2472175	2.14	**214**	613	**617**	**107**
			agr	0.10	616912			4		
			hop	0.00	1264956			0		
18I	99.96	100.0%	ld	3.75	3956538	3.62	**362**	981	**981**	**181**
			bic	2.44	384539			0		
			hop	0.00	12967			0		
18J	99.96	100.0%	ld	3.75	1170248	1.01	**101**	290	**290**	**50**
			hop	0.00	3183795			0		
18K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
18L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
18M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
18N	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
18O	99.96	100.0%	hop	0.00	4354043	1.48	**148**	0	**426**	**74**
			ld	3.75	1717579			426		
18P	99.96	100.0%	hop	0.00	4354043	1.67	**166**	0	**479**	**83**
			ld	3.75	1933904			479		
18Q	23.77	23.8%	hop	0.00	1035290	0.00	**0**	0	**0**	**0**
19D	24.17	24.2%	ld	3.75	514921	1.83	**44**	128	**128**	**22**
			hop	0.00	537752			0		
19E	81.38	81.4%	ld	3.75	1803719	2.32	**188**	447	**462**	**94**
			bic	2.44	499297			0		
			est	0.75	158227			8		
			agr	0.10	1083500			7		
19F	99.96	100.0%	ld	3.75	2611478	2.51	**251**	647	**723**	**126**
			est	0.75	736848			37		
			agr	0.10	748470			5		
			vld	2.00	257247			34		
19G	99.96	100.0%	ld	3.75	716371	1.30	**130**	178	**374**	**65**
			hop	0.00	574589			0		
			vld	2.00	1402460			185		
			agr	0.10	1660622			11		

ERU Density, Population, and Design Flow by Cell

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19H	99.96	100.0%	ld	3.75	2984153	2.59	**259**	740	**746**	**130**
			est	0.75	106114			5		
			agr	0.10	173658			1		
			hop	0.00	1090117			0		
19I	99.96	100.0%	ld	3.75	3610996	3.11	**311**	895	**896**	**155**
			agr	0.10	45571			0		
			hop	0.00	697476			0		
19J	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0		**0**
19K	99.96	100.0%	vld	2.00	340230	0.16	**16**	45	**45**	**8**
			hop	0.00	4013813			0		
19L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
19M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
19N	99.96	100.0%	hop	0.00	4018500	0.29	**29**	0	**83**	**14**
			ld	3.75	335543			83		
19O	99.96	100.0%	hop	0.00	210203	3.57	**357**	0	**1027**	**178**
			ld	3.75	4143840			1027		
19P	88.58	88.6%	hop	0.00	2776748	1.05	**93**	0	**268**	**47**
			ld	3.75	1081761			268		
20E	71.21	71.2%	agr	0.10	2757272	0.51	**36**	18	**104**	**18**
			ld	3.75	344435			85		
20F	99.96	100.0%	agr	0.10	3731786	0.42	**42**	25	**121**	**21**
			vld	2.00	499479			66		
			ld	3.75	122779			30		
20G	99.96	100.0%	vld	2.00	2981503	1.84	**184**	394	**531**	**92**
			ld	3.75	487634			121		
			est	0.75	227783			11		
			agr	0.10	657123			4		
20H	99.96	100.0%	vld	2.00	175576	0.64	**64**	23	**183**	**32**
			ld	3.75	333952			83		
			est	0.75	1203065			60		
			agr	0.10	2641451			17		
20I	99.96	100.0%	vld	2.00	3042318	1.90	**190**	402	**548**	**95**
			ld	3.75	579696			144		
			agr	0.10	233955			2		
			hop	0.00	498075			0		
20J	99.96	100.0%	vld	2.00	810053	0.37	**37**	107	**107**	**19**
			hop	0.00	3543990			0		
20K	99.96	100.0%	vld	2.00	1937281	0.89	**89**	256	**256**	**44**
			hop	0.00	2416762			0		
20L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
20M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
20N	99.96	100.0%	hop	0.00	2116469	1.93	**193**	0	**555**	**96**
			ld	3.75	2237574			555		
20O	99.96	100.0%	hop	0.00	890995	2.98	**298**	0	**859**	**149**
			ld	3.75	3463048			859		
20P	82.28	82.3%	hop	0.00	3575000	0.01	**1**	0	**2**	**0**
			ld	3.75	8943			2		
21E	69.01	69.0%	ld	3.75	3006107	3.75	**259**	745	**745**	**129**
21F	99.96	100.0%	agr	0.10	3383508	0.91	**91**	22	**263**	**46**
			ld	3.75	970535			241		
21G	99.96	100.0%	ld	3.75	587789	0.59	**59**	146	**171**	**30**
			agr	0.10	3766254			25		
21H	99.96	100.0%	vld	2.00	145361	3.64	**363**	19	**902**	**182**
			ld	3.75	2234679			554		
			md	5.50	887833			323		
			agr	0.10	962978			6		
			com	17.71	123193			0		

ERU Density, Population, and Design Flow by Cell

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21I	99.96	100.0%	vld	2.00	2430349	2.85	**285**	321	**762**	**142**
			ld	3.75	1483332			368		
			md	5.50	199256			72		
			com	17.71	49990			0		
			hop	0.00	191116			0		
21J	99.96	100.0%	vld	2.00	2225866	1.02	**102**	294	**294**	**51**
			hop	0.00	2128177			0		
21K	99.96	100.0%	vld	2.00	461307	0.38	**38**	61	**61**	**19**
			bic	2.44	305710			0		
			hop	0.00	3587026			0		
21L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
21M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
21N	99.96	100.0%	vld	2.00	126975	2.54	**254**	17	**732**	**127**
			ld	3.75	2885529			715		
			hop	0.00	1341539			0		
21O	99.96	100.0%	hop	0.00	2268417	1.80	**180**	0	**517**	**90**
			ld	3.75	2085626			517		
21P	49.84	49.9%	hop	0.00	2171065	0.00	**0**	0	**0**	**0**
22E	15.00	15.0%	est	0.75	240673	2.64	**40**	12	**114**	**20**
			ld	3.75	412651			102		
22F	86.69	86.7%	est	0.75	3234338	0.79	**68**	160	**196**	**34**
			agr	0.10	408192			3		
			ld	3.75	133557			33		
22G	99.96	100.0%	vld	2.00	309294	1.12	**112**	41	**322**	**56**
			ld	3.75	498373			124		
			est	0.75	3116609			155		
			agr	0.10	429767			3		
22H	99.96	100.0%	vld	2.00	244218	4.99	**499**	32	**992**	**249**
			ld	3.75	3426349			850		
			md	5.50	304394			111		
			com	17.71	379081			0		
22I	99.96	100.0%	vld	2.00	1416200	2.99	**299**	187	**695**	**149**
			ld	3.75	1861286			461		
			md	5.50	126678			46		
			com	17.71	140863			0		
			hop	0.00	809017			0		
22J	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
22K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
22L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
22M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
22N	99.96	100.0%	hop	0.00	1332251	1.39	**139**	0	**400**	**69**
			vld	2.00	3021792			400		
22O	99.96	100.0%	hop	0.00	3263990	0.53	**53**	0	**154**	**27**
			vld	2.00	1008252			133		
			ld	3.75	81802			20		
22P	37.80	37.8%	hop	0.00	1646567	0.00	**0**	0	**0**	**0**
23F	44.22	44.2%	agr	0.10	796287	0.48	**21**	5	**61**	**11**
			est	0.75	1130045			56		
23G	99.96	100.0%	vld	2.00	803689	0.98	**98**	106	**282**	**49**
			est	0.75	3550354			176		
23H	99.96	100.0%	vld	2.00	1970108	2.61	**261**	261	**654**	**130**
			ld	3.75	1589065			394		
			bic	2.44	602111			0		
			hop	0.00	192759			0		

ERU Density, Population, and Design Flow by Cell

Cell ID	Cell Area w/in Study Area *(ac)*	% of Cell w/in Study Area	Land Use Categories	Category ERU Density *(ERU's/ac)*	Category Land Use Area *(sf)*	Average ERU Density *(ERU's/ac)*	**Cell ERU's *(ERU's/cell)***	Category Population *(residents)*	**Cell Population *(residents/cell)***	**Cell Wastewater Design Flow *(gpm)***
23I	99.96	100.0%	vld	2.00	611320	2.08	**208**	81	**311**	**104**
			ld	3.75	906110			225		
			bic	2.44	1777302			0		
			est	0.75	109485			5		
			hop	0.00	949827			0		
23J	99.96	100.0%	bic	2.44	1015335	0.57	**57**	0	**0**	**28**
			hop	0.00	3338708			0		
23K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
23L	99.96	100.0%	hop	0.00	4310726	0.02	**2**	0	**6**	**1**
			vld	2.00	43318			6		
23M	99.96	100.0%	hop	0.00	3240251	0.51	**51**	0	**147**	**26**
			vld	2.00	1113793			147		
23N	99.96	100.0%	hop	0.00	979766	1.55	**155**	0	**446**	**77**
			vld	2.00	3374277			446		
23O	99.96	100.0%	hop	0.00	3540466	0.37	**37**	0	**108**	**19**
			vld	2.00	813577			108		
23P	60.53	60.6%	hop	0.00	2636752	0.00	**0**	0	**0**	**0**
24F	39.78	39.8%	est	0.75	1663952	0.72	**29**	83	**83**	**14**
			agr	0.10	68649			0		
24G	98.26	98.3%	vld	2.00	748003	0.97	**95**	99	**274**	**48**
			est	0.75	3531999			175		
24H	99.96	100.0%	vld	2.00	1569041	1.19	**119**	207	**267**	**60**
			est	0.75	1200587			60		
			bic	2.44	476858			0		
			hop	0.00	1107558			0		
24I	99.96	100.0%	est	0.75	259196	2.34	**234**	13	**13**	**117**
			bic	2.44	4094847			0		
24J	99.96	100.0%	bic	2.44	1116152	0.63	**63**	0	**0**	**31**
			hop	0.00	3237891			0		
24K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
24L	99.96	100.0%	hop	0.00	4192747	0.07	**7**	0	**21**	**4**
			vld	2.00	161297			21		
24M	99.96	100.0%	vld	2.00	2385578	1.17	**117**	315	**336**	**58**
			ld	3.75	81038			20		
			hop	0.00	1887427			0		
24N	99.96	100.0%	vld	2.00	2257757	2.70	**270**	299	**778**	**135**
			ld	3.75	1932770			479		
			hop	0.00	163516			0		
24O	99.96	100.0%	vld	2.00	1594730	0.73	**73**	211	**211**	**37**
			hop	0.00	2759313			0		
24P	96.08	96.1%	hop	0.00	4185037	0.00	**0**	0	**0**	**0**
24Q	4.17	4.2%	hop	0.00	181712	0.00	**0**	0	**0**	**0**
25F	1.79	1.8%	est	0.75	78075	0.75	**1**	4	**4**	**1**
25G	81.13	81.2%	vld	2.00	103302	0.70	**57**	14	**163**	**28**
			est	0.75	3020851			150		
			hop	0.00	409776			0		
25H	99.96	100.0%	vld	2.00	73286	1.54	**154**	10	**97**	**77**
			est	0.75	1761684			87		
			bic	2.44	2140488			0		
			hop	0.00	378585			0		
25I	99.96	100.0%	bic	2.44	4098547	3.34	**333**	0	**0**	**167**
			com	17.71	255496			0		
25J	99.96	100.0%	bic	2.44	1577702	2.97	**297**	0	**0**	**148**
			com	17.71	512227			0		
			hop	0.00	2264114			0		
25K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**

ERU Density, Population, and Design Flow by Cell

Cell ID	Cell Area w/in Study Area *(ac)*	% of Cell w/in Study Area	Land Use Categories	Category ERU Density *(ERU's/ac)*	Category Land Use Area *(sf)*	Average ERU Density *(ERU's/ac)*	**Cell ERU's *(ERU's/cell)***	Category Population *(residents)*	**Cell Population *(residents/cell)***	**Cell Wastewater Design Flow *(gpm)***
25L	99.96	100.0%	hop	0.00	4351174	0.00	**0**	0	**0**	**0**
			vld	2.00	2869			0		
25M	99.96	100.0%	vld	2.00	12970	0.01	**1**	2	**2**	**0**
			hop	0.00	4341073			0		
25N	99.96	100.0%	vld	2.00	33621	3.13	**313**	4	**901**	**156**
			ld	3.75	3616551			897		
			hop	0.00	703871			0		
25O	99.96	100.0%	vld	2.00	3160407	1.64	**164**	418	**473**	**82**
			ld	3.75	221750			55		
			hop	0.00	971886			0		
25P	99.96	100.0%	hop	0.00	4341544	0.01	**1**	0	**2**	**0**
			vld	2.00	12499			2		
25Q	58.26	58.3%	hop	0.00	2537897	0.00	**0**	0	**0**	**0**
25R	1.29	1.3%	hop	0.00	56162	0.00	**0**	0	**0**	**0**
26F	41.53	41.5%	est	0.75	1809068	0.75	**31**	90	**90**	**16**
26G	99.96	100.0%	est	0.75	2531870	0.44	**44**	126	**126**	**22**
			hop	0.00	1822173			0		
26H	99.96	100.0%	est	0.75	252338	0.26	**26**	13	**13**	**13**
			bic	2.44	391845			0		
			hop	0.00	3709859			0		
26I	99.96	100.0%	bic	2.44	3617511	3.60	**359**	0	**0**	**180**
			com	17.71	385747			0		
			hop	0.00	350785			0		
26J	99.96	100.0%	bic	2.44	1606025	5.42	**542**	0	**0**	**271**
			com	17.71	1110840			0		
			hop	0.00	1637178			0		
26K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
26L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
26M	99.96	100.0%	hop	0.00	4145877	0.18	**18**	0	**52**	**9**
			ld	3.75	208166			52		
26N	99.96	100.0%	hop	0.00	733452	3.12	**312**	0	**898**	**156**
			ld	3.75	3620591			898		
26O	99.96	100.0%	vld	2.00	3652268	2.28	**228**	483	**657**	**114**
			ld	3.75	701775			174		
26P	99.96	100.0%	vld	2.00	1915457	0.88	**88**	253	**253**	**44**
			hop	0.00	2438586			0		
26Q	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
26R	65.98	66.0%	hop	0.00	2874270	0.00	**0**	0	**0**	**0**
26S	9.21	9.2%	hop	0.00	401098	0.00	**0**	0	**0**	**0**
26T	7.37	7.4%	hop	0.00	321215	0.00	**0**	0	**0**	**0**
27F	41.32	41.3%	hop	0.00	484103	0.72	**30**	0	**56**	**15**
			est	0.75	1131833			56		
			bic	2.44	183890			0		
27G	92.36	92.4%	hop	0.00	2942369	0.56	**51**	0	**12**	**26**
			est	0.75	236267			12		
			bic	2.44	844732			0		
27H	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
27I	99.96	100.0%	hop	0.00	1209443	1.76	**176**	0	**0**	**88**
			bic	2.44	3144601			0		
27J	99.96	100.0%	hop	0.00	1513481	1.59	**159**	0	**0**	**80**
			bic	2.44	2840562			0		
27K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
27L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
27M	99.96	100.0%	ld	3.75	1532796	1.32	**132**	380	**380**	**66**
			hop	0.00	2821247			0		
27N	99.96	100.0%	ld	3.75	4354043	3.75	**375**	1080	**1080**	**187**

ERU Density, Population, and Design Flow by Cell

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27O	99.96	100.0%	vld	2.00	3187536	2.47	**247**	421	**711**	**123**
			ld	3.75	1166507			289		
27P	99.96	100.0%	vld	2.00	4252546	1.95	**195**	562	**562**	**98**
			hop	0.00	101497			0		
27Q	99.96	100.0%	hop	0.00	3441059	0.42	**42**	0	**121**	**21**
			vld	2.00	912984			121		
27R	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
27S	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
27T	79.43	79.5%	hop	0.00	3460046	0.00	**0**	0	**0**	**0**
27U	0.21	0.2%	hop	0.00	8978	0.00	**0**	0	**0**	**0**
28F	21.15	21.2%	hop	0.00	67729	2.26	**48**	0	**0**	**24**
			bic	2.44	853629			0		
28G	45.57	45.6%	hop	0.00	66857	2.36	**107**	0	**0**	**54**
			bic	2.44	1918328			0		
28H	99.96	100.0%	bic	2.44	497612	0.28	**28**	0	**0**	**14**
			hop	0.00	3856431			0		
28I	99.96	100.0%	bic	2.44	4284804	2.40	**240**	0	**0**	**120**
			hop	0.00	69239			0		
28J	99.96	100.0%	bic	2.44	3378261	1.89	**189**	0	**0**	**95**
			hop	0.00	975782			0		
28K	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
28L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
28M	99.96	100.0%	ld	3.75	1514289	1.30	**130**	375	**375**	**65**
			hop	0.00	2839754			0		
28N	99.96	100.0%	ld	3.75	4354043	3.75	**375**	1080	**1080**	**187**
28O	99.96	100.0%	vld	2.00	3292086	2.43	**243**	435	**699**	**121**
			ld	3.75	1061957			263		
28P	99.96	100.0%	vld	2.00	4354043	2.00	**200**	576	**576**	**100**
28Q	99.96	100.0%	vld	2.00	3750452	1.81	**181**	496	**521**	**90**
			est	0.75	495767			25		
			hop	0.00	107824			0		
28R	99.96	100.0%	vld	2.00	165148	0.58	**58**	22	**168**	**29**
			est	0.75	2942665			146		
			hop	0.00	1246230			0		
28S	99.96	100.0%	hop	0.00	2699848	0.28	**28**	0	**82**	**14**
			est	0.75	1654195			82		
28T	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
28U	24.42	24.4%	hop	0.00	1063698	0.00	**0**	0	**0**	**0**
29G	75.63	75.7%	hop	0.00	3294343	0.00	**0**	0	**0**	**0**
29H	99.96	100.0%	bic	2.44	2358427	1.32	**132**	0	**0**	**66**
			hop	0.00	1995616			0		
29I	99.96	100.0%	bic	2.44	4354043	2.44	**244**	0	**0**	**122**
29J	99.96	100.0%	bic	2.44	4181215	2.34	**234**	0	**0**	**117**
			hop	0.00	172828			0		
29K	99.96	100.0%	hop	0.00	3724073	0.35	**35**	0	**0**	**18**
			bic	2.44	629971			0		
29L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
29M	99.96	100.0%	ld	3.75	747475	0.70	**70**	185	**201**	**35**
			hop	0.00	3280439			0		
			est	0.75	326129			16		
29N	99.96	100.0%	ld	3.75	1867983	2.04	**204**	463	**586**	**102**
			est	0.75	2486060			123		
29O	99.96	100.0%	vld	2.00	918879	1.22	**122**	122	**352**	**61**
			ld	3.75	303876			75		
			est	0.75	3131288			155		
29P	99.96	100.0%	vld	2.00	884548	1.00	**100**	117	**289**	**50**
			est	0.75	3469495			172		

ERU Density, Population, and Design Flow by Cell

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29Q	99.96	100.0%	vld	2.00	182826	0.80	**80**	24	**231**	**40**
			est	0.75	4171217			207		
29R	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
29S	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
29T	99.96	100.0%	hop	0.00	2118620	0.39	**38**	0	**111**	**19**
			est	0.75	2235424			111		
29U	61.86	61.9%	hop	0.00	2694825	0.00	**0**	0	**0**	**0**
29V	0.28	0.3%	hop	0.00	12251	0.00	**0**	0	**0**	**0**
30F	24.54	24.6%	hop	0.00	1068918	0.00	**0**	0	**0**	**0**
30G	91.20	91.2%	hop	0.00	3710605	0.16	**15**	0	**0**	**7**
			bic	2.44	262211			0		
30H	99.96	100.0%	hop	0.00	256330	2.30	**230**	0	**0**	**115**
			bic	2.44	4097713			0		
30I	99.96	100.0%	bic	2.44	4354043	2.44	**244**	0	**0**	**122**
30J	99.96	100.0%	bic	2.44	4354043	2.44	**244**	0	**0**	**122**
30K	99.96	100.0%	hop	0.00	1967617	1.34	**134**	0	**0**	**67**
			bic	2.44	2386426			0		
30L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
30M	99.96	100.0%	hop	0.00	3738624	0.11	**11**	0	**31**	**5**
			est	0.75	615420			31		
30N	99.96	100.0%	hop	0.00	1441455	0.50	**50**	0	**144**	**25**
			est	0.75	2912588			144		
30O	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
30P	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
30Q	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
30R	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
30S	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
30T	99.96	100.0%	hop	0.00	59165	0.74	**74**	0	**213**	**37**
			est	0.75	4294878			213		
30U	99.96	100.0%	hop	0.00	4155465	0.03	**3**	0	**10**	**2**
			est	0.75	198578			10		
30V	56.75	56.8%	hop	0.00	2471850	0.00	**0**	0	**0**	**0**
30W	4.17	4.2%	hop	0.00	181722	0.00	**0**	0	**0**	**0**
31F	40.32	40.3%	hop	0.00	1756407	0.00	**0**	0	**0**	**0**
31G	99.96	100.0%	hop	0.00	2429321	1.08	**108**	0	**0**	**54**
			bic	2.44	1924722			0		
31H	99.96	100.0%	bic	2.44	4354043	2.44	**244**	0	**0**	**122**
31I	99.96	100.0%	bic	2.44	4354043	2.44	**244**	0	**0**	**122**
31J	99.96	100.0%	bic	2.44	4354043	2.44	**244**	0	**0**	**122**
31K	99.96	100.0%	bic	2.44	3701577	2.07	**207**	0	**0**	**104**
			hop	0.00	652466			0		
31L	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
31M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
31N	99.96	100.0%	hop	0.00	4354043	0.01	**1**	0	**2**	**0**
			est	0.75	48495			2		
31O	99.96	100.0%	est	0.75	1508591	0.26	**26**	75	**75**	**13**
			hop	0.00	2845452			0		
31P	99.96	100.0%	est	0.75	1938393	0.33	**33**	96	**96**	**17**
			hop	0.00	2415650			0		
31Q	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
31R	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
31S	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
31T	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
31U	99.96	100.0%	hop	0.00	2950546	0.24	**24**	0	**70**	**12**
			est	0.75	1403497			70		
31V	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
31W	98.85	98.9%	hop	0.00	4305767	0.00	**0**	0	**0**	**0**

ERU Density, Population, and Design Flow by Cell

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31X	60.71	60.7%	hop	0.00	2644340	0.00	**0**	0	**0**	**0**
31Y	9.47	9.5%	hop	0.00	412400	0.00	**0**	0	**0**	**0**
32F	12.24	12.2%	hop	0.00	533047	0.00	**0**	0	**0**	**0**
32G	30.09	30.1%	bic	2.44	924034	1.72	**52**	0	**0**	**26**
			hop	0.00	386703			0		
32H	29.15	29.2%	bic	2.44	1269790	2.44	**71**	0	**0**	**36**
32I	28.59	28.6%	bic	2.44	1245523	2.44	**70**	0	**0**	**35**
32J	28.47	28.5%	bic	2.44	1240298	2.44	**69**	0	**0**	**35**
32K	52.93	53.0%	bic	2.44	2078307	2.20	**116**	0	**0**	**58**
			hop	0.00	227179			0		
32L	99.96	100.0%	hop	0.00	4301974	0.03	**3**	0	**0**	**1**
			bic	2.44	52069			0		
32M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
32N	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
32O	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
32P	99.96	100.0%	hop	0.00	3674988	0.12	**12**	0	**34**	**6**
			est	0.75	679055			34		
32Q	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
32R	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
32S	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
32T	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
32U	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
32V	99.96	100.0%	hop	0.00	2883855	0.25	**25**	0	**73**	**13**
			est	0.75	1470188			73		
32W	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
32X	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
32Y	95.01	95.1%	hop	0.00	4138761	0.00	**0**	0	**0**	**0**
32Z	48.30	48.3%	hop	0.00	2103939	0.00	**0**	0	**0**	**0**
32AA	3.63	3.6%	hop	0.00	158338	0.00	**0**	0	**0**	**0**
33K	34.03	34.0%	bic	2.44	1482257	2.44	**83**	0	**0**	**42**
33L	99.96	100.0%	bic	2.44	698737	0.39	**39**	0	**0**	**20**
			hop	0.00	3655306			0		
33M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
33N	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
33O	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
33P	99.96	100.0%	hop	0.00	3682926	0.12	**12**	0	**33**	**6**
			est	0.75	671117			33		
33Q	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
33R	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
33S	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
33T	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
33U	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
33V	99.96	100.0%	hop	0.00	224948	0.71	**71**	0	**205**	**36**
			est	0.75	4129095			205		
33W	99.96	100.0%	hop	0.00	2294615	0.35	**35**	0	**102**	**18**
			est	0.75	2059428			102		
33X	99.96	100.0%	hop	0.00	3841482	0.09	**9**	0	**25**	**4**
			est	0.75	512561			25		
33Y	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
33Z	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
33AA	88.44	88.5%	hop	0.00	3852422	0.00	**0**	0	**0**	**0**
33BB	35.89	35.9%	hop	0.00	1563539	0.00	**0**	0	**0**	**0**
33CC	0.54	0.5%	hop	0.00	23609	0.00	**0**	0	**0**	**0**
34K	33.78	33.8%	bic	2.44	1471293	2.44	**82**	0	**0**	**41**
34L	99.96	100.0%	bic	2.44	2024207	1.13	**113**	0	**0**	**57**
			hop	0.00	2329836			0		
34M	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**

ERU Density, Population, and Design Flow by Cell

Cell ID	Cell Area w/in Study Area *(ac)*	% of Cell w/in Study Area	Land Use Categories	Category ERU Density *(ERU's/ac)*	Category Land Use Area *(sf)*	Average ERU Density *(ERU's/ac)*	**Cell ERU's *(ERU's/cell)***	Category Population *(residents)*	**Cell Population *(residents/cell)***	**Cell Wastewater Design Flow *(gpm)***
34N	99.96	100.0%	hop	0.00	3735151	0.11	**11**	0	**31**	**5**
			est	0.75	618892			31		
34O	99.96	100.0%	hop	0.00	4278019	0.01	**1**	0	**4**	**1**
			est	0.75	76024			4		
34P	99.96	100.0%	hop	0.00	3773765	0.10	**10**	0	**29**	**5**
			est	0.75	580278			29		
34Q	99.96	100.0%	hop	0.00	2340920	0.35	**35**	0	**100**	**17**
			est	0.75	2013123			100		
34R	99.96	100.0%	hop	0.00	2373569	0.34	**34**	0	**98**	**17**
			est	0.75	1980474			98		
34S	99.96	100.0%	hop	0.00	2397570	0.34	**34**	0	**97**	**17**
			est	0.75	1956473			97		
34T	99.96	100.0%	hop	0.00	2415495	0.33	**33**	0	**96**	**17**
			est	0.75	1938548			96		
34U	99.96	100.0%	hop	0.00	2429131	0.33	**33**	0	**95**	**17**
			est	0.75	1924912			95		
34V	99.96	100.0%	hop	0.00	2442766	0.33	**33**	0	**95**	**16**
			est	0.75	1911277			95		
34W	99.96	100.0%	hop	0.00	2456402	0.33	**33**	0	**94**	**16**
			est	0.75	1897641			94		
34X	99.96	100.0%	hop	0.00	2142906	0.38	**38**	0	**110**	**19**
			est	0.75	2211137			110		
34Y	99.96	100.0%	hop	0.00	1888222	0.42	**42**	0	**122**	**21**
			est	0.75	2465821			122		
34Z	99.96	100.0%	hop	0.00	1941044	0.42	**42**	0	**120**	**21**
			est	0.75	2412999			120		
34AA	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
34BB	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
34CC	75.28	75.3%	hop	0.00	3279233	0.00	**0**	0	**0**	**0**
35K	33.52	33.5%	bic	2.44	1460329	2.44	**82**	0	**0**	**41**
35L	99.96	100.0%	bic	2.44	4048692	2.27	**227**	0	**0**	**113**
			hop	0.00	305351			0		
35M	99.96	100.0%	bic	2.44	27444	0.02	**2**	0	**0**	**1**
			hop	0.00	4326599			0		
35N	99.96	100.0%	hop	0.00	3074466	0.22	**22**	0	**63**	**11**
			est	0.75	1279577			63		
35O	99.96	100.0%	hop	0.00	339014	0.69	**69**	0	**199**	**35**
			est	0.75	4015030			199		
35P	99.96	100.0%	hop	0.00	2990569	0.23	**23**	0	**68**	**12**
			est	0.75	1363474			68		
35Q	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
35R	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
35S	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
35T	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
35U	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
35V	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
35W	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
35X	99.96	100.0%	hop	0.00	1921011	0.42	**42**	0	**121**	**21**
			est	0.75	2433032			121		
35Y	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
35Z	99.96	100.0%	est	0.75	4354043	0.75	**75**	216	**216**	**37**
35AA	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
35BB	99.96	100.0%	hop	0.00	4354043	0.00	**0**	0	**0**	**0**
35CC	91.74	91.8%	hop	0.00	3996339	0.00	**0**	0	**0**	**0**
36K	10.84	10.8%	bic	2.44	472144	2.44	**26**	0	**0**	**13**
36L	32.39	32.4%	bic	2.44	1411082	2.44	**79**	0	**0**	**40**

ERU Density, Population, and Design Flow by Cell

Cell ID	Cell Area w/in Study Area *(ac)*	% of Cell w/in Study Area	Land Use Categories	Category ERU Density *(ERU's/ac)*	Category Land Use Area *(sf)*	Average ERU Density *(ERU's/ac)*	**Cell ERU's *(ERU's/cell)***	Category Population *(residents)*	**Cell Population *(residents/cell)***	**Cell Wastewater Design Flow *(gpm)***
36M	32.27	32.3%	bic	2.44	587385	1.02	**33**	0	**0**	**16**
			hop	0.00	818185			0		
36N	32.14	32.2%	hop	0.00	1041402	0.19	**6**	0	**18**	**3**
			est	0.75	358655			18		
36O	32.01	32.0%	est	0.75	1394545	0.75	**24**	69	**69**	**12**
36P	32.01	32.0%	est	0.75	1183424	0.64	**20**	59	**59**	**10**
			hop	0.00	211121			0		
36Q	32.01	32.0%	hop	0.00	1394545	0.00	**0**	0	**0**	**0**
36R	32.01	32.0%	hop	0.00	1394545	0.00	**0**	0	**0**	**0**
36S	32.01	32.0%	hop	0.00	1394545	0.00	**0**	0	**0**	**0**
36T	32.01	32.0%	hop	0.00	1394545	0.00	**0**	0	**0**	**0**
36U	32.01	32.0%	hop	0.00	1394545	0.00	**0**	0	**0**	**0**
36V	32.01	32.0%	hop	0.00	1394545	0.00	**0**	0	**0**	**0**
36W	32.01	32.0%	hop	0.00	1394545	0.00	**0**	0	**0**	**0**
36X	32.01	32.0%	hop	0.00	1394545	0.38	**12**	0	**35**	**6**
			est	0.75	703387			35		
36Y	32.01	32.0%	est	0.75	1394545	0.75	**24**	69	**69**	**12**
36Z	33.37	33.4%	est	0.75	1453635	0.75	**25**	72	**72**	**13**
36AA	33.68	33.7%	hop	0.00	1467046	0.00	**0**	0	**0**	**0**
36BB	33.99	34.0%	hop	0.00	1480456	0.00	**0**	0	**0**	**0**
36CC	31.16	31.2%	hop	0.00	1357156	0.00	**0**	0	**0**	**0**

APPENDIX D
ERU DENSITY, POPULATION AND WASTEWATER DESIGN FLOWS BY COLLECTION BASIN

Collection Basin R-1

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
6D	4354043	154338	4%	0	0	0	0.00
7B	4354043	43512	1%	0	0	0	0.00
7D	4354043	2712408	62%	0	0	0	0.00
7E	4354043	746568	17%	0	0	0	0.00
8A	2720433	991490	36%	0	0	0	0.00
8B	4354043	4063906	93%	0	0	0	0.00
8C	4354043	3019939	69%	29	83	14	0.03
8D	4354043	4266278	98%	220	632	110	0.24
8E	4354043	2301091	53%	30	87	15	0.03
9A	2699845	423849	16%	0	0	0	0.00
9B	4354043	2310424	53%	0	0	0	0.00
9C	4354043	3818482	88%	130	375	65	0.15
9D	4354043	4354043	100%	340	948	170	0.38
9E	4354043	1833057	42%	143	396	72	0.16
10C	4354043	2462160	57%	59	170	29	0.07
10D	4354043	4354043	100%	375	1080	187	0.42
10E	4354043	1723983	40%	124	357	62	0.14
11C	4354043	3329946	76%	100	288	50	0.11
11D	4354043	4354043	100%	375	1080	187	0.42
11E	4354043	1155265	27%	81	233	40	0.09
12B	4354043	210168	5%	0	0	0	0.00
12C	4354043	3990036	92%	141	406	71	0.16
12D	4354043	3661221	84%	314	904	157	0.35
12E	4354043	103593	2%	15	33	8	0.02
13C	4149965	2982612	72%	183	528	92	0.20
13D	4354043	3312678	76%	361	498	181	0.40
14C	1256658	1256658	100%	108	312	54	0.12
14D	1607155	1606703	100%	354	152	177	0.39
14E	2125073	372843	18%	152	0	76	0.17
		BASIN TOTALS =		**3634**	**8559**	**1817**	**4.05**

Collection Basin R-2

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
7E	4354043	328336	8%	0	0	0	0.00
7F	4354043	804885	18%	0	0	0	0.00
7G	4354043	195897	4%	0	0	0	0.00
8E	4354043	2052952	47%	27	77	13	0.03
8F	4354043	4354043	100%	238	686	119	0.27
8G	4354043	2995641	69%	86	247	43	0.10
9E	4354043	2523870	58%	197	545	99	0.22
9F	4354043	4112848	94%	354	1020	177	0.39
9G	4354043	753418	17%	77	174	38	0.09
10E	4354043	2622286	60%	188	543	94	0.21
10F	4354043	2121029	49%	410	689	205	0.46
11E	4354043	3198778	73%	224	644	112	0.25
11F	4354043	2695019	62%	393	1116	197	0.44
12D	4354043	692822	16%	59	171	30	0.07
12E	4354043	4250399	98%	619	1369	309	0.69
12F	4354043	3879897	89%	443	515	221	0.49
13D	4354043	1040463	24%	113	156	57	0.13
13E	4354043	4354043	100%	1176	1069	588	1.31
13F	4354043	4245910	98%	798	1044	399	0.89
14D	1607155	288	0%	0	0	0	0.00
14E	2125073	1752230	82%	712	0	356	0.79
14F	3436515	3119875	91%	350	423	175	0.39
15F	2273658	1616164	71%	119	221	60	0.13
16F	2276591	408913	18%	15	0	8	0.02
		BASIN TOTALS =		**6600**	**10710**	**3300**	**7.35**

Collection Basin R-3

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
6H	4354043	82751	2%	0	0	0	0.00
6I	4354043	563541	13%	0	0	0	0.00
7G	4354043	317116	7%	0	0	0	0.00
7H	4354043	3280822	75%	0	0	0	0.00
7I	4354043	2117742	49%	0	0	0	0.00
8G	4354043	1358402	31%	39	112	19	0.04
8H	4354043	4354043	100%	0	0	0	0.00
8I	4354043	1814987	42%	0	0	0	0.00
9F	4354043	241195	6%	21	60	10	0.02
9G	4354043	3600625	83%	367	833	183	0.41
9H	4354043	4354043	100%	318	788	159	0.35
9I	4354043	1725161	40%	84	0	42	0.09
10F	4354043	2233014	51%	432	725	216	0.48
10G	4354043	4354043	100%	671	1886	336	0.75
10H	4354043	4354043	100%	550	1495	275	0.61
10I	4354043	1299784	30%	136	0	68	0.15
11F	4354043	1659024	38%	242	687	121	0.27
11G	4354043	4354043	100%	482	925	241	0.54
11H	4354043	2755636	63%	427	1136	214	0.48
11I	4354043	137163	3%	34	40	17	0.04
12F	4354043	474146	11%	54	63	27	0.06
12G	4354043	4354043	100%	369	405	185	0.41
12H	4354043	1208659	28%	48	97	24	0.05
13F	4354043	102317	2%	19	25	10	0.02
13G	4354043	3357667	77%	645	858	323	0.72
14F	3436515	316640	9%	36	43	18	0.04
14G	4354043	2406435	55%	138	31	69	0.15
15F	2273658	557205	25%	41	76	21	0.05
15G	4354043	1480302	34%	92	64	46	0.10
		BASIN TOTALS =		**5246**	**10350**	**2623**	**5.84**

Collection Basin R-4

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
11H	4354043	1598407	37%	248	659	124	0.28
11I	4354043	734057	17%	180	214	90	0.20
12H	4354043	3145384	72%	124	252	62	0.14
12I	4354043	2115817	49%	264	565	132	0.29
13G	4354043	996153	23%	191	254	96	0.21
13H	4354043	4353676	100%	445	183	222	0.50
13I	4354043	1885731	43%	273	337	136	0.30
14G	4354043	1945185	45%	112	25	56	0.12
14H	4354043	4243633	97%	30	0	15	0.03
14I	4354043	890057	20%	18	4	9	0.02
15F	2273658	100289	4%	7	14	4	0.01
15G	4354043	2873741	66%	179	125	89	0.20
15H	4354043	2104970	48%	60	172	30	0.07
16F	2276591	1801544	79%	67	0	34	0.08
16G	4354043	2156600	50%	58	18	29	0.06
16H	4354043	94292	2%	7	19	3	0.01
17F	4215910	554441	13%	16	47	8	0.02
		BASIN TOTALS =		**2280**	**2889**	**1140**	**2.54**

Collection Basin R-5

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
6I	4354043	360896	8%	0	0	0	0.00
6J	4354043	39007	1%	0	0	0	0.00
7I	4354043	2236161	51%	0	0	0	0.00
7J	4354043	2516781	58%	0	0	0	0.00
8I	4354043	2539056	58%	0	0	0	0.00
8J	4354043	4354043	100%	0	0	0	0.00
8K	4354043	1213469	28%	0	0	0	0.00
8L	4354043	489425	11%	4	0	2	0.00
9I	4354043	2628882	60%	128	0	64	0.14
9J	4354043	4354043	100%	0	0	0	0.00
9K	4354043	4354043	100%	555	0	278	0.62
9L	4354043	4083263	94%	198	393	99	0.22
9M	4354043	24208	1%	1	0	1	0.00
10I	4354043	3054202	70%	320	0	160	0.36
10J	4354043	4354043	100%	660	0	330	0.74
10K	4354043	4354043	100%	698	199	349	0.78
10L	4354043	4354043	100%	287	811	144	0.32
10M	4354043	625827	14%	24	0	12	0.03
11I	4354043	3482822	80%	855	1016	427	0.95
11J	4354043	4354043	100%	703	124	351	0.78
11K	4354043	4354043	100%	369	1063	185	0.41
11L	4354043	4343549	100%	209	317	104	0.23
11M	4354043	492311	11%	12	0	6	0.01
12I	4354043	2238226	51%	280	598	140	0.31
12J	4354043	4354043	100%	792	273	396	0.88
12K	4354043	4312031	99%	233	659	117	0.26
12L	4354043	1785838	41%	109	8	54	0.12
13I	4354043	2469544	57%	357	441	179	0.40
13J	4354043	4353083	100%	746	205	373	0.83
13K	4354043	2428400	56%	63	5	31	0.07
14I	4354043	1971524	45%	40	8	20	0.05
14J	4354043	3349176	77%	36	0	18	0.04
15J	4354043	6945	0%	0	0	0	0.00
		BASIN TOTALS =		**7677**	**6119**	**3838**	**8.55**

Collection Basin R-6

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
6N	4354043	93061	2%	0	0	0	0.00
7M	4354043	666818	15%	0	0	0	0.00
7N	4354043	3209345	74%	28	0	14	0.03
7O	3188831	2911800	91%	241	0	120	0.27
7P	195050	195050	100%	79	0	40	0.09
8L	4354043	2173050	50%	16	0	8	0.02
8M	4354043	4281142	98%	189	0	95	0.21
8N	4354043	4354043	100%	158	0	79	0.18
8O	4354043	4354043	100%	447	0	224	0.50
8P	3660103	3660103	100%	651	0	326	0.73
8Q	851303	851303	100%	253	0	127	0.28
9L	4354043	270780	6%	13	26	7	0.01
9M	4354043	4329835	99%	180	0	90	0.20
9N	4354043	4354043	100%	144	0	72	0.16
9O	4354043	4354043	100%	168	0	84	0.19
9P	4234158	3562171	84%	146	0	73	0.16
9Q	3485563	257429	7%	1	0	0	0.00
10M	4354043	3728217	86%	142	0	71	0.16
10N	4354043	4354043	100%	189	0	95	0.21
10O	4354043	3611324	83%	355	0	177	0.40
10P	4354043	372109	9%	1	0	1	0.00
11L	4354043	10494	0%	1	1	0	0.00
11M	4354043	3861732	89%	92	0	46	0.10
11N	4354043	3848211	88%	242	0	121	0.27
11O	4354043	500611	11%	2	0	1	0.00
12K	4354043	42013	1%	2	6	1	0.00
12L	4354043	2568205	59%	156	12	78	0.17
12M	4354043	4095825	94%	116	0	58	0.13
12N	4354043	405317	9%	7	16	3	0.01
13J	4354043	961	0%	0	0	0	0.00
13K	4354043	1925643	44%	50	4	25	0.06
13L	4354043	4309434	99%	303	0	151	0.34
13M	4354043	1604100	37%	85	174	42	0.09
14J	4354043	326628	8%	3	0	2	0.00
14K	4354043	2381592	55%	0	0	0	0.00
14L	4354043	723415	17%	0	0	0	0.00
		BASIN TOTALS =		**4461**	**239**	**2230**	**4.97**

Collection Basin R-7

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
9P	4234158	671743	16%	27	0	14	0.03
9Q	3485563	3228134	93%	9	0	5	0.01
9R	2481757	2164754	87%	0	0	0	0.00
10O	4354043	743412	17%	73	0	37	0.08
10P	4354043	3981934	91%	11	0	5	0.01
10Q	4354043	4033376	93%	44	0	22	0.05
10R	3764699	157673	4%	0	0	0	0.00
11N	4354043	505832	12%	32	0	16	0.04
11O	4354043	3853432	89%	13	0	7	0.01
11P	4354043	4354043	100%	103	0	51	0.11
11Q	4354043	1983419	46%	60	107	30	0.07
12M	4354043	258218	6%	7	0	4	0.01
12N	4354043	3948726	91%	64	157	32	0.07
12O	4354043	4354043	100%	109	0	54	0.12
12P	4354043	2921122	67%	79	178	39	0.09
12Q	4354043	8729	0%	0	1	0	0.00
13L	4354043	44610	1%	3	0	2	0.00
13M	4354043	2741930	63%	145	297	73	0.16
13N	4354043	4354043	100%	188	266	94	0.21
13O	4354043	4263241	98%	357	787	179	0.40
13P	4354043	1209572	28%	68	195	34	0.08
14J	4354043	575994	13%	6	0	3	0.01
14K	4354043	1857220	43%	0	0	0	0.00
14L	4354043	2643531	61%	0	0	0	0.00
14M	4354043	4354043	100%	341	983	171	0.38
14N	4354043	3152101	72%	360	1024	180	0.40
14O	4354043	295431	7%	47	134	23	0.05
15J	4354043	290314	7%	0	0	0	0.00
15K	4354043	47447	1%	1	0	1	0.00
15L	4354043	63306	1%	1	2	0	0.00
15M	4354043	3202689	74%	59	171	30	0.07
15N	4354043	816904	19%	31	88	15	0.03
		BASIN TOTALS =		**2241**	**4391**	**1120**	**2.50**

Collection Basin R-8

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
9R	2481757	317003	13%	0	0	0	0.00
10Q	4354043	320667	7%	4	0	2	0.00
10R	3764699	3607026	96%	0	0	0	0.00
10S	769281	769281	100%	0	0	0	0.00
11Q	4354043	2370624	54%	72	128	36	0.08
11R	4354043	4354043	100%	94	270	47	0.10
11S	1486219	1486219	100%	20	59	10	0.02
12P	4354043	1432921	33%	39	87	19	0.04
12Q	4354043	4345314	100%	221	635	110	0.25
12R	4354043	4354043	100%	309	889	154	0.34
12S	1400926	1400926	100%	0	0	0	0.00
13O	4354043	90803	2%	8	17	4	0.01
13P	4354043	3144471	72%	176	507	88	0.20
13Q	4354043	4354043	100%	474	1366	237	0.53
13R	3909644	3909644	100%	109	313	54	0.12
13S	270123	270123	100%	0	0	0	0.00
14N	4354043	1201942	28%	137	390	69	0.15
14O	4354043	4058612	93%	642	1839	321	0.71
14P	4354043	4354043	100%	793	2139	397	0.88
14Q	4354043	4354043	100%	484	1393	242	0.54
14R	2338952	2338952	100%	0	0	0	0.00
15N	4354043	477295	11%	18	52	9	0.02
15O	4354043	2105364	48%	165	474	82	0.18
15P	4354043	3733189	86%	805	196	403	0.90
15Q	3519410	3514686	100%	251	94	125	0.28
15R	115918	115918	100%	0	0	0	0.00
		BASIN TOTALS =		**4819**	**10849**	**2409**	**5.37**

Collection Basin R-9

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
15P	4354043	917	0%	0	0	0	0.00
15Q	3519410	4698	0%	0	0	0	0.00
16P	4354043	2007037	46%	115	44	57	0.13
16Q	1943465	1808053	93%	363	0	182	0.40
17O	4354043	1724780	40%	39	43	19	0.04
17P	4354043	4354043	100%	196	563	98	0.22
17Q	2009539	2009539	100%	0	0	0	0.00
18N	4354043	709185	16%	0	0	0	0.00
18O	4354043	4129915	95%	140	404	70	0.16
18P	4354043	4354043	100%	166	479	83	0.19
18Q	1035290	1035290	100%	0	0	0	0.00
19M	4354043	369584	8%	0	0	0	0.00
19N	4354043	3776124	87%	25	72	13	0.03
19O	4354043	4354043	100%	357	1027	178	0.40
19P	3858509	3858509	100%	93	268	47	0.10
20M	4354043	3019096	69%	0	0	0	0.00
20N	4354043	4354043	100%	193	555	96	0.21
20O	4354043	4354043	100%	298	859	149	0.33
20P	3583943	3583943	100%	1	2	0	0.00
21L	4354043	727838	17%	0	0	0	0.00
21M	4354043	4339615	100%	0	0	0	0.00
21N	4354043	4354043	100%	254	732	127	0.28
21O	4354043	4354043	100%	180	517	90	0.20
21P	2171065	2171065	100%	0	0	0	0.00
22L	4354043	3061052	70%	0	0	0	0.00
22M	4354043	4354043	100%	0	0	0	0.00
22N	4354043	4354043	100%	139	400	69	0.15
22O	4354043	4354043	100%	53	154	27	0.06
22P	1646567	1646567	100%	0	0	0	0.00
23L	4354043	2872503	66%	1	4	1	0.00
23M	4354043	4354043	100%	51	147	26	0.06
23N	4354043	4354043	100%	155	446	77	0.17
23O	4354043	4354043	100%	37	108	19	0.04
23P	2636752	2636752	100%	0	0	0	0.00
24L	4354043	67502	2%	0	0	0	0.00
24M	4354043	1999468	46%	54	154	27	0.06
24N	4354043	3708521	85%	230	662	115	0.26
24O	4354043	4354043	100%	73	211	37	0.08
24P	4185037	3154895	75%	0	0	0	0.00
25N	4354043	2008	0%	0	0	0	0.00
25O	4354043	375748	9%	14	41	7	0.02
25P	4354043	53279	1%	0	0	0	0.00
		BASIN TOTALS =		**3228**	**7893**	**1614**	**3.60**

Collection Basin R-10

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
15M	4354043	458719	11%	8	24	4	0.01
15N	4354043	3059844	70%	115	331	57	0.13
15O	4354043	2249135	52%	176	507	88	0.20
15P	4354043	622495	14%	134	33	67	0.15
16M	4354043	2816599	65%	67	6	33	0.07
16N	4354043	4354043	100%	143	412	72	0.16
16O	4354043	4354043	100%	606	438	303	0.67
16P	4354043	2350490	54%	134	51	67	0.15
17L	4354043	1418515	33%	0	0	0	0.00
17M	4354043	4011666	92%	0	0	0	0.00
17N	4354043	4354043	100%	50	144	25	0.06
17O	4354043	2629466	60%	59	66	30	0.07
18K	4354043	24670	1%	0	0	0	0.00
18L	4354043	3662846	84%	0	0	0	0.00
18M	4354043	4354043	100%	0	0	0	0.00
18N	4354043	3644858	84%	0	0	0	0.00
18O	4354043	224128	5%	8	22	4	0.01
19L	4354043	612915	14%	0	0	0	0.00
19M	4354043	3691664	85%	0	0	0	0.00
19N	4354043	577919	13%	4	11	2	0.00
20M	4354043	100432	2%	0	0	0	0.00
		BASIN TOTALS =		**1504**	**2046**	**752**	**1.68**

Collection Basin R-11

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
14K	4354043	115196	3%	0	0	0	0.00
14L	4354043	989745	23%	0	0	0	0.00
15I	4354043	282028	6%	5	15	3	0.01
15J	4354043	2485431	57%	0	0	0	0.00
15K	4354043	4306596	99%	102	0	51	0.11
15L	4354043	4290737	99%	59	108	29	0.07
15M	4354043	692636	16%	13	37	6	0.01
16I	4354043	19624	0%	0	1	0	0.00
16J	4354043	2600917	60%	43	0	21	0.05
16K	4354043	4354043	100%	214	0	107	0.24
16L	4354043	4354043	100%	184	14	92	0.21
16M	4354043	1536226	35%	36	3	18	0.04
17J	4354043	192917	4%	11	20	6	0.01
17K	4354043	2833791	65%	78	127	39	0.09
17L	4354043	2935636	67%	0	0	0	0.00
17M	4354043	342377	8%	0	0	0	0.00
18K	4354043	138638	3%	0	0	0	0.00
18L	4354043	42740	1%	0	0	0	0.00
		BASIN TOTALS =		**746**	**326**	**373**	**0.83**

Collection Basin R-12

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
26R	2874270	115051	4%	0	0	0	0.00
26S	401098	161205	40%	0	0	0	0.00
27R	4354043	957640	22%	0	0	0	0.00
27S	4354043	2015785	46%	0	0	0	0.00
28Q	4354043	1525	0%	0	0	0	0.00
28R	4354043	2638209	61%	35	102	18	0.04
28S	4354043	1304587	30%	9	25	4	0.01
29O	4354043	2033	0%	0	0	0	0.00
29P	4354043	839515	19%	19	56	10	0.02
29Q	4354043	2708550	62%	50	144	25	0.06
29R	4354043	4327688	99%	75	215	37	0.08
29S	4354043	180562	4%	3	9	2	0.00
30M	4354043	219174	5%	1	2	0	0.00
30N	4354043	1332738	31%	15	44	8	0.02
30O	4354043	3568303	82%	61	177	31	0.07
30P	4354043	4354043	100%	75	216	37	0.08
30Q	4354043	4354043	100%	75	216	37	0.08
30R	4354043	4354043	100%	75	216	37	0.08
30S	4354043	422911	10%	7	21	4	0.01
31M	4354043	1326619	30%	0	0	0	0.00
31N	4354043	4354043	100%	1	2	0	0.00
31O	4354043	4354043	100%	26	75	13	0.03
31P	4354043	4354043	100%	33	96	17	0.04
31Q	4354043	4354043	100%	75	216	37	0.08
31R	4354043	4351358	100%	75	216	37	0.08
31S	4354043	251460	6%	4	12	2	0.00
32N	4354043	3045275	70%	0	0	0	0.00
32O	4354043	4354043	100%	0	0	0	0.00
32P	4354043	4354043	100%	12	34	6	0.01
32Q	4354043	4354043	100%	75	216	37	0.08
32R	4354043	3661906	84%	63	182	32	0.07
33N	4354043	872657	20%	0	0	0	0.00
33O	4354043	4324124	99%	0	0	0	0.00
33P	4354043	4354043	100%	12	33	6	0.01
33Q	4354043	4354043	100%	75	216	37	0.08
33R	4354043	952252	22%	16	47	8	0.02
34O	4354043	1529793	35%	0	1	0	0.00
34P	4354043	4002118	92%	9	26	5	0.01
34Q	4354043	1710456	39%	14	39	7	0.02
34R	4354043	22038	1%	0	0	0	0.00
35P	4354043	366626	8%	2	6	1	0.00
		BASIN TOTALS =		**993**	**2859**	**496**	**1.11**

Collection Basin R-13

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
23L	4354043	330165	8%	0	0	0	0.00
24L	4354043	3767065	87%	6	18	3	0.01
24M	4354043	2354757	54%	63	181	32	0.07
24N	4354043	642140	15%	40	115	20	0.04
24P	4185037	1030141	25%	0	0	0	0.00
24Q	181712	181712	100%	0	0	0	0.00
25L	4354043	3874874	89%	0	0	0	0.00
25M	4354043	4354043	100%	1	2	0	0.00
25N	4354043	4352035	100%	313	901	156	0.35
25O	4354043	3978295	91%	150	432	75	0.17
25P	4354043	4300764	99%	1	2	0	0.00
25Q	2537897	2537897	100%	0	0	0	0.00
25R	56162	56162	100%	0	0	0	0.00
26K	4354043	104744	2%	0	0	0	0.00
26L	4354043	4075071	94%	0	0	0	0.00
26M	4354043	4354043	100%	18	52	9	0.02
26N	4354043	4354043	100%	312	898	156	0.35
26O	4354043	4354043	100%	228	657	114	0.25
26P	4354043	4354043	100%	88	253	44	0.10
26Q	4354043	4354043	100%	0	0	0	0.00
26R	2874270	2759219	96%	0	0	0	0.00
26S	401098	193360	48%	0	0	0	0.00
27K	4354043	1203016	28%	0	0	0	0.00
27L	4354043	4352697	100%	0	0	0	0.00

27M	4354043	4354043	100%	132	380	66	0.15
27N	4354043	4354043	100%	375	1080	187	0.42
27O	4354043	4354043	100%	247	711	123	0.27
27P	4354043	4354043	100%	195	562	98	0.22
27Q	4354043	4354043	100%	42	121	21	0.05
27R	4354043	3396403	78%	0	0	0	0.00
28K	4354043	552169	13%	0	0	0	0.00
28L	4354043	4284360	98%	0	0	0	0.00
28M	4354043	4354043	100%	130	375	65	0.15
28N	4354043	4354043	100%	375	1080	187	0.42
28O	4354043	4354043	100%	243	699	121	0.27
28P	4354043	4354043	100%	200	576	100	0.22
28Q	4354043	4352518	100%	181	520	90	0.20
28R	4354043	1718274	39%	23	66	11	0.03
29L	4354043	1105775	25%	0	0	0	0.00
29M	4354043	4205886	97%	68	195	34	0.08
29N	4354043	4354043	100%	204	586	102	0.23
29O	4354043	4352147	100%	122	352	61	0.14
29P	4354043	3514528	81%	81	233	41	0.09
29Q	4354043	1645493	38%	30	87	15	0.03
30M	4354043	3263696	75%	8	23	4	0.01
30N	4354043	3020292	69%	35	100	17	0.04
30O	4354043	784988	18%	14	39	7	0.02
31M	4354043	176750	4%	0	0	0	0.00
		BASIN TOTALS =		**3922**	**11296**	**1961**	**4.37**

Collection Basin R-14

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
22I	4354043	335957	8%	23	54	12	0.03
22J	4354043	1779213	41%	0	0	0	0.00
22K	4354043	1689632	39%	0	0	0	0.00
22L	4354043	162733	4%	0	0	0	0.00
23H	4354043	269976	6%	16	41	8	0.02
23I	4354043	4074593	94%	194	291	97	0.22
23J	4354043	4354043	100%	57	0	28	0.06
23K	4354043	4354043	100%	0	0	0	0.00
23L	4354043	1151375	26%	1	2	0	0.00
24H	4354043	2922282	67%	80	179	40	0.09
24I	4354043	4354043	100%	234	13	117	0.26
24J	4354043	4354043	100%	63	0	31	0.07
24K	4354043	4354043	100%	0	0	0	0.00
24L	4354043	519476	12%	1	3	0	0.00
25G	3533930	577133	16%	9	27	5	0.01
25H	4354043	4325318	99%	153	96	76	0.17
25I	4354043	4354043	100%	333	0	167	0.37
25J	4354043	4354043	100%	297	0	148	0.33
25K	4354043	4354043	100%	0	0	0	0.00
25L	4354043	479169	11%	0	0	0	0.00
26G	4354043	2183912	50%	22	63	11	0.02
26H	4354043	4354043	100%	26	13	13	0.03
26I	4354043	4354043	100%	359	0	180	0.40
26J	4354043	4354043	100%	542	0	271	0.60
26K	4354043	4249299	98%	0	0	0	0.00
26L	4354043	278972	6%	0	0	0	0.00
27F	1799826	519891	29%	9	16	4	0.01
27G	4023369	3890819	97%	50	11	25	0.06
27H	4354043	4354043	100%	0	0	0	0.00

27I	4354043	4354043	100%	176	0	88	0.20
27J	4354043	4354043	100%	159	0	80	0.18
27K	4354043	3151027	72%	0	0	0	0.00
27L	4354043	1346	0%	0	0	0	0.00
28F	921358	921151	100%	48	0	24	0.05
28G	1985185	1364892	69%	74	0	37	0.08
28H	4354043	4234379	97%	27	0	14	0.03
28I	4354043	4354043	100%	240	0	120	0.27
28J	4354043	4354043	100%	189	0	95	0.21
28K	4354043	3801874	87%	0	0	0	0.00
28L	4354043	69683	2%	0	0	0	0.00
29H	4354043	1477047	34%	45	0	22	0.05
29I	4354043	4150287	95%	232	0	116	0.26
29J	4354043	4354043	100%	234	0	117	0.26
29K	4354043	4354043	100%	35	0	18	0.04
29L	4354043	3246130	75%	0	0	0	0.00
29M	4354043	149251	3%	2	7	1	0.00
30I	4354043	3221584	74%	180	0	90	0.20
30J	4354043	4354043	100%	244	0	122	0.27
30K	4354043	3518840	81%	108	0	54	0.12
30L	4354043	3431333	79%	0	0	0	0.00
30M	4354043	286208	7%	1	2	0	0.00
31I	4354043	433288	10%	24	0	12	0.03
31J	4354043	1285577	30%	72	0	36	0.08
31K	4354043	114641	3%	5	0	3	0.01
31L	4354043	7559	0%	0	0	0	0.00
		BASIN TOTALS =		**4565**	**816**	**2282**	**5.09**

Collection Basin R-15

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
18D	2090224	440026	21%	4	13	2	0.00
18E	4201289	639791	15%	40	115	20	0.04
18F	4354043	150521	3%	13	37	6	0.01
18G	4354043	141566	3%	6	17	3	0.01
18H	4354043	1122592	26%	55	159	28	0.06
18I	4354043	756218	17%	63	170	31	0.07
18J	4354043	76579	2%	2	5	1	0.00
18K	4354043	1491450	34%	0	0	0	0.00
18L	4354043	648457	15%	0	0	0	0.00
19D	1052672	1052672	100%	44	128	22	0.05
19E	3544744	3544744	100%	188	462	94	0.21
19F	4354043	4109510	94%	237	682	118	0.26
19G	4354043	4207569	97%	126	361	63	0.14
19H	4354043	4354043	100%	259	746	130	0.29
19I	4354043	4354043	100%	311	896	155	0.35
19J	4354043	3764615	86%	0	0	0	0.00
19K	4354043	4270813	98%	15	44	8	0.02
19L	4354043	3740503	86%	0	0	0	0.00
19M	4354043	292795	7%	0	0	0	0.00
20E	3101707	3101707	100%	36	104	18	0.04
20F	4354043	4354043	100%	42	121	21	0.05
20G	4354043	4354043	100%	184	531	92	0.21
20H	4354043	4354043	100%	64	183	32	0.07
20I	4354043	4354043	100%	190	548	95	0.21
20J	4354043	4354043	100%	37	107	19	0.04
20K	4354043	4354043	100%	89	256	44	0.10
20L	4354043	4354043	100%	0	0	0	0.00
20M	4354043	1234515	28%	0	0	0	0.00
21E	3006107	3006107	100%	259	745	129	0.29
21F	4354043	4354043	100%	91	263	46	0.10
21G	4354043	4354043	100%	59	171	30	0.07

21H	4354043	4354043	100%	363	902	182	0.40
21I	4354043	4354043	100%	285	762	142	0.32
21J	4354043	4354043	100%	102	294	51	0.11
21K	4354043	4354043	100%	38	61	19	0.04
21L	4354043	3626205	83%	0	0	0	0.00
21M	4354043	14428	0%	0	0	0	0.00
22E	653324	653324	100%	40	114	20	0.04
22F	3776087	3776087	100%	68	196	34	0.08
22G	4354043	4354043	100%	112	322	56	0.12
22H	4354043	4354043	100%	499	992	249	0.56
22I	4354043	4018086	92%	275	641	138	0.31
22J	4354043	2574830	59%	0	0	0	0.00
22K	4354043	2664831	61%	0	0	0	0.00
22L	4354043	1130258	26%	0	0	0	0.00
23F	1926332	1926332	100%	21	61	11	0.02
23G	4354043	4354043	100%	98	282	49	0.11
23H	4354043	4084067	94%	245	614	122	0.27
23I	4354043	279450	6%	13	20	7	0.01
24F	1732601	1732601	100%	29	83	14	0.03
24G	4280002	4280002	100%	95	274	48	0.11
24H	4354043	1431761	33%	39	88	20	0.04
25F	78075	78075	100%	1	4	1	0.00
25G	3533930	2951117	84%	47	136	24	0.05
25H	4354043	28725	1%	1	1	1	0.00
26F	1809068	1809068	100%	31	90	16	0.03
26G	4354043	2166155	50%	22	62	11	0.02
27F	1799826	1274120	71%	21	40	11	0.02
27G	4023369	132550	3%	2	0	1	0.00
		BASIN TOTALS =		**4864**	**12906**	**2432**	**5.42**

Collection Basin R-16

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
14H	4354043	110410	3%	1	0	0	0.00
14I	4354043	1492462	34%	31	6	15	0.03
14J	4354043	103190	2%	1	0	1	0.00
15H	4354043	2254358	52%	64	184	32	0.07
15I	4354043	4072440	94%	76	218	38	0.08
15J	4354043	1570649	36%	0	0	0	0.00
16F	2276591	66134	3%	2	0	1	0.00
16G	4354043	2193281	50%	59	18	30	0.07
16H	4354043	4259751	98%	304	875	152	0.34
16I	4354043	4334419	100%	95	275	48	0.11
16J	4354043	1756739	40%	29	0	14	0.03
17E	1855330	1855330	100%	12	33	6	0.01
17F	4215910	3668066	87%	109	313	54	0.12
17G	4354043	4354043	100%	231	664	115	0.26
17H	4354043	4354043	100%	243	701	122	0.27
17I	4354043	4354043	100%	240	536	120	0.27
17J	4354043	4161126	96%	242	428	121	0.27
17K	4354043	1521300	35%	42	68	21	0.05
18D	2090224	1654226	79%	16	47	8	0.02
18E	4201289	3557296	85%	222	639	111	0.25
18F	4354043	4203522	97%	362	1042	181	0.40
18G	4354043	4209943	97%	178	513	89	0.20
18H	4354043	3231451	74%	159	458	80	0.18
18I	4354043	3597825	83%	299	811	150	0.33
18J	4354043	4278656	98%	99	285	50	0.11
18K	4354043	2699653	62%	0	0	0	0.00
19F	4354043	244533	6%	14	41	7	0.02
19G	4354043	146474	3%	4	13	2	0.00
19J	4354043	586919	13%	0	0	0	0.00
19K	4354043	83230	2%	0	1	0	0.00
		BASIN TOTALS =		**3134**	**8169**	**1567**	**3.49**

Collection Basin R-17

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
26S	401098	239893	60%	0	0	0	0.00
26T	321215	321215	100%	0	0	0	0.00
27S	4354043	2338131	54%	0	0	0	0.00
27T	3460046	3460046	100%	0	0	0	0.00
27U	8978	8978	100%	0	0	0	0.00
28S	4354043	3049456	70%	20	57	10	0.02
28T	4354043	4354043	100%	0	0	0	0.00
28U	1063698	1063698	100%	0	0	0	0.00
29R	4354043	26355	1%	0	1	0	0.00
29S	4354043	4173481	96%	72	207	36	0.08
29T	4354043	4354043	100%	38	111	19	0.04
29U	2694825	2694825	100%	0	0	0	0.00
29V	12251	12251	100%	0	0	0	0.00
30S	4354043	3931132	90%	68	195	34	0.08
30T	4354043	4354043	100%	74	213	37	0.08
30U	4354043	4354043	100%	3	10	2	0.00
30V	2471850	2471850	100%	0	0	0	0.00
30W	181722	181722	100%	0	0	0	0.00
31R	4354043	2685	0%	0	0	0	0.00
31S	4354043	4102583	94%	71	203	35	0.08
31T	4354043	4354043	100%	75	216	37	0.08
31U	4354043	4354043	100%	24	70	12	0.03
31V	4354043	4354043	100%	0	0	0	0.00
31W	4305767	4305767	100%	0	0	0	0.00
31X	2644340	2644340	100%	0	0	0	0.00
31Y	412400	412400	100%	0	0	0	0.00
32R	4354043	692137	16%	12	34	6	0.01
32S	4354043	4354043	100%	75	216	37	0.08
32T	4354043	4354043	100%	75	216	37	0.08
32U	4354043	4354043	100%	75	216	37	0.08
32V	4354043	4354043	100%	25	73	13	0.03
32W	4354043	4354043	100%	0	0	0	0.00
32X	4354043	4354043	100%	0	0	0	0.00

32Y	4138761	4138761	100%	0	0	0	0.00
32Z	2103939	2103939	100%	0	0	0	0.00
32AA	158338	158338	100%	0	0	0	0.00
33R	4354043	3402960	78%	59	169	29	0.07
33S	4354043	4354043	100%	75	216	37	0.08
33T	4354043	4354043	100%	75	216	37	0.08
33U	4354043	4354043	100%	75	216	37	0.08
33V	4354043	4354043	100%	71	205	36	0.08
33W	4354043	4354043	100%	35	102	18	0.04
33X	4354043	4354043	100%	9	25	4	0.01
33Y	4354043	4354043	100%	0	0	0	0.00
33Z	4354043	4354043	100%	0	0	0	0.00
33AA	3852422	3852422	100%	0	0	0	0.00
33BB	1563539	1563539	100%	0	0	0	0.00
33CC	23609	23609	100%	0	0	0	0.00
34R	4354043	814567	19%	6	18	3	0.01
34S	4354043	2345970	54%	18	52	9	0.02
34T	4354043	4237059	97%	32	94	16	0.04
34U	4354043	4354043	100%	33	95	17	0.04
34V	4354043	4354043	100%	33	95	16	0.04
34W	4354043	4354043	100%	33	94	16	0.04
34X	4354043	4354043	100%	38	110	19	0.04
34Y	4354043	4354043	100%	42	122	21	0.05
34Z	4354043	4354043	100%	42	120	21	0.05
34AA	4354043	4354043	100%	0	0	0	0.00
34BB	4354043	4354043	100%	0	0	0	0.00
34CC	3279233	3279233	100%	0	0	0	0.00
35T	4354043	3647521	84%	0	0	0	0.00
35U	4354043	4354043	100%	0	0	0	0.00
35V	4354043	4354043	100%	0	0	0	0.00
35W	4354043	4354043	100%	0	0	0	0.00
35X	4354043	4354043	100%	42	121	21	0.05
35Y	4354043	4354043	100%	75	216	37	0.08
35Z	4354043	4354043	100%	75	216	37	0.08
35AA	4354043	4354043	100%	0	0	0	0.00
35BB	4354043	4354043	100%	0	0	0	0.00
35CC	3996339	3996339	100%	0	0	0	0.00
36T	1394545	1150903	83%	0	0	0	0.00
36U	1394545	1394545	100%	0	0	0	0.00
36V	1394545	1394545	100%	0	0	0	0.00
36W	1394545	1394545	100%	0	0	0	0.00
36X	1394545	1394545	100%	12	35	6	0.01
36Y	1394545	1394545	100%	24	69	12	0.03
36Z	1453635	1453635	100%	25	72	13	0.03
36AA	1467046	1467046	100%	0	0	0	0.00
36BB	1480456	1480456	100%	0	0	0	0.00
36CC	1357156	1357156	100%	0	0	0	0.00
		BASIN TOTALS =		**1637**	**4716**	**819**	**1.82**

Collection Basin R-18

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
34P	4354043	37203	1%	0	0	0	0.00
34Q	4354043	2643587	61%	21	61	11	0.02
34R	4354043	3517003	81%	28	79	14	0.03
34S	4354043	2009344	46%	16	45	8	0.02
34T	4354043	116984	3%	1	3	0	0.00
35P	4354043	260031	6%	1	4	1	0.00
35Q	4354043	4287679	98%	0	0	0	0.00
35R	4354043	4354043	100%	0	0	0	0.00
35S	4354043	4354043	100%	0	0	0	0.00
35T	4354043	706522	16%	0	0	0	0.00
36P	1394545	169893	12%	2	7	1	0.00
36Q	1394545	1394545	100%	0	0	0	0.00
36R	1394545	1394545	100%	0	0	0	0.00
36S	1394545	1394545	100%	0	0	0	0.00
36T	1394545	214213	15%	0	0	0	0.00
		BASIN TOTALS =		**69**	**199**	**35**	**0.08**

Collection Basin R-19

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
32M	4354043	605189	14%	0	0	0	0.00
32N	4354043	1058429	24%	0	0	0	0.00
33M	4354043	2418730	56%	0	0	0	0.00
33N	4354043	3481386	80%	0	0	0	0.00
33O	4354043	29919	1%	0	0	0	0.00
34M	4354043	1426724	33%	0	0	0	0.00
34N	4354043	4354043	100%	11	31	5	0.01
34O	4354043	2824736	65%	1	2	0	0.00
34P	4354043	314723	7%	1	2	0	0.00
35K	1460329	890959	61%	50	0	25	0.06
35L	4354043	3727812	86%	194	0	97	0.22
35M	4354043	3790866	87%	1	0	1	0.00
35N	4354043	4354043	100%	22	63	11	0.02
35O	4354043	4354043	100%	69	199	35	0.08
35P	4354043	3725460	86%	20	58	10	0.02
35Q	4354043	66364	2%	0	0	0	0.00
36K	472144	472144	100%	26	0	13	0.03
36L	1411082	1411082	100%	79	0	40	0.09
36M	1405570	1405570	100%	33	0	16	0.04
36N	1400057	1400057	100%	6	18	3	0.01
36O	1394545	1394545	100%	24	69	12	0.03
36P	1394545	1219139	87%	18	51	9	0.02
		BASIN TOTALS =		**555**	**494**	**278**	**0.62**

Collection Basin R-20

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
33K	1482257	1218006	82%	68	0	34	0.08
33L	4354043	3995652	92%	36	0	18	0.04
33M	4354043	1744214	40%	0	0	0	0.00
34K	1471293	1471293	100%	82	0	41	0.09
34L	4354043	4354043	100%	113	0	57	0.13
34M	4354043	2927319	67%	0	0	0	0.00
35K	1460329	569370	39%	32	0	16	0.04
35L	4354043	624334	14%	33	0	16	0.04
35M	4354043	563177	13%	0	0	0	0.00
		BASIN TOTALS =		**365**	**0**	**182**	**0.41**

Collection Basin R-21

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
30L	4354043	889106	20%	0	0	0	0.00
30M	4354043	585243	13%	1	4	1	0.00
31K	4354043	1416278	33%	67	0	34	0.08
31L	4354043	4316462	99%	0	0	0	0.00
31M	4354043	2850675	65%	0	0	0	0.00
32K	2305486	1555347	67%	79	0	39	0.09
32L	4354043	4354043	100%	3	0	1	0.00
32M	4354043	3748854	86%	0	0	0	0.00
32N	4354043	250860	6%	0	0	0	0.00
33K	1482257	264250	18%	15	0	7	0.02
33L	4354043	358392	8%	3	0	2	0.00
33M	4354043	190030	4%	0	0	0	0.00
		BASIN TOTALS =		**168**	**4**	**84**	**0.19**

Collection Basin R-22

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
30K	4354043	835203	19%	26	0	13	0.03
30L	4354043	33604	1%	0	0	0	0.00
31I	4354043	2288632	53%	128	0	64	0.14
31J	4354043	3066660	70%	172	0	86	0.19
31K	4354043	2823124	65%	134	0	67	0.15
31L	4354043	30022	1%	0	0	0	0.00
32I	1245523	897740	72%	50	0	25	0.06
32J	1240298	1240298	100%	69	0	35	0.08
32K	2305486	750138	33%	38	0	19	0.04
		BASIN TOTALS =		**618**	**0**	**309**	**0.69**

Collection Basin R-23

Cell	Total Cell Area (sf)	Area of Cell in Basin (sf)	Percentage of Cell in Basin (%)	ERU's in Basin (ERU's/cell)	Population in Basin (people)	Wastewater Design Flow (gpm)	Wastewater Design Flow (cfs)
28G	1985185	620293	31%	34	0	17	0.04
28H	4354043	119664	3%	1	0	0	0.00
29G	3294343	3294343	100%	0	0	0	0.00
29H	4354043	2876996	66%	87	0	44	0.10
29I	4354043	203756	5%	11	0	6	0.01
30F	1068918	1068918	100%	0	0	0	0.00
30G	3972817	3972817	100%	15	0	7	0.02
30H	4354043	4354043	100%	230	0	115	0.26
30I	4354043	1132459	26%	63	0	32	0.07
31F	1756407	1756407	100%	0	0	0	0.00
31G	4354043	4354043	100%	108	0	54	0.12
31H	4354043	4354043	100%	244	0	122	0.27
31I	4354043	1632123	37%	91	0	46	0.10
32F	533047	533047	100%	0	0	0	0.00
32G	1310736	1310736	100%	52	0	26	0.06
32H	1269790	1269790	100%	71	0	36	0.08
32I	1245523	347009	28%	19	0	10	0.02
		BASIN TOTALS =		**1026**	**0**	**513**	**1.14**

APPENDIX E
COMPUTER MODEL OUTPUT

10-YR ANALYSIS

PIPE SEGMENT: R-1-1

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total pipe flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	3005.00	3000.00	1018	0.49%	0.17	0.17	0.62	0	0	8	0.9	2.6	-	#VALUE!	#VALUE!
2	0.012	3000.00	2956.00	761	5.78%	0.00	0.17	2.11	0	0	8	3.2	9.0	-	#VALUE!	#VALUE!
3	0.012	2956.00	2928.00	748	3.74%	0.00	0.17	1.70	0	0	8	2.5	7.3	-	#VALUE!	#VALUE!
4	0.012	2928.00	2894.00	1172	2.90%	0.46	0.63	1.50	0	0	8	2.2	6.4	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-1-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2944.00	2942.00	251	0.80%	0.58	0.58	2.32	0	0	12	3.5	4.4	-	#VALUE!	#VALUE!
2	0.012	2942.00	2939.00	455	0.66%	0.00	0.58	2.10	0	0	12	3.1	4.0	-	#VALUE!	#VALUE!
3	0.012	2939.00	2903.00	2223	1.62%	0.00	0.58	3.30	0	0	12	4.9	6.3	-	#VALUE!	#VALUE!
4	0.012	2903.00	2896.00	637	1.10%	0.00	0.58	2.72	0	0	12	4.1	5.2	-	#VALUE!	#VALUE!
5	0.012	2896.00	2894.00	357	0.56%	0.00	0.58	1.94	0	0	12	2.9	3.7	-	#VALUE!	#VALUE!
6	0.012	2894.00	2862.00	1381	2.32%	0.00	0.58	3.95	0	0	12	5.9	7.5	-	#VALUE!	#VALUE!
7	0.012	2862.00	2849.00	1494	0.87%	0.91	1.49	4.39	0	0	15	6.5	5.3	-	#VALUE!	#VALUE!
8	0.012	2849.00	2846.00	234	1.28%	0.00	1.49	5.32	0	0	15	7.9	6.5	-	#VALUE!	#VALUE!
9	0.012	2846.00	2836.00	373	2.68%	0.00	1.49	7.69	0	0	15	11.5	9.4	-	#VALUE!	#VALUE!
REGIONAL																
10	0.012	2836.00	2806.00	831	3.61%	0.47	1.96	3.03	0	0	10	4.5	8.3	-	#VALUE!	#VALUE!
11	0.012	2806.00	2803.00	293	1.02%	0.00	1.96	2.62	0	0	12	3.9	5.0	-	#VALUE!	#VALUE!
12	0.012	2803.00	2790.73	1227	1.00%	0.09	2.05	2.59	0	0	12	3.9	4.9	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-2-2

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen/actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2907.50	2904.00	841	0.42%	0.20	0.20	0.57	0	0	8	0.8	2.4	-	#VALUE!	#VALUE!
2	0.012	2904.00	2888.00	1006	1.59%	0.00	0.20	1.11	0	0	8	1.7	4.7	-	#VALUE!	#VALUE!
3	0.012	2888.00	2859.00	356	8.16%	0.26	0.46	2.51	0	0	8	3.7	10.7	-	#VALUE!	#VALUE!
4	0.012	2859.00	2805.00	1376	3.93%	0.00	0.46	1.74	0	0	8	2.6	7.5	-	#VALUE!	#VALUE!
5	0.012	2805.00	2790.00	258	5.80%	0.00	0.46	2.12	0	0	8	3.2	9.1	-	#VALUE!	#VALUE!
6	0.012	2790.00	2782.00	258	3.10%	0.00	0.46	1.55	0	0	8	2.3	6.6	-	#VALUE!	#VALUE!
7	0.012	2782.00	2768.00	578	2.42%	0.95	1.41	8.69	0	0	16	13.0	9.3	-	#VALUE!	#VALUE!
8	0.012	2768.00	2744.00	662	3.63%	0.00	1.41	7.45	0	0	14	11.1	10.4	-	#VALUE!	#VALUE!
9	0.012	2744.00	2736.00	275	2.91%	0.00	1.41	6.67	0	0	14	10.0	9.3	-	#VALUE!	#VALUE!
10	0.012	2736.00	2730.00	447	1.34%	0.00	1.41	4.53	0	0	14	6.8	6.3	-	#VALUE!	#VALUE!
11	0.012	2730.00	2723.00	331	2.11%	0.27	1.68	5.69	0	0	14	8.5	7.9	-	#VALUE!	#VALUE!
12	0.012	2723.00	2718.00	263	1.90%	0.00	1.68	5.40	0	0	14	8.1	7.5	-	#VALUE!	#VALUE!
13	0.012	2718.00	2692.00	1256	2.07%	0.00	1.68	5.63	0	0	14	8.4	7.9	-	#VALUE!	#VALUE!
14	0.012	2692.00	2688.00	275	1.45%	0.41	2.09	5.67	0	0	15	8.5	6.9	-	#VALUE!	#VALUE!
15	0.012	2688.00	2681.00	478	1.46%	0.00	2.09	5.69	0	0	15	8.5	6.9	-	#VALUE!	#VALUE!
16	0.012	2681.00	2676.00	371	1.35%	0.00	2.09	5.46	0	0	15	8.1	6.6	-	#VALUE!	#VALUE!
17	0.012	2676.00	2654.00	1946	1.13%	0.00	2.09	5.00	0	0	15	7.5	6.1	-	#VALUE!	#VALUE!
18	0.012	2654.00	2627.00	735	3.67%	0.01	2.10	9.01	0	0	15	13.4	11.0	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-3-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2988.00	2954.00	1933	1.76%	0.17	0.17	1.17	0	0	8	1.7	5.0	-	#VALUE!	#VALUE!
2	0.012	2954.00	2932.00	230	9.58%	0.00	0.17	2.72	0	0	8	4.1	11.6	-	#VALUE!	#VALUE!
3	0.012	2932.00	2924.00	133	6.03%	0.00	0.17	2.16	0	0	8	3.2	9.2	-	#VALUE!	#VALUE!
3	0.012	2924.00	2902.00	782	2.81%	0.02	0.19	1.47	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!
4	0.012	2902.00	2896.00	402	1.49%	0.00	0.19	1.07	0	0	8	1.6	4.6	-	#VALUE!	#VALUE!
5	0.012	2896.00	2867.00	941	3.08%	0.00	0.19	1.54	0	0	8	2.3	6.6	-	#VALUE!	#VALUE!
6	0.012	2867.00	2736.00	4811	2.72%	0.77	0.96	1.45	0	0	8	2.2	6.2	-	#VALUE!	#VALUE!
7	0.012	2736.00	2728.00	492	1.63%	0.00	0.96	1.12	0	0	8	1.7	4.8	-	#VALUE!	#VALUE!
8	0.012	2728.00	2696.00	951	3.36%	0.43	1.39	4.76	0	0	12	7.1	9.0	-	#VALUE!	#VALUE!
9	0.012	2696.00	2647.00	1129	4.34%	0.64	2.03	5.40	0	0	12	8.1	10.3	-	#VALUE!	#VALUE!
10	0.012	2647.00	2644.00	932	0.32%	0.03	2.06	1.47	0.59	0.90	12	2.2	2.8	10	1.4	2.5
11	0.012	2644.00	2632.00	351	3.42%	0.02	2.08	8.69	0	0	15	13.0	10.6	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-6-2

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	3012.00	2973.00	1212	3.22%	0.84	0.84	2.86	0	0	10	4.3	7.8	-	#VALUE!	#VALUE!
2	0.012	2973.00	2971.00	213	0.94%	0.00	0.84	1.54	0	0	10	2.3	4.2	-	#VALUE!	#VALUE!
3	0.012	2971.00	2961.00	408	2.45%	0.00	0.84	4.06	0	0	12	6.1	7.7	-	#VALUE!	#VALUE!
4	0.012	2961.00	2958.00	392	0.76%	0.00	0.84	2.27	0	0	12	3.4	4.3	-	#VALUE!	#VALUE!
5	0.012	2958.00	2956.00	229	0.88%	0.20	1.04	2.43	0	0	12	3.6	4.6	-	#VALUE!	#VALUE!
6	0.012	2956.00	2952.00	885	0.45%	0.00	1.04	1.74	0	0	12	2.6	3.3	-	#VALUE!	#VALUE!
7	0.012	2952.00	2936.00	451	3.55%	0.00	1.04	4.89	0	0	12	7.3	9.3	-	#VALUE!	#VALUE!
8	0.012	2936.00	2929.00	376	1.86%	0.00	1.04	3.54	0	0	12	5.3	6.7	-	#VALUE!	#VALUE!
9	0.012	2929.00	2922.00	648	1.08%	0.35	1.39	2.69	0	0	12	4.0	5.1	-	#VALUE!	#VALUE!
10	0.012	2922.00	2916.00	511	1.17%	0.22	1.61	2.81	0	0	12	4.2	5.3	-	#VALUE!	#VALUE!
11	0.012	2916.00	2908.00	731	1.09%	0.00	1.61	2.71	0	0	12	4.0	5.2	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-5-10

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2827.00	2812.00	2023	0.74%	0.27	0.27	1.37	0	0	10	2.0	3.8	-	#VALUE!	#VALUE!

PIPE SEGMENT: NORTH TRUNK LINE (R-5-9)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2830.00	2826.00	1194	0.34%	2.08	2.08	6.67	0	0	21	10.0	4.1	-	#VALUE!	#VALUE!
2	0.012	2826.00	2818.00	1936	0.41%	1.05	3.13	4.91	0	0	18	7.3	4.2	-	#VALUE!	#VALUE!
3	0.012	2818.00	2812.00	923	0.65%	0.07	3.20	6.16	0	0	18	9.2	5.2	-	#VALUE!	#VALUE!
4	0.012	2812.00	2790.00	1135	1.94%	0.33	3.53	6.55	0	0	15	9.8	8.0	-	#VALUE!	#VALUE!
5	0.012	2790.00	2780.00	552	1.81%	0.00	3.53	6.33	0	0	15	9.4	7.7	-	#VALUE!	#VALUE!
6	0.012	2780.00	2760.00	351	5.70%	0.00	3.53	6.19	0	0	12	9.2	11.8	-	#VALUE!	#VALUE!
7	0.012	2760.00	2740.00	240	8.33%	0.00	3.53	7.49	0	0	12	11.2	14.2	-	#VALUE!	#VALUE!
8	0.012	2740.00	2722.00	367	4.90%	0.00	3.53	5.74	0	0	12	8.6	10.9	-	#VALUE!	#VALUE!
9	0.012	2722.00	2696.00	526	4.94%	1.00	4.53	5.76	0	0	12	8.6	11.0	-	#VALUE!	#VALUE!
10	0.012	2696.00	2666.00	1031	2.91%	0.00	4.53	4.42	0.11	1.50	12	6.6	8.4	8	2.2	6.4
11	0.012	2666.00	2649.00	604	2.81%	0.15	4.68	4.35	0.33	1.48	12	6.5	8.3	8	2.2	6.3
12	0.012	2649.00	2641.00	426	1.88%	0.00	4.68	6.44	0	0	15	9.6	7.8	-	#VALUE!	#VALUE!
13	0.012	2641.00	2640.00	220	0.45%	0.00	4.68	7.77	0	0	21	11.6	4.8	-	#VALUE!	#VALUE!
14	0.012	2640.00	2635.00	722	0.69%	0.00	4.68	9.60	0	0	21	14.3	6.0	-	#VALUE!	#VALUE!
15	0.012	2635.00	2632.00	775	0.39%	0.08	4.76	7.17	0	0	21	10.7	4.5	-	#VALUE!	#VALUE!
16	0.012	2632.00	2630.00	713	0.28%	2.08	6.84	8.72	0	0	24	13.0	4.1	-	#VALUE!	#VALUE!
17	0.012	2630.00	2627.00	1241	0.24%	0.02	6.86	11.08	0	0	27	16.5	4.2	-	#VALUE!	#VALUE!
18	0.012	2627.00	2626.50	170	0.29%	2.13	8.99	12.22	0	0	27	18.2	4.6	-	#VALUE!	#VALUE!
19	0.012	2626.50	2625.50	316	0.32%	0.05	9.04	4.30	4.74	6.49	18	6.4	3.6	21	9.7	4.0
20	0.012	2625.50	2623.77	577	0.30%	0.00	9.04	4.19	4.85	6.31	18	6.2	3.5	21	9.4	3.9

PIPE SEGMENT: R-10-1

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2671.58	2671.00	897	0.07%	0.13	0.13	0.22	0	0	8	0.3	1.0	-	#VALUE!	#VALUE!
2	0.012	2671.00	2670.76	412	0.06%	0.00	0.13	0.21	0	0	8	0.3	0.9	-	#VALUE!	#VALUE!
3	0.012	2670.76	2670.55	371	0.06%	0.00	0.13	0.21	0	0	8	0.3	0.9	-	#VALUE!	#VALUE!
4	0.012	2670.55	2670.29	459	0.06%	0.00	0.13	0.21	0	0	8	0.3	0.9	-	#VALUE!	#VALUE!
5	0.012	2670.29	2670.16	233	0.06%	0.00	0.13	0.21	0	0	8	0.3	0.9	-	#VALUE!	#VALUE!
6	0.012	2670.16	2669.00	2060	0.06%	0.00	0.13	0.21	0	0	8	0.3	0.9	-	#VALUE!	#VALUE!
7	0.012	2669.00	2668.50	673	0.07%	0.06	0.19	0.24	0	0	8	0.4	1.0	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-12-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	3034.42	3031.94	800	0.31%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
2	0.012	3031.94	3029.77	700	0.31%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
3	0.012	3029.77	3027.01	890	0.31%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
4	0.012	3027.01	3024.47	818	0.31%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
5	0.012	3024.47	3022.75	557	0.31%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
6	0.012	3022.75	3020.62	686	0.31%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
7	0.012	3020.62	3018.52	675	0.31%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
8	0.012	3018.52	3016.00	776	0.32%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
9	0.012	3016.00	3008.00	1257	0.64%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
10	0.012	3008.00	3000.00	1360	0.59%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
11	0.012	3000.00	2992.00	1065	0.75%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
12	0.012	2992.00	2985.00	1216	0.58%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
13	0.012	2985.00	2979.00	655	0.92%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
14	0.012	2979.00	2966.74	659	1.86%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
15	0.012	2966.74	2960.82	319	1.86%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
16	0.012	2960.82	2937.75	1240	1.86%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
17	0.012	2937.75	2922.00	849	1.86%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
18	0.012	2922.00	2865.00	1130	5.04%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
19	0.012	2865.00	2850.00	273	5.49%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
20	0.012	2850.00	2824.00	630	4.13%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
21	0.012	2824.00	2812.00	672	1.79%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
22	0.012	2812.00	2800.00	698	1.72%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
23	0.012	2800.00	2786.00	776	1.80%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
24	0.012	2786.00	2772.00	491	2.85%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
25	0.012	2772.00	2764.00	1121	0.71%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
26	0.012	2764.00	2740.00	1123	2.14%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
27	0.012	2740.00	2728.00	1471	0.82%	0.14	0.14	4.25	0	0	15	6.3	5.2	-	#VALUE!	#VALUE!
28	0.012	2728.00	2719.00	923	0.98%	0.09	0.23	4.64	0	0	15	6.9	5.6	-	#VALUE!	#VALUE!
29	0.012	2719.00	2709.00	1337	0.75%	0.12	0.35	4.07	0	0	15	6.1	4.9	-	#VALUE!	#VALUE!
30	0.012	2709.00	2691.00	2373	0.76%	0.16	0.51	4.09	0	0	15	6.1	5.0	-	#VALUE!	#VALUE!
31	0.012	2691.00	2677.00	1384	1.01%	0.00	0.51	4.73	0	0	15	7.1	5.8	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-14-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2810.00	2798.00	1119	1.07%	0.03	0.03	0.91	0	0	8	1.4	3.9	-	#VALUE!	#VALUE!
2	0.012	2798.00	2793.00	894	0.56%	0.02	0.05	0.66	0	0	8	1.0	2.8	-	#VALUE!	#VALUE!
3	0.012	2793.00	2788.00	849	0.59%	0.00	0.05	0.67	0	0	8	1.0	2.9	-	#VALUE!	#VALUE!
4	0.012	2788.00	2780.00	1039	0.77%	0.00	0.05	0.77	0	0	8	1.2	3.3	-	#VALUE!	#VALUE!
5	0.012	2780.00	2767.00	1220	1.07%	0.02	0.07	0.91	0	0	8	1.4	3.9	-	#VALUE!	#VALUE!
6	0.012	2767.00	2750.00	1184	1.44%	0.00	0.07	1.05	0	0	8	1.6	4.5	-	#VALUE!	#VALUE!
7	0.012	2750.00	2740.00	1068	0.94%	0.01	0.08	0.85	0	0	8	1.3	3.6	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-15-6 (REGIONAL)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2677.00	2670.00	964	0.73%	0.54	0.54	4.01	0	0	15	6.0	4.9	-	#VALUE!	#VALUE!
2	0.012	2670.00	2652.00	963	1.87%	0.00	0.54	6.43	0	0	15	9.6	7.8	-	#VALUE!	#VALUE!
3	0.012	2652.00	2634.00	1213	1.48%	0.07	0.61	5.73	0	0	15	8.5	7.0	-	#VALUE!	#VALUE!
4	0.012	2634.00	2628.00	1111	0.54%	0.10	0.71	3.46	0	0	15	5.2	4.2	-	#VALUE!	#VALUE!
5	0.012	2628.00	2618.00	1399	0.71%	0.12	0.83	3.97	0	0	15	5.9	4.8	-	#VALUE!	#VALUE!
REGIONAL																
6	0.012	2618.00	2611.00	1382	0.51%	4.17	5.00	1.85	3.15	3.35	12	2.8	3.5	15	5.0	4.1
7	0.012	2611.00	2604.00	1287	0.54%	0.05	5.05	1.91	3.14	3.47	12	2.9	3.6	15	5.2	4.2
8	0.012	2604.00	2594.00	1171	0.85%	0.46	5.51	2.40	3.11	4.34	12	3.6	4.6	15	6.5	5.3
9	0.012	2594.00	2588.00	761	0.79%	0.09	5.60	2.30	3.30	4.17	12	3.4	4.4	15	6.2	5.1
10	0.012	2588.00	2585.00	471	0.64%	0.00	5.60	2.07	3.53	3.75	12	3.1	3.9	15	5.6	4.6
11	0.012	2585.00	2579.75	1146	0.46%	0.00	5.60	1.76	3.84	5.18	12	2.6	3.3	18	7.7	4.4
12	0.012	2579.75	2575.36	1011	0.43%	0.00	5.60	1.71	3.89	5.04	12	2.6	3.2	18	7.5	4.3

PIPE SEGMENT: R-15-10 (Regional)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2626.00	2614.00	1298	0.92%	0.39	0.39	0.85	0	0	8	1.3	3.6	-	#VALUE!	#VALUE!
2	0.012	2614.00	2611.00	289	1.04%	0.08	0.47	0.90	0	0	8	1.3	3.8	-	#VALUE!	#VALUE!
3	0.012	2611.00	2608.00	657	0.46%	0.00	0.47	1.08	0	0	10	1.6	2.9	-	#VALUE!	#VALUE!
4	0.012	2608.00	2600.00	1350	0.59%	0.00	0.47	1.23	0	0	10	1.8	3.4	-	#VALUE!	#VALUE!
5	0.012	2600.00	2592.00	2087	0.38%	0.09	0.56	1.61	0	0	12	2.4	3.1	-	#VALUE!	#VALUE!
6	0.012	2592.00	2586.50	1529	0.36%	0.26	0.82	1.56	0	0	12	2.3	3.0	-	#VALUE!	#VALUE!
7	0.012	2586.50	2585.00	384	0.39%	0.04	0.86	1.62	0	0	12	2.4	3.1	-	#VALUE!	#VALUE!
8	0.010	2585.00	2581.00	897	0.45%	2.63	3.49	3.77	0	0	15	5.6	4.6	-	#VALUE!	#VALUE!
9	0.010	2581.00	2577.65	658	0.51%	0.00	3.49	4.03	0	0	15	6.0	4.9	-	#VALUE!	#VALUE!
10	0.010	2577.65	2576.39	745	0.17%	0.00	3.49	3.76	0	0	18	5.62	3.2	-	#VALUE!	#VALUE!
11	0.012	2576.39	2575.35	421	0.25%	0.00	3.49	3.79	0	0	18	5.66	3.2	-	#VALUE!	#VALUE!
12	0.012	2575.35	2574.38	405	0.24%	0.00	3.49	3.73	0	0	18	5.57	3.2	-	#VALUE!	#VALUE!
13	0.012	2574.38	2573.63	326	0.23%	0.00	3.49	3.66	0	0	18	5.46	3.1	-	#VALUE!	#VALUE!
14	0.012	2573.63	2572.38	547	0.23%	0.00	3.49	3.64	0	0	18	5.44	3.1	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-16-1

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2729.37	2690.49	2495	1.56%	0.31	0.31	1.10	0	0	8	1.6	4.7	-	#VALUE!	#VALUE!
2	0.012	2690.49	2664.88	936	2.74%	0.00	0.31	1.45	0	0	8	2.2	6.2	-	#VALUE!	#VALUE!
3	0.012	2664.88	2633.84	2232	1.39%	0.00	0.31	1.04	0	0	8	1.5	4.4	-	#VALUE!	#VALUE!
4	0.012	2633.84	2624.15	320	3.02%	0.00	0.31	1.53	0	0	8	2.3	6.5	-	#VALUE!	#VALUE!
5	0.012	2624.15	2608.00	1298	1.24%	0.00	0.31	0.98	0	0	8	1.5	4.2	-	#VALUE!	#VALUE!
6	0.012	2608.00	2605.91	830	0.25%	0.96	1.27	1.30	0	0	12	1.9	2.5	-	#VALUE!	#VALUE!
7	0.012	2605.91	2601.92	1587	0.25%	0.00	1.27	1.30	0	0	12	1.9	2.5	-	#VALUE!	#VALUE!
8	0.010	2601.92	2600.50	563	0.25%	0.20	1.47	1.56	0	0	12	2.3	3.0	-	#VALUE!	#VALUE!
9	0.010	2600.50	2597.18	1318	0.25%	0.00	1.47	1.56	0	0	12	2.3	3.0	-	#VALUE!	#VALUE!
10	0.012	2597.18	2594.46	1084	0.25%	0.57	2.04	2.36	0	0	15	3.5	2.9	-	#VALUE!	#VALUE!
11	0.012	2594.46	2593.53	367	0.25%	0.00	2.04	2.37	0	0	15	3.5	2.9	-	#VALUE!	#VALUE!
12	0.012	2593.53	2590.08	1371	0.25%	0.28	2.32	2.36	0	0	15	3.5	2.9	-	#VALUE!	#VALUE!
13	0.010	2590.08	2588.10	788	0.25%	0.14	2.46	2.83	0	0	15	4.2	3.4	-	#VALUE!	#VALUE!
14	0.012	2588.10	2586.76	533	0.25%	0.17	2.63	3.83	0	0	18	5.7	3.2	-	#VALUE!	#VALUE!
15	0.012	2586.76	2585.86	317	0.28%	0.00	2.63	4.07	0	0	18	6.1	3.4	-	#VALUE!	#VALUE!
16	0.012	2585.86	2585.00	382	0.23%	0.00	2.63	3.63	0	0	18	5.4	3.1	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-17-5

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2940.00	2930.00	1216	0.82%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!

PIPE SEGMENT: FRT PRC TRNK - UPPER (R-17-5)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2928.00	2920.00	556	1.44%	0.00	0.00	0.00	0	0	0	0.0	0.1	-	#VALUE!	#VALUE!
2	0.012	2920.00	2916.91	576	0.54%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
3	0.012	2916.91	2912.54	814	0.54%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
4	0.012	2912.54	2908.89	679	0.54%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
5	0.012	2908.89	2905.00	724	0.54%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
6	0.012	2905.00	2899.00	1024	0.59%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
7	0.012	2899.00	2893.57	804	0.68%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
8	0.012	2893.57	2883.70	1233	0.80%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
9	0.012	2883.70	2880.00	557	0.66%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
10	0.012	2880.00	2875.00	650	0.77%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
11	0.012	2875.00	2860.00	1412	1.06%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
12	0.012	2860.00	2847.17	1711	0.75%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
13	0.012	2847.17	2832.69	1930	0.75%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
14	0.012	2832.69	2796.36	4845	0.75%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
15	0.012	2796.36	2790.04	842	0.75%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
16	0.012	2790.04	2781.00	1331	0.68%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
17	0.012	2781.00	2777.00	599	0.67%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
18	0.012	2777.00	2772.10	883	0.55%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!
19	0.012	2772.10	2768.00	744	0.55%	0.00	0.00	0.00	0	0	0	0.0	0.0	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-23-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2818.00	2814.00	691	0.58%	0.16	0.16	0.67	0	0	8	1.0	2.9	-	#VALUE!	#VALUE!
2	0.012	2814.00	2808.00	1139	0.53%	0.05	0.21	0.64	0	0	8	1.0	2.7	-	#VALUE!	#VALUE!
3	0.012	2808.00	2797.00	1263	0.87%	0.00	0.21	0.82	0	0	8	1.2	3.5	-	#VALUE!	#VALUE!
4	0.012	2797.00	2790.00	904	0.77%	0.05	0.26	0.77	0	0	8	1.2	3.3	-	#VALUE!	#VALUE!
5	0.012	2790.00	2780.00	596	1.68%	0.00	0.26	1.14	0	0	8	1.7	4.9	-	#VALUE!	#VALUE!
6	0.012	2780.00	2775.00	631	0.79%	0.00	0.26	0.78	0	0	8	1.2	3.3	-	#VALUE!	#VALUE!
7	0.012	2775.00	2770.00	386	1.30%	0.00	0.26	1.00	0	0	8	1.5	4.3	-	#VALUE!	#VALUE!
8	0.012	2770.00	2748.38	776	2.79%	0.00	0.26	1.47	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!
9	0.012	2748.38	2734.22	508	2.79%	0.00	0.26	1.47	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!
10	0.012	2734.22	2719.09	543	2.79%	0.00	0.26	1.47	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!
11	0.012	2719.09	2699.56	701	2.79%	0.00	0.26	1.47	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!
12	0.012	2699.56	2669.99	1061	2.79%	0.31	0.57	1.47	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!

PIPE SEGMENT: FRT PRC TRNK - LOWER (R-19-1)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2768.00	2766.00	421	0.48%	0.05	0.05	0.61	0	0	8	0.9	2.6	-	#VALUE!	#VALUE!
2	0.012	2766.00	2764.00	420	0.48%	0.00	0.05	0.61	0	0	8	0.9	2.6	-	#VALUE!	#VALUE!
3	0.012	2764.00	2762.00	375	0.53%	0.00	0.05	0.64	0	0	8	1.0	2.7	-	#VALUE!	#VALUE!
4	0.012	2762.00	2755.00	758	0.92%	0.02	0.07	0.85	0	0	8	1.3	3.6	-	#VALUE!	#VALUE!
5	0.012	2755.00	2750.00	747	0.67%	0.00	0.07	0.72	0	0	8	1.1	3.1	-	#VALUE!	#VALUE!
6	0.012	2750.00	2745.00	1224	0.41%	0.00	0.07	0.56	0	0	8	0.8	2.4	-	#VALUE!	#VALUE!
7	0.012	2745.00	2737.00	1194	0.67%	0.24	0.31	0.72	0	0	8	1.1	3.1	-	#VALUE!	#VALUE!
8	0.012	2737.00	2734.00	702	0.43%	0.00	0.31	0.57	0	0	8	0.9	2.5	-	#VALUE!	#VALUE!
9	0.012	2734.00	2726.00	1635	0.49%	0.00	0.31	0.62	0	0	8	0.9	2.6	-	#VALUE!	#VALUE!
10	0.012	2726.00	2721.00	954	0.52%	0.00	0.31	0.64	0	0	8	1.0	2.7	-	#VALUE!	#VALUE!
11	0.012	2721.00	2718.00	610	0.49%	0.00	0.31	0.62	0	0	8	0.9	2.6	-	#VALUE!	#VALUE!
12	0.012	2718.00	2714.00	851	0.47%	0.00	0.31	0.60	0	0	8	0.9	2.6	-	#VALUE!	#VALUE!
13	0.012	2714.00	2710.00	644	0.62%	0.00	0.31	0.69	0	0	8	1.0	3.0	-	#VALUE!	#VALUE!
14	0.012	2710.00	2702.00	1225	0.65%	0.00	0.31	0.71	0	0	8	1.1	3.0	-	#VALUE!	#VALUE!
15	0.012	2702.00	2698.00	862	0.46%	0.00	0.31	0.60	0	0	8	0.9	2.6	-	#VALUE!	#VALUE!
16	0.012	2698.00	2686.79	2242	0.50%	0.00	0.31	0.62	0	0	8	0.9	2.7	-	#VALUE!	#VALUE!
17	0.012	2686.79	2682.34	890	0.50%	0.00	0.31	0.62	0	0	8	0.9	2.7	-	#VALUE!	#VALUE!
18	0.012	2682.34	2676.28	1212	0.50%	0.00	0.31	0.62	0	0	8	0.9	2.7	-	#VALUE!	#VALUE!
19	0.012	2676.28	2669.99	1208	0.52%	0.00	0.31	0.63	0	0	8	0.9	2.7	-	#VALUE!	#VALUE!

20-YR ANALYSIS

PIPE SEGMENT: R-1-1

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total pipe flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	3005.00	3000.00	1018	0.49%	0.27	0.27	0.62	0	0	8	0.9	2.6	-	#VALUE!	#VALUE!
2	0.012	3000.00	2956.00	761	5.78%	0.00	0.27	2.11	0	0	8	3.2	9.0	-	#VALUE!	#VALUE!
3	0.012	2956.00	2928.00	748	3.74%	0.00	0.27	1.70	0	0	8	2.5	7.3	-	#VALUE!	#VALUE!
4	0.012	2928.00	2894.00	1172	2.90%	0.75	1.02	1.50	0	0	8	2.2	6.4	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-1-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2944.00	2942.00	251	0.80%	0.95	0.95	2.32	0	0	12	3.5	4.4	-	#VALUE!	#VALUE!
2	0.012	2942.00	2939.00	455	0.66%	0.00	0.95	2.10	0	0	12	3.1	4.0	-	#VALUE!	#VALUE!
3	0.012	2939.00	2903.00	2223	1.62%	0.00	0.95	3.30	0	0	12	4.9	6.3	-	#VALUE!	#VALUE!
4	0.012	2903.00	2896.00	637	1.10%	0.00	0.95	2.72	0	0	12	4.1	5.2	-	#VALUE!	#VALUE!
5	0.012	2896.00	2894.00	357	0.56%	0.00	0.95	1.94	0	0	12	2.9	3.7	-	#VALUE!	#VALUE!
6	0.012	2894.00	2862.00	1381	2.32%	0.00	0.95	3.95	0	0	12	5.9	7.5	-	#VALUE!	#VALUE!
7	0.012	2862.00	2849.00	1494	0.87%	1.36	2.31	4.39	0	0	15	6.5	5.3	-	#VALUE!	#VALUE!
8	0.012	2849.00	2846.00	234	1.28%	0.00	2.31	5.32	0	0	15	7.9	6.5	-	#VALUE!	#VALUE!
9	0.012	2846.00	2836.00	373	2.68%	0.00	2.31	7.69	0	0	15	11.5	9.4	-	#VALUE!	#VALUE!
REGIONAL																
10	0.012	2836.00	2806.00	831	3.61%	1.21	3.52	4.93	0	0	12	7.4	9.4	-	#VALUE!	#VALUE!
11	0.012	2806.00	2803.00	293	1.02%	0.00	3.52	2.62	0.90	0.89	12	3.9	5.0	8	1.3	3.8
12	0.012	2803.00	2790.73	1227	1.00%	0.38	3.90	2.59	1.31	1.59	12	3.9	4.9	10	2.4	4.4

PIPE SEGMENT: R-2-2

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen/actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2907.50	2904.00	841	0.42%	0.79	0.79	1.03	0	0	10	1.5	2.8	-	#VALUE!	#VALUE!
2	0.012	2904.00	2888.00	1006	1.59%	0.00	0.79	2.01	0	0	10	3.0	5.5	-	#VALUE!	#VALUE!
3	0.012	2888.00	2859.00	356	8.16%	0.82	1.61	4.55	0	0	10	6.8	12.5	-	#VALUE!	#VALUE!
4	0.012	2859.00	2805.00	1376	3.93%	0.00	1.61	3.16	0	0	10	4.7	8.6	-	#VALUE!	#VALUE!
5	0.012	2805.00	2790.00	258	5.80%	0.00	1.61	3.84	0	0	10	5.7	10.5	-	#VALUE!	#VALUE!
6	0.012	2790.00	2782.00	258	3.10%	0.00	1.61	2.81	0	0	10	4.2	7.7	-	#VALUE!	#VALUE!
7	0.012	2782.00	2768.00	578	2.42%	1.27	2.88	8.69	0	0	16	13.0	9.3	-	#VALUE!	#VALUE!
8	0.012	2768.00	2744.00	662	3.63%	0.00	2.88	7.45	0	0	14	11.1	10.4	-	#VALUE!	#VALUE!
9	0.012	2744.00	2736.00	275	2.91%	0.00	2.88	6.67	0	0	14	10.0	9.3	-	#VALUE!	#VALUE!
10	0.012	2736.00	2730.00	447	1.34%	0.00	2.88	4.53	0	0	14	6.8	6.3	-	#VALUE!	#VALUE!
11	0.012	2730.00	2723.00	331	2.11%	0.48	3.36	5.69	0	0	14	8.5	7.9	-	#VALUE!	#VALUE!
12	0.012	2723.00	2718.00	263	1.90%	0.00	3.36	5.40	0	0	14	8.1	7.5	-	#VALUE!	#VALUE!
13	0.012	2718.00	2692.00	1256	2.07%	0.00	3.36	5.63	0	0	14	8.4	7.9	-	#VALUE!	#VALUE!
14	0.012	2692.00	2688.00	275	1.45%	0.73	4.09	5.67	0	0	15	8.5	6.9	-	#VALUE!	#VALUE!
15	0.012	2688.00	2681.00	478	1.46%	0.00	4.09	5.69	0	0	15	8.5	6.9	-	#VALUE!	#VALUE!
16	0.012	2681.00	2676.00	371	1.35%	0.00	4.09	5.46	0	0	15	8.1	6.6	-	#VALUE!	#VALUE!
17	0.012	2676.00	2654.00	1946	1.13%	0.00	4.09	5.00	0	0	15	7.5	6.1	-	#VALUE!	#VALUE!
18	0.012	2654.00	2627.00	735	3.67%	0.08	4.17	9.01	0	0	15	13.4	11.0	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-3-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2988.00	2954.00	1933	1.76%	0.68	0.68	1.17	0	0	8	1.7	5.0	-	#VALUE!	#VALUE!
2	0.012	2954.00	2932.00	230	9.58%	0.00	0.68	2.72	0	0	8	4.1	11.6	-	#VALUE!	#VALUE!
3	0.012	2932.00	2924.00	133	6.03%	0.00	0.68	2.16	0	0	8	3.2	9.2	-	#VALUE!	#VALUE!
3	0.012	2924.00	2902.00	782	2.81%	0.21	0.89	1.47	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!
4	0.012	2902.00	2896.00	402	1.49%	0.00	0.89	1.07	0	0	8	1.6	4.6	-	#VALUE!	#VALUE!
5	0.012	2896.00	2867.00	941	3.08%	0.00	0.89	1.54	0	0	8	2.3	6.6	-	#VALUE!	#VALUE!
6	0.012	2867.00	2736.00	4811	2.72%	1.67	2.56	1.45	1.11	1.45	8	2.2	6.2	8	2.2	6.2
7	0.012	2736.00	2728.00	492	1.63%	0.00	2.56	1.12	1.44	2.03	8	1.7	4.8	10	3.0	5.6
8	0.012	2728.00	2696.00	951	3.36%	0.58	3.14	4.76	0	0	12	7.1	9.0	-	#VALUE!	#VALUE!
9	0.012	2696.00	2647.00	1129	4.34%	0.78	3.92	5.40	0	0	12	8.1	10.3	-	#VALUE!	#VALUE!
10	0.012	2647.00	2644.00	932	0.32%	0.07	3.99	1.47	2.52	2.67	12	2.2	2.8	15	4.0	3.2
11	0.012	2644.00	2632.00	351	3.42%	0.04	4.03	8.69	0	0	15	13.0	10.6	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-6-2

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	3012.00	2973.00	1212	3.22%	1.03	1.03	2.86	0	0	10	4.3	7.8	-	#VALUE!	#VALUE!
2	0.012	2973.00	2971.00	213	0.94%	0.00	1.03	1.54	0	0	10	2.3	4.2	-	#VALUE!	#VALUE!
3	0.012	2971.00	2961.00	408	2.45%	0.00	1.03	4.06	0	0	12	6.1	7.7	-	#VALUE!	#VALUE!
4	0.012	2961.00	2958.00	392	0.76%	0.00	1.03	2.27	0	0	12	3.4	4.3	-	#VALUE!	#VALUE!
5	0.012	2958.00	2956.00	229	0.88%	0.24	1.27	2.43	0	0	12	3.6	4.6	-	#VALUE!	#VALUE!
6	0.012	2956.00	2952.00	885	0.45%	0.00	1.27	1.74	0	0	12	2.6	3.3	-	#VALUE!	#VALUE!
7	0.012	2952.00	2936.00	451	3.55%	0.00	1.27	4.89	0	0	12	7.3	9.3	-	#VALUE!	#VALUE!
8	0.012	2936.00	2929.00	376	1.86%	0.00	1.27	3.54	0	0	12	5.3	6.7	-	#VALUE!	#VALUE!
9	0.012	2929.00	2922.00	648	1.08%	0.43	1.70	2.69	0	0	12	4.0	5.1	-	#VALUE!	#VALUE!
10	0.012	2922.00	2916.00	511	1.17%	0.25	1.95	2.81	0	0	12	4.2	5.3	-	#VALUE!	#VALUE!
11	0.012	2916.00	2908.00	731	1.09%	0.00	1.95	2.71	0	0	12	4.0	5.2	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-5-10

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2827.00	2812.00	2023	0.74%	0.36	0.36	1.37	0	0	10	2.0	3.8	-	#VALUE!	#VALUE!

PIPE SEGMENT: NORTH TRUNK LINE (R-5-9)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2830.00	2826.00	1194	0.34%	2.59	2.59	6.67	0	0	21	10.0	4.1	-	#VALUE!	#VALUE!
2	0.012	2826.00	2818.00	1936	0.41%	1.65	4.24	4.91	0	0	18	7.3	4.2	-	#VALUE!	#VALUE!
3	0.012	2818.00	2812.00	923	0.65%	0.43	4.67	6.16	0	0	18	9.2	5.2	-	#VALUE!	#VALUE!
4	0.012	2812.00	2790.00	1135	1.94%	0.48	5.15	6.55	0	0	15	9.8	8.0	-	#VALUE!	#VALUE!
5	0.012	2790.00	2780.00	552	1.81%	0.00	5.15	6.33	0	0	15	9.4	7.7	-	#VALUE!	#VALUE!
6	0.012	2780.00	2760.00	351	5.70%	0.00	5.15	6.19	0	0	12	9.2	11.8	-	#VALUE!	#VALUE!
7	0.012	2760.00	2740.00	240	8.33%	0.00	5.15	7.49	0	0	12	11.2	14.2	-	#VALUE!	#VALUE!
8	0.012	2740.00	2722.00	367	4.90%	0.00	5.15	5.74	0	0	12	8.6	10.9	-	#VALUE!	#VALUE!
9	0.010	2722.00	2696.00	526	4.94%	1.22	6.37	6.92	0	0	12	10.3	13.1	-	#VALUE!	#VALUE!
10	0.012	2696.00	2666.00	1031	2.91%	0.00	6.37	4.42	1.95	2.72	12	6.6	8.4	10	4.1	7.4
11	0.012	2666.00	2649.00	604	2.81%	0.15	6.52	4.35	2.17	2.68	12	6.5	8.3	10	4.0	7.3
12	0.012	2649.00	2640.50	426	2.00%	0.00	6.52	6.64	0	0	15	9.9	8.1	-	#VALUE!	#VALUE!
13	0.010	2640.50	2640.00	220	0.23%	0.00	6.52	6.60	0	0	21	9.8	4.1	-	#VALUE!	#VALUE!
14	0.012	2640.00	2635.00	722	0.69%	0.00	6.52	9.60	0	0	21	14.3	6.0	-	#VALUE!	#VALUE!
15	0.012	2635.00	2632.00	775	0.39%	0.10	6.62	7.17	0	0	21	10.7	4.5	-	#VALUE!	#VALUE!
16	0.010	2632.00	2630.00	713	0.28%	4.03	10.65	10.46	0.19	0.56	24	15.6	5.0	8	0.8	2.4
17	0.012	2630.00	2627.00	1241	0.24%	0.14	10.79	11.08	0	0	27	16.5	4.2	-	#VALUE!	#VALUE!
18	0.010	2627.00	2626.50	170	0.29%	4.21	15.00	14.67	0.33	0.57	27	21.9	5.5	8	0.9	2.4
19	0.010	2626.50	2625.50	316	0.32%	0.08	15.08	5.16	9.92	11.11	18	7.7	4.4	24	16.6	5.3
20	0.010	2625.50	2623.77	577	0.30%	0.00	15.08	5.02	10.06	10.82	18	7.5	4.2	24	16.1	5.1

PIPE SEGMENT: R-9-5

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2850.00	2840.00	513	1.95%	0.48	0.48	1.23	0	0	8	1.8	5.3	-	#VALUE!	#VALUE!
2	0.012	2840.00	2830.00	600	1.67%	0.00	0.48	1.14	0	0	8	1.7	4.9	-	#VALUE!	#VALUE!
3	0.012	2830.00	2816.00	830	1.69%	0.00	0.48	1.14	0	0	8	1.7	4.9	-	#VALUE!	#VALUE!
4	0.012	2816.00	2800.00	1219	1.31%	0.12	0.60	1.01	0	0	8	1.5	4.3	-	#VALUE!	#VALUE!
5	0.012	2800.00	2770.00	1332	2.25%	0.00	0.60	1.32	0	0	8	2.0	5.6	-	#VALUE!	#VALUE!
6	0.012	2770.00	2753.00	1167	1.46%	0.12	0.72	1.06	0	0	8	1.6	4.5	-	#VALUE!	#VALUE!
7	0.012	2753.00	2735.00	1484	1.21%	0.00	0.72	0.97	0	0	8	1.4	4.1	-	#VALUE!	#VALUE!
8	0.012	2735.00	2720.00	1098	1.37%	0.12	0.84	1.03	0	0	8	1.5	4.4	-	#VALUE!	#VALUE!
9	0.012	2720.00	2705.00	1287	1.17%	0.00	0.84	0.95	0	0	8	1.4	4.1	-	#VALUE!	#VALUE!
10	0.012	2705.00	2694.00	1248	0.88%	0.12	0.96	1.50	0	0	10	2.2	4.1	-	#VALUE!	#VALUE!
11	0.012	2694.00	2677.00	1011	1.68%	0.12	1.08	2.07	0	0	10	3.1	5.7	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-10-2

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2677.00	2676.54	412	0.11%	1.08	1.08	1.57	0	0	15	2.3	1.9	-	#VALUE!	#VALUE!
2	0.012	2676.54	2675.60	842	0.11%	0.00	1.08	1.57	0	0	15	2.3	1.9	-	#VALUE!	#VALUE!
3	0.012	2675.60	2675.39	184	0.11%	0.00	1.08	1.57	0	0	15	2.3	1.9	-	#VALUE!	#VALUE!
4	0.012	2675.39	2675.00	343	0.11%	0.00	1.08	1.59	0	0	15	2.4	1.9	-	#VALUE!	#VALUE!
5	0.012	2675.00	2674.60	527	0.07%	0.00	1.08	1.29	0	0	15	1.9	1.6	-	#VALUE!	#VALUE!
6	0.012	2674.60	2673.50	777	0.14%	0.18	1.26	1.77	0	0	15	2.6	2.2	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-10-1

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2671.58	2671.00	897	0.07%	0.18	0.18	0.22	0	0	8	0.3	1.0	-	#VALUE!	#VALUE!
2	0.012	2671.00	2670.76	412	0.06%	0.00	0.18	0.21	0	0	8	0.3	0.9	-	#VALUE!	#VALUE!
3	0.012	2670.76	2670.55	371	0.06%	0.00	0.18	0.21	0	0	8	0.3	0.9	-	#VALUE!	#VALUE!
4	0.012	2670.55	2670.29	459	0.06%	0.00	0.18	0.21	0	0	8	0.3	0.9	-	#VALUE!	#VALUE!
5	0.012	2670.29	2670.16	233	0.06%	0.00	0.18	0.21	0	0	8	0.3	0.9	-	#VALUE!	#VALUE!
6	0.012	2670.16	2669.00	2060	0.06%	0.00	0.18	0.21	0	0	8	0.3	0.9	-	#VALUE!	#VALUE!
7	0.012	2669.00	2668.50	673	0.07%	0.20	0.38	0.43	0	0	10	0.6	1.2	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-15-5 (Gravity Flow)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2905.00	2870.00	1216	2.88%	1.91	1.91	2.71	0	0	10	4.0	7.4	-	#VALUE!	#VALUE!
2	0.012	2870.00	2848.00	1355	1.62%	0.00	1.91	2.03	0	0	10	3.0	5.6	-	#VALUE!	#VALUE!
3	0.012	2848.00	2802.00	1593	2.89%	0.00	1.91	2.71	0	0	10	4.0	7.4	-	#VALUE!	#VALUE!
4	0.012	2802.00	2780.00	1052	2.09%	0.00	1.91	2.31	0	0	10	3.4	6.3	-	#VALUE!	#VALUE!
5	0.012	2780.00	2764.00	737	2.17%	0.00	1.91	2.35	0	0	10	3.5	6.4	-	#VALUE!	#VALUE!
6	0.012	2764.00	2752.00	509	2.36%	0.00	1.91	2.45	0	0	10	3.7	6.7	-	#VALUE!	#VALUE!
7	0.012	2752.00	2716.00	1513	2.38%	0.00	1.91	2.46	0	0	10	3.7	6.7	-	#VALUE!	#VALUE!
8	0.012	2716.00	2710.00	699	0.86%	0.00	1.91	2.40	0	0	12	3.6	4.6	-	#VALUE!	#VALUE!
9	0.012	2710.00	2691.00	583	3.26%	0.00	1.91	4.68	0	0	12	7.0	8.9	-	#VALUE!	#VALUE!
10	0.012	2691.00	2677.00	664	2.11%	0.00	1.91	3.76	0	0	12	5.6	7.2	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-12-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	3034.42	3031.94	800	0.31%	0.18	0.18	0.49	0	0	8	0.7	2.1	-	#VALUE!	#VALUE!
2	0.012	3031.94	3029.77	700	0.31%	0.00	0.18	0.49	0	0	8	0.7	2.1	-	#VALUE!	#VALUE!
3	0.012	3029.77	3027.01	890	0.31%	0.06	0.24	0.49	0	0	8	0.7	2.1	-	#VALUE!	#VALUE!
4	0.012	3027.01	3024.47	818	0.31%	0.00	0.24	0.49	0	0	8	0.7	2.1	-	#VALUE!	#VALUE!
5	0.012	3024.47	3022.75	557	0.31%	0.06	0.30	0.49	0	0	8	0.7	2.1	-	#VALUE!	#VALUE!
6	0.012	3022.75	3020.62	686	0.31%	0.00	0.30	0.49	0	0	8	0.7	2.1	-	#VALUE!	#VALUE!
7	0.012	3020.62	3018.52	675	0.31%	0.06	0.36	0.49	0	0	8	0.7	2.1	-	#VALUE!	#VALUE!
8	0.012	3018.52	3016.00	776	0.32%	0.00	0.36	0.50	0	0	8	0.7	2.1	-	#VALUE!	#VALUE!
9	0.012	3016.00	3008.00	1257	0.64%	0.06	0.42	0.70	0	0	8	1.0	3.0	-	#VALUE!	#VALUE!
10	0.012	3008.00	3000.00	1360	0.59%	0.00	0.42	0.67	0	0	8	1.0	2.9	-	#VALUE!	#VALUE!
11	0.012	3000.00	2992.00	1065	0.75%	0.09	0.51	0.76	0	0	8	1.1	3.3	-	#VALUE!	#VALUE!
12	0.012	2992.00	2985.00	1216	0.58%	0.00	0.51	0.67	0	0	8	1.0	2.9	-	#VALUE!	#VALUE!
13	0.012	2985.00	2979.00	655	0.92%	0.09	0.60	0.84	0	0	8	1.3	3.6	-	#VALUE!	#VALUE!
14	0.012	2979.00	2966.74	659	1.86%	0.00	0.60	1.20	0	0	8	1.8	5.1	-	#VALUE!	#VALUE!
15	0.012	2966.74	2960.82	319	1.86%	0.13	0.73	1.20	0	0	8	1.8	5.1	-	#VALUE!	#VALUE!
16	0.012	2960.82	2937.75	1240	1.86%	0.00	0.73	1.20	0	0	8	1.8	5.1	-	#VALUE!	#VALUE!
17	0.012	2937.75	2922.00	849	1.86%	0.00	0.73	1.20	0	0	8	1.8	5.1	-	#VALUE!	#VALUE!
18	0.012	2922.00	2865.00	1130	5.04%	0.01	0.74	1.98	0	0	8	2.9	8.4	-	#VALUE!	#VALUE!
19	0.012	2865.00	2850.00	273	5.49%	0.00	0.74	2.06	0	0	8	3.1	8.8	-	#VALUE!	#VALUE!
20	0.012	2850.00	2824.00	630	4.13%	0.00	0.74	1.79	0	0	8	2.7	7.6	-	#VALUE!	#VALUE!
21	0.012	2824.00	2812.00	672	1.79%	0.00	0.74	1.18	0	0	8	1.8	5.0	-	#VALUE!	#VALUE!
22	0.012	2812.00	2800.00	698	1.72%	0.00	0.74	1.15	0	0	8	1.7	4.9	-	#VALUE!	#VALUE!
23	0.012	2800.00	2786.00	776	1.80%	0.00	0.74	1.18	0	0	8	1.8	5.1	-	#VALUE!	#VALUE!
24	0.012	2786.00	2772.00	491	2.85%	0.00	0.74	1.49	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!
25	0.012	2772.00	2764.00	1121	0.71%	0.00	0.74	0.74	0	0	8	1.1	3.2	-	#VALUE!	#VALUE!
26	0.012	2764.00	2740.00	1123	2.14%	0.00	0.74	1.29	0	0	8	1.9	5.5	-	#VALUE!	#VALUE!
27	0.012	2740.00	2728.00	1471	0.82%	0.65	1.39	4.25	0	0	15	6.3	5.2	-	#VALUE!	#VALUE!
28	0.012	2728.00	2719.00	923	0.98%	0.20	1.59	4.64	0	0	15	6.9	5.6	-	#VALUE!	#VALUE!
29	0.012	2719.00	2709.00	1337	0.75%	0.27	1.86	4.07	0	0	15	6.1	4.9	-	#VALUE!	#VALUE!
30	0.012	2709.00	2691.00	2373	0.76%	0.25	2.11	4.09	0	0	15	6.1	5.0	-	#VALUE!	#VALUE!
31	0.012	2691.00	2677.00	1384	1.01%	0.00	2.11	4.73	0	0	15	7.1	5.8	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-14-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2810.00	2798.00	1119	1.07%	0.15	0.15	0.91	0	0	8	1.4	3.9	-	#VALUE!	#VALUE!
2	0.012	2798.00	2793.00	894	0.56%	0.14	0.29	0.66	0	0	8	1.0	2.8	-	#VALUE!	#VALUE!
3	0.012	2793.00	2788.00	849	0.59%	0.00	0.29	0.67	0	0	8	1.0	2.9	-	#VALUE!	#VALUE!
4	0.012	2788.00	2780.00	1039	0.77%	0.00	0.29	0.77	0	0	8	1.2	3.3	-	#VALUE!	#VALUE!
5	0.012	2780.00	2767.00	1220	1.07%	0.14	0.43	0.91	0	0	8	1.4	3.9	-	#VALUE!	#VALUE!
6	0.012	2767.00	2750.00	1184	1.44%	0.00	0.43	1.05	0	0	8	1.6	4.5	-	#VALUE!	#VALUE!
7	0.012	2750.00	2740.00	1068	0.94%	0.09	0.52	0.85	0	0	8	1.3	3.6	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-15-6

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.010	2677.00	2670.00	964	0.73%	4.10	4.10	4.81	0	0	15	7.2	5.8	-	#VALUE!	#VALUE!
2	0.012	2670.00	2652.00	963	1.87%	0.00	4.10	6.43	0	0	15	9.6	7.8	-	#VALUE!	#VALUE!
3	0.012	2652.00	2634.00	1213	1.48%	0.21	4.31	5.73	0	0	15	8.5	7.0	-	#VALUE!	#VALUE!
4	0.010	2634.00	2628.00	1111	0.54%	0.30	4.61	4.15	0.46	0.78	15	6.2	5.0	8	1.2	3.3
5	0.010	2628.00	2618.00	1399	0.71%	0.13	4.74	4.77	0	0	15	7.1	5.8	-	#VALUE!	#VALUE!
REGIONAL																
6	0.012	2618.00	2611.00	1382	0.51%	4.17	8.91	8.21	0.70	1.13	21	12.3	5.1	10	1.7	3.1
7	0.012	2611.00	2604.00	1287	0.54%	0.06	8.97	8.51	0.46	0.65	21	12.7	5.3	8	1.0	2.8
8	0.012	2604.00	2594.00	1171	0.85%	1.19	10.16	10.66	0	0	21	15.9	6.6	-	#VALUE!	#VALUE!
9	0.012	2594.00	2588.00	761	0.79%	0.26	10.42	10.24	0.18	0.78	21	15.3	6.4	8	1.2	3.3
10	0.012	2588.00	2585.00	471	0.64%	0.00	10.42	9.20	1.22	1.27	21	13.7	5.7	10	1.9	3.5
11	0.012	2585.00	2579.75	1146	0.46%	0.00	10.42	7.81	2.61	3.18	21	11.7	4.8	15	4.8	3.9
12	0.012	2579.75	2575.36	1011	0.43%	0.00	10.42	7.60	2.82	3.10	21	11.3	4.7	15	4.6	3.8

PIPE SEGMENT: R-15-10

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2626.00	2614.00	1298	0.92%	0.57	0.57	0.85	0	0	8	1.3	3.6	-	#VALUE!	#VALUE!
2	0.012	2614.00	2611.00	289	1.04%	0.17	0.74	0.90	0	0	8	1.3	3.8	-	#VALUE!	#VALUE!
3	0.012	2611.00	2608.00	657	0.46%	0.00	0.74	1.08	0	0	10	1.6	2.9	-	#VALUE!	#VALUE!
4	0.012	2608.00	2600.00	1350	0.59%	0.00	0.74	1.23	0	0	10	1.8	3.4	-	#VALUE!	#VALUE!
5	0.012	2600.00	2592.00	2087	0.38%	0.19	0.93	1.61	0	0	12	2.4	3.1	-	#VALUE!	#VALUE!
6	0.012	2592.00	2586.50	1529	0.36%	0.29	1.22	1.56	0	0	12	2.3	3.0	-	#VALUE!	#VALUE!
7	0.012	2586.50	2585.00	384	0.39%	0.09	1.31	1.62	0	0	12	2.4	3.1	-	#VALUE!	#VALUE!
8	0.012	2585.00	2581.00	897	0.45%	3.22	4.53	5.11	0	0	18	7.6	4.3	-	#VALUE!	#VALUE!
9	0.012	2581.00	2578.00	658	0.46%	0.00	4.53	5.16	0	0	18	7.7	4.4	-	#VALUE!	#VALUE!
10	0.012	2578.00	2577.20	745	0.11%	0.00	4.53	2.50	2.03	2.51	18	3.73	2.1	18	3.7	2.1
11	0.012	2577.20	2576.74	421	0.11%	0.00	4.53	2.52	2.01	2.53	18	3.76	2.1	18	3.8	2.1
12	0.012	2576.74	2576.31	405	0.11%	0.00	4.53	2.48	2.05	2.49	18	3.71	2.1	18	3.7	2.1
13	0.012	2576.31	2575.95	326	0.11%	0.00	4.53	2.53	2.00	2.54	18	3.78	2.1	18	3.8	2.1
14	0.012	2575.95	2575.36	547	0.11%	0.00	4.53	2.50	2.03	2.51	18	3.74	2.1	18	3.7	2.1

PIPE SEGMENT: R-16-1

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2729.37	2690.49	2495	1.56%	0.00	0.00	1.10	0	0	8	1.6	4.7	-	#VALUE!	#VALUE!
2	0.012	2690.49	2664.88	936	2.74%	0.00	0.00	1.45	0	0	8	2.2	6.2	-	#VALUE!	#VALUE!
3	0.012	2664.88	2633.84	2232	1.39%	0.00	0.00	1.04	0	0	8	1.5	4.4	-	#VALUE!	#VALUE!
4	0.012	2633.84	2624.15	320	3.02%	0.00	0.00	1.53	0	0	8	2.3	6.5	-	#VALUE!	#VALUE!
5	0.012	2624.15	2608.00	1298	1.24%	0.00	0.00	0.98	0	0	8	1.5	4.2	-	#VALUE!	#VALUE!
6	0.010	2608.00	2605.91	830	0.25%	1.42	1.42	1.56	0	0	12	2.3	3.0	-	#VALUE!	#VALUE!
7	0.010	2605.91	2601.92	1587	0.25%	0.00	1.42	1.56	0	0	12	2.3	3.0	-	#VALUE!	#VALUE!
8	0.010	2601.92	2600.50	563	0.25%	0.27	1.69	1.56	0.13	0.53	12	2.3	3.0	8	0.8	2.3
9	0.010	2600.50	2597.18	1318	0.25%	0.00	1.69	1.56	0.13	0.53	12	2.3	3.0	8	0.8	2.3
10	0.010	2597.18	2594.46	1084	0.25%	0.76	2.45	2.83	0	0	15	4.2	3.4	-	#VALUE!	#VALUE!
11	0.010	2594.46	2593.53	367	0.25%	0.00	2.45	2.84	0	0	15	4.2	3.5	-	#VALUE!	#VALUE!
12	0.012	2593.53	2590.08	1371	0.25%	0.35	2.80	3.83	0	0	18	5.7	3.2	-	#VALUE!	#VALUE!
13	0.012	2590.08	2588.10	788	0.25%	0.24	3.04	3.83	0	0	18	5.7	3.2	-	#VALUE!	#VALUE!
14	0.012	2588.10	2586.76	533	0.25%	0.18	3.22	3.83	0	0	18	5.7	3.2	-	#VALUE!	#VALUE!
15	0.012	2586.76	2585.86	317	0.28%	0.00	3.22	4.07	0	0	18	6.1	3.4	-	#VALUE!	#VALUE!
16	0.012	2585.86	2585.00	382	0.23%	0.00	3.22	3.63	0	0	18	5.4	3.1	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-17-5

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2940.00	2930.00	1216	0.82%	0.18	0.18	0.80	0	0	8	1.2	3.4	-	#VALUE!	#VALUE!

PIPE SEGMENT: FRT PRC TRNK - UPPER (R-17-5)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2928.00	2920.00	556	1.44%	0.30	0.30	1.05	0	0	8	1.6	4.5	-	#VALUE!	#VALUE!
2	0.012	2920.00	2916.91	576	0.54%	0.00	0.30	0.64	0	0	8	1.0	2.8	-	#VALUE!	#VALUE!
3	0.012	2916.91	2912.54	814	0.54%	0.00	0.30	0.64	0	0	8	1.0	2.8	-	#VALUE!	#VALUE!
4	0.012	2912.54	2908.89	679	0.54%	0.00	0.30	0.64	0	0	8	1.0	2.8	-	#VALUE!	#VALUE!
5	0.012	2908.89	2905.00	724	0.54%	0.00	0.30	0.64	0	0	8	1.0	2.8	-	#VALUE!	#VALUE!
6	0.012	2905.00	2899.00	1024	0.59%	0.03	0.33	0.67	0	0	8	1.0	2.9	-	#VALUE!	#VALUE!
7	0.012	2899.00	2893.57	804	0.68%	0.00	0.33	0.72	0	0	8	1.1	3.1	-	#VALUE!	#VALUE!
8	0.012	2893.57	2883.70	1233	0.80%	0.00	0.33	0.79	0	0	8	1.2	3.4	-	#VALUE!	#VALUE!
9	0.012	2883.70	2880.00	557	0.66%	0.00	0.33	0.72	0	0	8	1.1	3.1	-	#VALUE!	#VALUE!
10	0.012	2880.00	2875.00	650	0.77%	0.00	0.33	0.77	0	0	8	1.2	3.3	-	#VALUE!	#VALUE!
11	0.012	2875.00	2860.00	1412	1.06%	0.00	0.33	0.91	0	0	8	1.4	3.9	-	#VALUE!	#VALUE!
12	0.012	2860.00	2847.17	1711	0.75%	0.00	0.33	0.76	0	0	8	1.1	3.3	-	#VALUE!	#VALUE!
13	0.012	2847.17	2832.69	1930	0.75%	0.00	0.33	0.76	0	0	8	1.1	3.3	-	#VALUE!	#VALUE!
14	0.012	2832.69	2796.36	4845	0.75%	0.00	0.33	0.76	0	0	8	1.1	3.3	-	#VALUE!	#VALUE!
15	0.012	2796.36	2790.04	842	0.75%	0.00	0.33	0.76	0	0	8	1.1	3.3	-	#VALUE!	#VALUE!
16	0.012	2790.04	2781.00	1331	0.68%	0.00	0.33	0.72	0	0	8	1.1	3.1	-	#VALUE!	#VALUE!
17	0.012	2781.00	2777.00	599	0.67%	0.00	0.33	0.72	0	0	8	1.1	3.1	-	#VALUE!	#VALUE!
18	0.012	2777.00	2772.10	883	0.55%	0.00	0.33	0.66	0	0	8	1.0	2.8	-	#VALUE!	#VALUE!
19	0.012	2772.10	2768.00	744	0.55%	0.00	0.33	0.65	0	0	8	1.0	2.8	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-23-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2818.00	2814.00	691	0.58%	0.34	0.34	0.67	0	0	8	1.0	2.9	-	#VALUE!	#VALUE!
2	0.012	2814.00	2808.00	1139	0.53%	0.17	0.51	0.64	0	0	8	1.0	2.7	-	#VALUE!	#VALUE!
3	0.012	2808.00	2797.00	1263	0.87%	0.00	0.51	0.82	0	0	8	1.2	3.5	-	#VALUE!	#VALUE!
4	0.012	2797.00	2790.00	904	0.77%	0.08	0.59	0.77	0	0	8	1.2	3.3	-	#VALUE!	#VALUE!
5	0.012	2790.00	2780.00	596	1.68%	0.00	0.59	1.14	0	0	8	1.7	4.9	-	#VALUE!	#VALUE!
6	0.012	2780.00	2775.00	631	0.79%	0.00	0.59	0.78	0	0	8	1.2	3.3	-	#VALUE!	#VALUE!
7	0.012	2775.00	2770.00	386	1.30%	0.00	0.59	1.00	0	0	8	1.5	4.3	-	#VALUE!	#VALUE!
8	0.012	2770.00	2748.38	776	2.79%	0.00	0.59	1.47	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!
9	0.012	2748.38	2734.22	508	2.79%	0.00	0.59	1.47	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!
10	0.012	2734.22	2719.09	543	2.79%	0.00	0.59	1.47	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!
11	0.012	2719.09	2699.56	701	2.79%	0.00	0.59	1.47	0	0	8	2.2	6.3	-	#VALUE!	#VALUE!
12	0.012	2699.56	2669.99	1061	2.79%	1.33	1.92	4.33	0	0	12	6.5	8.2	-	#VALUE!	#VALUE!

PIPE SEGMENT: FRT PRC TRNK - LOWER (R-19-1)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2768.00	2766.00	421	0.48%	0.65	0.65	1.10	0	0	10	1.6	3.0	-	#VALUE!	#VALUE!
2	0.012	2766.00	2764.00	420	0.48%	0.00	0.65	1.10	0	0	10	1.6	3.0	-	#VALUE!	#VALUE!
3	0.012	2764.00	2762.00	375	0.53%	0.00	0.65	1.16	0	0	10	1.7	3.2	-	#VALUE!	#VALUE!
4	0.012	2762.00	2755.00	758	0.92%	0.10	0.75	1.53	0	0	10	2.3	4.2	-	#VALUE!	#VALUE!
5	0.012	2755.00	2750.00	747	0.67%	0.00	0.75	1.30	0	0	10	1.9	3.6	-	#VALUE!	#VALUE!
6	0.012	2750.00	2745.00	1224	0.41%	0.00	0.75	1.02	0	0	10	1.5	2.8	-	#VALUE!	#VALUE!
7	0.012	2745.00	2737.00	1194	0.67%	0.58	1.33	2.12	0	0	12	3.2	4.0	-	#VALUE!	#VALUE!
8	0.012	2737.00	2734.00	702	0.43%	0.00	1.33	1.70	0	0	12	2.5	3.2	-	#VALUE!	#VALUE!
9	0.012	2734.00	2726.00	1635	0.49%	0.00	1.33	1.81	0	0	12	2.7	3.4	-	#VALUE!	#VALUE!
10	0.012	2726.00	2721.00	954	0.52%	0.00	1.33	1.88	0	0	12	2.8	3.6	-	#VALUE!	#VALUE!
11	0.012	2721.00	2718.00	610	0.49%	0.00	1.33	1.82	0	0	12	2.7	3.5	-	#VALUE!	#VALUE!
12	0.012	2718.00	2714.00	851	0.47%	0.00	1.33	1.78	0	0	12	2.7	3.4	-	#VALUE!	#VALUE!
13	0.012	2714.00	2710.00	644	0.62%	0.00	1.33	2.04	0	0	12	3.0	3.9	-	#VALUE!	#VALUE!
14	0.012	2710.00	2702.00	1225	0.65%	0.00	1.33	2.10	0	0	12	3.1	4.0	-	#VALUE!	#VALUE!
15	0.012	2702.00	2698.00	862	0.46%	0.00	1.33	1.77	0	0	12	2.6	3.4	-	#VALUE!	#VALUE!
16	0.012	2698.00	2686.79	2242	0.50%	0.00	1.33	1.83	0	0	12	2.7	3.5	-	#VALUE!	#VALUE!
17	0.012	2686.79	2682.34	890	0.50%	0.00	1.33	1.83	0	0	12	2.7	3.5	-	#VALUE!	#VALUE!
18	0.012	2682.34	2676.28	1212	0.50%	0.00	1.33	1.83	0	0	12	2.7	3.5	-	#VALUE!	#VALUE!
19	0.012	2676.28	2669.99	1208	0.52%	0.00	1.33	1.87	0	0	12	2.8	3.6	-	#VALUE!	#VALUE!

BUILDOUT ANALYSIS

PIPE SEGMENT: R-1-1

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total pipe flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	3005.00	3000.00	1018	0.49%	0.28	0.28	0.62	0	0	8	0.9	2.6	-	#VALUE!	#VALUE!
2	0.012	3000.00	2956.00	761	5.78%	0.00	0.28	2.11	0	0	8	3.2	9.0	-	#VALUE!	#VALUE!
3	0.012	2956.00	2928.00	748	3.74%	0.00	0.28	1.70	0	0	8	2.5	7.3	-	#VALUE!	#VALUE!
4	0.012	2928.00	2894.00	1172	2.90%	0.76	1.04	1.50	0	0	8	2.2	6.4	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-1-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2944.00	2942.00	251	0.80%	0.98	0.98	2.32	0	0	12	3.5	4.4	-	#VALUE!	#VALUE!
2	0.012	2942.00	2939.00	455	0.66%	0.00	0.98	2.10	0	0	12	3.1	4.0	-	#VALUE!	#VALUE!
3	0.012	2939.00	2903.00	2223	1.62%	0.00	0.98	3.30	0	0	12	4.9	6.3	-	#VALUE!	#VALUE!
4	0.012	2903.00	2896.00	637	1.10%	0.00	0.98	2.72	0	0	12	4.1	5.2	-	#VALUE!	#VALUE!
5	0.012	2896.00	2894.00	357	0.56%	0.00	0.98	1.94	0	0	12	2.9	3.7	-	#VALUE!	#VALUE!
6	0.012	2894.00	2862.00	1381	2.32%	0.00	0.98	3.95	0	0	12	5.9	7.5	-	#VALUE!	#VALUE!
7	0.012	2862.00	2849.00	1494	0.87%	1.38	2.36	4.39	0	0	15	6.5	5.3	-	#VALUE!	#VALUE!
8	0.012	2849.00	2846.00	234	1.28%	0.00	2.36	5.32	0	0	15	7.9	6.5	-	#VALUE!	#VALUE!
9	0.012	2846.00	2836.00	373	2.68%	0.00	2.36	7.69	0	0	15	11.5	9.4	-	#VALUE!	#VALUE!
REGIONAL																
10	0.012	2836.00	2806.00	831	3.61%	1.24	3.60	4.93	0	0	12	7.4	9.4	-	#VALUE!	#VALUE!
11	0.012	2806.00	2803.00	293	1.02%	0.00	3.60	2.62	0.98	1.61	12	3.9	5.0	10	2.4	4.4
12	0.012	2803.00	2790.73	1227	1.00%	0.44	4.04	2.59	1.45	1.59	12	3.9	4.9	10	2.4	4.4

PIPE SEGMENT: R-2-2

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen/actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.010	2907.50	2904.00	841	0.42%	1.09	1.09	1.23	0	0	10	1.8	3.4	-	#VALUE!	#VALUE!
2	0.012	2904.00	2888.00	1006	1.59%	0.00	1.09	2.01	0	0	10	3.0	5.5	-	#VALUE!	#VALUE!
3	0.012	2888.00	2859.00	356	8.16%	1.13	2.22	4.55	0	0	10	6.8	12.5	-	#VALUE!	#VALUE!
4	0.012	2859.00	2805.00	1376	3.93%	0.00	2.22	3.16	0	0	10	4.7	8.6	-	#VALUE!	#VALUE!
5	0.012	2805.00	2790.00	258	5.80%	0.00	2.22	3.84	0	0	10	5.7	10.5	-	#VALUE!	#VALUE!
6	0.012	2790.00	2782.00	258	3.10%	0.00	2.22	2.81	0	0	10	4.2	7.7	-	#VALUE!	#VALUE!
7	0.012	2782.00	2768.00	578	2.42%	1.88	4.10	8.69	0	0	16	13.0	9.3	-	#VALUE!	#VALUE!
8	0.012	2768.00	2744.00	662	3.63%	0.00	4.10	7.45	0	0	14	11.1	10.4	-	#VALUE!	#VALUE!
9	0.012	2744.00	2736.00	275	2.91%	0.00	4.10	6.67	0	0	14	10.0	9.3	-	#VALUE!	#VALUE!
10	0.012	2736.00	2730.00	447	1.34%	0.00	4.10	4.53	0	0	14	6.8	6.3	-	#VALUE!	#VALUE!
11	0.010	2730.00	2723.00	331	2.11%	2.12	6.22	6.82	0	0	14	10.2	9.5	-	#VALUE!	#VALUE!
12	0.010	2723.00	2718.00	263	1.90%	0.00	6.22	6.48	0	0	14	9.7	9.0	-	#VALUE!	#VALUE!
13	0.010	2718.00	2692.00	1256	2.07%	0.00	6.22	6.75	0	0	14	10.1	9.4	-	#VALUE!	#VALUE!
14	0.012	2692.00	2688.00	275	1.45%	0.91	7.13	5.67	1.46	1.92	15	8.5	6.9	10	2.9	5.3
15	0.012	2688.00	2681.00	478	1.46%	0.00	7.13	5.69	1.44	1.93	15	8.5	6.9	10	2.9	5.3
16	0.012	2681.00	2676.00	371	1.35%	0.00	7.13	5.46	1.67	1.85	15	8.1	6.6	10	2.8	5.1
17	0.012	2676.00	2654.00	1946	1.13%	0.00	7.13	5.00	2.13	2.76	15	7.5	6.1	12	4.1	5.2
18	0.012	2654.00	2627.00	735	3.67%	0.22	7.35	9.01	0	0	15	13.4	11.0	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-3-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2988.00	2954.00	1933	1.76%	1.67	1.67	1.17	0.50	1.17	8	1.7	5.0	8	1.7	5.0
2	0.012	2954.00	2932.00	230	9.58%	0.00	1.67	2.72	0	0	8	4.1	11.6	-	#VALUE!	#VALUE!
3	0.012	2932.00	2924.00	133	6.03%	0.00	1.67	2.16	0	0	8	3.2	9.2	-	#VALUE!	#VALUE!
3	0.012	2924.00	2902.00	782	2.81%	0.51	2.18	1.47	0.71	1.47	8	2.2	6.3	8	2.2	6.3
4	0.012	2902.00	2896.00	402	1.49%	0.00	2.18	1.07	1.11	1.07	8	1.6	4.6	8	1.6	4.6
5	0.012	2896.00	2867.00	941	3.08%	0.00	2.18	1.54	0.64	1.54	8	2.3	6.6	8	2.3	6.6
6	0.012	2867.00	2736.00	4811	2.72%	1.84	4.02	1.45	2.57	2.63	8	2.2	6.2	10	3.9	7.2
7	0.012	2736.00	2728.00	492	1.63%	0.00	4.02	1.12	2.90	3.31	8	1.7	4.8	12	4.9	6.3
8	0.012	2728.00	2696.00	951	3.36%	0.70	4.72	4.76	0	0	12	7.1	9.0	-	#VALUE!	#VALUE!
9	0.010	2696.00	2647.00	1129	4.34%	0.92	5.64	6.48	0	0	12	9.7	12.3	-	#VALUE!	#VALUE!
10	0.012	2647.00	2644.00	932	0.32%	0.10	5.74	1.47	4.27	4.34	12	2.2	2.8	18	6.5	3.7
11	0.012	2644.00	2632.00	351	3.42%	0.11	5.85	8.69	0	0	15	13.0	10.6	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-6-2

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	3012.00	2973.00	1212	3.22%	1.64	1.64	2.86	0	0	10	4.3	7.8	-	#VALUE!	#VALUE!
2	0.010	2973.00	2971.00	213	0.94%	0.00	1.64	1.85	0	0	10	2.8	5.1	-	#VALUE!	#VALUE!
3	0.012	2971.00	2961.00	408	2.45%	0.00	1.64	4.06	0	0	12	6.1	7.7	-	#VALUE!	#VALUE!
4	0.012	2961.00	2958.00	392	0.76%	0.00	1.64	2.27	0	0	12	3.4	4.3	-	#VALUE!	#VALUE!
5	0.012	2958.00	2956.00	229	0.88%	0.42	2.06	2.43	0	0	12	3.6	4.6	-	#VALUE!	#VALUE!
6	0.010	2956.00	2952.00	885	0.45%	0.00	2.06	2.09	0	0	12	3.1	4.0	-	#VALUE!	#VALUE!
7	0.012	2952.00	2936.00	451	3.55%	0.00	2.06	4.89	0	0	12	7.3	9.3	-	#VALUE!	#VALUE!
8	0.012	2936.00	2929.00	376	1.86%	0.00	2.06	3.54	0	0	12	5.3	6.7	-	#VALUE!	#VALUE!
9	0.012	2929.00	2922.00	648	1.08%	1.73	3.79	2.69	1.10	1.66	12	4.0	5.1	10	2.5	4.5
10	0.012	2922.00	2916.00	511	1.17%	0.28	4.07	2.81	1.26	1.73	12	4.2	5.3	10	2.6	4.7
11	0.012	2916.00	2908.00	731	1.09%	0.00	4.07	2.71	1.36	1.67	12	4.0	5.2	10	2.5	4.6

PIPE SEGMENT: R-5-10

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2827.00	2812.00	2023	0.74%	0.78	0.78	1.37	0	0	10	2.0	3.8	-	#VALUE!	#VALUE!

PIPE SEGMENT: NORTH TRUNK LINE (R-5-9)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2830.00	2826.00	1194	0.34%	5.78	5.78	6.67	0	0	21	10.0	4.1	-	#VALUE!	#VALUE!
2	0.012	2826.00	2818.00	1936	0.41%	6.97	12.75	4.91	7.84	7.41	18	7.3	4.2	21	11.1	4.6
3	0.012	2818.00	2812.00	923	0.65%	0.46	13.21	6.16	7.05	9.30	18	9.2	5.2	21	13.9	5.8
4	0.012	2812.00	2790.00	1135	1.94%	0.92	14.13	6.55	7.58	10.64	15	9.8	8.0	18	15.9	9.0
5	0.012	2790.00	2780.00	552	1.81%	0.00	14.13	6.33	7.80	10.29	15	9.4	7.7	18	15.4	8.7
6	0.012	2780.00	2760.00	351	5.70%	0.00	14.13	6.19	7.94	11.22	12	9.2	11.8	15	16.7	13.6
7	0.012	2760.00	2740.00	240	8.33%	0.00	14.13	7.49	6.64	7.49	12	11.2	14.2	12	11.2	14.2
8	0.012	2740.00	2722.00	367	4.90%	0.00	14.13	5.74	8.39	10.41	12	8.6	10.9	15	15.5	12.7
9	0.012	2722.00	2696.00	526	4.94%	1.40	15.53	5.76	9.77	10.45	12	8.6	11.0	15	15.6	12.7
10	0.012	2696.00	2666.00	1031	2.91%	0.00	15.53	4.42	11.11	13.04	12	6.6	8.4	18	19.5	11.0
11	0.012	2666.00	2649.00	604	2.81%	0.14	15.67	4.35	11.32	12.83	12	6.5	8.3	18	19.1	10.8
12	0.012	2649.00	2640.50	426	2.00%	0.00	15.67	6.64	9.03	10.80	15	9.9	8.1	18	16.1	9.1
13	0.012	2640.50	2640.00	220	0.23%	0.00	15.67	5.50	10.17	10.75	21	8.2	3.4	27	16.0	4.0
14	0.012	2640.00	2635.00	722	0.69%	0.00	15.67	9.60	6.07	6.36	21	14.3	6.0	18	9.5	5.4
15	0.012	2635.00	2632.00	775	0.39%	0.11	15.78	7.17	8.61	10.24	21	10.7	4.5	24	15.3	4.9
16	0.012	2632.00	2630.00	713	0.28%	5.85	21.63	8.72	12.91	11.94	24	13.0	4.1	27	17.8	4.5
17	0.012	2630.00	2627.00	1241	0.24%	0.14	21.77	11.08	10.69	11.08	27	16.5	4.2	27	16.5	4.2
18	0.012	2627.00	2626.50	170	0.29%	7.39	29.16	12.22	16.94	16.19	27	18.2	4.6	30	24.2	4.9
19	0.012	2626.50	2625.50	316	0.32%	0.10	29.26	4.30	24.96	27.31	18	6.4	3.6	36	40.8	5.8
20	0.012	2625.50	2623.77	577	0.30%	0.00	29.26	4.19	25.07	26.58	18	6.2	3.5	36	39.7	5.6

PIPE SEGMENT: R-9-5

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2850.00	2840.00	513	1.95%	1.37	1.37	2.23	0	0	10	3.3	6.1	-	#VALUE!	#VALUE!
2	0.012	2840.00	2830.00	600	1.67%	0.00	1.37	2.06	0	0	10	3.1	5.6	-	#VALUE!	#VALUE!
3	0.012	2830.00	2816.00	830	1.69%	0.00	1.37	2.07	0	0	10	3.1	5.7	-	#VALUE!	#VALUE!
4	0.010	2816.00	2800.00	1219	1.31%	0.55	1.92	2.19	0	0	10	3.3	6.0	-	#VALUE!	#VALUE!
5	0.012	2800.00	2770.00	1332	2.25%	0.00	1.92	2.39	0	0	10	3.6	6.5	-	#VALUE!	#VALUE!
6	0.012	2770.00	2753.00	1167	1.46%	0.53	2.45	3.13	0	0	12	4.7	5.9	-	#VALUE!	#VALUE!
7	0.012	2753.00	2735.00	1484	1.21%	0.00	2.45	2.86	0	0	12	4.3	5.4	-	#VALUE!	#VALUE!
8	0.012	2735.00	2720.00	1098	1.37%	0.34	2.79	3.03	0	0	12	4.5	5.8	-	#VALUE!	#VALUE!
9	0.012	2720.00	2705.00	1287	1.17%	0.00	2.79	2.80	0	0	12	4.2	5.3	-	#VALUE!	#VALUE!
10	0.012	2705.00	2694.00	1248	0.88%	0.26	3.05	4.41	0	0	15	6.6	5.4	-	#VALUE!	#VALUE!
11	0.012	2694.00	2677.00	1011	1.68%	0.53	3.58	6.10	0	0	15	9.1	7.4	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-10-2

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2677.00	2676.54	412	0.11%	3.58	3.58	1.57	2.01	2.56	15	2.3	1.9	18	3.8	2.2
2	0.012	2676.54	2675.60	842	0.11%	0.00	3.58	1.57	2.01	2.56	15	2.3	1.9	18	3.8	2.2
3	0.012	2675.60	2675.39	184	0.11%	0.00	3.58	1.57	2.01	2.56	15	2.3	1.9	18	3.8	2.2
4	0.012	2675.39	2675.00	343	0.11%	0.00	3.58	1.59	1.99	2.58	15	2.4	1.9	18	3.8	2.2
5	0.012	2675.00	2674.60	527	0.07%	0.00	3.58	1.29	2.29	3.16	15	1.9	1.6	21	4.7	2.0
6	0.012	2674.60	2673.50	777	0.14%	1.03	4.61	1.77	2.84	2.88	15	2.6	2.2	18	4.3	2.4

PIPE SEGMENT: R-10-1

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2671.58	2671.00	897	0.07%	0.65	0.65	0.66	0	0	12	1.0	1.3	-	#VALUE!	#VALUE!
2	0.012	2671.00	2670.76	412	0.06%	0.00	0.65	1.12	0	0	15	1.7	1.4	-	#VALUE!	#VALUE!
3	0.012	2670.76	2670.55	371	0.06%	0.00	0.65	1.12	0	0	15	1.7	1.4	-	#VALUE!	#VALUE!
4	0.012	2670.55	2670.29	459	0.06%	0.00	0.65	1.12	0	0	15	1.7	1.4	-	#VALUE!	#VALUE!
5	0.012	2670.29	2670.16	233	0.06%	0.00	0.65	1.12	0	0	15	1.7	1.4	-	#VALUE!	#VALUE!
6	0.012	2670.16	2669.00	2060	0.06%	0.00	0.65	1.12	0	0	15	1.7	1.4	-	#VALUE!	#VALUE!
7	0.012	2669.00	2668.50	673	0.07%	0.33	0.98	1.28	0	0	15	1.9	1.6	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-15-5 (Gravity Flow)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2905.00	2870.00	1216	2.88%	6.10	6.10	7.98	0	0	15	11.9	9.7	-	#VALUE!	#VALUE!
2	0.010	2870.00	2848.00	1355	1.62%	0.00	6.10	7.19	0	0	15	10.7	8.7	-	#VALUE!	#VALUE!
3	0.012	2848.00	2802.00	1593	2.89%	0.00	6.10	7.99	0	0	15	11.9	9.7	-	#VALUE!	#VALUE!
4	0.012	2802.00	2780.00	1052	2.09%	0.00	6.10	6.80	0	0	15	10.1	8.3	-	#VALUE!	#VALUE!
5	0.012	2780.00	2764.00	737	2.17%	0.00	6.10	6.93	0	0	15	10.3	8.4	-	#VALUE!	#VALUE!
6	0.012	2764.00	2752.00	509	2.36%	0.00	6.10	7.22	0	0	15	10.8	8.8	-	#VALUE!	#VALUE!
7	0.012	2752.00	2716.00	1513	2.38%	0.00	6.10	7.25	0	0	15	10.8	8.8	-	#VALUE!	#VALUE!
8	0.010	2716.00	2710.00	699	0.86%	0.00	6.10	5.23	0.87	0.98	15	7.8	6.4	8	1.5	4.2
9	0.012	2710.00	2691.00	583	3.26%	0.00	6.10	8.48	0	0	15	12.7	10.3	-	#VALUE!	#VALUE!
10	0.012	2691.00	2677.00	664	2.11%	0.00	6.10	6.82	0	0	15	10.2	8.3	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-12-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	3034.42	3031.94	800	0.31%	0.68	0.68	0.89	0	0	10	1.3	2.4	-	#VALUE!	#VALUE!
2	0.012	3031.94	3029.77	700	0.31%	0.00	0.68	0.89	0	0	10	1.3	2.4	-	#VALUE!	#VALUE!
3	0.012	3029.77	3027.01	890	0.31%	0.26	0.94	1.44	0	0	12	2.2	2.7	-	#VALUE!	#VALUE!
4	0.012	3027.01	3024.47	818	0.31%	0.00	0.94	1.44	0	0	12	2.2	2.7	-	#VALUE!	#VALUE!
5	0.012	3024.47	3022.75	557	0.31%	0.16	1.10	1.44	0	0	12	2.2	2.7	-	#VALUE!	#VALUE!
6	0.012	3022.75	3020.62	686	0.31%	0.00	1.10	1.44	0	0	12	2.2	2.7	-	#VALUE!	#VALUE!
7	0.012	3020.62	3018.52	675	0.31%	0.57	1.67	2.62	0	0	15	3.9	3.2	-	#VALUE!	#VALUE!
8	0.012	3018.52	3016.00	776	0.32%	0.00	1.67	2.68	0	0	15	4.0	3.3	-	#VALUE!	#VALUE!
9	0.012	3016.00	3008.00	1257	0.64%	0.61	2.28	3.75	0	0	15	5.6	4.6	-	#VALUE!	#VALUE!
10	0.012	3008.00	3000.00	1360	0.59%	0.00	2.28	3.61	0	0	15	5.4	4.4	-	#VALUE!	#VALUE!
11	0.012	3000.00	2992.00	1065	0.75%	0.89	3.17	4.07	0	0	15	6.1	5.0	-	#VALUE!	#VALUE!
12	0.012	2992.00	2985.00	1216	0.58%	0.00	3.17	3.57	0	0	15	5.3	4.3	-	#VALUE!	#VALUE!
13	0.012	2985.00	2979.00	655	0.92%	0.95	4.12	4.50	0	0	15	6.7	5.5	-	#VALUE!	#VALUE!
14	0.012	2979.00	2966.74	659	1.86%	0.00	4.12	6.41	0	0	15	9.6	7.8	-	#VALUE!	#VALUE!
15	0.012	2966.74	2960.82	319	1.86%	1.27	5.39	6.40	0	0	15	9.6	7.8	-	#VALUE!	#VALUE!
16	0.012	2960.82	2937.75	1240	1.86%	0.00	5.39	6.41	0	0	15	9.6	7.8	-	#VALUE!	#VALUE!
17	0.012	2937.75	2922.00	849	1.86%	0.00	5.39	6.40	0	0	15	9.6	7.8	-	#VALUE!	#VALUE!
18	0.012	2922.00	2865.00	1130	5.04%	0.09	5.48	10.56	0	0	15	15.8	12.8	-	#VALUE!	#VALUE!
19	0.012	2865.00	2850.00	273	5.49%	0.00	5.48	11.02	0	0	15	16.4	13.4	-	#VALUE!	#VALUE!
20	0.012	2850.00	2824.00	630	4.13%	0.00	5.48	9.55	0	0	15	14.3	11.6	-	#VALUE!	#VALUE!
21	0.012	2824.00	2812.00	672	1.79%	0.00	5.48	6.28	0	0	15	9.4	7.6	-	#VALUE!	#VALUE!
22	0.012	2812.00	2800.00	698	1.72%	0.00	5.48	6.16	0	0	15	9.2	7.5	-	#VALUE!	#VALUE!
23	0.012	2800.00	2786.00	776	1.80%	0.00	5.48	6.31	0	0	15	9.4	7.7	-	#VALUE!	#VALUE!
24	0.012	2786.00	2772.00	491	2.85%	0.00	5.48	7.94	0	0	15	11.8	9.7	-	#VALUE!	#VALUE!
25	0.012	2772.00	2764.00	1121	0.71%	0.00	5.48	6.46	0	0	18	9.6	5.5	-	#VALUE!	#VALUE!
26	0.012	2764.00	2740.00	1123	2.14%	0.00	5.48	11.18	0	0	18	16.7	9.4	-	#VALUE!	#VALUE!
27	0.012	2740.00	2728.00	1471	0.82%	3.94	9.42	10.42	0	0	21	15.5	6.5	-	#VALUE!	#VALUE!
28	0.012	2728.00	2719.00	923	0.98%	0.38	9.80	4.64	5.16	7.55	15	6.9	5.6	18	11.3	6.4
29	0.012	2719.00	2709.00	1337	0.75%	0.42	10.22	4.07	6.15	6.61	15	6.1	4.9	18	9.9	5.6
30	0.012	2709.00	2691.00	2373	0.76%	0.32	10.54	4.09	6.45	6.66	15	6.1	5.0	18	9.9	5.6
31	0.012	2691.00	2677.00	1384	1.01%	0.00	10.54	4.73	5.81	7.69	15	7.1	5.8	18	11.5	6.5

PIPE SEGMENT: R-14-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2810.00	2798.00	1119	1.07%	1.31	1.31	1.65	0	0	10	2.5	4.5	-	#VALUE!	#VALUE!
2	0.012	2798.00	2793.00	894	0.56%	0.49	1.80	1.94	0	0	12	2.9	3.7	-	#VALUE!	#VALUE!
3	0.012	2793.00	2788.00	849	0.59%	0.00	1.80	1.99	0	0	12	3.0	3.8	-	#VALUE!	#VALUE!
4	0.012	2788.00	2780.00	1039	0.77%	0.00	1.80	2.28	0	0	12	3.4	4.3	-	#VALUE!	#VALUE!
5	0.012	2780.00	2767.00	1220	1.07%	0.44	2.24	2.68	0	0	12	4.0	5.1	-	#VALUE!	#VALUE!
6	0.012	2767.00	2750.00	1184	1.44%	0.00	2.24	3.11	0	0	12	4.6	5.9	-	#VALUE!	#VALUE!
7	0.012	2750.00	2740.00	1068	0.94%	1.00	3.24	4.55	0	0	15	6.8	5.5	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-15-6

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2677.00	2670.00	964	0.73%	16.95	16.95	2.21	14.74	14.03	12	3.3	4.2	24	20.9	6.7
2	0.012	2670.00	2652.00	963	1.87%	0.00	16.95	3.54	13.41	15.76	12	5.3	6.7	21	23.5	9.8
3	0.012	2652.00	2634.00	1213	1.48%	0.74	17.69	3.16	14.53	14.05	12	4.7	6.0	21	21.0	8.7
4	0.012	2634.00	2628.00	1111	0.54%	0.42	18.11	3.46	14.65	16.57	15	5.2	4.2	27	24.7	6.2
5	0.012	2628.00	2618.00	1399	0.71%	0.14	18.25	3.97	14.28	13.92	15	5.9	4.8	24	20.8	6.6
REGIONAL																
6	0.012	2618.00	2611.00	1382	0.51%	4.17	22.42	8.21	14.21	16.04	21	12.3	5.1	27	23.9	6.0
7	0.012	2611.00	2604.00	1287	0.54%	0.06	22.48	8.51	13.97	16.62	21	12.7	5.3	27	24.8	6.2
8	0.012	2604.00	2594.00	1171	0.85%	1.65	24.13	10.66	13.47	15.21	21	15.9	6.6	24	22.7	7.2
9	0.012	2594.00	2588.00	761	0.79%	0.34	24.47	10.24	14.23	14.62	21	15.3	6.4	24	21.8	6.9
10	0.012	2588.00	2585.00	471	0.64%	0.00	24.47	9.20	15.27	17.98	21	13.7	5.7	27	26.8	6.8
11	0.012	2585.00	2579.75	1146	0.46%	0.00	24.47	7.81	16.66	15.26	21	11.7	4.8	27	22.8	5.7
12	0.012	2579.75	2575.36	1011	0.43%	0.00	24.47	7.60	16.87	19.67	21	11.3	4.7	30	29.4	6.0

PIPE SEGMENT: R-15-10

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2626.00	2614.00	1298	0.92%	0.65	0.65	0.85	0	0	8	1.3	3.6	-	#VALUE!	#VALUE!
2	0.012	2614.00	2611.00	289	1.04%	0.22	0.87	0.90	0	0	8	1.3	3.8	-	#VALUE!	#VALUE!
3	0.012	2611.00	2608.00	657	0.46%	0.00	0.87	1.08	0	0	10	1.6	2.9	-	#VALUE!	#VALUE!
4	0.012	2608.00	2600.00	1350	0.59%	0.00	0.87	1.23	0	0	10	1.8	3.4	-	#VALUE!	#VALUE!
5	0.012	2600.00	2592.00	2087	0.38%	0.23	1.10	1.61	0	0	12	2.4	3.1	-	#VALUE!	#VALUE!
6	0.012	2592.00	2586.50	1529	0.36%	0.31	1.41	1.56	0	0	12	2.3	3.0	-	#VALUE!	#VALUE!
7	0.012	2586.50	2585.00	384	0.39%	0.12	1.53	1.62	0	0	12	2.4	3.1	-	#VALUE!	#VALUE!
8	0.010	2585.00	2581.00	897	0.45%	3.70	5.23	6.13	0	0	18	9.1	5.2	-	#VALUE!	#VALUE!
9	0.010	2581.00	2578.00	658	0.46%	0.00	5.23	6.19	0	0	18	9.2	5.2	-	#VALUE!	#VALUE!
10	0.012	2578.00	2577.20	745	0.11%	0.00	5.23	2.50	2.73	2.51	18	3.73	2.1	18	3.7	2.1
11	0.012	2577.20	2576.74	421	0.11%	0.00	5.23	2.52	2.71	2.53	18	3.76	2.1	18	3.8	2.1
12	0.010	2576.74	2576.31	405	0.11%	0.00	5.23	2.98	2.25	2.99	18	4.45	2.5	18	4.5	2.5
13	0.012	2576.31	2575.95	326	0.11%	0.00	5.23	2.53	2.70	2.54	18	3.78	2.1	18	3.8	2.1
14	0.012	2575.95	2575.36	547	0.11%	0.00	5.23	2.50	2.73	2.51	18	3.74	2.1	18	3.7	2.1

PIPE SEGMENT: R-16-1

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	actual pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2729.37	2690.49	2495	1.56%	0.00	0.00	1.10	0	0	8	1.6	4.7	-	#VALUE!	#VALUE!
2	0.012	2690.49	2664.88	936	2.74%	0.00	0.00	1.45	0	0	8	2.2	6.2	-	#VALUE!	#VALUE!
3	0.012	2664.88	2633.84	2232	1.39%	0.00	0.00	1.04	0	0	8	1.5	4.4	-	#VALUE!	#VALUE!
4	0.012	2633.84	2624.15	320	3.02%	0.00	0.00	1.53	0	0	8	2.3	6.5	-	#VALUE!	#VALUE!
5	0.012	2624.15	2608.00	1298	1.24%	0.00	0.00	0.98	0	0	8	1.5	4.2	-	#VALUE!	#VALUE!
1	0.012	2608.00	2605.91	830	0.25%	1.66	1.66	1.30	0.36	0.44	12	1.9	2.5	8	0.7	1.9
2	0.012	2605.91	2601.92	1587	0.25%	0.00	1.66	1.30	0.36	0.44	12	1.9	2.5	8	0.7	1.9
3	0.010	2601.92	2600.50	563	0.25%	0.29	1.95	1.56	0.39	0.53	12	2.3	3.0	8	0.8	2.3
4	0.010	2600.50	2597.18	1318	0.25%	0.00	1.95	1.56	0.39	0.53	12	2.3	3.0	8	0.8	2.3
5	0.010	2597.18	2594.46	1084	0.25%	0.88	2.83	2.83	0.00	0.53	15	4.2	3.4	8	0.8	2.3
6	0.010	2594.46	2593.53	367	0.25%	0.00	2.83	2.84	0	0	15	4.2	3.5	-	#VALUE!	#VALUE!
7	0.012	2593.53	2590.08	1371	0.25%	0.38	3.21	3.83	0	0	18	5.7	3.2	-	#VALUE!	#VALUE!
8	0.012	2590.08	2588.10	788	0.25%	0.28	3.49	3.83	0	0	18	5.7	3.2	-	#VALUE!	#VALUE!
9	0.012	2588.10	2586.76	533	0.25%	0.21	3.70	3.83	0	0	18	5.7	3.2	-	#VALUE!	#VALUE!
10	0.012	2586.76	2585.86	317	0.28%	0.00	3.70	4.07	0	0	18	6.1	3.4	-	#VALUE!	#VALUE!
11	0.010	2585.86	2585.00	382	0.23%	0.00	3.70	4.35	0	0	18	6.5	3.7	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-17-5

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2940.00	2930.00	1216	0.82%	1.33	1.33	1.45	0	0	10	2.2	4.0	-	#VALUE!	#VALUE!

PIPE SEGMENT: FRT PRC TRNK - UPPER (R-17-5)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2928.00	2920.00	556	1.44%	1.84	1.84	1.91	0	0	10	2.9	5.2	-	#VALUE!	#VALUE!
2	0.012	2920.00	2916.91	576	0.54%	0.00	1.84	1.90	0	0	12	2.8	3.6	-	#VALUE!	#VALUE!
3	0.012	2916.91	2912.54	814	0.54%	0.00	1.84	1.90	0	0	12	2.8	3.6	-	#VALUE!	#VALUE!
4	0.012	2912.54	2908.89	679	0.54%	0.00	1.84	1.90	0	0	12	2.8	3.6	-	#VALUE!	#VALUE!
5	0.012	2908.89	2905.00	724	0.54%	0.00	1.84	1.90	0	0	12	2.8	3.6	-	#VALUE!	#VALUE!
6	0.012	2905.00	2899.00	1024	0.59%	0.08	1.92	1.98	0	0	12	3.0	3.8	-	#VALUE!	#VALUE!
7	0.012	2899.00	2893.57	804	0.68%	0.00	1.92	2.13	0	0	12	3.2	4.0	-	#VALUE!	#VALUE!
8	0.012	2893.57	2883.70	1233	0.80%	0.00	1.92	2.32	0	0	12	3.5	4.4	-	#VALUE!	#VALUE!
9	0.012	2883.70	2880.00	557	0.66%	0.00	1.92	2.11	0	0	12	3.2	4.0	-	#VALUE!	#VALUE!
10	0.012	2880.00	2875.00	650	0.77%	0.00	1.92	2.27	0	0	12	3.4	4.3	-	#VALUE!	#VALUE!
11	0.012	2875.00	2860.00	1412	1.06%	0.00	1.92	2.67	0	0	12	4.0	5.1	-	#VALUE!	#VALUE!
12	0.012	2860.00	2847.17	1711	0.75%	0.00	1.92	2.25	0	0	12	3.4	4.3	-	#VALUE!	#VALUE!
13	0.012	2847.17	2832.69	1930	0.75%	0.00	1.92	2.25	0	0	12	3.4	4.3	-	#VALUE!	#VALUE!
14	0.012	2832.69	2796.36	4845	0.75%	0.00	1.92	2.25	0	0	12	3.4	4.3	-	#VALUE!	#VALUE!
15	0.012	2796.36	2790.04	842	0.75%	0.00	1.92	2.25	0	0	12	3.4	4.3	-	#VALUE!	#VALUE!
16	0.012	2790.04	2781.00	1331	0.68%	0.00	1.92	2.14	0	0	12	3.2	4.1	-	#VALUE!	#VALUE!
17	0.012	2781.00	2777.00	599	0.67%	0.00	1.92	2.12	0	0	12	3.2	4.0	-	#VALUE!	#VALUE!
18	0.012	2777.00	2772.10	883	0.55%	0.00	1.92	1.93	0	0	12	2.9	3.7	-	#VALUE!	#VALUE!
19	0.012	2772.10	2768.00	744	0.55%	0.00	1.92	1.92	0	0	12	2.9	3.7	-	#VALUE!	#VALUE!

PIPE SEGMENT: R-23-3

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2818.00	2814.00	691	0.58%	0.72	0.72	1.21	0	0	10	1.8	3.3	-	#VALUE!	#VALUE!
2	0.012	2814.00	2808.00	1139	0.53%	0.30	1.02	1.16	0	0	10	1.7	3.2	-	#VALUE!	#VALUE!
3	0.012	2808.00	2797.00	1263	0.87%	0.00	1.02	1.49	0	0	10	2.2	4.1	-	#VALUE!	#VALUE!
4	0.012	2797.00	2790.00	904	0.77%	0.12	1.14	1.40	0	0	10	2.1	3.8	-	#VALUE!	#VALUE!
5	0.012	2790.00	2780.00	596	1.68%	0.00	1.14	2.07	0	0	10	3.1	5.7	-	#VALUE!	#VALUE!
6	0.012	2780.00	2775.00	631	0.79%	0.00	1.14	1.42	0	0	10	2.1	3.9	-	#VALUE!	#VALUE!
7	0.012	2775.00	2770.00	386	1.30%	0.00	1.14	1.82	0	0	10	2.7	5.0	-	#VALUE!	#VALUE!
8	0.012	2770.00	2748.38	776	2.79%	0.00	1.14	2.66	0	0	10	4.0	7.3	-	#VALUE!	#VALUE!
9	0.012	2748.38	2734.22	508	2.79%	0.00	1.14	2.66	0	0	10	4.0	7.3	-	#VALUE!	#VALUE!
10	0.012	2734.22	2719.09	543	2.79%	0.00	1.14	2.66	0	0	10	4.0	7.3	-	#VALUE!	#VALUE!
11	0.012	2719.09	2699.56	701	2.79%	0.00	1.14	2.66	0	0	10	4.0	7.3	-	#VALUE!	#VALUE!
12	0.012	2699.56	2669.99	1061	2.79%	3.82	4.96	7.85	0	0	15	11.7	9.5	-	#VALUE!	#VALUE!

PIPE SEGMENT: FRT PRC TRNK - LOWER (R-19-1)

PIPES 1 & 2 DATA							TOTAL DESIGN FLOW				PIPE 1 FLOW ANALYSIS			PIPE 2 FLOW ANALYSIS		
pipe segment	manning's coefficient (n)	upstream invert (ft)	downstream invert (ft)	pipe length (ft)	pipe slope (%)	upstream point inflow (cfs)	total design flow, Q (cfs)	pipe 1 capacity, Q_1, (cfs)	pipe 2 design flow, Q_2, (cfs)	pipe 2 capacity, Q_2, (cfs)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)	chosen pipe size (in)	full pipe flow, Q_{full} (cfs)	full pipe velocity, V_{full} (fps)
1	0.012	2768.00	2766.00	421	0.48%	2.54	2.54	3.24	0	0	15	4.8	3.9	-	#VALUE!	#VALUE!
2	0.012	2766.00	2764.00	420	0.48%	0.00	2.54	3.24	0	0	15	4.8	3.9	-	#VALUE!	#VALUE!
3	0.012	2764.00	2762.00	375	0.53%	0.00	2.54	3.43	0	0	15	5.1	4.2	-	#VALUE!	#VALUE!
4	0.012	2762.00	2755.00	758	0.92%	0.29	2.83	4.52	0	0	15	6.7	5.5	-	#VALUE!	#VALUE!
5	0.012	2755.00	2750.00	747	0.67%	0.00	2.83	3.85	0	0	15	5.7	4.7	-	#VALUE!	#VALUE!
6	0.012	2750.00	2745.00	1224	0.41%	0.00	2.83	3.01	0	0	15	4.5	3.7	-	#VALUE!	#VALUE!
7	0.012	2745.00	2737.00	1194	0.67%	0.99	3.82	3.85	0	0	15	5.7	4.7	-	#VALUE!	#VALUE!
8	0.012	2737.00	2734.00	702	0.43%	0.00	3.82	5.00	0	0	18	7.5	4.2	-	#VALUE!	#VALUE!
9	0.012	2734.00	2726.00	1635	0.49%	0.00	3.82	5.35	0	0	18	8.0	4.5	-	#VALUE!	#VALUE!
10	0.012	2726.00	2721.00	954	0.52%	0.00	3.82	5.54	0	0	18	8.3	4.7	-	#VALUE!	#VALUE!
11	0.012	2721.00	2718.00	610	0.49%	0.00	3.82	5.36	0	0	18	8.0	4.5	-	#VALUE!	#VALUE!
12	0.012	2718.00	2714.00	851	0.47%	0.00	3.82	5.24	0	0	18	7.8	4.4	-	#VALUE!	#VALUE!
13	0.012	2714.00	2710.00	644	0.62%	0.00	3.82	6.02	0	0	18	9.0	5.1	-	#VALUE!	#VALUE!
14	0.012	2710.00	2702.00	1225	0.65%	0.00	3.82	6.18	0	0	18	9.2	5.2	-	#VALUE!	#VALUE!
15	0.012	2702.00	2698.00	862	0.46%	0.00	3.82	5.21	0	0	18	7.8	4.4	-	#VALUE!	#VALUE!
16	0.012	2698.00	2686.79	2242	0.50%	0.00	3.82	5.41	0	0	18	8.1	4.6	-	#VALUE!	#VALUE!
17	0.012	2686.79	2682.34	890	0.50%	0.00	3.82	5.41	0	0	18	8.1	4.6	-	#VALUE!	#VALUE!
18	0.012	2682.34	2676.28	1212	0.50%	0.00	3.82	5.41	0	0	18	8.1	4.6	-	#VALUE!	#VALUE!
19	0.012	2676.28	2669.99	1208	0.52%	0.00	3.82	5.52	0	0	18	8.2	4.7	-	#VALUE!	#VALUE!

APPENDIX F
BASIN DISCUSSION

This Appendix seeks to present thoughts, theories, descriptions, considerations, and methodologies particular to each individual wastewater collection basin. These basin discussions come from the November 2005 Master Plan Study prepared by Sunrise Engineering, Inc. Many of the calculations, cost estimates, and recommended improvements come from the analysis done in 2005 for buildout conditions and do not apply to this master plan update. The reader is referred to Section 5 of this study for complete recommendations and analyses.

A. COLLECTION BASIN R-1

Wastewater collection basin R-1 is the westernmost basin within the study area and primarily comprises the existing community and developable area near the Green Springs Golf Course. The basin extends southward to beyond the I-15 corridor at the Washington City freeway exit. Significant portions of collection sub-basin R-1-1 and collection sub-basin R-1-2 are comprised of Habitat Conservation Plan (HCP) land where no development is expected; these areas are located in the northern and western segments of the basin. In contrast, a significant portion of the basin from the Green Springs Golf Course southward has already been fully developed.

It is expected that future development in the basin will generally follow the land use patterns specified by Winston Associates. It is notable that because no development is currently permitted on HCP land, no future wastewater flows will be generated in these areas. Flows from developed areas of the basin are expected to occur according to Winston Associates land use specifications and the calculations presented in Section 2 of this study.

The computer model that was developed to analyze the hydraulic capacity of the existing wastewater system indicates that most of the existing system in collection basin R-1 is sized adequately to convey projected wastewater flows at buildout. The exception occurs in the system along 3050 East between Middleton Drive and the southern city boundary. Maps of the existing wastewater system in this location show 10-inch and 8-inch pipes in 3050 East. The computer models show that in order to convey buildout flows, the existing 10-inch pipe should be replaced with a 12-inch pipe and the existing 8-inch pipe should be replaced with a 15-inch pipe.

It should be noted that reports from Washington City maintenance staff indicate that the wastewater system in collection basin R-1 functions properly under existing development conditions. It is therefore concluded that any required upsizing of the existing pipes in 3050 East is the direct result of new development in the basin.

The accounting of master plan system cost estimates for wastewater collection basin R-1 assumes that the undersized pipes in 3050 East are regional lines, the replacement of which will be funded through the regular $900 impact fee assessed for regional facilities by the City of St. George. As a result, no replacement costs for the pipes in 3050 East are included in the accounting of master plan facility costs for the basin. The only master plan system cost that is included for the basin is the share of future wastewater system master planning that the City is expected to commission.

Several assumptions pertaining to collection basin R-1 deserve mentioning. First, analysis of the capacity of the existing wastewater system assumes that a significant portion of the flows that will be generated by future development north of the Green Springs Golf Course will be routed to the existing 12-inch pipe on the east side of the golf course. If this were not the case, the existing 8-inch line in Green Springs Drive would be overloaded. Second, evaluation of the hydraulic adequacy of the southern reaches of the existing system is based solely on

Washington City flows. No effort has been made to include flows that may be entering the system from the City of St. George to the west. It is recommended that regional planners consider flows from both Washington City and St. George City when the pipes in 3050 East are replaced. Lastly, it was assumed that the downstream regional system has adequate capacity to receive Washington City flows at buildout. It is recommended that regional planners consider whether or not the receiving system should be upsized.

B. COLLECTION BASIN R-2

Wastewater collection basin R-2 is the collection basin which generally lies within the Mill Creek drainage basin both north and south of the I-15 corridor. A portion of sub-basin R-2-1 in the north end of the collection basin is comprised of Habitat Conservation Plan (HCP) land where no development is expected. The basin extends southward across the I-15 corridor to Industrial Road in Washington City.

It is expected that future development in the basin will generally follow the patterns specified by the Winston Associates land use plan. Because no development is currently permitted on HCP land, no future wastewater flows will be generated in the HCP areas. Flows generated by other areas of the basin under buildout conditions are expected to be typical of land uses specified by the Winston Associates plan. Discussion on how wastewater flows are calculated from the land use plan is presented in Section 2 of this study.

Most existing development in basin R-2 lies south of the I-15 corridor in older areas of Washington City and north of the I-15 corridor in areas near the Green Springs Golf Course. Aerial photographs show that the largest growth potential in the basin occurs north of the I-15 corridor.

Hydraulic analysis of the existing wastewater trunk line indicates that most of the system is sized to adequately convey all flows which will be routed to the line under fully developed land use conditions. The exception occurs in the lower reaches of the line in collection sub-basin R-2-6. If land uses in the northern portion of basin R-2 reach the densities predicted by the Winston Associates land use plan, it is recommended that the existing 15-inch trunk line be replaced with an 18-inch pipe. It is suggested that Washington City observe development in the northern portion of basin R-2 before expending resources on the pipe replacement effort. Reality may be such that development in the northern portion of the basin occurs at a density less than that predicted by Winston Associates. If this is the case, replacement of the existing 15-inch pipe may ultimately not be necessary.

Analysis of projected development patterns in undeveloped areas north of the I-15 corridor showed that a 10-inch trunk line would be required to convey wastewater flows from collection sub-basins R-2-1 and R-2-2 to the existing 16-inch pipe which passes under I-15 at Mill Creek and Buena Vista Boulevard.

It should be noted that Washington City staff have reported that the existing wastewater pipe system in collection basin R-2 functions properly under current development conditions. It is therefore reasonably concluded that any required upsizing of the existing system will be the direct result of new development within the basin.

The accounting of master plan facility costs for each collection basin assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by the development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs for each collection basin also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the assumptions outlined in the preceding paragraph and understanding that upsizing of the existing 15-inch line will be required due to new development, the calculation of master plan facility costs for wastewater collection basin R-2 includes not only the cost of upsizing the new trunk line from an 8-inch line to a 10-inch line but also the cost of replacing the existing 15-inch line with an 18-inch line. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City. Because the work is to be done in an area where groundwater is not

expected to be a problem, no inclusion for expenses arising from construction in groundwater-laden areas is made. Finally, because installation of the proposed 15-inch line will require removal of existing surface improvements, an inclusion has been made for the cost of removal and replacement of asphalt.

It should be noted that the Washington City Construction Design Standards manual specifies that sanitary sewer mains, trunks and outfalls shall be designed to carry not less than 250 gallons per capita per day when running 2/3 full. Planning of the proposed system improvements in this study generally follows that guideline. However, in some sections of the system, it is more economically reasonable to allow flows to exceed the 2/3-full standard. Certain sections of the system in collection basin R-2 are examples of this allowance. The model spreadsheet printout, given in the Appendix E of this study, shows which pipes were allowed to exceed the 2/3-full standard and gives the relationship between actual and full pipe flows.

C. COLLECTION BASIN R-3

Wastewater collection basin R-3 lies east of the Mill Creek drainage basin (wastewater collection basin R-2) and includes a substantial area north of I-15 as well as a significant portion of the older Washington City area south of the freeway. The basin extends southward to approximately 800 South. The western boundary of the basin in historic Washington City is approximately Main Street while the eastern boundary occurs at Urie Drive.

More than half of wastewater collection sub-basin R-3-1 in the north end of basin R-3 is comprised of Habitat Conservation Plan (HCP) land where no development is expected. Nevertheless, the Winston Associates land use plan specifies that a significant land area north of the I-15 corridor will be developed. Aerial photographs reveal that most of the area south of I-15 is already developed as part of historic Washington City.

The 1997 Wastewater Collection System Master Plan indicates that, disregarding infiltration and inflow, the existing trunk lines (the lines extending down Main Street and 100 East) in the basin had adequate capacity to convey flows under development conditions in 1997. Reports from Washington City maintenance staff indicate that the existing lines have adequate capacity to convey wastewater flows generated by existing development conditions. The 1997 plan does, however, predict that the existing lines would be undersized if required to convey wastewater flows from buildout development specified by the plan. Similarly, the analysis completed by this study also shows that a significant portion of the existing trunk lines will have to be replaced if buildout densities in the basin reach those specified by the Winston Associates land use plan.

The figure illustrating the system layout in basin R-3 shows that a major portion of the system will need to be upsized if expected buildout densities are reached. Accordingly, because replacement of the existing system is the effect of new development in the basin, all costs associated with upsizing the line have been included in the accounting of master plan facility costs for the basin.

It should be noted that the existing system is not drastically undersized. It is therefore suggested that Washington City observe development in the northern portion of basin R-3 before expending resources on the pipe replacement effort. Reality may be such that development in the northern portion of the basin occurs at a density less than that predicted by Winston Associates. If this is the case, replacement of the existing pipe system may ultimately not be necessary. The exception occurs on the existing segment of 8-inch pipe that extends southward from the Mill Creek crossing. In this location, the existing pipe will certainly need to be replaced .

Review of the accounting of master plan facility costs outlined in the 1997 Wastewater Collection System Master Plan provided no evidence that impact fees have already been collected for the upsizing improvements. The costs are therefore considered eligible for collection by this study. The recommended impact fee of $650 outlined in the 1997 study for areas of Washington City north of the Virgin River was apparently to have funded the improvement outlined in Section 2.3.1 of that study, none of which specified upsizing the trunk lines in collection basin R-3.

Lastly, it was assumed for the purposes of this study that wastewater flows from development in collection sub-basin R-3-2 will be routed to the existing line in Buena Vista Boulevard and the receiving Main Street trunk line. This appears to be the most logical route and would preclude the requirement of boring under I-15 to connect the wastewater system to a different receiving line.

D. COLLECTION BASIN R-4

Wastewater collection basin R-4 lies south of the I-15 corridor and covers the eastern portion of historic Washington City. This collection basin is unique compared to many of the other collection basins because no trunk line has its origin within this basin. Rather, the basin is transected by the major trunk line which carries wastewater flows from collection basins R-5 and R-6. Wastewater flow generated within collection basin R-4 is discharged to the transecting trunk line.

Aerial photographs show that the land within collection basin R-4 is largely developed. Nevertheless, actual development in the region is somewhat lighter than the buildout densities specified in the Winston Associates land use plan. It is therefore assumed that development in collection basin R-4 will continue until the densities prescribed by Winston are reached. The rate of development, however, is expected to be slow since other more easily developable lands are readily available.

Hydraulic analysis of the existing wastewater trunk line indicates that most of the system is sized to adequately convey all flows which will be routed to the system under fully developed land use conditions. The exception occurs in the lower reaches of the trunk line in collection sub-basins R-4-7 and R-4-8. If upstream land uses reach the densities predicted by Winston Associates, it is recommended that the existing 21-inch and 20-inch trunk lines be replaced with a 27-inch pipe. It is also recommended that the existing 8-inch line be replaced with a 15-inch pipe that would be the outlet of the proposed water resource recovery facility (WRRF). The attached figure illustrates the recommended system upgrades.

The attached figure also shows the recommended location of the proposed Washington West WRRF in collection basin R-4. The purposes of the WRRF are to maximize availability of increasingly precious water by creating a source of secondary irrigation water (estimates show that the Washington West WRRF could produce up to 2,269 gpm under buildout conditions) and to minimize the capacity increases that will be required on the downstream wastewater system. Flows expected to enter the facility are those generated by collection basins R-2, R-3, R-4, collection sub-basin R-5-10, and the average discharge flow from the Grapevine Wash WRRF (see the discussion for basin R-5). Additional discussion on water resource recovery facilities is given in Section 4.D of this study.

It should be noted that upstream development may not reach the densities predicted by the Winston Associates land use plan. It is therefore suggested that Washington City observe development in the upper areas of collection basin R-3 and collection basin R-4 before expending resources on the pipe replacement effort. Reality may be such that development in the upper portions of these basins occurs at a density less than that predicted by Winston Associates. If this is the case, replacement of the existing 20-inch and 21-inch pipes may not ultimately be necessary. It is recommended that implementation of the system upsizing in collection basin R-4 be included in later phases of the total master plan system.

The accounting of master plan facility costs for collection basin R-4 includes the cost of constructing the Washington West WRRF, the cost of replacing the existing 20-inch, 21-inch, and 8-inch pipes, and the share of master planning that will be required in collection basin R-4 in the future. The WRRF is included because the facility will serve a regional purpose, both by providing a source of secondary water for the northern half of Washington City and by reducing the amount of flow and corresponding cost that will be transferred to the downstream system. The pipe system upgrades have been included because Washington City staff have reported that the existing wastewater pipe system in collection basin R-4 functions properly under current development conditions. It is therefore reasonably concluded that any required upsizing of the existing system will be the direct result of

new development within the basin.

It should be noted that the Washington City Construction Design Standards manual specifies that sanitary sewer mains, trunks and outfalls shall be designed to carry not less than 250 gallons per capita per day when running 2/3 full. Planning of the proposed system improvements in this study generally follows that guideline. However, in some sections of the system, it is more economically reasonable to allow flows to exceed the 2/3-full standard. Certain sections of the system in collection basin R-4 are examples of this allowance. The model check spreadsheet printout, given in the appendix, shows which pipes were allowed to exceed the 2/3-full standard and gives the relationship between actual and full pipe flows (Q/Q_{full}).

E. COLLECTION BASIN R-5

Wastewater collection basin R-5 is the basin that lies east of collection basin R-4 and extends to the high elevations along the Washington Black Ridge. The basin primarily covers the Grapevine Wash drainage. The southern end of the basin occurs at the confluence of the Cottonwood Wash and the Virgin River.

A significant area in the northern portion of the basin (located in wastewater collection sub-basins R-5-1 and R-5-2) is comprised of Habitat Conservation Plan (HCP) land where no development is expected. Aerial photographs and the Winston Associates land use plan show that the area is lightly developed and that the majority of development will occur south of the I-15 corridor. In fact, significant development in the basin is already underway in the region between I-15 and Telegraph Road.

Hydraulic analysis of the wastewater trunk line segments which lie within the basin boundaries indicates that each of the segments are sized to adequately convey flows which will be routed to the lines under buildout land use conditions. It should be noted that the analysis assumes that a water resource recovery facility (WRRF) will be constructed near the crossing of Telegraph Road over Grapevine Wash. If the WRRF is not constructed in this location, a separate analysis should be completed to determine the adequacy of the downstream system.

The attached figure, which illustrates the system infrastructure existing in and recommended for wastewater collection basin R-5, shows the existing Ridge Pointe and Sienna Hills lift stations as well as the proposed Grapevine Wash WRRF. The purposes of the WRRF are to maximize availability of increasingly precious water by creating a source of secondary irrigation water (estimates show that the Grapevine Wash WRRF could produce up to 1176 gpm under buildout conditions) and to minimize the capacity increases that will be required on the downstream wastewater system. Additional discussion on water resource recovery facilities is given in Section 4.D of this study.

The accounting of master plan facility costs for the basin includes the cost of constructing the Grapevine Wash WRRF and the share of master planning that will be required in Washington City in the future. The WRRF is included because the facility will serve a regional purpose, both by providing a source of secondary water for the northern half of the City as well as reducing the amount of flow and corresponding cost that will be transferred to the downstream system. Moreover, the WRRF does not serve the sole purpose of any single entity. All wastewater pipe systems in the basin will be local systems which convey flow to the trunk lines and facilities shown in the attached illustration. Hence, no cost for pipe system construction has been included in the accounting of master plan facility costs.

Flows which are expected to enter the Grapevine Wash WRRF are the condensed wastewater flows which would pass through the Coral Canyon WRRF in collection basin R-6 and the wastewater flows generated by collection basin R-5, with the exception of sub-basin R-5-10 which drains directly into the trunk line in collection basin R-4. The flows injected into the 10-inch force main by the Black Ridge lift station (see the discussion for collection basin R-6) will also enter the Grapevine Wash WRRF.

It was assumed, for the purposes of this study, that the existing 10-inch force main in Telegraph Road could function as both the inlet and outlet line from the Grapevine Wash WRRF. Because of its diameter, the existing line is more suited to carrying the outflow than the inflow, but it appears that the line is suitable for both. Some reconfiguration will be required as part of the WRRF design to make the line function accordingly.

It was also assumed that wastewater effluent generated by development north of the I-15 corridor would be routed underneath the freeway

by means of boring to the wastewater system in collection basin R-5 rather than being routed to the existing system north of the freeway in collection basin R-3. It appears that this alternative will be most feasible based on topographical considerations in the area.

F. COLLECTION BASIN R-6

Wastewater collection basin R-6 is primarily comprised of the Coral Canyon Planned Community Development in Washington City and lies south of the I-15 corridor in Cottonwood Wash between the Washington Black Ridge and the eastern city boundary.

Development in the basin is expected to closely follow the master planned Coral Canyon development layout. As a result, for the purposes of calculating wastewater flows generated by buildout populations in the basin, development densities were taken as the densities specified by the Coral Canyon master plan rather than those specified by the Winston Associates land use plan. Densities predicted by the Coral Canyon master plan are somewhat lighter than the densities predicted by the Winston Associates land use plan.

As shown by Washington City's GIS map of the existing wastewater system, a gravity wastewater trunk line conveys effluent from the developed portion of the basin north of Telegraph Road to the Coral Canyon lift station located near Telegraph Road. The computer model created to analyze the system indicates that the existing system is generally sized to adequately convey wastewater flows produced by buildout populations in the basin. The model does show that, at peak flows, several segments of the trunk line will flow at levels above the 2/3 full design criteria. The model also shows that the capacity of the lowest segment of pipe will be exceeded slightly under peak flow conditions. However, because the system was designed and approved for the development, no change to the system is currently recommended. It is recommended that, as development continues in the basin, the developer is occasionally required to show that the existing system possesses adequate capacity to convey wastewater flows from the tributary area.

Current development plans for the area south of Telegraph Road include extension of the golf course and installation of a secondary water reservoir. Some residential development is planned for the southeastern bench; it appears that wastewater from this area can be routed to the Coral Canyon lift station via a gravity wastewater system.

The attached figure, which illustrates the system infrastructure existing in and recommended for wastewater collection basin R-6, shows the existing Coral Canyon lift station as well as a proposed wastewater recovery facility (WWRF) and a proposed lift station on the Washington Black Ridge. The purposes of the WRRF are to maximize availability of increasingly precious water by creating a source of secondary irrigation water (estimates show that the Coral Canyon WRRF could produce up to 714 gpm under buildout conditions) and to minimize the capacity increases that will be required on the downstream wastewater system. The purpose of the Black Ridge lift station is to inject wastewater produced by residential development on the Black Ridge into the existing 10-inch force main that currently conveys wastewater from the Coral Canyon lift station to the gravity system in collection basin R-5. Additional discussion on water resource recovery facilities is given in Section 4.D of this study.

Because the entire wastewater collection basin is to be developed by a single entity, all costs associated with improvements in the basin will be incurred by that entity. As a result, the accounting of master plan system costs for the basin only includes the portion of master planning that will be required to periodically analyze the status of the basin. The cost of any remaining infrastructure work, including construction of the Black Ridge lift station and the Coral Canyon WRRF will be borne by the developer.

It should be noted that the existing 10-inch force main which conveys wastewater effluent from the Coral Canyon development over the Washington Black Ridge was designed and constructed to handle flows from collection basin R-6 without the reducing effects of an in-line water resource

recovery facility (WRRF). It is therefore expected that, after the area is fully developed and the WRRF is constructed, velocities and flow rates through the 10-inch force main will be less than those normally recommended for wastewater flow in a force main. This can lead to conditions where anaerobic decay of the wastewater material is prevalent and offensive odors are produced. It is recommended that this problem be mitigated or avoided as the WRRF is designed and constructed.

G. COLLECTION BASIN R-7

Wastewater collection basin R-7 extends southward from Purgatory Flat in Hurricane City, comprises the valley east of the Harrisburg Dome ridge line, and continues south to the Virgin River. The Winston Associates land use plan specifies that the valley will be primarily developed for industrial and medium density residential land uses. It is expected that development in the basin will generally follow the uses prescribed by Winston Associates. It does appear that a certain portion of the basin will remain under the control of the Bureau of Land Management (BLM) for perpetuity. Wastewater production values calculated based on the Winston Associates land use plan were reduced to account for the fact that no development is expected on BLM land.

The most significant challenge to the routing of wastewater in the basin is the barrier formed by the Virgin River and the rugged topography along the banks of the river. No convenient method for constructing a wastewater pipeline across the river currently exists, and the topography along the northern bank of the Virgin River makes constructing a trunk line along the river to the wastewater system in basin R-4 impractical.

Development in collection basin R-7 is currently being promoted by a single developer who also controls a significant portion of the developable acreage in collection basin R-8. Because of the significant challenges to the routing of wastewater in basin R-7, the developer, in coordination with Washington City, is proposing that a fully contained wastewater treatment system be implemented as the solution for wastewater remediation in the area.

The treatment system being advocated by the developer and the City is a mechanically simple, passive treatment system consisting of anaerobic primary treatment, subsurface flow constructed wetlands with recycle, and a re-circulating sand filter. Treated effluent from the system would be used as a secondary irrigation water source for the development. The system eliminates the need to construct a continuous trunk line from collection basin R-7 to receiving lines in basin R-4 and provides for the re-use of treated wastewater as irrigation water. Additional discussion on various components of the alternative wastewater treatment methods suggested for use in basin R-7 is provided in Section 4 of this study.

Because current development plans for collection basin R-7 specify the constructed wetlands and sand filter treatment system which would be installed at the expense of the developer, the accounting of master plan system costs for the basin only includes the portion of future master planning that would periodically review wastewater system needs in the basin.

H. COLLECTION BASIN R-8

Wastewater collection basin R-8 is the area comprising Sunrise Valley and the surrounding hills north of the Virgin River and east of the current city boundary. The Winston Associates land use plan specifies that the area will be primarily developed for medium density and medium-high density residential land uses. It is expected that development in the basin will generally follow the uses prescribed by Winston Associates. It does appear that a certain portion of the basin will remain under the control of the Bureau of Land Management (BLM) for perpetuity. Wastewater production values calculated based on the Winston Associates land use plan were reduced to account for the fact that no development is expected on BLM land.

The most significant challenge to the routing of wastewater in the basin is the barrier formed by the Virgin River and the rugged topography along the banks of the river. No convenient method for constructing a wastewater pipe across the river currently exists, and the topography along the northern bank of the Virgin River makes constructing a trunk line along the river to the wastewater system in basin R-4 impractical.

Development in collection basin R-8 is currently being promoted by a single developer who also controls a significant portion of the developable acreage in collection basin R-7. Because of the significant challenges to the routing of wastewater in basin R-8, the developer, in coordination with Washington City, is proposing that a fully contained wastewater treatment system be implemented as the solution for wastewater remediation in the area.

The treatment system being advocated by the developer and the City is a mechanically simple, passive treatment system consisting of anaerobic primary treatment, subsurface flow constructed wetlands with recycle, and a re-circulating sand filter. Treated effluent from the system would be used as a secondary irrigation water source for the development. The system eliminates the need to construct a continuous trunk line from collection basin R-8 to receiving lines in basin R-4 and provides for the re-use treated wastewater as irrigation water. Additional discussion on various components of the alternative wastewater treatment methods suggested for use in basin R-7 is provided in Section 4 of this study.

Because current development plans for collection basin R-8 specify the constructed wetlands and sand filter treatment system which would be installed at the expense of the developer, the accounting of master plan system costs for the basin only includes the portion of future master planning that would periodically review wastewater system needs in the basin.

I. COLLECTION BASIN R-9

Wastewater collection basin R-9 lies in the northern third of Warner Valley. The gradient in that section of the valley is northward toward the Virgin River. Even though much of the land in Warner Valley is now held by the Bureau of Land Management (BLM), it is expected that a significant portion of the developable land in the valley will be turned over to the State School and Institutional Trust Lands Administration (SITLA) and subsequently developed.

It was assumed for the purposes of this master plan study that all lands which are privately held and those lands which are or will become the jurisdiction of SITLA will be developed at the densities specified by the Winston Associates land use plan and will produce wastewater flows accordingly. It was also assumed that those areas which are to be held by the BLM through perpetuity will not be developed. These areas are not expected to produce any future wastewater flows.

Figure 3.B-1 in Appendix A is the wastewater collection basin and land use map which shows the projected BLM, SITLA, ACEC (Areas of Critical Environmental Concern) and private land uses within the study area. Analysis of the land use scenarios and resulting wastewater flows in collection basin R-9 indicates the need for a regional trunk line extending from the middle portion of the basin to the lower reaches near the Virgin River. At that point, the R-9 trunk line would discharge to the regional line proposed by this study for construction through collection basins R-10, R-11, R-16 and R-15 to the Punchbowl Dome WRRF proposed for construction in wastewater collection basin R-15.

The accounting of master plan facility costs for each collection basin assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by the development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs for each collection basin also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the general assumptions outlined in the preceding paragraph, the calculation of master plan facility costs for wastewater collection basin R-9 includes the cost of upsizing the proposed trunk line from an 8-inch pipe to a pipe of the appropriate segment lengths and diameters as shown in the attached figure. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City. Because the work is to be done in an area where groundwater is not expected to be a problem, no inclusion for expenses arising from construction in groundwater-laden areas is made. Finally, since it is expected that installation of the trunk line will occur prior to the placement of road surfaces, no inclusion has been made for the removal and replacement of asphalt.

It should be noted that the Washington County Water Conservancy District has been conducting preliminary studies regarding the construction of a reservoir in the northern end of Warner Valley for capture and storage of high-water flows which periodically come down the Virgin River. At this time, construction of the reservoir is a possibility but not a probability. Hence, this master plan assumes that the R-10 trunk line can be constructed as proposed. In the event that the Conservancy District reservoir is constructed, the most likely scenario of wastewater routing from collection basin R-10 is one that pumps wastewater effluent from the lowest collection point in the basin southward over the ridge to the gravity system proposed in collection basin R-14. This alternative scenario would significantly change the required wastewater system pipe sizes for all of the affected system; if it occurs, a revised master plan analysis may be required.

It should also be noted that the alignment shown is for planning purposed only; it is expected that development in the basin will drive the final alignment of the wastewater system.

J. COLLECTION BASIN R-10

Wastewater collection basin R-10 lies in the northern half of Long Valley, is bounded on the north by the Virgin River, is bounded on the east by Warner Ridge, is bounded on the south by the Long Valley summit, and is bounded on the west by Washington Dome. The gradient in the basin is northward toward the Virgin River.

Figure 3.B-1 in Appendix A is the wastewater collection basin and land use map which shows the projected Bureau of Land Management (BLM), School and Institutional Trust Lands Administration (SITLA), Areas of Critical Environmental Concern (ACEC) and private land uses within the study area. As can be seen in the figure, a significant portion of basin R-10 is either undevelopable or will remain under the jurisdiction of the BLM. As a result, little development is expected in the basin and wastewater flows are expected to be minimal. The master plan facility proposed for the basin is a transecting trunk line that would receive flows from collection basins R-9 and R-10 and convey them westward through collection basin R-11.

Review of possible alignments and rights-of-way that would allow construction of a gravity trunk line from the outlet of wastewater collection basin R-9 through basin R-10 and on to the Punchbowl Dome WRRF in collection basin R-15 revealed few viable options. The most obvious alignment was the St. George and Washington Canal right-of-way. With the implementation of the proposed secondary irrigation system and continuing development in the Washington and St. George Fields areas, demand for irrigation water delivered by the canal is diminishing and will ultimately cease. At that point, the old right-of way could still be used as a wastewater utility right-of-way.

Use of the St. George and Washington Canal right-of-way presents unique challenges for the design of a gravity wastewater system. The extremely flat slope of the canal alignment results in the need for unusually large pipe diameters to convey relatively light flows. In addition, the minimal slope requirements and flow velocities specified in the Washington City Construction Design manual are not met. Because of the shallow slopes and slow-moving fluid, self-cleaning of the pipes may be hindered and the potential of anaerobic decay of organic matter with the associated production of offensive odors may be a problem. It is suggested that final design of the system consider these facts. The alternative is to construct a force main in place of the proposed gravity line. The obvious disadvantage of constructing the force main is the perpetual requirement for pumping energy.

The accounting of master plan facility costs for each wastewater collection basin in the study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs for each collection basin also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the general assumptions outlined in the preceding paragraph, the calculation of master plan facility costs for wastewater collection basin R-10 includes the cost of upsizing the proposed trunk line from an 8-inch pipe to a pipe of the appropriate segment lengths and diameters as shown in the attached figure. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City. Because the work is to be done in an area where groundwater is not expected to be a problem, no inclusion for expenses arising from construction in groundwater-laden areas is made.

The attached figure, which illustrates the system improvements recommended for construction in wastewater collection basin R-10, shows a

proposed lift station north of the trunk line in the low-lying areas near the Virgin River. The proposed lift station would be a local facility used to boost wastewater generated by development in the existing fields into the proposed 27-inch trunk line. Because the facility would serve a local rather than regional purpose, no inclusion of the cost of the facility was provided in the accounting of master plan facility costs.

K. COLLECTION BASIN R-11

Wastewater collection basin R-11 is the area bounded on three sides by the Shinob Kibe plateau, the Virgin River and the Washington Dome ridge. The gradient in the basin is northward toward the Virgin River.

Figure 3.B-1 in Appendix A is the wastewater collection basin and land use map which shows the projected Bureau of Land Management (BLM), School and Institutional Trust Lands Administration (SITLA), Areas of Critical Environmental Concern (ACEC) and private land uses within the study area. As can be seen in the figure, significant portions of the basin are either undevelopable or will be perpetually held by the BLM. No future wastewater flows are expected from these areas. The remaining portion of the basin is largely slated for industrial development.

The master plan facility proposed in collection basin R-11 is a transecting 27-inch trunk line that would receive discharge flows from collection basin R-10 and local flows from basin R-11 and convey them westward through collection basin R-16. The alignment of the recommended trunk line is the St. George and Washington Canal right-of-way. With the implementation of the proposed secondary irrigation system and continuing development in the Washington and St. George Fields areas, demand for irrigation water delivered by the canal is diminishing and will ultimately cease. At that point, the old right-of way could still be used as a wastewater utility right-of-way.

Use of the St. George and Washington Canal right-of-way presents unique challenges for the design of a gravity wastewater system. The extremely flat slope of the canal alignment results in the need for unusually large pipe diameters to convey relatively light flows. In addition, the minimal slope requirements and flow velocities specified in the Washington City Construction Design manual are not met. Because of the shallow slopes and slow-moving fluid, self-cleaning of the pipes may be hindered and the potential of anaerobic decay of organic matter with the associated production of offensive odors may be a problem. It is suggested that final design of the system consider these facts. The alternative is to construct a force main in place of the proposed gravity line. The obvious disadvantage of constructing the force main is the perpetual requirement for pumping energy.

The accounting of master plan facility costs for each wastewater collection basin in the study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs for each collection basin also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the general assumptions outlined in the preceding paragraph, the calculation of master plan facility costs for wastewater collection basin R-11 includes the cost of upsizing the proposed trunk line from an 8-inch pipe to a 27-inch pipe as shown in the attached figure. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City. Because the work is to be done in an area where groundwater is not expected to be a problem, no inclusion for expenses arising from construction in groundwater-laden areas is made.

The attached figure, which illustrates the system improvements recommended for construction in wastewater collection basin R-11, shows a proposed lift station north of the trunk line in the low-lying areas near the Virgin River. The proposed lift station would be a local facility used to boost wastewater generated by development in the existing fields into the proposed 27-inch trunk line. Because the facility would serve a local rather than regional purpose, no inclusion of the

cost of the facility was provided in the accounting of master plan facility costs.

L. COLLECTION BASIN R-12

Wastewater collection basin R-12 is that portion of Warner Valley which lies north of the divide between Warner Valley and Fort Pierce Wash drainages. Surface water in the collection basin drains to a natural depression near the north edge of the basin; there is no surface drainage outlet from the basin. The alignment of the wastewater trunk line proposed by this study passes through the depression and extends to the gravity system shown in collection basin R-13. Extending the R-12 trunk line to the R-13 pipe will require an approximate 20 foot cut to pass through the divide between collection basins R-12 and R-13.

The accounting of master plan facility costs for each wastewater collection basin in the study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the general assumptions outlined in the preceding paragraph, the calculation of master plan facility costs for wastewater collection basin R-12 includes the cost of upsizing the proposed trunk line from an 8-inch pipe to a pipe of the appropriate segment lengths and diameters as shown in the attached figure. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City. Because the work is to be done in an area where groundwater is not expected to be a problem, no inclusion for expenses arising from construction in groundwater-laden areas is made. In addition, since it is expected that installation of the trunk line will occur prior to the placement of road surfaces, no inclusion has been made for the removal and replacement of asphalt.

Regarding the calculation of wastewater flows from basin R-12, a significant portion of the land within collection basin R-12 is currently held under the jurisdiction of the BLM (Bureau of Land Management) while some is held by private landowners. Authorities in the BLM administration have indicated that much of the land in collection basin R-13 will eventually be turned over to SITLA (Utah School and Institutional Trust Land Administration) and ultimately made available for development.

It was assumed for the purposes of calculating wastewater flows from the basin that all lands which are privately held and those lands which are or will become the jurisdiction of SITLA will be developed as specified by the Winston Associates land use plan and will produce wastewater flows accordingly. Conversely, it was assumed that those areas which are to be perpetually held by the BLM will not be developed. In addition, those areas designated as Areas of Critical Environmental Concern (ACEC) will not be developed. As a result, no wastewater flows are expected from BLM or ACEC lands.

M. COLLECTION BASIN R-13

Wastewater collection basin R-13 is the middle section of Warner Valley that drains through the Warner Ridge gap south of Punchbowl Dome. The wastewater collection system proposed by this master plan region consists of the trunk line which extends from collection basin R-12 and enters collection basin R-14 at the gap in Warner Ridge. The proposed system is entirely a gravity system.

The accounting of master plan facility costs for each wastewater collection basin in the study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the general assumptions outlined in the preceding paragraph, the calculation of master plan facility costs for wastewater collection basin R-13 includes the cost of upsizing the proposed trunk line from an 8-inch pipe to a pipe of the appropriate segment lengths and diameters as shown in the attached figure. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City. Because the work is to be done in an area where groundwater is not expected to be a problem, no inclusion for expenses arising from construction in groundwater-laden areas is made. In addition, since it is expected that installation of the trunk line will occur prior to the placement of road surfaces, no inclusion has been made for the removal and replacement of asphalt.

Regarding the calculation of wastewater flows from basin R-13, a significant portion of the land within collection basin R-13 is currently held under the jurisdiction of the BLM (Bureau of Land Management) while some is held by private landowners. Authorities in the BLM administration have indicated that much of the land in collection basin R-13 will eventually be turned over to SITLA (Utah School and Institutional Trust Land Administration) and ultimately made available for development.

It was assumed for the purposes of calculating wastewater flows from the basin that all lands which are privately held and those lands which are or will become the jurisdiction of SITLA will be developed as specified by the Winston Associates land use plan and will produce wastewater flows accordingly. Conversely, it was assumed that those areas which are to be perpetually held by the BLM will not be developed. In addition, those areas designated as Areas of Critical Environmental Concern (ACEC) will not be developed. As a result, no wastewater flows are expected from BLM or ACEC lands.

N. COLLECTION BASIN R-14

Wastewater collection basin R-14 lies west of Warner Ridge and north of the Fort Pierce Wash drainage divide near the old airport runway. The north edge of the basin borders the south end of Long Valley (see the attached figure).

Master plan wastewater pipe improvements proposed for construction in collection basin R-14 include two components. The first component is the major trunk line extending from the gap in Warner Ridge to the outlet of basin R-14. The major trunk line conveys wastewater effluent from collection basins R-12 and R-13 to the outlet on the north end of basin R-14. The second component is the minor trunk line which collects wastewater effluent from the southern portion of basin R-14 and discharges it to the major trunk line.

Figure 3.B-1 in Appendix A is the wastewater collection basin and land use map which shows the projected Bureau of Land Management (BLM), School and Institutional Trust Lands Administration (SITLA), Areas of Critical Environmental Concern (ACEC) and private land uses within the study area. As can be seen in the figure, the eastern edge of collection basin R-14 will be designated as ACEC land for perpetuity and will therefore produce no wastewater effluent. The remainder of the basin is expected to produce wastewater according to the land uses designated by the Winston Associates land use plan. Much of the basin is zoned for business and industrial development.

The accounting of master plan facility costs for each wastewater collection basin in the study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the general assumptions outlined in the preceding paragraph, the calculation of master plan facility costs for wastewater collection basin R-14 includes the cost of upsizing the proposed trunk lines from 8-inch pipe to pipe of the appropriate segment lengths and diameters as shown in the attached figure. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City. Because the work is to be done in an area where groundwater is not expected to be a problem, no inclusion for expenses arising from construction in groundwater-laden areas is made. In addition, since it is expected that installation of the trunk line will occur prior to the placement of road surfaces, no inclusion has been made for the removal and replacement of asphalt.

Also included in the accounting of master plan costs for collection basin R-14 is a wastewater utilities yard. It is expected that as growth continues in Washington City, the existing utility yard will become inadequate and obsolete. In order to meet the needs of the growing City, an updated and larger yard has been specified. The yard has been proposed for construction in collection basin R-14 because the location is a site that provides the most convenient access to all areas within the study area boundaries.

O. COLLECTION BASIN R-15

Wastewater collection basin R-15 covers the southwestern half of Long Valley and most of Washington Fields and extends north to Nichols Peak and south to beyond the St. George and Washington Canal. Aerial photographs of the basin show that the area is largely undeveloped at this time. However, development in the basin is proceeding at a rapid pace. It is expected that development in the basin will generally follow the land use patterns specified by Winston Associates. Wastewater flows generated from within the basin under buildout conditions are expected to occur according to the calculations presented in Section 2 of this study.

The master plan wastewater system suggested for construction in collection basin R-15 is the most complex system in any of the basins and consists of several components including both proposed and existing trunk lines as well as a water resource recovery facility (WRRF).

The proposed trunk lines in the basin include a 30-inch pipe which would convey wastewater effluent from collection basin R-16 to the proposed Punchbowl Dome WRRF as well as a 24-inch line which would route wastewater from collection basin R-14 to the Punchbowl Dome WRRF. The proposed system also includes the gravity system exiting the WRRF and extending to the regional receiving lines at the border of Washington City and the City of St. George.

The existing wastewater system in collection basin R-15 routes effluent from the northern portion of the basin to the receiving regional lines in the City of St. George. Hydraulic analysis of the existing trunk lines indicates that the system is sized to adequately convey all flows which will be routed to the line under fully developed land use conditions. It does appear that portions of the receiving system are undersized, but since those segments of the system are not under the control of Washington City, no accounting for their improvement has been included in this study.

The attached figure of master plan system improvements for collection basin R-15 shows the recommended location of the proposed Punchbowl Dome WRRF in basin R-15. The purposes of the WRRF are to maximize availability of increasingly precious water by creating a source of secondary irrigation water (estimates show that the Punchbowl Dome WRRF could produce up to 2438 gpm under buildout conditions) and to minimize the capacity increases that will be required on the downstream wastewater system. Flows expected to enter the facility are those generated by collection basins R-9, R-10, R-11, R-12, R-13, R-14 and portions of basin R-15. The location of the WRRF is such that it is convenient to the incoming wastewater lines and will offer efficient charging of the future secondary irrigation system in the area. Additional discussion on water resource recovery facilities is given in Section 4.D of this study.

The accounting of master plan facility costs for each wastewater collection basin in the study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs for each collection basin also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the general assumptions outlined in the preceding paragraph, the calculation of master plan facility costs for wastewater collection basin R-15 includes the cost of upsizing the proposed trunk lines from 8-inch pipe to pipe of the appropriate segment lengths and diameters as shown in the attached figure. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City. Because the work is to be done in an area

where groundwater is expected to be a problem, an inclusion has been given for encountering groundwater during construction of the 10-inch, 12-inch and 21-inch lines.

The alignment of the proposed 30-inch trunk line in wastewater collection basin R-15 is within the St. George and Washington Canal right-of-way. Using this alignment presents unique challenges for the design of a gravity wastewater system. The extremely flat slope of the canal alignment results in the need for unusually large pipe diameters to convey relatively light flows. In addition, the minimal slope requirements and flow velocities specified in the Washington City Construction Design manual are not met. Because of the shallow slopes and slow-moving fluid, self-cleaning of the pipe segments may be hindered and the potential of anaerobic decay of organic matter with the associated production of offensive odors may be a problem. It is suggested that final design of the system consider these facts. The alternative is to construct a force main in place of the proposed gravity line. The obvious disadvantage of constructing the force main is the perpetual requirement for pumping energy.

P. COLLECTION BASIN R-16

Wastewater collection basin R-16 is the area of Washington City south of the Virgin River, east of the Shinob Kibe plateau and north of Nichols Peak. Aerial photographs of the basin show that the area is moderately developed at this time. However, development in the basin is proceeding at a rapid pace and it is expected that this trend will continue until the basin's maximum density is reached.

The master plan wastewater system for basin R-16 consists of two components which are the existing trunk line that conveys wastewater from all regions of the basin to the receiving system in the City of St. George and the proposed 27-inch and 30-inch lines recommended for construction in the St. George and Washington Canal right-of-way. The proposed lines in the canal right-of-way would convey wastewater generated in collection basins R-9, R-10 and R-11 to the Punchbowl Dome Water Resource Recovery Facility (WRRF) proposed for construction in collection basin R-15.

Hydraulic models created to analyze the existing and proposed wastewater systems in Washington City show that if development in basin R-16 continues to the densities specified by the Winston Associates land use plan, upstream segments of the existing trunk line will lack the capacity to convey peak wastewater flows generated in the area. Washington City staff has suggested that even though development in the basin is proceeding at a rapid pace, it is not likely that development in the basin will reach the densities specified by the Winston Associates plan. As a result, no accounting for increasing the capacity of the existing system has been made in the accounting of master plan facility costs for this basin. If necessary, the issue will be dealt with in future planning studies.

The alignment of the proposed 27-inch and 30-inch trunk line in wastewater collection basin R-16 is within the St. George and Washington Canal right-of-way. Using this alignment presents unique challenges for the design of a gravity wastewater system. The extremely flat slope of the canal alignment results in the need for unusually large pipe diameters to convey relatively light flows. In addition, the minimal slope requirements and flow velocities specified in the Washington City Construction Design manual are not met. Because of the shallow slopes and slow-moving fluid, self-cleaning of the pipe segments may be hindered and the potential of anaerobic decay of organic matter with the associated production of offensive odors may be a problem. It is suggested that final design of the system consider these facts. The alternative is to construct a force main in place of the proposed gravity line. The obvious disadvantage of constructing the force main is the perpetual requirement for pumping energy.

The accounting of master plan facility costs for each wastewater collection basin in the study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs for each collection basin also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the general assumptions outlined in the preceding paragraph, the calculation of master plan facility costs for wastewater collection basin R-16 includes the cost of upsizing the proposed trunk lines from 8-inch pipe to pipe of the appropriate segment lengths and diameters as shown in the attached figure. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City.

Q. COLLECTION BASIN R-17

Wastewater collection basin R-17 lies in the southernmost end of Warner Valley and is that portion of the valley which drains southward to the Fort Pierce Wash. Figure 3.B-1 in Appendix A is the wastewater collection basin and land use map which shows the projected Bureau of Land Management (BLM), School and Institutional Trust Lands Administration (SITLA), Areas of Critical Environmental Concern (ACEC) and private land uses within the study area. As can be seen from the map, the BLM will retain a portion of the basin on the western side; in addition, the rugged nature of the terrain in that area makes the possibility of future development slim. A portion of the southern boundary of the basin is covered by a designated ACEC. No wastewater flows are expected from these areas of the collection basin.

It is expected that the remaining portion of the basin will be developed under the estate land use category as identified and defined by the Winston Associates land use plan. Wastewater flows generated within the basin are expected to be typical of developmental densities corresponding to the estate land use. Discussion on how wastewater flows are calculated from the land use plan is presented in Section 2 of this study. The master plan improvements for the basin (shown in the attached figure) consist of a trunk line which would convey wastewater from the basin to a future receiving line in the Fort Pierce Wash.

The accounting of master plan facility costs for each wastewater collection basin in the study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs for each collection basin also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the general assumptions outlined in the preceding paragraph, the calculation of master plan facility costs for wastewater collection basin R-17 includes the cost of upsizing the proposed trunk lines from 8-inch pipe to pipe of the appropriate segment lengths and diameters as shown in the attached figure. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City. Because the work is to be done in an area where groundwater is not expected to be a problem, no inclusion for expenses arising from construction in groundwater-laden areas is made. Finally, since it is expected that installation of the trunk line will occur prior to the placement of road surfaces, no inclusion has been made for the removal and replacement of asphalt.

Communication with St. George City wastewater planners verified that no major studies have as yet been undertaken that have specified a major wastewater trunk line which extends into the upper reaches of Fort Pierce Wash. St. George City has requested that a copy of this plan be provided to them so that future studies can consider how development in areas draining to Fort Pierce Wash will be served.

R. COLLECTION BASIN R-18

Wastewater collection basin R-18 is the southernmost collection basin outlined in the master plan study area. Surface water in the basin ultimately drains to the Fort Pierce Wash. Most of the land in the basin has been designated as an Area of Critical Environmental Concern (ACEC); development is only expected in the very northern edge of the basin. Figure 3.B-1 in Appendix A shows those portions of the basin designated as ACEC land and their location within the basin. It is expected that the developable portion of the basin will be improved under the estate land use category as identified and defined by the Winston Associates land use plan. The master plan improvements for the basin (shown in the attached figure) consist of a trunk line which would convey wastewater from collection basin R-17 to a future receiving line in the Fort Pierce Wash.

The accounting of master plan facility costs for each wastewater collection basin in the study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs for each collection basin also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the general assumptions outlined in the preceding paragraph, the calculation of master plan facility costs for wastewater collection basin R-18 includes the cost of upsizing the proposed trunk line from an 8-inch pipe to a 12-inch pipe. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City. Because the work is to be done in an area where groundwater is not expected to be a problem, no inclusion for expenses arising from construction in groundwater-laden areas is made. Finally, since it is expected that installation of the trunk line will occur prior to the placement of road surfaces, no inclusion has been made for the removal and replacement of asphalt.

Communication with St. George City wastewater planners verified that no major studies have as yet been undertaken that have specified a major wastewater trunk line which extends into the upper reaches of Fort Pierce Wash. St. George City has requested that a copy of this plan be provided to them so that future studies can consider how development in areas draining to Fort Pierce Wash will be served.

S. COLLECTION BASIN R-19

Wastewater collection basin R-19 is located on the southernmost boundary of the study area and drains to the Fort Pierce Wash. Aerial photos of the basin show that the region currently has some light agricultural development. Figure 3.B-1 in Appendix A shows that much of the basin lies within the boundaries of the declared Area of Critical Environmental Concern (ACEC). Much of the remaining portion of the basin is undevelopable due to rugged terrain. Some development, however, is expected in the southwest corner of the basin. When development does occur, wastewater from the basin should be routed to the trunk line proposed in Fort Pierce Wash.

Since the developable area in the basin is relatively small and any wastewater line planned for the area would serve a local rather than regional purpose, no master plan system has been specified for the basin. Furthermore, development in the basin is not expected immediately. As a result, the only cost included in the accounting of master plan system improvements is the shared cost of future master planning in the City. It is expected that more detailed planning for the basin will occur as development in the area approaches the basin.

Communication with St. George City wastewater planners verified that no major studies have as yet been undertaken that have specified a major wastewater trunk line which extends into the upper reaches of Fort Pierce Wash. St. George City has requested that a copy of this plan be provided to them so that future studies can consider how development in areas draining to Fort Pierce Wash will be served.

T. COLLECTION BASIN R-20

Wastewater collection basin R-20 is located at the southwest end of Warner Ridge and includes Beehive Dome within its boundaries. Aerial photographs of the basin show that the region has some light agricultural development. Figure 3.B-1 in Appendix A shows that approximately 65% of the collection basin falls within the designated Area of Critical Environmental Concern (ACEC). However, some development is predicted along the western edge of the basin. Should this occur, wastewater from the basin should be routed to the future trunk line proposed for construction in Fort Pierce Wash.

Since the developable area in the basin is relatively small and any wastewater line planned for the area would serve a local rather than regional purpose, no master plan system has been specified for the basin. Furthermore, development in the basin is not expected immediately. As a result, the only cost included in the accounting of master plan system improvements is the shared cost of future master planning in the City. It is expected that more detailed planning for the basin will occur as development in the area approaches the basin.

Communication with St. George City wastewater planners verified that no major studies have as yet been undertaken that have specified a major wastewater trunk line which extends into the upper reaches of Fort Pierce Wash. St. George City has requested that a copy of this plan be provided to them so that future studies can consider how development in areas draining to Fort Pierce Wash will be served.

U. COLLECTION BASIN R-21

Wastewater collection basin R-21 lies north of basin R-20 on the western side of Warner Ridge. Aerial photographs of the basin show that the region is entirely undeveloped. Figure 3.B-1 in Appendix A shows that approximately 90% of the collection basin falls within the designated Area of Critical Environmental Concern (ACEC). However, some development is possible along the western edge of the basin. Should this occur, wastewater from the basin should be routed to the future trunk line proposed for construction in Fort Pierce Wash.

Since the developable area in the basin is relatively small and any wastewater line planned for the area would serve a local rather than regional purpose, no master plan system has been specified for the basin. As a result, the only cost included in the accounting of master plan system improvements is the shared cost of future master planning in the City. It is expected that more detailed planning for the basin will occur as development in the area approaches the basin.

Communication with St. George City wastewater planners verified that no major studies have as yet been undertaken that have specified a major wastewater trunk line which extends into the upper reaches of Fort Pierce Wash. St. George City has requested that a copy of this plan be provided to them so that future studies can consider how development in areas draining to Fort Pierce Wash will be served.

V. COLLECTION BASIN R-22

Wastewater collection basin R-22 lies on the southern edge of the study area boundary. Figure 3.B-1 in Appendix A shows that only a very small percentage of the basin falls within the designated boundaries of the Area of Critical Environmental Concern (ACEC). The remainder of the basin is slated for industrial development according to the Winston Associates land use plan. The methodologies used for deriving wastewater flows from the land use plan is given in the discussion in Section 2 of this study.

When development in the basin does occur, wastewater from the basin should be routed to the trunk line proposed for construction in the Fort Pierce Wash. Since any wastewater line planned for the area would serve a local rather than regional purpose, no master plan pipe system has been specified for the basin. The only cost included in the accounting of master plan system improvements is the shared cost of future master planning in the City.

Communication with St. George City wastewater planners verified that no major studies have as yet been undertaken that have specified a major wastewater trunk line which extends into the upper reaches of Fort Pierce Wash. St. George City has requested that a copy of this plan be provided to them so that future studies can consider how development in areas of Washington City which drain to Fort Pierce Wash will be served.

W. COLLECTION BASIN R-23

Wastewater collection basin R-23 lies south and east of the old airport runway near the southwest corner of the study area. Aerial photographs show that little of the basin is currently developed. However, significant development in the basin is anticipated. Industrial use is the development type specified for the basin by the Winston Associates land use plan. When development in the basin occurs, wastewater from the basin should be routed to the trunk line proposed for construction in the Fort Pierce Wash.

The accounting of master plan facility costs for each wastewater collection basin in the study assumes that developers are responsible for installing a wastewater pipe system of the appropriate size and alignment to convey flows generated by their development to the nearest constructed trunk line with adequate receiving capacity. It is generally assumed that an 8-inch line is sufficient for this purpose. The accounting of master plan facility costs for each collection basin also assumes that Washington City will pay the cost of upsizing a developer's wastewater line, when that line is considered a trunk line, using wastewater impact fee funds.

Considering the general assumptions outlined in the preceding paragraph, the calculation of master plan facility costs for wastewater collection basin R-23 includes the cost of upsizing the proposed trunk line from an 8-inch pipe to a 10-inch pipe. The calculation also includes the cost of mapping the system in the City's GIS (Global Information Systems) as well as the shared cost of future master planning in the City. Because the work is to be done in an area where groundwater is not expected to be a problem, no inclusion for expenses arising from construction in groundwater-laden areas is made. Furthermore, since it is expected that installation of the trunk line will occur prior to the placement of road surfaces, no inclusion has been made for the removal and replacement of asphalt.

Communication with St. George City wastewater planners verified that no major studies have as yet been undertaken that have specified a major wastewater trunk line which extends into the upper reaches of Fort Pierce Wash. St. George City has requested that a copy of this plan be provided to them so that future studies can consider how development in areas of Washington City draining to the Fort Pierce Wash will be served.

X. ST. GEORGE FIELDS WRRF

It is recommended that Washington City join with the City of St. George in constructing a water resource recovery facility (WRRF) at the confluence of the major trunk lines exiting collection basin R-15. This will facilitate capture of useful secondary irrigation water from the wastewater stream and allow the resource to be used throughout the area. In addition, it will minimize the requirement for downstream receiving lines to be upsized by the City of St. George.

Figure 5.A-1 in Appendix A shows the recommended location of the proposed St. George fields WRRF outside wastewater collection basin R-15. The purposes of the WRRF are to maximize availability of increasingly precious water resources by creating a source of secondary irrigation water and to minimize the capacity increases that will be required on the downstream wastewater system. Flows expected to enter the facility are those generated by collection basins R-16, portions of collection basin R-15, the average discharge flow from the Punchbowl Dome WRRF (see the discussion for collection basin R-15), and those flows generated by upstream areas of St. George City. Additional discussion on water resource recovery facilities is given in Section 4.D of this study.

Based on flows currently projected to enter the facility from both Washington City and St. George City, the St. George Fields WRRF is expected to produce approximately 1,735 gpm of secondary irrigation water assuming the contributing collection areas develop fully as specified by applicable land use plans. Estimates show that the St. George Fields WRRF could produce up to 1,236 gpm of secondary irrigation water under buildout conditions based on Washington City flows alone.

Because the St. George Fields WRRF falls outside any of the designated wastewater collection basins, the cost of the facility is included in the accounting of master plan system costs as an individual entity. The cost given in the accounting is the cost of a facility that is sized to treat Washington City flows